BALLUFF

sensors worldwide

Object Detection

... inductive, photoelectric, magnetic field, capacitive





Balluff is a worldwide leading company in the field of position detection.

Our product lines include electronic sensors, transducers employing various operating principles, identification systems, bus-capable sensors as well as electromechanical and inductive multiple and single position switches. Balluff products are found wherever accuracy and reliability are demanded.

Wherever there is a need to automate, sense objects, or report linear and rotary motion to controllers – Balluff is always the right partner.

Our QM system meets the requirements of DIN EN ISO 9001:2000. Eleven Balluff companies have a certified QM system, two a certified environmental protection system. By mastering process-capable production and assembly techniques and statistical process control we achieve consistently high product quality. Intensive testing prior to series production ensures reliable function.

With more than 50 years of experience in the field of sensors, the Balluff Group is today one of the most capable manufacturers of standard as well as custom position switches. Innovative technology and application-specific customer solutions are the hallmarks of the entire product range.

Highly qualified development engineers and experienced designers work closely with the manufacturing side to ensure mature series products that are used successfully in every area of automation – even under extreme and aggressive operating conditions.

CERTIFIED DIN EN ISO 9001 QUALITY SYSTEM

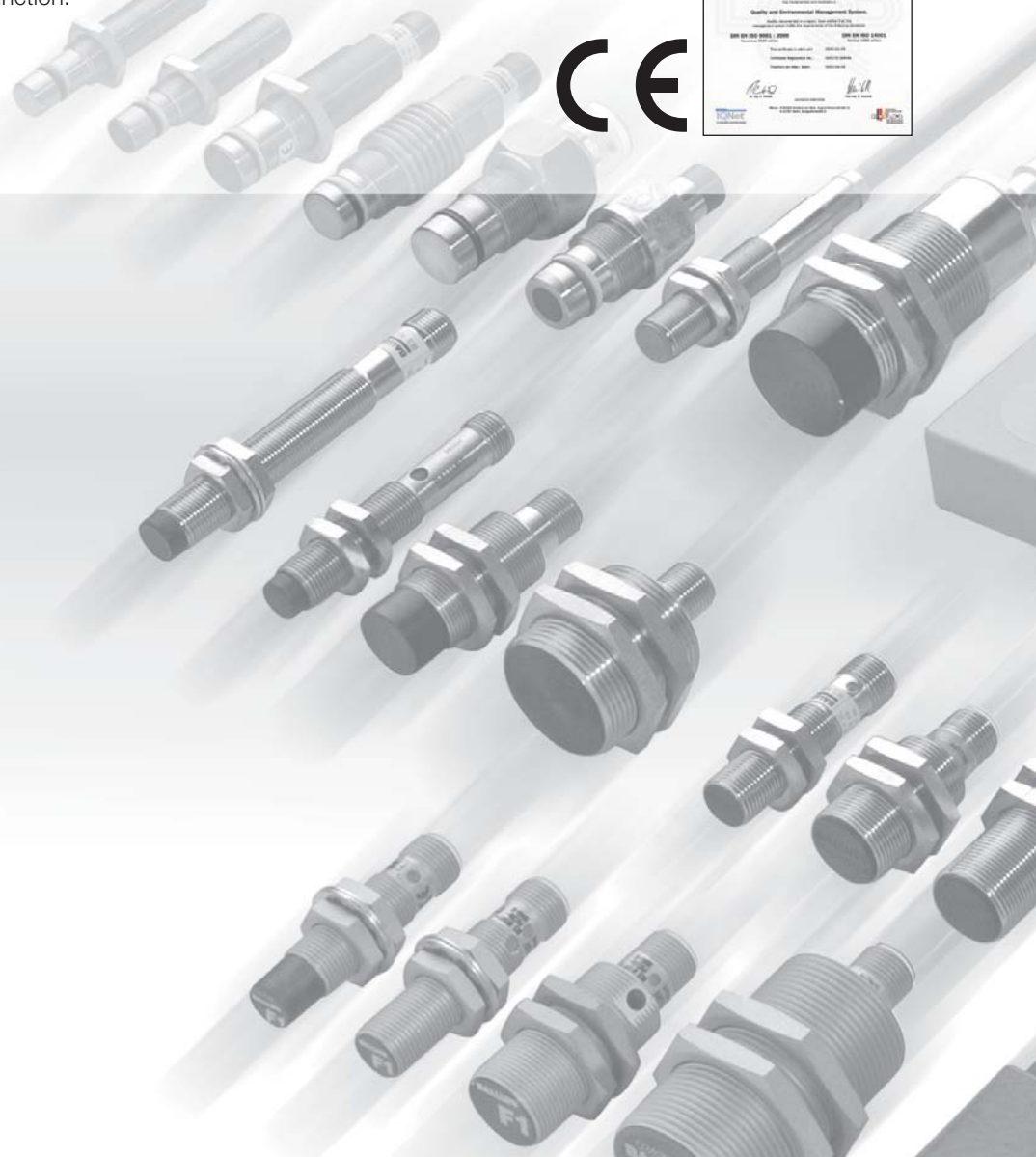

CERTIFICATE

CE









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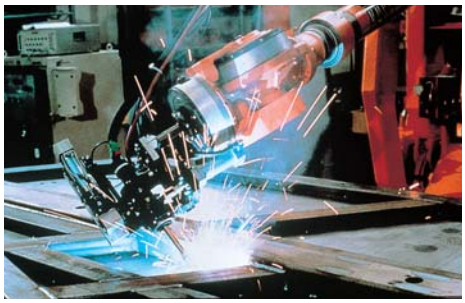
- Inductive Distance Sensors
- Magneto-inductive Position Sensors
- Photoelectric Distance Sensors

Please ask for separate brochure!

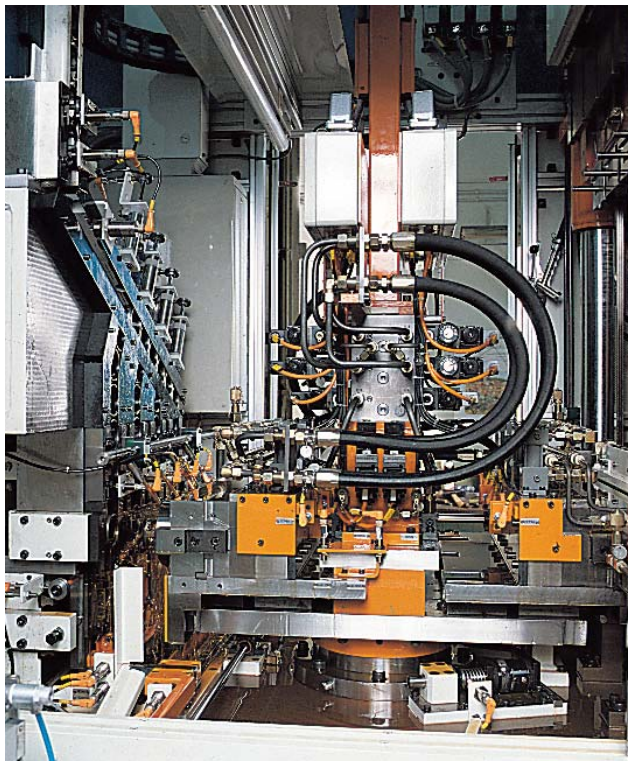










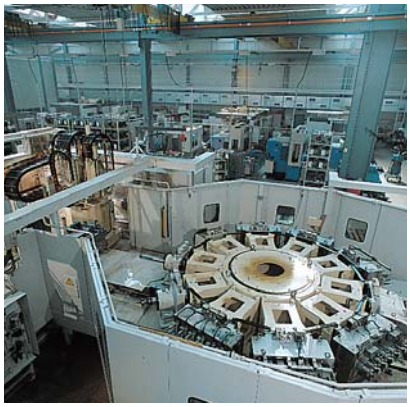


The increasing automation of production processes means that machines and equipment need to be equipped with controls and sensors.

The sensors are the sensory organs of the machine. They monitor the position of machine members, detect flaws and damage on tools and incorporate the data they gather into the material flow at process speed.

Sensors are needed to meet the demand for increased flexibility of production lines and automatic quality control, improved occupational safety, material and energy conservation.

Sensors must be adapted to their environment and be able to communicate with other systems.







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i Alphanumeric Directory

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1.0.4 Electrical connection values
1.0.6 Wiring diagrams
1.0.7 Series/parallel connection

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3.0.2 Product overview
3.0.3 General description, principles of operation
3.0.5 Installation notes
3.0.6 Ambient notes

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3.2.2 BMF Ø 6.5 mm...M12

4 Capacitive Sensors

4.2 Principles, definitions
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2.1.104 BLG Light grids

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2.3.9 Mounting cuff, Mounting clamps
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4.15 DC Ø 20 mm
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5.46 Fasteners
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General operating instructions can be found at the end of section **5**.

Object Detection

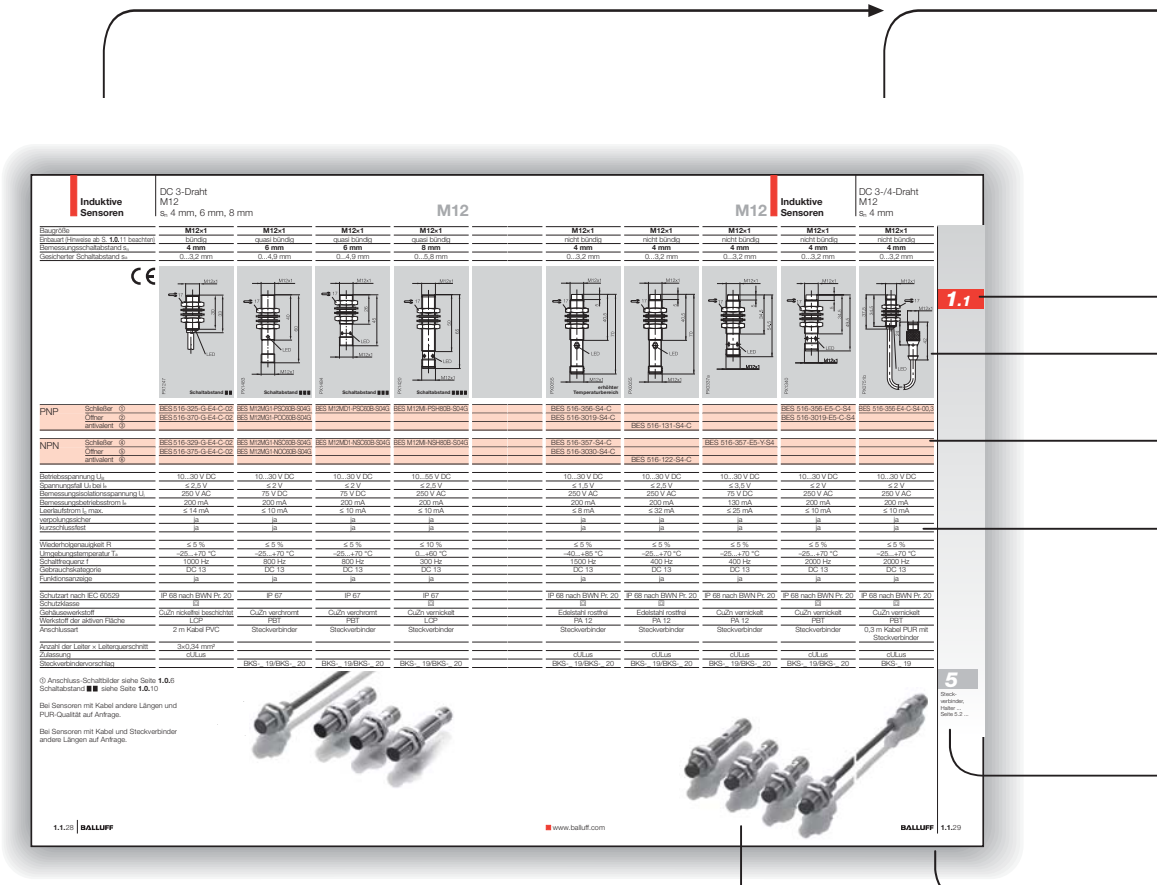
648 pages of information, over 2100 products – optimized for every automation task:

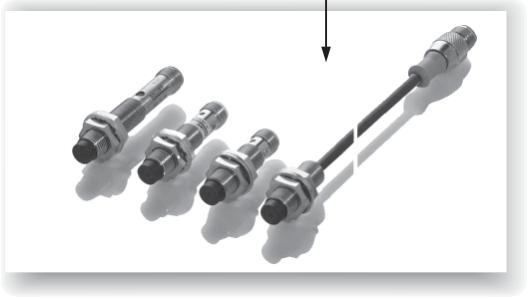
- Inductive Sensors
- Photoelectric Sensors
- Sensors for Pneumatic Cylinders
- Magnetic Field Sensors
- Capacitive Sensors
- Accessories

General information and technical explanations introduce each section.

Please observe the installation notes!

Column arrangement of sensors:
Housing size, mounting rated and assured operating distance



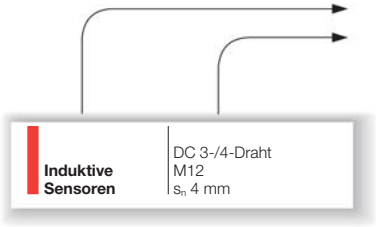


Photographic illustrations help you search for the desired sensor.

Object Detection – Page Overview

Do you already know the ordering code for your Balluff sensor? The alphanumeric product listing tells you on which page to find it.

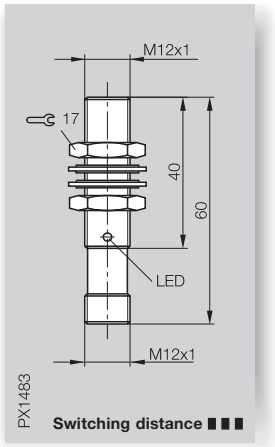
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Section

Page overview: output type housings (tubular, block style) operating distance ...

Dimensional housing drawing



Ordering code, switching function with reference to wiring diagrams.

Technical data per IEC (specifications, electrical data, mechanical data). References to connection options (PVC or PUR cable, connectors ...).

Reference to accessories

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to
BES 516-324-SA8-02

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6-KT. Winkelsatz 0,7-2,0		5.74
BCS 010-POB-1-L-PU-02	new	4.8
BCS 010-PSB-1-L-PU-02		4.8
BCS 012-PS-1-L-S4		4.9
BCS 012-PSB-1-L-S4		4.8
BCS 20MG10-XPA1Y-8B-03		4.15
BCS G34KN2-NOC20G-AV02	new	4.11
BCS G34KN2-NSC24G-AV02		4.11
BCS G34KN2-POC20G-AV02	new	4.11
BCS G34KN2-PSC24G-AV02		4.11
BCS G34KN2-UOT20G-AV02	new	4.12
BCS G34KN2-UST20G-AV02	new	4.12
BCS M08EG1-PSC15C-S49G	new	4.8
BCS M08EG-PSC30G-S49G	new	4.8
BCS M12ED-XXS40B-BP02-GZ01		4.16
BCS M12EG2-XXS10B-BT01-GZ01-501		4.16
BCS M18EM1-POC80C-S04G	new	4.9
BCS M18EM1-PSC80C-S04G		4.9
BCS M18EM-POC15G-S04G	new	4.9
BCS M18EM-PSC15G-S04G	new	4.9
BCS M18KM3-NOC80G-BV02	new	4.9
BCS M18KM3-NSC80G-BV02		4.9
BCS M18KM3-POC80G-BV02	new	4.9
BCS M18KM3-POC80G-S04G-001		4.9
BCS M18KM3-PSC80G-BV02		4.9
BCS M18KM3-PSC80G-S04G		4.9
BCS M18KM3-UOT80G-BV02	new	4.12
BCS M18KM3-UST80G-BV02	new	4.12
BCS M30EG2-PSC30G-S04K	new	4.10
BCS M30EM2-PSC20C-S04K	new	4.10
BCS M30KM7-PPH15G-S04U		4.10
BCS M30KN2-NOC15G-AV02	new	4.10
BCS M30KN2-NSC18G-AV02		4.10
BCS M30KN2-POC15G-AV02	new	4.10
BCS M30KN2-PSC18G-AV02		4.10
BCS M30KN2-UOT15G-AV02	new	4.12
BCS M30KN2-UST15G-AV02	new	4.12
BCS R08KE-POC80C-EP00,2-GS49	new	4.13
BCS R08KE-POCFAC-EP00,2-GS49	new	4.13
BCS R08KE-PSC80C-EP00,2-GS49	new	4.13
BCS R08KE-PSCFAC-EP00,2-GS49	new	4.13
BDD-UM 3023		5.45
BES 03,0-KB-3		5.63
BES 04,0-KB-1		5.62
BES 04,0-KB-3		5.63
BES 05,0-KB-1		5.62
BES 05,0-KB-3		5.63
BES 05,0-KH-2S		5.59
BES 06,5-BS-1		5.62
BES 06,5-KB-1		5.62
BES 06,5-KB-3		5.63
BES 06,5-KB-7		5.62
BES 08,0-BS-1		5.62
BES 08,0-KB-3		5.63
BES 08,0-KB-3-F		5.63
BES 08,0-KB-4-F		5.64
BES 08,0-KB-5-F	new	5.64
BES 08,0-KB-7		5.62
BES 08,0-KH-2L		5.59
BES 08,0-KH-2L/W		5.59
BES 08,0-KH-2S		5.59
BES 08,0-KH-2S/W		5.59
BES 08,0-KH-3L		5.61
BES 08,0-KH-4-F		5.59
BES 08,0-KH-6L	new	5.61
BES 08,0-KH-6L/W	new	5.61
BES 08-DM-1		5.73
BES 08-FA-49		5.66
BES 08-FA-89		5.66
BES 08-FA-BS-4,0-G		5.66
BES 08-FA-BS-4,0-W		5.66
BES 08-FA-BS-8,0-G		5.66
BES 08-FA-BS-8,0-W		5.66
BES 08-HW-1		5.65
BES 08-SM-1		5.70
BES 08-SM-1F	new	5.70
BES 113-3019-SA1-S4		1.5.18
BES 113-356-SA31-S4		1.5.18
BES 113-356-SA6-S4		1.5.18
BES 113-FD-1		1.5.19
BES 12,0-BS-1		5.62
BES 12,0-KB-2		5.62
BES 12,0-KB-2-F		5.62
BES 12,0-KB-3		5.63
BES 12,0-KB-3-F		5.63
BES 12,0-KB-3-F-SA1		5.63
BES 12,0-KB-3-F-SA2		5.63
BES 12,0-KB-4-F		5.64
BES 12,0-KB-5-F		5.64
BES 12,0-KB-602-02/12		5.67
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BES 12,0-KB-602-06/12		5.67
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BES 12,0-KH-2L/W		5.59
BES 12,0-KH-2S		5.59
BES 12,0-KH-2S/W		5.59
BES 12,0-KH-3L		5.61
BES 12,0-KH-3X	new	5.61
BES 12,0-KH-4		5.59
BES 12,0-KH-4-F		5.59
BES 12,0-KH-5F	new	5.61
BES 12-FA-70		5.66
BES 12-HW-1		5.65
BES 12-SM-2		5.70
BES 14,5-BS-1		5.62
BES 16,0-BS-1		5.62
BES 16-HW-1		5.65
BES 18,0-BS-1		5.62
BES 18,0-KB-2		5.62
BES 18,0-KB-3		5.63
BES 18,0-KB-3-F		5.63
BES 18,0-KB-3-F-SA1		5.63
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BES 18,0-KB-4-F		5.64
BES 18,0-KB-5-F		5.64
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BES 18-HW-1		5.65
BES 18-SM-1		5.70
BES 18-SM-2		5.71
BES 18-SM-3		4.9
BES 20,0-BS-1		5.62
BES 22,0-BS-1		5.62
BES 24-HW-1		5.65
BES 30,0-BS-1		5.62
BES 30,0-KB-3-F		5.63
BES 30,0-KB-4-F		5.64
BES 30,0-KB-5-F		5.64
BES 30,0-KH-2L		5.29
BES 30,0-KH-2L/W		5.59
BES 30,0-KH-2S		5.59
BES 30,0-KH-2S/W		5.59
BES 30,0-KH-4		5.59
BES 30,0-KH-4-F		5.59
BES 30-HW-1		5.65
BES 30-SM-1		5.71
BES 30-SM-2		5.71
BES 30-SM-3		4.10
BES 36,0-BS-1		5.62
BES 36-HW-1		5.65
BES 515-123-S4-C		1.5.47
BES 515-325-B0-C-PU-03		1.5.44
BES 515-325-E5-T-S4		1.5.49
BES 515-325-S4-C		1.5.44
BES 515-326-B0-C-PU-03		1.5.46
BES 515-326-E5-T-S4		1.5.49
BES 515-326-S4-C		1.5.46
BES 515-327-E5-T-S4		1.5.49
BES 515-327-S4-C		1.5.47
BES 515-356-B0-C-03		1.5.45
BES 515-356-E4-C-03		1.5.45
BES 515-356-E5-T-S4		1.5.49
BES 515-356-S4-C		1.5.45
BES 515-360-B0-C-PU-03		1.5.47
BES 515-360-E5-T-S4		1.5.49
BES 515-360-S4-C		1.5.47
BES 515-362-S4-C		1.5.47
BES 516-100-S45-S4-D		1.5.29
BES 516-105-B0-C-03		1.1.34
BES 516-105-G-S4-H		1.1.35
BES 516-105-S4-C		1.1.33
BES 516-105-SA2-05		1.5.43
BES 516-105-SA5		1.5.43
BES 516-111-B0-C-03		1.1.34
BES 516-111-S4-C		1.1.33
BES 516-113-B0-C-03		1.1.25
BES 516-113-S4-C		1.1.24

BES 516-114-B0-C-03		1.1.41
BES 516-114-G-S4-H		1.1.42
BES 516-114-S4-C		1.1.40
BES 516-114-SA1-05		1.5.43
BES 516-118-B0-C-03		1.1.25
BES 516-118-S4-C		1.1.24
BES 516-120-B0-C-03		1.1.41
BES 516-120-S4-C		1.1.40
BES 516-120-SA2		1.5.43
BES 516-122-B0-C-03		1.1.30
BES 516-122-S4-C		1.1.29
BES 516-123-B0-C-03		1.1.38
BES 516-123-G-S4-H		1.1.39
BES 516-123-S4-C		1.1.37
BES 516-124-B0-C-03		1.1.38
BES 516-124-S4-C		1.1.37
BES 516-125-B0-C-03		1.1.45
BES 516-125-S4-C		1.1.44
BES 516-125-SA1-05		1.5.43
BES 516-126-B0-C-03		1.1.45
BES 516-131-B0-C-03		1.1.30
BES 516-131-S4-C		1.1.29
BES 516-133-M0-C-02		1.1.59
BES 516-133-M0-C-S4-00,2		1.1.59
BES 516-160-H3-L		1.1.61
BES 516-161-H3-L		1.1.61
BES 516-207-S27-E		1.3.2
BES 516-208-S27-E		1.3.2
BES 516-209-S27-E		1.3.3
BES 516-210-S27-E		1.3.3
BES 516-211-E5-E-S27		1.3.3
BES 516-212-E5-E-S27		1.3.3
BES 516-213-E5-E-S27		1.3.3
BES 516-214-E5-E-S27		1.3.3
BES 516-215-E5-E-S27		1.3.3
BES 516-216-E5-E-S27		1.3.3
BES 516-217-E5-E-S27		1.3.3
BES 516-218-E5-E-S27		1.3.3
BES 516-3		5.41
BES 516-3005-E4-C-PU-02		1.1.7
BES 516-3005-E4-C-S4-00,3	new	1.1.6
BES 516-3005-E4-C-S49-00,3		1.1.6
BES 516-3005-E5-C-S49		1.1.6
BES 516-3005-G-E4-C-PU-02		1.1.8
BES 516-3005-G-E4-C-S26-00,3		1.1.8
BES 516-3005-G-E4-C-S4-00,2		1.1.7
BES 516-3005-G-E4-C-S49-00,3		1.1.7
BES 516-3005-G-E5-C-S49		1.1.7
BES 516-3006-E5-C-S49		1.1.6
BES 516-3006-G-E4-C-PU-02		1.1.8
BES 516-3006-G-E5-C-S49		1.1.7
BES 516-3007-E4-C-PU-02		1.1.3
BES 516-3007-E4-C-S49-00,3		1.1.3
BES 516-3007-E5-C-S49		1.1.3
BES 516-3007-G-E4-C-PU-02		1.1.5
BES 516-3007-G-E4-C-S26-00,2		1.1.5
BES 516-3007-G-E4-C-S4-00,2		1.1.4
BES 516-3007-G-E4-C-S49-00,3		1.1.4
BES 516-3007-G-E5-C-S49		1.1.4
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BES 516-3008-E5-C-S49		1.1.3
BES 516-3008-G-E4-C-PU-02		1.1.5
BES 516-3008-G-E4-C-S49-00,2		1.1.4
BES 516-3008-G-E5-C-S49		1.1.4
BES 516-300-S128-S4-D		1.5.27
BES 516-300-S129-S4-D		1.5.27
BES 516-300-S135-D-PU-05		1.5.30
BES 516-300-S135-NEX-S4-D		1.5.37
BES 516-300-S135-S4-D		1.5.29
BES 516-300-S144-S4-D		1.5.27
BES 516-300-S149-S4-D		1.5.26
BES 516-300-S152-S4-D		1.5.26
BES 516-300-S156-S4-D		1.5.26
BES 516-300-S162-D-PU-05		1.5.30
BES 516-300-S162-S4-D		1.5.29
BES 516-300-S163-S4-D		1.5.28
BES 516-300-S164-S4-D		1.5.28
BES 516-300-S166-02		1.1.50
BES 516-300-S166-S49		1.1.50
BES 516-300-S170-02		1.1.50
BES 516-300-S170-S49		1.1.50
BES 516-300-S178-D-PU-05		1.5.30
BES 516-300-S180-02		1.1.50
BES 516-300-S180-S49		1.1.50
BES 516-300-S190-S4		1.5.31
BES 516-300-S202-02		1.1.50
BES 516-300-S202-S49		1.1.50
BES 516-300-S203		1.5.31
BES 516-300-S205-D-PU-03		1.5.25
BES 516-300-S237-D-PU-05		1.5.26
BES 516-300-S240-D-PU-03		1.5.31
BES 516-300-S242-S4-D		1.5.28
BES 516-300-S249-NEX-S4-D		1.5.37
BES 516-300-S249-S4-D		1.5.30
BES 516-300-S254-S49		1.1.50
BES 516-300-S255		1.1.54
BES 516-300-S260-S4-D		1.5.27
BES 516-300-S262-NEX-S4-D		1.5.37
BES 516-300-S262-S4-D		1.5.30
BES 516-300-S265-S4-D		1.5.29
BES 516-300-S270-S4-D		1.5.23
BES 516-300-S279		1.1.54
BES 516-300-S281-S4-D		1.5.29
BES 516-300-S289-B0-D-PU-05		1.5.23
BES 516-300-S291-S4-D		1.5.23
BES 516-300-S292-B0-D-PU-05		1.5.23
BES 516-300-S298-S4-D		1.5.29
BES 516-300-S300-S4-D		1.5.28
BES 516-300-S305-S4-D	new	1.5.30
BES 516-300-S308-NEX-S4-D		1.5.37
BES 516-300-S315-S4-N		1.5.38
BES 516-300-S318-S4-N	new	1.5.38
BES 516-300-S321-NEX-S4-D	new	1.5.37
BES 516-300-S321-S4-D	new	1.5.25
BES 516-300-S322-S4-D	new	1.5.25
BES 516-300-S323-S4-D	new	1.5.25
BES 516-300-S324-S4-D	new	1.5.25
BES 516-3017-E4-C-S49-00,3		1.1.3
BES 516-3017-E5-C-S49		1.1.3
BES 516-3017-G-E4-C-PU-02		1.1.5
BES 516-3017-G-E4-C-S4-00,2		1.1.4
BES 516-3017-G-E4-C-S49-00,3	new	1.1.4
BES 516-3017-G-E5-C-S49		1.1.4
BES 516-3018-G-E4-C-PU-02		1.1.5
BES 516-3018-G-E5-C-S49		1.1.4
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BES 516-3019-E4-C-02		1.1.30
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BES 516-3019-S4-C		1.1.29
BES 516-3021-G-E4-C-02		1.1.11
BES 516-3021-G-E5-C-S49		1.1.11
BES 516-3022-E5-C-S49		1.1.6
BES 516-3022-G-E4-C-PU-02		1.1.8
BES 516-3022-G-E4-C-S49-00,3	new	1.1.7
BES 516-3022-G-E5-C-S49		1.1.7
BES 516-3023-G-E4-C-PU-02		1.1.8
BES 516-3023-G-E5-C-S49		1.1.7
BES 516-3025-G-E5-C-S49		1.1.11
BES 516-3026-B0-C-02		1.1.38
BES 516-3026-E4-Y-02		1.1.38
BES 516-3026-E5-Y-S4		1.1.38
BES 516-3026-S4-C		1.1.37
BES 516-3028-E5-Y-S4		1.1.41
BES 516-3028-G-E4-Y-02		1.1.43
BES 516-3028-G-E5-Y-S4		1.1.42
BES 516-3028-S4-C		1.1.40
BES 516-3029-B0-C-02		1.1.45
BES 516-3029-E4-Y-02		1.1.45
BES 516-3029-E5-Y-S4		1.1.44
BES 516-3029-S4-C		1.1.44
BES 516-3030-B0-C-02		1.1.30
BES 516-3030-E4-C-02		1.1.30
BES 516-3030-S4-C		1.1.29
BES 516-3031-B0-C-02		1.1.38
BES 516-3033-B0-C-02		1.1.45
BES 516-3033-S4-C		1.1.44
BES 516-3040-I02-C-PU-02		1.1.47
BES 516-3040-I02-C-S4-00,3	new	1.1.47
BES 516-3040-I02-C-S49		1.1.47
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BES 516-3041-I02-C-PU-02		1.1.47
BES 516-3041-I02-C-S49		1.1.47
BES 516-3042-I02-C-PU-02		1.1.47
BES 516-3042-I02-C-S49		1.1.47
BES 516-3043-I02-C-PU-02	new	1.1.47
BES 516-3043-I02-C-S49	new	1.1.47
BES 516-3044-G-E4-C-PU-02		1.1.2
BES 516-3044-G-E4-C-S49-00,3		1.1.2
BES 516-3045-G-E4-C-PU-02	new	1.1.2
BES 516-3046-G-E4-L-PU-02		1.1.2
BES 516-3048-G-E4-C-PU-02		1.1.3
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BES 516-324-E0-C-02		1.1.17
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BES 516-324-SA17-05		1.5.22
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BES 516-324-SA33		1.1.14
BES 516-324-SA44-C-02		1.1.17
BES 516-324-SA45-E4-C-PU-03		1.1.17
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BES 516-325-E5-C-S4	1.1.24
BES 516-325-E5-Y-S49	1.1.25
BES 516-325-G-E4-C-02	1.1.28
BES 516-325-G-E4-C-S4-00,5	1.1.27
BES 516-325-G-E5-C-S4	1.1.27
BES 516-325-G-E5-C-S49	1.1.27
BES 516-325-G-S4-C	1.1.26
BES 516-325-S4-C	1.1.24
BES 516-325-S4-W	1.5.10
BES 516-325-SA19-03	1.5.42
BES 516-325-SA45	1.1.25
BES 516-325-SA56-03	1.1.26
BES 516-326-B0-C-02	1.1.34
BES 516-326-E4-C-02	1.1.35
BES 516-326-E5-C-S4	1.1.34
BES 516-326-G-B0-C-PU-02	1.1.36
BES 516-326-G-E4-Y-02	1.1.37
BES 516-326-G-E5-Y-S4	1.1.36
BES 516-326-G-E5-Y-S49	1.1.36
BES 516-326-G-S4-C	1.1.35
BES 516-326-G-S4-H	1.1.35
BES 516-326-S4-C	1.1.33
BES 516-326-S4-W	1.5.10
BES 516-326-SA23-03	1.5.23
BES 516-327-B0-C-02	1.1.41
BES 516-327-E4-Y-02	1.1.41
BES 516-327-E5-Y-S4	1.1.41
BES 516-327-G-E4-Y-02	1.1.43
BES 516-327-G-E5-Y-S4	1.1.42
BES 516-327-G-E5-Y-S49	1.1.43
BES 516-327-S4-C	1.1.40
BES 516-327-S4-W	1.5.11
BES 516-329-B0-C-02	1.1.25
BES 516-329-E4-C-02	1.1.26
BES 516-329-E5-C-S4	1.1.24
BES 516-329-G-E4-C-02	1.1.28
BES 516-329-G-E5-C-S4	1.1.27
BES 516-329-G-E5-C-S49	1.1.27
BES 516-329-S4-C	1.1.24
BES 516-329-SA14-A0-X-03	1.5.42
BES 516-340-H2-Y	1.1.60
BES 516-341-H2-Y	1.1.60
BES 516-341-H2-Y-S4	1.1.60
BES 516-343-E0-C-02	1.1.17
BES 516-343-E4-C-02	1.1.17
BES 516-343-G-E4-C-02	1.1.20
BES 516-343-G-E5-C-S49	1.1.19
BES 516-343-S49-C	1.1.15
BES 516-344-H2-Y	1.1.60
BES 516-346-H2-Y	1.1.60
BES 516-346-H2-Y-S4	1.1.60
BES 516-346-H2-Y-S49	1.1.60
BES 516-347-M0-C-02	1.1.59
BES 516-347-M0-C-S4-00,2	1.1.58
BES 516-347-M0-C-S49	1.1.58
BES 516-347-M0-C-S49-00,2	1.1.59
BES 516-347-SA2-03	1.5.43
BES 516-349-E4-C-02	1.1.12
BES 516-350-E4-C-02	1.1.12
BES 516-355-B0-C-02	1.1.34
BES 516-355-E5-Y-S4	1.1.33
BES 516-355-G-E4-Y-02	1.1.37
BES 516-355-G-E5-Y-S4	1.1.36
BES 516-355-G-E5-Y-S49	1.1.36
BES 516-355-S4-C	1.1.33
BES 516-356-B0-C-02	1.1.30
BES 516-356-E4-C-02	1.1.30
BES 516-356-E4-C-S4-00,3	1.1.29
BES 516-356-E5-C-S4	1.1.29
BES 516-356-S4-C	1.1.29
BES 516-356-S4-W	1.5.10
BES 516-357-B0-C-02	1.1.30
BES 516-357-E4-Y-02	1.1.30
BES 516-357-E5-Y-S4	1.1.29
BES 516-357-S4-C	1.1.29
BES 516-359-B0-C-02	1.1.41
BES 516-359-E4-Y-02	1.1.41
BES 516-359-E5-Y-S4	1.1.41
BES 516-359-G-E4-Y-02	1.1.43
BES 516-359-G-E5-Y-S49	1.1.43
BES 516-359-S4-C	1.1.40
BES 516-360-B0-C-02	1.1.38
BES 516-360-E4-Y-02	1.1.38
BES 516-360-E5-Y-S4	1.1.38
BES 516-360-G-S4-H	1.1.39
BES 516-360-S4-C	1.1.37
BES 516-360-S4-W	1.5.10
BES 516-361-B0-C-02	1.1.38
BES 516-361-E4-Y-02	1.1.38
BES 516-361-E5-Y-S4	1.1.38
BES 516-361-S4-C	1.1.37
BES 516-362-B0-C-02	1.1.45
BES 516-362-E4-Y-02	1.1.45
BES 516-362-E5-Y-S4	1.1.44
BES 516-362-G-S4-H	1.1.45
BES 516-362-S4-C	1.1.44
BES 516-362-S4-H	1.1.44
BES 516-362-S4-W	1.5.11
BES 516-363-B0-C-02	1.1.45
BES 516-363-E4-Y-02	1.1.45
BES 516-363-E5-Y-S4	1.1.44
BES 516-363-S4-C	1.1.44
BES 516-366-G-E4-Y-02	1.1.37
BES 516-366-G-E5-Y-S49	1.1.36
BES 516-366-S4-C	1.1.33
BES 516-367-E5-Y-S4	1.1.33
BES 516-367-G-E4-Y-02	1.1.37
BES 516-367-G-E5-Y-S4	1.1.36
BES 516-367-G-E5-Y-S49	1.1.36
BES 516-367-S4-C	1.1.33
BES 516-370-B0-C-02	1.1.25
BES 516-370-E4-C-02	1.1.26
BES 516-370-E5-C-S4	1.1.24
BES 516-370-G-E4-C-02	1.1.28
BES 516-370-G-E5-C-S4	1.1.27
BES 516-370-G-E5-C-S49	1.1.27
BES 516-370-S4-C	1.1.24
BES 516-370-SA9-E5-C-S4	1.5.23
BES 516-371-E0-C-02	1.1.10
BES 516-371-E0-C-S49-00,5	1.1.9
BES 516-371-E4-C-02	1.1.10
BES 516-371-E4-C-S49-00,3	1.1.9
BES 516-371-E5-C-S49	1.1.9
BES 516-371-G-E4-C-02	1.1.11
BES 516-371-G-E4-C-S49-00,3	1.1.11
BES 516-371-G-E5-C-S49	1.1.11
BES 516-371-G-S49-C	1.1.11
BES 516-371-S49-C	1.1.9
BES 516-371-SA10-02	1.1.10
BES 516-371-SA10-S4-00,3 new	1.1.9
BES 516-371-SA10-S49-00,3 new	1.1.10
BES 516-371-SA13-PU-02	1.1.12
BES 516-371-SA15-C-S49	1.1.11
BES 516-372-E4-C-02	1.1.10
BES 516-372-G-E4-C-02	1.1.11
BES 516-372-G-E5-C-S49	1.1.11
BES 516-372-SA1-02	1.1.10
BES 516-375-B0-C-02	1.1.25
BES 516-375-E4-C-02	1.1.26
BES 516-375-E5-C-S4	1.1.24
BES 516-375-G-E4-C-02	1.1.28
BES 516-375-G-E5-C-S4	1.1.27
BES 516-375-G-E5-C-S49	1.1.27
BES 516-375-S4-C	1.1.24
BES 516-377-E0-C-02	1.1.17
BES 516-377-E0-C-S49-00,2	1.1.15
BES 516-377-E3-C-S4-PU-00,3 new	1.1.16
BES 516-377-E4-C-02	1.1.17
BES 516-377-G-E4-C-02	1.1.20
BES 516-377-G-E4-C-S49-00,3	1.1.19
BES 516-377-G-E5-C-S49	1.1.19
BES 516-377-G-S49-C	1.1.18
BES 516-377-S49-C	1.1.15
BES 516-378-E0-C-02	1.1.17
BES 516-378-E4-C-02	1.1.17
BES 516-378-G-E4-C-02	1.1.20
BES 516-378-G-E5-C-S49	1.1.19
BES 516-378-S49-C	1.1.15
BES 516-383-E0-C-02	1.1.22
BES 516-383-E4-C-02	1.1.22
BES 516-383-S49-C	1.1.21
BES 516-384-E0-C-02	1.1.22
BES 516-384-E4-C-02	1.1.22
BES 516-4	5.41
BES 516-418-E4-L-02 new	1.4.3
BES 516-418-E5-L-S27 new	1.4.3
BES 516-420-E4-L-02 new	1.4.3
BES 516-420-E5-L-S27 new	1.4.3
BES 516-449-BO-L-02 new	1.4.3
BES 516-449-S27-L new	1.4.2
BES 516-527-E0-H-03	1.2.2
BES 516-527-S4-H	1.2.2
BES 516-539-S4-H	1.2.6

BES 516-541-S4-H		1.2.8
BES 516-543-B0-H-03		1.2.4
BES 516-543-S4-H		1.2.4
BES 516-545-B0-H-03		1.2.5
BES 516-545-S4-H		1.2.5
BES 516-547-S4-H		1.2.7
BES 516-549-S4-H		1.2.9
BES 516-611-A-1		5.37
BES 516-615-NS-1-PU-05		5.36
BES 516-615-PS-1-PU-05		5.36
BES 516-620-PS-02		4.16
BES 516-7	new	5.41
BES 516-706-A-3		5.39
BES 516-706-B-3		5.39
BES 516-706-Z-3		5.39
BES 516-IV 2		5.35
BES 517-132-M3-H		1.1.65
BES 517-132-M3-H-S4		1.1.65
BES 517-132-M5-H		1.1.67
BES 517-132-M5-H-S4		1.1.67
BES 517-132-M6-H		1.1.65
BES 517-132-M6-H-S4		1.1.65
BES 517-132-M7-H		1.1.67
BES 517-132-M7-H-S4		1.1.67
BES 517-134-M3-H		1.1.65
BES 517-134-M5-H		1.1.67
BES 517-134-M5-H-S4		1.1.67
BES 517-134-M6-H		1.1.65
BES 517-134-M6-H-S4		1.1.65
BES 517-139-M4-H		1.1.69
BES 517-139-M5-H		1.1.69
BES 517-140-M5-H		1.1.69
BES 517-140-M5-H-S4		1.1.69
BES 517-1603-QN-S-03		1.1.58
BES 517-1603-QP-S-03		1.1.58
BES 517-1605-QN-S-03		1.1.58
BES 517-1605-QP-S-03		1.1.58
BES 517-223-M3-E		1.3.6
BES 517-223-M5-E		1.3.6
BES 517-224-M4-E		1.3.7
BES 517-224-M5-E		1.3.7
BES 517-351-N0-C-03		1.1.53
BES 517-351-N0-C-S49-00,32		1.1.53
BES 517-351-N1-C		1.1.53
BES 517-351-N2-C		1.1.53
BES 517-351-SA2-C		1.1.53
BES 517-352-N0-C-03		1.1.53
BES 517-352-N1-C		1.1.53
BES 517-352-N2-C		1.1.53
BES 517-385-M3-CW-S		1.5.13
BES 517-385-M3-CW-S-S4		1.5.13
BES 517-385-MV-C		1.1.66
BES 517-385-V-C-S4		1.1.66
BES 517-398-N0-C-03		1.1.53
BES 517-398-N0-C-S49-00,2		1.1.53
BES 517-398-N1-C		1.1.53
BES 517-398-N2-C		1.1.53
BES 517-399-N0-C-03		1.1.53
BES 517-399-N0-C-S49-00,2		1.1.53
BES 517-399-N1-C		1.1.53
BES 517-399-N2-C		1.1.53
BES G04EC-NSC08B-S26G		1.1.3
BES G04EC-POC08B-S26G		1.1.3
BES G04EC-PSC08B-S26G		1.1.3
BES G04ED-PSC15B-S26G		1.1.4
BES G04ED-PSC50F-EP02		1.1.5
BES G04ED-PSC50F-S26G		1.1.5
BES G06EB-NOC40F-S49G	new	1.1.13
BES G06EB-NSC40F-S49G	new	1.1.13
BES G06EB-POC40F-S49G	new	1.1.13
BES G06EB-PSC40F-S49G	new	1.1.13
BES G06ED-NOC40F-BV02	new	1.1.13
BES G06ED-NSC40F-BV02	new	1.1.13
BES G06ED-POC40F-BV02	new	1.1.13
BES G06ED-PSC40F-BV02	new	1.1.13
BES G06EF-PSC40F-S49G		1.1.13
BES G06MD-GNX10B-EV02-EEX	new	1.5.40
BES G06MH1-NSC30B-S04G		1.1.12
BES G06MH1-PSC30B-S04G		1.1.12
BES G06MI-NOC30B-S49G		1.1.12
BES G06MI-NSC30B-S49G		1.1.12
BES G06MI-POC30B-S49G		1.1.12
BES G06MI-PSC30B-S49G		1.1.12
BES G08EG-PSC15B-BV02	new	1.1.13
BES HS-01-P1-C16/Q40		5.68
BES HS-01-P1-C8/Q40		5.68
BES IKJ-S-050-P-2-S-S4-C		1.5.52
BES IKN-070T.38-G-S4	new	1.5.54
BES IKU-011T.28-G-S4	new	1.5.53
BES IKU-031.28-S4		1.5.53
BES IKV-010.23-G-Z-S4		1.5.51
BES IKV-025.23-G-Z-S4		1.5.51
BES IKV-045.23-G-Z-S4		1.5.51
BES M05EC-NSC08B-S26G		1.1.6
BES M05EC-POC08B-S26G		1.1.6
BES M05EC-PSC08B-S26G		1.1.6
BES M05ED-PSC15B-S26G		1.1.7
BES M05ED-PSC50F-EP02		1.1.8
BES M05ED-PSC50F-S26G		1.1.8
BES M05ED-PSD05B-ES02-T01		1.5.42
BES M08EB-NOC40F-S49G	new	1.1.23
BES M08EB-NSC40F-S49G	new	1.1.23
BES M08EB-POC40F-S49G	new	1.1.23
BES M08EB-PSC40F-S49G	new	1.1.23
BES M08EC-NSC15B-S49G	new	1.1.15
BES M08EC-POC15B-S49G	new	1.1.15
BES M08EC-PSC15B-S04G	new	1.1.15
BES M08EC-PSC15B-S49G	new	1.1.15
BES M08ED-NOC40F-BV02	new	1.1.23
BES M08ED-NSC25F-S04G	new	1.1.21
BES M08ED-NSC40F-BV02	new	1.1.23
BES M08ED-POC40F-BV02	new	1.1.23
BES M08ED-PSC25F-S04G	new	1.1.21
BES M08ED-PSC40F-BV02	new	1.1.23
BES M08EE-NOC20B-S49G	new	1.1.19
BES M08EE-NSC15B-S04G	new	1.1.15
BES M08EE-NSC20B-S49G	new	1.1.19
BES M08EE-POC15B-S04G	new	1.1.15
BES M08EE-POC20B-S49G	new	1.1.19
BES M08EE-PSC15B-S04G	new	1.1.15
BES M08EE-PSC20B-S04G	new	1.1.19
BES M08EE-PSC20B-S49G	new	1.1.19
BES M08EF-POC15B-BP02	new	1.1.17
BES M08EF-PSC15B-BP02	new	1.1.17
BES M08EG1-PSC15A-S04G-W		1.5.4
BES M08EG-NOC40F-BV02	new	1.1.23
BES M08EG-NSC25F-S04G	new	1.1.21
BES M08EG-NSC40F-BV02	new	1.1.23
BES M08EG-POC25F-S04G	new	1.1.21
BES M08EG-POC40F-BV02	new	1.1.23
BES M08EG-PSC15A-S49G-W		1.5.5
BES M08EG-PSC25F-S04G	new	1.1.21
BES M08EG-PSC40F-BV02	new	1.1.23
BES M08EH-NOC15B-S04G	new	1.1.14
BES M08EH-NOC40F-S04G	new	1.1.22
BES M08EH-NOC40F-S49G	new	1.1.22
BES M08EH-NSC15B-S04G	new	1.1.14
BES M08EH-NSC40F-S04G	new	1.1.22
BES M08EH-NSC40F-S49G	new	1.1.22
BES M08EH-POC15B-S04G	new	1.1.14
BES M08EH-POC40F-S04G	new	1.1.22
BES M08EH-POC40F-S49G	new	1.1.22
BES M08EH-PSC15B-S04G	new	1.1.14
BES M08EH-PSC20B-S04G	new	1.1.18
BES M08EH-PSC40F-S04G	new	1.1.22
BES M08EH-PSC40F-S49G	new	1.1.22
BES M08MD-GNX10B-EV02-EEX	new	1.5.40
BES M08ME1-GSC20B-S04G		1.2.2
BES M08ME1-USC20B-S04G		1.2.2
BES M08MG1-NOC60F-S49G		1.1.23
BES M08MG1-NSC60F-S04G		1.1.23
BES M08MG1-NSC60F-S49G		1.1.23
BES M08MG1-POC60F-S49G		1.1.23
BES M08MG1-PSC60F-S04G		1.1.23
BES M08MG1-PSC60F-S49G		1.1.23
BES M08MG-GSC20B-BP00,3-GS04		1.2.3
BES M08MG-GSC20B-BV02		1.2.3
BES M08MG-USC20B-BV02		1.2.3
BES M08MH1-NOC15B-S04G		1.1.14
BES M08MH1-NSC15B-S04G		1.1.14
BES M08MH1-NSC20B-S04G		1.1.18
BES M08MH1-NSC30B-S04G		1.1.20
BES M08MH1-NSC30B-S49G		1.1.20
BES M08MH1-POC15B-S04G		1.1.14
BES M08MH1-PSC15B-S04G		1.1.14
BES M08MH1-PSC20B-S04G		1.1.18
BES M08MH1-PSC30B-S04G		1.1.20
BES M08MH1-PSC30B-S49G		1.1.20
BES M08MI-NSC15B-BV02		1.1.16
BES M08MI-NSC15B-S49G		1.1.14
BES M08MI-NSC20B-BV02		1.1.19
BES M08MI-NSC20B-S49G		1.1.18
BES M08MI-NSC40B-BP00,2-GS04		1.1.21
BES M08MI-NSC40B-S49G		1.1.21
BES M08MI-POC15B-BV02		1.1.16
BES M08MI-POC20B-S49G		1.1.18
BES M08MI-PSC15B-BV02		1.1.16
BES M08MI-PSC15B-S49G		1.1.14
BES M08MI-PSC20B-BV02		1.1.19
BES M08MI-PSC20B-S49G		1.1.18
BES M08MI-PSC40B-BP00,2-GS04		1.1.21

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BES M08MI-PSC40B-S49G		1.1.21
BES M12EE-POC40B-S04G	new	1.5.45
BES M12EE-PSC40B-S04G		1.5.45
BES M12EF1-NSC10F-S04G-S	new	1.5.21
BES M12EF1-PSC10F-S04G-S	new	1.5.21
BES M12EG1-NSC60Z-S04G-S11	new	1.5.20
BES M12EG1-PSC60Z-S04G-S11	new	1.5.20
BES M12EI-NSC40B-S04G	new	1.5.44
BES M12EI-POC40B-S04G		1.5.44
BES M12EI-PSC40B-S04G		1.5.44
BES M12EI-PSC40B-S04G-009	new	1.5.45
BES M12EL-PSC15B-S04G-HM01		1.5.16
BES M12MC1-NSC10F-S04G		1.1.32
BES M12MC1-PSC10F-S04G		1.1.32
BES M12MD1-NSC60B-S04G		1.1.28
BES M12MD1-PSC60B-S04G		1.1.28
BES M12MD-PSC80E-S04G-W		1.5.5
BES M12MD-NOC80F-S04G	new	1.1.31
BES M12MD-NSC80F-S04G	new	1.1.31
BES M12MD-POC80F-S04G	new	1.1.31
BES M12MD-PSC80F-S04G	new	1.1.31
BES M12ME-GNX40B-S04G-EEX	new	1.5.41
BES M12MF1-NSC10F-S04G		1.1.32
BES M12MF1-POC10F-S04G		1.1.32
BES M12MF1-PSC10F-S04G		1.1.32
BES M12MF1-PSC30A-S04G-W		1.5.5
BES M12MF-GSC30B-S04G		1.2.4
BES M12MF-USC30B-S04G		1.2.4
BES M12MG1-NOC60B-S04G		1.1.28
BES M12MG1-NSC60B-S04G		1.1.28
BES M12MG1-POC60B-S04G		1.1.28
BES M12MG1-PSC60B-S04G		1.1.28
BES M12MG-GSC30B-BP00,3-GS04		1.2.5
BES M12MG-GSC30B-BV02		1.2.5
BES M12MG-NOC80F-BV02	new	1.1.31
BES M12MG-NOC80F-S04G	new	1.1.31
BES M12MG-NSC80F-BV02	new	1.1.31
BES M12MG-NSC80F-S04G	new	1.1.31
BES M12MG-POC80F-BV02	new	1.1.31
BES M12MG-POC80F-S04G	new	1.1.31
BES M12MG-PSC80F-BV02	new	1.1.31
BES M12MG-PSC80F-S04G	new	1.1.31
BES M12MG-USC30B-BV02		1.2.5
BES M12MI-NOC20B-S04G		1.1.24
BES M12MI-NOC40B-S04G		1.1.27
BES M12MI-NSC20B-BV02		1.1.26
BES M12MI-NSC20B-S04G		1.1.24
BES M12MI-NSC40B-BV02		1.1.27
BES M12MI-NSC40B-S04G		1.1.27
BES M12MI-NSH80B-S04G		1.1.28
BES M12MI-POC20B-BV02		1.1.26
BES M12MI-POC20B-S04G		1.1.24
BES M12MI-POC40B-BV02		1.1.27
BES M12MI-POC40B-S04G		1.1.27
BES M12MI-PSC20B-BV02		1.1.26
BES M12MI-PSC20B-S04G		1.1.24
BES M12MI-PSC20B-S04G-M01	new	1.5.15
BES M12MI-PSC40B-BV02		1.1.27
BES M12MI-PSC40B-S04G		1.1.27
BES M12MI-PSC40B-S04G-M01	new	1.5.15
BES M12MI-PSH80B-S04G		1.1.28
BES M12ML-PSC30A-S04G-W		1.5.5
BES M12ML-PSC30A-S04G-W01		1.5.8
BES M12ML-PSC80E-S04G-W		1.5.5
BES M12ML-PSC80E-S04G-W01		1.5.8
BES M18EF1-NSC20F-S04G-S	new	1.5.21
BES M18EF1-PSC20F-S04G-S	new	1.5.21
BES M18EG1-NSC10Z-S04G-S11	new	1.5.21
BES M18EG1-PSC10Z-S04G-S11	new	1.5.21
BES M18EI-POC80B-S04G	new	1.5.46
BES M18EI-PSC80B-S04G		1.5.46
BES M18MD1-NSC12B-S04G		1.1.37
BES M18MD1-PSC12B-S04G		1.1.37
BES M18MD-PSC12E-S04G-W		1.5.7
BES M18ME1-GNX80B-S04G-EEX	new	1.5.41
BES M18ME1-NSC20F-S04G		1.1.39
BES M18ME1-PSC20F-S04G		1.1.39
BES M18MF1-PSC50A-S04G-W		1.5.7
BES M18MF-GSC70B-S04K		1.2.6
BES M18MF-USC70B-S04K		1.2.6
BES M18MG1-NSC12B-S04G		1.1.37
BES M18MG1-PSC12B-S04G		1.1.37
BES M18MG-GSC70B-BP00,3-GS04		1.2.7
BES M18MG-GSC70B-BV02		1.2.7
BES M18MG-NOC16F-BV02	new	1.1.39
BES M18MG-NOC16F-S04K	new	1.1.39
BES M18MG-NSC16F-BV02	new	1.1.39
BES M18MG-NSC16F-S04K	new	1.1.39
BES M18MG-POC16F-BV02	new	1.1.39
BES M18MG-POC16F-S04K	new	1.1.39
BES M18MG-PSC16F-BV02	new	1.1.39
BES M18MG-PSC16F-S04K	new	1.1.39
BES M18MG-USC70B-BV02		1.2.7
BES M18MI-NOC50B-S04K		1.1.33
BES M18MI-NSC50B-BV02		1.1.34
BES M18MI-NSC50B-S04K		1.1.33
BES M18MI-NSC80B-BV02		1.1.36
BES M18MI-NSC80B-S04K		1.1.35
BES M18MI-POC50B-BV02		1.1.34
BES M18MI-POC50B-S04K		1.1.33
BES M18MI-POC80B-S04K		1.1.35
BES M18MI-PSC50A-S04G-WM01		1.5.15
BES M18MI-PSC50B-BV02		1.1.34
BES M18MI-PSC50B-S04G		1.1.33
BES M18MI-PSC50B-S04K		1.1.33
BES M18MI-PSC80B-BV02		1.1.36
BES M18MI-PSC80B-S04G		1.1.35
BES M18MI-PSC80B-S04K		1.1.35
BES M18ML-PSC12E-S04G-W		1.5.7
BES M18ML-PSC12E-S04G-W01		1.5.9
BES M18ML-PSC50A-S04G-W		1.5.6
BES M18ML-PSC50A-S04G-W01		1.5.8
BES M30EE1-NSC40F-S04G-S	new	1.5.21
BES M30EE1-PSC40F-S04G-S	new	1.5.21
BES M30EG1-NSC20Z-S04G-S11	new	1.5.21
BES M30EG1-PSC20Z-S04G-S11	new	1.5.21
BES M30ME1-GNX15B-S04G-EEX	new	1.5.41
BES M30MF-GSC15B-BP00,3-GS04		1.2.9
BES M30MF-GSC15B-BV02		1.2.9
BES M30MF-GSC15B-S04K		1.2.8
BES M30MF-USC15B-BV02		1.2.9
BES M30MF-USC15B-S04K		1.2.8
BES M30MG1-PSC40F-S04G		1.1.46
BES M30MI1-NSC22B-S04G		1.1.43
BES M30MI1-POC22B-S04G		1.1.43
BES M30MI1-PSC22B-S04G		1.1.43
BES M30MI-NOC10B-BV02		1.1.41
BES M30MI-NOC10B-S04K		1.1.40
BES M30MI-NOC15B-S04K	new	1.1.42
BES M30MI-NSC10B-BV02		1.1.41
BES M30MI-NSC10B-S04K		1.1.40
BES M30MI-NSC15B-S04K	new	1.1.42
BES M30MI-POC10B-BV02		1.1.41
BES M30MI-POC10B-S04K		1.1.40
BES M30MI-POC15B-BV02	new	1.1.43
BES M30MI-POC15B-S04K	new	1.1.42
BES M30MI-PSC10B-BV02		1.1.41
BES M30MI-PSC10B-S04G		1.1.40
BES M30MI-PSC10B-S04K		1.1.40
BES M30MI-PSC15B-BV02		1.1.43
BES M30MI-PSC15B-S04G	new	1.1.42
BES M30MI-PSC15B-S04K		1.1.42
BES M30ML-PSC10A-S04G-W		1.5.7
BES M30ML-PSC20E-S04G-W		1.5.7
BES M30MM-NOC30F-BV02	new	1.1.46
BES M30MM-NOC30F-S04K	new	1.1.45
BES M30MM-NSC30F-BV02	new	1.1.46
BES M30MM-NSC30F-S04K	new	1.1.45
BES M30MM-POC30F-BV02	new	1.1.46
BES M30MM-POC30F-S04K	new	1.1.45
BES M30MM-PSC30F-BV02	new	1.1.46
BES M30MM-PSC30F-S04K	new	1.1.45
BES Q05AC-NOC08B-S26G	new	1.1.47
BES Q05AC-NSC08B-S26G	new	1.1.47
BES Q05AC-POC08B-S26G	new	1.1.47
BES Q05AC-PSC08B-S26G	new	1.1.47
BES Q08MG-NSC30B-S49G		1.1.52
BES Q08MG-PSC30B-S49G		1.1.52
BES Q08ZC-NOC20B-BV02		1.1.51
BES Q08ZC-NOC20B-S49G		1.1.51
BES Q08ZC-NSC20B-BV02		1.1.51
BES Q08ZC-NSC20B-S49G		1.1.51
BES Q08ZC-POC20B-BV02		1.1.51
BES Q08ZC-POC20B-S49G		1.1.51
BES Q08ZC-PSC20B-BV02		1.1.51
BES Q08ZC-PSC20B-S49G		1.1.51
BES Q08ZC-PSC25B-S49G	new	1.1.51
BES Q08ZE-NSC20B-BV02		1.1.51
BES Q08ZE-POC20B-BV02		1.1.51
BES Q08ZE-POC20B-S49G		1.1.51
BES Q08ZE-PSC20B-BV02		1.1.51
BES Q08ZE-PSC20B-S49G		1.1.51
BES Q08ZE-PSC25B-S49G	new	1.1.52
BES Q40-HW-1		5.68
BES Q40-HW-2		5.68
BES Q40-HW-3		5.68
BES Q40KEU-USU15B-S27G		1.3.5

BES Q40KEU-USU25F-S27G		1.3.5
BES Q40KFU-GNX20B-S92G-EEX	new	1.5.41
BES Q40KFU-GNX35F-S92G-EEX	new	1.5.41
BES Q40KFU-GOH15B-EP00,8-GS04		1.2.11
BES Q40KFU-GSH15B-EP00,8-GS04		1.2.11
BES Q40KFU-GSH15B-S04G		1.2.10
BES Q40KFU-NAC25F-S04G		1.1.63
BES Q40KFU-PAC15A-S04G		1.5.2
BES Q40KFU-PAC15A-S04G-W01		1.5.9
BES Q40KFU-PAC20A-S04G		1.5.2
BES Q40KFU-PAC20B-S04G		1.1.62
BES Q40KFU-PAC30F-S04G		1.1.63
BES Q40KFU-PAC35E-S04G		1.5.3
BES Q40KFU-PAC35E-S04G-W01		1.5.9
BES Q40KFU-PAC40E-S04G		1.5.3
BES Q40KFU-PSC15A-S04G		1.5.2
BES Q40KFU-PSC15A-S04G-M01		1.5.15
BES Q40KFU-PSC15A-S04G-W01		1.5.9
BES Q40KFU-PSC20A-S04G		1.5.2
BES Q40KFU-PSC20B-S04G		1.1.62
BES Q40KFU-PSC30F-S04G		1.1.63
BES Q40KFU-PSC35E-S04G		1.5.3
BES Q40KFU-PSC35E-S04G-W01		1.5.9
BES Q40KFU-PSC35Z-S04G-011		1.5.3
BES Q40KGU-PAC25Z-S04G-011	new	1.5.3
BES Q40-SH-1		5.69
BES Q40-SH-2		5.69
BES Q80KA-GSH50B-S04Q		1.2.11
BES Q80KA-PAH40B-S04Q	new	1.1.68
BES Q80KA-PAH50F-S04Q	new	1.1.68
BES Q80KA-PSH40B-S04Q	new	1.1.68
BES Q80KA-PSH50F-S04Q	new	1.1.68
BES R01-FK-1		1.1.55
BES R01-FK-1		1.5.11/12
BES R01ZC-NAC70B-BP05		1.1.55
BES R01ZC-PAC70B-BP00.2-GS04		1.1.55
BES R01ZC-PAC70B-BP03		1.1.55
BES R01ZC-PSC50B-BX00.2-GS04-V		1.5.12
BES R01ZC-PSC50B-BX00.2-GS04-W01		1.5.11
BES R01ZC-PSC50B-BX03-V		1.5.13
BES R01ZC-PSC50B-BX05-W01		1.5.11
BES R01ZC-PSC70B-BP00.3-GS49	new	1.1.55
BES R03KC-NOC30B-EP05	new	1.1.49
BES R03KC-NSC30B-EP05	new	1.1.49
BES R03KC-POC30B-EP05	new	1.1.49
BES R03KC-PSC30B-BP00,3-GS49		1.1.49
BES R03KC-PSC30B-EP02		1.1.49
BES R04KC-NOC15B-EP00,13-GS49		1.1.48
BES R04KC-NOC15B-EP00,2-GS26		1.1.48
BES R04KC-NOC15B-EV02		1.1.48
BES R04KC-NSC15B-EP00,13-GS49		1.1.48
BES R04KC-NSC15B-EP00,2-GS26		1.1.48
BES R04KC-NSC15B-EV02		1.1.48
BES R04KC-POC15B-EP00,13-GS49		1.1.48
BES R04KC-POC15B-EP00,2-GS26		1.1.48
BES R04KC-POC15B-EV02		1.1.48
BES R04KC-PSC15B-EP00,13-GS49		1.1.48
BES R04KC-PSC15B-EP00,2-GS26		1.1.48
BES R04KC-PSC15B-EV02		1.1.48
BES R04KC-PSC15B-LV00,3	new	1.1.48
BES R04KC-PSC25F-EP00,3-GS49	new	1.1.49
BES R04KC-PSC25F-EV02		1.1.49
BES R05KB-NOC40B-EV02		1.1.57
BES R05KB-NSC40B-S49A		1.1.57
BES R05KB-POC40B-S49A		1.1.57
BES R05KB-PSC20B-BP00,3-GS49	new	1.1.56
BES R05KB-PSC20B-EP02		1.1.56
BES R05KB-PSC20B-S49A		1.1.56
BES R05KB-PSC40B-EP00,3-GS04	new	1.1.57
BES R05KB-PSC40B-EV02		1.1.57
BES R05KB-PSC40B-S49A		1.1.57
BES R05KB-USU20B-EV02		1.3.4
BES R05KB-USU40B-EV02		1.3.4
BES Z03K-GSS10B-EP00,15-GS04-006		1.2.12
BES Z03K-GSS10B-S04U-006		1.2.12
BFB 75K-001-N-02	new	2.2.5
BFB 75K-001-N-S75	new	2.2.5
BFB 75K-001-P-02	new	2.2.5
BFB 75K-001-P-S75	new	2.2.5
BFB 75K-002-N-S75	new	2.2.7
BFB 75K-002-P-S75	new	2.2.7
BFB 75K-003-N-02	new	2.2.7
BFB 75K-003-P-02	new	2.2.7
BFO 02-PK-1		2.2.25
BFO 02-UK-1		2.2.25
BFO 04-FL-1		2.2.25
BFO 04-FL-2		2.2.25
BFO 04-FS-1		2.2.25
BFO 04-PK-1		2.2.21
BFO 06-FS-1		2.2.25
BFO 08,0-KB-1		2.3.17
BFO 18A-LAA-MZG-20-		2.2.29
BFO 18A-LAA-UZG-20-		2.2.29
BFO 18A-LCC-SMG-20-		2.2.29
BFO 18A-LCC-UZG-20-		2.2.29
BFO 18A-LEE-MZG-20-		2.2.29
BFO 18A-LEE-SMG-20-		2.2.29
BFO 18A-LEE-UZG-20-		2.2.29
BFO 18A-LFF-MZG-10-		2.2.28
BFO 18A-LFF-SMG-10-		2.2.28
BFO 18A-LGG-MZG-10-		2.2.28
BFO 18A-LGG-SMG-10-		2.2.28
BFO 18A-XAA-MZG-30-		2.2.31
BFO 18A-XAA-SMG-30-		2.2.31
BFO 18A-XAA-UZG-30-		2.2.31
BFO 18A-XAC-SMG-30-		2.2.31
BFO 18A-XAE-MZG-30-		2.2.31
BFO 18A-XAE-SMG-30-		2.2.31
BFO 18A-XAE-UZG-30-		2.2.31
BFO 18A-XAF-MZG-15-		2.2.30
BFO 18A-XAF-SMG-15-		2.2.30
BFO 18A-XAG-MZG-15-		2.2.30
BFO 18V-LCC-MZG-23-		2.2.29
BFO 18V-LCC-SMG-23-		2.2.29
BFO 18V-LDD-MZG-23-		2.2.29
BFO 18V-LDD-SMG-23-		2.2.29
BFO 18V-XAC-MZG-30-		2.2.31
BFO 18V-XAC-SMG-30-		2.2.31
BFO 18V-XAD-MZG-30-		2.2.31
BFO 18V-XAD-SMG-30-		2.2.31
BFO 30-A1		2.3.17
BFO CT		2.2.24
BFO D10-LA-CB-EAK-05-02		2.2.18
BFO D10-LA-DC-10		2.2.24
BFO D10-XA-GB-EAK-10-02		2.2.23
BFO D10-XA-HB-EAK-10-02	new	2.2.23
BFO D10-XA-RB-EAK-10-02		2.2.23
BFO D13-LA-EC-10		2.2.24
BFO D13-LA-QB-EAK-05-02		2.2.19
BFO D13-LA-WB-EAK-05-02	new	2.2.19
BFO D13-LG-05-EAK-30-02	new	2.2.20
BFO D13-LG-10-EAK-30-02	new	2.2.20
BFO D13-XA-JB-EAK-20-02		2.2.23
BFO D13-XB-KB-EAK-10-02	new	2.2.22
BFO D13-XB-RB-EAK-10-02		2.2.23
BFO D22-LA-AC-20		2.2.21
BFO D22-LA-AD-EAK-52-02		2.2.20
BFO D22-LA-BC-10		2.2.21
BFO D22-LA-BD-EAK-52-02		2.2.20
BFO D22-LA-CC-30		2.2.21
BFO D22-LAH-KB-EAK-10-02		2.2.18
BFO D22-LA-KB-EAK-10-02		2.2.18
BFO D22-LA-NB-PZK-10-02		2.2.19
BFO D22-LAP-KB-EAK-15-02		2.2.19
BFO D22-LA-QB-PAK-05-02		2.2.19
BFO D22-LA-RB-EAK-10-02	new	2.2.18
BFO D22-LAS-EB-EAK-10-02		2.2.19
BFO D22-LA-TB-EAK-10-02		2.2.19
BFO D22-LAT-KB-EAK-10-02		2.2.18
BFO D22-LD-EAK-10-20		2.2.21
BFO D22-XA-CD-EAK-110-02	new	2.2.24
BFO D22-XA-DB-EAK-20-01		2.2.23
BFO D22-XA-ED-EAK-250-02	new	2.2.24
BFO D22-XAH-LB-EAK-20-02		2.2.22
BFO D22-XA-LB-EAK-20-02		2.2.22
BFO D22-XA-MB-PAK-10-02		2.2.24
BFO D22-XAP-LB-EAK-30-02		2.2.23
BFO D22-XA-SB-EAK-20-02		2.2.23
BFO D22-XAT-LB-EAK-20-02		2.2.22
BFO D22-XA-UB-EAK-20-02		2.2.22
BFO D22-XBF-LB-EAK-15-02		2.2.23
BFO D22-XB-LB-EAK-15-02	new	2.2.23
BFO D22-XB-UB-EAK-15-02		2.2.22
BFO D25-LA-CD-EAK-110-02	new	2.2.20
BFO D25-LA-ED-EAK-250-02	new	2.2.20
BFO N22-LA-FB-EAK-05-01	new	2.2.18
BFS 26K-PS-L01-S115		2.2.79
BFS 26K-PS-L02-S115-C		2.2.79
BFS 26K-PS-L03-S115-C		2.2.79
BFS 27K-NS-L01-S115		2.2.81
BFS 27K-NS-L02-S115		2.2.81
BFS 27K-NSR-L01-S115		2.2.81
BFS 27K-NSR-L02-S115		2.2.81
BFS 27K-PS-L01-S115		2.2.81
BFS 27K-PS-L02-S115		2.2.81
BFS 27K-PSR-L01-S115		2.2.81
BFS 27K-PSR-L02-S115		2.2.81
BGL 10A-001-S49		2.2.84
BGL 10A-002-S49		2.2.84
BGL 120A-001-S49		2.2.87

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BGL 20A-002-S49	2.2.85
BGL 21-AH	2.2.91
BGL 21-AR	2.2.91
BGL 21-AS	2.2.91
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BGL 220A-001-S49	2.2.87
BGL 220A-002-S49	2.2.87
BGL 30A-001-S49	2.2.85
BGL 30A-002-S49	2.2.85
BGL 30A-003-S49	2.2.88
BGL 30A-004-S49	2.2.88
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BGL 50A-003-S49	2.2.89
BGL 50A-004-S49	2.2.89
BGL 5A-001-S49	2.2.84
BGL 5A-002-S49	2.2.84
BGL 80A-001-S49	2.2.86
BGL 80A-002-S49	2.2.86
BGL 80A-003-S49	2.2.89
BGL 80A-004-S49	2.2.89
BHS B135V-PSD15-S04	1.5.33
BHS B135V-PSD15-S04-T01	1.5.32
BHS B135V-PSD25-S04-003	1.5.34
BHS B249V-PSD15-S04	1.5.33
BHS B249V-PSD25-BP00,2-S04-003	1.5.35
BHS B249V-PSD25-S04-003	1.5.34
BHS B265V-PSD15-S04	1.5.33
BHS B265V-PSD25-S04-003	1.5.35
BHS B400V-PSD15-S04	1.5.33
BHS B400V-PSD25-BP00,2-S04-003	1.5.35
BHS B400V-PSD25-S04-003	1.5.34
BHS E308V-PSD15-S04	1.5.33
BKS 08-CS-00	5.32
BKS 12-CS-00	5.32
BKS 12-CS-01	5.32
BKS 23-CS-00	
	5.32
BKS-B 19-1/GS4-PU-01	5.16
BKS-B 19-1-03	5.12
BKS-B 19-1-PU2-03	5.12
BKS-B 19-3/GS4-PU-01	5.16
BKS-B 19-3-05	5.12
BKS-B 19-4-05	5.12
BKS-B 20-1-03	5.13
BKS-B 20-1-PU2-03	5.13
BKS-B 20-3/GS4-PU-01	5.16
BKS-B 20-4/GS4-PU-01	5.16
BKS-B 20-4-03	5.13
BKS-B 20-8-PU-03	5.13
BKS-B 25-1/GS49-PU-01 new	5.2
BKS-B 25-1-PU-03	5.2
BKS-B 25-3-PU-03	5.2
BKS-B 26-1/GS49-PU-01 new	5.2
BKS-B 26-1-PU-03	5.2
BKS-B 26-3-PU-03	5.2
BKS-B 48-1/GS49-PU-01	5.8
BKS-B 48-1-03	5.3
BKS-B 48-1-PU2-05	5.3
BKS-B 49-1/GS49-PU-01	5.8
BKS-B 49-1-03	5.3
BKS-B 49-4-03	5.3
BKS-S 10-3	5.18
BKS-S 10-4	5.18
BKS-S 10-6	5.18
BKS-S 19-1/GS4-PU-01	5.16
BKS-S 19-11-PU-03	5.12
BKS-S 19-12-PU-05	5.12
BKS-S 19-13-PU-05	5.12
BKS-S 19-14-PU-05	5.12
BKS-S 19-1-PU-03	5.12
BKS-S 19-3/GS4-PU-01	5.16
BKS-S 19-3-PU-03	5.12
BKS-S 19-4/GS49-PU-01	5.17
BKS-S 19-4-PU-03	5.12
BKS-S 19-8-PU-03	5.12
BKS-S 19-9-PU-03	5.12
BKS-S 20-10-PU-05	5.13
BKS-S 20-11-PU-03	5.13
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BKS-S 20-13-PU-05	5.13
BKS-S 20-1-PU-03	5.13
BKS-S 20-2-PU-05	5.13
BKS-S 20-3/GS4-PU-01	5.16
BKS-S 20-3-PU-03	5.13
BKS-S 20-4/GS49-PU-01	5.17
BKS-S 20-4/GS4-PU-01	5.16
BKS-S 20-4-PU-03	5.13
BKS-S 20-5-PU-03	5.13
BKS-S 20-6-PU-03	5.13
BKS-S 20-7-PU-05	5.13
BKS-S 20-8-PU-03	5.13
BKS-S 20-9-PU-05	5.13
BKS-S 20E-4-PU-03	5.13
BKS-S 20E-8-PU-03	5.13
BKS-S 23-1-05	5.14
BKS-S 23-3-05	5.14
BKS-S 24-3-03	5.14
BKS-S 27-03	5.22
BKS-S 28-03	5.22
BKS-S 28E-03	5.22
BKS-S 40-1-PU-03	5.4
BKS-S 40-4-PU-03	5.4
BKS-S 40-6-PU-03	5.4
BKS-S 41-1-05	5.4
BKS-S 48-03	5.3
BKS-S 48-1/GS49-PU-01	5.8
BKS-S 48-1/GS4-PU-01	5.8
BKS-S 49-1-PU-03	5.3
BKS-S 49-4/GS49-PU-01	5.9
BKS-S 49-4/GS4-PU-01	5.9
BKS-S 49-4-PU-03	5.3
BKS-S 49-6-PU-05	5.3
BKS-S 49E-4-PU-03	5.4
BKS-S 7-1	5.21
BKS-S 74-1/GS49-PU-01 new	5.9
BKS-S 74-3-03	5.4
BKS-S 75-1/GS49-PU-00,1	5.9
BKS-S 75-14-03	5.5
BKS-S 75-3/GS4-PU-00,5	5.9
BKS-S 75-3-03	5.5
BKS-S 76-RT04 new	5.20
BKS-S 77-RT04 new	5.20
BKS-S 81-00	5.5
BKS-S 82-00	5.5
BKS-S 8-3	5.18
BKS-S 8-4	5.18
BKS-S 8-6	5.18
BKS-S 91-00	5.5
BKS-S107-RT14	5.19
BKS-S109-RT14	5.19
BKS-S111-RT13	5.7
BKS-S113-RT13	5.7
BKS-S134-17-05	5.15
BKS-S137-17-PU-05	5.15
BKS-S138-PU-05	5.15
BKS-S139-PU-05	5.15
BKS-S141-00	5.6
BKS-S142-00	5.6
BKS-S144-00	5.18
BKS-S146-00	5.5
BKS-S149-00	5.6
BKS-S150-00	5.6
BKS-S196-21-PU-05	5.30
BKS-S196-22-PU-05	5.30
BKS-S197-21-PU-05	5.31
BKS-S197-22-PU-05	5.31
BKS-S212-1/S214-PU-01 new	5.11
BKS-S212-1-PU-02 new	5.11
BKS-S212-3/S214-PU-01 new	5.11
BKS-S212-3-PU-02 new	5.11
BKS-S213-1-PU-02 new	5.11
BKS-S213-3/S214-PU-01 new	5.11
BKS-S213-3-PU-02 new	5.11
BKS-S213-4/S214-PU-01 new	5.11
BKS-S213-8/S214-PU-01 new	5.11
BKS-S216-RT14 new	5.7
BKS-S218-RT14 new	5.7
BKS-S220-12-PB-02 new	5.23
BKS-S221-12-PB-02 new	5.23
BKS-S260-3-02 new	5.13
BKS-S49-TM1-02 new	5.33
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BKT 18KF-001-N-02	2.2.59
BKT 18KF-001-N-S4	2.2.59
BKT 18KF-001-P-02	2.2.59
BKT 18KF-001-P-S4	2.2.59

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BKT 21M-002-P-S4	2.2.61
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BKT 6K-001-N-S75	2.2.57
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BLE 18KF-NA-1PP-S4-C	2.1.60
BLE 18KF-PA-1LT-C-02	2.1.65
BLE 18KF-PA-1LT-S4-C	2.1.64
BLE 18KF-PA-1PP-C-02	2.1.61
BLE 18KF-PA-1PP-S4-C	2.1.60
BLE 18KW-NA-1LT-C-02	2.1.81
BLE 18KW-NA-1LT-S4-C	2.1.80
BLE 18KW-NA-1PP-C-02	2.1.77
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BLE 18KW-PA-1LT-S4-C	2.1.80
BLE 18KW-PA-1PP-C-02	2.1.77
BLE 18KW-PA-1PP-S4-C	2.1.76
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BLS 65K-1-G50-1	2.1.165
BLS 65K-5-G50-1	2.1.165
BLS 65K-5-G50-2-S4	2.1.165
BLS 6K-XX-1E-C-02	2.1.125
BLS 6K-XX-1E-S49-C	2.1.125
BLS 6K-XX-1E-S75-C	2.1.125
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BMF 21-HW-11	3.1.21
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BMF 21K-NS-C-2-PU-02	3.1.20
BMF 21K-NS-C-2-S49	3.1.20
BMF 21K-PS-C-2-PU-02	3.1.20
BMF 21K-PS-C-2-S49	3.1.20
BMF 273K-NO-C-2A-SA2-S49-00,3 new	3.1.4
BMF 273K-NS-C-2A-SA2-S49-00,3 new	3.1.4
BMF 273K-NS-C-2-PU-02 new	3.1.4
BMF 273K-PO-C-2A-SA2-S49-00,3 new	3.1.4
BMF 273K-PS-C-2A-SA2-S49-00,3 new	3.1.4
BMF 273K-PS-C-2-PU-02 new	3.1.4
BMF 303-HW-28	3.1.7
BMF 303-HW-30	3.1.7
BMF 303-HW-31 new	3.1.7
BMF 303-HW-33	3.1.7
BMF 303-HW-40	3.1.7
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BMF 303-HW-51	3.1.7
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BMF 305-HW-24	3.1.10
BMF 305-HW-25	3.1.12
BMF 305-HW-26	3.1.12
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BMF 305K-NO-C-2-SA2-S49-00,3	3.1.8
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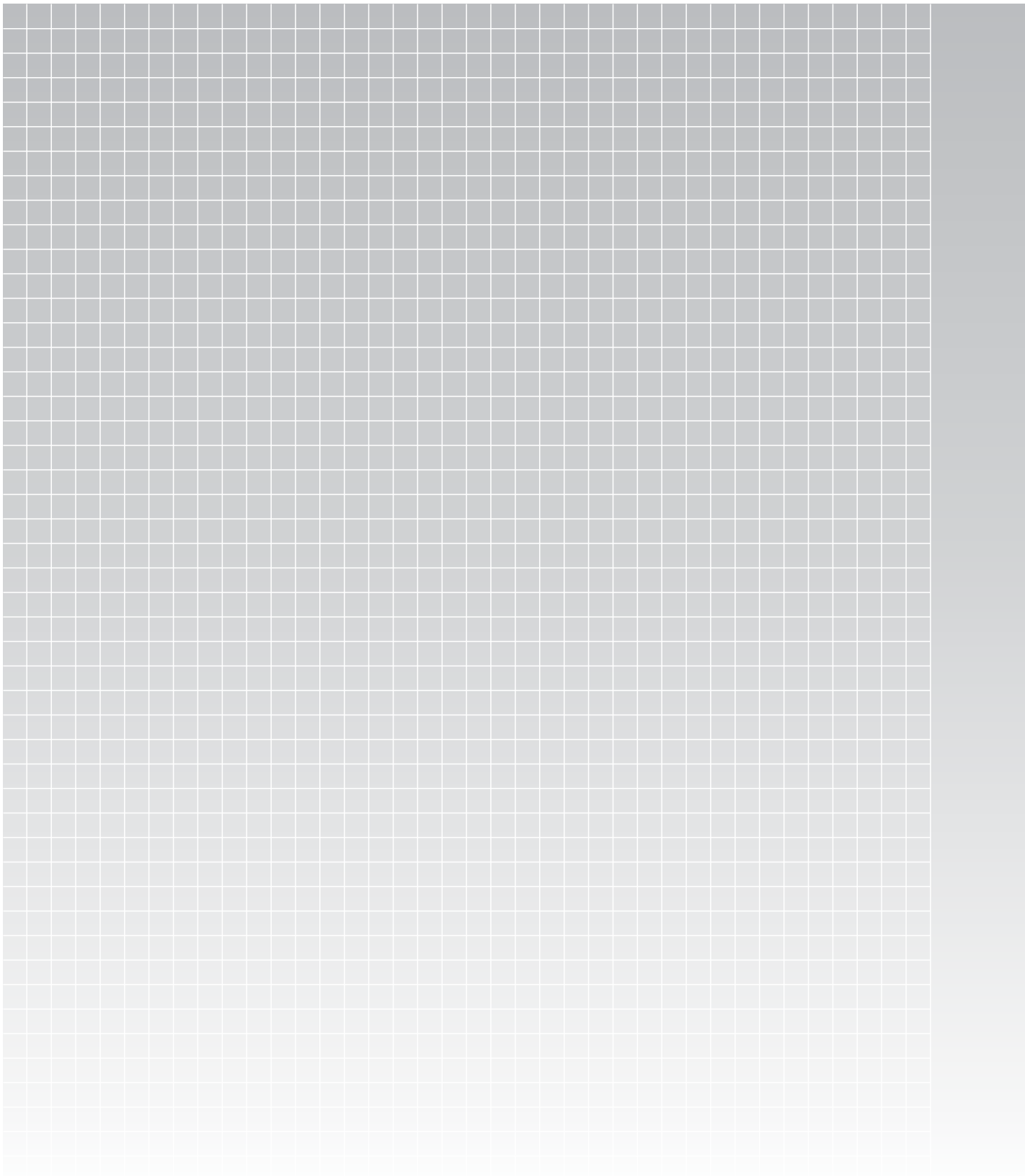
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BMF 307-HW-73-115		3.1.16
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BOD 63M-LA04-S115	new	2.2.48
BOD 63M-LB02-S115	new	2.2.47
BOD 63M-LB04-S115	new	2.2.48
BOD 66-HW-1		2.3.8
BOD 66M-LA04-S92-C		2.2.53
BOD 66M-LB04-S92-C		2.2.53
BOD 66M-RA01-S92-C		2.2.51
BOD 66M-RB01-S92-C		2.2.51
BOD 6K-RA01-C-02		2.2.35
BOD 6K-RA01-S75-C		2.2.35
BOS 08M-PO-PR11-02		2.1.5
BOS 08M-PO-PR11-S49		2.1.4
BOS 08M-PO-RD11-02		2.1.4
BOS 08M-PO-RD11-S49		2.1.4
BOS 08M-PO-RE10-03		2.1.5
BOS 08M-PO-RE10-S49		2.1.5
BOS 08M-PS-PR11-02		2.1.5
BOS 08M-PS-PR11-S49		2.1.4
BOS 08M-PS-RD11-02		2.1.4
BOS 08M-PS-RD11-S49		2.1.4
BOS 08M-PS-RE10-03		2.1.5
BOS 08M-PS-RE10-S49		2.1.5
BOS 08M-X-RS10-03		2.1.5
BOS 08M-X-RS10-S49		2.1.5
BOS 12,0-BS-1		2.3.9
BOS 12-BL-1		2.3.12
BOS 12-LT-1		2.3.14
BOS 12M-NA-LE10-03	new	2.1.15
BOS 12M-NA-LE10-S4	new	2.1.15
BOS 12M-PA-LE10-03	new	2.1.15
BOS 12M-PA-LE10-S4	new	2.1.15
BOS 12M-PO-1PD-B0-C-03		2.1.9
BOS 12M-PO-1PD-S4-C		2.1.9
BOS 12M-PO-1QA-B0-C-03		2.1.10
BOS 12M-PO-1QA-S4-C		2.1.10
BOS 12M-PO-1YA-B0-C-03		2.1.9
BOS 12M-PO-1YA-S4-C		2.1.8
BOS 12M-PO-1YB-B0-C-03		2.1.9
BOS 12M-PO-1YB-S4-C		2.1.9
BOS 12M-PS-1N1I-S4-C		2.1.8
BOS 12M-PS-1PD-B0-C-03		2.1.9
BOS 12M-PS-1PD-S4-C		2.1.9
BOS 12M-PS-1QA-B0-C-03		2.1.10
BOS 12M-PS-1QA-S4-C		2.1.10
BOS 12M-PS-1YA-B0-C-03		2.1.9
BOS 12M-PS-1YA-S4-C		2.1.8
BOS 12M-PS-1YB-B0-C-03		2.1.9
BOS 12M-PS-1YB-S4-C		2.1.9
BOS 12M-PU-1HA-S4-C		2.1.8
BOS 12M-XT-LS11-03	new	2.1.15
BOS 12M-XT-LS11-S4	new	2.1.15
BOS 12M-XT-LS12-03	new	2.1.15
BOS 12M-XT-LS12-S4	new	2.1.15
BOS 12-SM-1		2.3.15
BOS 12-WS-1		2.3.16
BOS 15K-R-B2-02		2.1.133
BOS 15K-R-B2-P-S75		2.1.132
BOS 15K-R-C10-02		2.1.133
BOS 15K-R-C10-P-S75		2.1.132
BOS 15K-R-C50-02		2.1.133
BOS 15K-R-C50-P-S75		2.1.132
BOS 15K-R-D12-02		2.1.133
BOS 15K-R-D12-P-S75		2.1.132
BOS 15K-S-B2-02		2.1.133
BOS 15K-S-B2-P-S75		2.1.133
BOS 15K-S-C10-02		2.1.133
BOS 15K-S-C10-P-S75		2.1.133
BOS 15K-S-C50-02		2.1.133
BOS 15K-S-C50-P-S75		2.1.133
BOS 15K-S-D12-02		2.1.133
BOS 15K-S-D12-P-S75		2.1.133
BOS 18,0-KB-1		2.3.9

BOS 18-BL-1	2.3.12
BOS 18-BL-2	2.3.12
BOS 18E-PO-1YA-E5-D-S4	2.1.48
BOS 18E-PS-1N2M-S4-D	2.1.48
BOS 18E-PS-1UB-E5-D-S4	2.1.49
BOS 18E-PS-1UB-SA1-S4	2.1.49
BOS 18E-PS-1WD-E5-D-S4	2.1.49
BOS 18E-PS-1XA-SA1-S4	2.1.49
BOS 18E-PS-1XB-SA1-S4	2.1.49
BOS 18E-PS-1XD-SA1-S4	2.1.49
BOS 18E-PS-1YA-E5-D-S4	2.1.48
BOS 18E-PS-1YB-E5-D-S4	2.1.48
BOS 18E-PS-1YD-E5-D-S4	2.1.48
BOS 18-HS-1	2.3.10
BOS 18KF-NA-1FR-C-02	2.2.15
BOS 18KF-NA-1FR-S4-C	2.2.15
BOS 18KF-NA-1GA-C-02	2.1.55
BOS 18KF-NA-1GA-S4-C	2.1.55
BOS 18KF-NA-1HA-C-02	2.1.54
BOS 18KF-NA-1HA-S4-C	2.1.54
BOS 18KF-NA-1LOC-C-02	2.1.62
BOS 18KF-NA-1LOC-S4-C	2.1.62
BOS 18KF-NA-1LQP-C-02	2.1.63
BOS 18KF-NA-1LQP-S4-C	2.1.63
BOS 18KF-NA-1N1R-C-02	2.1.55
BOS 18KF-NA-1N1R-S4-C	2.1.55
BOS 18KF-NA-1PD-C-02	2.1.57
BOS 18KF-NA-1PD-S4-C	2.1.57
BOS 18KF-NA-1PE-C-02	2.1.57
BOS 18KF-NA-1PE-S4-C	2.1.57
BOS 18KF-NA-1QD-C-02	2.1.59
BOS 18KF-NA-1QD-S4-C	2.1.59
BOS 18KF-NA-1RE-C-02	2.1.59
BOS 18KF-NA-1RE-S4-C	2.1.59
BOS 18KF-NA-1TB-C-02	2.1.58
BOS 18KF-NA-1TB-S4-C	2.1.58
BOS 18KF-NA-1XA-C-02	2.1.56
BOS 18KF-NA-1XA-S4-C	2.1.56
BOS 18KF-PA-1FR-C-02	2.2.15
BOS 18KF-PA-1FR-S4-C	2.2.15
BOS 18KF-PA-1GA-C-02	2.1.55
BOS 18KF-PA-1GA-S4-C	2.1.55
BOS 18KF-PA-1HA-C-02	2.1.54
BOS 18KF-PA-1HA-S4-C	2.1.54
BOS 18KF-PA-1LOC-C-02	2.1.62
BOS 18KF-PA-1LOC-S4-C	2.1.62
BOS 18KF-PA-1LQP-C-02	2.1.63
BOS 18KF-PA-1LQP-S4-C	2.1.63
BOS 18KF-PA-1N1R-C-02	2.1.55
BOS 18KF-PA-1N1R-S4-C	2.1.55
BOS 18KF-PA-1PD-C-02	2.1.57
BOS 18KF-PA-1PD-S4-C	2.1.57
BOS 18KF-PA-1PE-C-02	2.1.57
BOS 18KF-PA-1PE-S4-C	2.1.57
BOS 18KF-PA-1QD-C-02	2.1.59
BOS 18KF-PA-1QD-S4-C	2.1.59
BOS 18KF-PA-1RE-C-02	2.1.59
BOS 18KF-PA-1RE-S4-C	2.1.59
BOS 18KF-PA-1TB-C-02	2.1.58
BOS 18KF-PA-1TB-S4-C	2.1.58
BOS 18KF-PA-1XA-C-02	2.1.56
BOS 18KF-PA-1XA-S4-C	2.1.56
BOS 18K-NU-ID10-02	2.1.86
BOS 18K-NU-ID10-S4	2.1.86
BOS 18K-NU-IE10-02	2.1.87
BOS 18K-NU-IE10-S4	2.1.87
BOS 18K-NU-PR10-02	2.1.87
BOS 18K-NU-PR10-S4	2.1.86
BOS 18K-PU-ID10-02	2.1.86
BOS 18K-PU-ID10-S4	2.1.86
BOS 18K-PU-IE10-02	2.1.87
BOS 18K-PU-IE10-S4	2.1.87
BOS 18K-PU-PR10-02	2.1.87
BOS 18K-PU-PR10-S4	2.1.86
BOS 18KR-NU-ID10-02	2.1.88
BOS 18KR-NU-ID10-S4	2.1.88
BOS 18KR-NU-IE10-02	2.1.89
BOS 18KR-NU-IE10-S4	2.1.89
BOS 18KR-NU-PR10-02	2.1.89
BOS 18KR-NU-PR10-S4	2.1.88
BOS 18KR-PU-ID10-02	2.1.88
BOS 18KR-PU-ID10-S4	2.1.88
BOS 18KR-PU-IE10-02	2.1.89
BOS 18KR-PU-IE10-S4	2.1.89
BOS 18KR-PU-PR10-02	2.1.89
BOS 18KR-PU-PR10-S4	2.1.88
BOS 18KR-XT-IS10-02	2.1.89
BOS 18KR-XT-IS10-S4	2.1.89
BOS 18KW-NA-1HA-C-02	2.1.72
BOS 18KW-NA-1HA-S4-C	2.1.72
BOS 18KW-NA-1LOB-C-02	2.1.78
BOS 18KW-NA-1LOB-S4-C	2.1.78
BOS 18KW-NA-1LQH-C-02	2.1.79
BOS 18KW-NA-1LQH-S4-C	2.1.79
BOS 18KW-NA-1N1R-C-02	2.1.73
BOS 18KW-NA-1N1R-S4-C	2.1.73
BOS 18KW-NA-1PD-C-02	2.1.74
BOS 18KW-NA-1PD-S4-C	2.1.74
BOS 18KW-NA-1QC-C-02	2.1.75
BOS 18KW-NA-1QC-S4-C	2.1.75
BOS 18KW-NA-1TB-C-02	2.1.75
BOS 18KW-NA-1TB-S4-C	2.1.75
BOS 18KW-NA-1XA-C-02	2.1.73
BOS 18KW-NA-1XA-S4-C	2.1.73
BOS 18KW-PA-1HA-C-02	2.1.72
BOS 18KW-PA-1HA-S4-C	2.1.72
BOS 18KW-PA-1LOB-C-02	2.1.78
BOS 18KW-PA-1LOB-S4-C	2.1.78
BOS 18KW-PA-1LQH-C-02	2.1.79
BOS 18KW-PA-1LQH-S4-C	2.1.79
BOS 18KW-PA-1N1R-C-02	2.1.73
BOS 18KW-PA-1N1R-S4-C	2.1.73
BOS 18KW-PA-1PD-C-02	2.1.74
BOS 18KW-PA-1PD-S4-C	2.1.74
BOS 18KW-PA-1QC-C-02	2.1.75
BOS 18KW-PA-1QC-S4-C	2.1.75
BOS 18KW-PA-1TB-C-02	2.1.75
BOS 18KW-PA-1TB-S4-C	2.1.75
BOS 18KW-PA-1XA-C-02	2.1.73
BOS 18KW-PA-1XA-S4-C	2.1.73
BOS 18K-XT-IS10-02	2.1.87
BOS 18K-XT-IS10-S4	2.1.87
BOS 18-LT-1	2.3.14
BOS 18M-GU-1PF-S4-Y	2.1.23
BOS 18M-NA-1QB-E4-C-03	2.1.23
BOS 18M-NA-1QB-E5-C-S4	2.1.23
BOS 18M-NA-1VD-E4-C-03	2.1.23
BOS 18M-NA-1VD-E5-C-S4	2.1.23
BOS 18M-NA-LD10-02	2.1.32
BOS 18M-NA-LD10-S4	2.1.32
BOS 18M-NA-LE10-02	2.1.33
BOS 18M-NA-LE10-S4	2.1.33
BOS 18M-NA-LR10-02	2.1.33
BOS 18M-NA-LR10-S4	2.1.32
BOS 18M-NOV-LH22-S4	new 2.1.31
BOS 18M-NSV-LH22-S4	new 2.1.31
BOS 18M-PA-1HA-S4-C	2.1.20
BOS 18M-PA-1PA-E4-C-03	2.1.21
BOS 18M-PA-1PA-E5-C-S4	2.1.21
BOS 18M-PA-1PD-E4-C-03	2.1.21
BOS 18M-PA-1PD-E5-C-S4	2.1.21
BOS 18M-PA-1PF-E5-C-S4	2.1.22
BOS 18M-PA-1QB-E4-C-03	2.1.23
BOS 18M-PA-1QB-E5-C-S4	2.1.23
BOS 18M-PA-1VD-E5-C-S4	2.1.23
BOS 18M-PA-LD10-02	2.1.32
BOS 18M-PA-LD10-S4	2.1.32
BOS 18M-PA-LE10-02	2.1.33
BOS 18M-PA-LE10-S4	2.1.33
BOS 18M-PA-LR10-02	2.1.33
BOS 18M-PA-LR10-S4	2.1.32
BOS 18M-PO-1PD-E4-C-03	2.1.27
BOS 18M-PO-1RB-E4-C-03	2.1.27
BOS 18M-PO-1RB-E5-C-S4	2.1.27
BOS 18M-PO-1RD-E4-C-03	2.1.27
BOS 18M-PO-1RD-E5-C-S4	2.1.27
BOS 18M-PO-1XA-E4-C-03	2.1.26
BOS 18M-PO-1XA-E5-C-S4	2.1.26
BOS 18M-PO-1XB-E4-C-03	2.1.26
BOS 18M-PO-1XB-E5-C-S4	2.1.26
BOS 18M-POV-LH22-S4	new 2.1.31
BOS 18M-PS-1HA-E5-C-S4	2.1.20
BOS 18M-PS-1PD-E4-C-03	2.1.27
BOS 18M-PS-1RB-E4-C-03	2.1.27
BOS 18M-PS-1RB-E5-C-S4	2.1.27
BOS 18M-PS-1RD-E4-C-03	2.1.27
BOS 18M-PS-1RD-E5-C-S4	2.1.27
BOS 18M-PS-1XA-E4-C-03	2.1.26
BOS 18M-PS-1XA-E5-C-S4	2.1.26
BOS 18M-PS-1XB-E4-C-03	2.1.26
BOS 18M-PS-1XB-E5-C-S4	2.1.26
BOS 18M-PSV-LH22-S4	new 2.1.31
BOS 18M-PU-1PD-S4-C	2.1.41
BOS 18M-PU-1PD-SA4-C	2.1.22
BOS 18M-PU-1PD-SA5-C	2.1.21
BOS 18M-PU-1QB-S4-C	2.1.41
BOS 18MR-NA-LD10-02	2.1.34
BOS 18MR-NA-LD10-S4	2.1.34
BOS 18MR-NA-LE10-02	2.1.35
BOS 18MR-NA-LE10-S4	2.1.35
BOS 18MR-NA-LR10-02	2.1.35
BOS 18MR-NA-LR10-S4	2.1.34
BOS 18MR-PA-1HA-S4-C	2.1.44
BOS 18MR-PA-LD10-02	2.1.34
BOS 18MR-PA-LD10-S4	2.1.34
BOS 18MR-PA-LE10-02	2.1.35
BOS 18MR-PA-LE10-S4	2.1.35
BOS 18MR-PA-LR10-02	2.1.35
BOS 18MR-PA-LR10-S4	2.1.34
BOS 18MR-PS-1HA-E5-C-S4	2.1.44
BOS 18MR-PS-1OD-E5-C-S4	2.1.45
BOS 18MR-PS-1QB-E5-C-S4	2.1.45
BOS 18MR-XT-LS10-02	2.1.35
BOS 18MR-XT-LS10-S4	2.1.35
BOS 18M-WS-7PB-B1-L-03	2.1.42

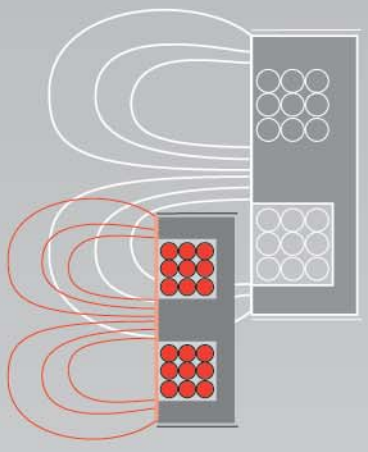
BOS 18M-WS-7RB-B0-L-03
to
Zahnscheiben (Lockwashers)

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BOS 18M-WS-7RB-B0-L-03	2.1.42
BOS 18M-WS-7XA-B0-L-03	2.1.42
BOS 18M-WS-7XB-B0-L-03	2.1.42
BOS 18M-XT-LS10-02	2.1.33
BOS 18M-XT-LS10-S4	2.1.33
BOS 18-NF-1	2.3.15
BOS 18-NF-2	2.3.15
BOS 18-PF-1	2.3.14
BOS 18-PK-1	2.3.14
BOS 18-SM-1	2.3.15
BOS 18-SM-2	2.3.15
BOS 18-UK-1	2.3.16
BOS 18-UK-10	2.3.16
BOS 18-UK-2	2.3.16
BOS 21-AD-1	2.3.9
BOS 21-HS-1	2.3.11
BOS 21-HW-1	2.3.6
BOS 21-HW-2	2.3.6
BOS 21-HW-3	2.3.6
BOS 21-HW-4	new 2.3.7
BOS 21-KH-1	2.3.9
BOS 21-KH-2	2.3.9
BOS 21M-NA-ID10-S4	2.1.139
BOS 21M-NA-IE10-S4	2.1.141
BOS 21M-NA-LD10-S4	2.1.143
BOS 21M-NA-LE10-S4	2.1.143
BOS 21M-NA-LR10-S4	2.1.143
BOS 21M-NA-PK10-S4	2.1.141
BOS 21M-NA-PR10-S4	2.1.140
BOS 21M-NA-PT10-S4	2.1.141
BOS 21M-NA-RD10-S4	2.1.139
BOS 21M-NUS-LH12-S4	2.1.142
BOS 21M-NUS-RH12-S4	2.1.138
BOS 21M-NUS-RV13-S4	2.1.139
BOS 21M-PA-ID10-S4	2.1.139
BOS 21M-PA-IE10-S4	2.1.141
BOS 21M-PA-LD10-S4	2.1.143
BOS 21M-PA-LE10-S4	2.1.143
BOS 21M-PA-LR10-S4	2.1.143
BOS 21M-PA-PK10-S4	2.1.141
BOS 21M-PA-PR10-S4	2.1.140
BOS 21M-PA-PT10-S4	2.1.141
BOS 21M-PA-RD10-S4	2.1.139
BOS 21M-PUS-LH12-S4	2.1.142
BOS 21M-PUS-RH12-S4	2.1.138
BOS 21M-PUS-RV13-S4	2.1.139
BOS 21M-XT-IS11-S4	2.1.141
BOS 21M-XT-LS11-S4	2.1.143
BOS 26-HW-1	2.3.7
BOS 26K-NA-1HC-S4-C	2.1.150
BOS 26K-NA-1IE-S4-C	2.1.151
BOS 26K-NA-1LHA-SA1-S4-C	new 2.1.152
BOS 26K-NA-1LHB-S4-C	2.1.153
BOS 26K-NA-1LHC-S4-C	2.1.153
BOS 26K-NA-1LQP-S4-C	new 2.1.153
BOS 26K-NA-1QE-S4-C	2.1.151
BOS 26K-PA-1HC-S4-C	2.1.150
BOS 26K-PA-1IE-S4-C	2.1.151
BOS 26K-PA-1LHA-SA1-S4-C	new 2.1.152
BOS 26K-PA-1LHB-S4-C	2.1.153
BOS 26K-PA-1LHC-S4-C	2.1.153
BOS 26K-PA-1LQP-S4-C	new 2.1.153
BOS 26K-PA-1QE-S4-C	2.1.151
BOS 26K-PO-1QE-SA1-C	2.1.151
BOS 2-HW-1	2.3.6
BOS 2-HW-2	2.3.6
BOS 2-HW-3	2.3.6
BOS 2K-NO-PR10-02	2.1.105
BOS 2K-NO-RH10-02	2.1.103
BOS 2K-NS-PR10-02	2.1.105
BOS 2K-NS-RD10-02	2.1.105
BOS 2K-NS-RE10-02	2.1.107
BOS 2K-NS-RH10-02	2.1.103
BOS 2K-NS-RH11-02	2.1.103
BOS 2K-PO-PR10-00,2-S49	2.1.105
BOS 2K-PO-PR10-02	2.1.105
BOS 2K-PO-RE10-02	new 2.1.107
BOS 2K-PO-RH10-00,2-S49	2.1.102
BOS 2K-PO-RH11-02	2.1.103
BOS 2K-PS-PR10-00,2-S49	2.1.105
BOS 2K-PS-PR10-00,2-S75	2.1.105
BOS 2K-PS-PR10-02	2.1.105
BOS 2K-PS-RD10-00,2-S49	2.1.104
BOS 2K-PS-RD10-00,2-S75	2.1.104
BOS 2K-PS-RD10-02	2.1.105
BOS 2K-PS-RE10-00,2-S49	2.1.106
BOS 2K-PS-RE10-00,2-S75	2.1.107
BOS 2K-PS-RE10-02	2.1.107
BOS 2K-PS-RH10-00,2-S49	2.1.102
BOS 2K-PS-RH10-00,2-S75	2.1.102
BOS 2K-PS-RH10-02	2.1.103
BOS 2K-PS-RH11-00,2-S49	2.1.103
BOS 2K-PS-RH11-00,2-S75	2.1.103
BOS 2K-PS-RH11-02	2.1.103
BOS 2K-X-RS10-00,2-S49	2.1.106
BOS 2K-X-RS10-00,2-S75	2.1.107
BOS 2K-X-RS10-02	2.1.107
BOS 30,0-KB-1	2.3.9
BOS 30M-GA-1PH-S4-C	2.1.94
BOS 30M-PU-1PH-SA3-C	2.1.94
BOS 36-HW-1	2.3.7
BOS 36K-PA-1HD-S4-C	2.1.158
BOS 36K-PA-1PH-S4-C	2.1.159
BOS 36K-PA-1QH-S4-C	2.1.159
BOS 5-BL-1	2.3.13
BOS 5-BL-2	2.3.13
BOS 5-BL-3	2.3.13
BOS 5-BL-4	2.3.13
BOS 5-BL-5	2.3.13
BOS 5-BL-6	2.3.13
BOS 5-BL-7	2.3.13
BOS 5-BL-8	2.3.13
BOS 5-BL-9	2.3.13
BOS 5-HW-1	2.3.6
BOS 5-HW-2	2.3.7
BOS 5-HW-3	2.3.7
BOS 5-HW-4	2.3.8
BOS 5-HW-5	2.3.8
BOS 5-HW-6	2.3.8
BOS 5K-NO-ID10-02	2.1.113
BOS 5K-NO-ID10-S75	2.1.113
BOS 5K-NO-IX10-02	2.1.115
BOS 5K-NO-IX10-S75	2.1.115
BOS 5K-NO-IX10-S75-S	2.1.115
BOS 5K-NO-RD11-02	2.1.113
BOS 5K-NO-RD11-S75	2.1.113
BOS 5K-NO-RH12-02	new 2.1.112
BOS 5K-NO-RH12-S75	new 2.1.112
BOS 5K-NO-RR10-02	2.1.115
BOS 5K-NO-RR10-S75	2.1.114
BOS 5K-NO-RR10-S75-S	2.1.114
BOS 5K-NS-ID10-02	2.1.113
BOS 5K-NS-ID10-S75	2.1.113
BOS 5K-NS-IX10-02	2.1.115
BOS 5K-NS-IX10-S75	2.1.115
BOS 5K-NS-RD11-02	2.1.113
BOS 5K-NS-RD11-S75	2.1.113
BOS 5K-NS-RH12-02	new 2.1.112
BOS 5K-NS-RH12-S75	new 2.1.112
BOS 5K-NS-RR10-02	2.1.115
BOS 5K-NS-RR10-S75	2.1.114
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BOS 5K-PO-IX10-S75	2.1.115
BOS 5K-PO-IX10-S75-S	2.1.115
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BOS 5K-PS-RH12-S75	new 2.1.112
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BOS 5K-PS-RR10-S75	2.1.114
BOS 65-HW-1	2.3.8
BOS 65K-1-B8T-1	2.1.165
BOS 65K-1-C200T-1	2.1.165
BOS 65K-1-M110T-1	2.1.165
BOS 65K-5-B8T-1	2.1.165
BOS 65K-5-B8T-2P-S4	2.1.165
BOS 65K-5-C200T-1	2.1.165
BOS 65K-5-C200T-2P-S4	2.1.165
BOS 65K-5-M110T-1	2.1.165
BOS 65K-5-M110T-2P-S4	2.1.165
BOS 6-HW-1	2.3.7
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BOS 6K-NU-1HA-C-02	2.1.121

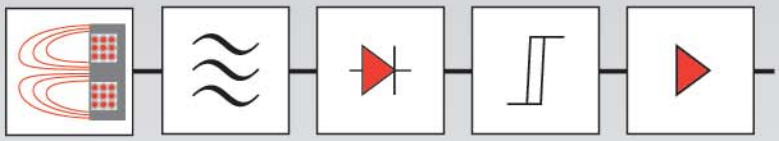
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BOS 6K-NU-1LHA-SA1-S75-C	2.1.127
BOS 6K-NU-1LQA-C-02	2.1.127
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BOS 6K-NU-1QA-C-02	2.1.123
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BOS 6K-NU-1QC-C-02	2.1.125
BOS 6K-NU-1QC-S75-C	2.1.124
BOS 6K-NU-1TA-C-02	2.1.122
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BOS 6K-PU-1HA-S49-C	2.1.120
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BOS 6K-PU-1LHA-S75-C	2.1.126
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BOS 6K-PU-1OC-S75-C	2.1.121
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BOS 6K-PU-1QA-S75-C	2.1.123
BOS 6K-PU-1QC-C-02	2.1.125
BOS 6K-PU-1QC-S49-C	2.1.124
BOS 6K-PU-1QC-S75-C	2.1.124
BOS 6K-PU-1TA-C-02	2.1.122
BOS 6K-PU-1TA-S75-C	2.1.122
BOS 73K-PU-1FR-C-02	2.2.9
BOS 73K-PU-1FR-C-S75-00,1	2.2.9
BOS 74-HW-1	2.3.8
BOS 74K-UU-1FR-B0-Z-02	2.2.11
BOS 74K-UU-1FR-B0-Z-S49-00,2	2.2.11
BOS 74K-UU-1FS-B0-Z-02	2.2.11
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BOS R-14	2.3.2
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BOS R-16	2.3.4
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BOS R-26	2.3.3
BOS R-27	2.3.3
BOS R-28	2.3.3
BOS R-29	2.3.3
BOS R-3	2.3.2
BOS R-30	2.3.5
BOS R-33 new	2.3.3
BOS R-5	2.3.3
BOS R-6-0,25	2.3.5
BOS R-6-45	2.3.5
BOS R-7-0,25	2.3.5
BOS R-7-22	2.3.5
BOS R-8-0,25	2.3.5
BOS R-8-22	2.3.5
BOS R-9	2.3.3
BOS S-C01	5.43
BOS S-C02	5.43
BOS S-F01	5.43
BOS S-F02	5.43
BOS S-M01	5.43
BOS S-M02	5.43
BOS S-T01	5.43
BOS S-T02	5.43
BOWA 0408-PS-C-S49	2.2.102
BOWA 0808-PS-C-S49	2.2.103
BOWA 1208-PS-C-S49	2.2.103
BSB-04-F01P/4-M01M-2319	5.24
BSB-04-F01P/4-M02M-KP-05	5.25
BSB-04-F01P/8-M01M-2319	5.24
BSB-04-F01P/8-M02M-KP-05	5.25
BSB-04-F02P/8-M01K-2319	5.26
BSB-04-F02P/8-M02K-2319	5.26
BSB-04-P01P/4-M02K-HKP-05	5.27
BSB-04-P01P/4-M02K-HTS	5.28
BSB-04-P01P/8-M02K-HKP-05	5.27
BSB-04-P01P/8-M02K-HTS	5.28
BSB-49-F01P/8-M02K-HTS	5.29
BSB-49-F01P/8-M02K-KP-05	5.29
BWL 110110D-L011-S49	2.2.97
BWL 110110D-L012-S49	2.2.97
BWL 110110D-R011-S49	2.2.95
BWL 110110D-R012-S49	2.2.95
BWL 2222B-001-S4	2.2.98
BWL 2222C-001-S4	2.2.98
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BWL 4040D-L012-S49	2.2.96
BWL 4040D-R011-S49	2.2.94
BWL 4040D-R012-S49	2.2.94
BWL 4241A-001-S4	2.2.99
BWL 4241A-001-S49	2.2.99
BWL 4260A-001-S4	2.2.99
BWL 4260A-001-S49	2.2.99
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BWL 5454D-L012-S49	2.2.96
BWL 5454D-R011-S49	2.2.94
BWL 5454D-R012-S49	2.2.94
BWL 6868D-L011-S49	2.2.97
BWL 6868D-L012-S49	2.2.97
BWL 6868D-R011-S49	2.2.95
BWL 6868D-R012-S49	2.2.95
BWL 9090D-L011-S49	2.2.97
BWL 9090D-L012-S49	2.2.97
BWL 9090D-R011-S49	2.2.95
BWL 9090D-R012-S49	2.2.95
Federscheibe (Compression disc)	5.72
Magnet rund (Magnet round) 620961	3.2.3
Magnet rund (Magnet round) 709084	3.2.3
Magnetplatte (Magnet plate) 620260	3.2.3
Montageplatte B 4 - 2057	5.69
Muttern aus Edelstahl (Stainless nuts)	5.72
Muttern aus Kunststoff (Plastic nuts)	5.72
Muttern aus Metall (Metal nuts)	5.72
RSC 4/7	5.18
RSC 5/7 new	5.19
RSCW 4/7	5.19
RSCW 5/7 new	5.19
Schlauchschelle (Hose Clamp) BMF Gr. 0	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 1	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 2	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 3	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 4	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 5	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 6	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 7	3.1.23
Schlauchschelle (Hose Clamp) BMF Gr. 8	3.1.23
STAHL 9170/20-12-11S new	1.5.39
STAHL 9170/20-12-21S new	1.5.39
Zahnscheiben (Lockwashers)	5.72

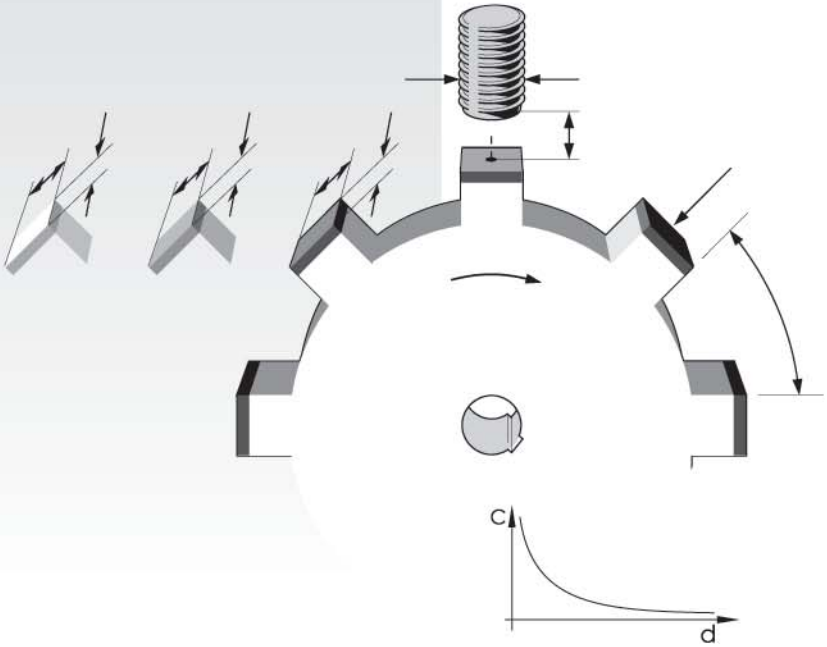


Principles









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

1.0.2 Function descriptions, definitions
1.0.3 Delay times, temperature effects and limits, Magnetic field immunity
1.0.4 Electrical parameters
1.0.5 Electrical parameters, output circuits
1.0.6 Wiring diagrams
1.0.7 Series and parallel connection, Utilization categories
1.0.8 Protection circuits
1.0.9 Response curves
1.0.10 Switching distances
1.0.11 Installation
1.0.14 Materials
1.0.16 Cable types, tightening torques, removal clearance, housing tolerances
1.0.17 Quality
1.0.18 Standards
1.0.20 Product overview

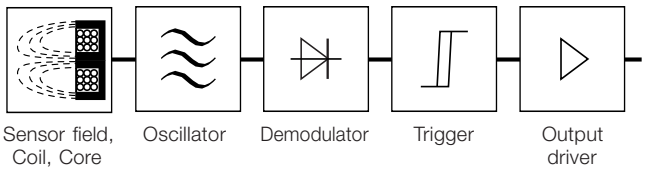
Principle

... 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.

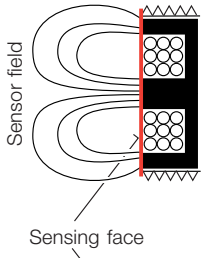
Function groups

... of the Balluff proximity switch are:



Sensing face

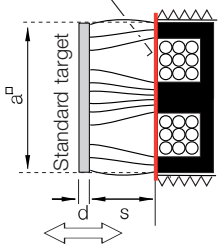
... is the area through which the high-frequency sensor field enters the air space. It is determined primarily by the base of the shell core and corresponds roughly to the surface area of the shell core cap.



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.

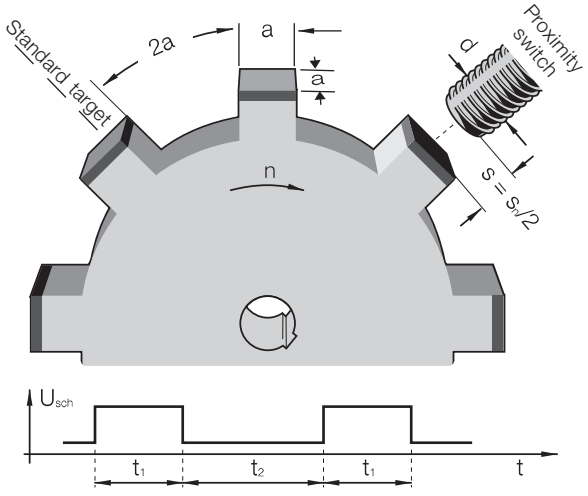
Material	Factor
steel	1.0
copper	0.25...0.45
brass	0.35...0.50
aluminum	0.30...0.45
stainless steel	0.60...1.00
nickel	0.65...0.75
cast iron	0.93...1.05

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

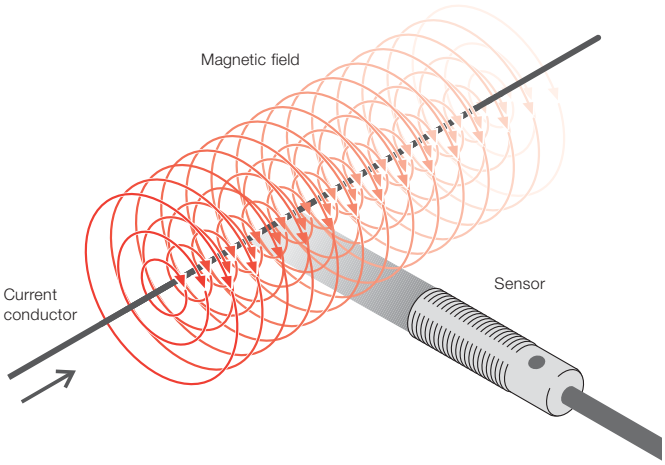
... is the temperature range over which the function of the switch is guaranteed.

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.

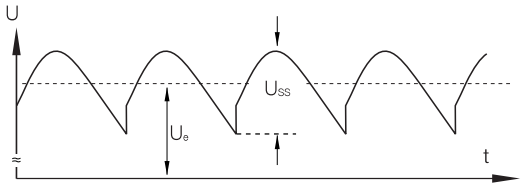
For proximity switches the highest rated operating voltage must be considered as the rated isolation voltage.

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.

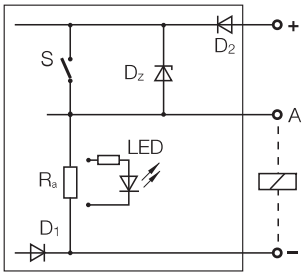
Minimum operating current I_m	... is the smallest load current required for function	of the switch when ON.
Output resistance R_a	... is the resistance between the output and the supply voltage which is built into the	switch; see „Output circuits“.
Load capacitance	... is the permissible total capacitance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

Output circuits

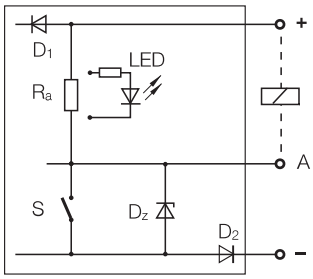
Driver stages

3-wire
DC switches

PNP, sourcing
(current source)



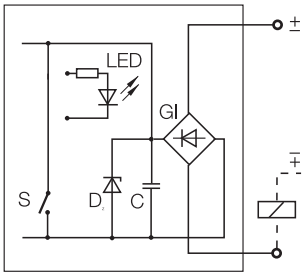
NPN, sinking
(current sink)



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

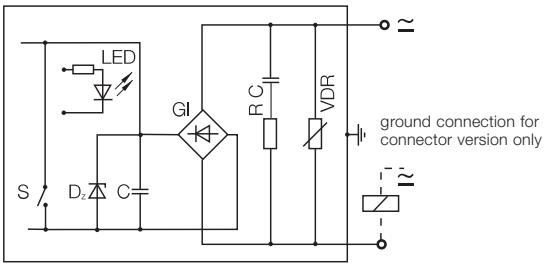
2-wire
DC switches

Non-polarized

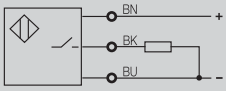
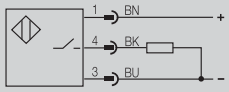
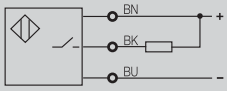
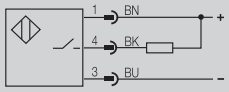
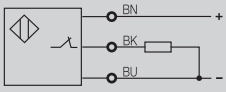
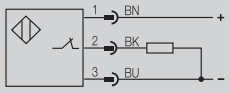
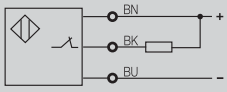
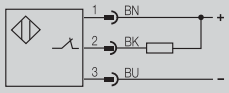
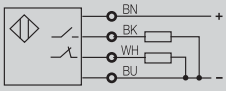
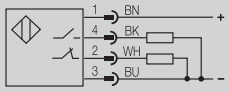
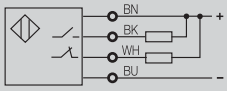
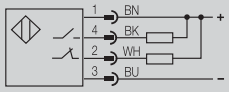
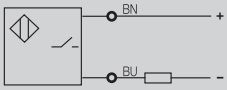
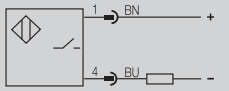
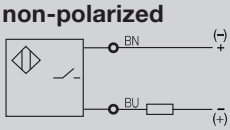
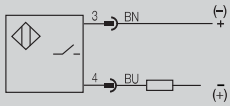
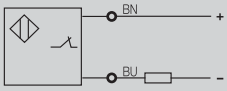
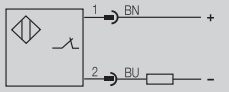
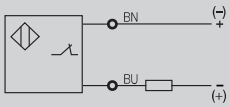
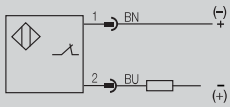
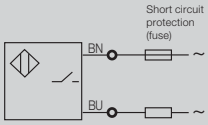
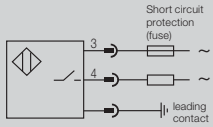
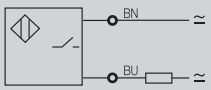
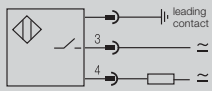
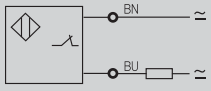
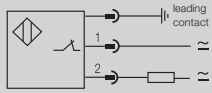
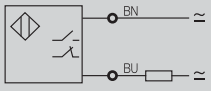


S = semiconductor switch
D_z = Z-Diode, limiter
C = capacitor
GI = bridge rectifier
LED = light emitting diode

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					

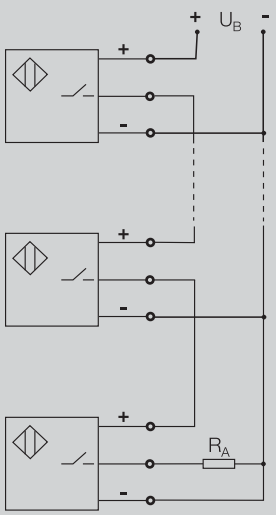
Wire colors
Coding
per DIN IEC 60757

BN	brown
BK	black
BU	blue
WH	white

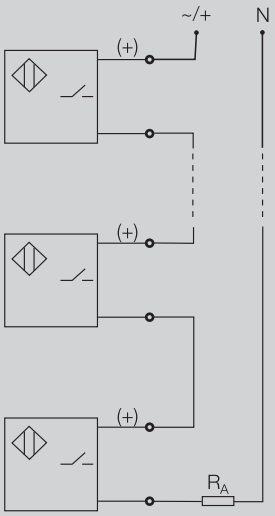
Series connection

... 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



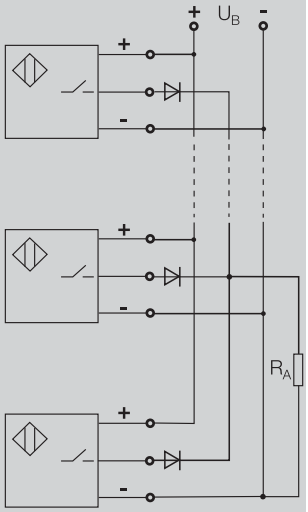
2-wire DC switch (AC/DC)



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

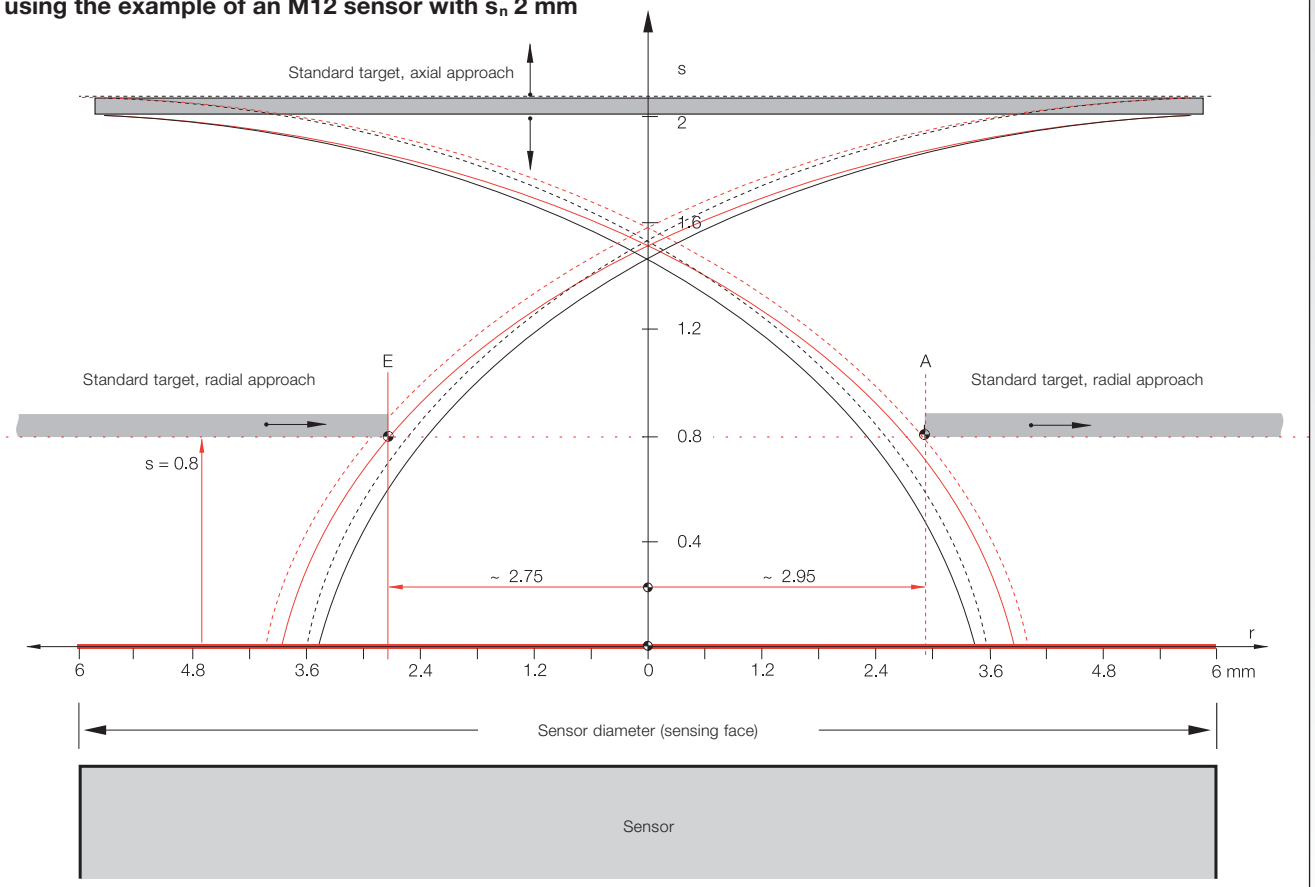
Due in part to manufacturing tolerances within a production run, the exact switchpoint must in any case be established on site. The solid lines represent the respective switchpoint (E), the dashed lines indicate the turn-off point (A). The red lines apply to switches with a clear zone, and the black 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

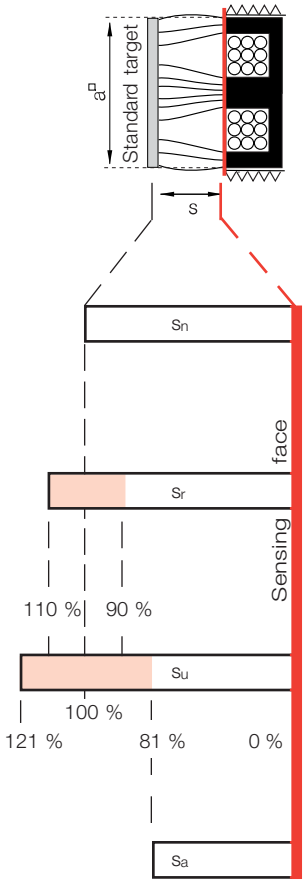
Switching distance s
... is the distance between the standard target and the sensing face of the proximity switch at which a signal change is generated
per EN 60947-5-2. For “normally open” this means from OFF to ON and for normally closed from ON to OFF.

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 ($0 \le s_a \le 0.81\ s_n$).



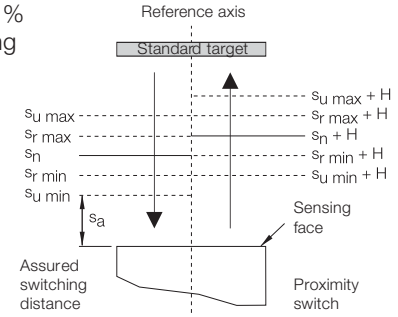
Switching distance identifier (in sections **1.1**, **1.2** and **1.5**)

		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 $R \le 0.1\ s_r$.

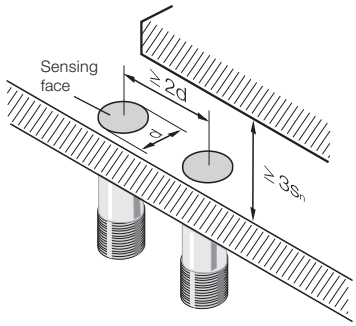
Hysteresis H (switching hysteresis when target is backed off)
... is given as a percentage of the effective operating distance s_r. It is measured at an ambient temperature of +23 °C ±5 and at the rated operational voltage.
It must be less than 20 % of the effective operating distance (s_r).
$H \le 0.2\ s_r$



Installation in metal
Sensors with standard switching distance

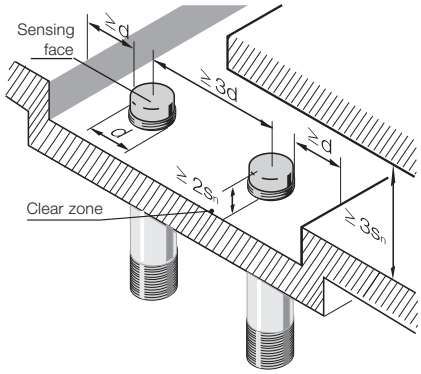
Flush mountable proximity switches

... 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.



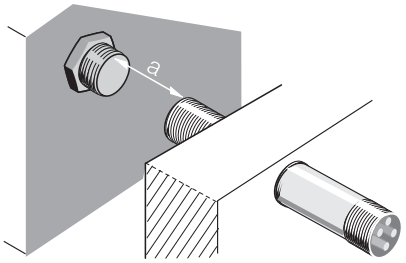
Non-flush mountable proximity switches

... 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.



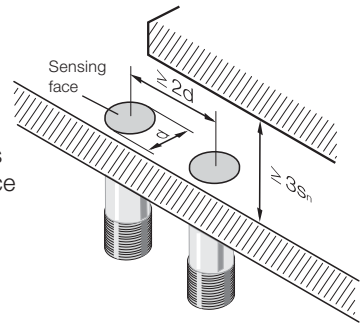
Installation medium

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

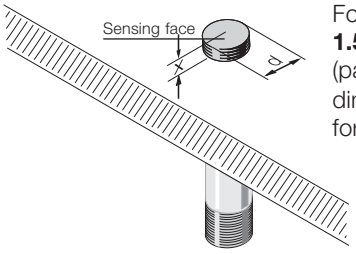
Installation in metal
Sensors with switching distance indicator ■■

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



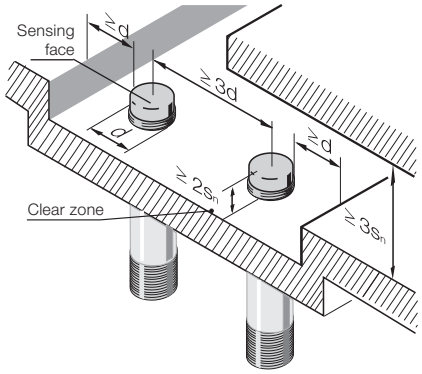
For Factor 1 sensors (page **1.5.**5 ...) and ATEX NAMUR (page **1.5.**40 ...) the dimension „×" is not needed for installation in metal.

For section **1.2**:

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

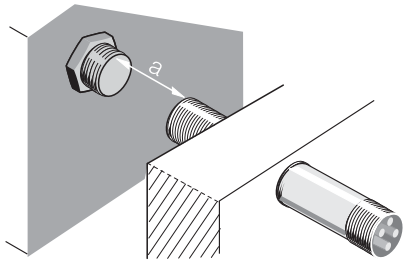
Non-flush mountable proximity switches

... 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

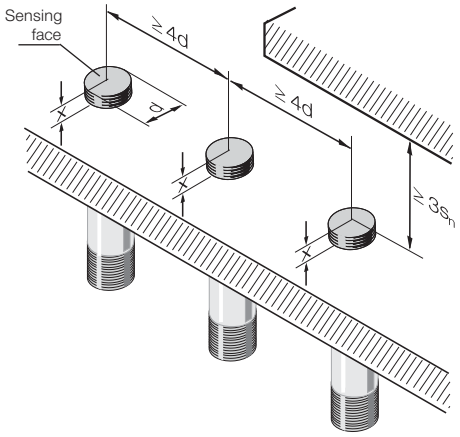
... requires for all inductive proximity switches a minimum distance of ≥ 4d between the sensing face.



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.



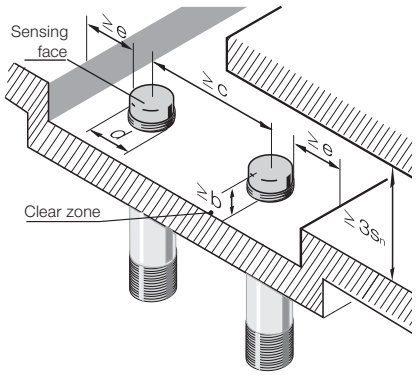
Housing size d	Switching distance ■■■ Dimension „x" for installation in ferromagnetic materials	other metals	Switching distance ■■■■ Dimension „x" for installation in ferromagnetic materials	other metals
Ø 6.5 mm, M8	2.0 mm	1.0 mm	3.0 mm	2.0 mm
M12	2.5 mm	2.0 mm	4.0 mm	3.0 mm
M18	4.0 mm	2.5 mm		
M30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

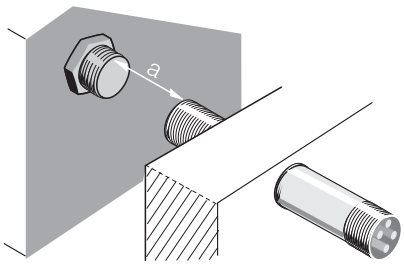
Housing size d	Dimension b	Dimension c	Dimension e
Ø 3 mm	≥ 10 mm	≥ 30 mm	≥ 10 mm
Ø 4 mm	≥ 15 mm	≥ 40 mm	≥ 20 mm
M5	≥ 15 mm	≥ 40 mm	≥ 20 mm
Ø 6.5 mm	≥ 8 mm	≥ 32 mm	≥ 8 mm
M8	≥ 8 mm	≥ 32 mm	≥ 8 mm
M12	≥ 10 mm	≥ 48 mm	≥ 12 mm
M18	≥ 20 mm	≥ 72 mm	≥ 18 mm
M30	≥ 35 mm in steel ≥ 25 mm in alloy ≥ 20 mm in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

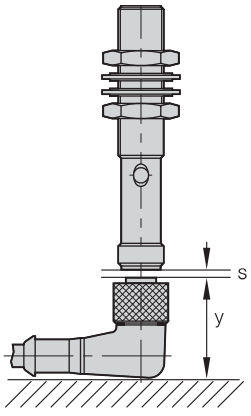
Tightening torques

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

Testing laboratory

The Balluff testing laboratory works in accordance with ISO/IEC 17025 and is accredited by the DATech for Testing of Electromagnetic Compatibility (EMC).

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.

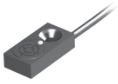
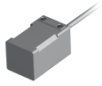
Balluff is a member of ALPHA

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.

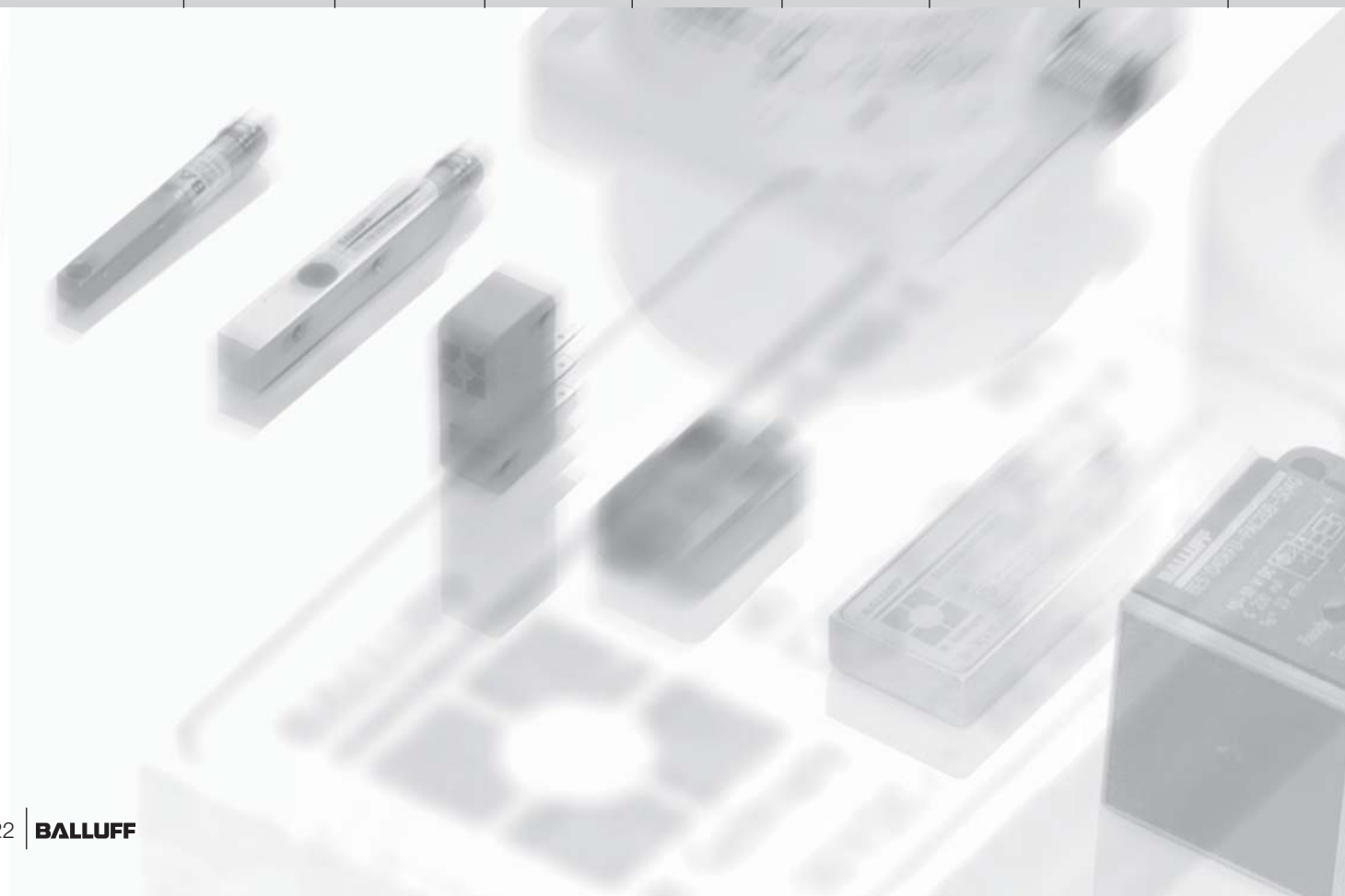
Sensors	Low-voltage equipment	EN 60947-5-2/IEC 60947-5-2	
	NAMUR sensors	EN 60947-5-6/IEC 60947-5-6	
Insulation class	II ⧈	EN 60947-5-2/IEC 60947-5-2	
Degree of protection (enclosure rating)	IP 60...67	EN 60529/IEC 60529	
	IP 68 per BWN Pr. 20	Balluff Factory Standard (BWN): Temperature storage 48 h 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.

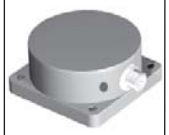
EMC (Electromagnetic Compatibility)	Emissions, RF noise voltage and RF noise radiation from electrical equipment	EN 55011
	Static discharge immunity (ESD)	EN 61000-4-2/IEC 61000-4-2
	Radio frequency immunity (RFI)	EN 61000-4-3/IEC 61000-4-3
	Immunity to fast transients (burst)	EN 61000-4-4/IEC 61000-4-4
	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 ...	

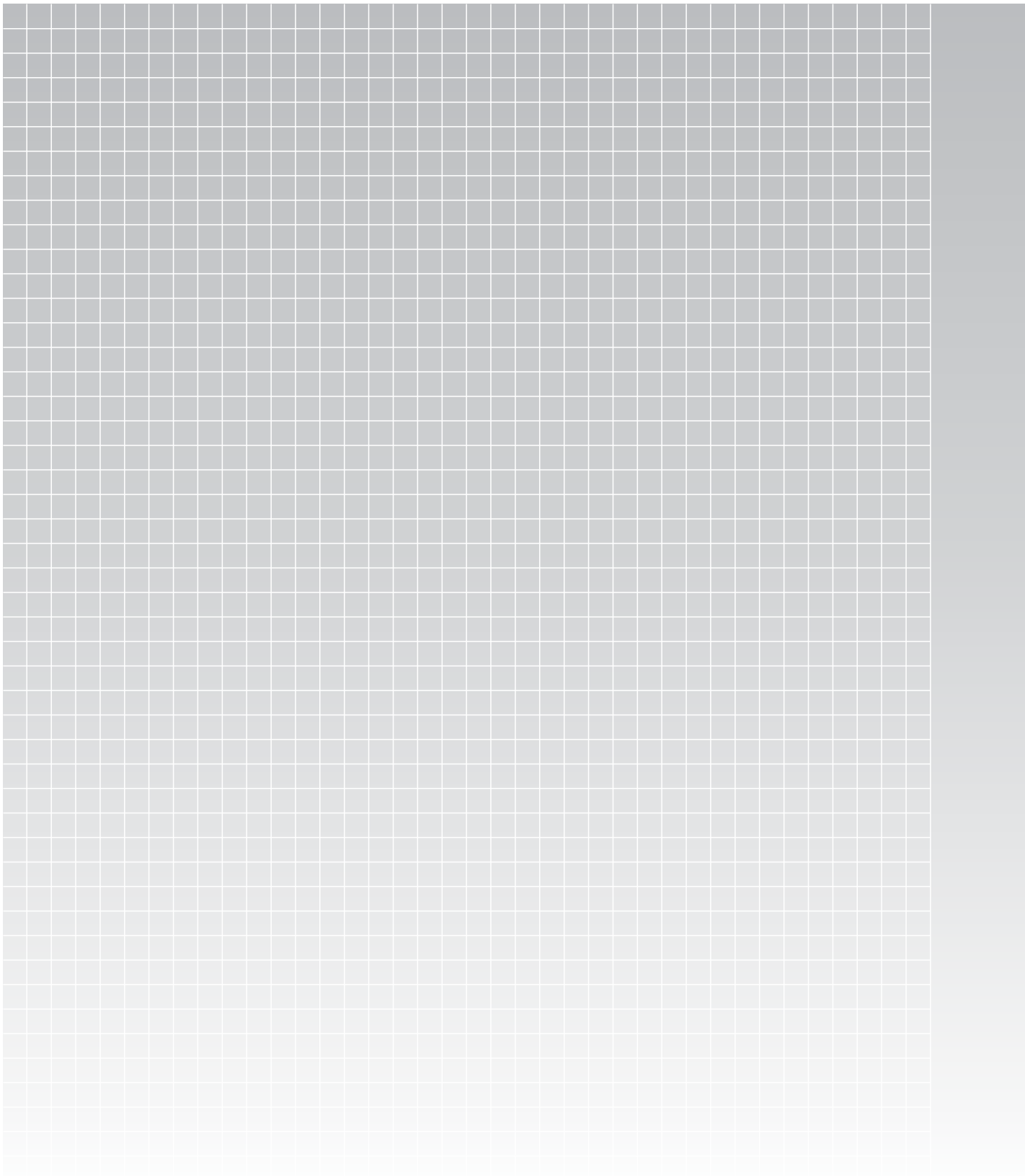
								
	5×5 mm	**8×8 mm**	**8×16 mm**	**10×30 mm**	**16.5×30 mm**	**17.5×17.3 mm**	**20×32 mm**	**25×50 mm**
	1.1.47	**1.1.**50 ...	**1.1.**48 ...	**1.1.**49	**1.1.**53	**1.1.**58	**1.1.**55	**1.1.**58 ...
							1.5.11	
							1.5.12 ...	
								1.5.43

								
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								

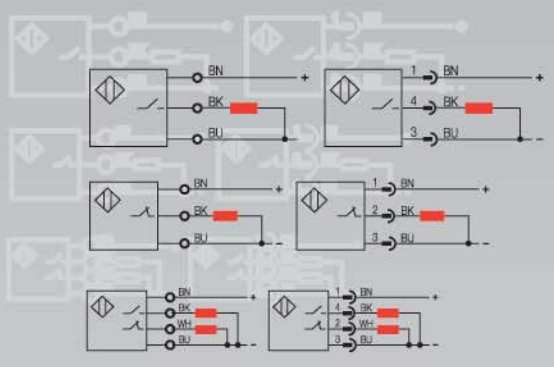


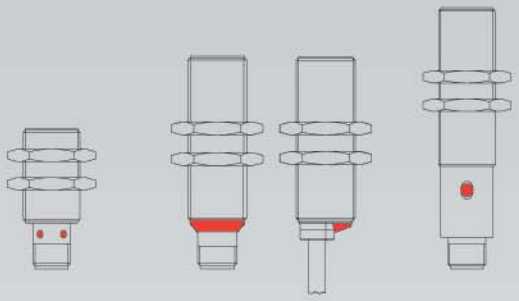
								
	35×35 mm	**∅ 80×67 mm**	**∅ 110×110 mm**	**Ring sensor**				
	1.5.53	**1.5.**52	**1.5.**54					
				1.5.51				





Inductive – DC 3-/4-wire





Short housing

Mid-length with maximum thread length

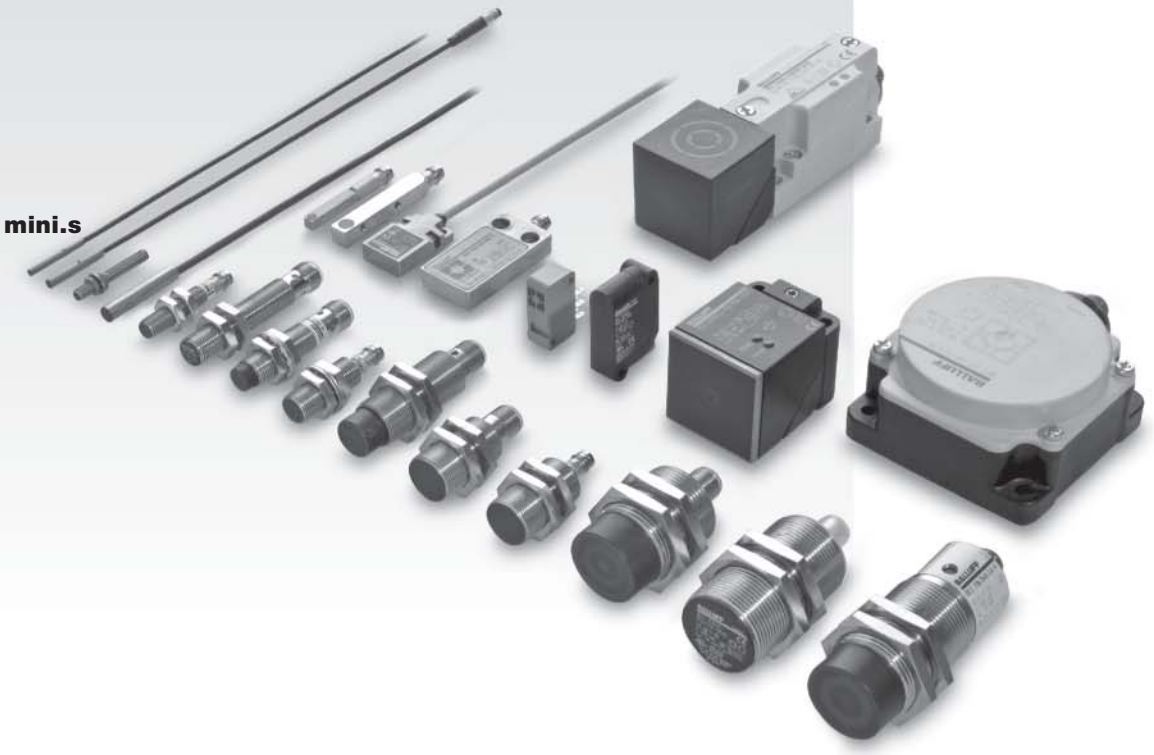
Long housing

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

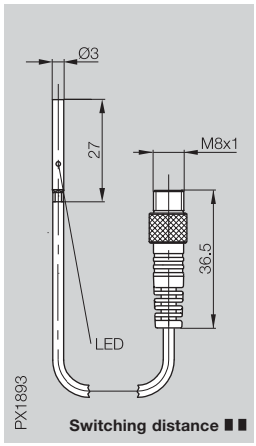
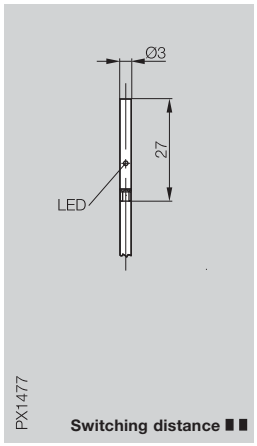
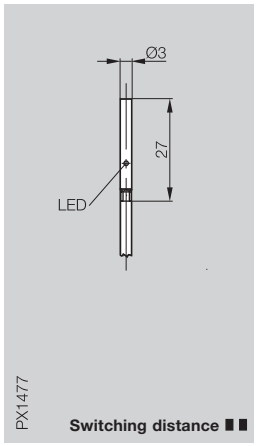
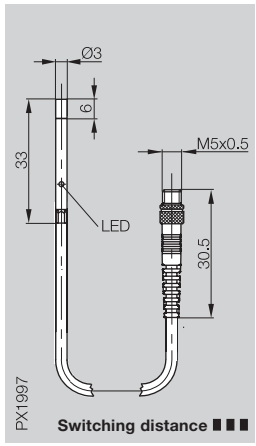
In this comprehensive line Balluff offers proximity switches from Ø 3 mm to 80×80 mm for virtually any application in the field of automation.

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.

1.1.2 Ø 3 mm
1.1.3 Ø 3 mm, Ø 4 mm
1.1.6 M5
1.1.9 Ø 6.5 mm
1.1.13 Ø 8 mm
1.1.14 M8
1.1.24 M12
1.1.33 M18
1.1.40 M30
1.1.47 Block style housings



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

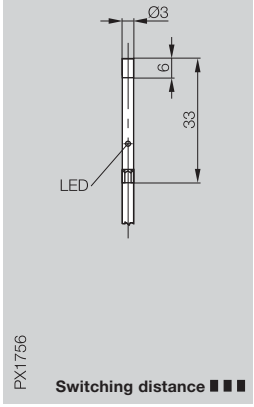
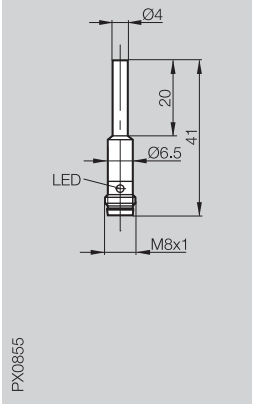
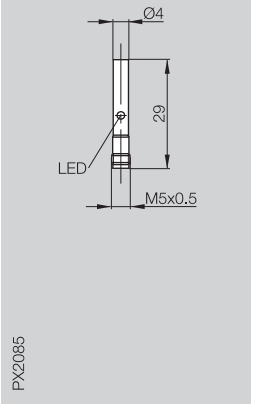
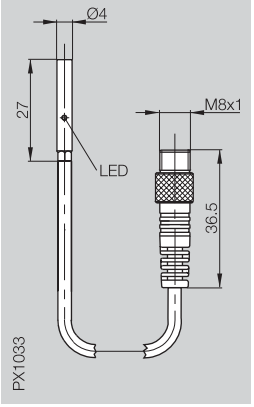
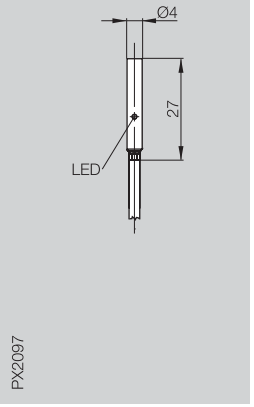
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

Other cable lengths on request.



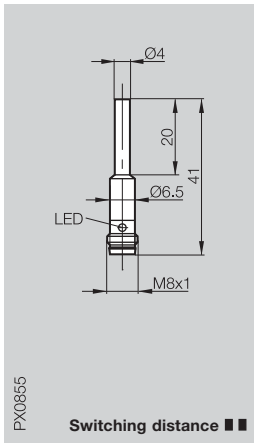
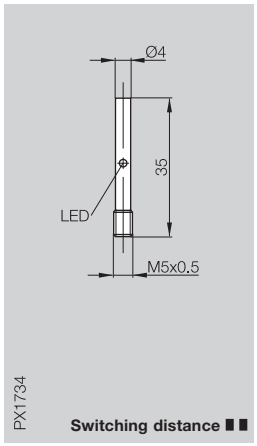
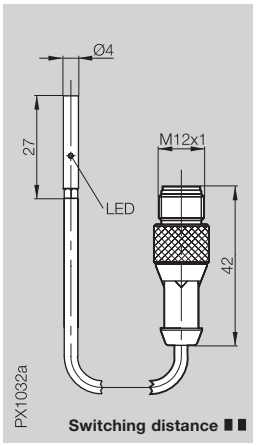
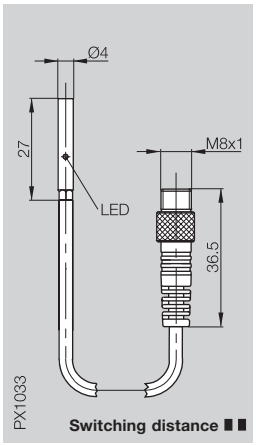


mini.s
The new sensor dimension

	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	



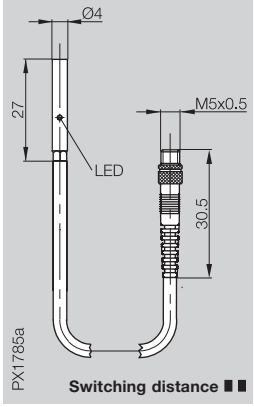
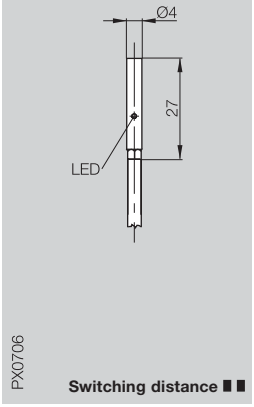
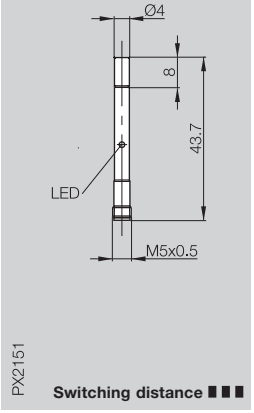
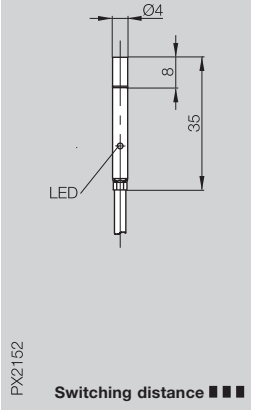
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5
Connectors, Holders ... Page 5.2 ...

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

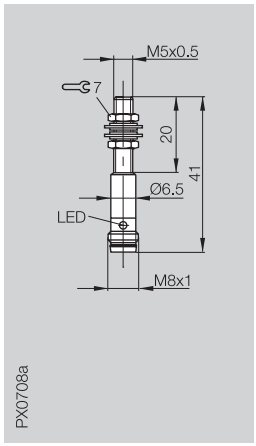
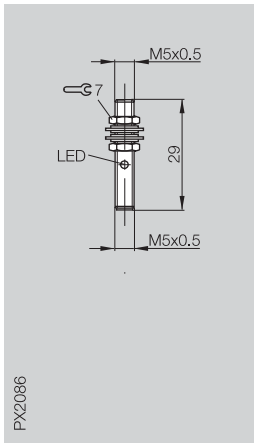
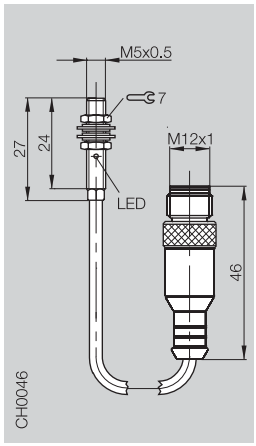
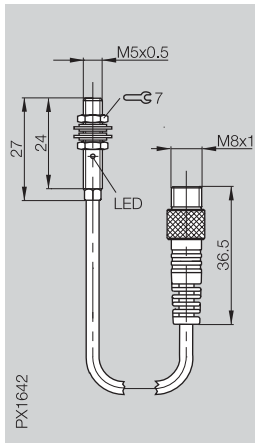
Other cable lengths on request.



	∅ 4 mm	**∅ 4 mm**	**∅ 4 mm**	**∅ 4 mm**	
	flush	flush	non-flush	non-flush	
	1.5 mm	**1.5 mm**	**5 mm**	**5 mm**	
	0...1.2 mm	0...1.2 mm	0...4.1 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		



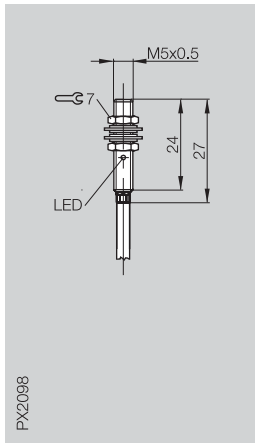
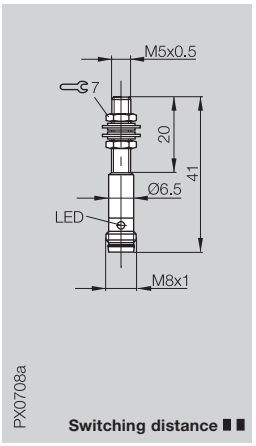
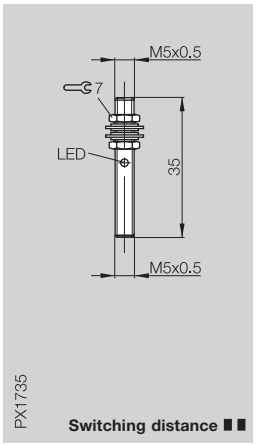
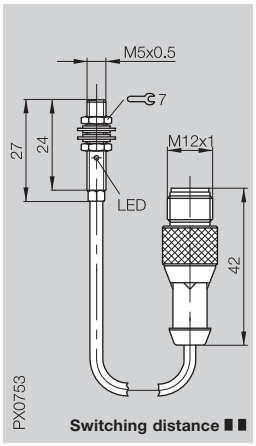
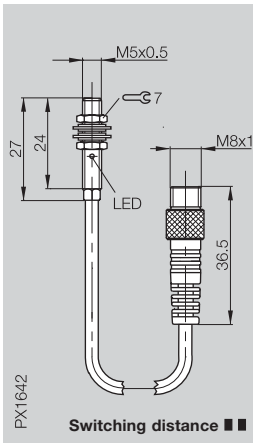
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5
Connectors, Holders ...
Page 5.2 ...

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.

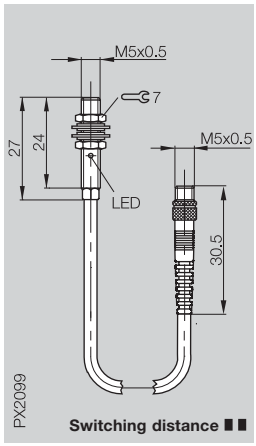
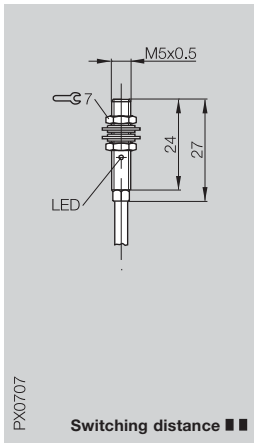
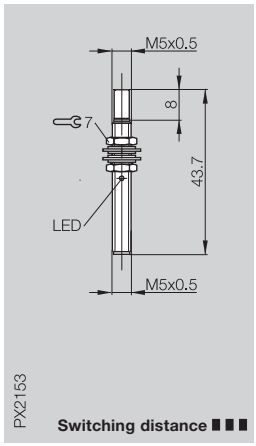
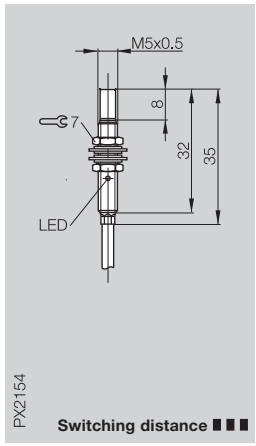


	M5×0.5	**M5×0.5**	**M5×0.5**	**M5×0.5**	**M5×0.5**
	flush	flush	flush	flush	flush
	0.8 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
	0...0.6 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
	BES 516-3005-E4-C-PU-02	BES 516-3005-G-E5-C-S49 BES 516-3022-G-E5-C-S49	BES M05ED-PSC15B-S26G	BES 516-3005-G-E4-C-S4-00,2	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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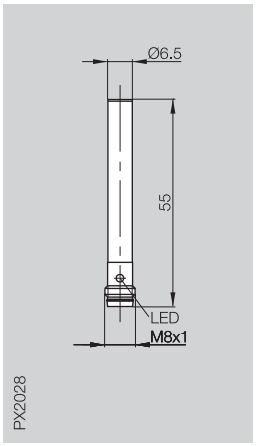
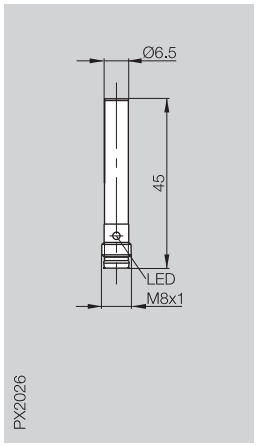
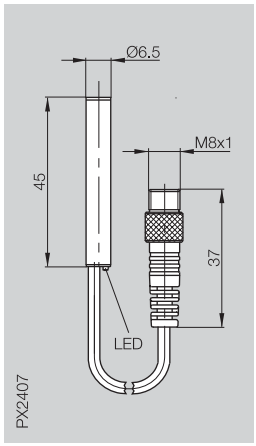
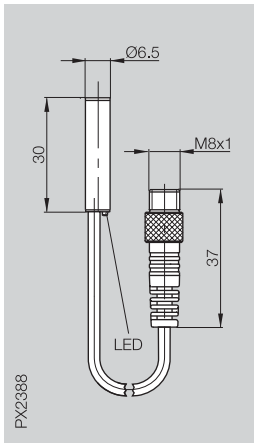
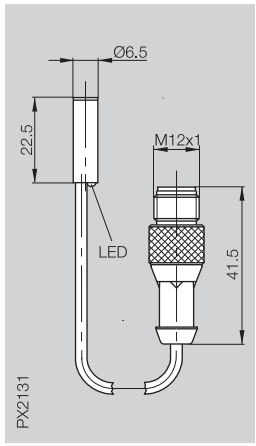
5
Connectors, Holders ...
Page 5.2 ...

Housing size		**M5×0.5**	**M5×0.5**	**M5×0.5**	**M5×0.5**
Mounting (see notes starting p. **1.0.**11)		flush	flush	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

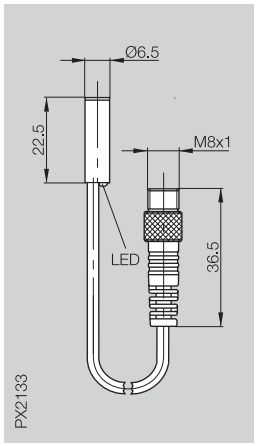
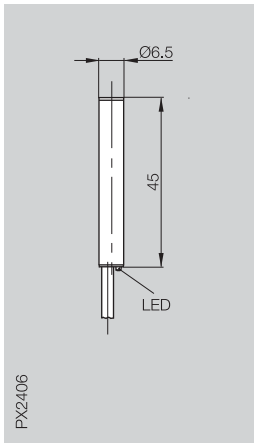
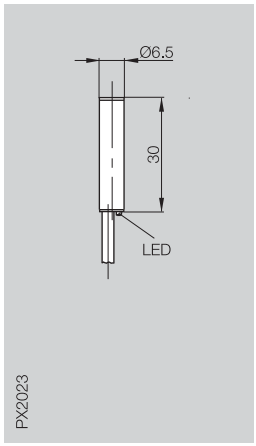
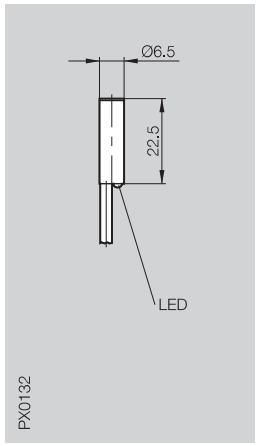
Other cable lengths on request.



	∅ 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



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

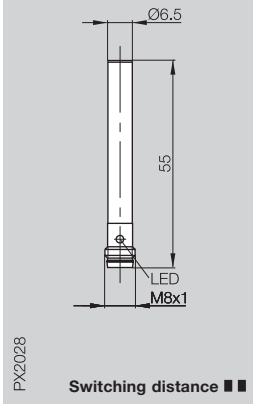
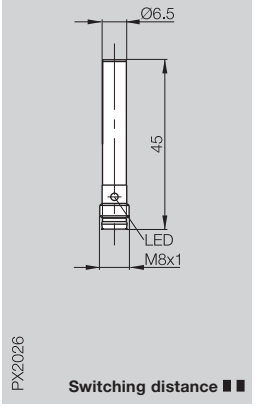
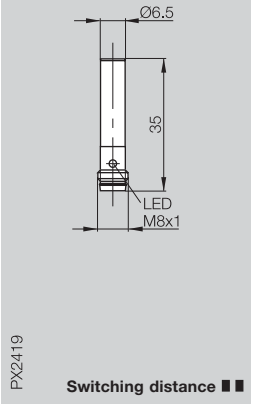
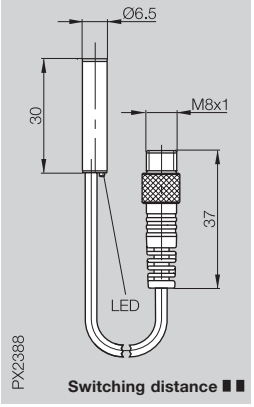
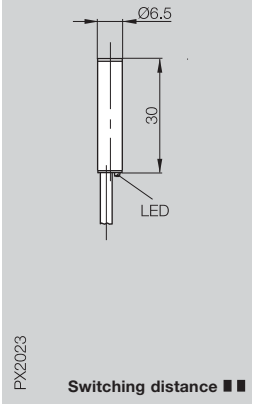
Housing size			Ø **6.5 mm**	Ø **6.5 mm**	Ø **6.5 mm**	Ø **6.5 mm**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush	flush
Rated operating distance s_n			**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a			0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
						
PNP	NO	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	**∅ 6.5 mm**	**∅ 6.5 mm**	**∅ 6.5 mm**	**∅ 6.5 mm**
	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 516-371-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	

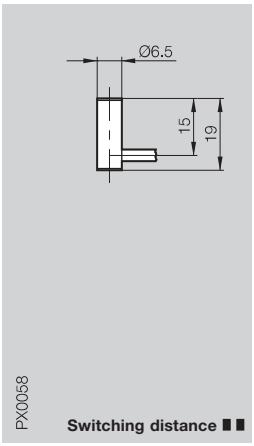
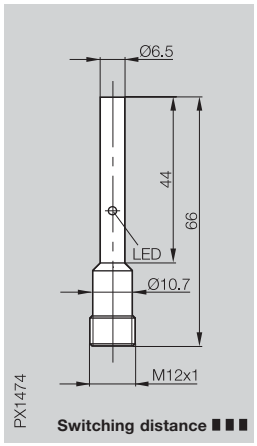
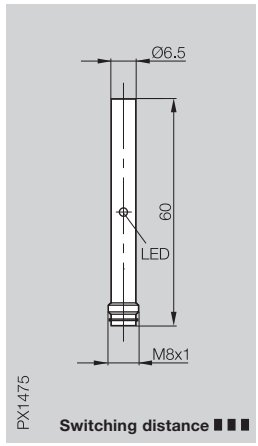
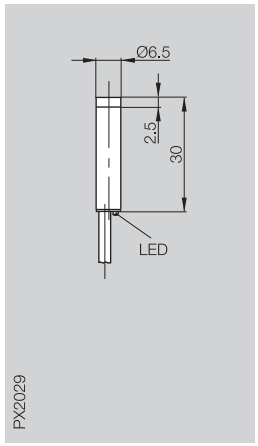


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Connectors, Holders ...
Page 5.2 ...

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

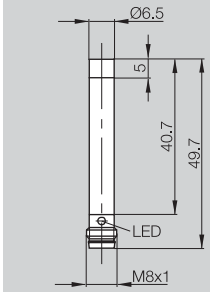
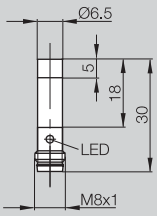
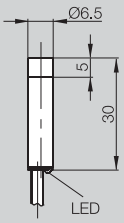
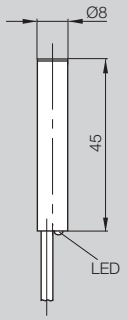
Ø6.5 mm

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.



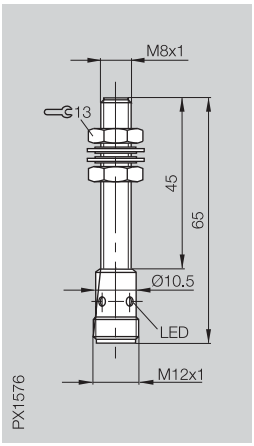
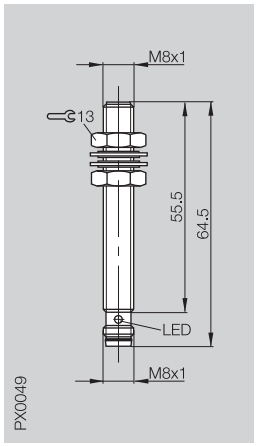
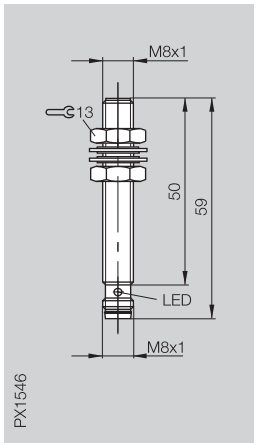
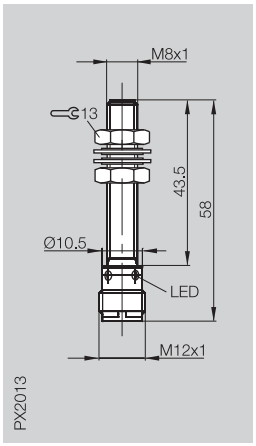
	Ø 6.5 mm	**Ø 6.5 mm**	**Ø 6.5 mm**		**Ø 8 mm**
	non-flush	non-flush	non-flush		flush
	4 mm	**4 mm**	**4 mm**		**1.5 mm**
	0...3.2 mm	0...3.2 mm	0...3.2 mm		0...1.2 mm
	 PX1613 **Switching distance ■■**	 PX2416 **Switching distance ■■**	 PX2415 **Switching distance ■■**		 PX2162
	BES G06EF-PSC40F-S49G	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			





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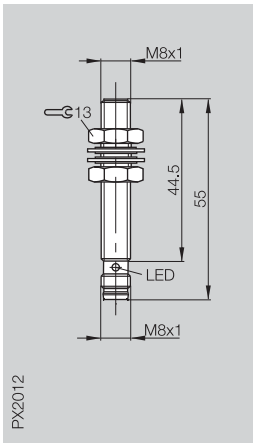
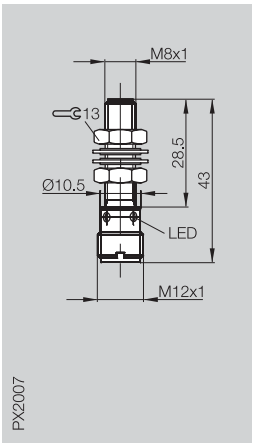
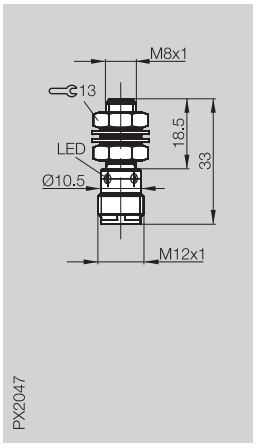
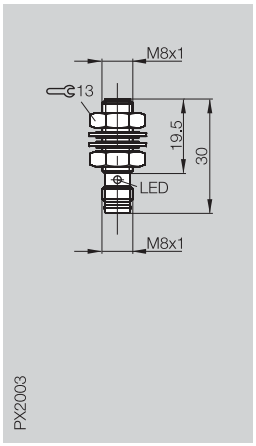
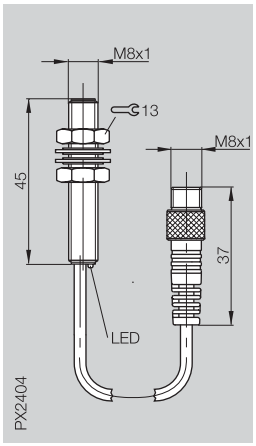
5
Connectors, Holders ...
Page 5.2 ...

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

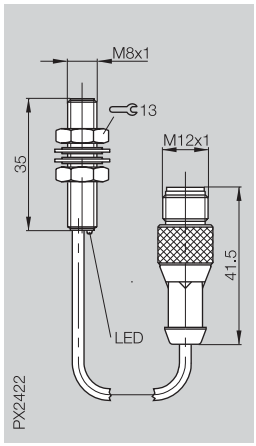
Other cable lengths on request.

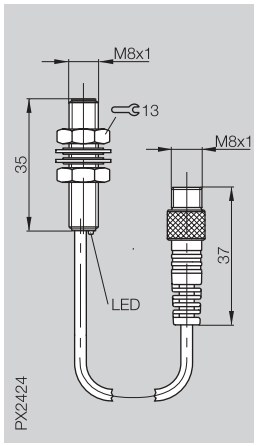


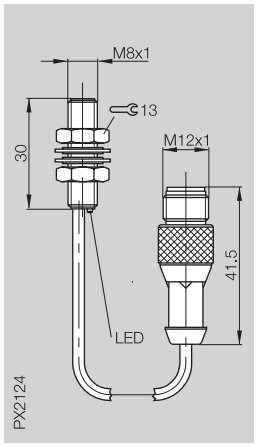
	M8×1	**M8×1**	**M8×1**	**M8×1**	**M8×1**
	flush	flush	flush	flush	flush
	1.5 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
	BES 516-324-S49-C BES 516-377-S49-C	BES M08EE-PSC15B-S04G BES M08EE-POC15B-S04G	BES M08EC-PSC15B-S04G	BES M08EC-PSC15B-S49G 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

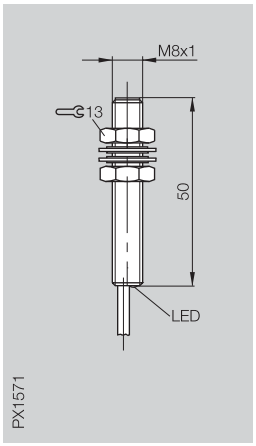


Housing size	**M8×1**	**M8×1**	**M8×1**	**M8×1**	
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush	
Rated operating distance s_n	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**	
Assured operating distance s_a	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	







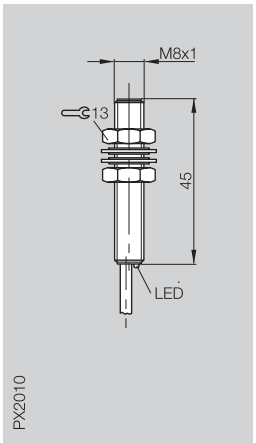
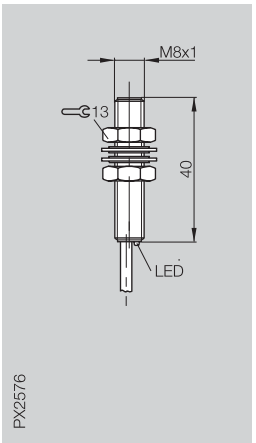
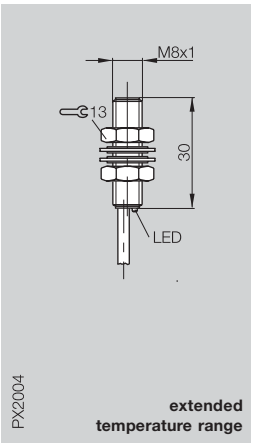
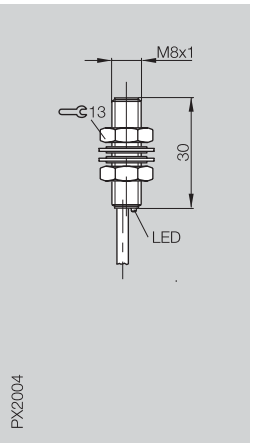
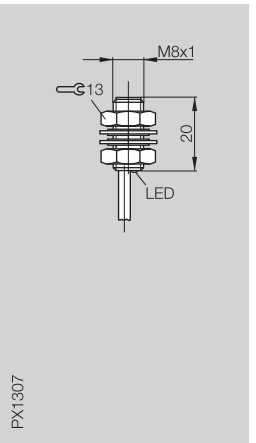


PNP	NO	①	BES 516-324-E3-C-S4-00,3	BES 516-324-E3-C-S49-00,3	BES 516-324-E4-C-S4-00,3	BES M08MI-PSC15B-BV02
	NC	②	BES 516-377-E3-C-S4-PU-00,3			BES M08MI-POC15B-BV02
NPN	NO	④				BES M08MI-NSC15B-BV02
	NC	⑤				
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	12...30 V DC
Voltage drop U_d at 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

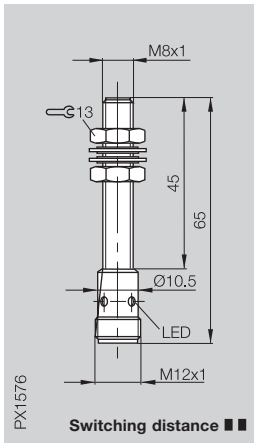
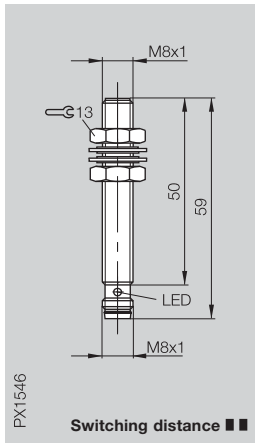
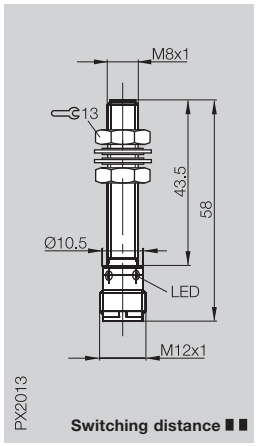
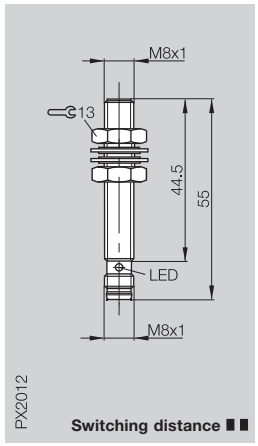
Other cable lengths on request.



	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 ...

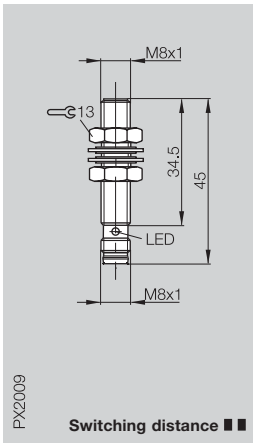
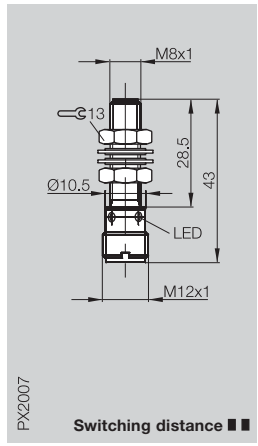
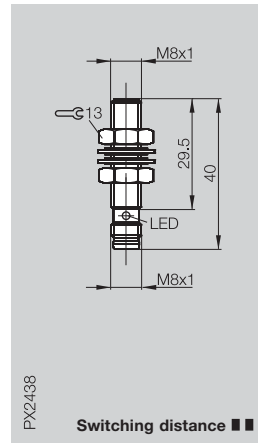
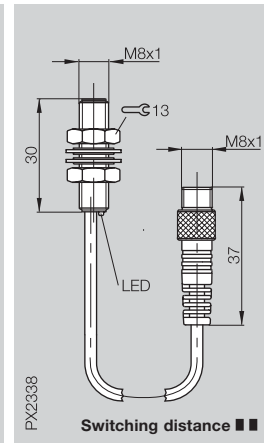
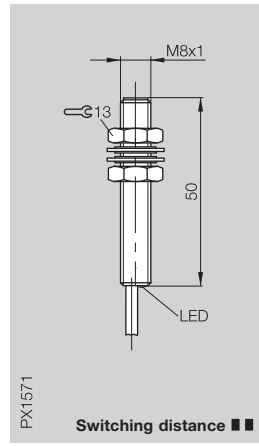
Housing size		**M8×1**	**M8×1**	**M8×1**	**M8×1**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**2 mm**	**2 mm**	**2 mm**	**2 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	
						
PNP	NO ①	BES M08MH1-PSC20B-S04G	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.

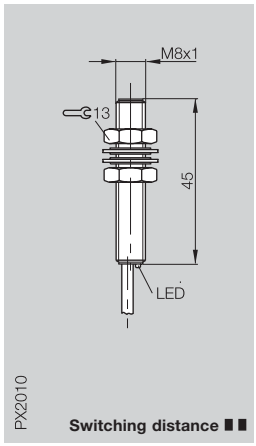
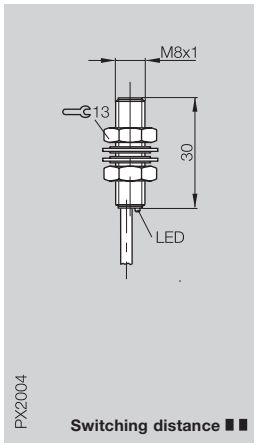
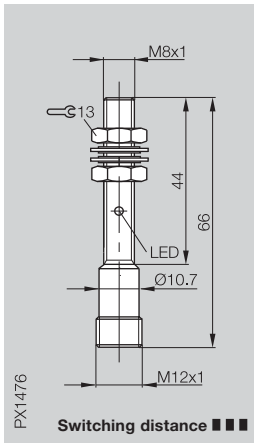
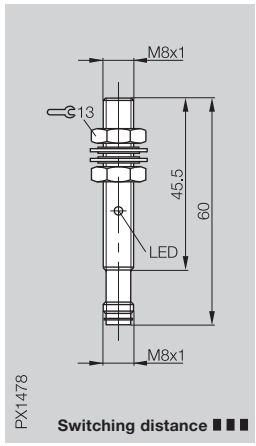


	M8×1	**M8×1**	**M8×1**	**M8×1**	**M8×1**
	flush	flush	flush	flush	flush
	2 mm	**2 mm**	**2 mm**	**2 mm**	**2 mm**
	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm
					
	BES 516-324-G-E5-C-S49 BES 516-377-G-E5-C-S49	BES M08EE-PSC20B-S04G	BES M08EE-PSC20B-S49G BES M08EE-POC20B-S49G	BES 516-324-G-E4-C-S49-00,2 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	



1.1

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

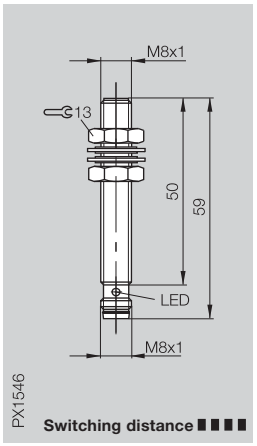
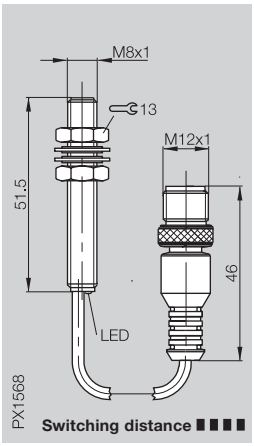
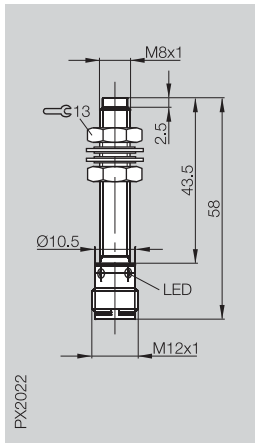
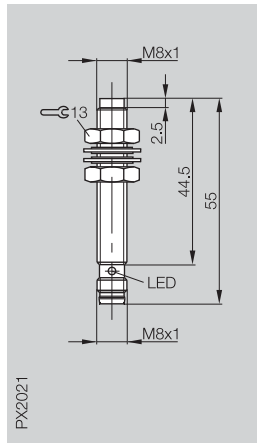
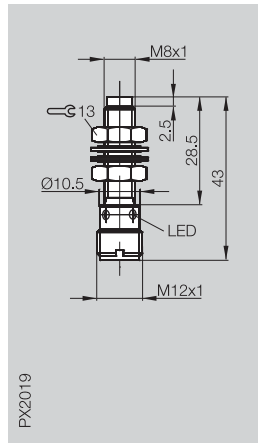
Housing size			**M8×1**	**M8×1**	**M8×1**	**M8×1**
Mounting (see notes starting p. **1.0.**11)			flush	flush	quasi flush	quasi flush
Rated operating distance s_n			**2 mm**	**2 mm**	**3 mm**	**3 mm**
Assured operating distance s_a			0...1.6 mm	0...1.6 mm	0...2.4 mm	0...2.4 mm
						
PNP	NO	①	BES 516-324-G-E0-C-02	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.

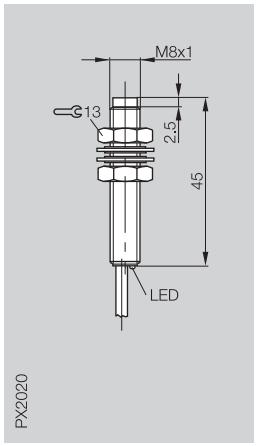
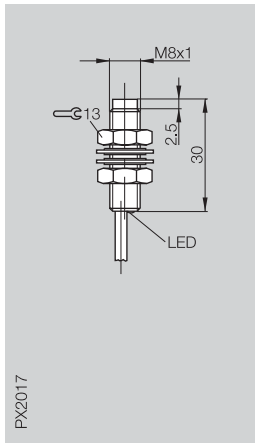
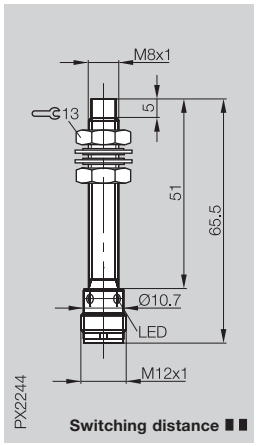
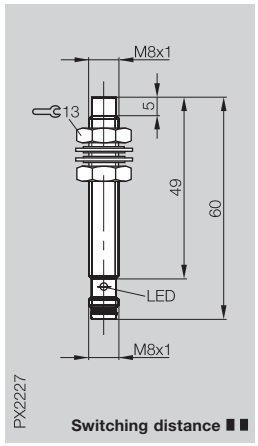


	M8×1	**M8×1**	**M8×1**	**M8×1**	**M8×1**
	quasi flush	quasi flush	non-flush	non-flush	non-flush
	4 mm	**4 mm**	**2.5 mm**	**2.5 mm**	**2.5 mm**
	0...2.9 mm	0...2.9 mm	0...2 mm	0...2 mm	0...2 mm
					
	BES M08MI-PSC40B-S49G	BES M08MI-PSC40B-BP00,2-GS04	BES M08EG-PSC25F-S04G BES M08EG-POC25F-S04G	BES 516-383-S49-C	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



1.1

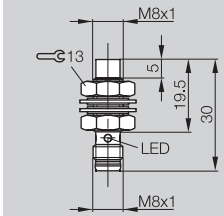
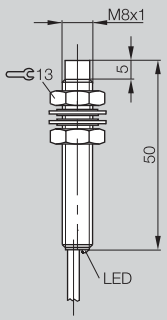
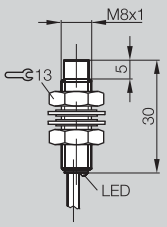
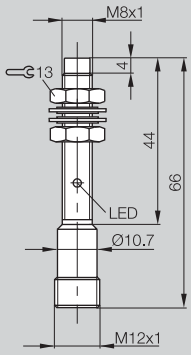
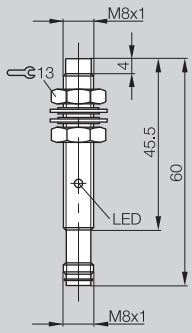
5
Connectors, Holders ...
Page 5.2 ...

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

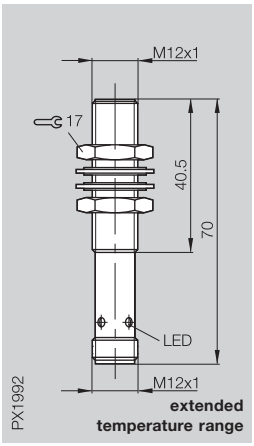
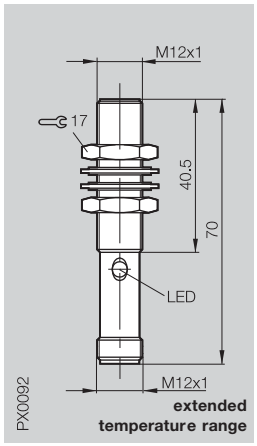
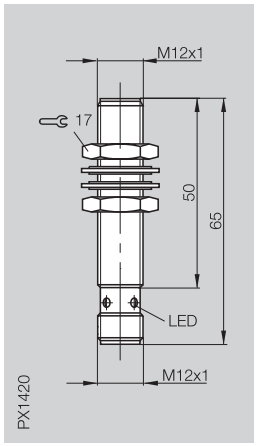
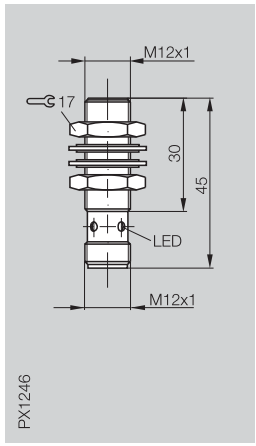
For sensors with cable, other lengths and PUR quality are available on request.



	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 ...

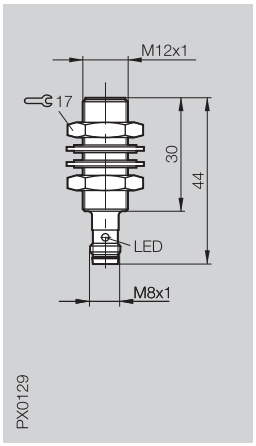
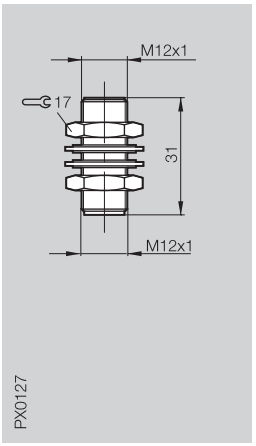
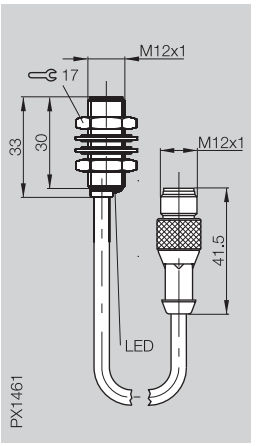
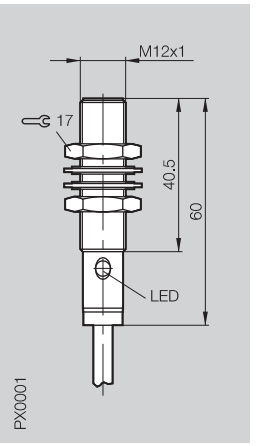
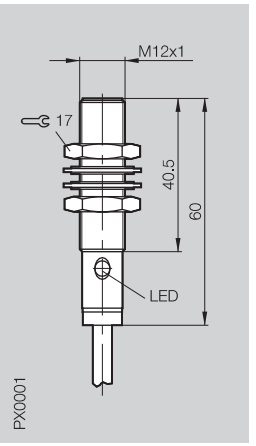
Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**2 mm**	**2 mm**	**2 mm**	**2 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...1.6 mm	0...1.6 mm	
						
PNP	NO ①	BES 516-325-S4-C		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.

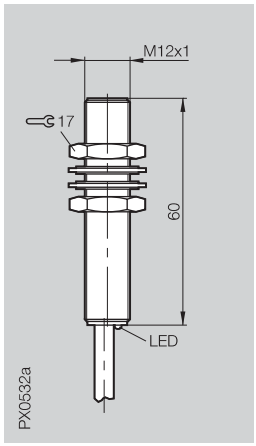
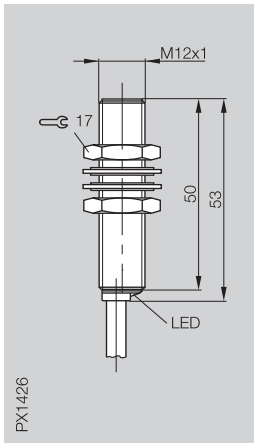
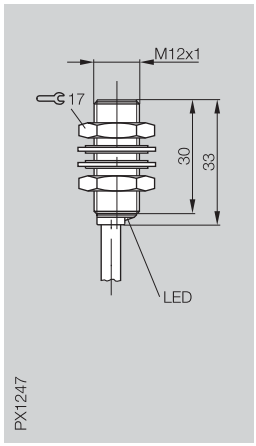
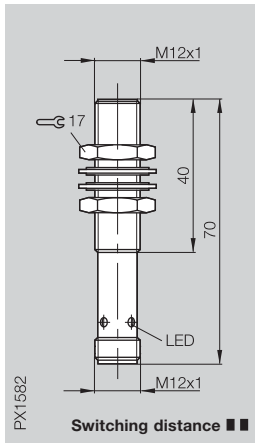
For sensors with cable and connector, other lengths are available on request.



	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		



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

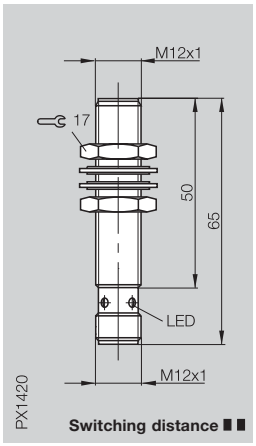
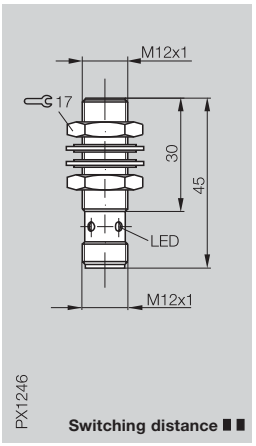
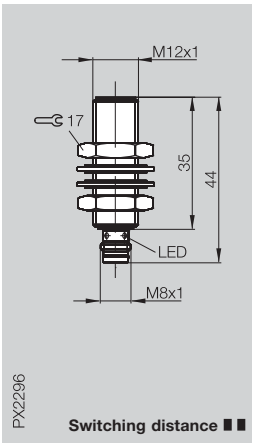
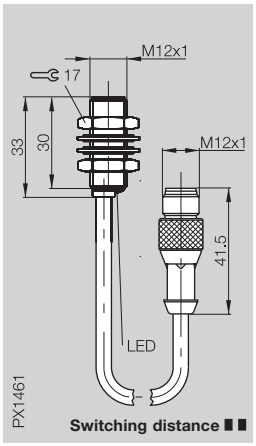
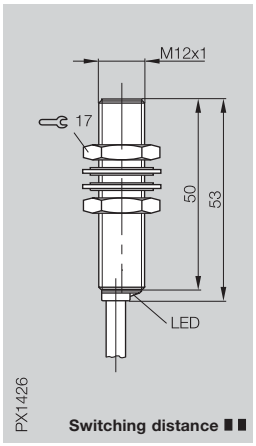
Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**2 mm**	**2 mm**	**2 mm**	**4 mm**	
Assured operating distance s_a		0...1.6 mm	0...1.6 mm	0...1.6 mm	0...3.2 mm	
						
PNP	NO ①	BES 516-325-SA56-03	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

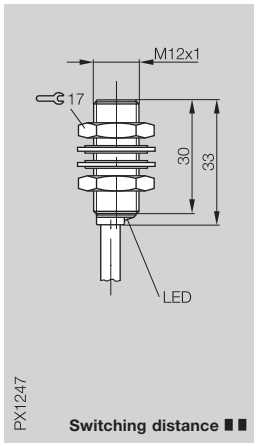
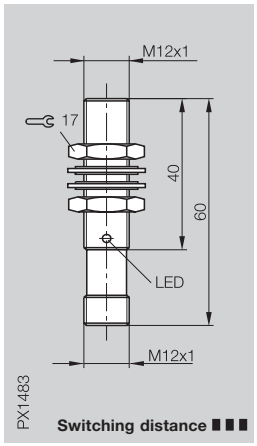
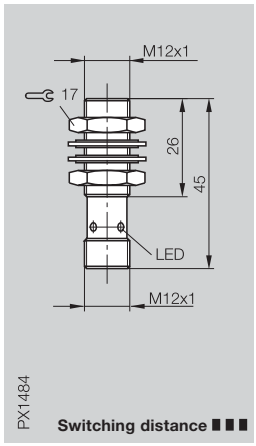
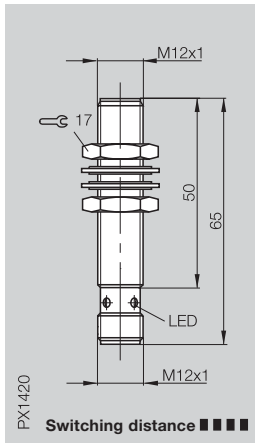
For sensors with cable, other lengths and PUR quality are available on request.

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	



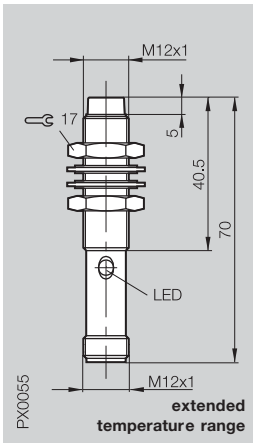
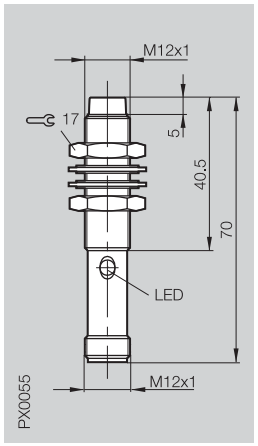
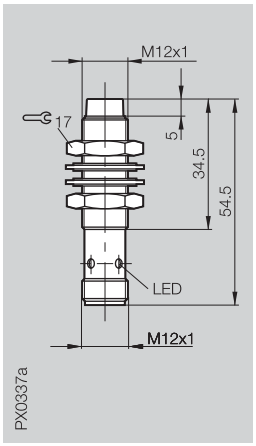
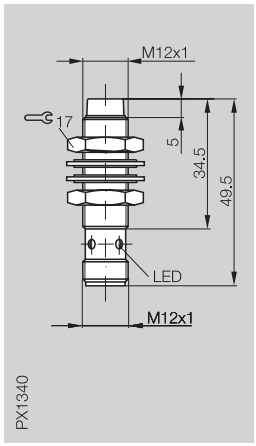
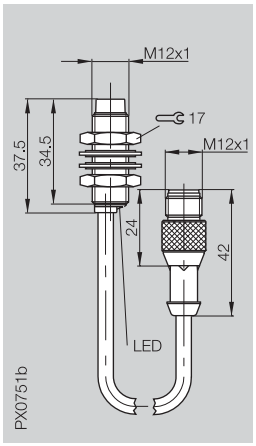
Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		flush	quasi flush	quasi flush	quasi flush
Rated operating distance s_n		**4 mm**	**6 mm**	**6 mm**	**8 mm**
Assured operating distance s_a		0...3.2 mm	0...4.9 mm	0...4.9 mm	0...5.8 mm
					
PNP	NO ①	BES 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

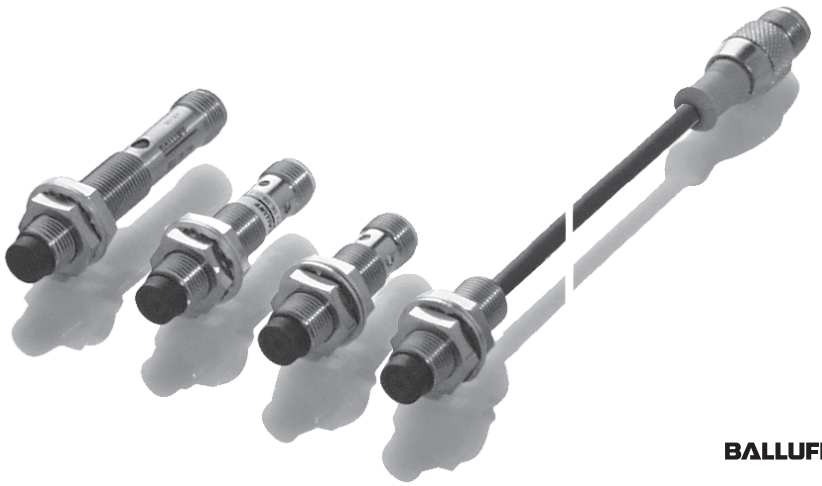
For sensors with cable, other lengths and PUR quality are available on request.

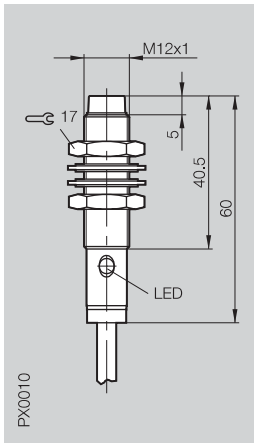
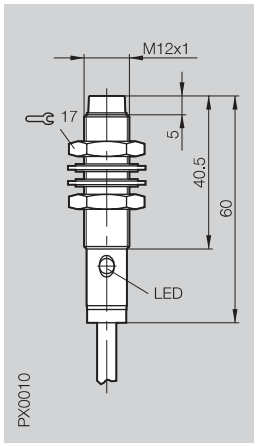
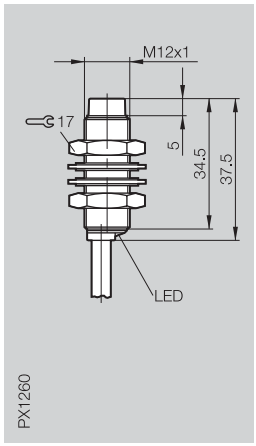
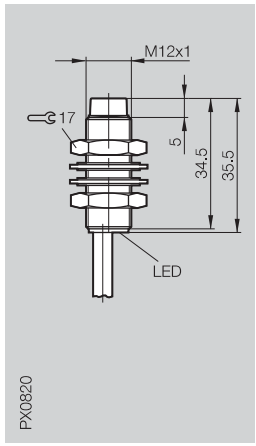
For sensors with cable and connector, other lengths are available on request.



	M12×1	M12×1	M12×1	M12×1	M12×1
	non-flush	non-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 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

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

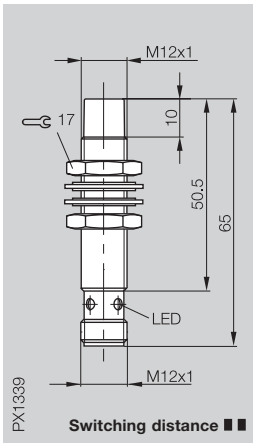
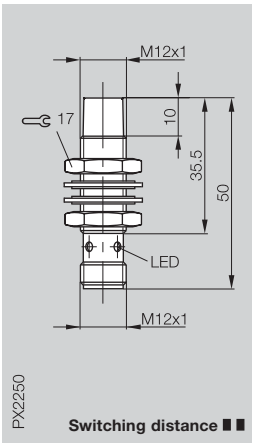
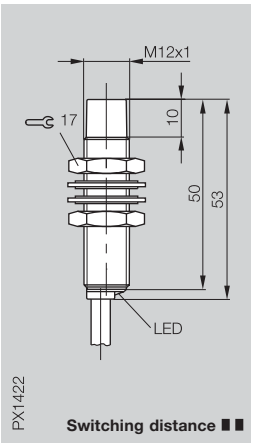


Housing size			**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush	non-flush	non-flush
Rated operating distance s_n			**4 mm**	**4 mm**	**4 mm**	**4 mm**
Assured operating distance s_a			0...3.2 mm	0...3.2 mm	0...3.2 mm	0...3.2 mm
						
PNP	NO	①	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

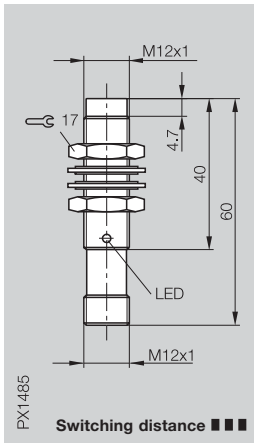
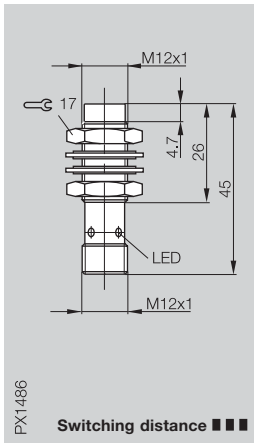
For sensors with cable, other lengths
quality are available on request.



	M12×1 non-flush **8 mm** 0...6.5 mm	**M12×1** non-flush **8 mm** 0...6.5 mm	**M12×1** non-flush **8 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			

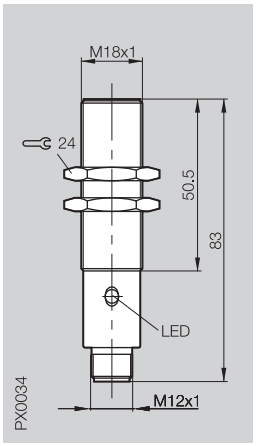
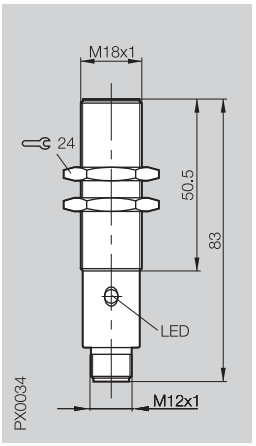
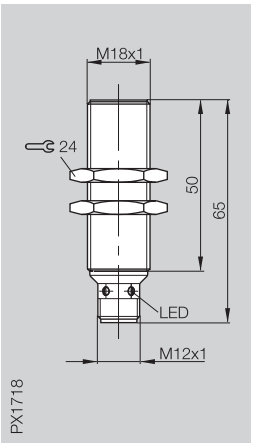
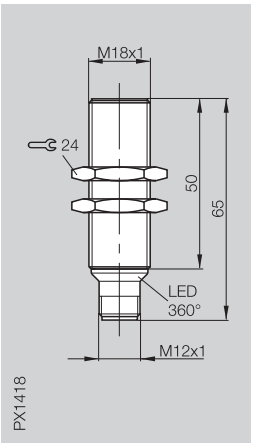
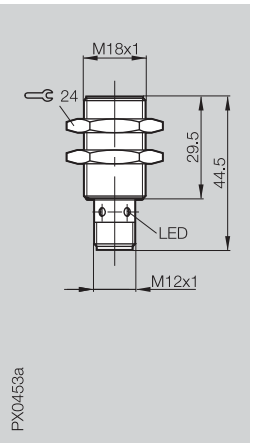


5
Connectors, Holders ...
Page 5.2 ...

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



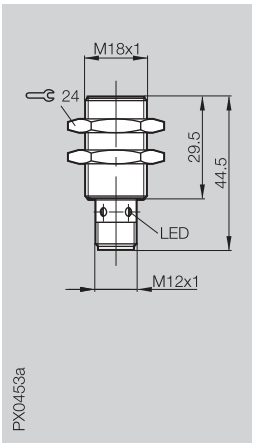
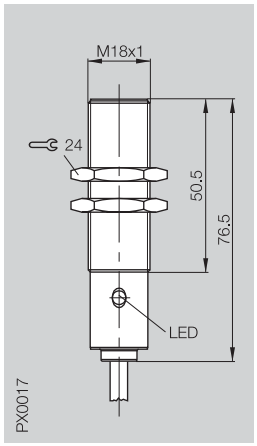
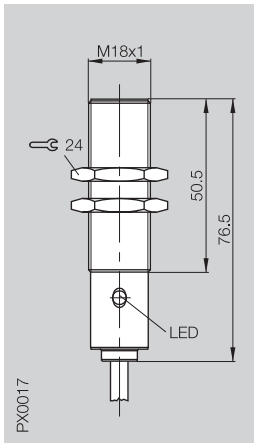
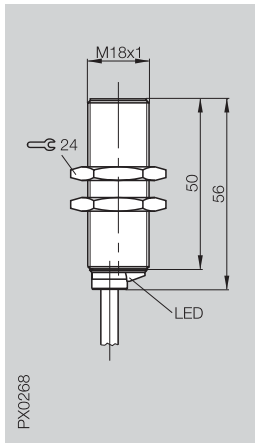
	M18×1	**M18×1**	**M18×1**	**M18×1**	**M18×1**
	flush	flush	flush	flush	flush
	5 mm	**5 mm**	**5 mm**	**5 mm**	**5 mm**
	0...4.1 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm
					
	BES 516-326-S4-C BES 516-367-S4-C	BES 516-105-S4-C	BES M18MI-PSC50B-S04G	BES M18MI-PSC50B-S04K BES M18MI-POC50B-S04K	BES 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



All-round LED



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

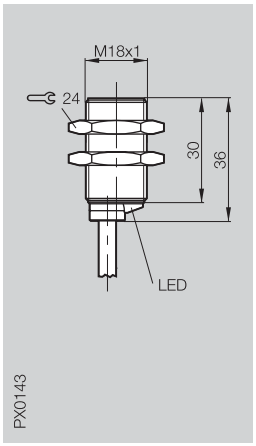
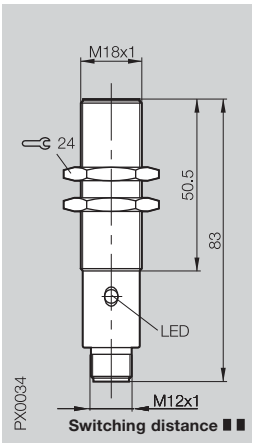
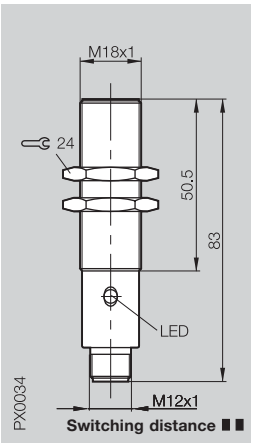
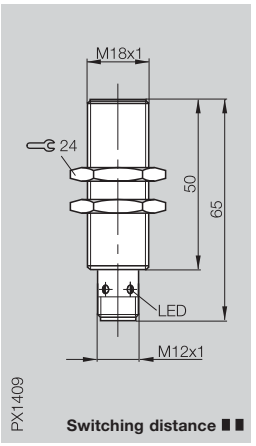
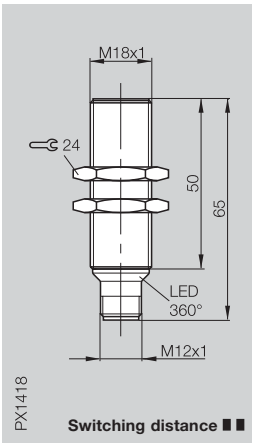
Housing size		**M18×1**	**M18×1**	**M18×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush
Rated operating distance s_n		**5 mm**	**5 mm**	**5 mm**	**5 mm**
Assured operating distance s_a		0...4.1 mm	0...4.1 mm	0...4.1 mm	0...4.1 mm
					
PNP	NO ①	BES 516-326-E5-C-S4	BES 516-326-B0-C-02		BES M18MI-PSC50B-BV02
	NC ②				BES M18MI-POC50B-BV02
	complementary ③			BES 516-105-B0-C-03	
NPN	NO ④		BES 516-355-B0-C-02		BES M18MI-NSC50B-BV02
	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.





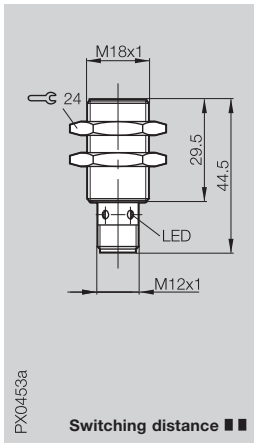
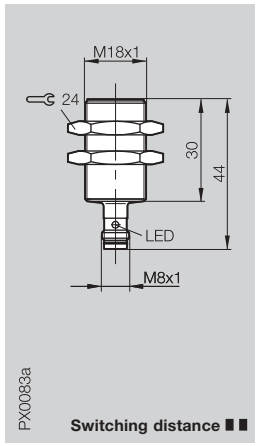
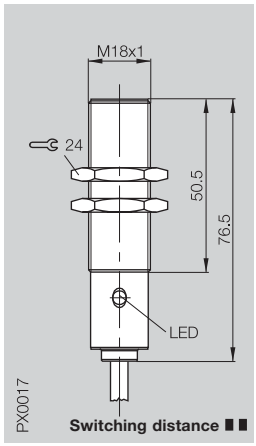
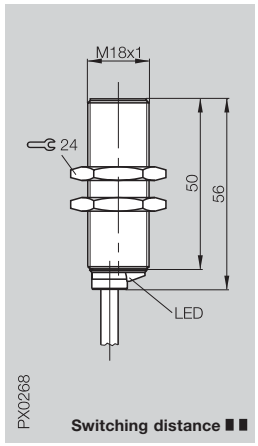
	M18×1	**M18×1**	**M18×1**	**M18×1**	**M18×1**
	flush	flush	flush	flush	flush
	5 mm	**8 mm**	**8 mm**	**8 mm**	**8 mm**
	0...4.1 mm	0...6.5 mm	0...6.5 mm	0...6.5 mm	0...6.5 mm
					
	BES 516-326-E4-C-02	BES 516-326-G-S4-C	BES 516-326-G-S4-H BES 516-105-G-S4-H	BES M18MI-PSC80B-S04G	BES M18MI-PSC80B-S04K 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

1.1

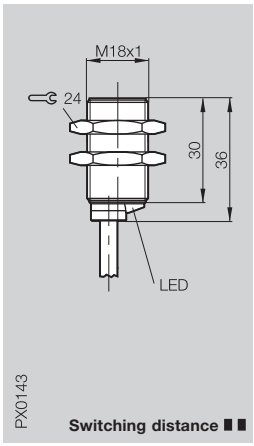
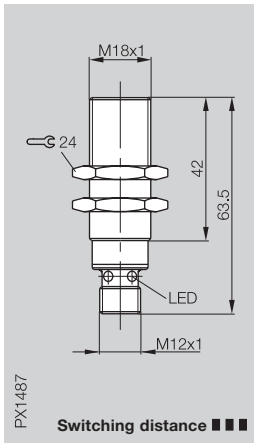
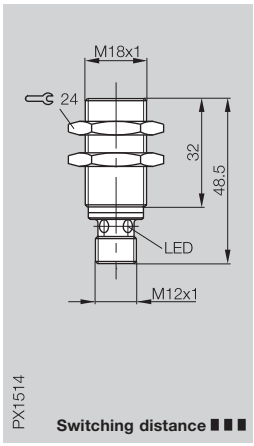
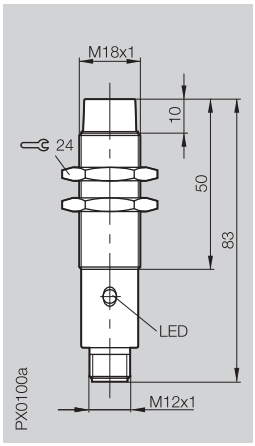
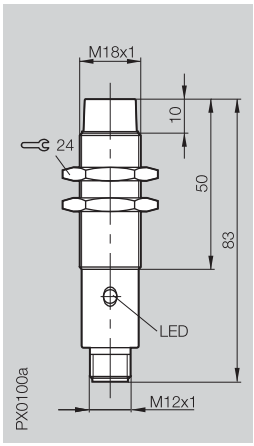
5
Connectors, Holders ...
Page 5.2 ...

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

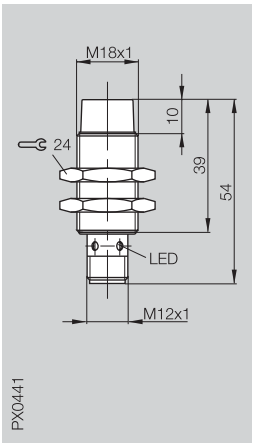
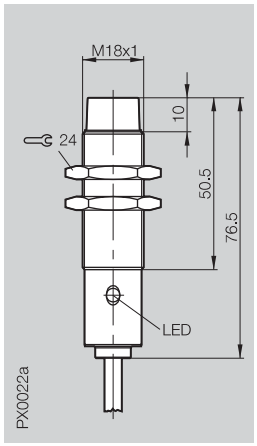
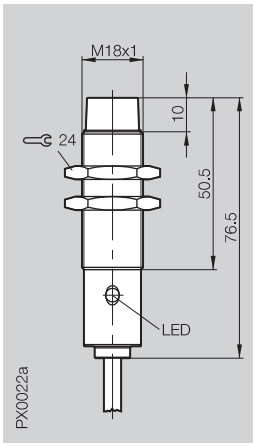
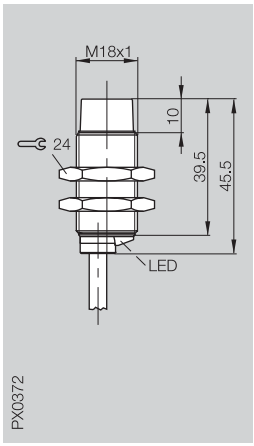
Other cable lengths on request.



	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



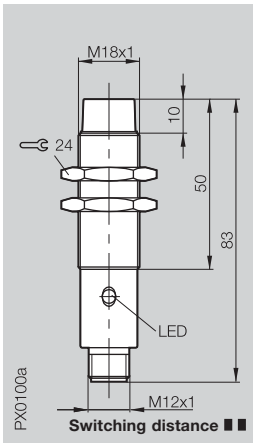
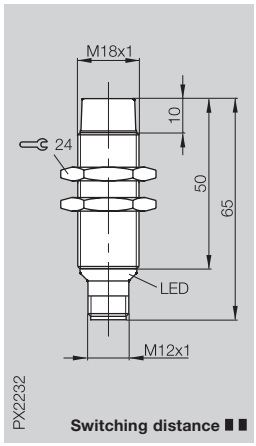
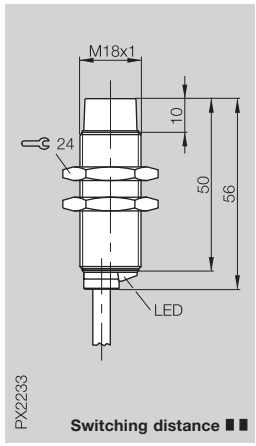
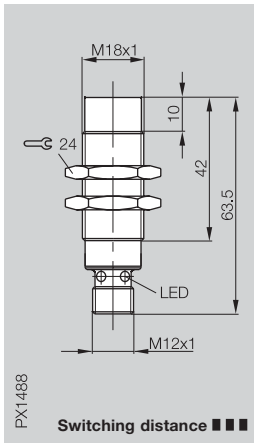
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5
Connectors, Holders ...
Page 5.2 ...

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

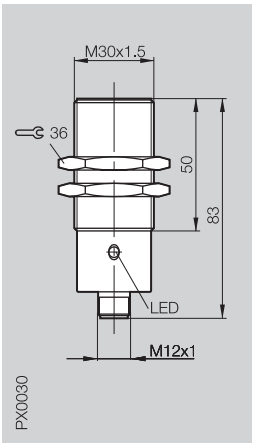
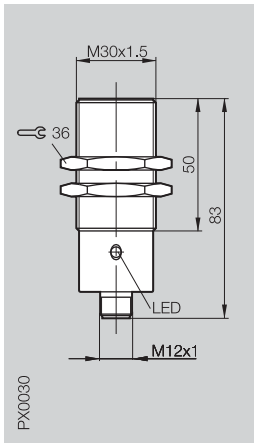
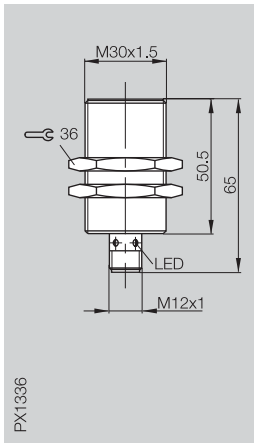
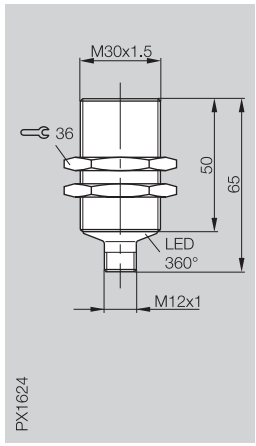
For sensors with cable, other lengths and PUR quality are available on request.



	M18×1 non-flush **16 mm** 0...13 mm	**M18×1** non-flush **16 mm** 0...12.8 mm	**M18×1** non-flush **16 mm** 0...12.8 mm	**M18×1** non-flush **20 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		
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20		BKS-_ 19/BKS-_ 20	



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

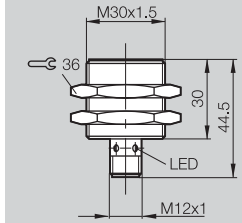
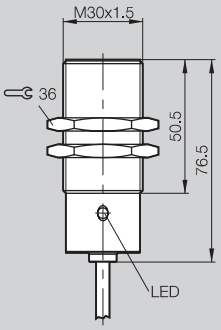
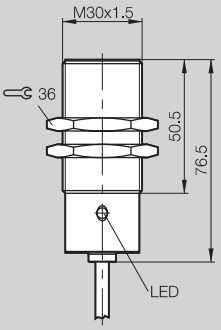
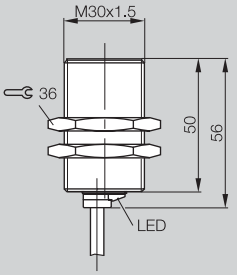
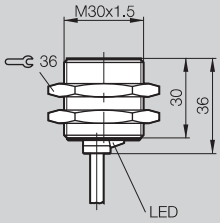
Housing size			**M30×1.5**	**M30×1.5**	**M30×1.5**	**M30×1.5**
Mounting (see notes starting p. **1.0.**11)			flush	flush	flush	flush
Rated operating distance s_n			**10 mm**	**10 mm**	**10 mm**	**10 mm**
Assured operating distance s_a			0...8.1 mm	0...8.1 mm	0...8.1 mm	0...8.1 mm
						
PNP	NO	①	BES 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.



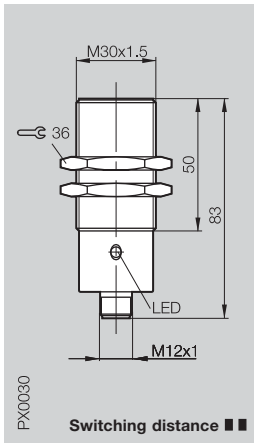
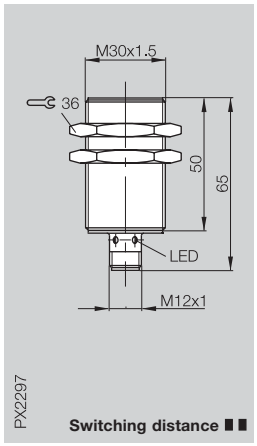
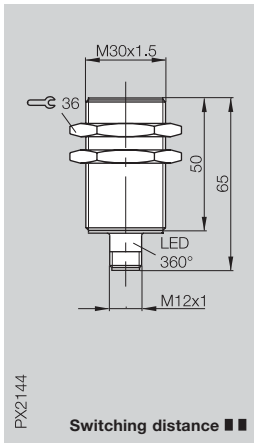
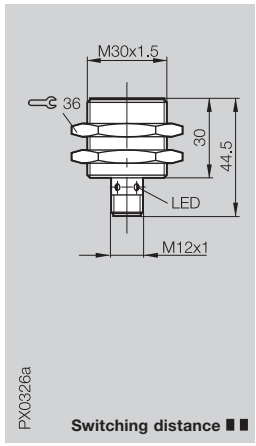
All-round LED

	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
	 PX0326a	 PX0023	 PX0023	 PX0499	 PX0146a
	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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5
Connectors, Holders ...
Page 5.2 ...

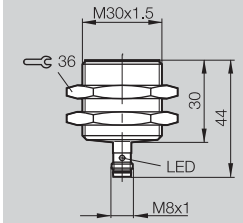
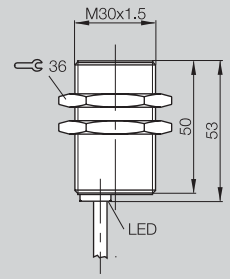
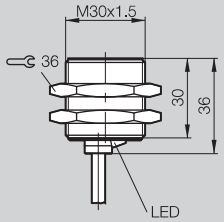
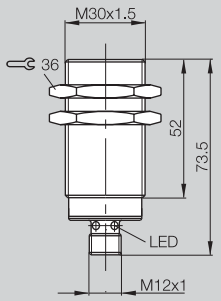
Housing size		**M30×1.5**	**M30x1.5**	**M30×1.5**	**M30×1.5**	
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush	
Rated operating distance s_n		**15 mm**	**15 mm**	**15 mm**	**15 mm**	
Assured operating distance s_a		0...12.2 mm	0...12.2 mm	0...12.2 mm	0...12.2 mm	
						
PNP	NO ①		BES M30MI-PSC15B-S04G	BES M30MI-PSC15B-S04K	BES 516-327-G-E5-Y-S4	
	NC ②			BES M30MI-POC15B-S04K	BES 516-3028-G-E5-Y-S4	
	complementary ③	BES 516-114-G-S4-H				
NPN	NO ④			BES M30MI-NSC15B-S04K		
	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.

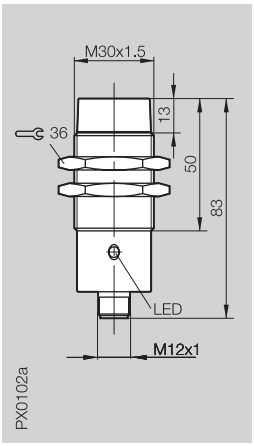
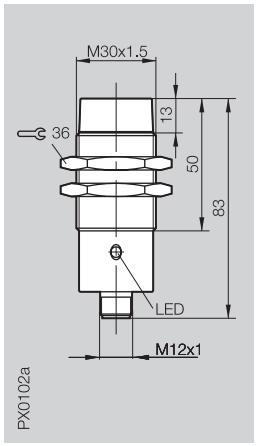
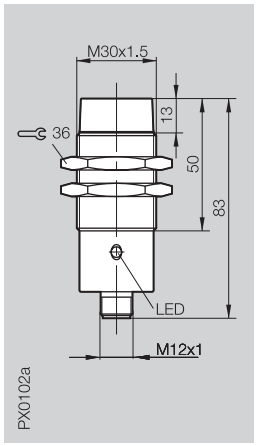
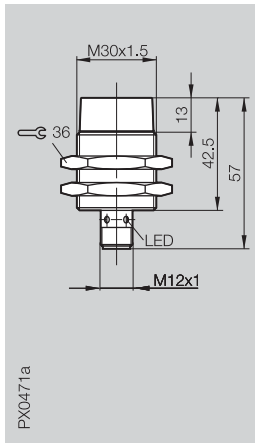


All-round LED

	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	



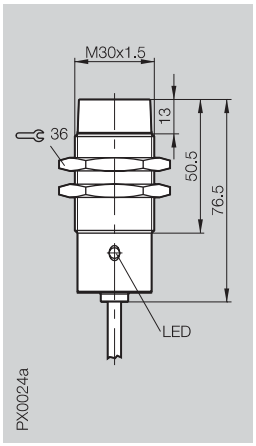
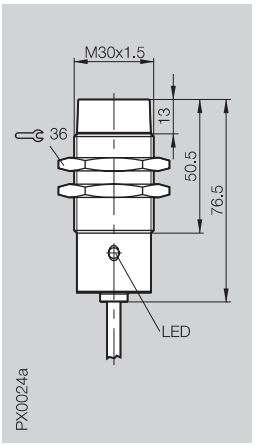
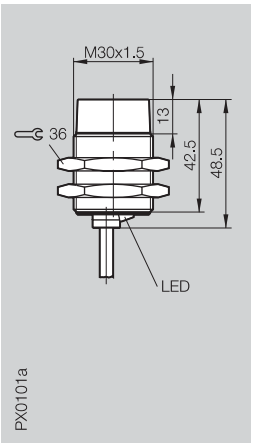
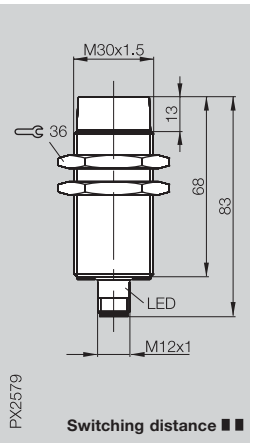
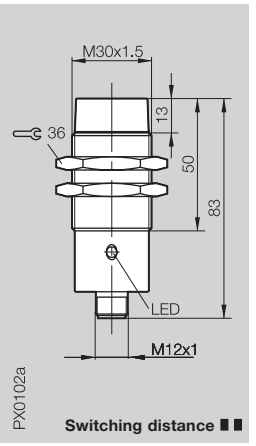
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5
Connectors, Holders ... Page 5.2 ...

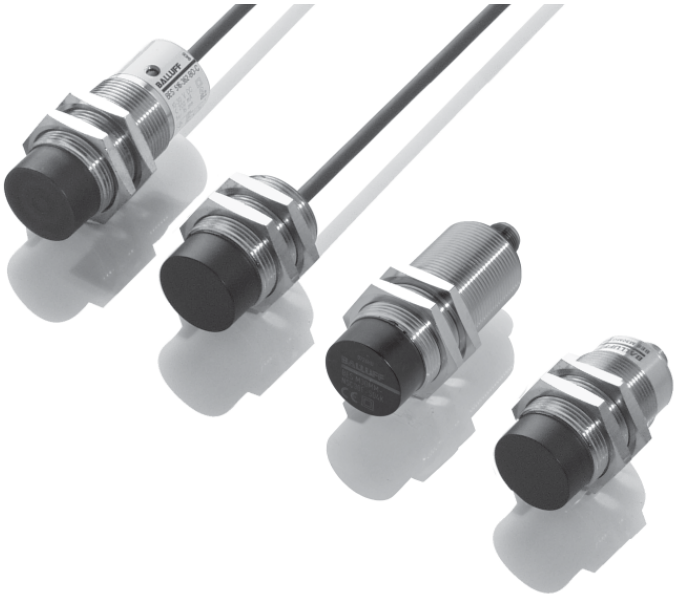
Housing size			**M30×1.5**	**M30×1.5**	**M30×1.5**	**M30×1.5**
Mounting (see notes starting p. **1.0.**11)			non-flush	non-flush	non-flush	non-flush
Rated operating distance s_n			**15 mm**	**15 mm**	**15 mm**	**15 mm**
Assured operating distance s_a			0...12.2 mm	0...12.2 mm	0...12.2 mm	0...12.2 mm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

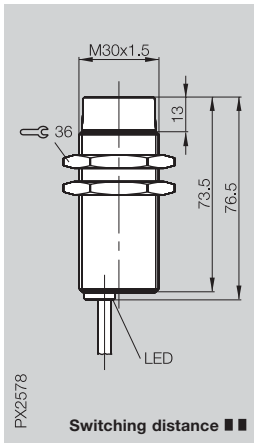


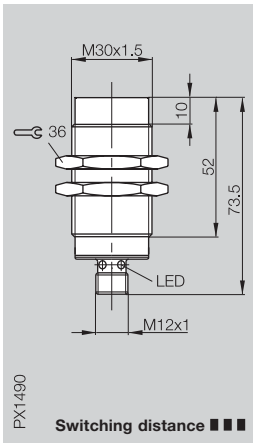
	M30×1.5 non-flush 15 mm 0...12.2 mm	M30×1.5 non-flush 15 mm 0...12.2 mm	M30×1.5 non-flush 15 mm 0...12.2 mm	M30×1.5 non-flush 30 mm 0...24.3 mm	M30×1.5 non-flush 30 mm 0...24.3 mm
					
	BES 516-362-B0-C-02 BES 516-3029-B0-C-02	BES 516-125-B0-C-03	BES 516-362-E4-Y-02 BES 516-3029-E4-Y-02	BES M30MM-PSC30F-S04K 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



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

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		



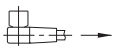


PNP	NO	①	BES M30MM-PSC30F-BV02	BES M30MG1-PSC40F-S04G
	NC	②	BES M30MM-POC30F-BV02	
NPN	NO	④	BES M30MM-NSC30F-BV02	
	NC	⑤	BES M30MM-NOC30F-BV02	

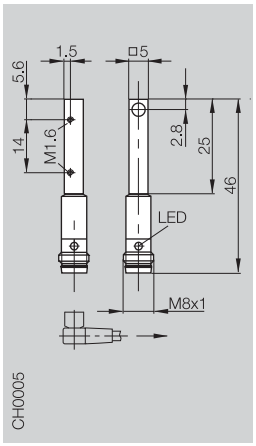
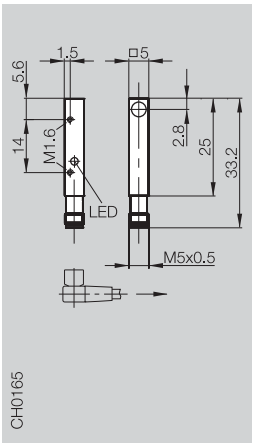
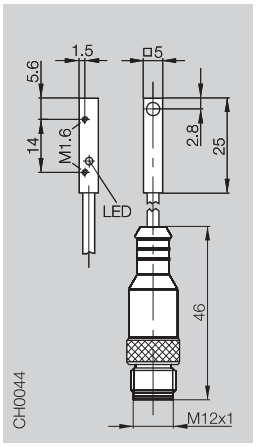
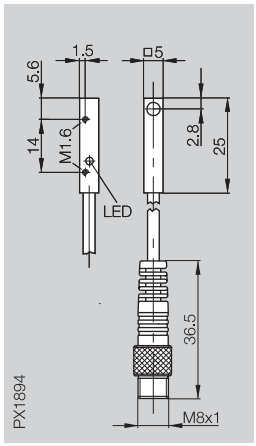
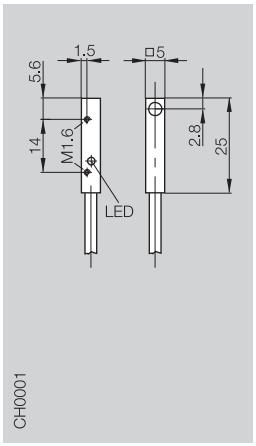
Supply voltage U_B	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2 V
Rated insulation voltage U_i	250 V AC	75 V DC
Rated operational current I_e	200 mA	200 mA
No-load supply current I_0 max.	≤ 10 mA	≤ 10 mA
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Repeat accuracy 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.

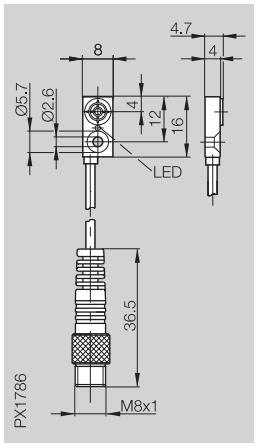
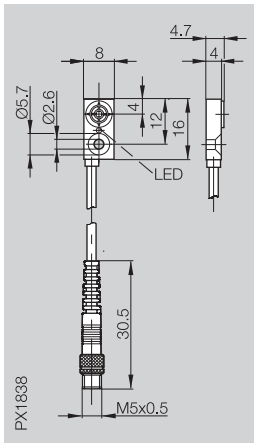
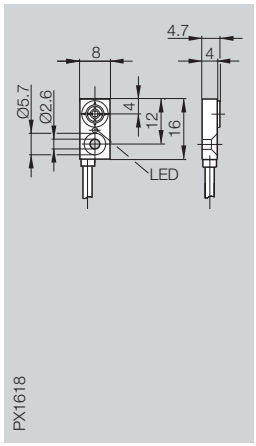
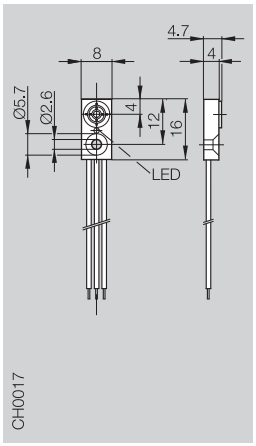
 Connector orientation



	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	



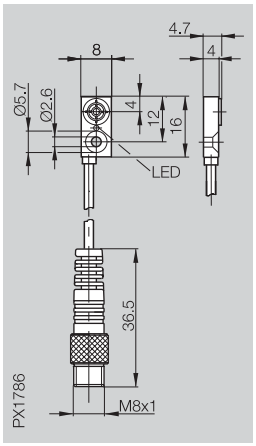
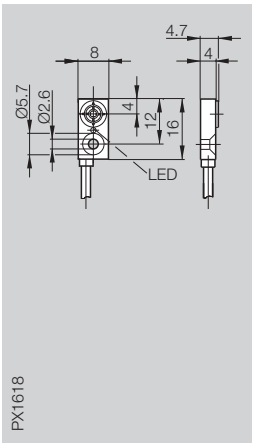
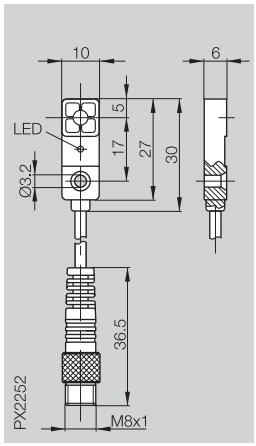
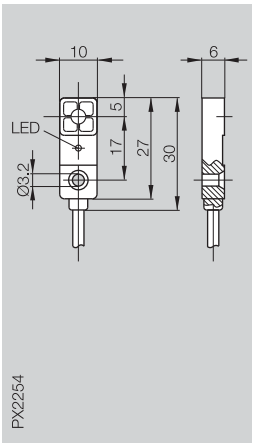
1.1
5
Connectors, Holders ... Page 5.2 ...

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		

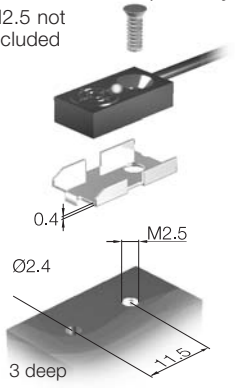
① Wiring diagrams see page **1.0.**6

Other cable lengths on request.

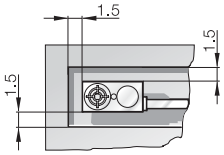


	8×16×4 mm R04	**8×16×4 mm** R04		**10×30×6 mm** R03	**10×30×6 mm** R03
	non-flush	non-flush		flush	flush
	2.5 mm	**2.5 mm**		**3 mm**	**3 mm**
	0...2 mm	0...2 mm		0...2.4 mm	0...2.4 mm
					
	BES R04KC-PSC25F-EP00,3-GS49	BES R04KC-PSC25F-EV02		BES R03KC-PSC30B-BP00,3-GS49	BES R03KC-PSC30B-EP02 BES R03KC-POC30B-EP05
					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



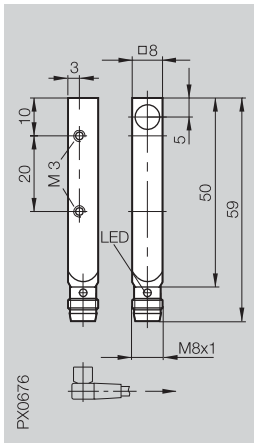
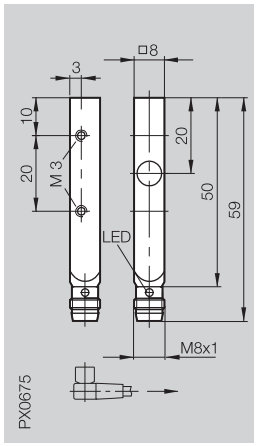
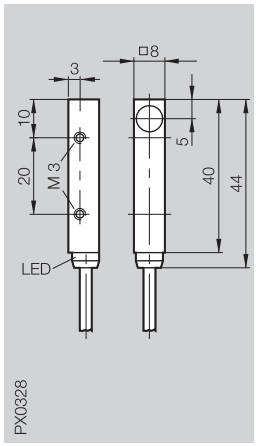
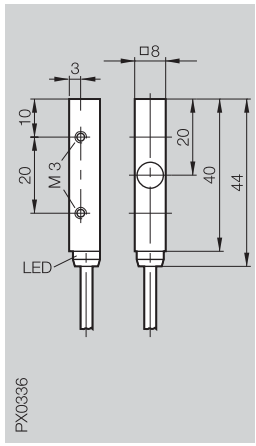
Installation note for
BES R04... with s_n 2.5 mm
Aluminum: full flush mountable
Steel: surrounding 1.5 mm clear zone





1.1
5
Connectors ...
page 5.2 ...

8×8×59 mm, 8×8×44 mm

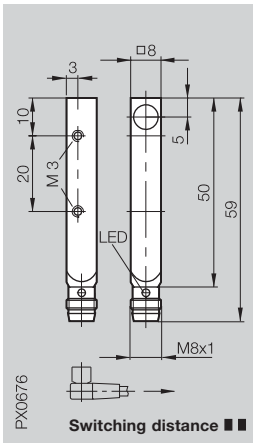
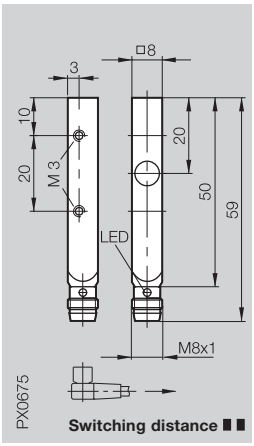
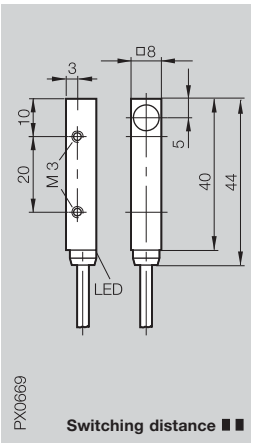
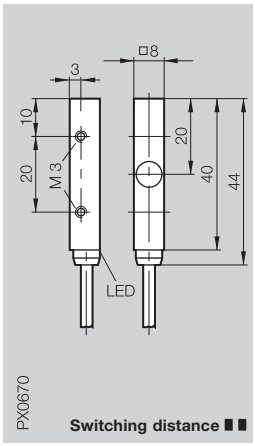
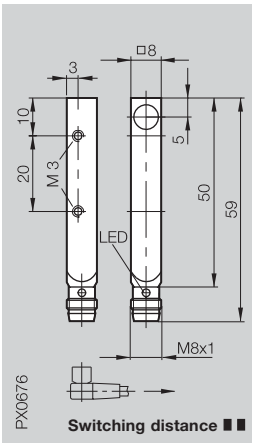
Housing size	**8×8×59 mm**	**8×8×59 mm**	**8×8×44 mm**	**8×8×44 mm**
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush
Rated operating distance s_n	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
				
PNP NO ①	BES 516-300-S166-S49	BES 516-300-S202-S49	BES 516-300-S166-02	BES 516-300-S202-02
PNP 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	
NPN 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.

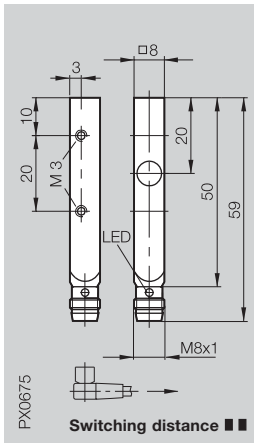
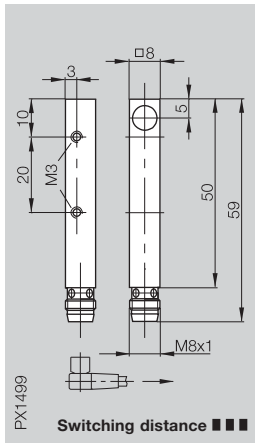
Connector orientation



	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



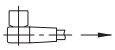
1.1
5
Connectors ...
page 5.2 ...

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		

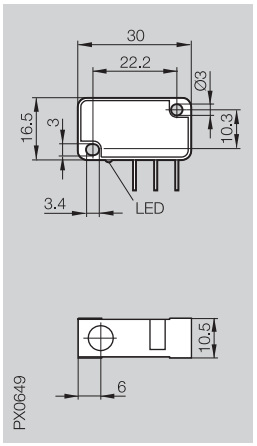
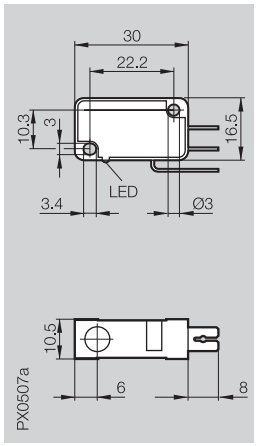
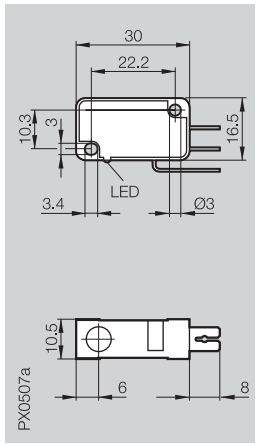
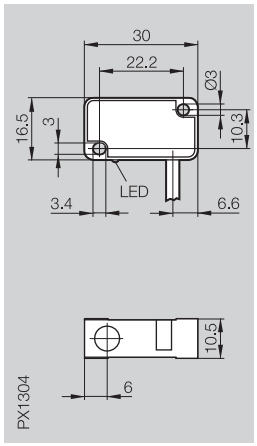
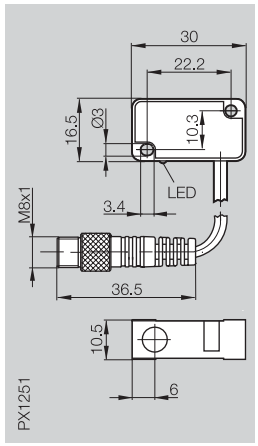
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

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	
					BKS-_ 48
			Special pin configuration		



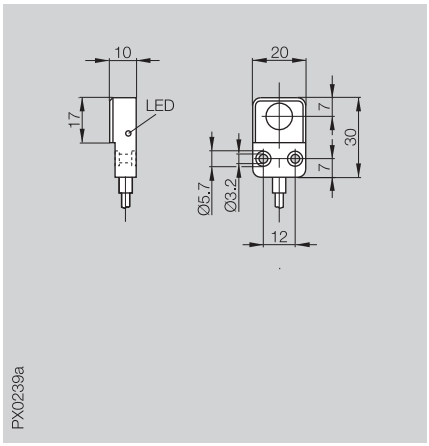




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5
Connectors ...
page 5.2 ...

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		

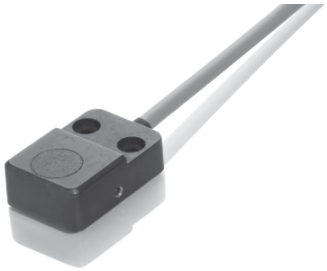


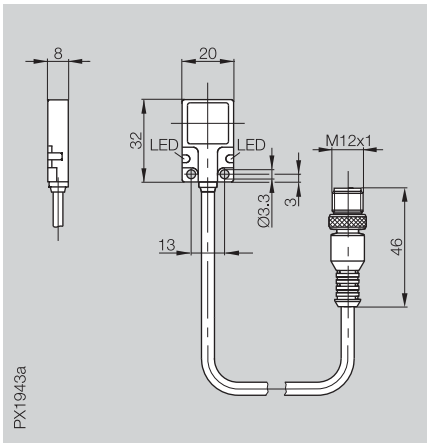
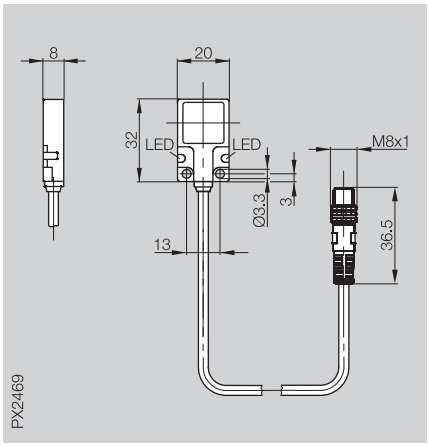
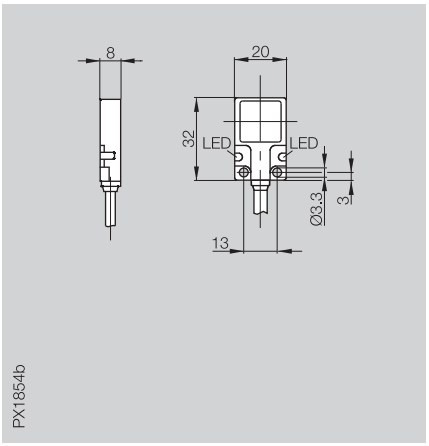
PNP	NO ①		BES 516-300-S279	
	complementary ③			
NPN	NO ④		BES 516-300-S255	
	complementary ⑥			
Supply voltage U_B			10...30 V DC	
Voltage drop U_d at I_e			≤ 0.5 V	
Rated insulation voltage U_i			75 V DC	
Rated operational current I_e			50 mA	
No-load supply current I_0 max.			≤ 25 mA	
Polarity reversal 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				

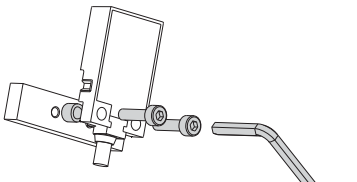
① Wiring diagrams see page **1.0.**6

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	



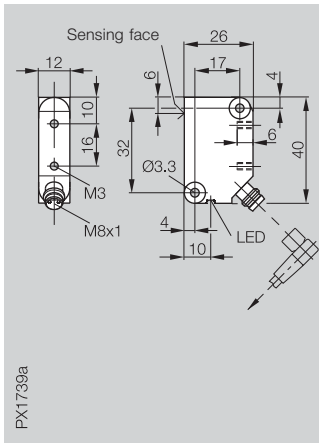
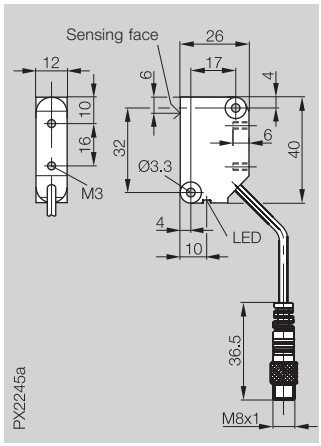
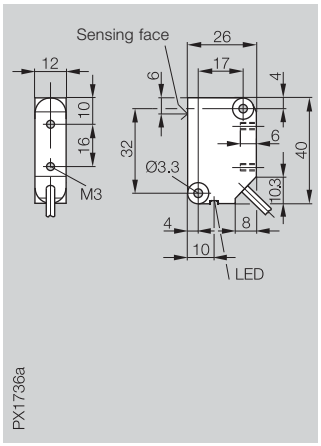
Mounting set BES R01-FK-1
consisting of:
2 cheese-head screws DIN 912 M3×12
2 spacers Ø5×Ø3.3×3.7
1 angled screwdriver DIN 911, 2.5 mm

Please order separately!



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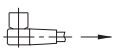
5
Connectors ...
page 5.2 ...

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	

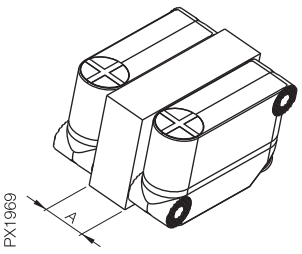
① Wiring diagrams see page **1.0.**6

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

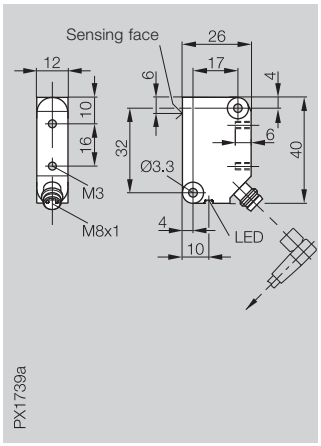
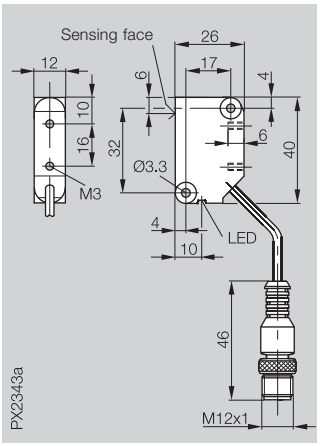
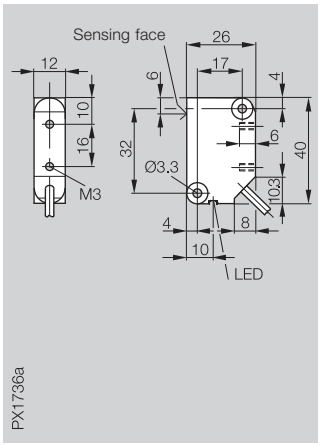
For sensors with cable and connector, other lengths are available on request.

 Connector orientation

Row mounting



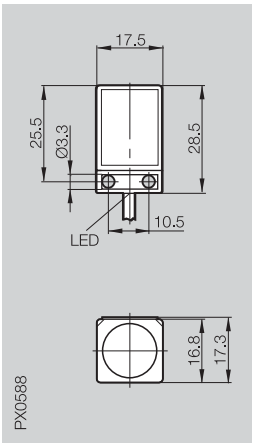
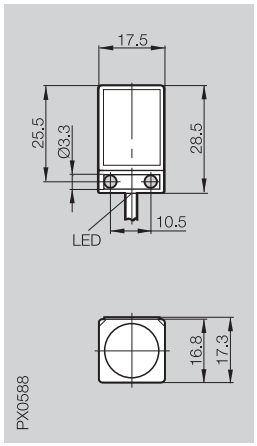
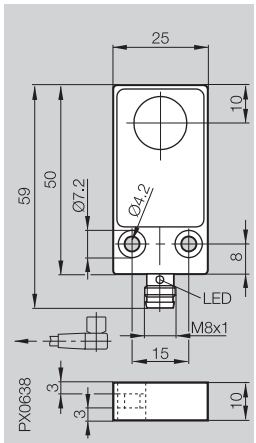
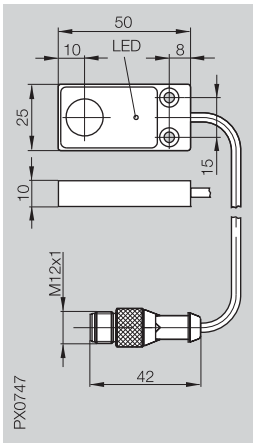
for s_n 2 mm
– the sensors can be mounted without Distance A
for s_n 4 mm
– for plastics or without existing material in the space = Distance A at least 17 mm
– for metal in the space = Distance A at least 12 mm

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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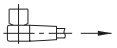
5
Connectors ...
page 5.2 ...

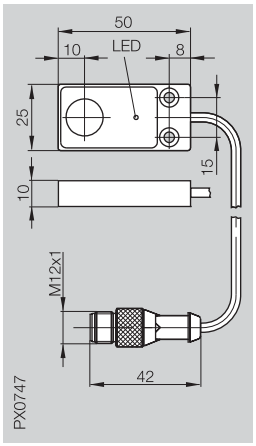
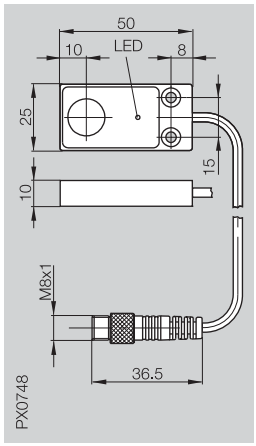
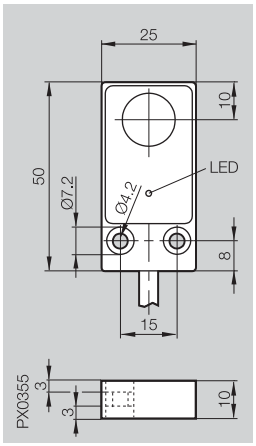
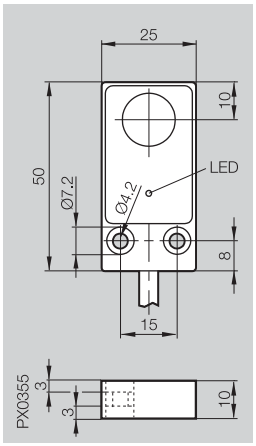
Housing size		**17.5×17.3×28.5 mm**	**17.5×17.3×28.5 mm**	**25×50×10 mm**	**25×50×10 mm**
Mounting (see notes starting p. **1.0.**11)		flush	non-flush	flush	flush
Rated operating distance s_n		**3 mm**	**5 mm**	**5 mm**	**5 mm**
Assured operating distance s_a		0...2.4 mm	0...4.1 mm	0...4.1 mm	0...4.1 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
	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.

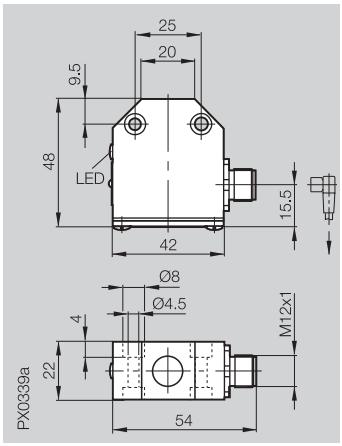
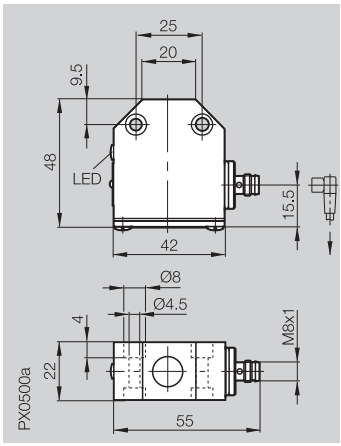
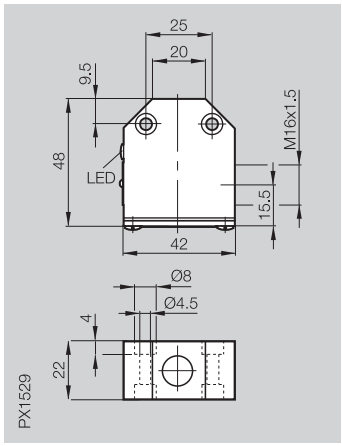
For sensors with cable and connector, other lengths are available on request.

 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			



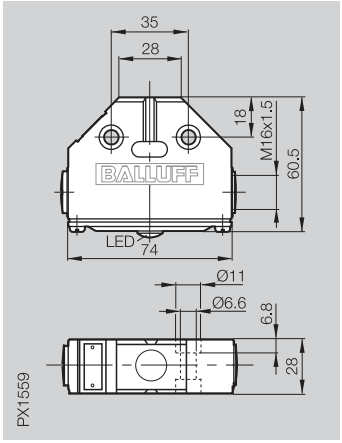
1.1
5
Connectors ...
page 5.2 ...

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				

1.1

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!



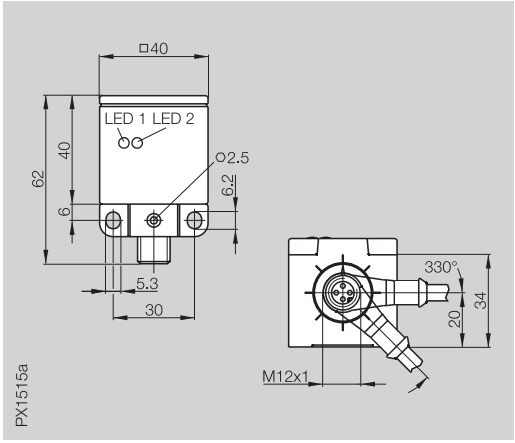




Housing size	**40×40×62 mm** Unicompact
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**20 mm**
Assured operating distance s_a	0...16.2 mm







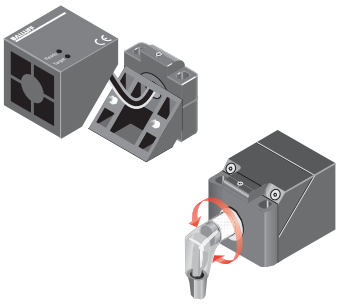
Unicompact
The flexible sensor for varied applications in machine and systems building, even when space is limited.

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	

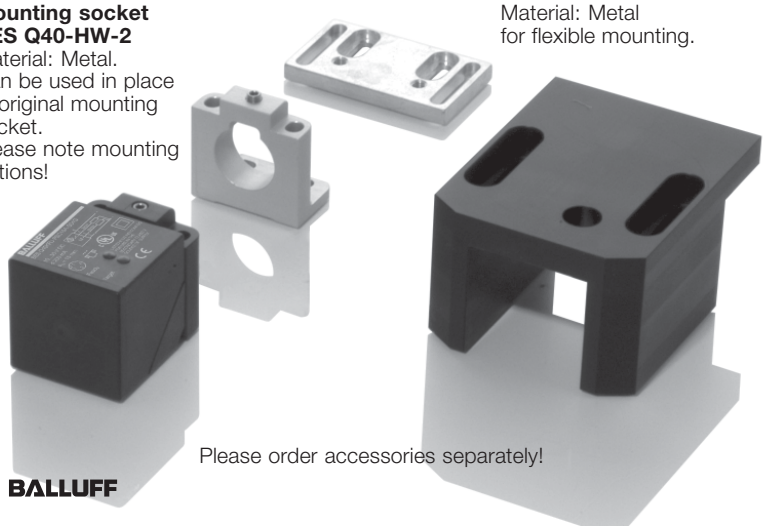
Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 20 mA
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °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

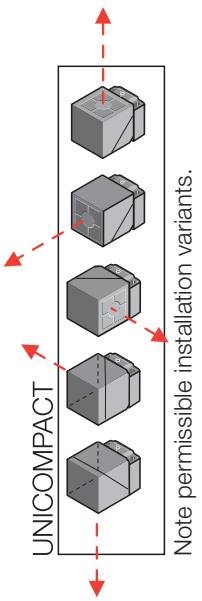


Mounting socket
BES Q40-HW-2
Material: Metal.
Can be used in place of original mounting socket.
Please note mounting options!

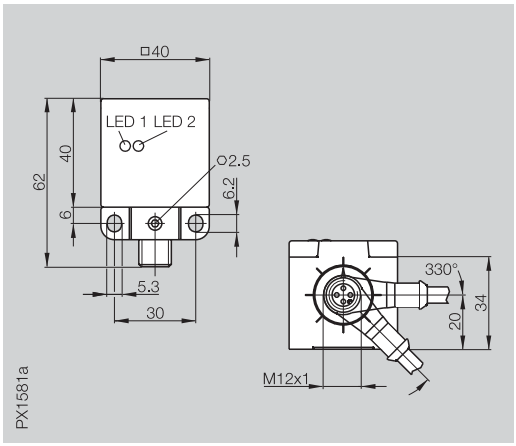
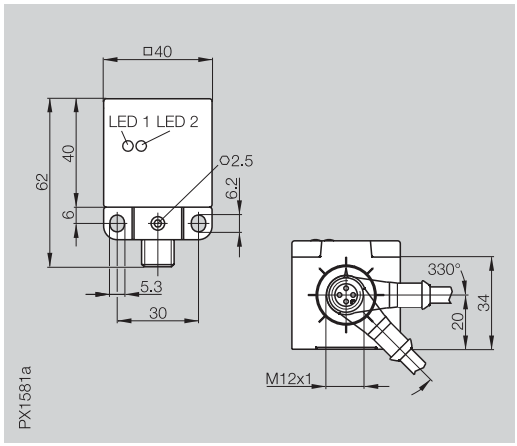
Mounting bracket
BES Q40-HW-1
Material: Metal
for flexible mounting.



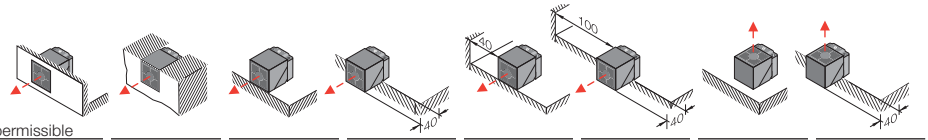
Protective cover
BES Q40-SH-2
Material: PA 6
Provides step protection.



Please order accessories separately!

	40×40×62 mm Unicompact	**40×40×62 mm** Unicompact
	non-flush	non-flush
	25 mm	**30 mm**
	0...20.3 mm	0...24.3 mm
		
	BES Q40KFU-NAC25F-S04G	BES Q40KFU-PSC30F-S04G BES Q40KFU-PAC30F-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

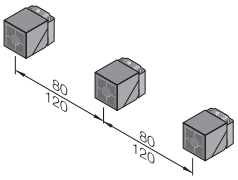
Permissible mounting options



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

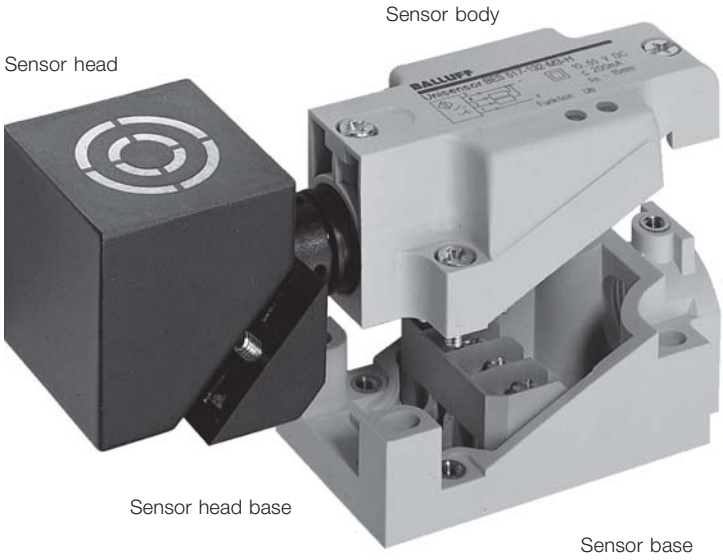
Row mounting

flush 80 mm
non-flush 120 mm



1.1

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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

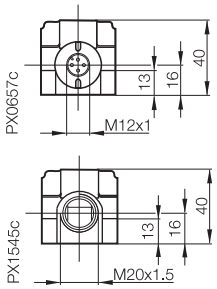
- Loosen the two holding screws on sensor head
- Rotate sensor head 180°
- Tighten holding screws

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		

CE

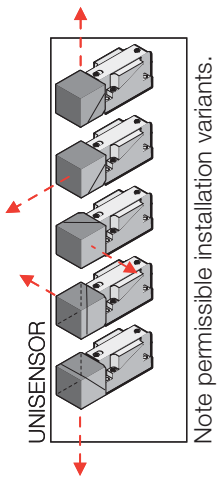


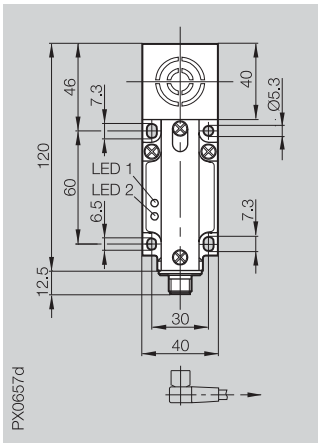
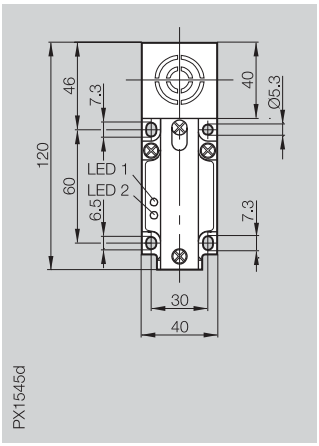
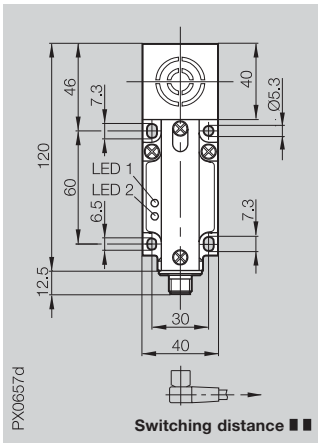
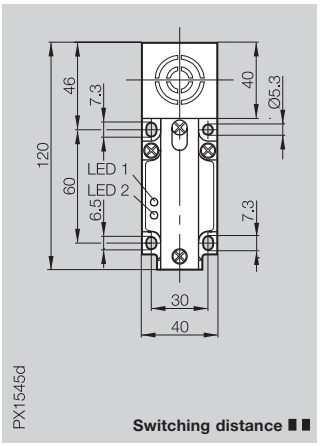
PNP	complementary	③
NPN	complementary	⑥

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 flush **15 mm** 0...12.2 mm	**40×40×120 mm** Unisensor flush **15 mm** 0...12.2 mm	**40×40×120 mm** Unisensor flush **20 mm** 0...16.2 mm	**40×40×120 mm** Unisensor flush **20 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

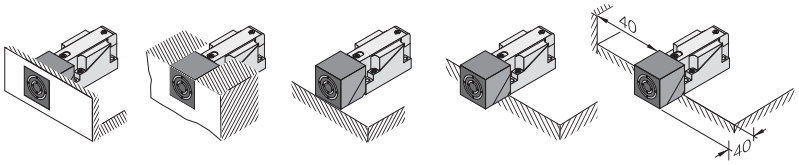
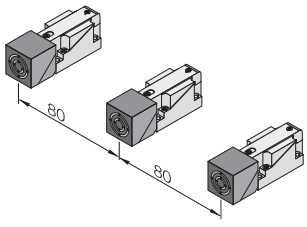


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

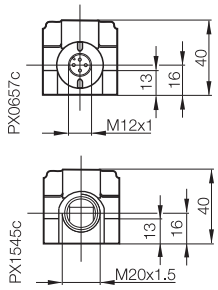
Row mounting

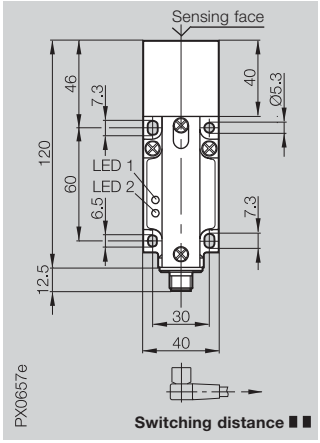


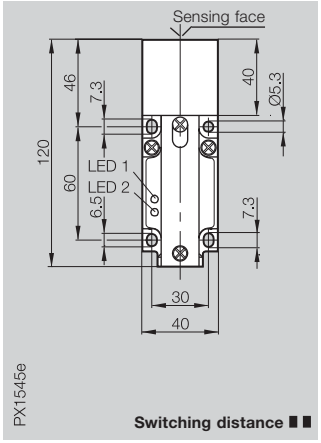
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5
Connectors, mounting plate ... page 5.2 ...

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





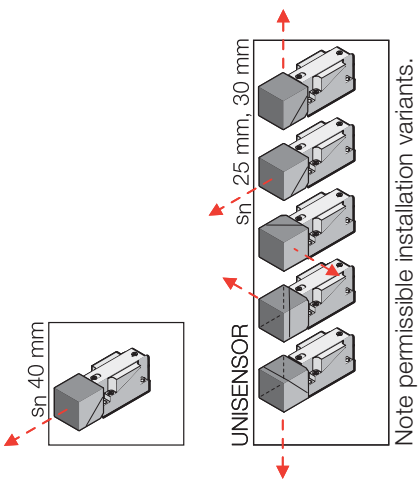


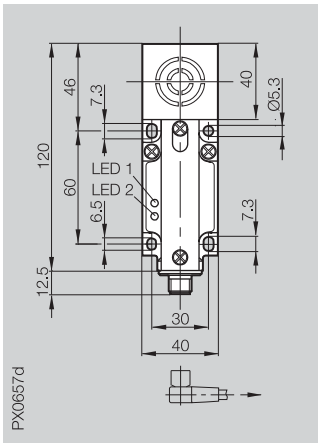
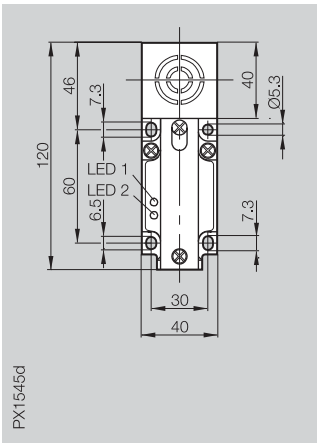
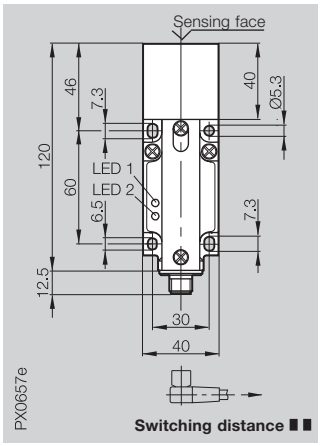
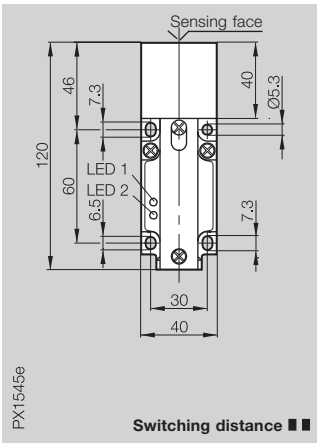
PNP	NO	①	BES 517-385-V-C-S4	BES 517-385-MV-C
	complementary	③		
NPN	complementary	⑥		
Supply voltage U_B			10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 3.5 V	≤ 3.5 V
Rated insulation voltage U_i			250 V AC	250 V AC
Rated operational current I_e			200 mA	200 mA
No-load supply current I_0 max.			≤ 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

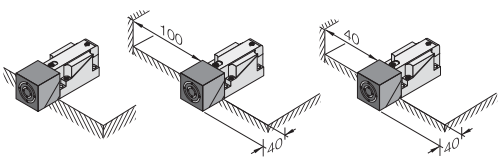
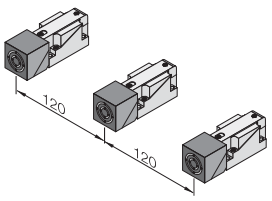


Fig. 1 Fig. 2 Fig. 3

Row mounting



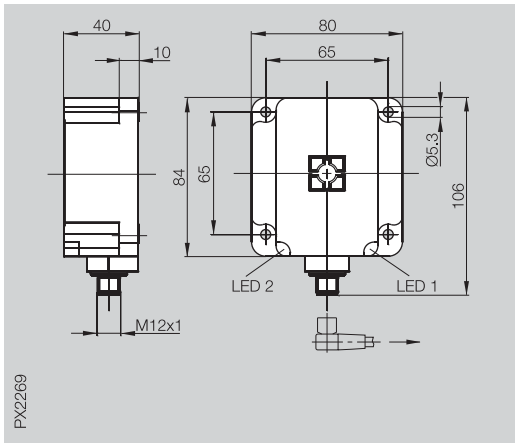
1.1

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

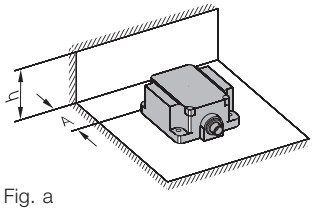


Fig. a

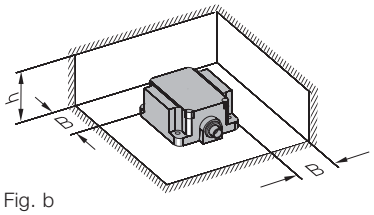


Fig. b

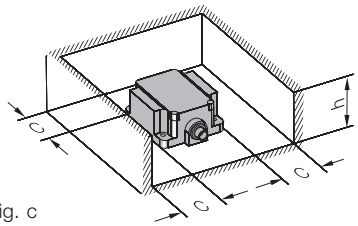


Fig. c

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 %.

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

Flush mount

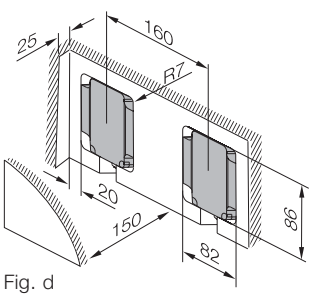
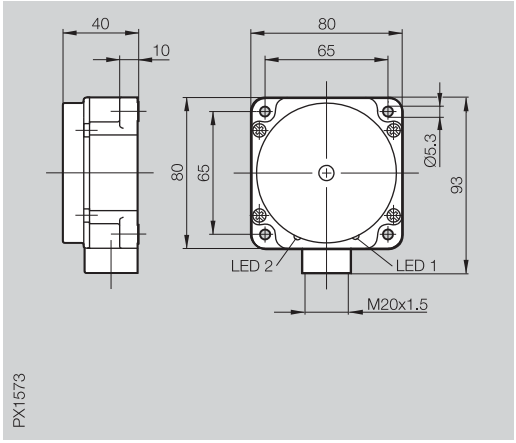
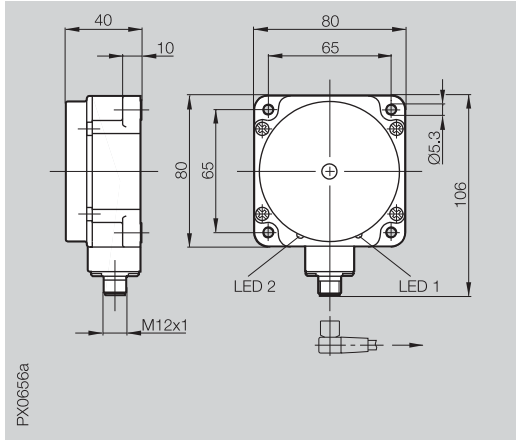


Fig. d



	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

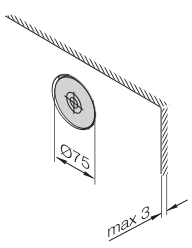


Fig. 1

Mounting in non-ferrous metals

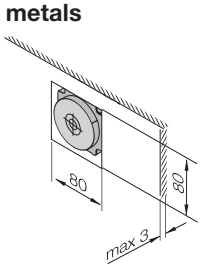


Fig. 2

Mounting in steel/ non-ferrous metals

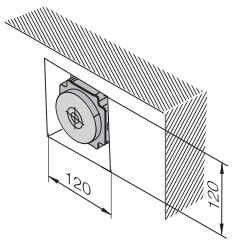


Fig. 3

Mounting on steel/ non-ferrous metals

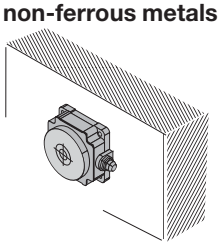
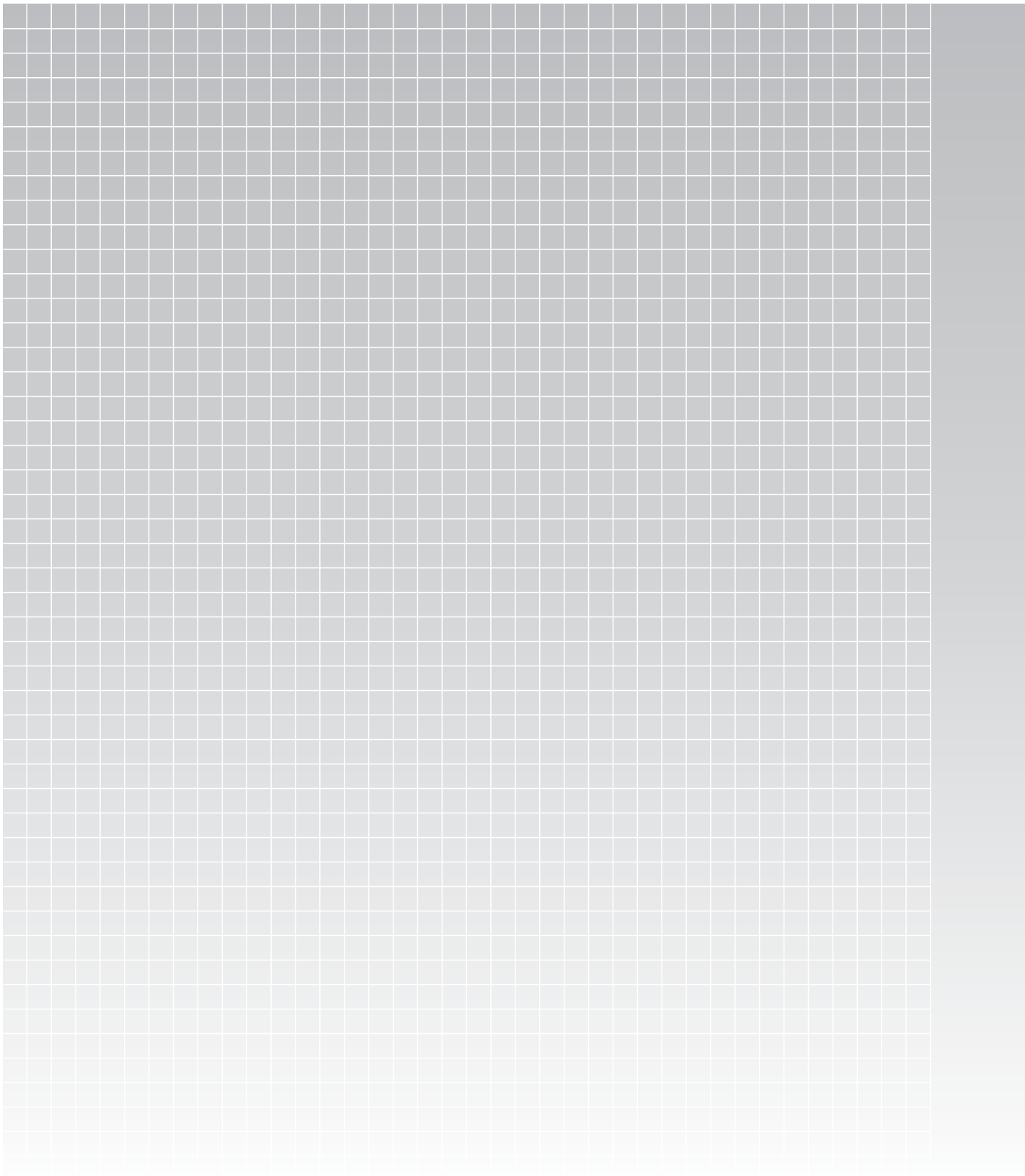


Fig. 4

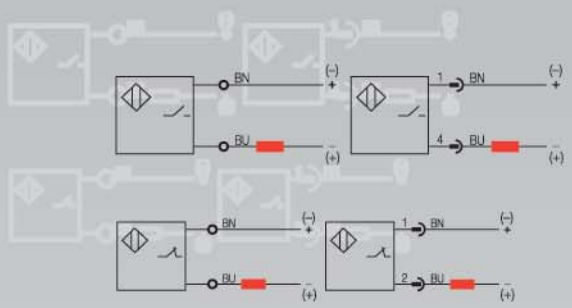


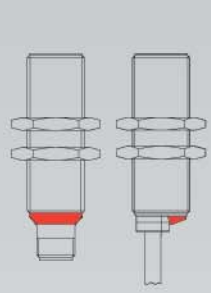
5
Connectors
page 5.2 ...



Inductive – DC 2-wire

1.2





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



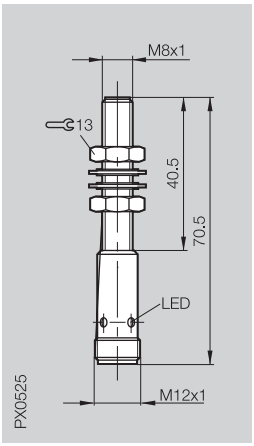
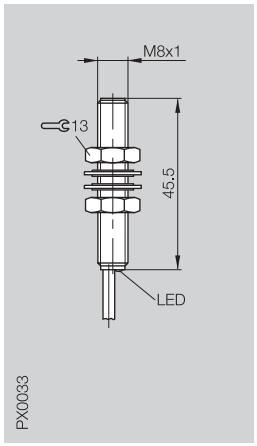
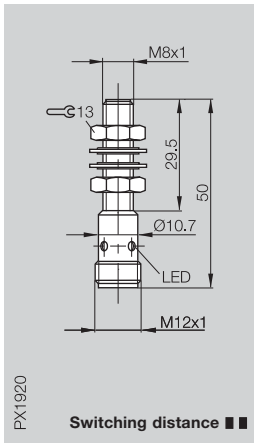
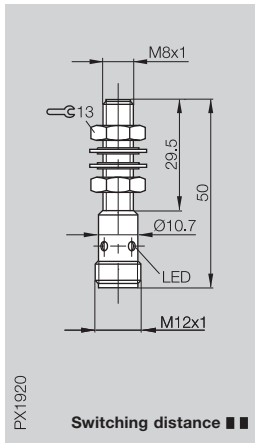
Size housing length

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.

1.2.2 M8
1.2.4 M12
1.2.6 M18
1.2.8 M30
1.2.10 Block style housings



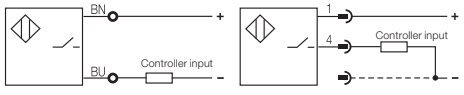
Housing size	**M8×1**	**M8×1**	**M8×1**	**M8×1**
Mounting (see notes starting p. **1.0.**11)	flush	flush	flush	flush
Rated operating distance s_n	**1.5 mm**	**1.5 mm**	**2 mm**	**2 mm**
Assured operating distance s_a	0...1.2 mm	0...1.2 mm	0...1.6 mm	0...1.6 mm
				
NO ⑨ non-polarized ⑦ polarized			BES 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

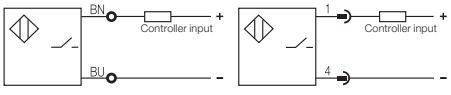
Other cable lengths and PUR cable jacket material on request.

Recommendation for wiring polarized sensors to 3-wire controllers

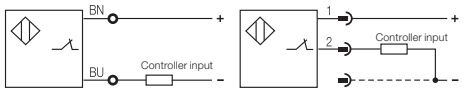
PNP/N.O.



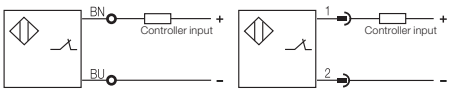
NPN/N.O.



PNP/N.C.



NPN/N.C.

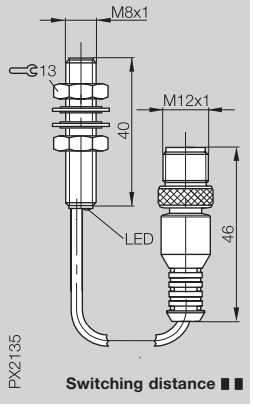
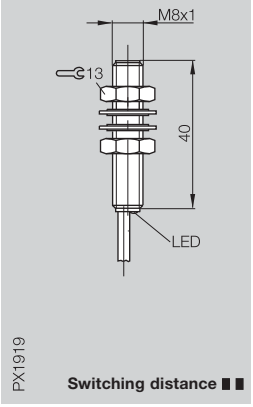
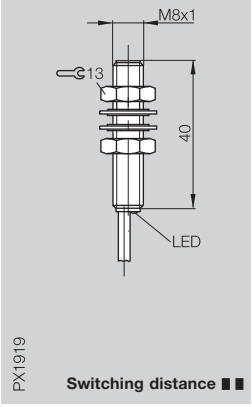


DC 2-wire sensors – for universal use

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.

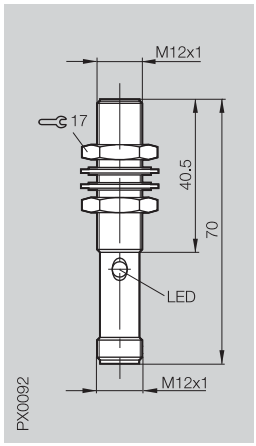
	M8×1 flush **2 mm** 0...1.6 mm	**M8×1** flush **2 mm** 0...1.6 mm	**M8×1** flush **2 mm** 0...1.6 mm		
					
	BES M08MG-GSC20B-BP00,3-GS04	BES M08MG-USC20B-BV02	BES M08MG-GSC20B-BV02		
	10...30 V DC polarized	10...30 V DC non-polarized	10...30 V DC polarized		
	≤ 5 V	≤ 5 V	≤ 5 V		
	75 V DC	75 V DC	75 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				

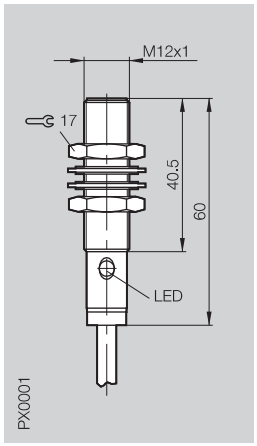


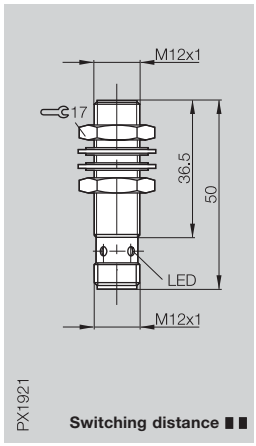
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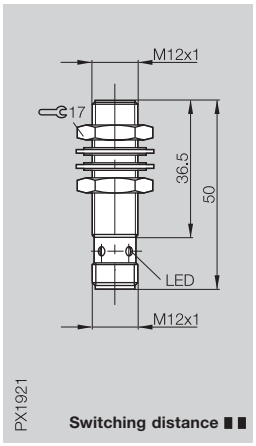
5
Connectors, Holders ...
Page 5.2 ...

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







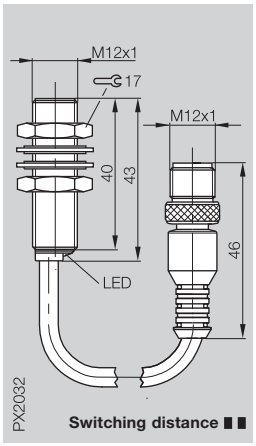
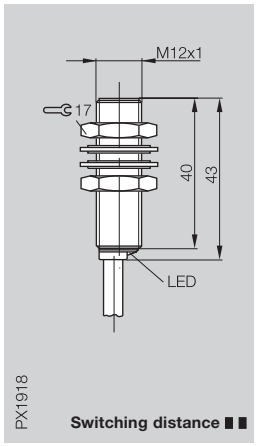
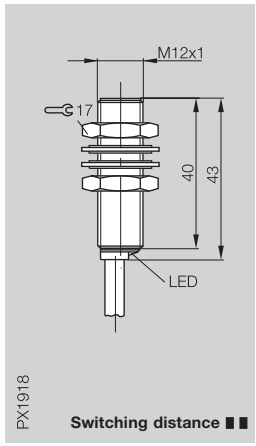
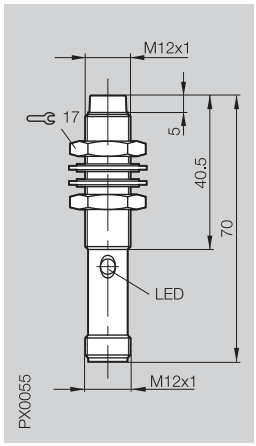
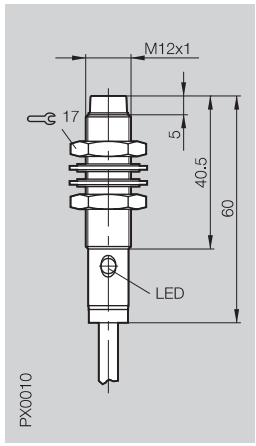


NO ⑨ non-polarized ⑦ polarized			BES M12MF-USC30B-S04G	BES M12MF-GSC30B-S04G
NC ⑩ non-polarized	BES 516-543-S4-H	BES 516-543-B0-H-03		
Supply voltage U_B	10...55 V DC non-polarized	10...55 V DC non-polarized	10...30 V DC non-polarized	10...30 V DC polarized
Voltage drop U_d at I_e	≤ 5 V	≤ 5 V	≤ 5 V	≤ 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.



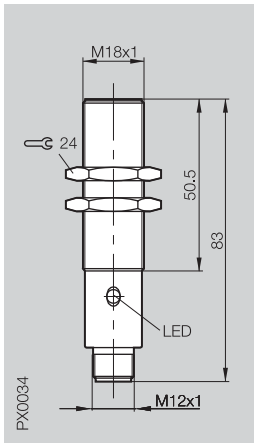
	M12×1	M12×1	M12×1	M12×1	M12×1
	flush	flush	flush	non-flush	non-flush
	3 mm	**3 mm**	**3 mm**	**4 mm**	**4 mm**
	0...2.4 mm	0...2.4 mm	0...2.4 mm	0...3.2 mm	0...3.2 mm
					
	BES M12MG-GSC30B-BP00,3-GS04	BES M12MG-USC30B-BV02	BES M12MG-GSC30B-BV02	BES 516-545-S4-H	BES 516-545-B0-H-03
	10...30 V DC polarized	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	

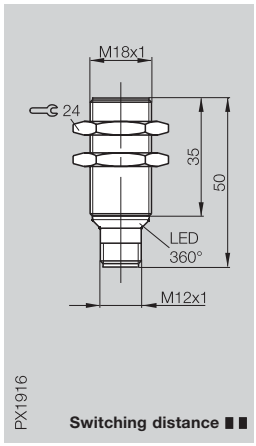


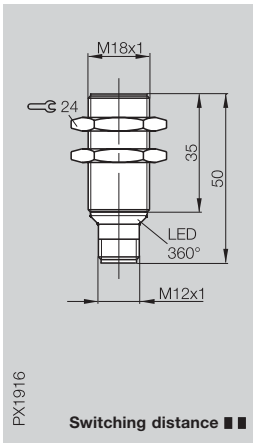
1.2

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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







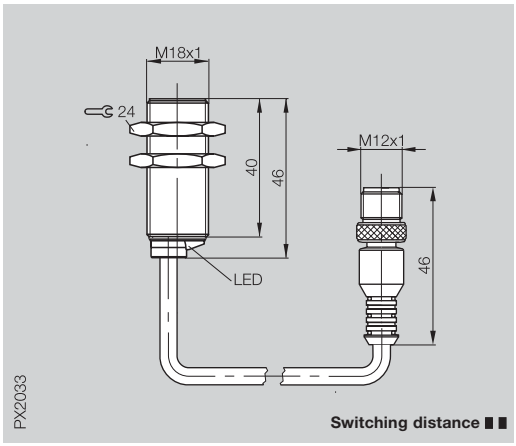
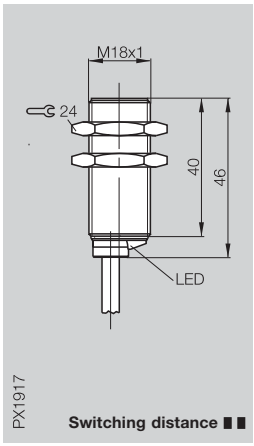
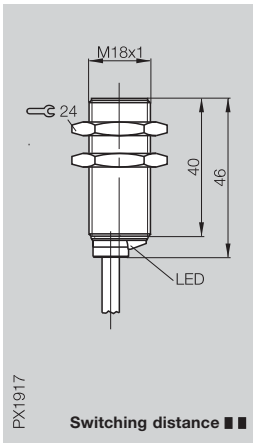
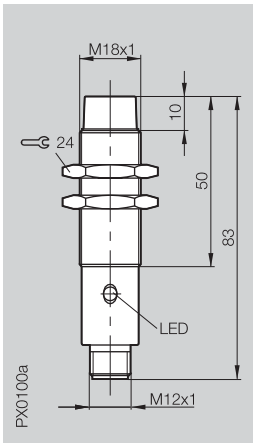
NO ⑨ non-polarized ⑦ polarized		BES M18MF-USC70B-S04K	BES M18MF-GSC70B-S04K
NC ⑩ non-polarized	BES 516-539-S4-H		
Supply voltage U_B	10...55 V DC non-polarized	10...30 V DC non-polarized	10...30 V DC polarized
Voltage drop U_d at I_e	≤ 5 V	≤ 5 V	≤ 4 V
Rated insulation voltage U_i	250 V AC	75 V DC	75 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

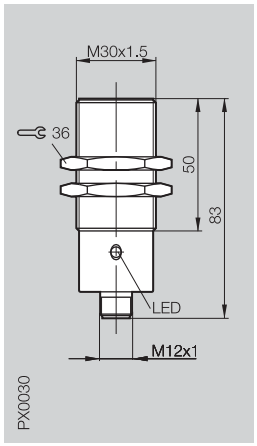
	M18×1	**M18×1**	**M18×1**	**M18×1**
	flush	flush	flush	non-flush
	7 mm	**7 mm**	**7 mm**	**8 mm**
	0...5.7 mm	0...5.7 mm	0...5.7 mm	0...6.5 mm
				
	BES M18MG-GSC70B-BP00,3-GS04	BES M18MG-USC70B-BV02	BES M18MG-GSC70B-BV02	BES 516-547-S4-H
	10...30 V DC polarized	10...30 V DC non-polarized	10...30 V DC 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

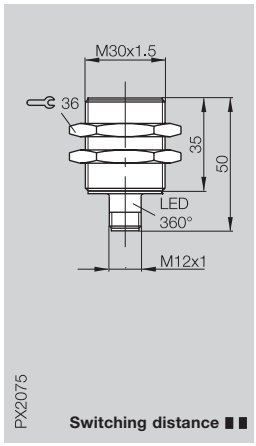


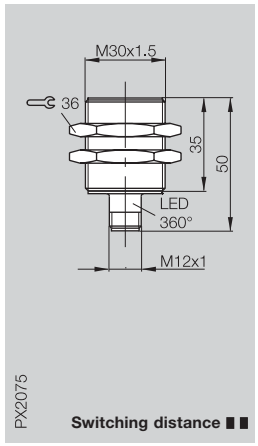
1.2

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







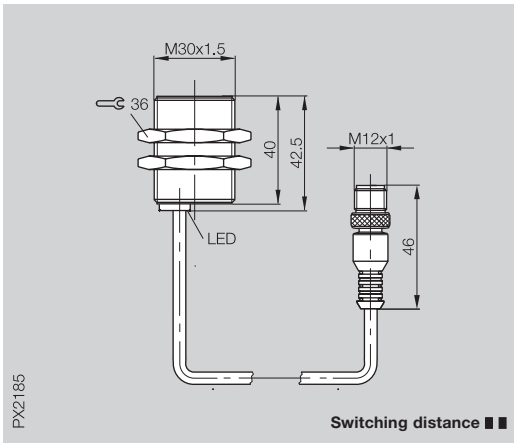
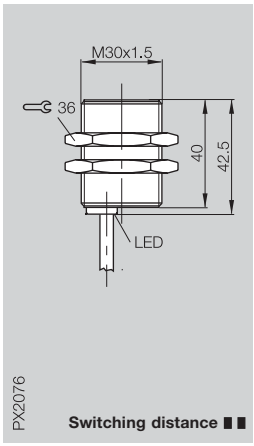
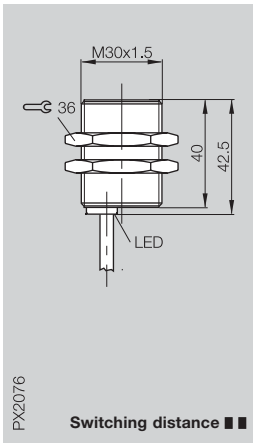
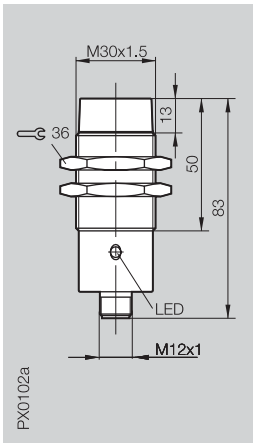
NO ⑨ non-polarized ⑦ polarized		BES M30MF-USC15B-S04K	BES M30MF-GSC15B-S04K
NC ⑩ non-polarized	BES 516-541-S4-H		
Supply voltage U_B	10...55 V DC non-polarized	10...30 V DC non-polarized	10...30 V DC polarized
Voltage drop U_d at I_e	≤ 5 V	≤ 5 V	≤ 4 V
Rated insulation voltage U_i	250 V AC	75 V DC	75 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

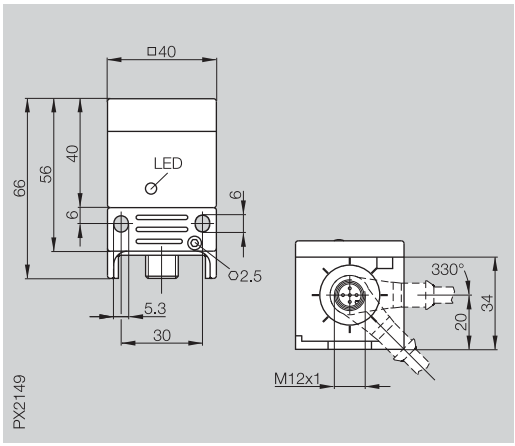
	M30×1.5	**M30×1.5**	**M30×1.5**	**M30×1.5**
	flush	flush	flush	non-flush
	15 mm	**15 mm**	**15 mm**	**15 mm**
	0...12.2 mm	0...12.2 mm	0...12.2 mm	0...12.2 mm
				
	BES M30MF-GSC15B-BP00,3-GS04	BES M30MF-USC15B-BV02	BES M30MF-GSC15B-BV02	BES 516-549-S4-H
	10...30 V DC polarized	10...30 V DC non-polarized	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



1.2

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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.

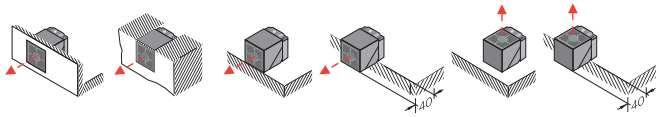
Maxisensor
Long switching distance with low installation height in the detection direction. Ideal for systems building and conveying equipment.

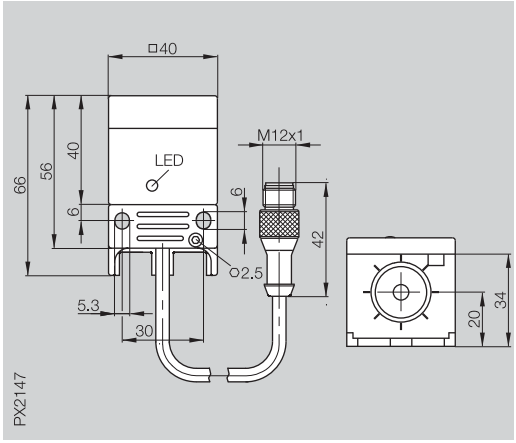
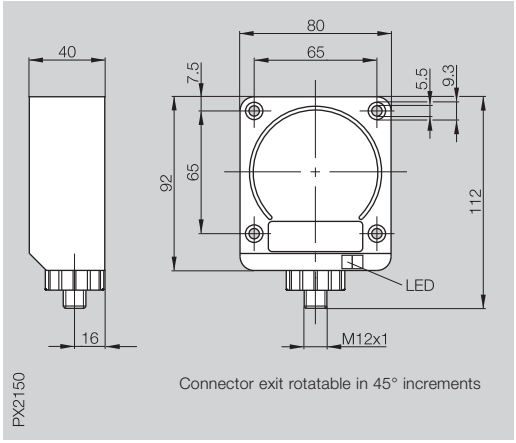
NO ⑦ polarized	BES Q40KFU-GSH15B-S04G
NC ⑧ polarized	
Supply voltage U_B	10...55 V DC polarized
Voltage drop U_d at I_e	≤ 4.6 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	100 mA
Minimum operating current I_m	2 mA
Off-state current I_r	≤ 800 µA
Polarity reversal protected	yes
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

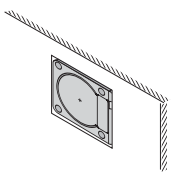


	40×40×66 mm Unicompact	**80×92×40 mm** Maxisensor
	flush	flush
	15 mm	**50 mm**
	0...12.2 mm	0...40.5 mm
		
	BES Q40KFU-GSH15B-EP00,8-GS04 BES Q40KFU-GOH15B-EP00,8-GS04	BES Q80KA-GSH50B-S04Q
	10...55 V DC polarized	10...55 V DC polarized
	≤ 4.6 V	≤ 4.6 V
	250 V AC	250 V AC
	100 mA	400 mA
	2 mA	4 mA
	≤ 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

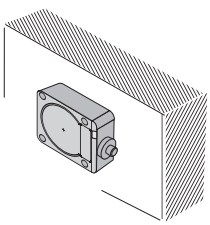


Permissible mounting variations for Maxisensor

Mounting in steel/ non-ferrous metals



Mounting on steel/ non-ferrous metals

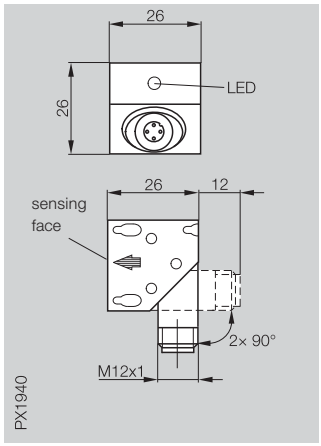


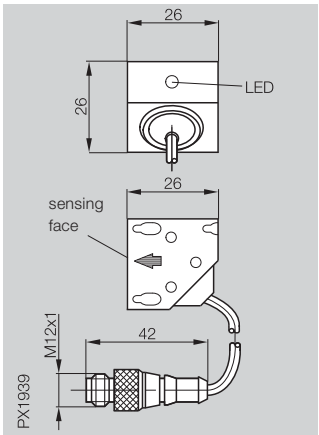
For non-flush mounting the switching distance is reduced by max. 5.5 mm.

1.2
5
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.

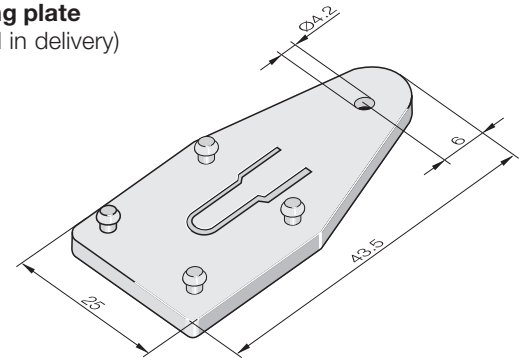
Simple replacement with no loss of position thanks to the fixed mounting plate:

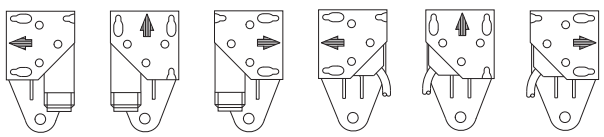
- Cost savings
- No special tools necessary
- Simple to install

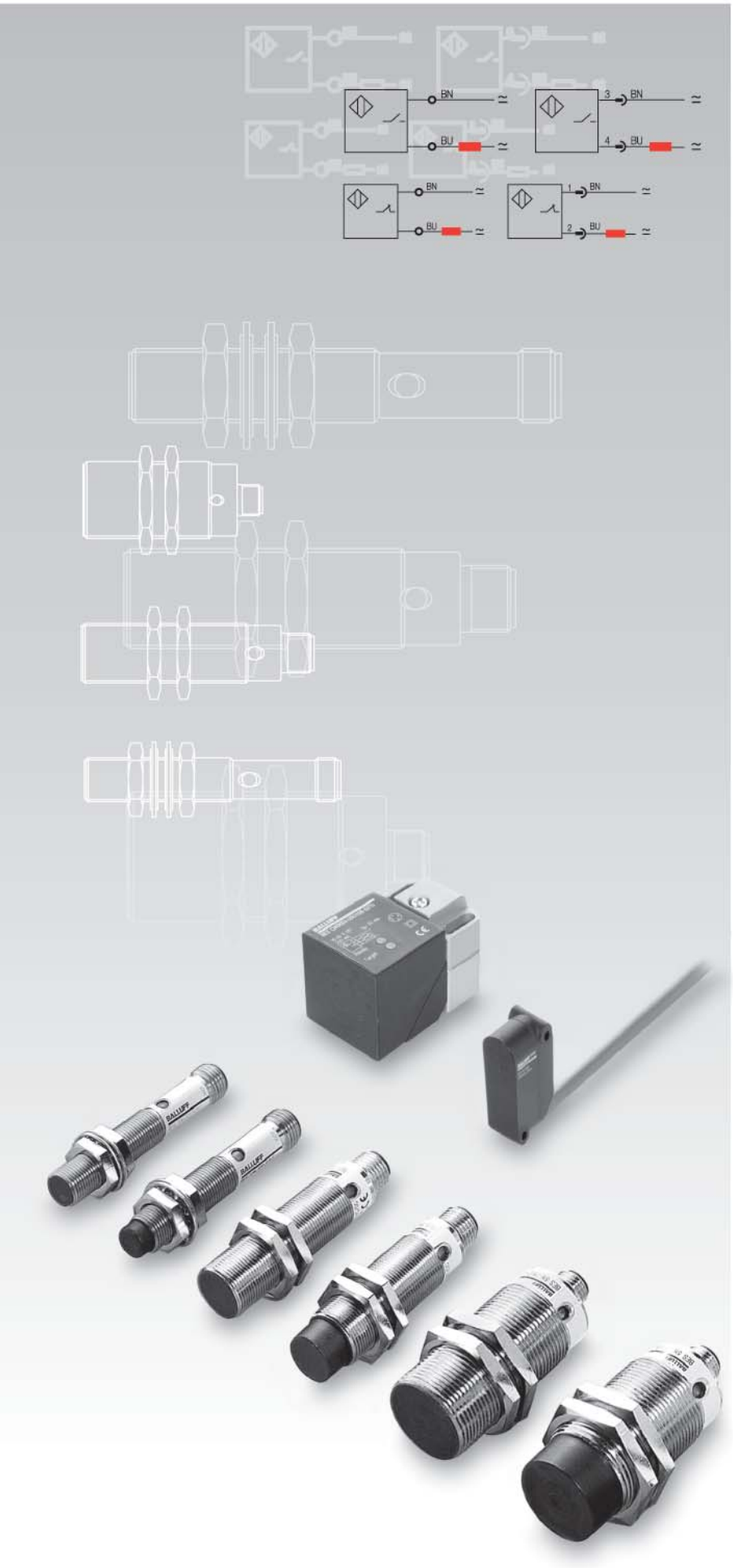
NO ⑦ polarized	BES Z03K-GSS10B-S04U-006	BES Z03K-GSS10B-EP00,15-GS04-006
Supply voltage U_B	10...36 V DC polarized	10...36 V DC polarized
Voltage drop U_d at I_e	≤ 4.5 V	≤ 4.5 V
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	100 mA	100 mA
Minimum operating current I_m	2 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

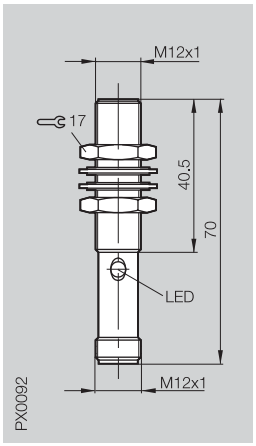
Our standard line in 2-wire AC/DC versions

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.

1.3.2 M12
1.3.3 M12, M18, M30
1.3.4 Block style housings

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

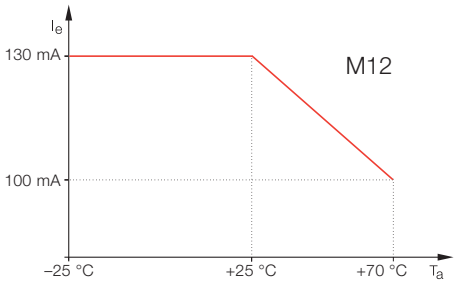
Degree of protection per IEC 60529	IP 67
Insulation class	with protection ground
Housing material	Stainless steel
Material of sensing face	PA 12
Connection	Connector

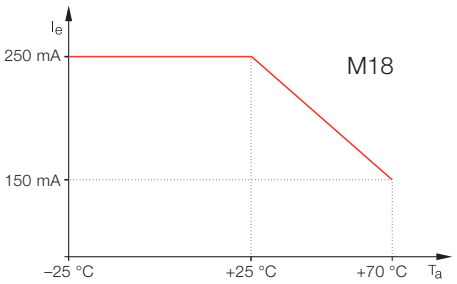
Approval	cULus
Recommended connector	BKS-S 27/BKS-S 28

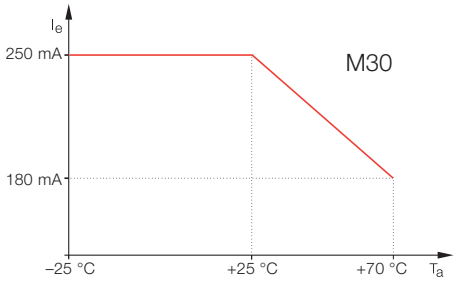
⑯ Wiring diagrams see page **1.0.**6

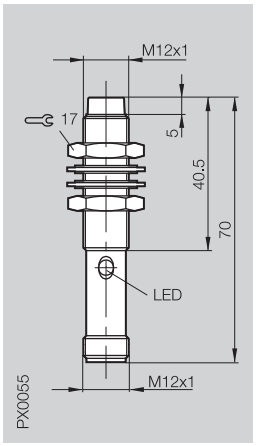
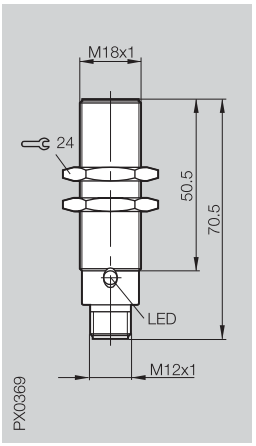
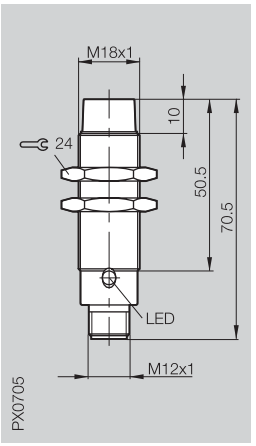
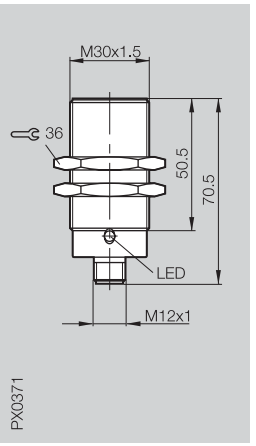
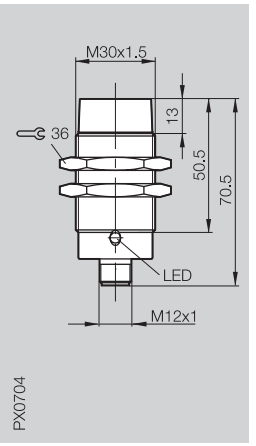
Cable versions (Insulation class 2) on request.

Current reduction as a function of ambient temperature range





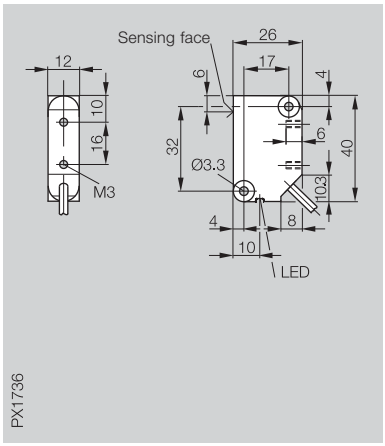


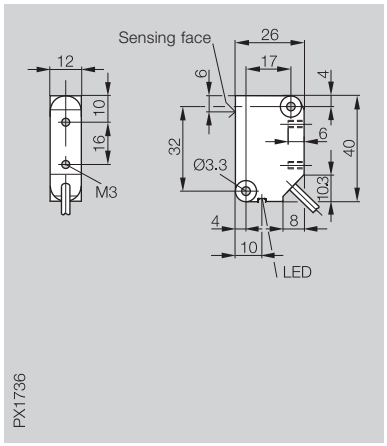
	M12×1	M18×1	M18×1	M30×1.5	M30×1.5
	non-flush	flush	non-flush	flush	non-flush
	4 mm	**5 mm**	**8 mm**	**10 mm**	**15 mm**
	0...3.2 mm	0...4.1 mm	0...6.5 mm	0...8.1 mm	0...12.2 mm
					
	BES 516-209-S27-E BES 516-210-S27-E	BES 516-211-E5-E-S27 BES 516-212-E5-E-S27	BES 516-213-E5-E-S27 BES 516-214-E5-E-S27	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



1.3
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





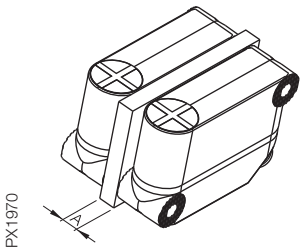
NO ⑬	BES R05KB-USU20B-EV02	BES R05KB-USU40B-EV02
Rated operational voltage U_e	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 12 V; ≤ 8.5 V dyn.	≤ 12 V; ≤ 8.5 V dyn.
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	130 mA	130 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.



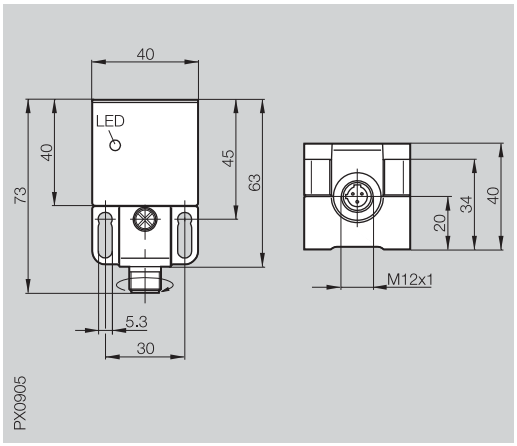
Row mounting

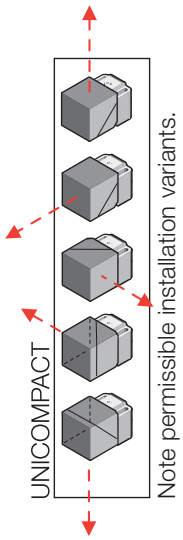


– for plastics or without existing material in the space
= Distance A at least 5 mm
– for metal in the space
= Distance A at least 4 mm

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



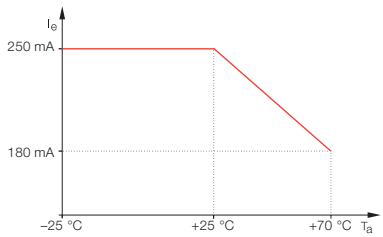




NO ⑯	BES Q40KEU-USU15B-S27G	BES Q40KEU-USU25F-S27G
Rated operational voltage U_e	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 11 V; ≤ 7.5 V dyn.	≤ 11 V; ≤ 7.5 V dyn.
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	250 mA	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

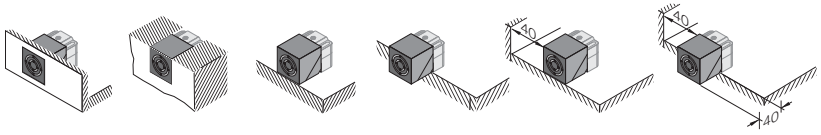
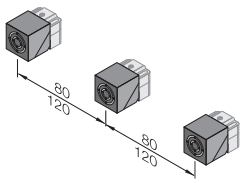
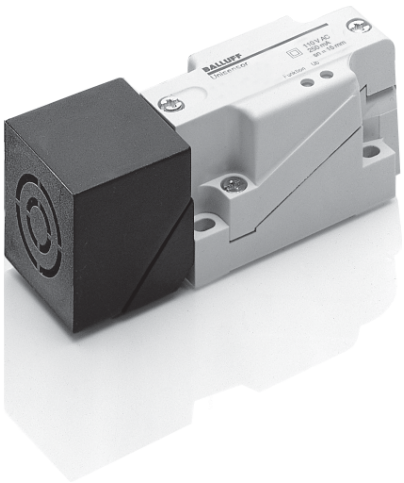


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

Row mounting
flush 80 mm
non-flush 120 mm

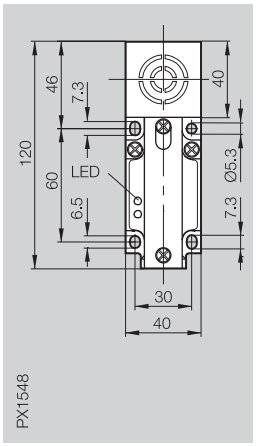


1.3
5
Connectors ...
page 5.2 ...



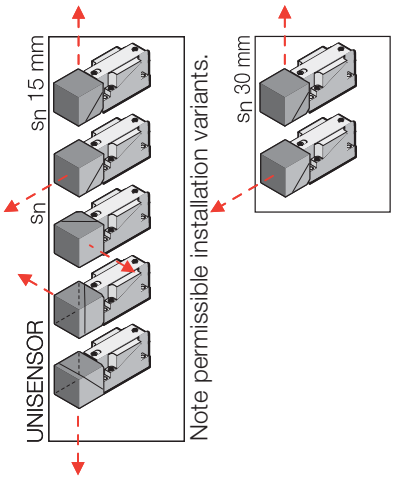
Housing size	**40×40×120 mm** Unisensor	**40×40×120 mm** Unisensor
Mounting (see notes starting p. **1.0.**11)	flush	non-flush
Rated operating distance s_n	**15 mm**	**30 mm**
Assured operating distance s_a	0...12.2 mm	0...24.3 mm





Programmable Unisensor

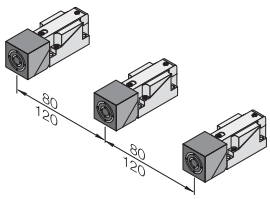
Unisensors can be set for normally open and normally closed function. A wire jumper is used to change the setting.



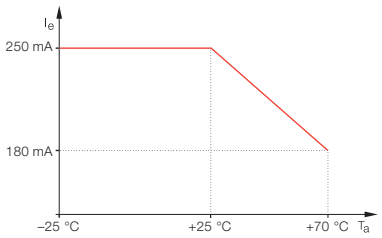
NO/NC programmable ⑮	BES 517-223-M3-E	BES 517-223-M5-E
Rated operational voltage U_e	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 11.5 V; ≤ 7.5 V dyn.	≤ 12.5 V; ≤ 9 V dyn.
Rated insulation voltage U_i	250 V AC	250 V AC
Rated operational current I_e	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

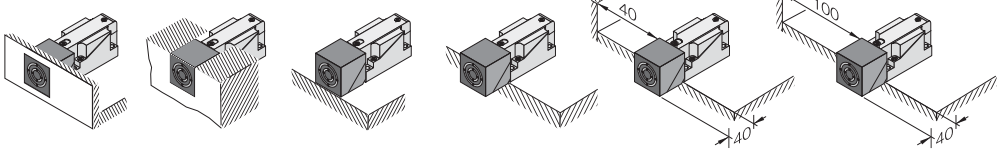
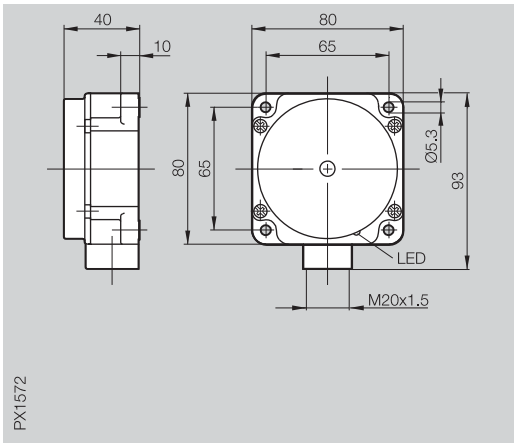


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5 Fig. 6

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

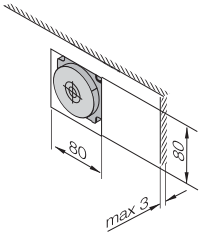


Fig. 1

Mounting in steel/ non-ferrous metals

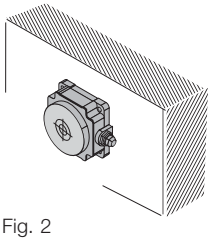
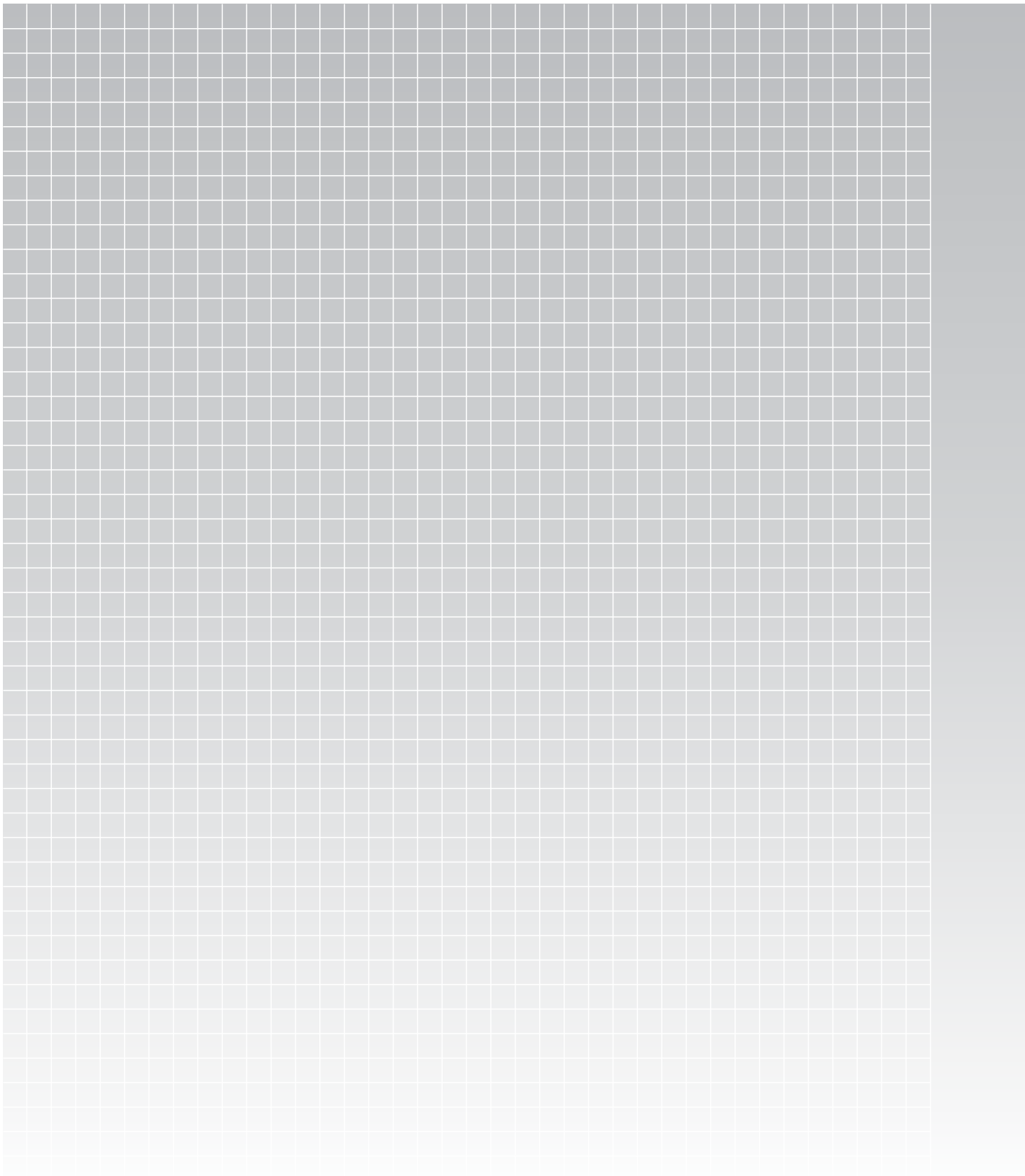
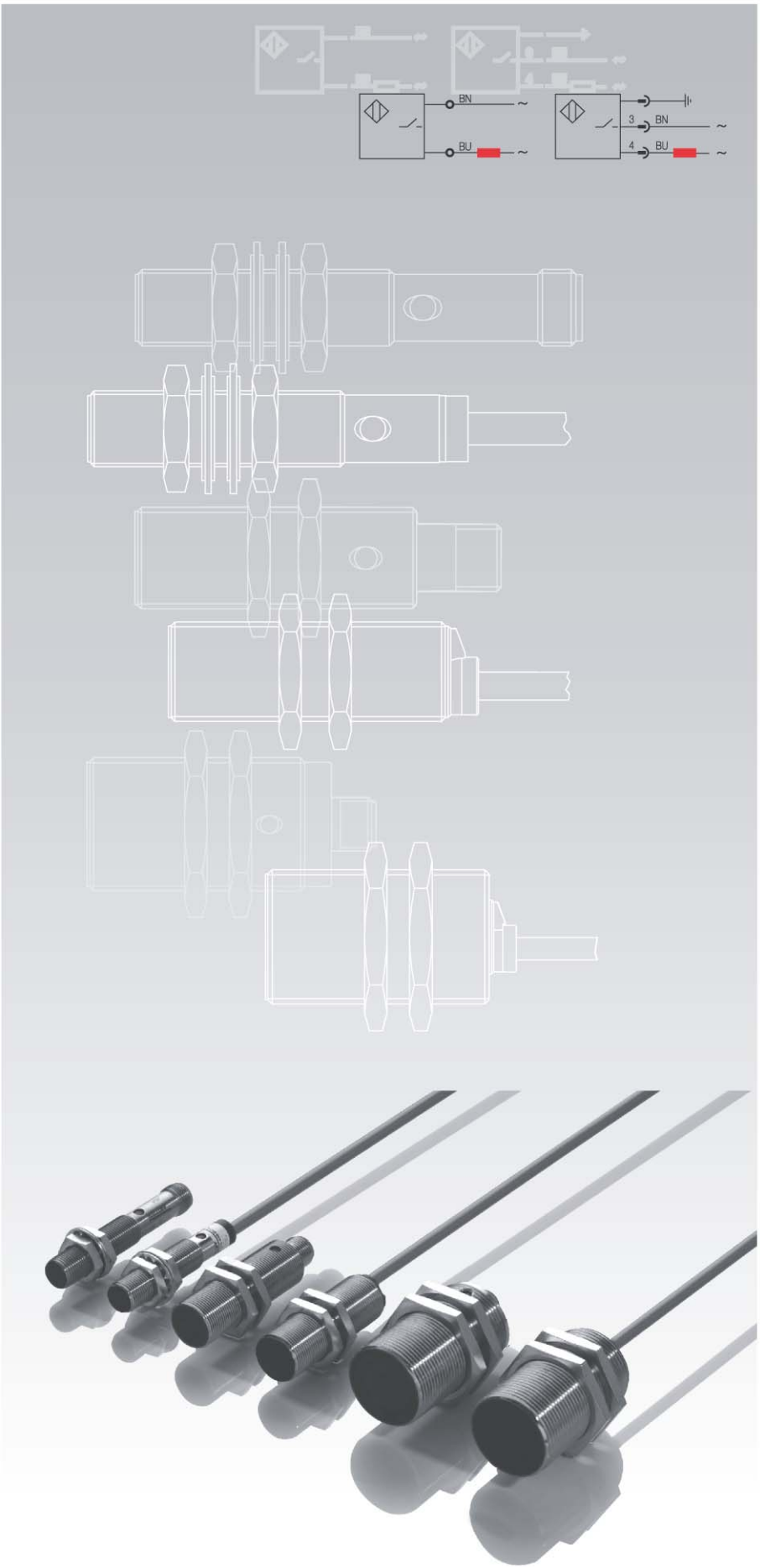


Fig. 2



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.

1.4.2 M12
1.4.3 M12, M18, M30

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

These sensors are used mainly in Asia and America.

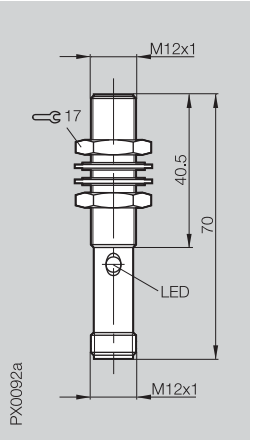
As long as the rated operating current is maintained, these sensors can be used for directly driving contactors and relays.

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.

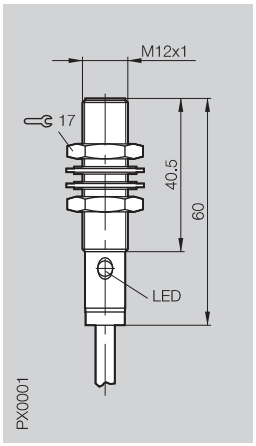
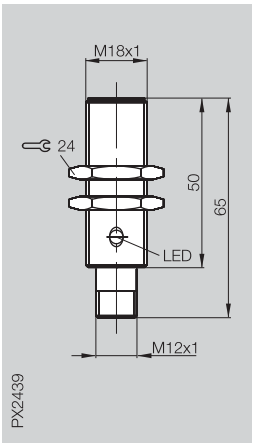
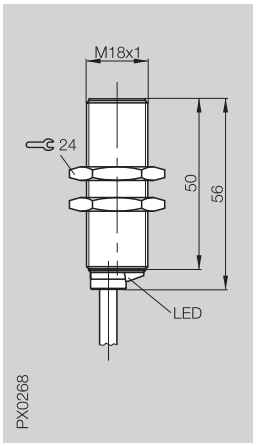
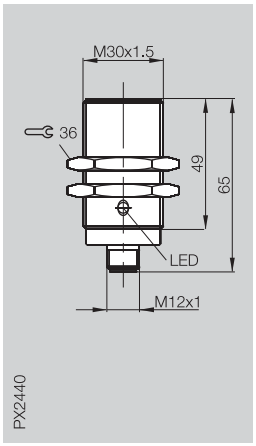
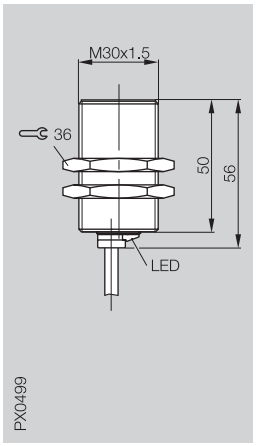
Housing size	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**2 mm**
Assured operating distance s_a	0...1.6 mm



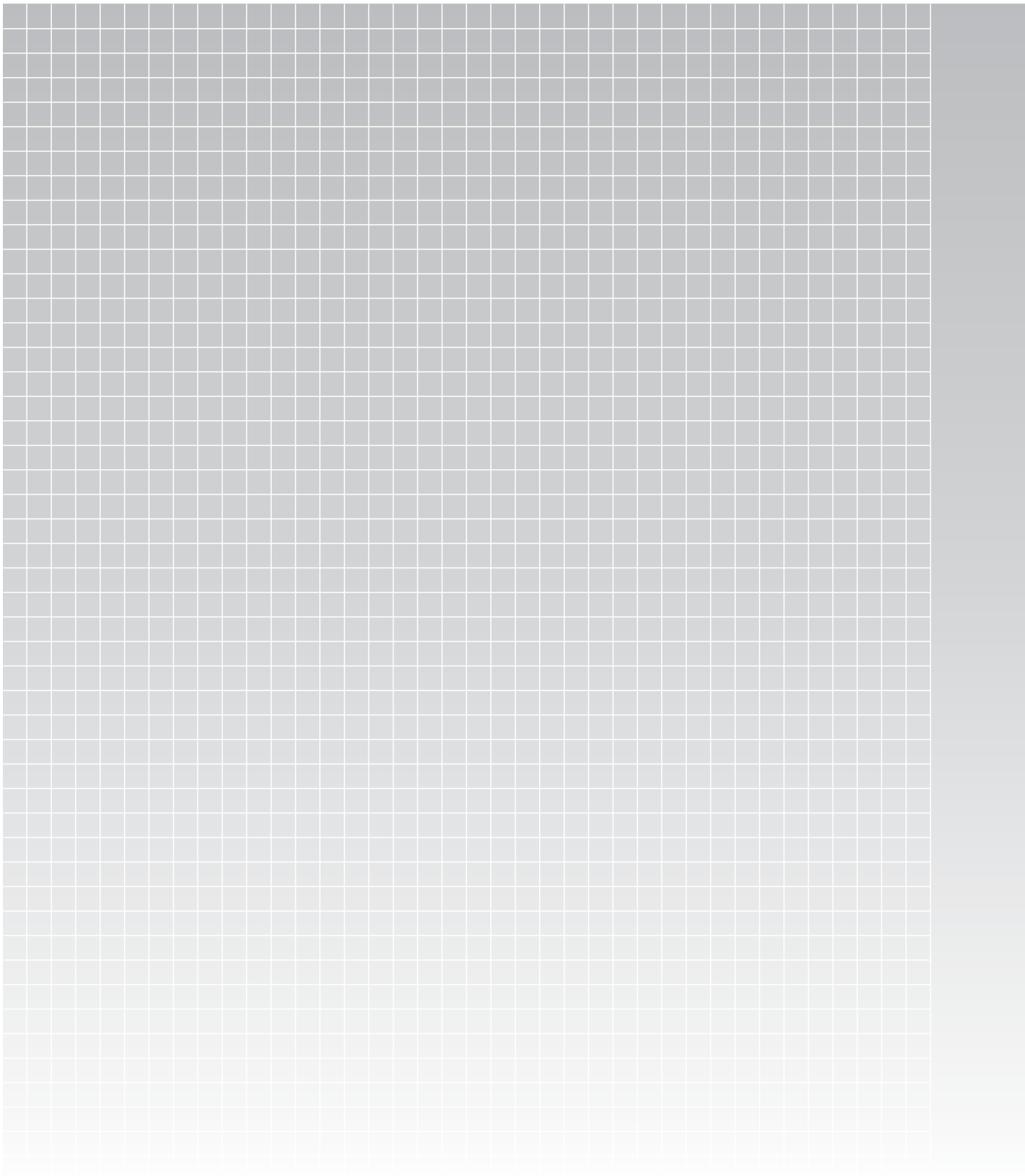
NO ⑪	BES 516-449-S27-L
Supply voltage U_B	20...250 V AC
Voltage drop U_d at I_e	≤ 4 V
Rated insulation voltage U_i	250 V AC
Rated operational current I_e	500 mA
Polarity reversal protected	yes
Short circuit protected	no
Repeat accuracy R	≤ 5 %
Ambient temperature range T_a	–25...+70 °C
Switching frequency 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

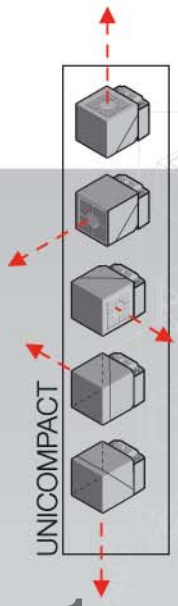
⑪ Wiring diagrams see page **1.0.**6

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	







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

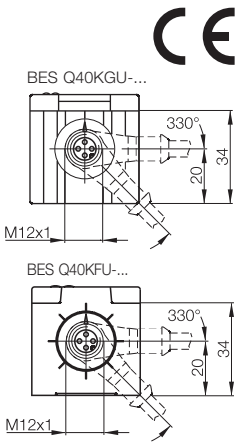
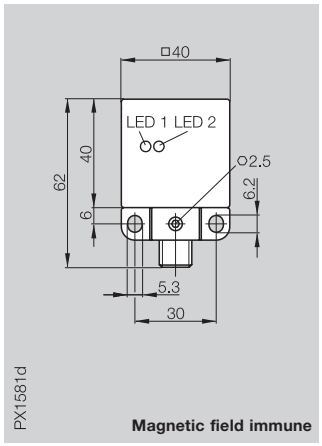
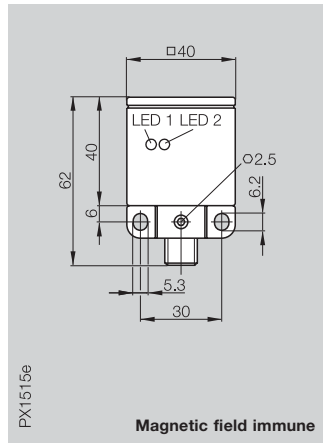
1.5.2 Factor 1 sensors with no reduction factor
1.5.4 Weld- and magnetic field immune sensors for welding environments
1.5.12 Magnetic field immune sensors, desensitized to magnetic fields
1.5.14 Desina diagnostic sensors for machine tools, dynamic function diagnostics
1.5.20 Steelface, sensors for extreme applications
1.5.22 Pressure rated sensors up to max. 500 bar
1.5.32 High-pressure rated sensors High-End and ATEX conformal
1.5.40 NAMUR sensors for standard applications in Ex zones (ATEX conformal)
1.5.42 Temperature rated sensors up to max. +120 °C
1.5.44 PROXINOX® stainless steel sensors for the food industry
1.5.50 Ring sensors
1.5.52 Sensors with large housings and extended switching distance

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

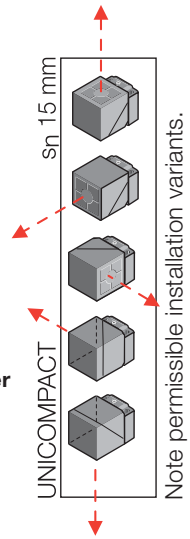
① Wiring diagrams see page **1.0.**6

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.

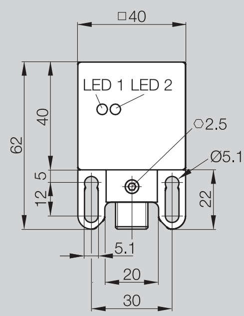
Protective cover
BES Q40-SH-2
Material:
PA 6 as step protection.

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



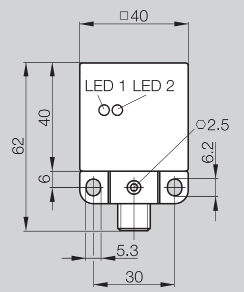
Please order accessories separately!

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



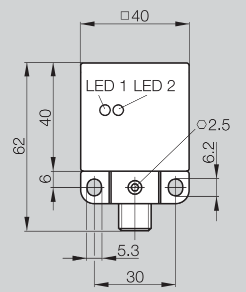
PX2378

Magnetic field immune



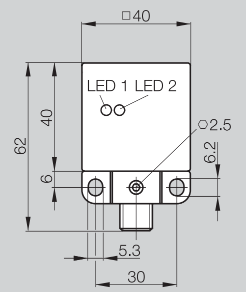
PX1581d

Magnetic field immune



PX1581d

Magnetic field immune

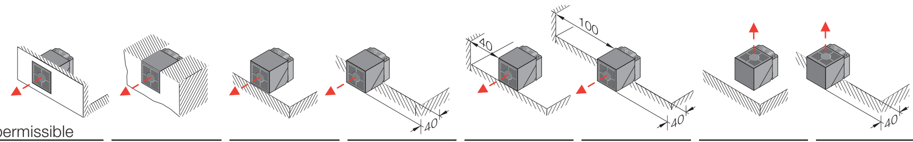


PX1581d

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

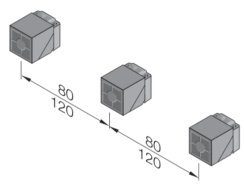
Permissible mounting options



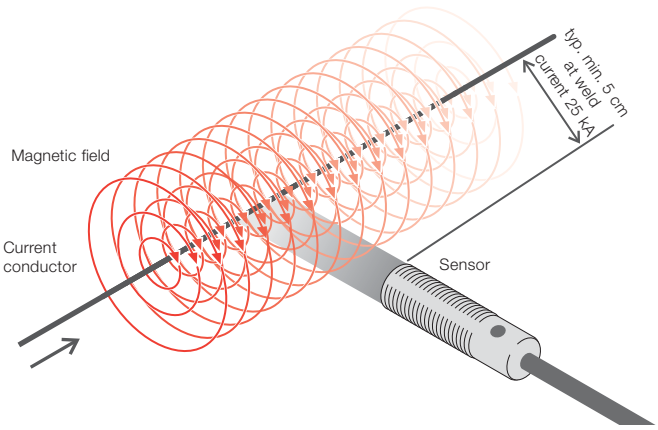
Rated operating distance s_n	Attached using	permissible							
15 mm	original mounting socket (plastic)	yes	yes	yes	yes	yes	yes	yes	yes
	Mounting socket BES Q40-HW-2 (metal)	yes	yes	yes	yes	yes	yes	yes	yes
20 mm	Original mounting socket (plastic)	yes	yes	yes	yes	yes	yes	yes	yes
	Mounting socket BES Q40-HW-2 (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

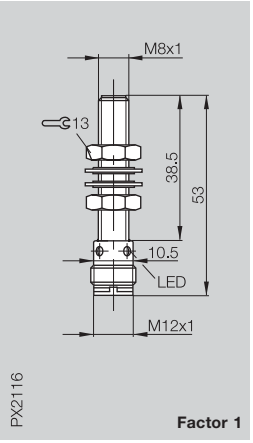
*s_r may be reduced by up to 15 %.
For BES...25Z/35Z...011 see additional mounting options at www.balluff.com

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.

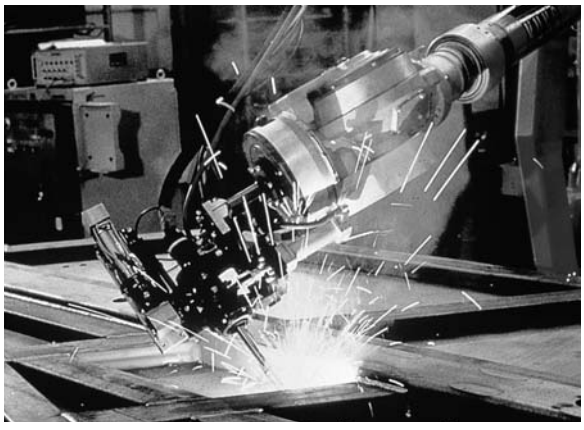
Note about part number

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

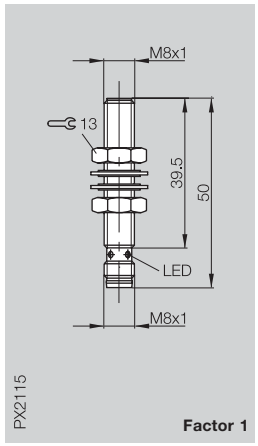
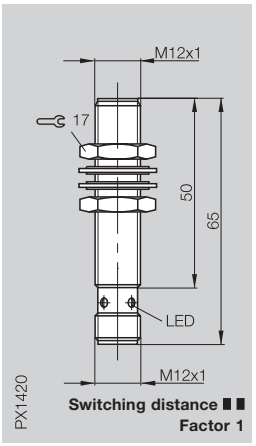
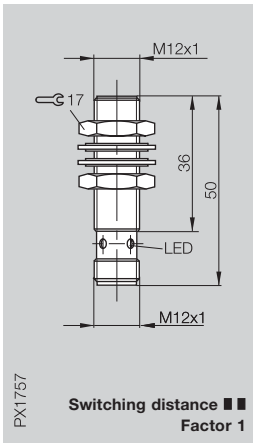
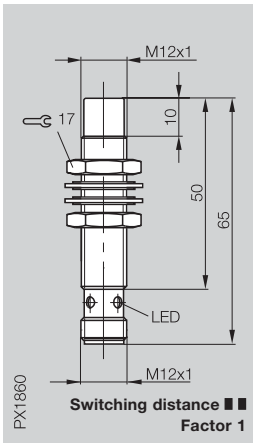
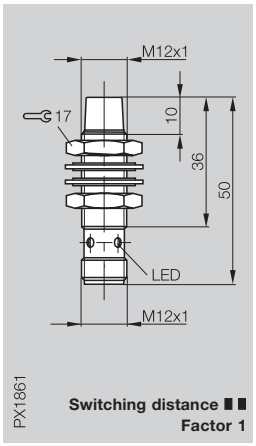
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

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



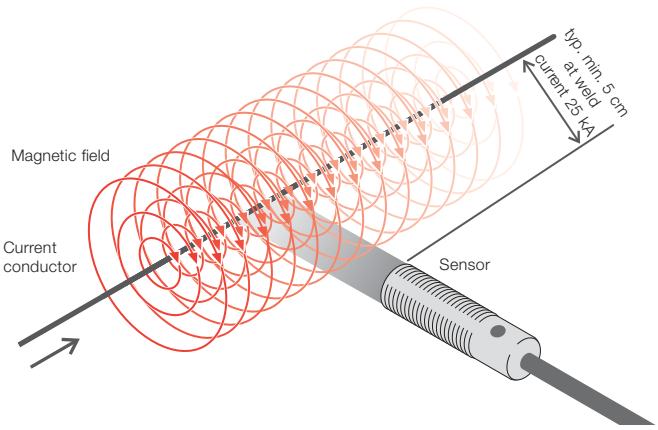
magnetic field ***immune***
+ weld splatter ***resistant***
= weld ***immune***

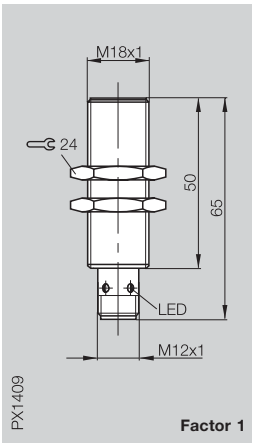
+ **Factor 1**

	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.

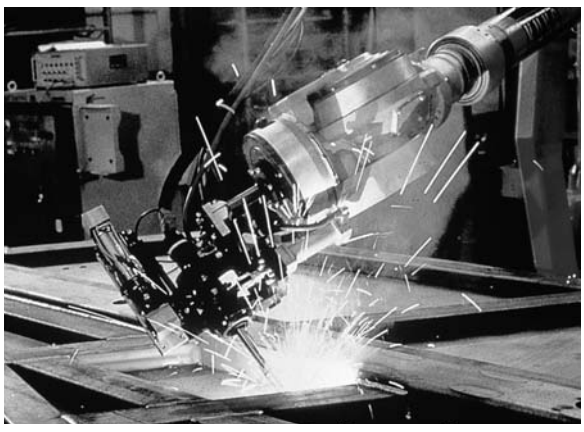
Note about part number

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

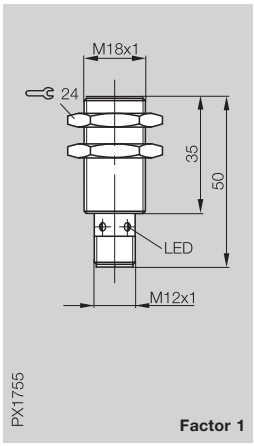
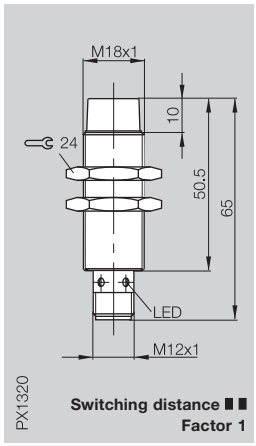
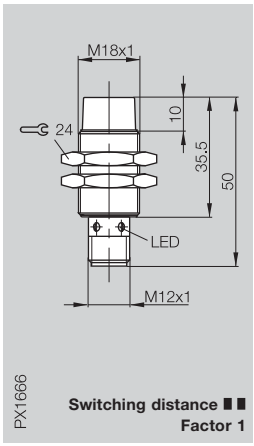
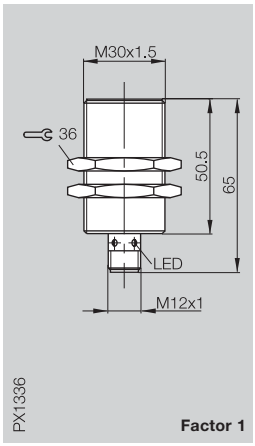
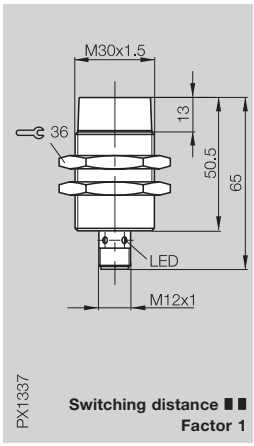
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

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

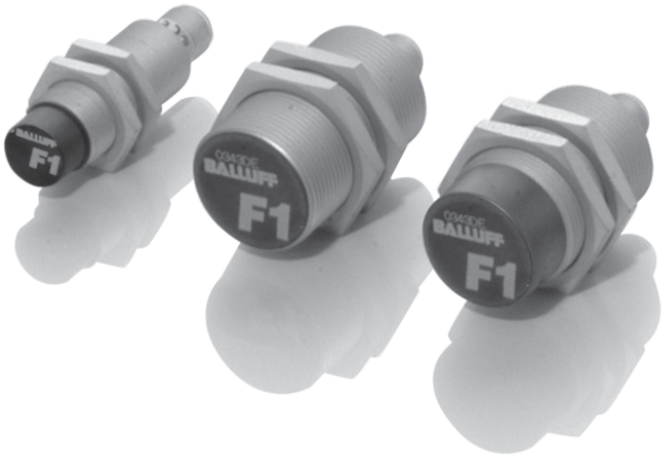


magnetic field ***immune***
+ weld splatter ***resistant***
= weld ***immune***

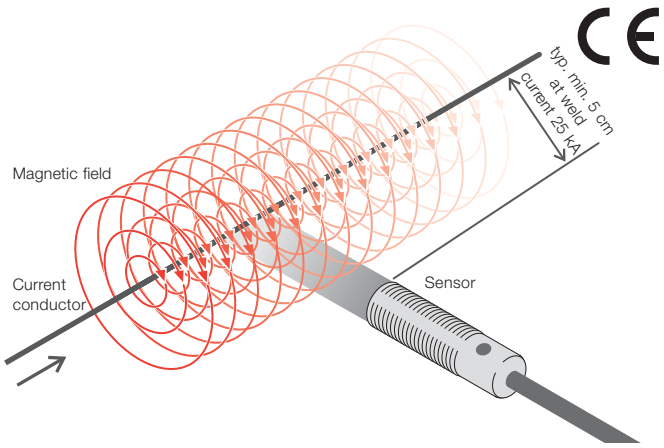
+ **Factor 1**

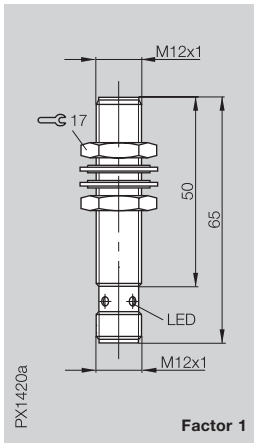
	M18×1	M18×1	M18×1	M30×1.5	M30×1.5
	flush	non-flush	non-flush	flush	non-flush
	5 mm	**12 mm**	**12 mm**	**10 mm**	**20 mm**
	0...4.1 mm	0...9.7 mm	0...9.7 mm	0...8.1 mm	0...16.2 mm
					
	BES M18MF1-PSC50A-S04G-W	BES M18ML-PSC12E-S04G-W	BES M18MD-PSC12E-S04G-W	BES M30ML-PSC10A-S04G-W	BES M30ML-PSC20E-S04G-W
	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

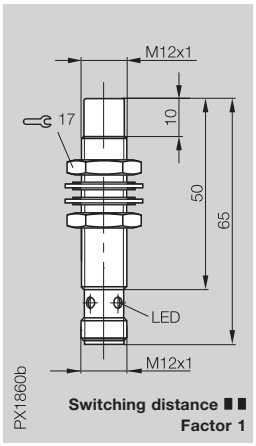


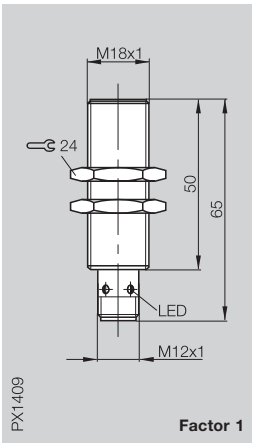


Housing size	**M12×1**	**M12×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)	flush	non-flush	flush
Rated operating distance s_n	**3 mm**	**8 mm**	**5 mm**
Assured operating distance s_a	0...2.2 mm	0...6.3 mm	0...3.9 mm









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 / complementary ③	BES M12ML-PSC30A-S04G-W01	BES M12ML-PSC80E-S04G-W01	BES M18ML-PSC50A-S04G-W01
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.

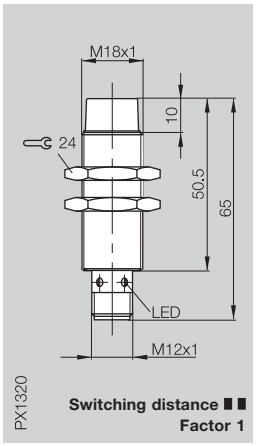


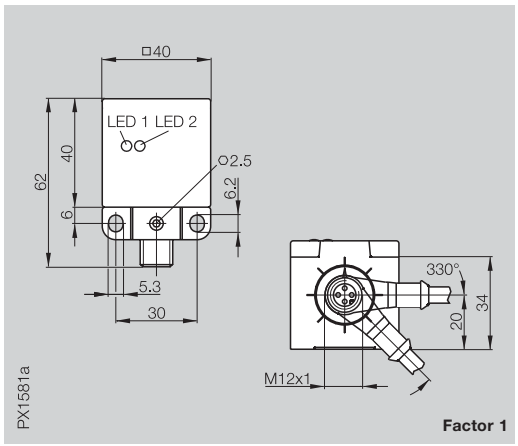
magnetic field ***immune***
+ weld splatter ***resistant***
= weld ***immune***

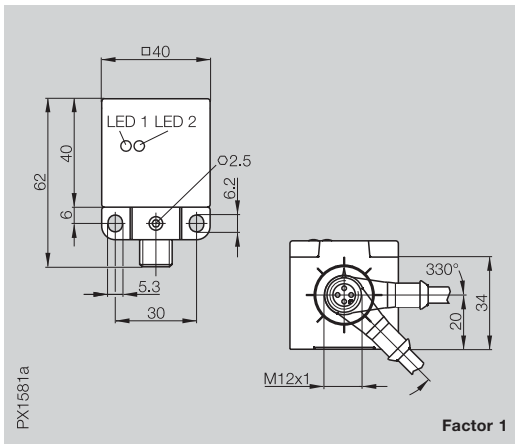
+ **Factor 1**

+ 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

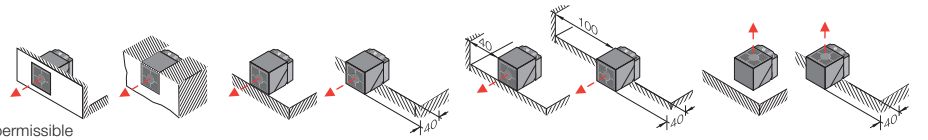






	BES M18ML-PSC12E-S04G-W01	BES Q40KFU-PSC15A-S04G-W01 BES Q40KFU-PAC15A-S04G-W01	BES Q40KFU-PSC35E-S04G-W01 BES Q40KFU-PAC35E-S04G-W01
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	250 V AC	250 V AC	250 V AC
	200 mA	200 mA	200 mA
	≤ 15 mA	≤ 20 mA	≤ 20 mA
	yes	yes	yes
	yes	yes	yes
	≤ 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

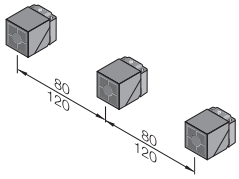
Permissible mounting options Unicompact



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!

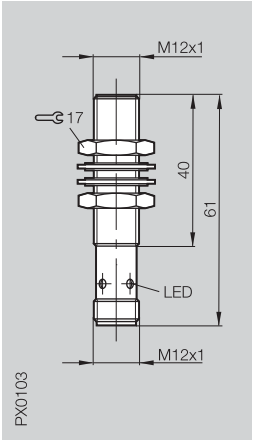
Please order accessories separately!

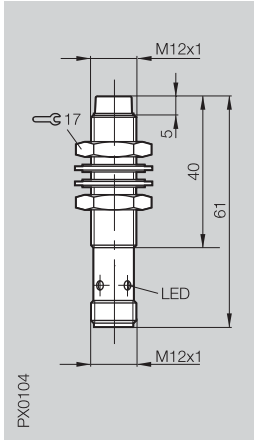
1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

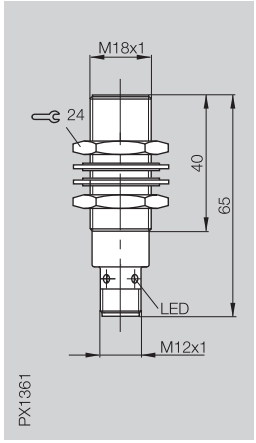
5
Connectors, Holders ...
Page 5.2 ...

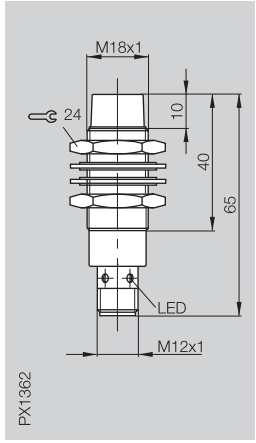
Housing size	**M12×1**	**M12×1**	**M18×1**	**M18×1**
Mounting (see notes starting p. **1.0.**11)	flush	non-flush	flush	non-flush
Rated operating distance s_n	**2 mm**	**4 mm**	**5 mm**	**8 mm**
Assured operating distance s_a	0...1.6 mm	0...3.2 mm	0...4.1 mm	0...6.5 mm











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.

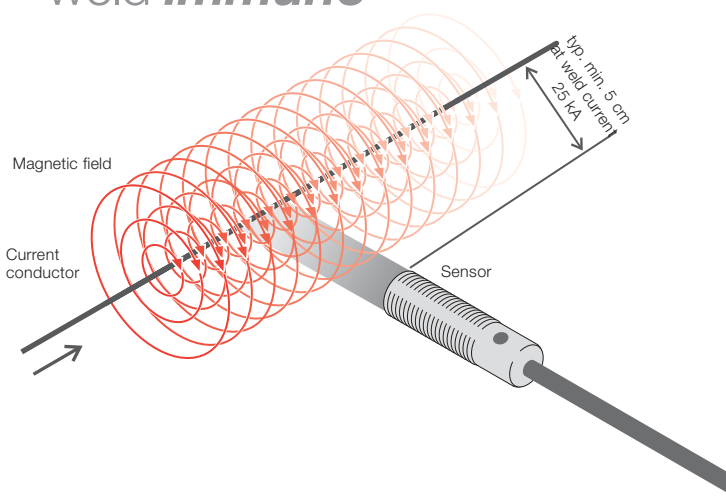
Magnetic field immune

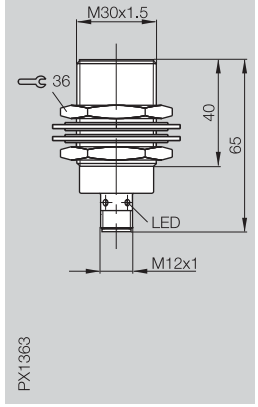
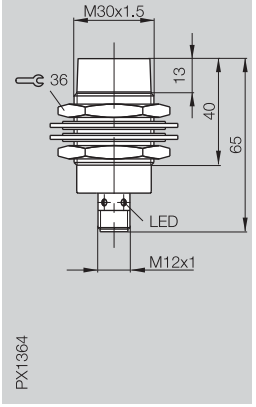
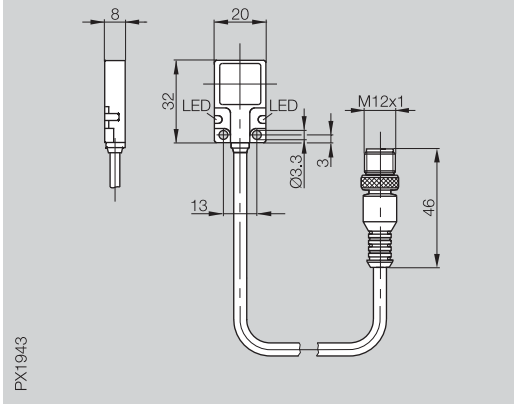
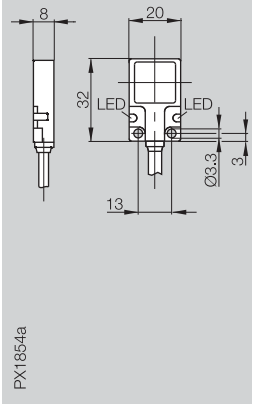
Insensitive to magnetic fields which can be created with electrical currents of up to 25 kA (at a distance from energetic conductors of approx. 5 cm).

Weld splatter resistant

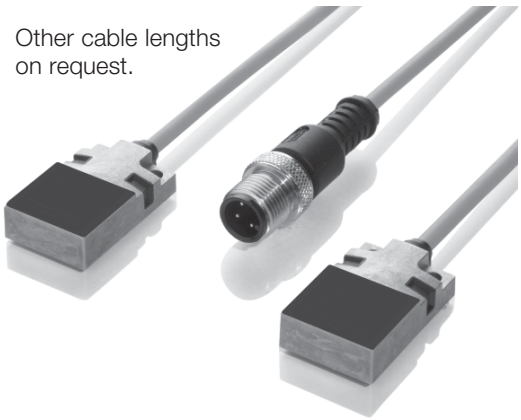
Resistant to metal splatter and combustion remains caused by welding.

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.

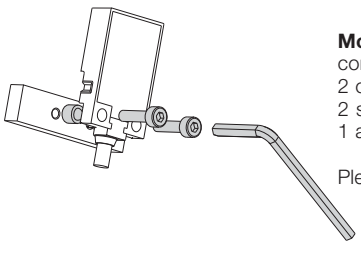
BES ...**-W01**
Ceramic coating.
Rugged ceramic coating, thick for the most extreme welding environments.

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

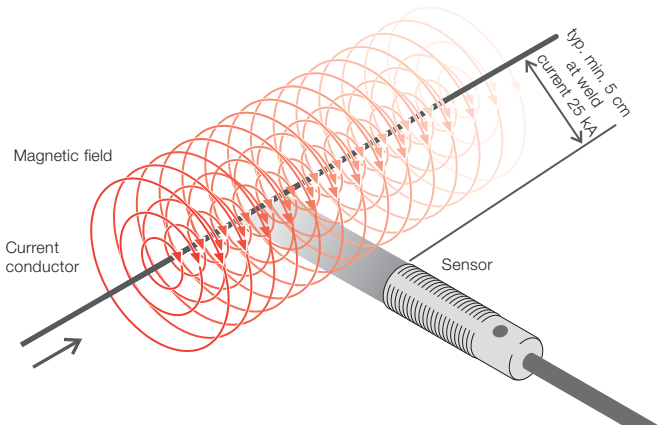


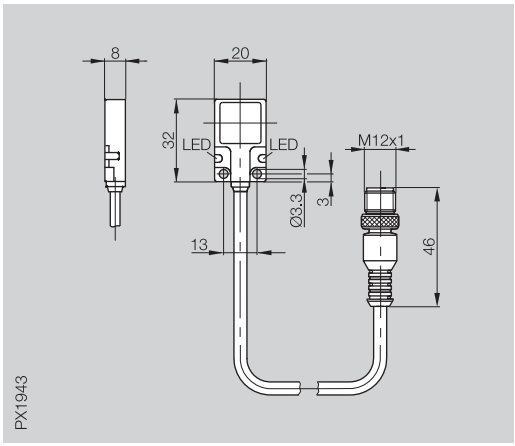
Mounting set BES R01-FK-1
consisting of:
2 cheese-head screws DIN 912 M3×12
2 spacers Ø5×Ø3.3×3.7
1 angled screwdriver DIN 911, 2.5 mm

Please order separately!

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

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





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

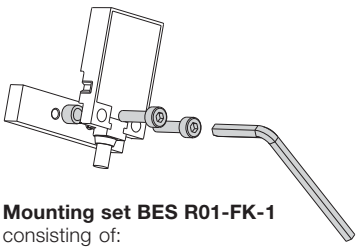
PNP	NO	①	BES R01ZC-PSC50B-BX00.2-GS04-V
Supply voltage U_B			10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V
Rated insulation voltage U_i			75 V DC
Rated operational current I_e			200 mA
No-load supply current I_0 max.			≤ 15 mA
Polarity reversal protected			yes
Short circuit protected			yes
Repeat accuracy 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.

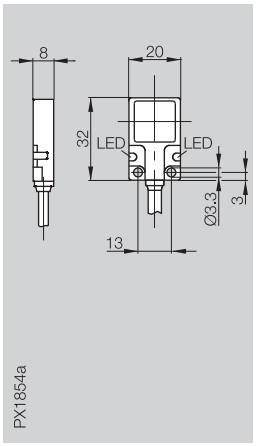
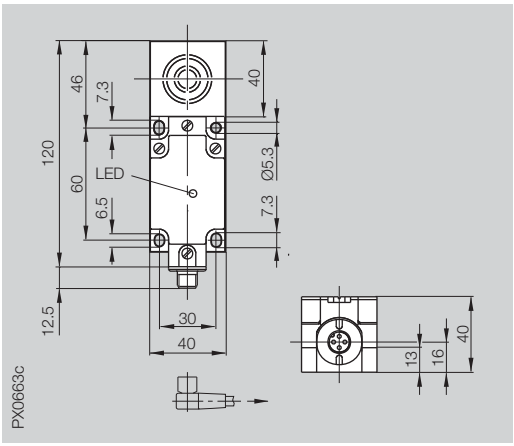
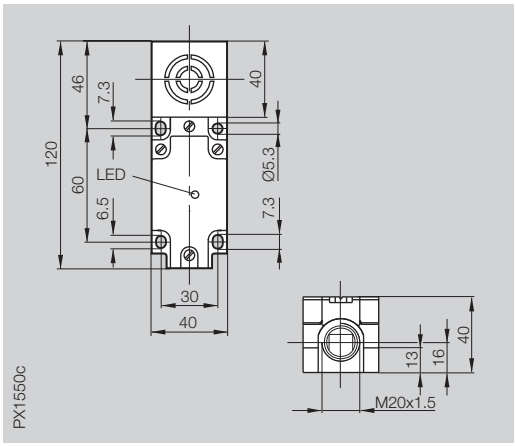
Connector orientation





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

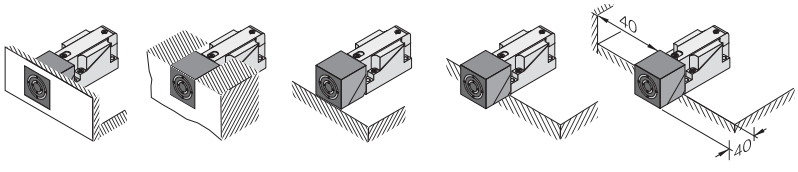
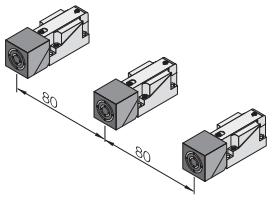
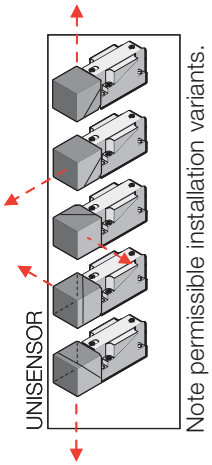


Fig. 1 Fig. 2 Fig. 3 Fig. 4 Fig. 5

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)

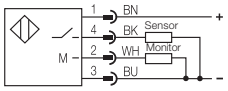
DESINA

www.desina.de

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

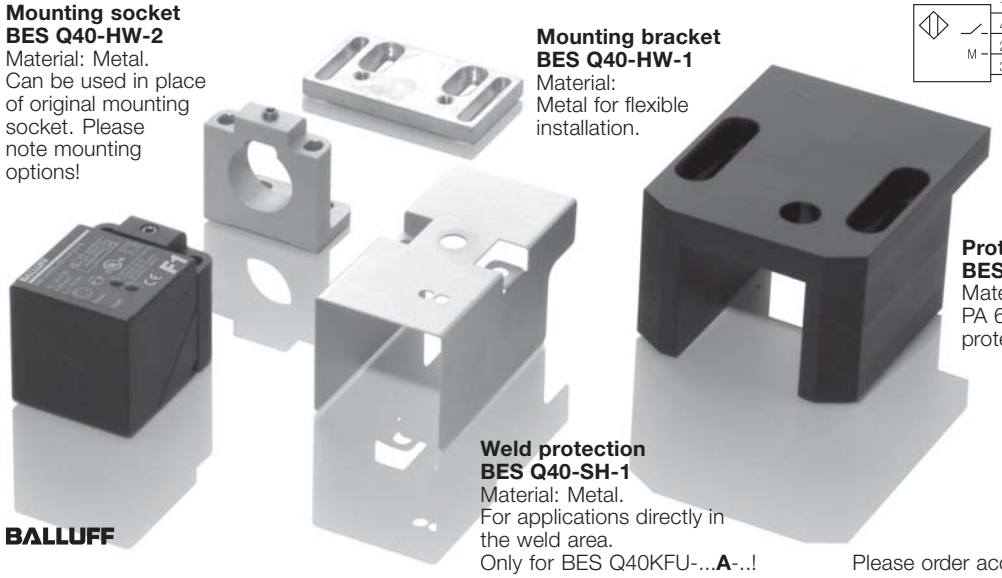
Switching distance ■■ see page **1.0.**10

Wiring diagram



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

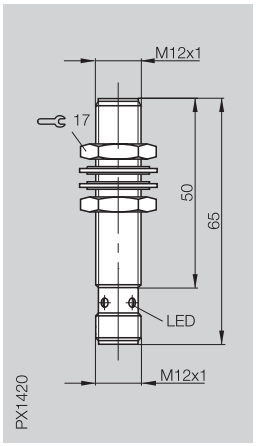
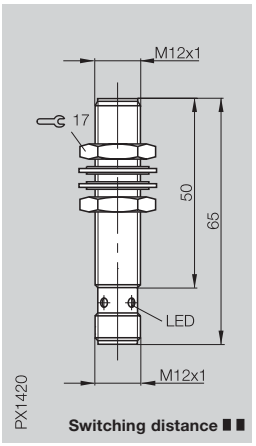
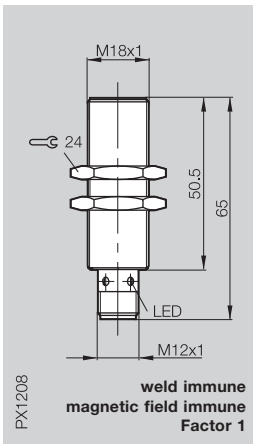
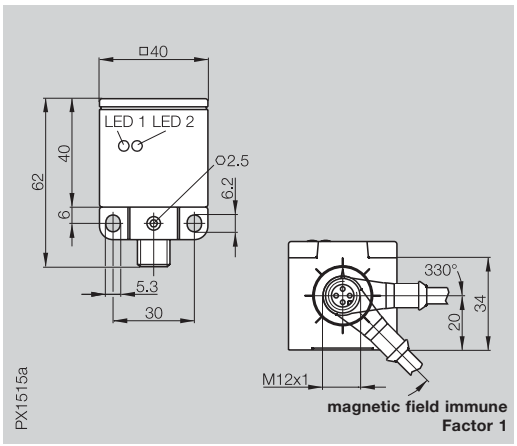
Mounting bracket
BES Q40-HW-1
Material:
Metal for flexible installation.



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

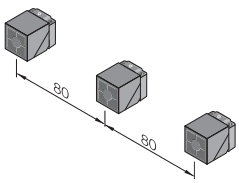
Weld protection
BES Q40-SH-1
Material: Metal.
For applications directly in the weld area.
Only for BES Q40KFU-...**A**-..!

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

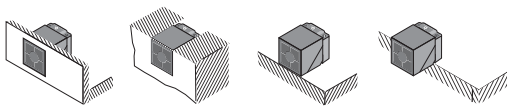
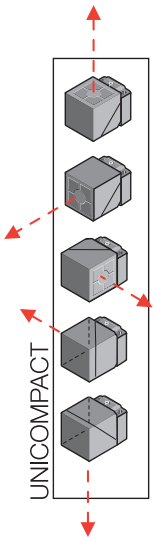


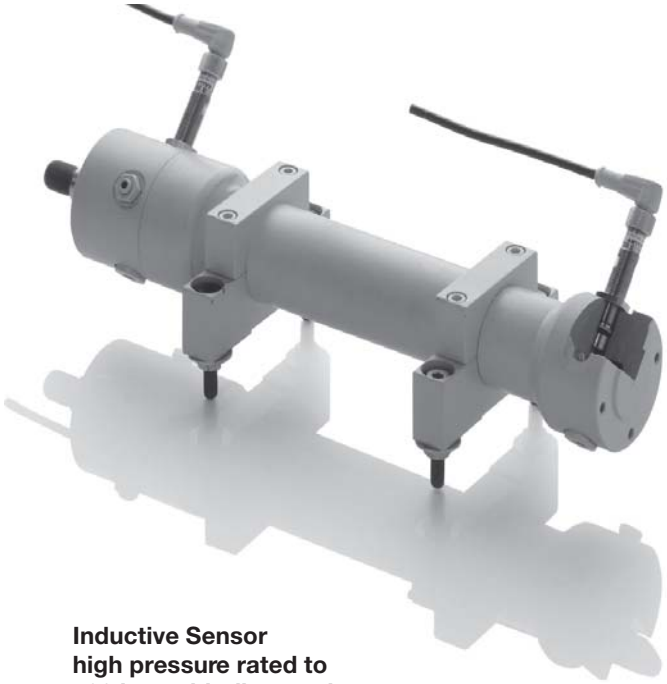
Fig. 1 Fig. 2 Fig. 3 Fig. 4



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.

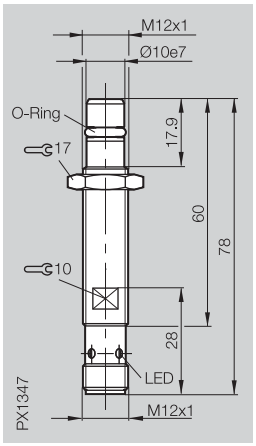
Note!

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

Part numbering

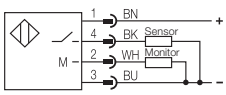
BES ...**-HM01**
Diagnostic function and high pressure rated active surface.

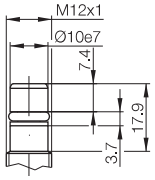
Housing size	**M12×1**
Mounting (see notes starting p. **1.0.**11)	flush
Rated operating distance s_n	**1.5 mm**
Assured operating distance s_a	0...1.2 mm



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

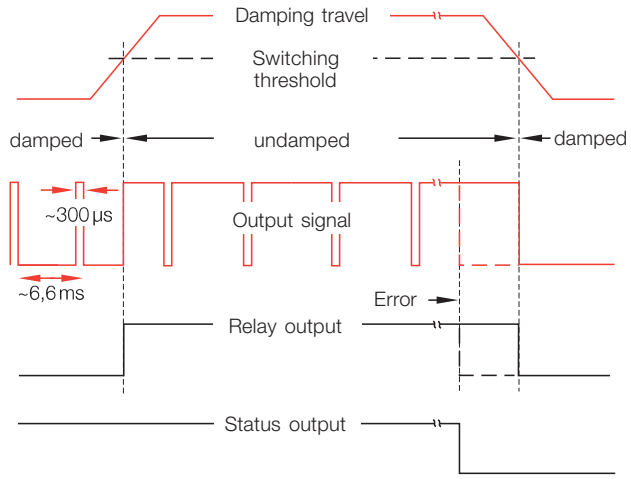
Proximity switches with dynamic diagnostics allow monitoring of the sensor functions including the cable.

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:

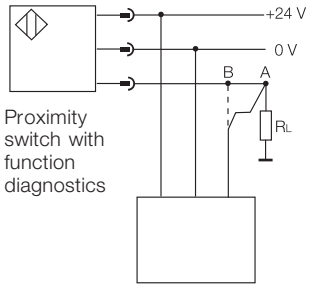
Inductive Sensors
see page **1.5.**18
– BES 113-356-SA6-S4
Normally open
– BES 113-356-SA31-S4
Normally open
– BES 113-3019-SA1-S4
Normally closed

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

Single faults are detected when monitoring for the entire system.

Installation notes

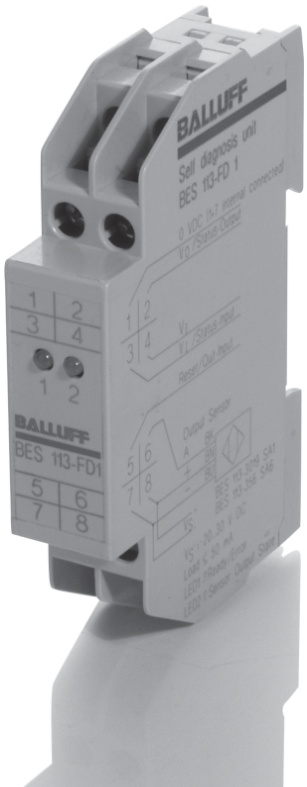
The signal line for the function diagnostics unit should be connected as closely as possible to the load R_L (Point A). When Point B is connected the cable segment between B and load R_L is not monitored.



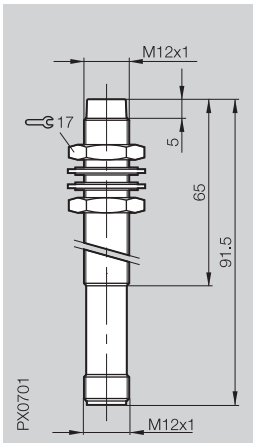
Note!

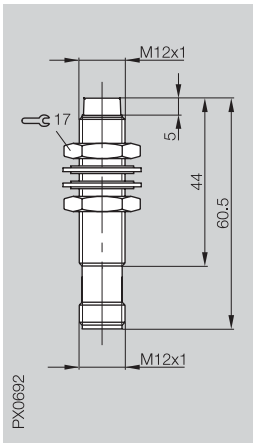
The system described here is not suitable for systems with personal protection.

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

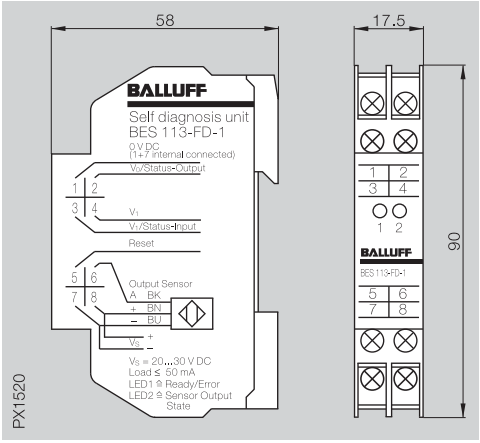


Description	**Function diagnostics unit** with electronic output
Use	For function diagnostic sensors BES 113-... (see page **1.5.**18) or BCS 20... page **4.**15

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.



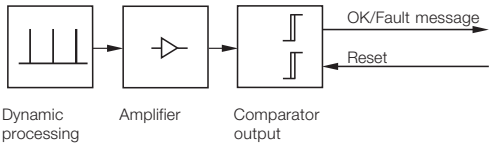
Ordering code		BES 113-FD-1
Supply voltage U_B		20...30 V DC
Ripple		≤ 15 %
No-load current		approx. 20 mA
Output voltage U_0 (referenced to 0 V)	low	0...(0.1×U_B) for defects in sensor or processor (fault)
	high	(0.5×U_B)...U_B for error-free function
Output current max.		50 mA
Ambient temperature range		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

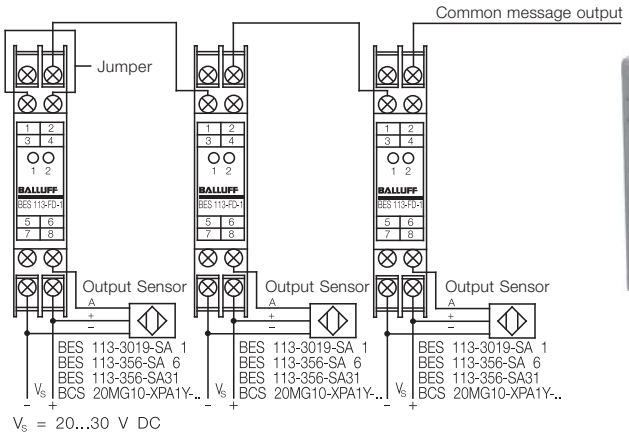
When cascading several BES 113-FD-1 the output (2) must be connected to the input (3) of the following device. The jumper between V_I is not needed except for the first device.

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.

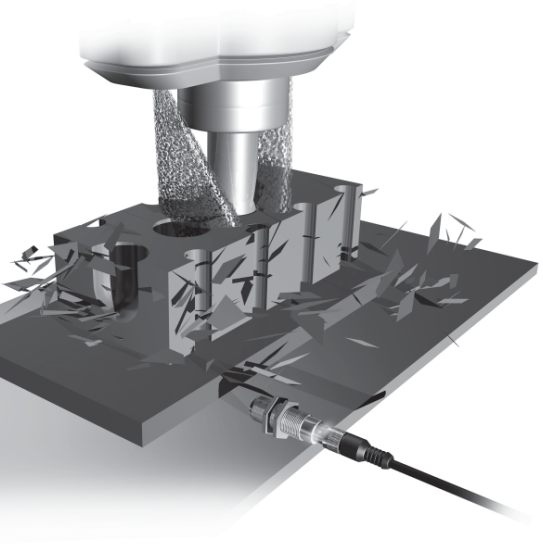
Small and space-saving, the BES 113-FD-1 can be attached to a DIN rail per DIN EN 50022-35.



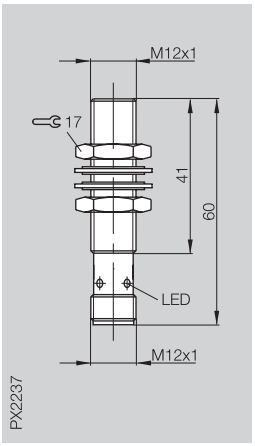
Cascading







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

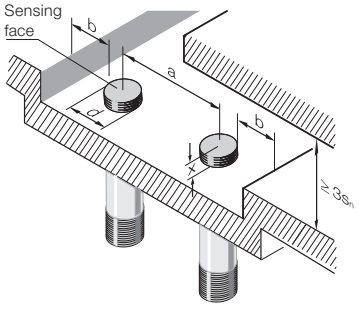
Installation dimensions for quasi flush sensors (please note)

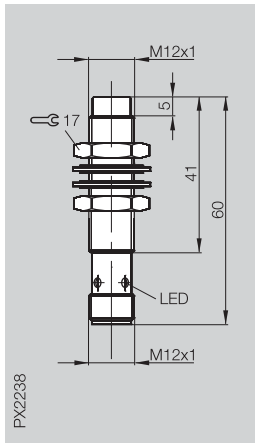
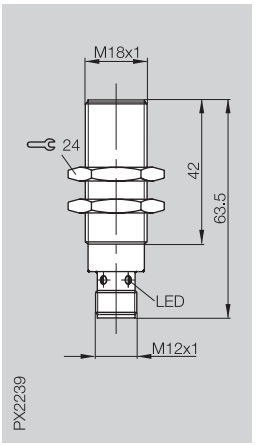
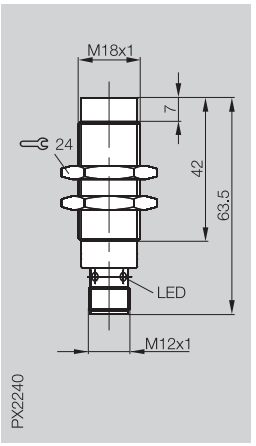
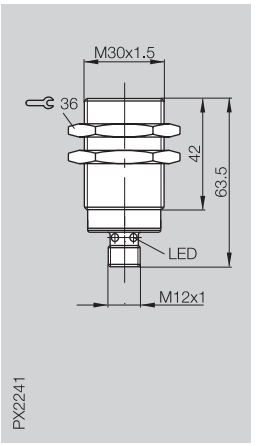
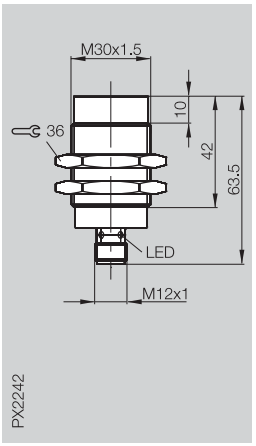
Housing size	Dimension a	Dimension b	Dimension x	For installation in
M12	≥ 50 mm	≥ 6 mm	≥ 7 mm	Steel Fe 360
			≥ 12 mm	Aluminum
			≥ 12 mm	Brass
			≥ 10 mm	Stainless steel
M18	≥ 60 mm	≥ 16 mm	≥ 14 mm	Steel Fe 360
			≥ 12 mm	Aluminum
			≥ 14 mm	Brass
			≥ 16 mm	Stainless steel
M30	≥ 90 mm	≥ 30 mm	≥ 28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

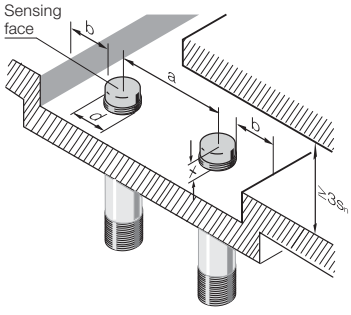
Installation dimensions for non-flush sensors (please note)

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



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

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.

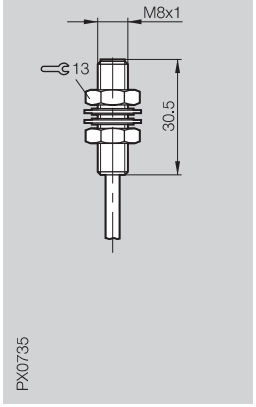
Numerous applications in hydraulic cylinders and valves have resulted in this model-rich sensor line. What are your requirements?

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



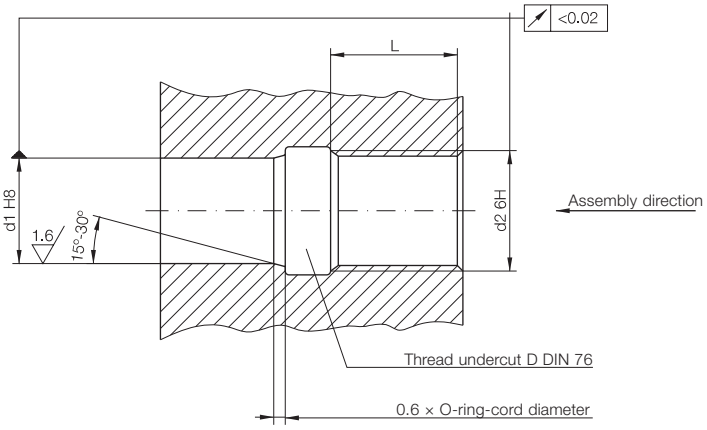
PNP	NO	①	BES 516-324-SA17-05
	NC	②	

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

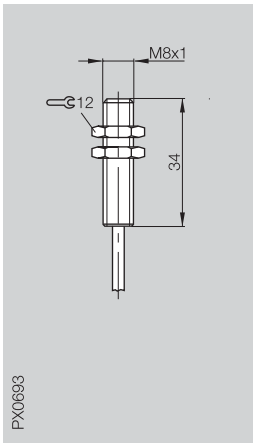
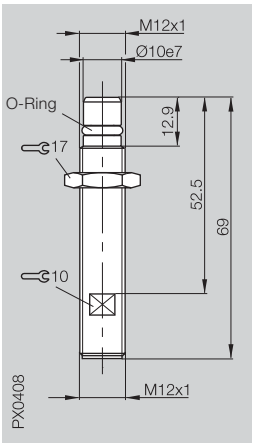
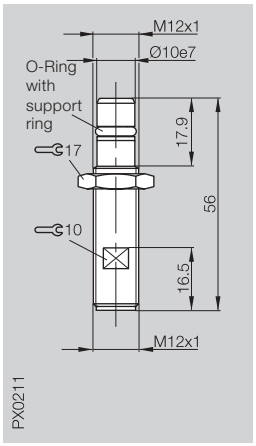
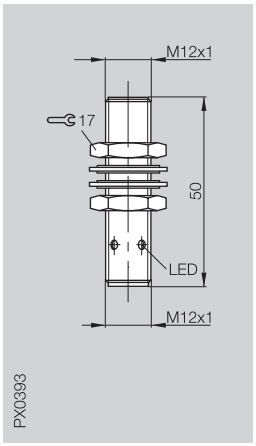
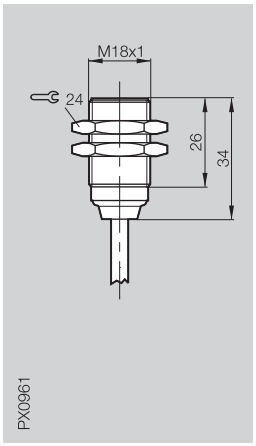
Other cable lengths on request.

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

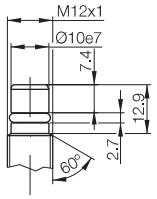


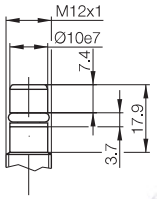
Example using BES 516-300-S270-S4-D:

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	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	
		5.3×2.4/631753	5.3×2.4/631753		
			10×5.9×1/705918		
	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











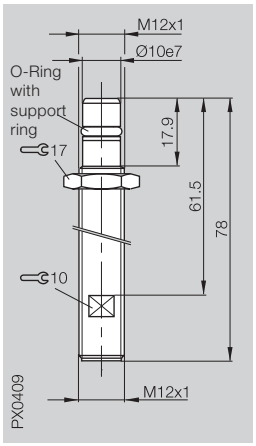
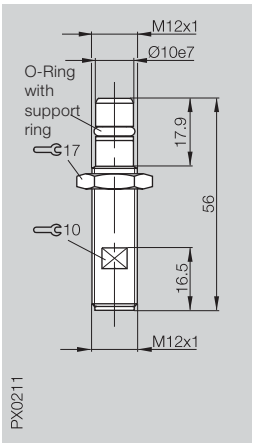
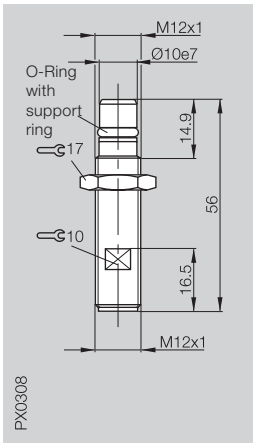
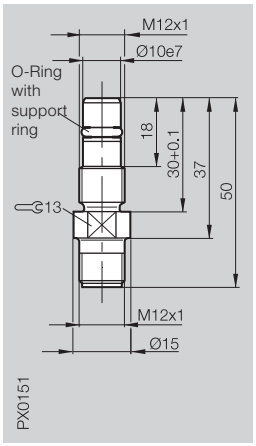
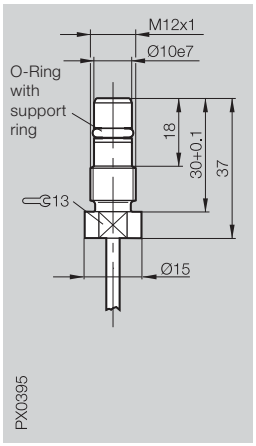
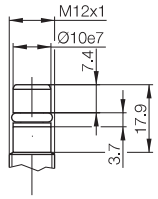
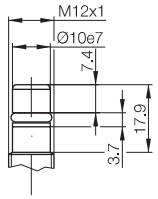
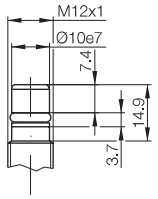
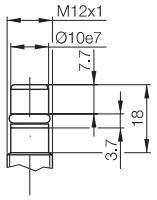
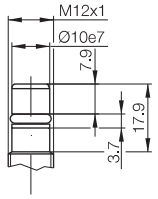
Housing size	
Mounting (see notes starting p. **1.0.**11)	
Rated operating distance s_n	
Assured operating distance s_a	

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		

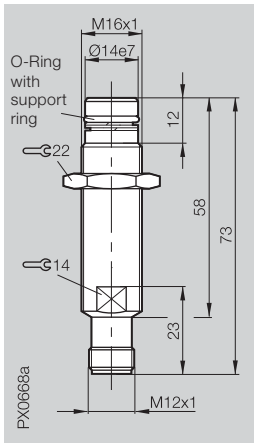
① Wiring diagrams see page **1.0.**6

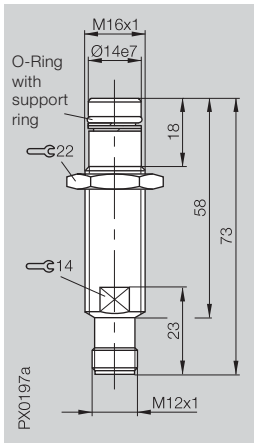
Other cable lengths on request.

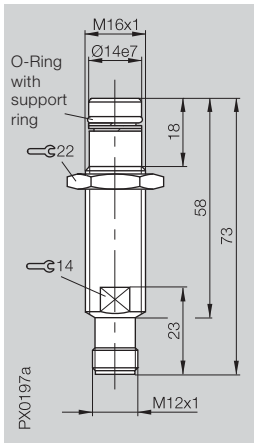
	M12×1	**M12×1**	**M12×1**	**M12×1**	**M12×1**
	flush	flush	flush	flush	flush
	1.5 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
	BES 516-300-S321-S4-D	BES 516-300-S322-S4-D	BES 516-300-S323-S4-D	BES 516-300-S324-S4-D	BES 516-300-S205-D-PU-03
	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**
					

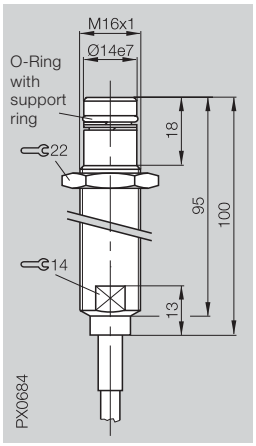
5
Connectors, Holders ...
Page 5.2 ...

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





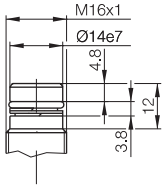


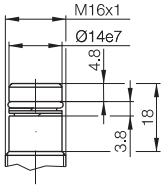


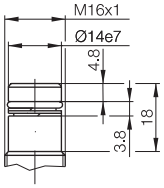
PNP						
	NO	①	BES 516-300-S152-S4-D	BES 516-300-S149-S4-D		
	NC	②			BES 516-300-S156-S4-D	BES 516-300-S237-D-PU-05
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e			≤ 1.5 V	≤ 1.5 V	≤ 1.5 V	≤ 1.5 V
Rated insulation voltage U_i			75 V DC	75 V DC	75 V DC	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**

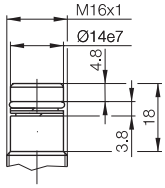
① Wiring diagrams see page **1.0.**6

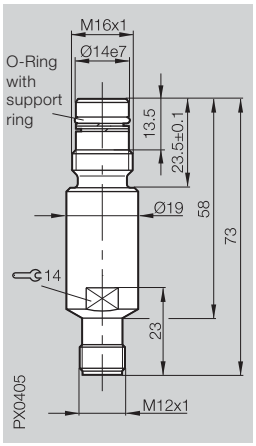
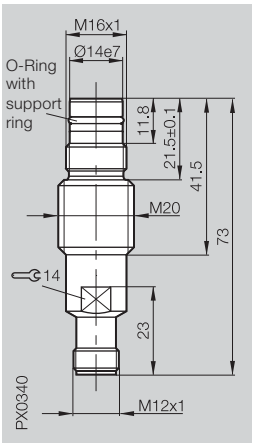
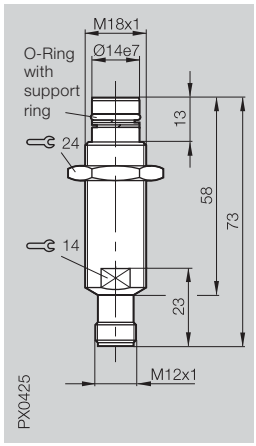
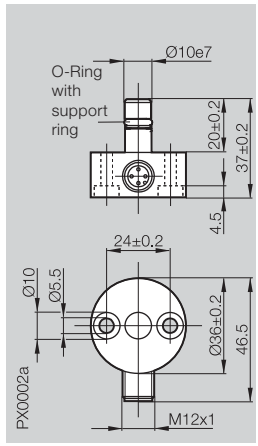
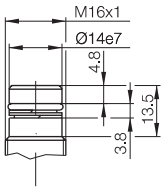
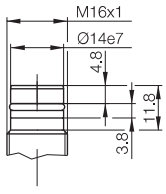
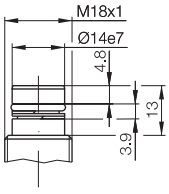
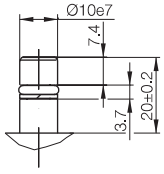
Other cable lengths on request.



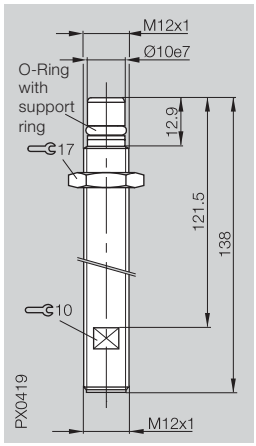
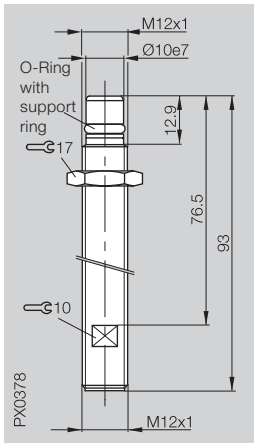
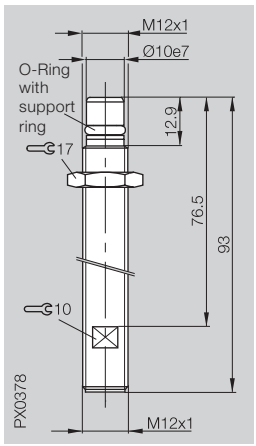
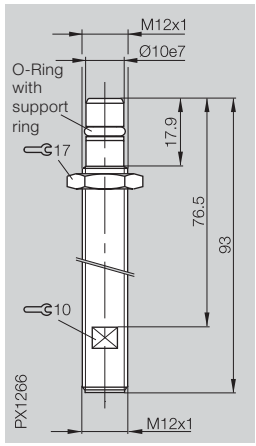
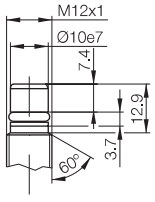
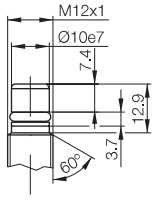
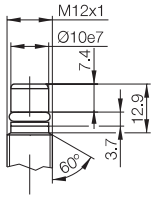
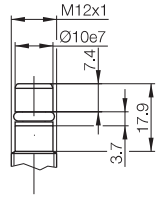




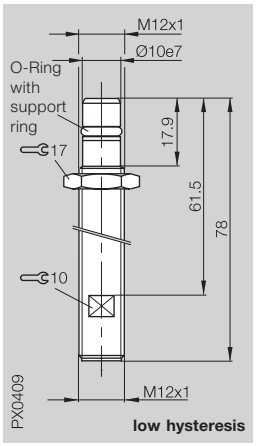
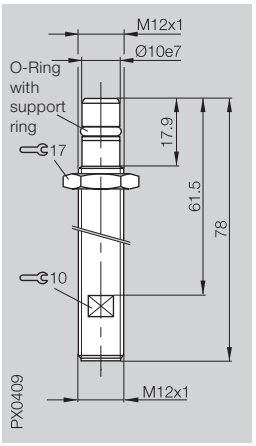
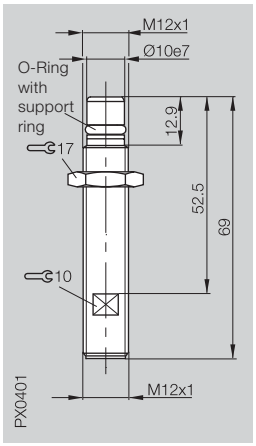
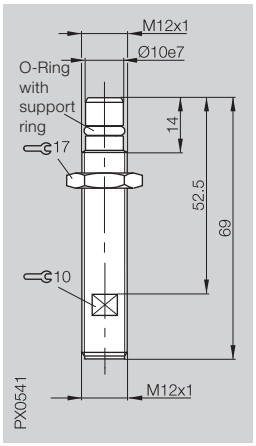
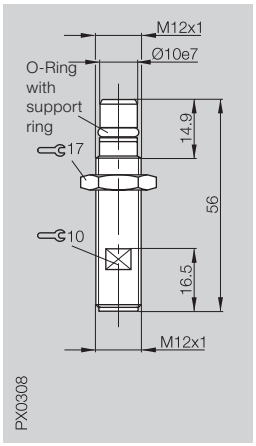
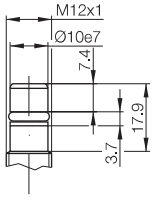
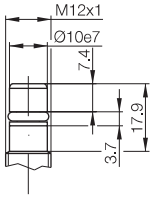
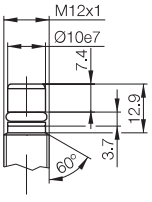
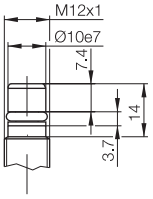
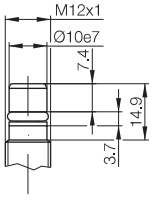


	M16×1/Ø 19 mm	M16×1/M20	M18×1	Ø 10 mm/Ø 36 mm
	flush	flush	flush	flush
	1.5 mm	**1.5 mm**	**1.5 mm**	**1.5 mm**
	0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
				
	BES 516-300-S129-S4-D	BES 516-300-S128-S4-D	BES 516-300-S144-S4-D	BES 516-300-S260-S4-D
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V 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 ...

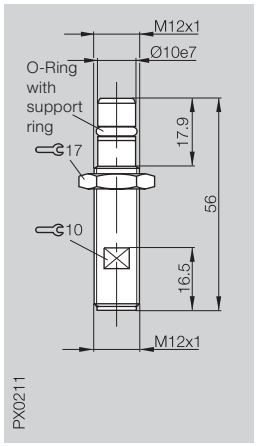
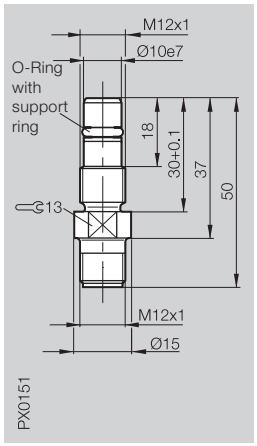
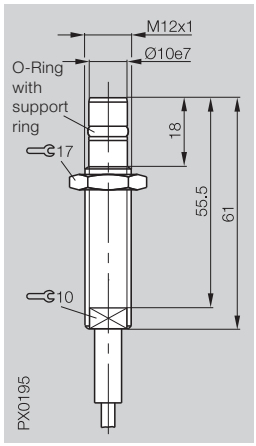
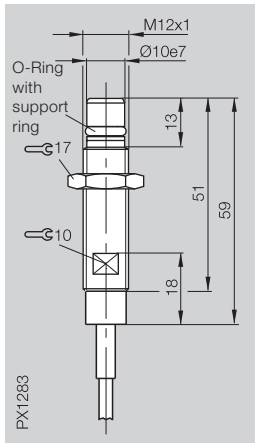
Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush
Rated operating distance s_n		**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a		0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
PNP	NO ①	BES 516-300-S164-S4-D	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-S265-S4-D
				BES 516-300-S281-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**
					

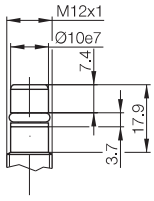
Also available as inductive **diagnostics capable sensor,** see page **1.5**.16

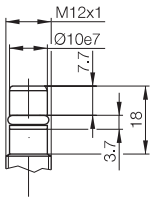


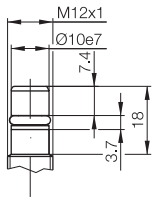
Housing size		**M12×1**	**M12×1**	**M12×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush
Rated operating distance s_n		**1.5 mm**	**1.5 mm**	**1.5 mm**	**1.5 mm**
Assured operating distance s_a		0...1.2 mm	0...1.2 mm	0...1.2 mm	0...1.2 mm
					
PNP	NO ①	BES 516-300-S249-S4-D	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**

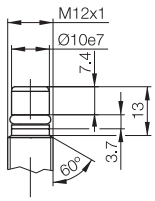
① Wiring diagrams see page **1.0.**6

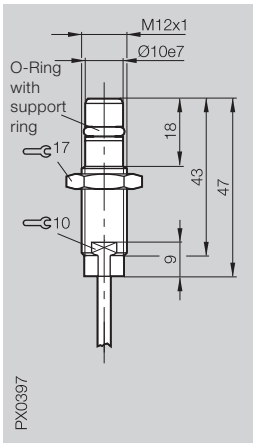
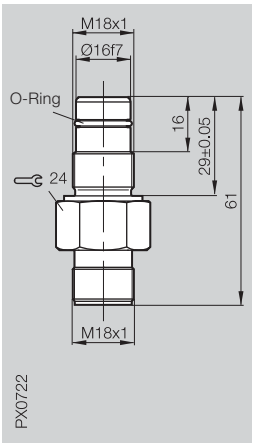
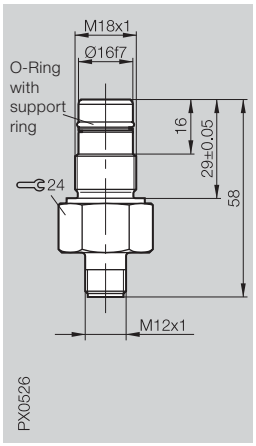
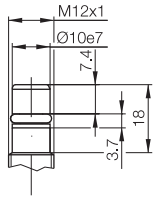
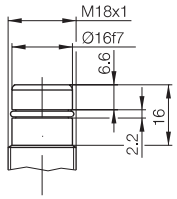
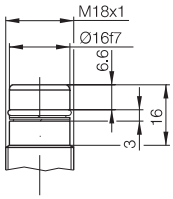
Other cable lengths on request.





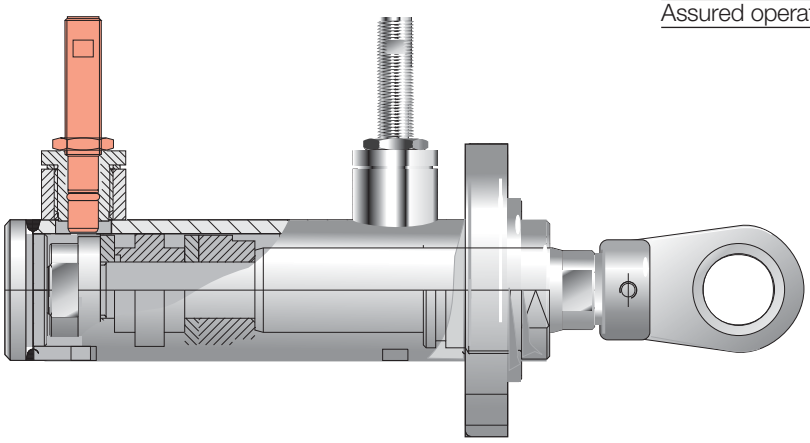




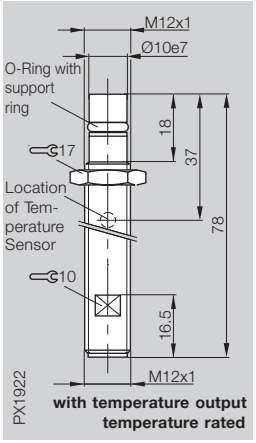
	M12×1	**M18×1**	**M18×1**
	flush	flush	flush
	1.5 mm	**3 mm**	**3 mm**
	0...1.2 mm	0...2.1 mm	0...2.1 mm
			
	BES 516-300-S240-D-PU-03	BES 516-300-S203	BES 516-300-S190-S4
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 3.5 V	≤ 3.5 V
	75 V DC	75 V DC	75 V DC
	200 mA	130 mA	130 mA
	≤ 8 mA	≤ 20 mA	≤ 25 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**
			

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

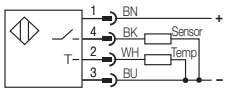
5
Connectors, Holders ...
Page 5.2 ...



Housing size	**M12×1**
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.

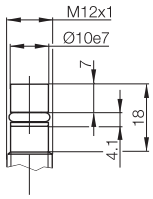
Part numbering

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

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

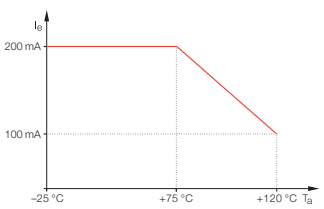
PNP	NO	①	BHS B135V-PSD15-S04-T01
Supply voltage U_B			10...30 V DC
Voltage drop U_d at I_e			≤ 2.5 V
Rated insulation voltage U_i			75 V DC
Rated operational current I_e			200 mA
No-load supply current I_0 max.			≤ 8 mA
Polarity reversal protected			yes
Short circuit protected			yes
Repeat accuracy R			≤ 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



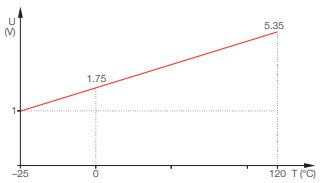


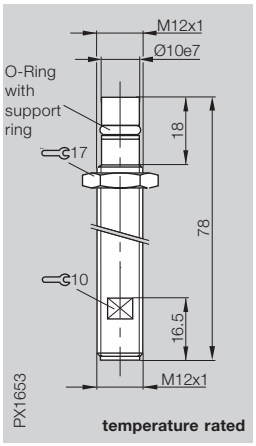
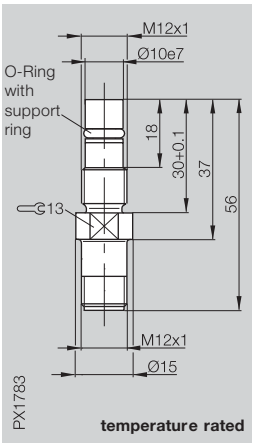
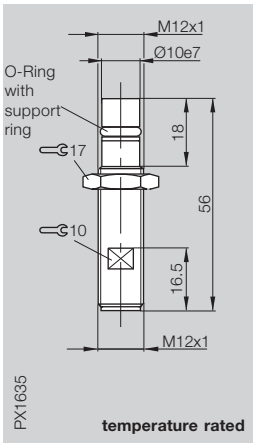
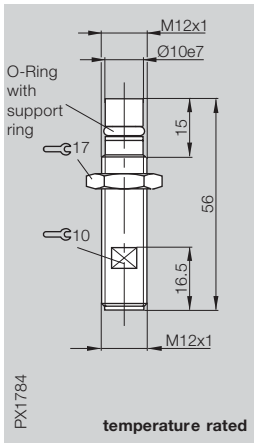
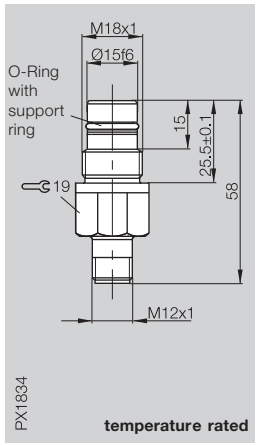
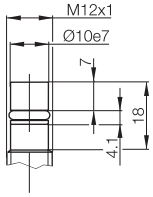
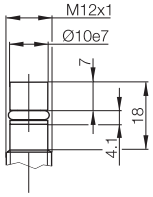
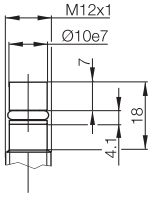
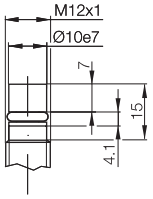
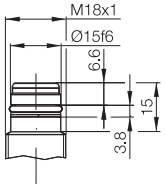
Current reduction as a function of ambient temperature range

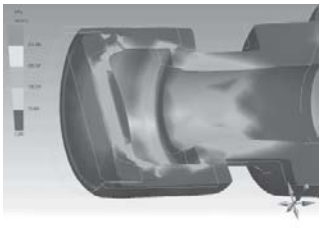


Temperature output

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**	
					



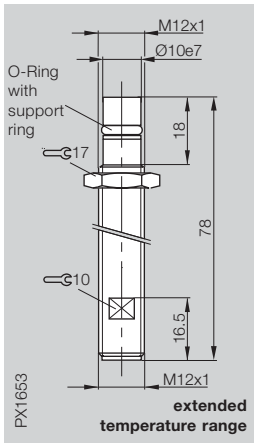
Simulation (FEM method) of the stress distribution under high pressure on housing and ceramic cap

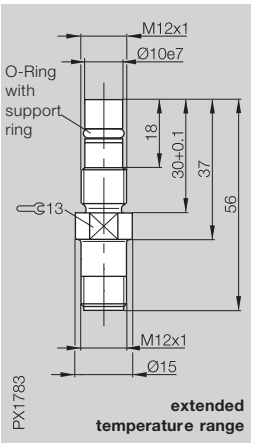


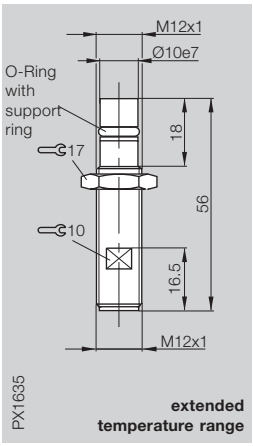
1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

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



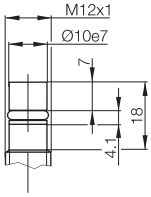


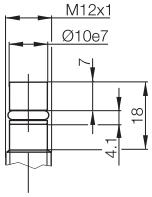


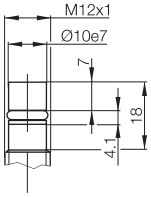
PNP NO ①	BHS B135V-PSD25-S04-003	BHS B400V-PSD25-S04-003	BHS B249V-PSD25-S04-003
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i	75 V DC	75 V DC	75 V DC
Rated operational current I_e	200 mA	200 mA	200 mA
No-load supply 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

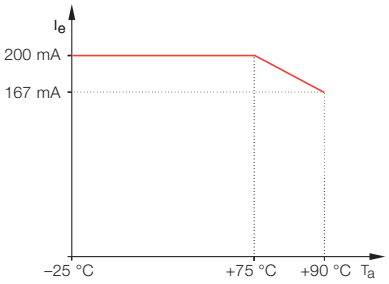
Other cable lengths on request.



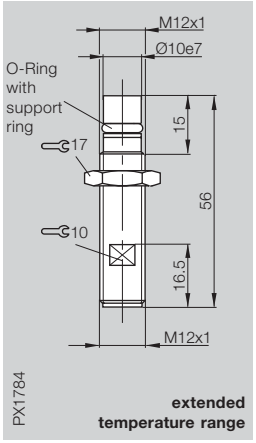
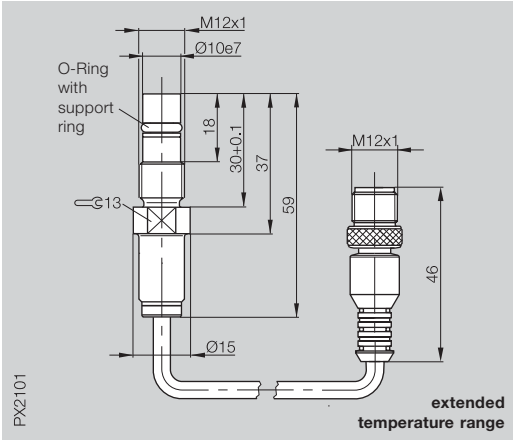
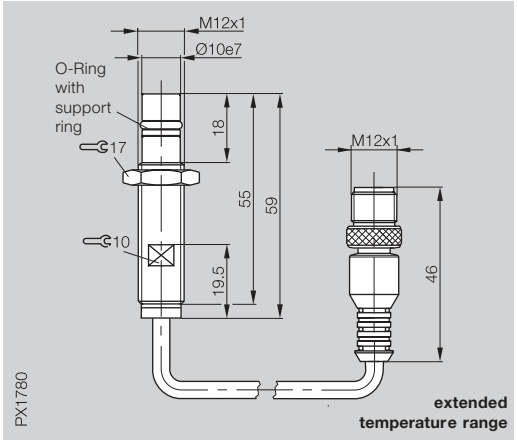
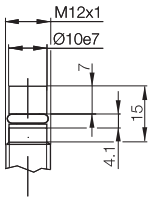
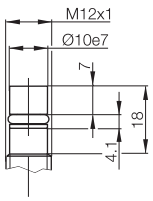
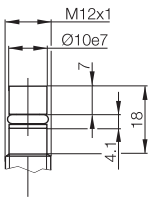


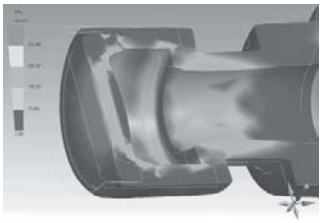


Current reduction as a function of ambient temperature range





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



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.



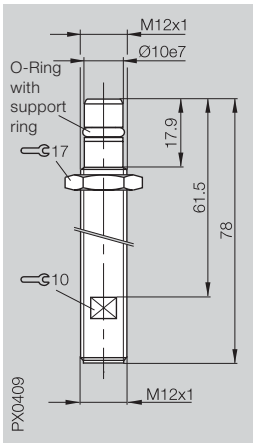
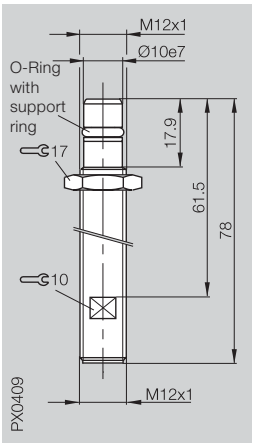
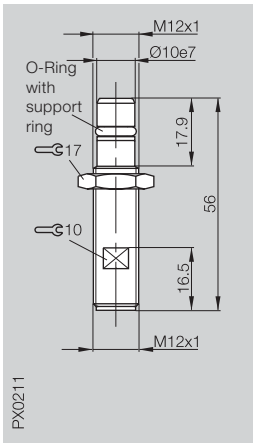
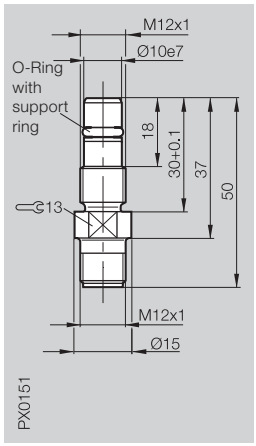
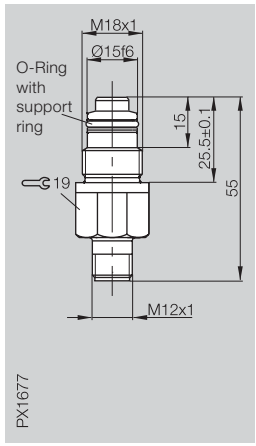
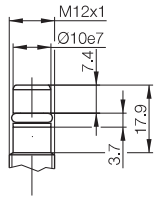
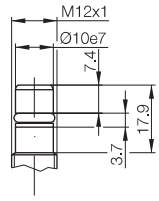
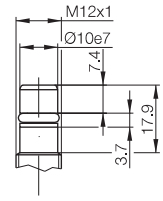
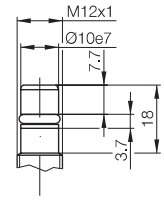
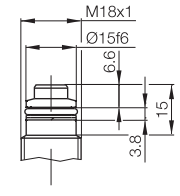
Housing size	
Mounting (see notes starting p. **1.0.**11)	
Rated operating distance s_n	
Assured operating distance s_a	

CE

Ex

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	
					

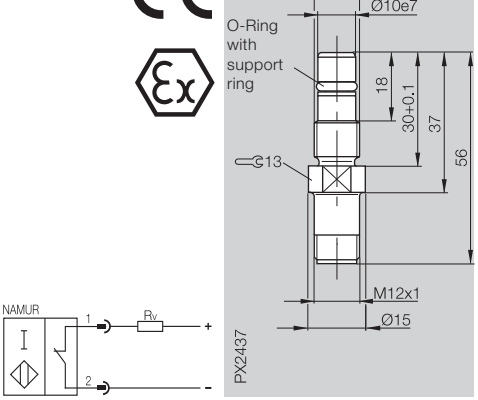
5
Connectors, Holders ...
Page 5.2 ...

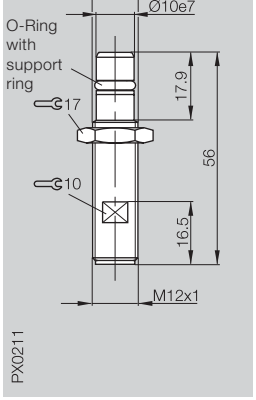
high pressure rated NAMUR

Ignition protection type "Intrinsically Safe"



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





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

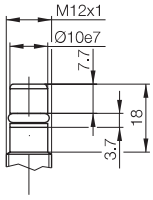
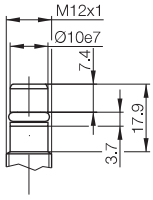
Inductive sensors to NAMUR specification consist essentially of an oscillator with a dampable oscillator coil and a demodulator.

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

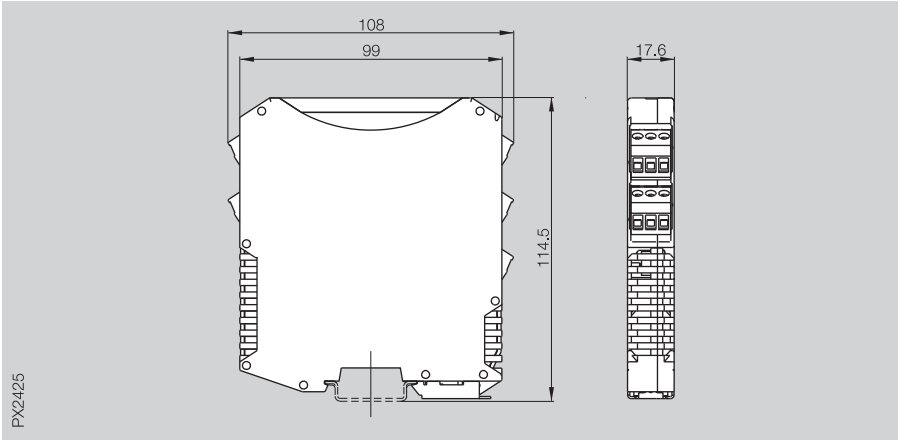
They can be used in conjunction with suitable switching amplifiers such as from Steel (see next page) in explosive systems or Zone 1 and Zone 2 areas. The switch amplifier must be installed outside the explosive area.

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.

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
$s_r = \infty$	≥ 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.

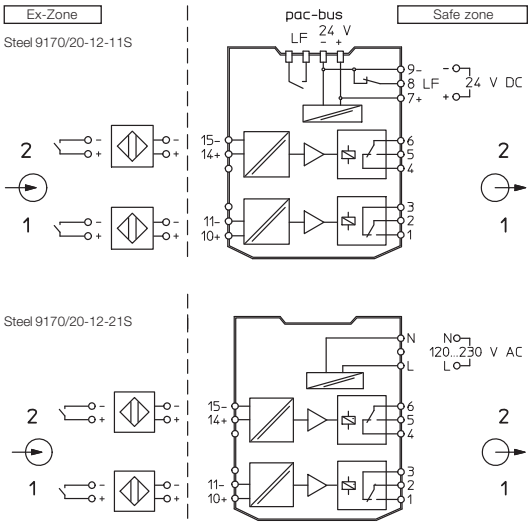
Note!

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

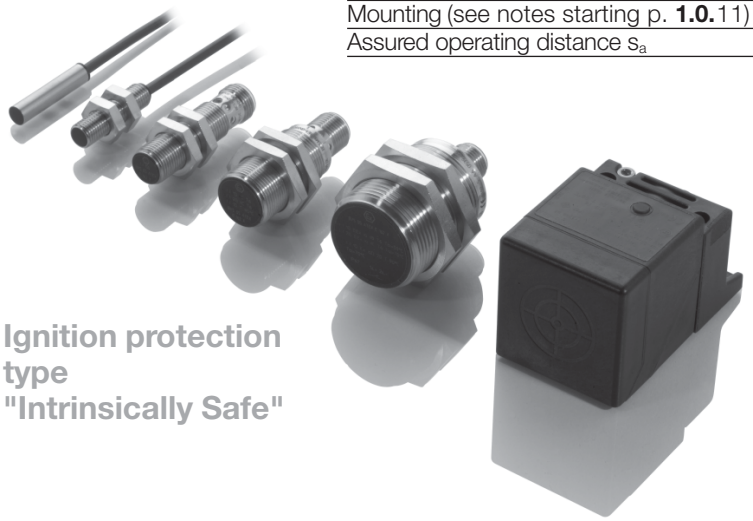
You must also observe the requirements for the EC Type Examination Certificate.



Wiring diagrams

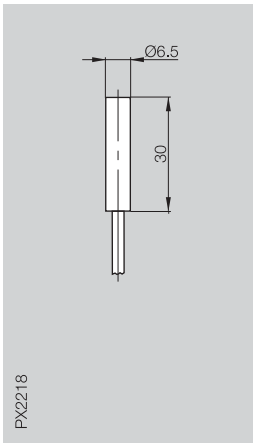


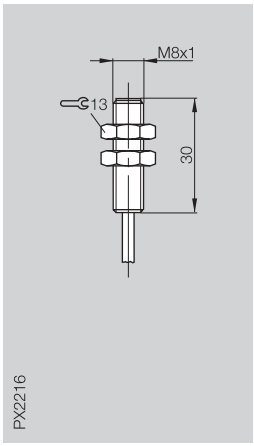
DC 2-wire
∅ 6.5 mm, M8
s_n 1 mm



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.

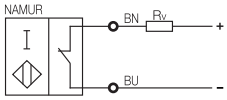
NAMUR	BES G06MD-GNX10B-EV02-EEX	BES M08MD-GNX10B-EV02-EEX
Rated operational voltage U_e	8.2 V DC	8.2 V DC
Supply voltage U_B	7.7...9 V DC	7.7...9 V DC
Rated insulation voltage U_i	75 V DC	75 V DC
Current draw:	Current change (no trigger response)	Current change (no trigger response)
Open (undamped)	≤ 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

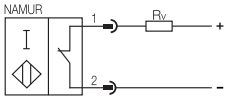
Switching distance ■■ see page **1.0.**10

Wiring diagrams

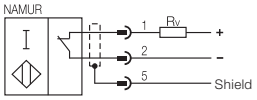
BES G06.../M08...



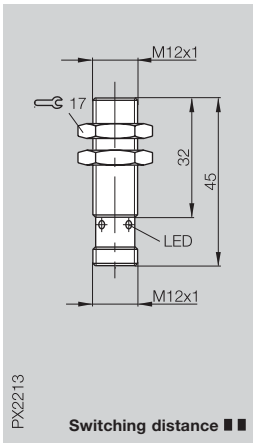
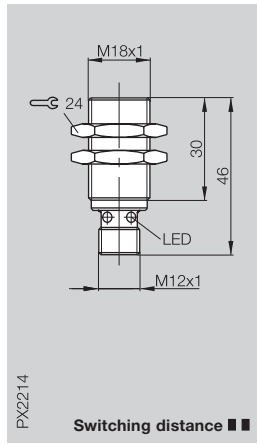
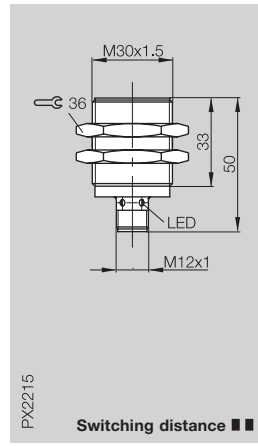
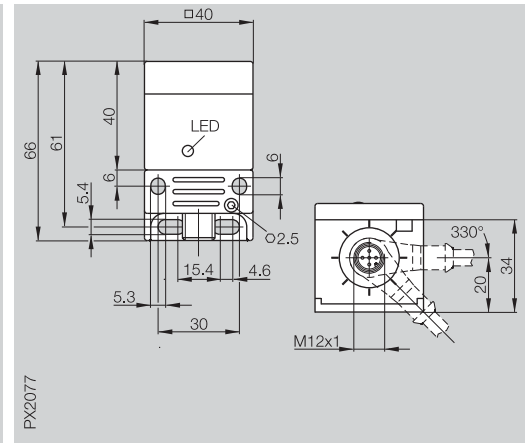
BES M12.../M18.../M30...



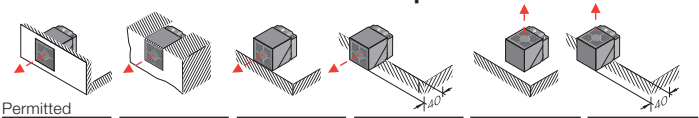
Unicompact



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

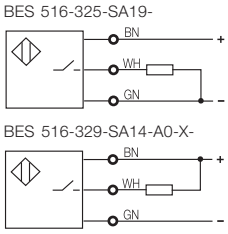
	M12×1	**M18×1**	**M30×1.5**	**40×40×66 mm** Unicompact	**40×40×66 mm** Unicompact
	flush	flush	flush	flush	non-flush
	4 mm	**8 mm**	**15 mm**	**20 mm**	**35 mm**
	0...3.2 mm	0...6.5 mm	0...12.2 mm	0...16.2 mm	0...28.4 mm
					
	BES M12ME-GNX40B-S04G-EEX	BES M18ME1-GNX80B-S04G-EEX	BES M30ME1-GNX15B-S04G-EEX	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

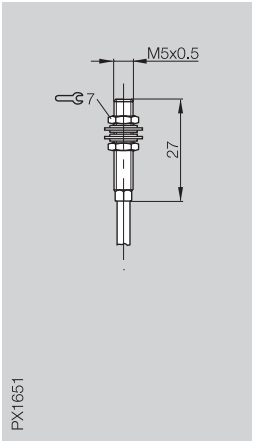
Permissible installation variations for Unicompact

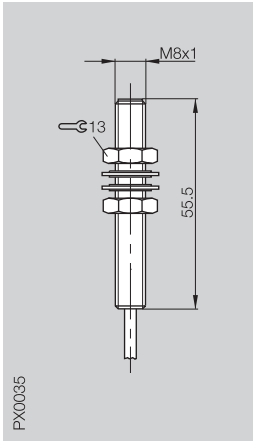


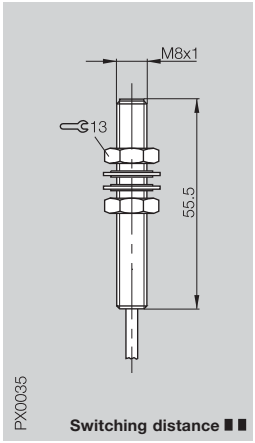
Rated operating distance s_n	Permitted					
20 mm	yes	yes	yes	yes	yes	yes
35 mm	no	no	no	yes	no	yes

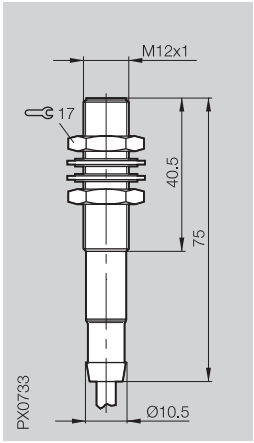
Housing size		**M5×0.5**	**M8×1**	**M8×1**	**M12×1**
Mounting (see notes starting p. **1.0.**11)		flush	flush	flush	flush
Rated operating distance s_n		**0.5 mm**	**1 mm**	**2 mm**	**2 mm**
Assured operating distance s_a		0...0.4 mm	0...0.8 mm	0...1.6 mm	0...1.6 mm
PNP	NO ①	BES M05ED-PSD05B-ES02-T01	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**









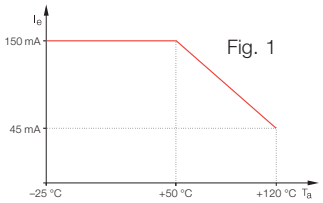


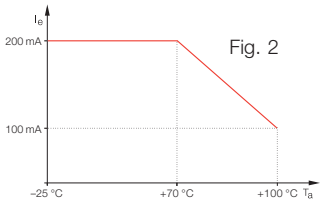
① Wiring diagrams see page **1.0.**6
Exception: BES 516-325-SA19- and BES 516-329-SA14-A0-X- see above

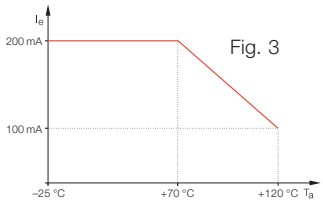
Switching distance ■■ see page **1.0.**10

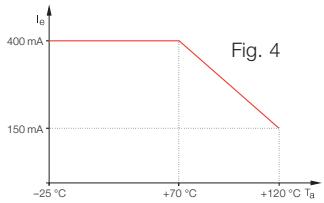
Other cable lengths on request.

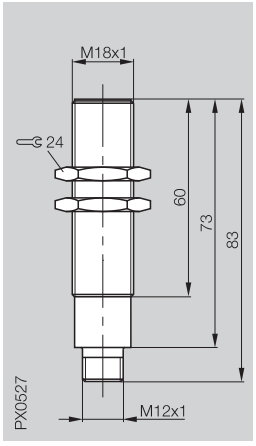
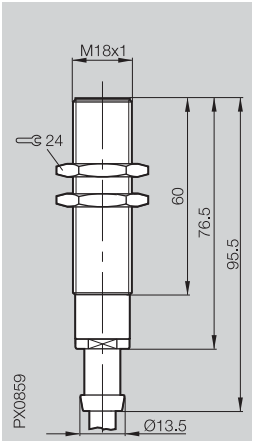
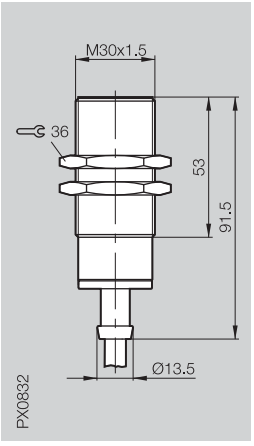
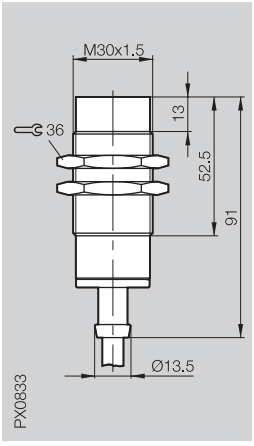
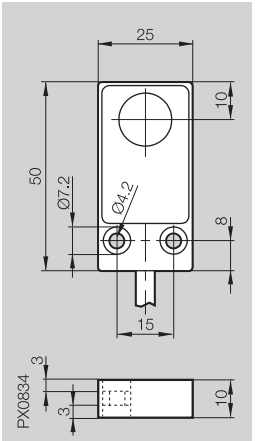
Current reduction as a function of ambient temperature range









	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				

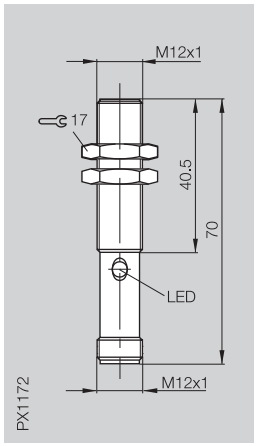
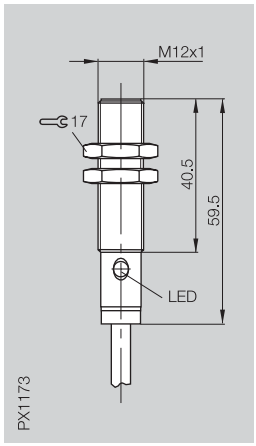
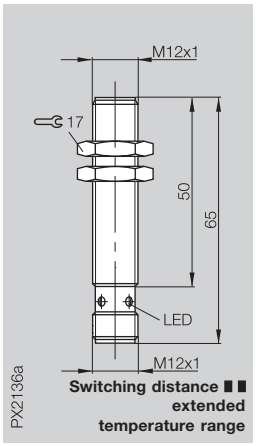
Temperature rated sensors to +120 °C

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

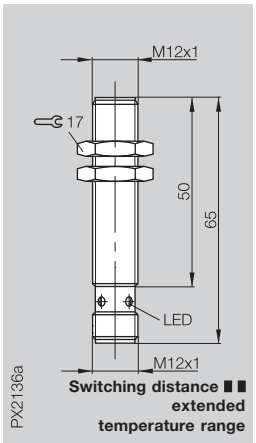
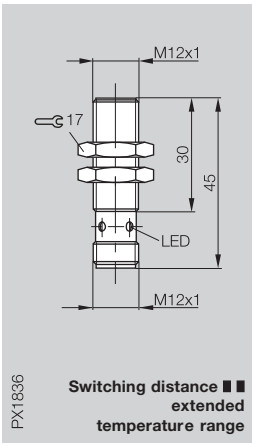
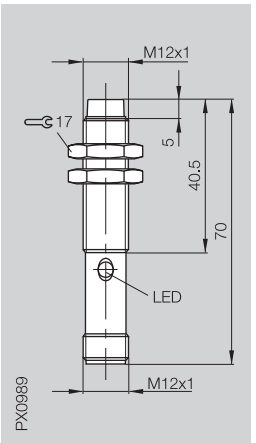
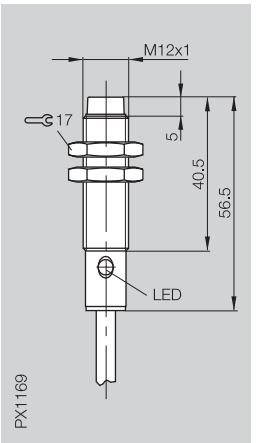
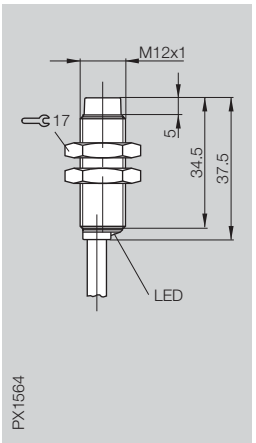
① Wiring diagrams see page **1.0.**6
Switching distance ■■ see page **1.0.**10

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		

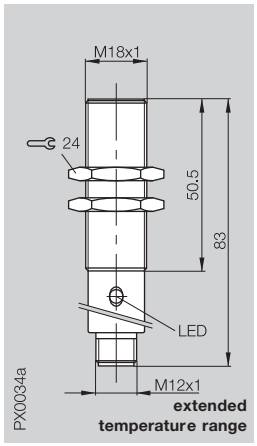


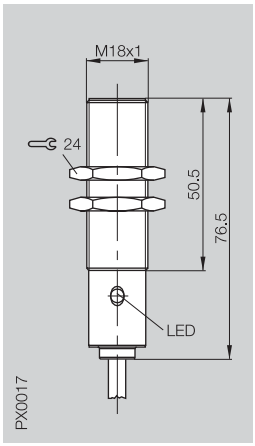
1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

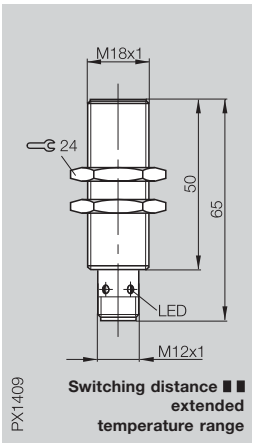
5
Connectors, Holders ...
Page 5.2 ...

Housing size	**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





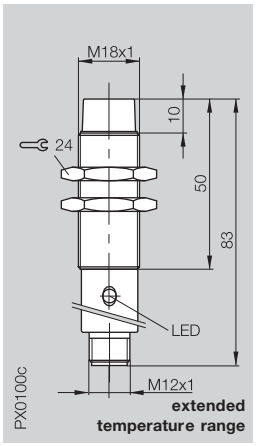
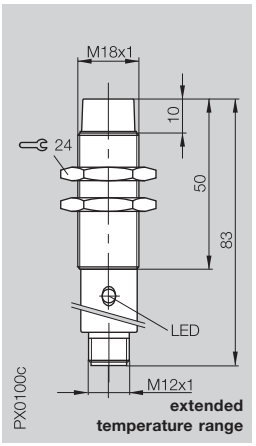
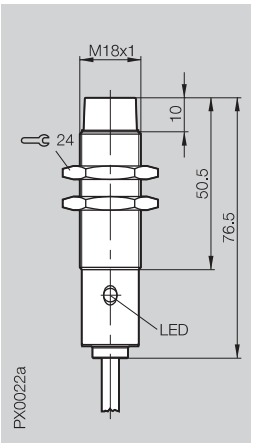
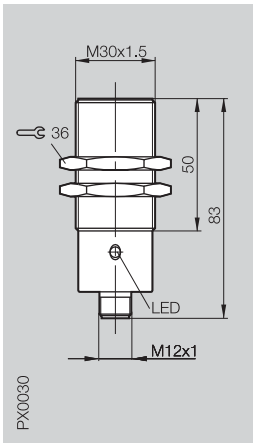
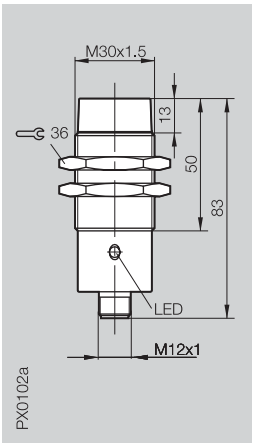


PNP					
	NO	①	BES 515-326-S4-C	BES 515-326-B0-C-PU-03	BES M18EI-PSC80B-S04G
	NC	②			BES M18EI-POC80B-S04G
	complementary	③			

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

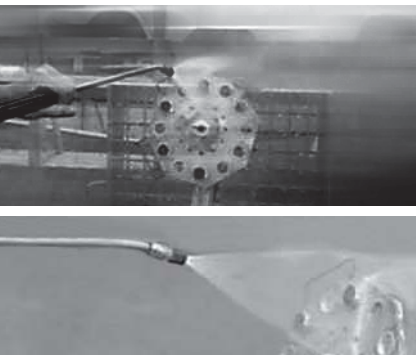


1.5
Factor 1
Weld immune
Magnetic field immune
Diagnostic
Steelface
Pressure rated
Pressure rated Ex
Namur Ex
Temperature rated
PROXINOX®
Ring Sensors
Extended switching distance

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	

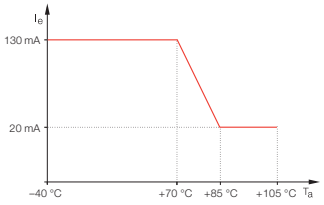
CE

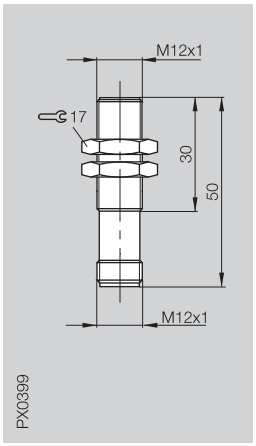
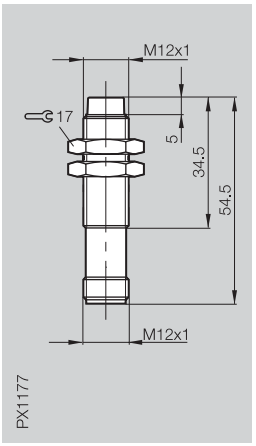
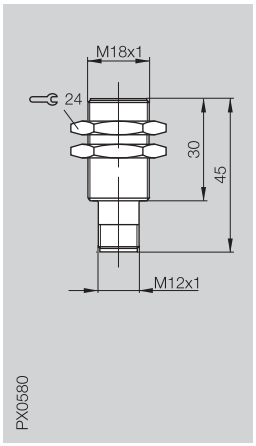
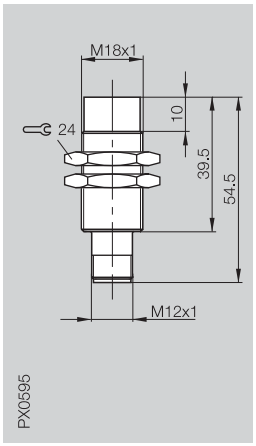
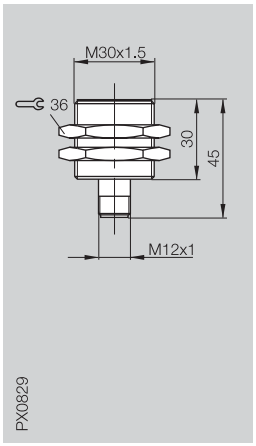
stainless steel

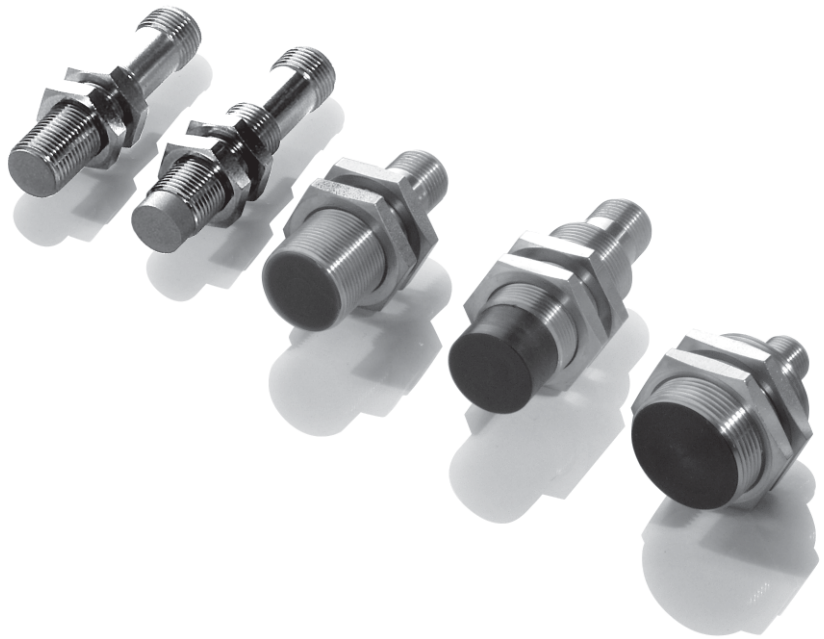
PNP	NO	①
Supply voltage U_B		
Voltage drop U_d at I_e		
Rated insulation voltage U_i		
Rated operational current I_e		
No-load supply current I_0 max.		
Polarity reversal protected		
Short circuit protected		
Repeat accuracy R		
Ambient temperature range T_a		
Ambient temperature T_a at load current ≤ 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		

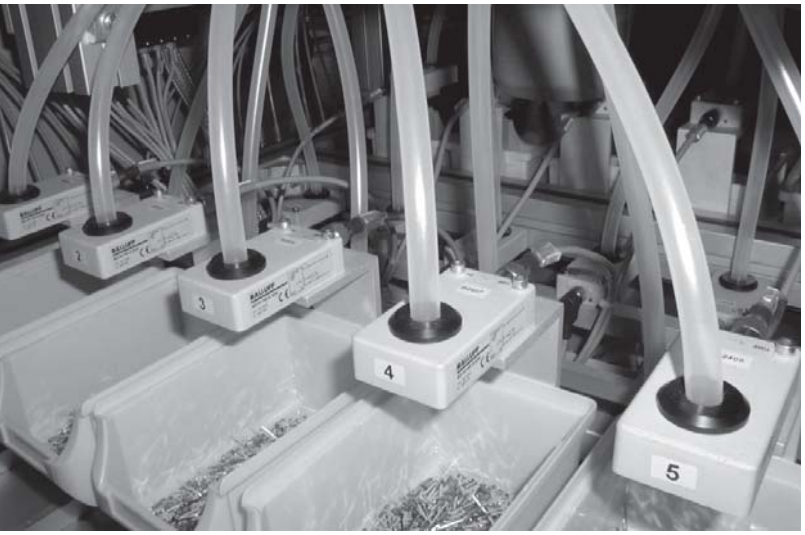
① Wiring diagrams see page **1.0.**6

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.

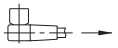
The output is static, i. e., it remains active as long as a metal part is located in the sensing range.

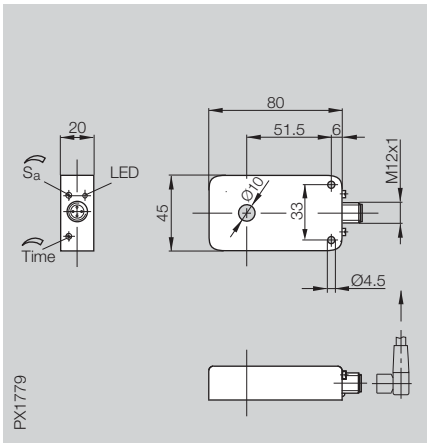
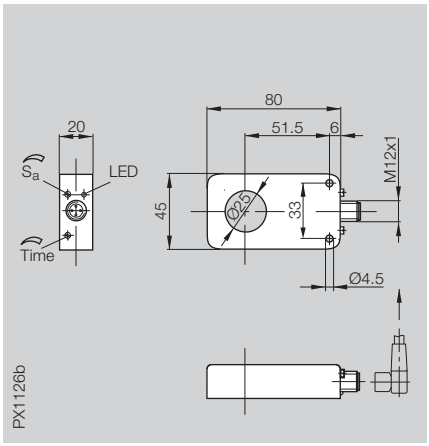
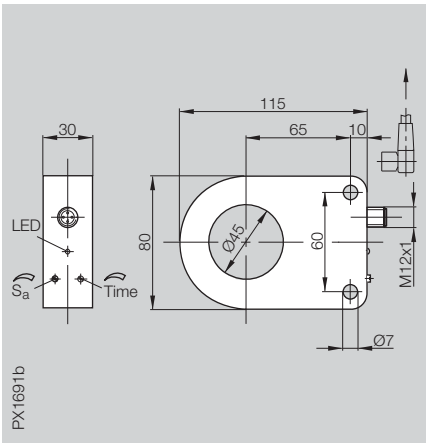
Housing size	
Inside diameter d_w	
Minimum object size steel taper (St 37)	

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



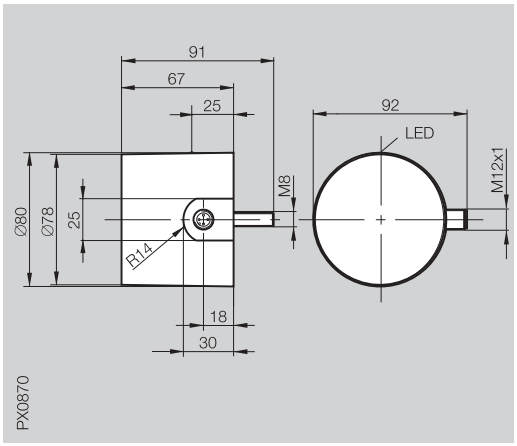


Ring sensor housing size 80×45×20 mm
also available as **analog distance sensor**.



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		

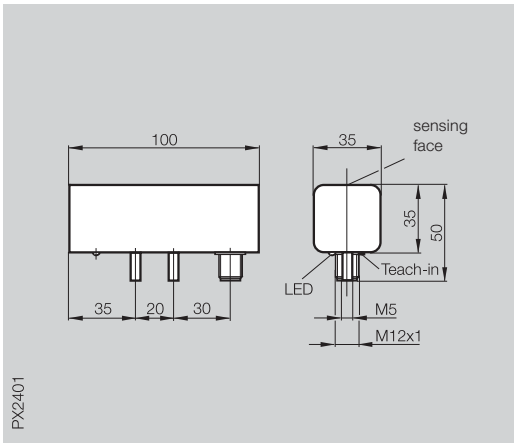
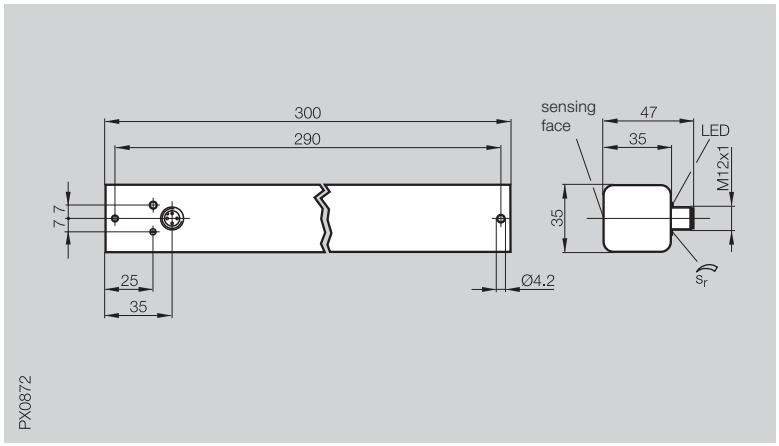
Supply voltage U_B	10...55 V DC
Voltage drop U_d at I_e	≤ 2 V
Rated insulation voltage U_i	75 V DC
Rated operational current I_e	200 mA
No-load supply current I_0 max.	≤ 10 mA
Output resistance R_a	Open collector
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 5 %
Ambient 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.

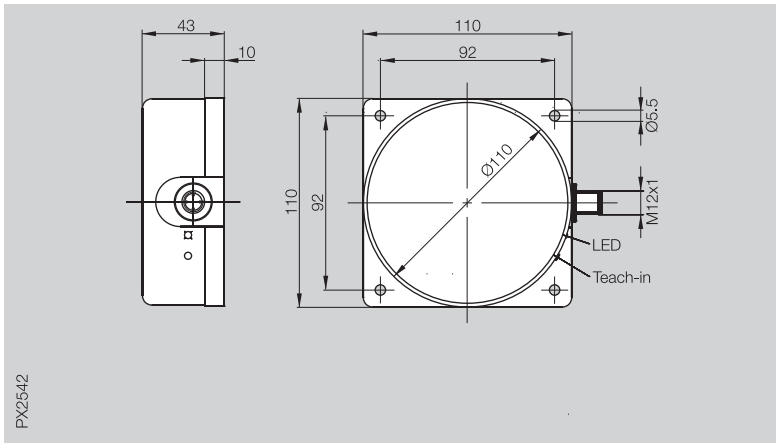


	35×35×100 mm	35×35×300 mm
	non-flush	non-flush
	30 mm (adjustable with teach-in key)	**30 mm (adjustable)**
	0...24.3 mm	0...24.3 mm
		
	BES IKU-011T.28-G-S4	BES IKU-031.28-S4
	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V
	75 V DC	75 V DC
	400 mA	200 mA
	≤ 10 mA	≤ 10 mA
	Open collector	Open collector
	yes	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



5
Connectors ... page 5.2 ...

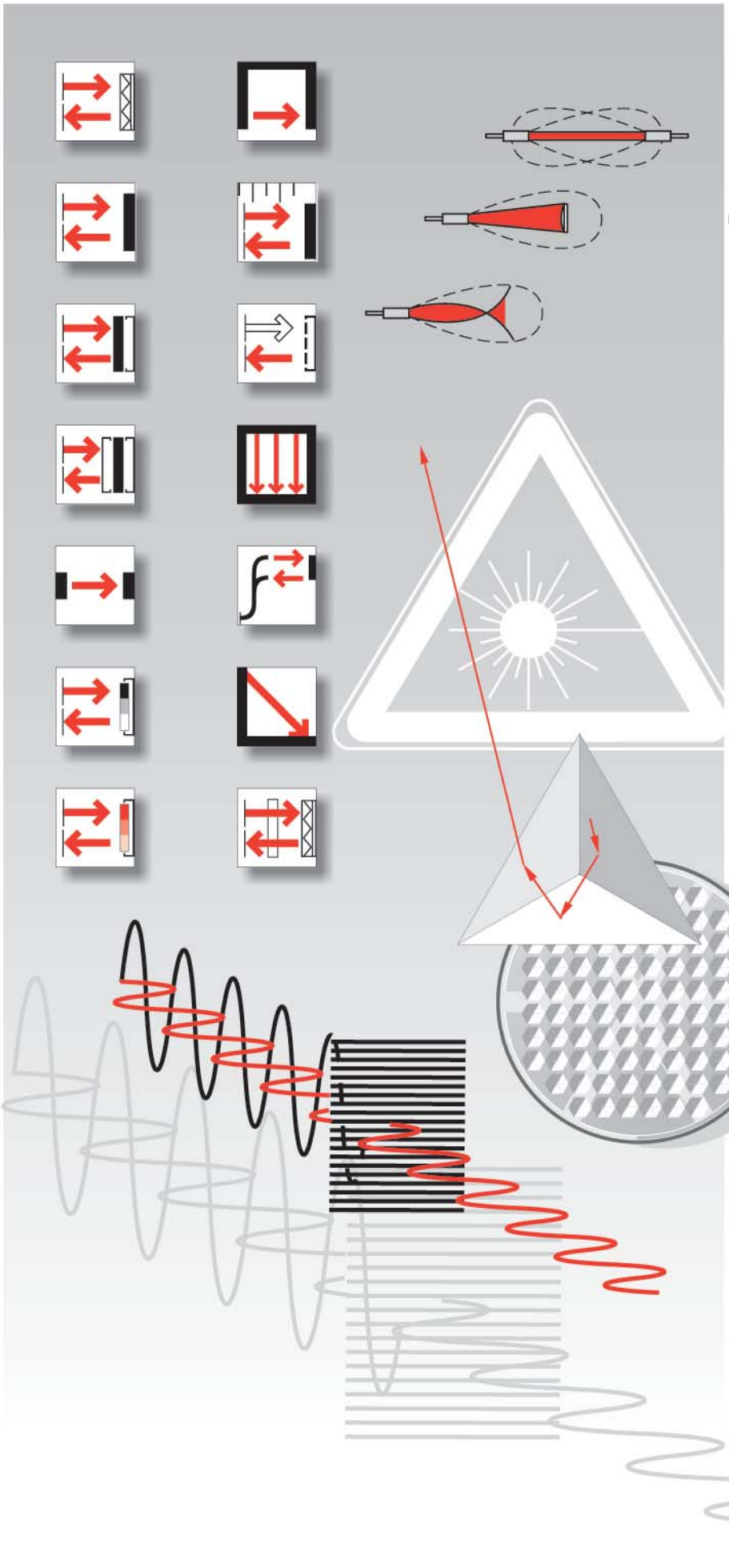
Housing size	**110×110×43 mm**
Mounting (see notes starting p. **1.0.**11)	non-flush
Rated operating distance s_n	**70 mm (adjustable with teach-in key)**
Assured operating distance s_a	0...56.7 mm



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





Photoelectric Sensors Principles

Only true specialists can excel in any given area. This is why Balluff has expanded its product range of photoelectric sensors, which has always been designed to meet the most varied of challenges.

We consider ourselves as a partner and consultant for our customers. We are constantly improving and expanding our product range, so that when you come to us you will find the best solution.

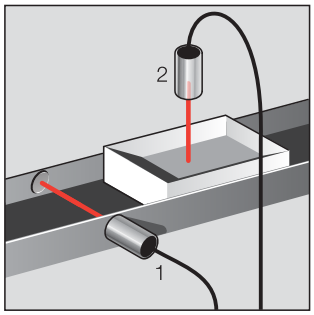
The most significant new additions are:

- Series BOS 2K
- Series BOS 5K
- Series BOS 12M
- Series BOS 18M
- Series BOS 26K
- Fiber optic base units BFB 75K
- Plastic fiber optics
- Series BOD 26K

2.0.2 Applications
2.0.8 Product overview
2.0.16 Principles, definitions

The application examples are shown in simplified form. Complete part numbers are not provided for the recommended sensors since the exact model will vary from application to application. Our applications assistance group will help you to find the optimal solution.

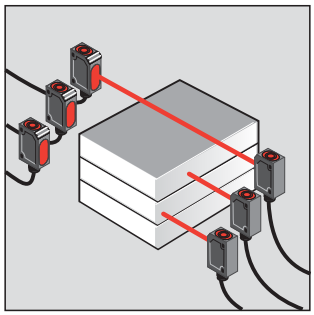
Sensing size and contents of containers



BOS 18M-..-1QB-... Retroreflective
BOS R-1 Reflector
BOS 18M-..-1HA-... Diffuse with background suppression and adjustable switching distance

The retroreflective sensor (1) indicates the presence of the box. Boxes can be counted or the length of a box determined (from the pulse duration). The diffuse sensor (2) has background suppression (background suppression) and its range is adjustable. It checks the contents of the boxes on the conveyor belt.

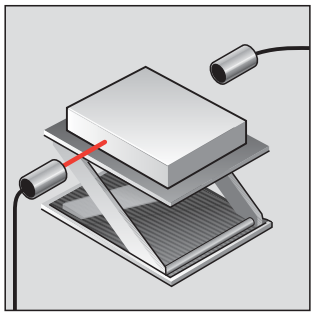
Sensing stack height



BLS 15K-... Emitter
BLE 15K-... Receiver

Each through-beam pair checks a certain stack height.
Several sensors can be mounted over each other. The sensing accuracy in the vertical axis is just a few millimeters if the supplied apertures are used.

Guiding a moveable stage

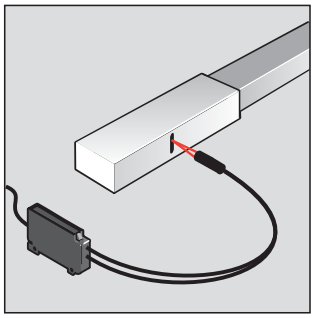


BLE 18M-... Receiver
BLS 18M-... Emitter
BOS 18-BL-2 Slit aperture

The sensors are arranged so that the upper metal block breaks the light beam. When the block is removed for processing, the beam path is open. The sensor gives a signal, and the stage is automatically raised by the height of a block.



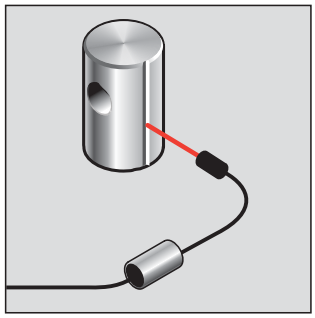
Sensing a read mark



BFB 75K-... Base units for plastic fiber optics
BFO ... Fiber optics

A marking (light band) on a dark background (belt, tube, container etc.) can be detected. Here a base unit for fiber optics and a plastic fiber optic cable are used.

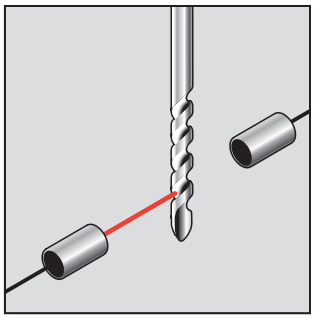
Detecting a groove



BOS 18M-..-1PD-... Diffuse with adjustable sensing distance
BFO 18-... Fiber optic cable

To sense a groove on a bearing pillow, a diffuse sensor is adjusted using a fiber optic cable so that the bearing pillow is always detected. The groove interrupts the beam (no reflection). The switch changes its output condition.

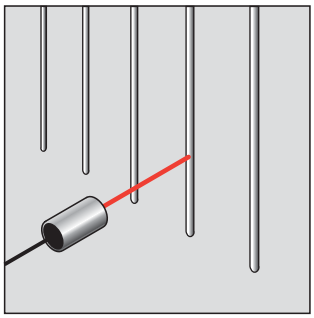
Drill break monitor



BLS 18M-... Emitter
BLE 18M-... Receiver
BOS 18-BL-2 Double slit diaphragm for through-beams

Broken drill detection from a distance of 2 meters can be accomplished using a through-beam system with double slit diaphragm. Drills larger than approx. 2 mm diameter can be checked. To detect even smaller drills (up to ∅ 0.1 mm), use a laser through-beam sensor.

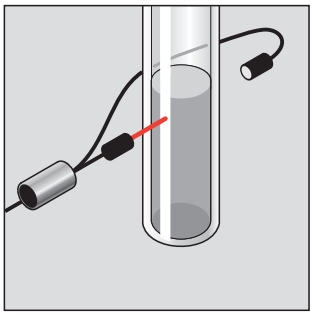
Small parts detection



BOS 18M-... Diffuse with adjustable sensing distance
BOS 18-PK-1 Plano-convex lens
BOS 18M-..-1HA-... Diffuse with background suppression

Detection of small parts while masking the background is done using a BOS 18-PK-1 optical adapter. For example, threads with a diameter of 0.05 mm could be sensed, whereby color is not a factor. The sensing range here is approx. 0...13 mm. Longer ranges can be achieved by using diffuse sensors with background suppression.

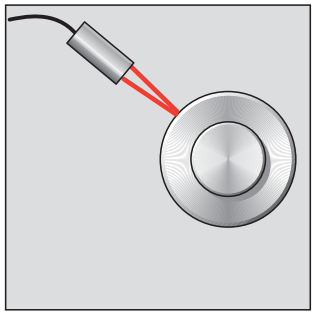
Level detection in transparent containers



BOS 18M-..-1PD-... Diffuse
BFO 18A-... Fiber optics

A diffuse sensor with fiber optic attachment is used as a through-beam to monitor the level in a transparent container (cylinder). If there is no liquid at the height of the sensor, the light beam is not interrupted and instead arrives at the receiver. If there is liquid at the height of the sensor, the light beam is deflected by the receiver. The switch changes its output condition.

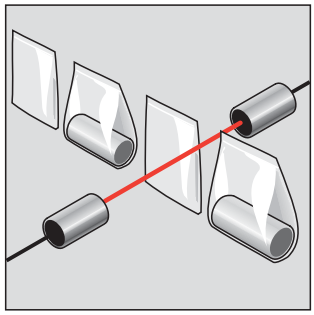
Differentiating various diameters



BOS 18M-..-1HA-... Diffuse with background suppression and adjustable switching distance

To detect various shaft diameters, a diffuse sensor with background suppression (background suppression) is calibrated so that it switches when the diameter is large. If there is a small diameter at the check point, it is recognized as “background”.
The switch does not change.

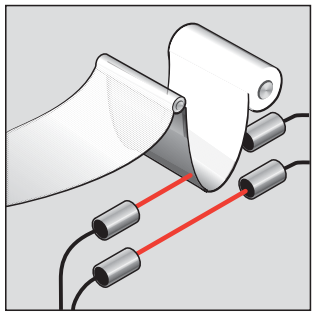
Checking contents of a package



BLE 18M-... Receiver
BLS 18M-... Emitter
BOS 18-BL-1 Diaphragm for through-beams

A through-beam version is used to check the contents of the packaging. Emitter and receiver are arranged such that the light beam passes through the packaging. If the package is empty, the intensity is sufficient to illuminate the receiver. If, however, there are contents in the package, the contents interrupt this beam from the emitter. The switching output changes.

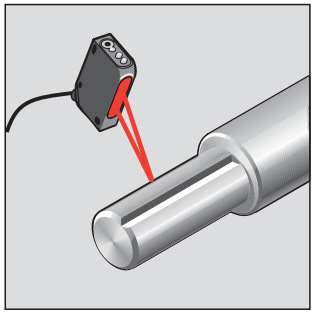
Slack control



BLE 18M-... Receiver
BLS 18M-... Emitter

Two through-beam sensors can be used to control the guiding of a roller conveyor. The through-beams are arranged above each other so that at optimum slack the lower light beam is clear and the upper beam interrupted. If both light paths are clear, more roll tension is needed. If both are interrupted, there is too much material (slack) present.

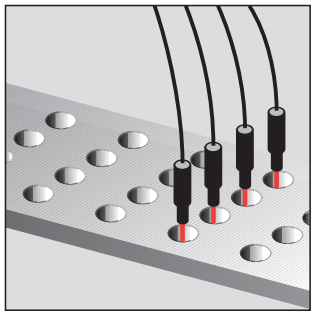
Parts positioning



BOS 26K-..-1LHB-... Laser sensor with background suppression and adjustable switching distance

For the positioning of a turned part, a previous slot can be used. A laser light diffuse sensor is set with background suppression such that it detects the surface of the rotating part. If the light beam strikes the slot, the light is reflected back to the sensor at a different angle. The switch recognizes this as a background signal and ignores it, i. e. changes its switching state.

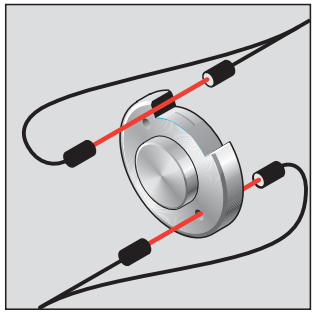
Level control of granules in small packages



BFB 75K-... Base units for plastic fiber optics
BFO ... Fiber optics

A group of sensors monitors the contents of a whole row of small packets on a conveyor belt. The plastic fiber optics cable can be user-cut to the desired length.
Standard supplied length is 2 meters.

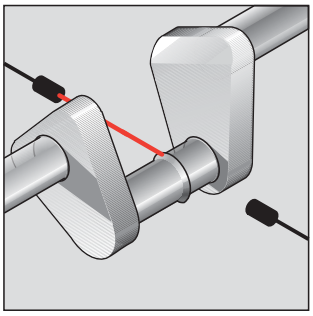
Quality control on workpieces



BFB 75K-... Base units for plastic fiber optics
BFO ... Fiber optics

Multiple sensors with fiber optic attachments simultaneously check different features of a workpiece. Only if all holes, screws, tolerances and surface qualities are present, will the workpiece be accepted. Later failures and stalling are thus avoided.

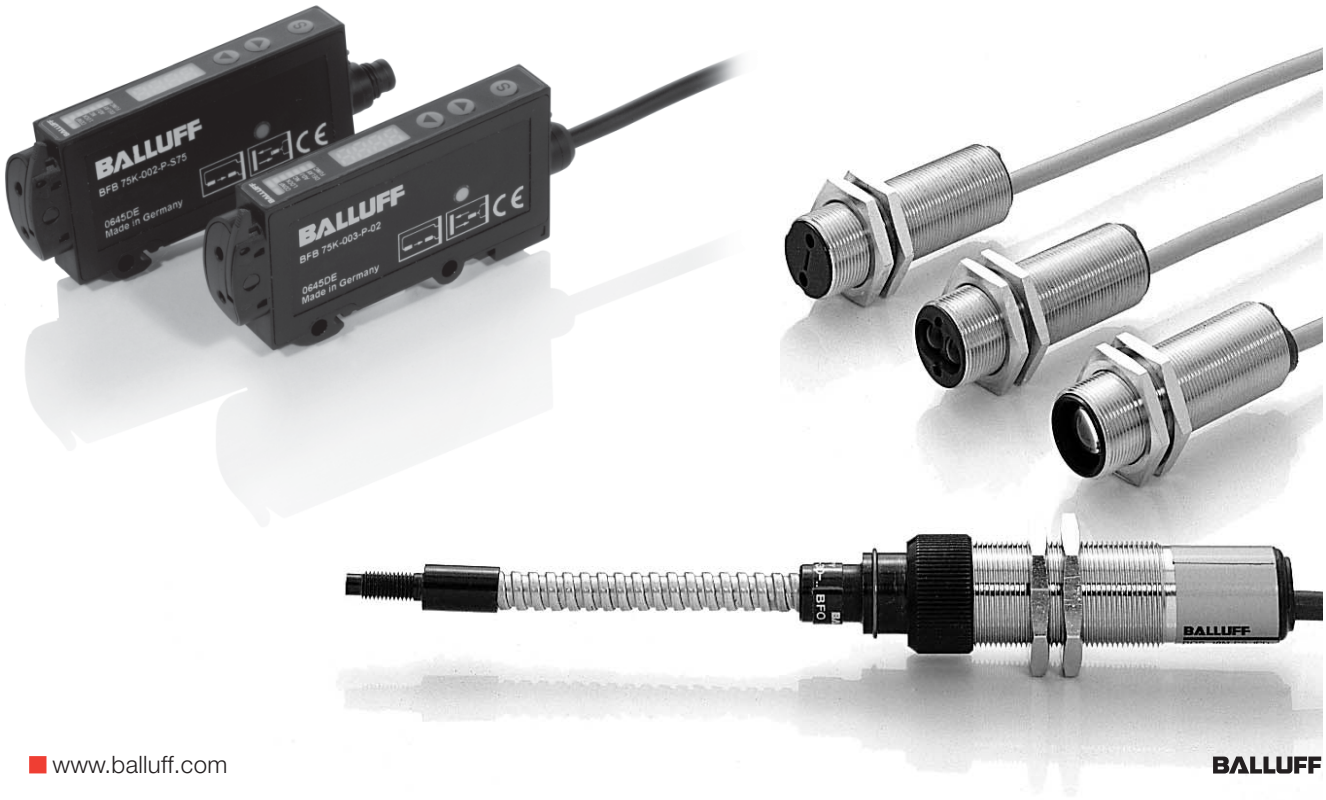
Detecting a bead on a cam shaft



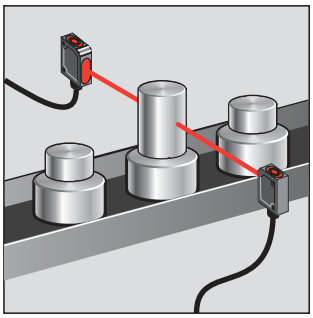
BOS 18M-..-1PD-... Diffuse with adjustable sensing distance
BFO 18-... Fiber optics cable

To determine whether a bead is present or not, a fiber optic attachment is used with a diffuse sensor. The fiber optic is arranged on a level parallel to the camshaft. If a bead is present, the light beam is interrupted. With no bead, the beam path is free.

2.0



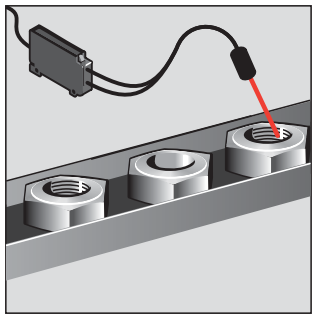
Part sorting



BLS 6K-... Emitter
BLE 6K-... Receiver

To sort out parts which vary in height, a through-beam sensor can be used. By pressing a button you can calibrate the BLS/BLE 6K so that the taller part interrupts the light beam and can be separated out. The teach-in procedure allows you
to make this setting rapidly and adjust it to changing requirements.

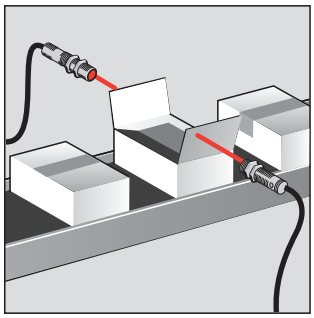
Thread checking



BFB 75K-... Base units for plastic fiber optics
BFO ... Fiber optics

Prior to assembling nuts, a check needs to be made to determine whether threads are present or not. If the threads are present, they will reflect the light back to the fiber optics and the sensor will operate.
If no threads are present, total reflection takes place on the bare wall of the hole and no light returns to the fiber optics. There is no breaker signal on the sensor.

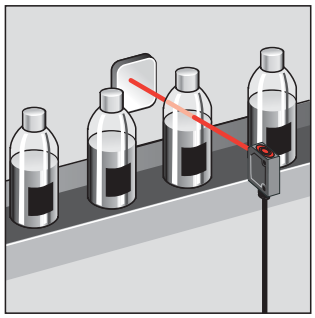
Packaging inspection



BLS 12M-... Emitter
BLE 12M-... Receiver

To check whether a packaging is correctly closed, a through-beam sensor is configured so that the light path is just above the packaging. If the packaging is not correctly closed, the obstructing lid interrupts the light beam and the through-beam sensor signals this.

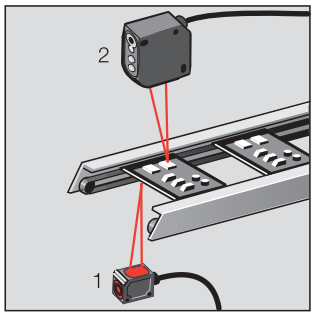
Counting transparent bottles



BOS 6K-.../ BOS 21M-... Retroreflective for glass sensing

Reliable sensing of transparent objects, which absorb very little light, is best done using retroreflective sensors with low hysteresis.
Using the BOS 6K with teach-in calibration you can even change the calibration setting while the process is running. It is no longer necessary to stop the process, since the sensors can, for example, be calibrated during the warm-up phase.

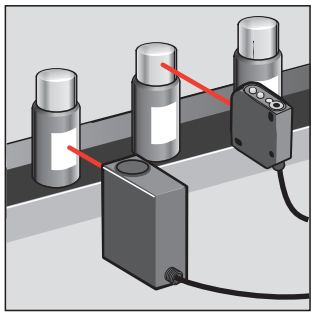
Circuit board inspection/ positioning



BOS 15K	Diffuse focused
BOS 26K	Laser diffuse sensor with background suppression

To bring the circuit board to a particular inspection position, a focused diffuse sensor (1) is used. The circuit board crosses the light path of the sensor exactly at its focal point, thus enabling maximum precision. The small light spot from the laser diffuse sensor (2) and the background suppression can be used to check whether even small components are present on the board.

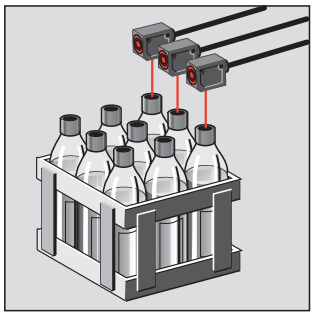
Final inspection: labels, caps



BKT	Contrast sensor
BOS 26K	Diffuse with background suppression

For final inspection of dish detergent bottles a check must be made to determine whether the label and cap are attached. A contrast sensor is used for the label inspection.
This distinguishes between the relative reflectivity of the label and the bottle.
The cap is detected using a diffuse sensor with background suppression. Advantage of background suppression: if no cap is present, the threaded closure can be suppressed.

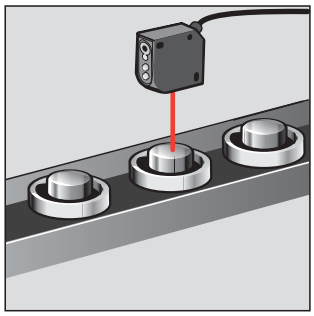
Checking for caps



BOS 26K	Diffuse with background suppression
BOS 18M	Diffuse with background suppression

Depending on installation circumstances and the required switching distance, a wide variety of diffuse sensors with background suppression can be employed. For tight mounting spaces the BOS 6K is ideal. If maximum resolution is required, the BOS 18M is the best choice; and if greater sensing range is needed, sensors from the series BOS 26K, BOS 36K or BOS 65K will solve the problem.

Checking for correct quantity



BOS 26K	Diffuse with background suppression

Diffuse sensors with background suppression are used to check in detail whether an assembly process has been completed. These sense small objects with high precision and
are not misled by different colors. Using laser sensors with background suppression allows even finer details to be detected.



	mini.s						
							
Type	**BOS 08M**	**BOS 12M**	**BOS 18M Potentiometer**	**BOS 18M Laser**	**BOS 18MR Laser**	**BOS 18M teach-in**	**BOS 18MR**
Housing material	Metal	Metal	Metal	Metal	Metal	Metal	Metal
	Sensing distance/range						
Through-beam Emitter/receiver	0...1.1 m	0...3 m, 0...5 m 0...30 m	16 m	0...60 m	0...60 m	16 m	0...16 m
Retroreflective			4 m				
Retroreflective with polarizing filter	25...550 mm	0...1.5 m	2 m		0.1...9 m	2 m	0...2 m
Retroreflective for detecting glass							
Diffuse	0...55 mm	100 mm, 200 mm, 400 mm	100 mm, 200 mm, 400 mm, 1 m		0...250 mm	400 mm	400 mm
Diffuse with background suppression		0...24 mm, 10...60 mm	10...120 mm, 40...120 mm	30...150 mm			10...120 mm, 40...120 mm
Fiber optic Base unit			depending on fiber type				
	Technical data						
Supply voltage	10...30 V DC	10...30 V DC	10...30 V DC, 20...250 V AC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC, 10...36 V DC
Output Function	PNP NO/NC	PNP NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP NO/NC	PNP NO/NC
Connection	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector	Connector
Operating temperature	–10...+60 °C	–20...+60 °C	–20...+60 °C	–15...+55 °C	–10...+50 °C	–15...+55 °C	–25...+55 °C
Degree of protection per IEC 60529	IP 67	IP 67	IP 65/IP 67	IP 67	IP 67	IP 67	IP 67
Light	red	Infrared/red/laser	Infrared/red	Laser	Laser	Infrared/red	red
Dimensions	M8×50...57.5 mm	M12×65...74 mm	M18×62...95 mm	M18×79...85 mm	M18×79...93.5 mm	M18×70...72 mm	M18×78.6...82 mm
Features				Focusable through-beam version	Focusable through-beam version	Alarm output	
see starting page	**2.1.**4	**2.1.**8	**2.1.**20	**2.1.**30	**2.1.**34	**2.1.**40	**2.1.**44

	BOS 18E **Stainless steel**	BOS 18KF Plastic	BOS 18KF Laser Plastic	BOS 18KW Plastic	BOS 18KW Laser Plastic	BOS 18K Plastic	BOS 18KR Plastic	BOS 30M Metal
								
	16 m	0...20 m	0...60 m	0...15 m	0...50 m	0...13 m	0...11 m	
	4 m	0.1...5 m						
	2 m	0.1...4.5 m	0.1...16 m	0.1...3 m	0.1...9 m	0.1...2.2 m	0.1...1.7 m	
		0.1...1.7 m		0.1...1.7 mm				
	100 mm, 200 mm, 400 mm	0...100 mm, 0...400 mm, 0...700 mm	0...350 mm	0...80 mm, 0...400 mm	0...250 mm	0...300 mm	0...250 mm	0...2 m
	40 mm	50...100 mm 100 mm, 40...100 mm		50...100 mm 100 mm				
								depending on fiber type
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	PNP NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC
	Connector	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector
	–20...+75 °C	–25...+55 °C	–10...+50 °C	–25...+55 °C	–10...+50 °C	–25...+55 °C	–25...+55 °C	–20...+60 °C
	IP 68	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67	IP 65
	Infrared/red	Infrared/red	Laser	Infrared/red	Laser	Infrared/red	Infrared/red	Infrared
	M18×70 mm	M18×67...81.5 mm	M18×67...81.5 mm	M18×79...93.5 mm	M18×79...93.5 mm	M18×67...81.5 mm	M18×79...93.5 mm	M30×92...108 mm
	Tighter sealing, glass or plastic fiber optics	flexible mounting options	flexible mounting options	flexible mounting options	flexible mounting options			
	2.1.48	**2.1.**54	**2.1.**62	**2.1.**72	**2.1.**78	**2.1.**86	**2.1.**88	**2.1.**94

	mini.s 						
Type	**BOS Q08M**	**BOS 2K**	**BOS 5K**	**BOS 6K**	**BOS 6K Laser**	**BOS 15K**	**BOS 21M**
Housing material	Metal	Plastic	Plastic	Plastic	Plastic	Plastic	Metal
	Sensing distance/range						
Through-beam Emitter/receiver	0...1.1 m	0...1.2 m	0...10 m	0...6.5 m		0...5 m	0...20 m
Retroreflective							
Retroreflective with polarizing filter	25...550 mm	45...800 mm	0.1...4 m	5...700 mm 0.05...3 m	0.05...1.5 m	0.1...2 m	0.1...8 m, 0...4 m
Retroreflective for detecting glass				5...500 mm			0...2 m
Diffuse	0...55 mm	1...55 mm	0...900 mm, 50...200 mm	20...300 mm		12 mm, 100 mm, 500 mm	0.01...1 m, 0.05...2 m
Diffuse with background suppression		1...15 mm 1...30 mm	40...200 mm	25...100 mm	20...60 mm, 30...110 mm		20...200 mm, 70...200 mm
Fiber optic Base unit				depending on fiber type			
	Technical data						
Supply voltage	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Output Function	PNP NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC
Connection	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector
Operating temperature	–10...+60 °C	–20...+50 °C	–25...+55 °C	–20...+60 °C	–20...+60 °C	–15...+55 °C	–25...+55 °C
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67	IP 67	IP 66	IP 67
Light	red	red	Infrared/red	Infrared/red	Laser	Infrared/red	Infrared/red
Dimensions	8×8×44...59 mm	20.6×12.5×7.6 mm	19.5×31.5×10.8 mm	32×20×12 mm	20×30×12 mm	29×44×13 mm	41.5×49×15 mm
Features				teach-in	teach-in	also with axial light exit	Through-beam with autocollimation
see starting page	**2.1.**98	**2.1.**102	**2.1.**112	**2.1.**120	**2.1.**126	**2.1.**132	**2.1.**138

								
	BOS 21M Laser Metal	**BOS 26K** Plastic	**BOS 26K Laser** Plastic	**BOS 36K** Plastic	**BOS 65K** Plastic			
	0...60 m			0...50 m	0...50 m			
		0...5.5 mm	0...20 m					
	0.1...20 m			0.1...8 m	0.3...8 m			
	0...600 mm			10...2000 mm	50...2000 mm			
	50...100 mm	30...300 mm, 150...600 mm	30...150 mm, 50...300 mm	100...500 mm	200...1100 mm			
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC, 17...264 V AC/DC			
	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP NO/NC	PNP/NPN NO/NC			
	Connector	Connector	Connector	Connector	Connector/ terminal chamber			
	–10...+50 °C	–20...+60 °C	–15...+45 °C	–10...+55 °C	–20...+55 °C			
	IP 67	IP 67	IP 67	IP 66	IP 67			
	Laser	Infrared/red	Laser	Infrared/red	Infrared/red			
	41.5×49×15 mm	50×50×17 mm	50×50×17 mm	55×65×20 mm	73×85×32 mm			
		Through-beam with autocollimation	Through-beam with autocollimation	rotatable connector	Time functions, Alarm output Universal voltage			
	2.1.142	**2.1.**150	**2.1.**152	**2.1.**158	**2.1.**165			

								
Type	**BFB 75K**	**BOS 73K**	**BOS 74K**	**BOS 6K**	**BOS 18KF**			
Housing material	Plastic	Plastic	Plastic	Plastic	Plastic			
	Sensing distance/range							
Fiber optic Base unit	depending on fiber type	depending on fiber type	depending on fiber type	depending on fiber type	depending on fiber type			
Fiber optics								
Distance sensor								
Diffuse with background suppression								
	Technical data							
Supply voltage	10...30 V DC	11...26 V DC	10...30 V DC	10...30 V DC	10...30 V DC			
Output Function	PNP/NPN NO/NC	PNP NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC			
Connection	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector/ Cable			
Operating temperature	–20...+60 °C	–25...+55 °C	–10...+60 °C	–20...+60 °C	–25...+55 °C			
Degree of protection per IEC 60529	IP 64	IP 54	IP 66	IP 67	IP 67			
Light	red	red	red	red	red			
Dimensions	35×65×10.5 mm	30×60×9 mm	41×69×12 mm	27×37×12 mm	M18×82.5...87 mm			
Features	with display Analog output	with display						
see starting page	**2.2.**5	**2.2.**9	**2.2.**11	**2.2.**13	**2.2.**15			

								
	BFO Plastic	**BFO 18** Polyurethane, metal, silicon	**BOD 6K** Plastic	**BOD 18KF** Plastic	**BOD 26K Laser** Plastic	**BOD 63M Laser** Metal	**BOD 66M** Metal	**BOD 66M Laser** Metal
			20...80 mm	50...100 mm	45...85, 30...100, 80... 300 mm	200...2000 mm 200...6000 mm	100...600 mm	200...2000 mm
			20...80 mm		30...100 mm, 80... 300 mm	200...2000 mm 200...6000 mm	100...600 mm	200...2000 mm
			15...30 V DC	10...30 V DC	18...28 V DC 18...30 V DC	15...30 V DC	18...30 V DC	18...30 V DC
			analog PNP NO/NC	analog	analog/PNP NO/NC	analog/PNP NO	analog/PNP NO	analog/PNP NO
			Connector/ Cable	Connector/ Cable	Connector/ Cable	Connector	Connector	Connector
	–40...+115 °C	-20...+85 °C, -20...+170 °C	–20...+60 °C	–25...+55 °C	–10...+60 °C	–10...+55 °C	–20...+50 °C	–20...+50 °C
			IP 67	IP 67	IP 67	IP 65	IP 65	IP 65
	for red light	for infrared light	red	red	Laser	Laser	red	Laser
			20×32×12 mm	M18×77...81.5 mm	50×50×17 mm	90×70×35 mm	73×90×30 mm	73×90×30 mm
		Special lengths possible	Teach-in		adjustable Measuring range			
	2.2.18	**2.2.**28	**2.2.**35	**2.2.**37	**2.2.**39	**2.2.**47	**2.2.**51	**2.2.**53

							
Type	**BKT 6K**	**BKT 18KF**	**BKT 21M**	**BKT M**	**BLT 18KF**	**BLT 21M**	**BLT M**
Housing material	Plastic	Plastic	Metal	Metal	Metal	Metal	Metal
	Sensing distance/range						
Contrast sensor	40...150 mm	10 mm	19 mm	9 mm (18 mm)			
Luminescence sensor					8...20 mm	0...40 mm	9...18 mm
Color sensor							
Fork sensor							
Angle sensor							
Dynamic optical window							
Light grid							
	Technical data						
Supply voltage	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Output Function	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	analog/PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	analog/PNP/NPN NO/NC
Connection	Connector/ Cable	Connector/ Cable	Connector	Connector/ Cable	Connector/ Cable	Connector	Connector
Operating temperature	–20...+60 °C	–25...+55 °C	–25...+55 °C	–10...+55 °C	–25...+55 °C	–10...+55 °C	–10...+55 °C
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67
Light	Laser	white	white	red/green	UV	UV	UV
Dimensions	20×30×12 mm	M18×77...81.5 mm	42.5×50×15 mm	62×83×31 mm	M18×77...81.5 mm	42.5×50×15 mm	62×83×31 mm
Features	focused light beam			Interchangeable optics			other sensing distances with added lenses
see starting page	**2.2.**57	**2.2.**59	**2.2.**61	**2.2.**63	**2.2.**69	**2.2.**71	**2.2.**73

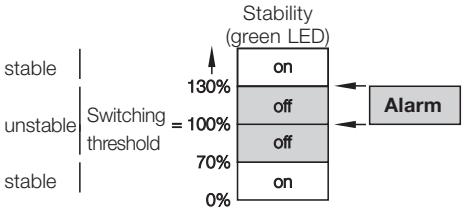
								
	BFS 26K Plastic	**BFS 27K** Plastic	**BGL** Metal	**BGL 21** Metal	**BWL** Standard Metal	**BWL** Automotive Metal	**BOWA** Metal	**BLG** Metal
	12...32, 15...30, 18... 22 mm	5...45 mm						
			5, 10, 20, 30, 50, 80, 120, 180, 220 mm	2 mm fixed				
					40, 54, 68, 90, 110 mm	22×22, 43×43, 42×62 mm		
							40×80, 80×80, 120×80 mm fixed	
								0.15...2.1 m
	12...28 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	24 V DC
	3 × PNP NO	3 × PNP/NPN NO; RS 485	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP NO	PNP NO	PNP/analog NO
	Connector	Connector	Connector	Connector	Connector	Connector	Connector	Connector
	–10...+55 °C	–10...+55 °C	–10...+60 °C	0...+55 °C	–10...+60 °C	–10...+60 °C	–10...+55 °C	0...+55 °C
	IP 67	IP 67	IP 67	IP 65	IP 67	IP 67	IP 65	IP 65
	white	white	Red/laser	red/green	Red/laser	Infrared	Infrared	Infrared
	50×50×17 mm	50×50×25 mm	depending on type	90×26×20 mm	depending on type	depending on type	depending on type	depending on type
	various light spot sizes	Display, high switching frequencies	stackable	for label sensing	stackable		Dynamic measurement	Various measuring field heights
	2.2.79	**2.2.**81	**2.2.**84	**2.2.**91	**2.2.**94	**2.2.**98	**2.2.**102	**2.2.**107

Wire colors
designation
per DIN IEC 60757

BN	brown
BK	black
BU	blue
OG	orange
WH	white
RD	red
GY	gray

The **alarm output ...**
(for series BOS 15, BOS 18 teach-in, BOS 25, BOS 65, BOS 74)

... in the receiver (PNP open collector – 30 mA). The receiver is equipped with an alarm output. It acts as a warning signal when the function is affected by contamination or mechanical maladjustment. The alarm output is activated when the receive signal is present in the alarm range for a defined



length of time. For series BOS 18M teach-in and BOS 65K the entire family, including diffuse and retroreflective, is equipped with an alarm.

Analog output

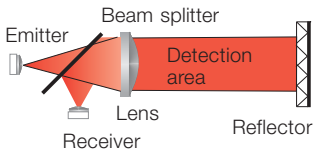
A sensor with an analog output does not switch at a particular target distance. These devices have an analog output with a distance-dependent output signal. The output voltage is proportional to the object point in the sensing area. These systems operate on the same principle as sensors with background suppression. They generate a linear output signal within a certain range (measuring range)

Turn-off delay ...

... is the time which the sensor requires for actuation when the target object leaves the sensing zone, at a transmission efficiency factor of 0.5.

Autocollimation

Emitter and receiver use a common lens. The emitter light passes through the beam splitter and the lens to the reflector. The reflector bounces the emitter light back to the lens. This gives retroreflective sensors having autocollimation a small, round beam profile. And there are further benefits: no dead zone for sensing and for the reflector, better small parts detection, and the switching characteristic is independent of the approach direction.



Dark switching
per DIN 44030

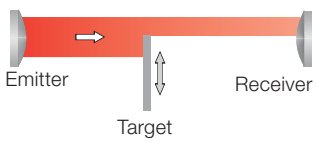
Light receiver	Amplifier	Consumer
non-illuminated	conducting	switched on
illuminated	non-conducting	switched off

Turn-on delay ...

... is the response time a sensor needs if the target object enters the sensing zone, with the transmission efficiency at a factor of 2.

Through-beam

Through-beam sensors consist of separate emitter and receiver units which must be aligned on opposite sides of the sensing path. A target interrupts the light beam and causes the receiver to switch, regardless of the surface characteristics. Through-beam versions are best in unfavorable conditions (e.g. dust, moisture, oil). Ranges of up to 50 m can be achieved.



Color sensing

Sensors for color recognition detect objects based on their color. The sensor is calibrated so that it recognizes objects having a certain color. Objects with different colors do not generate a switching signal.

Fiber optics

Optical conductors are made of glass or plastic with a diameter of as little as 50 µm and bunched in bundles of several hundred individual fibers to form so-called fiber optics. The fiber ends are ground and polished to meet the quality criteria of the optical industry.
The individual fibers are coated with a very thin layer of lubricant. This reduces friction against the outer jacket and between the fibers, so that broken fibers are prevented even when the cable is continuously flexed. The transmission properties are guaranteed over a longer period of time.
The ends of the bundles are potted with the connection sleeve and the jacket. Balluff fiber optics thus have an IP 67 rating (IP 65 for metal jacket).Moisture and aggressive media cannot hurt either the fibers or the slide coating, so the optical properties remain unaffected.
This design distributes axial pull forces evenly over all the fibers and protects the individual fibers from excessive pull loads



Polyurethane jacket

- Temperature T = +85 °C
- Excellent chemical resistance
- Flexible
- No embrittlement from oils and cooling emulsions.

Metal corrugated tube, silicon jacketed

- Temperature T = +150 °C
- Highly flexible
- Crush-resistant
- Can be sterilized.

Metal jacket

- Temperature T = +150 °C
- Resistant to hot chips
- Flexible
- Crush-resistant

Focusing

To achieve a smaller light spot, the light beam from the emitter is focused using lenses. Focusing and the resulting light spot allow the switch to better detect small parts and details.
Focusing is often used with retroreflective sensors, as well as with diffuse sensors, and in conjunction with background suppression.

Ambient light ...

... is the portion of light which is picked up by the receiver, but does not originate from the emitter.

Fork sensor

Fork sensors are through-beam designs in which the emitter and receiver are arranged opposing in a U-shaped housing. The fixed housing makes alignment and the electrical connection easier. Different ranges are available by selecting different housing configurations. Slot openings of between 5 and 220 mm in various step sizes are available. The built-in potentiometer and diaphragms allow you to adjust the fork sensors easily for detecting parts down to a diameter of 60 mm.

Gray scale shift

Gray scale shift is the switching distance difference when calibrating using different object reflectivities. The sensor is calibrated for a distance using a Kodak gray card with 90 % Reflexion. A Kodak gray card having 18 % Reflexion is used and the resulting distance measured. The difference between these two switchpoints in % is referred to as the gray scale shift. The smaller the gray scale shift the less color-dependent the sensor will be.

Light switching
per DIN 44030

Light receiver	**Amplifier**	**Consumer**
illuminated	conducting	switched on
non-illuminated	non-conducting	switched off

Background suppression (background suppression)

Background suppression allows objects within a certain switching distance to be detected without being affected by a reflecting background and virtually independent of object reflectivity (color or surface texture).
Background suppression is realized by allowing the beam cones of the emitter and receiver to intersect. This results in a division of the field of view into an active area and the background. In addition, by dividing the receiver into at least two adjacent areas (e. g. by using a dual diode or a PSD element) and by means of a geometric arrangement (triangulation), the actual position of the object within the sensing range can be determined. These two design features allow the object to be reliably distinguished from the background. Diffuse sensors with background suppression are characterized by low gray scale shift and hysteresis.

Hysteresis H ...

...is the distance between the switchpoints for a target approaching and then receding from a photoelectric switch.

Kodak gray card

The “standard target” for photoelectric sensors is the Kodak gray card. This is a cardboard sheet whose surface has a defined degree of reflectivity. The side with 90 % reflection is used for determining the range of diffuse sensors, and the side with 18 % for determining the gray scale shift.

Correction factors (for diffuse types)

For objects with varying reflection characteristics, the range can be determined by using the correction factors shown. See the adjacent table.

Correction factor	Object, surface
1	Paper, white, matte 200 g/m²
1.2...1.6	Metal, shiny
1.2...1.8	Aluminum, black anodized
1	Styrofoam, white
0.6	Cotton fabric, white
0.5	PVC, gray
0.4	Wood, rough
0.3	Cardboard, black, shiny
0.1	Cardboard, black, matte

Short circuit protection

The output leads can be connected to the wrong potential without destroying the sensor. Together with their polarity reversal protection, these sensors are completely protected against miswiring.

Lasers, laser class

The purpose of laser protection classes is to protect persons from laser radiation by specifying limit values. Based on this, the lasers used are classified according to a scale reflecting the degree of hazard.
The calculations and associated limit values for the classification are described in EN 60825-1:2001-11. The grouping is based on a combination of output power and wavelength, taking into account emission duration, number of pulses and angle extension.

Balluff sensors operate in the following laser protection classes

Class 1: harmless, no protective measures necessary
Class 2: low power, eyelid reflex is sufficient protection. For devices in Class 2 the eye protects itself from looking too long into the beam through the eyelid reflex. Appropriate warning labels must be affixed to the device and in some cases to the machine in which the laser is used. No other mechanical or optical protection measures are required. When using devices from class 1 and 2, no person responsible for laser protection needs to be present.

Light as a sensor medium ...

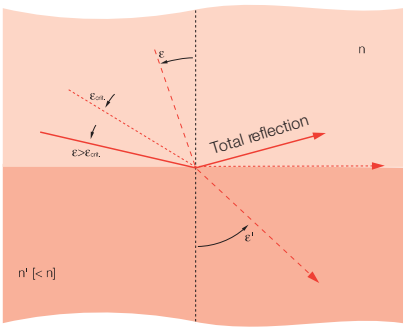
...is used in numerous areas of technology and in everyday life in controlling applications. Generally a change in the light intensity in an optical beam (between emitter and receiver) caused by a target object is evaluated. Depending on the properties of this object and the characteristics of the optical beam, the light beam is either interrupted or reflected, or even scattered. Pulsed infrared LED's are normally used as the emitter, and phototransistors as the receiver. The output signal is for the most part independent of the ambient light conditions, since visible light can be easily filtered out.
In critical sensing applications, diffuse sensors or through-beam systems with red light LED's are used, since the light beam and the sensing point can be visually seen and more easily adjusted. Balluff offers three sensor types for the various application requirements: diffuse, retroreflective, and through-beam sensors.

Light refraction

Light beams experience a change in direction at the surfaces of two optical media with differing optical density (e. g. glass/air), i. e. they are refracted.
The degree of refraction is dependent on the quotients of the optical densities **n** of both media and on the angle of incidence ε to the optical axis.

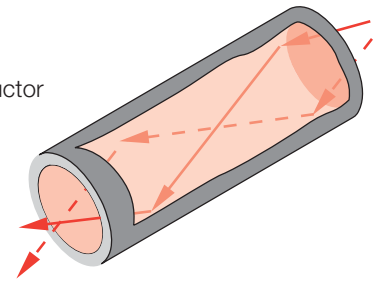
$$\sin \varepsilon' = \frac{n}{n'} \sin \varepsilon$$

If a light beam travels from a dense medium **n** into a thinner one **n'**, its course there will show a greater angle ε'. Above $\varepsilon_{crit.}$ (critical angle, at which the deflected beam runs parallel to the boundary layer), however, it re-enters the medium with density **n**, i. e. here there is total reflection.



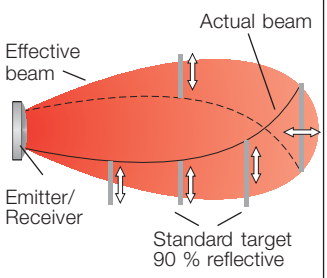
Light transmission by total reflection

Without the total reflection at boundary layers described above, fiber optics of today's quality would not be feasible. They consist of a cylindrical, light-conducting core and a surrounding thin-wall jacket. The optical density **n** of the core is greater than that of the jacket. A light beam is always completely reflected at the junction between core and jacket, and can therefore never leave the core in a radial direction. Theoretically the light is not weakened by these reflections; however, contamination and small defects both in the core material as well as the boundary layer do cause losses (attenuation) and effectively limit the conductor length over which reliable information can be propagated.



Diffuse

With diffuse types the emitter and receiver are integrated into a single housing. Orientation to the target is not critical.
A target object (e. g. a standard target which is 90 % reflective) bounces a part of the light from its surface back to the receiver. Once the standard target enters the effective beam (see illustration), a change in the output switching state occurs.
The sensing distance depends upon size, shape, color and surface characteristics of the reflecting target object.
Using a Kodak gray card with 90 % reflectivity (like white paper), distances of up to 2 m can be obtained.



Max. **humidity ...** ... is 35...85 % (non-condensing).

Luminescence

To locate invisible marks on objects, so-called luminescent materials (contained in special chalks, inks, paints etc.) are used which can only be made visible under ultraviolet (UV) light. The fluorescent materials convert the invisible UV light (short wavelength, here 380 nm) into visible light (between blue 450 nm and dark red 780 nm). This effect is called photoluminescence. The visible light can then be detected as usual by the receiver component of the sensor.

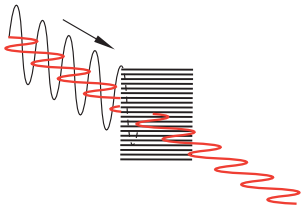
Polarizing filters

When do you need them?

A part of the emitter light in retroreflective systems is reflected directly back to the receiver from target objects with shiny surfaces, e. g. stainless steel, aluminum or tinplate. Simple retroreflective systems can thus not reliably distinguish reflected „object light“ from „reflector light“. False switching can therefore not be ruled out. Balluff retroreflective sensors are available with **polarizing filters,** which together with a **Balluff reflector,** an **“optically active” prism** mirror, provide a selective barrier against the reflected “object light” while still allowing the “reflector light” to pass freely.

How do they work?

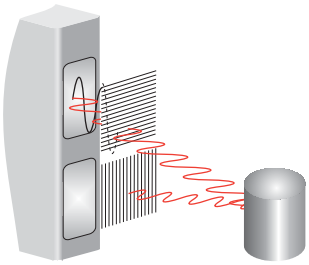
Light consists of a number of „single beams“, all of which oscillate sinusoidally around their propagation axes. Their polarization planes are, however, independent of each other and can assume any angle orientation (see figure). When they meet a polarizing filter (fine grid lines), only the beams oscillating parallel to the grid plane are allowed to pass, and those oscillating at right angles to the grid are canceled out. Of all the other polarization planes, only the portion which consists of parallel components is allowed to pass.



... for blocking reflected light

Behind the filter, the light only oscillates parallel to the polarization plane. For this light, an additional 90° rotated polarizing filter becomes an impassable barrier.

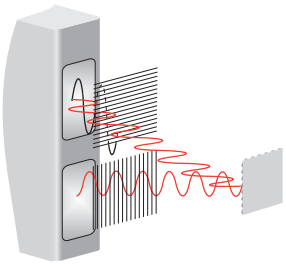
With a 90° rotated polarizing filter in front of both the emitter and receiver of a retroreflective system, you can therefore prevent the reflected light of a reflecting target object from falsely triggering the signal of the photo-receiver.



... for reliable detection of reflecting target objects

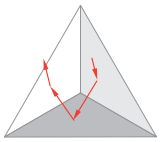
On the other hand, the light reflected from the triple mirror, with its polarization plane rotated by 90° as described above, is allowed to pass unhindered by this filter.

The receiver of a retro-reflective system is thereby fully shielded even when a reflecting target object enters the beam, so that the object is still reliably detected.



Reflectors
Optically active triple mirrors

The two-dimensional principle of retroreflection described above can be carried over to a spatial system with three mirrors which are oriented at right angles to each other (one corner of a cube standing on its point). A light beam entering this system is totally reflected by all three surfaces and exits parallel to the incident beam.
Triple mirrors are said to be **"optically active"**, because they also rotate the polarization level of the reflected light beam by 90°.
This characteristic is needed – together with a **polarizing filter** (see page **2.0.**20) – to provide reliable detection of reflecting objects using retroreflective sensor systems.



Six triple-mirrors are combined into a hexagon and arranged in honeycomb fashion. Their orientation with respect to the light beam is then totally unproblematic.

These are generally made of plastics with high optical density, injected as sheets or pressed into flexible tape.



Reflection
What is it?

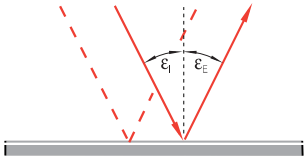
Light beams extend to a straight line in free space. Upon striking an object, they are reflected.

Depending on the surface composition of the object, one of three types of reflection occurs: total reflection, retroreflection, and diffuse reflection.

Total reflection ...

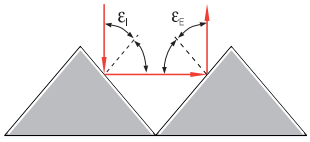
... occurs with a highly shiny (reflecting) surface. The angle of incidence of a light beam is thereby the same as the angle of reflection ($\varepsilon_I = \varepsilon_E$).

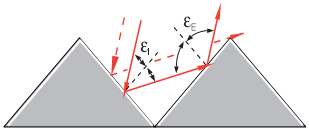
The reflection losses are in the ideal case negligible.



Retroreflection ...

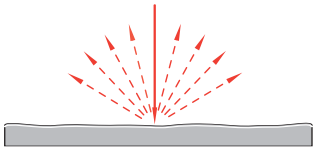
... is caused by two mirrors at vertical angles to each other. The double reflection causes a light beam to be bounced back in the same direction.
The angle of incidence can thus be altered in a relatively wide range.





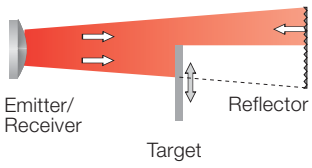
Diffuse reflection ...

... occurs with an uneven and rough surface. It can be demonstrated with a variety of poorly-reflecting and differently-aligned miniature mirrors.
Incidental light is widely „scattered" from such a surface. The reflection losses are higher the darker and more matte finished the surface is.
Diffuse sensors, for example, detect diffuse reflecting light from target objects.



Retroreflective

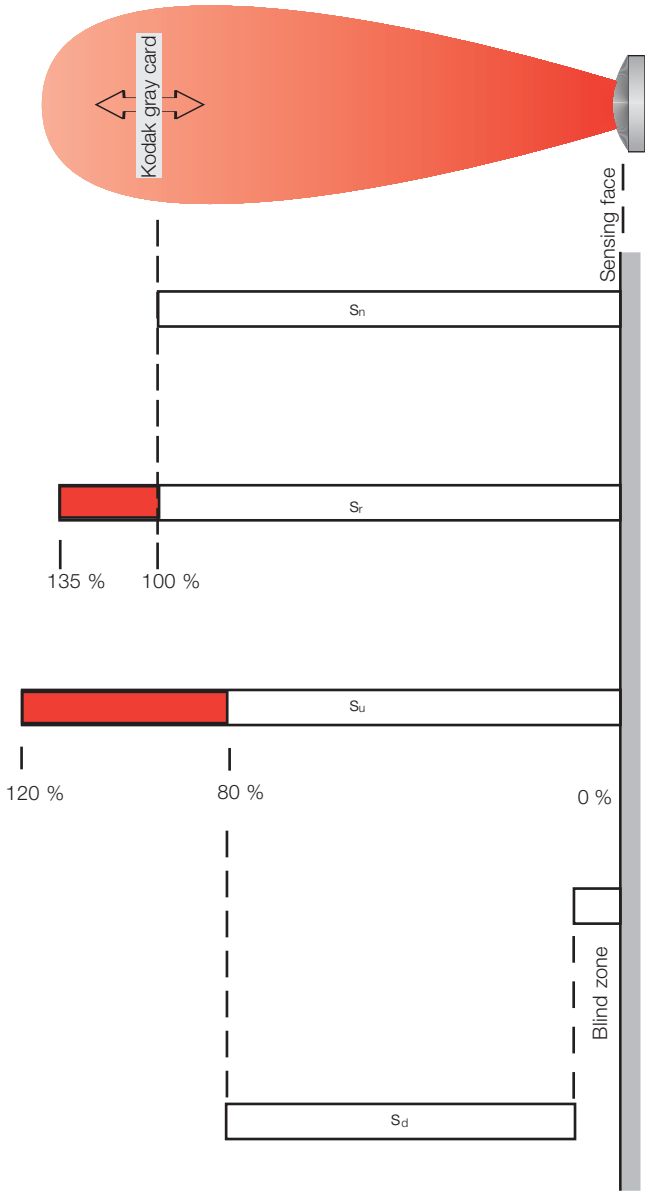
Retroreflective types have the emitter and receiver integrated into a single housing.A reflector on the opposite side of the beam bounces the emitter's light back to the receiver.
A target object interrupts the reflected light beam and causes a change in the output signal.
With reflective surfaces it is recommended that the light reflected from the object be filtered out using a polarizing filter in front of the receiver, in order to prevent any possible fault signals.



Switching distance

Switching distance s ...

... is the distance between the target plate and the „sensing face“ of the diffuse sensor when the signal changes (as per EN 60947-5-2).



Rated-switching distance s_n ...

... is a switching distance parameter which ignores manufacturing tolerances, random variance, and external influences like temperature and voltage.

Actual switching distance s_r ...

... is the switching distance at rated voltage U_e taking into account manufacturing tolerances at rated ambient temperature (T = +23 °C ±0.5).

Useful switching distance s_u ...

... is the permissible switching distance within specified voltage and temperature ranges ($0.80\ s_n \leq s_u \leq 1.20\ s_n$).

Blind zone ...

... is the area between the "sensing face" and minimum switching distance, within which an object cannot be detected.

Detection range s_d ...

... is the area within which the switching distance of a photoelectric switch can be set using a standard target.

Emitter light

Optical sensors generally use the following emitter components:

Red light-LED
Visible light, good as an alignment aid and for sensor adjustment.

Infrared-LED (IR)
Invisible beam with high energy.

Red light laser
Visible light whose physical properties make it ideal for small parts detection and long ranges.

Teach-in

Sensor settings on teach-in sensors do not have to be made using a potentiometer or slide switches; everything is controlled with the push of a button. The microcontroller integrated into teach-in sensors allows the entire setup sequence to be controlled by pressing the button. The use of defined calibration steps also means that the sensor cannot be calibrated for an unreliable zone. The microcontroller also assumes control of the contamination indicator and the contamination output. A variety of Balluff teach-in sensors also provide the option of remote operation, whereby the teach-in calibration process is initiated “externally” through a cable line.

Technical Data, general

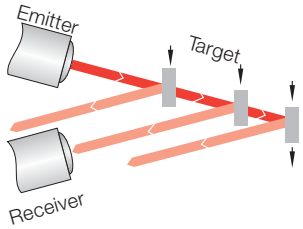
	Diffuse					Background suppression			Retroreflective			Through-beam			
Rated operating distance s_n	100 mm	200 mm	400 mm	1 m	2 m	120 mm	250 mm	1.1 m	2 m	4 m	8 m	5 m	8 m	16 m	50 m
Actual switching distance (in % of s_n)	125	125	125	135	150	135	135	135	150	150	150	150	150	150	150
Switching hysteresis (in %)	≤ 20	≤ 20	≤ 25	≤ 15	≤ 15	≤ 1	≤ 1	≤ 1	≤ 10	≤ 10	≤ 10	≤ 15	≤ 15	≤ 15	≤ 15
Ø of the response beam at s_n/2 typ. (mm)	20	25	150	300	300	6	10	25	50	100	150				
Ø of the active area (mm)												8	12	12	20

Temperature drift ... ... is the switchpoint shift with changing temperature in % of s_r.

The **test input ...** (for series BOS 15, BOS 25, BOS 36, BOS 65, BOS 74) ... for the emitter interrupts the light pulses from the emitter and allows the function of emitter and receiver to be checked. When using Test+, Test– must be at 0 V, when using Test–, Test+ must be at 10...30 V. The receiver output must switch each time when a voltage of 10...30 V DC (Test+) or 0 V (Test–) is present on the test input. Contamination or maladjustment of the optical axis causes the emitter signal to reach the receiver only weakly, if at all. Therefore the output will not switch even though the test input is activated. The test function provides a remote check of the through-beam type and serves as a preventative measure.

Transmission ... ... is a measure for the lights transmission ability of a medium. It is defined as the ratio of:
– passed to
– entering light (in %).
Diffuse transmission is the term which is used when the light is partially or completely diffused.

In **triangulation ...** ... the light cones of a through-beam system intersect each other at a narrow angle. A target object will **only be registered in the area** where the cones overlap.
The emitter light which is reflected or diffused from objects outside this limited zone cannot be registered by the photo-receiver. With this triangulation method relatively small distance changes (e.g. grooves, shaft recesses) are identified. Color and shape of the object have very little effect on the registration.



Ambient operating temperature ... ... is the temperature range within which reliable operation of the photoelectric switch is guaranteed. Balluff standard:
$-15\ °C \leq T_a \leq +55\ °C$

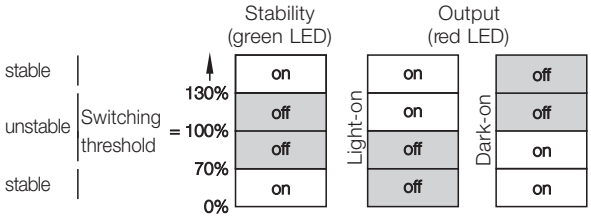
Polarity reversal protection The supply voltage leads can be reversed without destroying the sensor. In combination with the short circuit protection, these sensors are completely protected against miswiring.

Contamination ... (influence on the sensing range) ... reduces the indicated sensing range of sensors and fiber optics as compared with „pure air“, because the dirt and dust particles:
– accumulate on the lenses and impair their light transparency,
– absorb and scatter light in the beam path.
An oil-free source of compressed air can be used to prevent the effects of dirt and contamination due to impure air.

The **contamination indicator (green) ...** (for series BOS 15, BOS 18 (some), BOS 25, BOS 65, BOS 74)

... illuminates in the „safe“ range, where the input energy is at least 30 % over or under the „threshold energy“.
The “threshold energy”, at which a signal change on the output is triggered, is defined as 100 %.
The “safe” range is therefore reached when:

– the input signal is at **130 %** or more of the threshold energy
– the input signal is at **70 %** or less than the threshold energy.

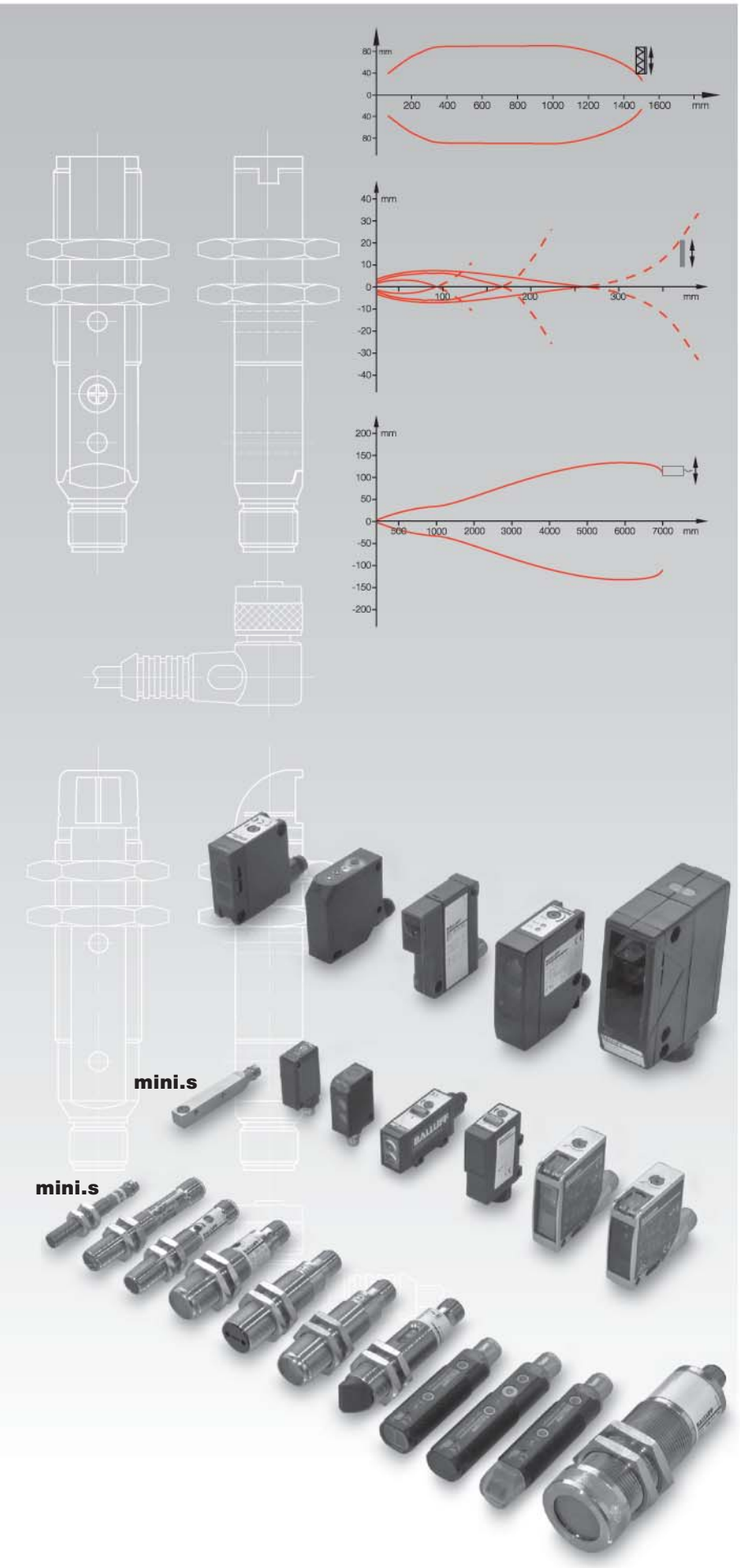


Contamination scale

Pure air	Ideal conditions
Trace contamination	Relatively clean air in indoor rooms
Slight contamination	Tool and storage rooms
Moderate contamination	Dusty and vaporous environment Switching distance reduced by a factor of $s = 0.5\ s_u$
High contamination	Heavy precipitations, swirling flakes and chips Photoelectric sensor function may fail
Highest contamination	Coal dust precipitating on the lens Photoelectric sensor function may fail

Resistance

to mechanical impact per EN 60068-2-27	Pulse shape: half-sine Peak acceleration: 300 $\frac{m}{s^2}$ (30 g_n) Pulse duration: 11 ms	3 shocks per main axis and direction, for a total of 18 shocks
to continuous shock per EN 60068-2-29	Pulse shape: half-sine Peak acceleration: 1000 $\frac{m}{s^2}$ (100 g_n) Pulse duration: 2 ms	4,000 shocks per main axis and direction, i. e. 24,000 shocks in total
to mechanical vibration per EN 600068-2-6	Frequency range: 10...2000 Hz Amplitude: 1 mm (peak-to-peak) to 122 Hz 30 g_n above 122 Hz	Duration: 20 for each position and direction



Photoelectric Sensors – Standard

Round style
2.1.2 **BOS 08M**
M8 Metal
2.1.6 **BOS 12M**
M12 Metal
2.1.16 **BOS 18M**
M18 Metal
with potentiometer
tough
with teach-in
Laser
with AC voltage
with angled head
2.1.46 **BOS 18E**
M18 stainless steel
2.1.52 **BOS 18KF**
M18 plastic
Laser
2.1.70 **BOS 18KW**
M18 plastic
with angled head
Laser
2.1.84 **BOS 18K(R)**
M18 plastic
2.1.92 **BOS 30M**
M30 metal

Cube style
2.1.96 **BOS Q08M**
mini.s
2.1.100 **BOS 2K**
mini.s
2.1.110 **BOS 5K**
mini.s
with potentiometer
2.1.118 **BOS 6K**
mini.s
with teach-in
Laser
2.1.130 **BOS 15K**
2.1.136 **BOS 21M**
Laser
2.1.148 **BOS 26K**
Laser
2.1.156 **BOS 36K**
2.1.162 **BOS 65K**

The new dimension from Balluff – small in size, big in performance

Miniaturization in the Balluff line continues at full pace. The new Opto-mini.s BOS 08M sensors stand out with ease of handling and fixed sensing distances and ranges.

This sensor family includes diffuse sensors in tubular M8 housing, retroreflective and through-beam sensors.

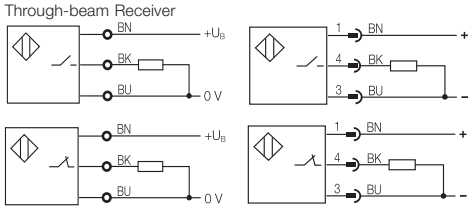
These small photoelectric sensors open up possibilities in high-dynamic applications such as on robot gripper arms. Here is where components with the lightest weight, a small footprint and yet the greatest switching precision are demanded.

In short: The new BOS 08M are small, tough, flexible and economical.

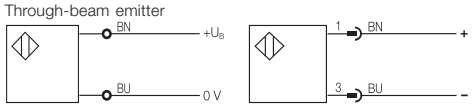


Wiring diagrams

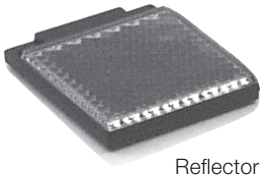
Diffuse, Retroreflective,
Through-beam Receiver



Through-beam emitter



Recommended accessories
please order separately



Reflector
BOS R-9



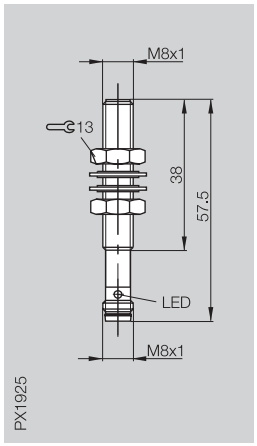
Connector
BKS-_ 48/BKS-_ 49

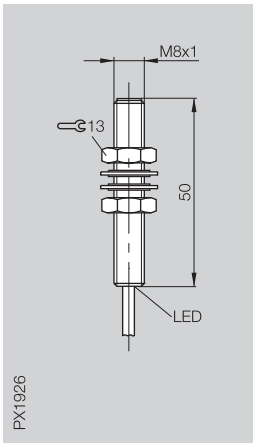
Type	Sensing distance/ range	Light type		Output		Output function		Switching frequency	U_B	Connection		Special features		Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 3-pin	Cable	Polarizing filter		
Diffuse														
BOS 08M-PS-RD11-S49	0...55 mm	■		■		■		500 Hz	■	■				**2.1.**4
BOS 08M-PO-RD11-S49	0...55 mm	■		■			■	500 Hz	■	■				**2.1.**4
BOS 08M-PS-RD11-02	0...55 mm	■		■		■		500 Hz	■		■			**2.1.**4
BOS 08M-PO-RD11-02	0...55 mm	■		■			■	500 Hz	■		■			**2.1.**4
Retroreflective														
BOS 08M-PS-PR11-S49	25...550 mm	■		■			■	500 Hz	■	■		■		**2.1.**4
BOS 08M-PO-PR11-S49	25...550 mm	■		■		■		500 Hz	■	■		■		**2.1.**4
BOS 08M-PS-PR11-02	25...550 mm	■		■			■	500 Hz	■		■	■		**2.1.**5
BOS 08M-PO-PR11-02	25...550 mm	■		■		■		500 Hz	■		■	■		**2.1.**5
Through-beam														
BOS 08M-PS-RE10-S49	0...1.1 m	■		■			■	500 Hz	■	■				**2.1.**5
BOS 08M-PO-RE10-S49	0...1.1 m	■		■		■		500 Hz	■	■				**2.1.**5
BOS 08M-PS-RE10-03	0...1.1 m	■		■			■	500 Hz	■		■			**2.1.**5
BOS 08M-PO-RE10-03	0...1.1 m	■		■		■		500 Hz	■		■			**2.1.**5
BOS 08M-X-RS10-S49	0...1.1 m	■							■	■				**2.1.**5
BOS 08M-X-RS10-03	0...1.1 m	■							■		■			**2.1.**5

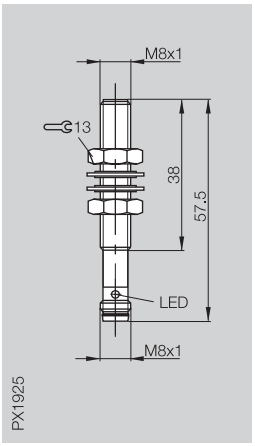
2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
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BOS 08M
Sensing distance 55 mm
Range 550 mm

Diffuse	Sensing distance	**0...55 mm**	**0...55 mm**		
Retroreflective	Range			**25...550 mm**	
Through-beam	Range				

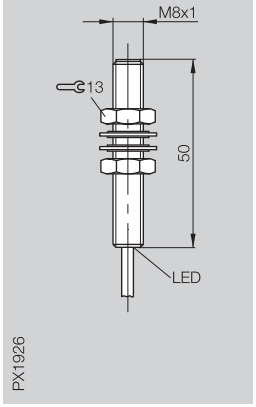
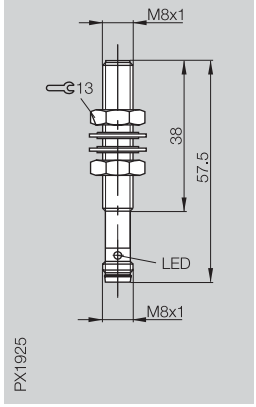
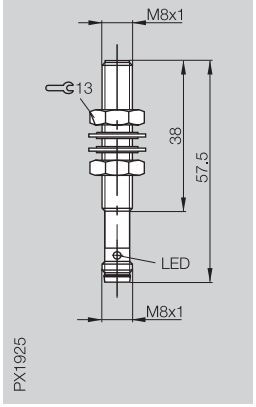
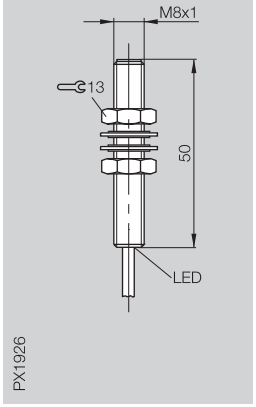
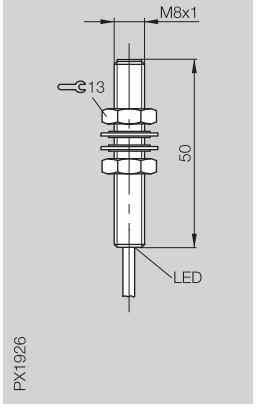






Diffuse					
PNP, NO	55 mm		BOS 08M-PS-RD11-S49	BOS 08M-PS-RD11-02	
PNP, NC	55 mm		BOS 08M-PO-RD11-S49	BOS 08M-PO-RD11-02	
Retroreflective					
PNP, NO	550 mm	polarizing filter			BOS 08M-PS-PR11-S49
PNP, NC	550 mm	polarizing filter			BOS 08M-PO-PR11-S49
Through-beam					
PNP, NO	1.1 m	Receiver			
PNP, NC	1.1 m	Receiver			
	1.1 m	Emitter			
Electrical data					
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC
Ripple			10 %	10 %	10 %
No-load supply current I_0 max.			20 mA	20 mA	20 mA
Switching output			PNP-Transistor	PNP-Transistor	PNP-Transistor
Output current			100 mA	100 mA	100 mA
Switching type			Light- or dark-on	Light- or dark-on	Light- or dark-on
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V	≤ 2 V
Settings			fixed	fixed	fixed
Optical data					
Recommended sensing distance/range			0...50 mm	0...50 mm	25...550 mm
Emitter, light type			LED, red light	LED, red light	LED, red light
Wavelength			640 nm	640 nm	640 nm
Indicators					
Light reception indicator			LED yellow	LED yellow	LED yellow
Output function indicator					
Time data					
Response time			1 ms	1 ms	1 ms
Switching frequency f			500 Hz	500 Hz	500 Hz
Mechanical data					
Dimensions			M8×57.5 mm	M8×50 mm	M8×57.5 mm
Connection			M8 connector, 3-pin	2 m cable, PUR	M8 connector, 3-pin
No. of wires × cross-section				3×0.14 mm²	
Housing material			Nickel plated brass	Nickel plated brass	Nickel plated brass
Optical surface			PMMA	PMMA	PMMA
Weight			13 g	47 g	13 g
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	IP 67
Polarity reversal protected			yes	yes	yes
Short circuit protected			yes	yes	yes
Ambient temperature range T_a			–10...+60 °C	–10...+60 °C	–10...+60 °C
Ambient light rejection per			EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R9 reflector.

	25...550 mm	**0...1.1 m**	**0...1.1 m**	**0...1.1 m**	**0...1.1 m**
					
	BOS 08M-PS-PR11-02 BOS 08M-PO-PR11-02				
		BOS 08M-PS-RE10-S49 BOS 08M-PO-RE10-S49		BOS 08M-PS-RE10-03 BOS 08M-PO-RE10-03	
			BOS 08M-X-RS10-S49		BOS 08M-X-RS10-03
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %	10 %
	20 mA	15 mA	15 mA	15 mA	15 mA
	PNP-Transistor	PNP-Transistor		PNP-Transistor	
	100 mA	100 mA		100 mA	
	Light- or dark-on	Light- or dark-on		Light- or dark-on	
	≤ 2 V	≤ 2 V		≤ 2 V	
	fixed	fixed	fixed	fixed	fixed
	25...500 mm	0...1 m	0...1 m	0...1 m	0...1 m
	LED, red light		LED, red light		LED, red light
	640 nm		640 nm		640 nm
	LED yellow				
		LED red		LED red	
	1 ms	1 ms		1 ms	
	500 Hz	500 Hz		500 Hz	
	M8×50 mm	M8×57.5 mm	M8×57.5 mm	M8×50 mm	M8×50 mm
	2 m cable, PUR	M8 connector, 3-pin	M8 connector, 3-pin	3 m cable, PUR	3 m cable, PUR
	3×0.14 mm²			3×0.14 mm²	2×0.14 mm²
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	PMMA	PMMA	PMMA	PMMA	PMMA
	47 g	13 g	13 g	47 g	47 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

One feature stands out in all these ingenious designs: **Simplicity.**

Series **BOS 12M** represents a radical simplification of sensor technology for the most common applications.

All the sensors are enclosed in the same housing as a typical inductive proximity switch (M12×1). This means **photoelectric sensors and inductive proximity switches are mechanically and electrically compatible!**
As for mounting, there is no simpler concept for sensors than a bore hole.

This brings simplification to the design of the system or machine, makes conversions of the sensing principle easier while using **multi-use of the accessories** to reduce inventory. That means **standardization and simplification** of the sensors. Series BOS 12M in the tough metal housing is fully potted, with an enclosure rating of IP 67.

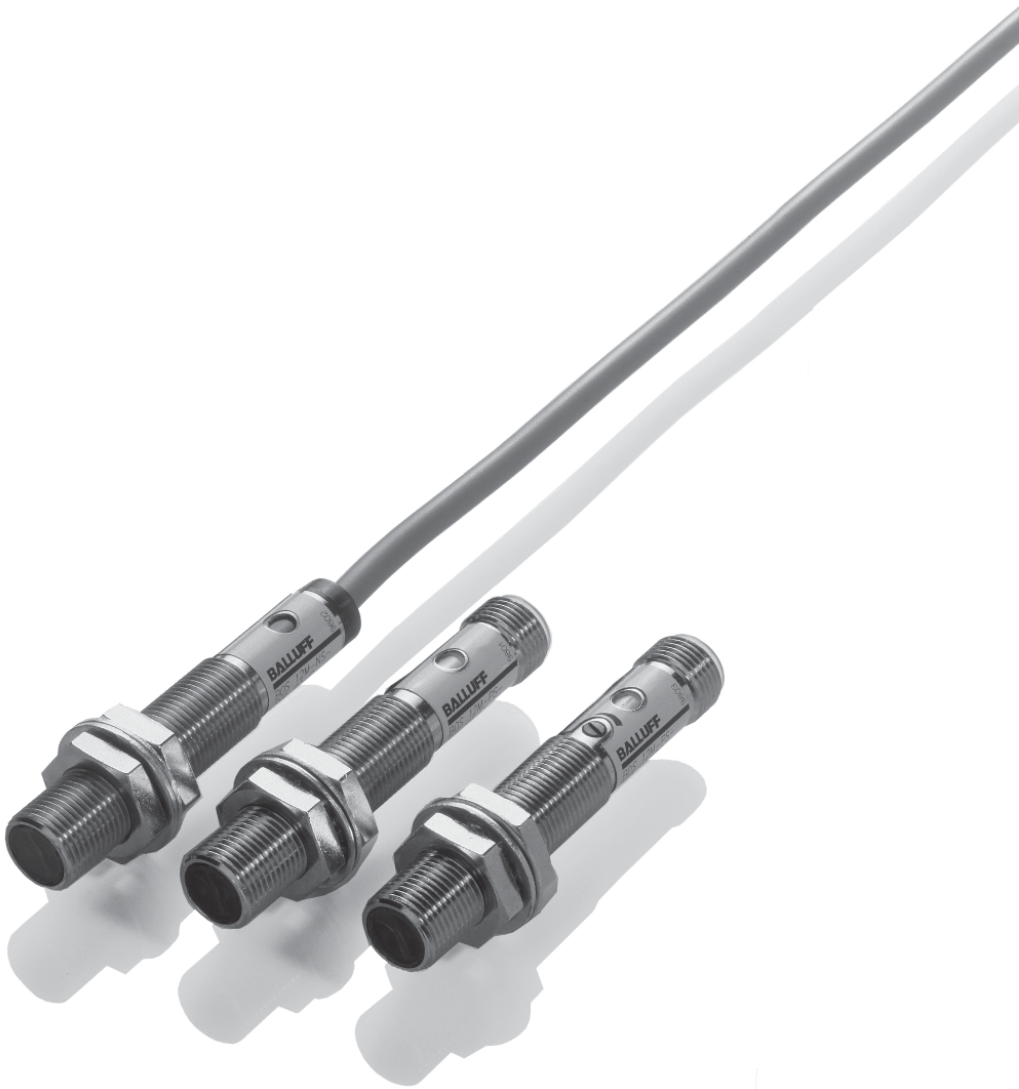
There is a new laser through-beam model available in 2 versions. For long range or small parts detection.

Features

- Supply voltage 10...30 V DC, polarity reversal protected
- Function indicator for the output
- Degree of protection IP 67
- Standard (M12×1) metal housing
- Red and infrared light versions
- Fixed and adjustable sensitivity
- PNP or NPN, light switching or dark switching
- Cable and connector versions (M12 connector)

Applications

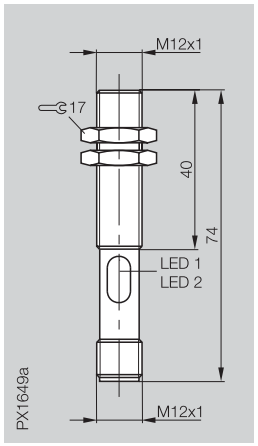
- General automation tasks
- Assembly and handling
- Machine tools
- Packaging
- Robots
- Machine tool building

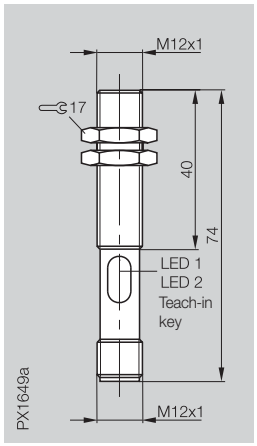


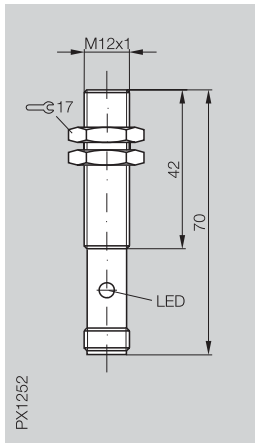
Type	Sensing distance/ range	Light type			Output		Output function		Switching frequency	U_B	Connection		Features		Page
		Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable, 3 m	Polarizing filter	Teach-in	
Diffuse with HGA															
BOS 12M-PS-1N1I-S4-C	0...24 mm	■			■		■		1 kHz	■	■				**2.1.**8
BOS 12M-PU-1HA-S4-C	10...60 mm	■			■		■	■	1 kHz	■	■			■	**2.1.**8
Diffuse															
BOS 12M-PS-1YA-S4-C	1...100 mm	■			■		■		200 Hz	■	■				**2.1.**8
BOS 12M-PO-1YA-S4-C	1...100 mm	■			■			■	200 Hz	■	■				**2.1.**8
BOS 12M-PS-1YA-B0-C-03	1...100 mm	■			■		■		200 Hz	■		■			**2.1.**9
BOS 12M-PO-1YA-B0-C-03	1...100 mm	■			■			■	200 Hz	■		■			**2.1.**9
BOS 12M-PS-1YB-S4-C	1...200 mm	■			■		■		200 Hz	■	■				**2.1.**9
BOS 12M-PO-1YB-S4-C	1...200 mm	■			■			■	200 Hz	■	■				**2.1.**9
BOS 12M-PS-1YB-B0-C-03	1...200 mm	■			■		■		200 Hz	■		■			**2.1.**9
BOS 12M-PO-1YB-B0-C-03	1...200 mm	■			■			■	200 Hz	■		■			**2.1.**9
BOS 12M-PS-1PD-S4-C	1...400 mm		■		■		■		200 Hz	■	■				**2.1.**9
BOS 12M-PO-1PD-S4-C	1...400 mm		■		■			■	200 Hz	■	■				**2.1.**9
BOS 12M-PS-1PD-B0-C-03	1...400 mm		■		■		■		200 Hz	■		■			**2.1.**9
BOS 12M-PO-1PD-B0-C-03	1...400 mm		■		■			■	200 Hz	■		■			**2.1.**9
Retro-reflective															
BOS 12M-PS-1QA-S4-C	0...1,5 m	■			■			■	200 Hz	■	■		■		**2.1.**10
BOS 12M-PO-1QA-S4-C	0...1,5 m	■			■		■		200 Hz	■	■		■		**2.1.**10
BOS 12M-PS-1QA-B0-C-03	0...1,5 m	■			■			■	200 Hz	■		■	■		**2.1.**10
BOS 12M-PO-1QA-B0-C-03	0...1,5 m	■			■		■		200 Hz	■		■	■		**2.1.**10
Through-beam															
BLE 12M-PA-1PD-S4-C	0...5 m	■			■		■	■	500 Hz	■	■				**2.1.**11
BLE 12M-PA-1PD-B0-C-03	0...5 m	■			■		■	■	500 Hz	■		■			**2.1.**11
BLS 12M-XX-1RD-S4-L	0...5 m	■								■	■				**2.1.**11
BLS 12M-XX-1RD-B0-L-03	0...5 m	■								■		■			**2.1.**11
Laser Through-beam															
BOS 12M-PA-LE10-S4				■	■		■	■	1 kHz	■	■				**2.1.**13
BOS 12M-PA-LE10-03				■	■		■	■	1 kHz	■		■			**2.1.**13
BOS 12M-NA-LE10-S4				■		■	■	■	1 kHz	■	■				**2.1.**13
BOS 12M-NA-LE10-03				■		■	■	■	1 kHz	■		■			**2.1.**13
BOS 12M-XT-LS11-S4	0...3 m			■						■	■				**2.1.**15
BOS 12M-XT-LS11-03	0...3 m			■						■		■			**2.1.**15
BOS 12M-XT-LS12-S4	0...30 m			■						■	■				**2.1.**15
BOS 12M-XT-LS12-03	0...30 m			■						■		■			**2.1.**15

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2.3 Photoelectric sensors accessories page 2.3.2 ...
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Diffuse with background suppression	Sensing distance	**0...24 mm**	**10...60 mm**	
Diffuse	Sensing distance			**1...100 mm**



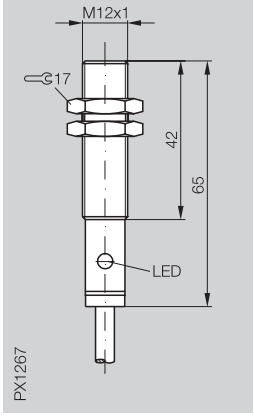
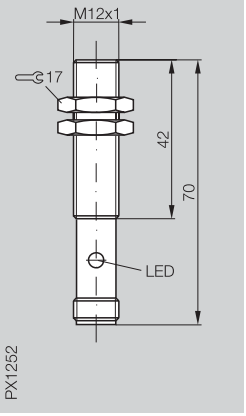
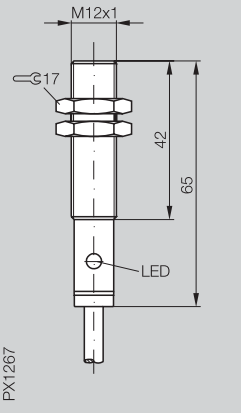
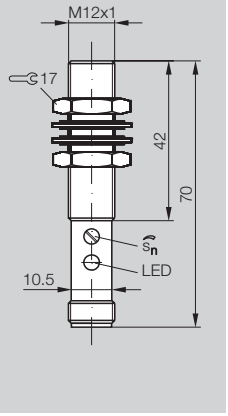
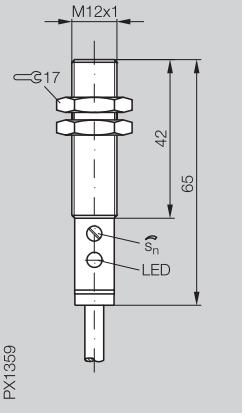




Diffuse			
PNP 24 mm HGA	BOS 12M-PS-1N1I-S4-C		
PNP 10...60 mm HGA, Teach-in		BOS 12M-PU-1HA-S4-C	
PNP 100 mm			BOS 12M-PS-1YA-S4-C
PNP 100 mm			BOS 12M-PO-1YA-S4-C
PNP 200 mm			
PNP 200 mm			
PNP 400 mm			
PNP 400 mm			
Electrical data			
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Ripple	10 %	10 %	10 %
No-load supply current I_0 max.	≤ 25 mA	≤ 25 mA	≤ 20 mA
Switching output*	PNP-Transistor	PNP-Transistor	PNP-Transistor
Output current	100 mA	100 mA	≤ 200 mA
Switching type	Light-on	Light-/dark-on (selectable)	Light- or dark-on
Voltage drop U_d at I_e	≤ 2.4 V	≤ 2.4 V	≤ 2.5 V
Settings	fixed	Teach-in	fixed
Optical data			
Emitter, light type	LED, red light	LED, red light	LED, red light
Wavelength	660 nm	660 nm	660 nm
Light spot diameter	5×5 mm	5×5 mm at 50 mm	
Distance hysteresis (18 %/18 %)	≤ 5 %	≤ 5 %	
Gray value shift (90 %/18 %)	≤ 5 %	≤ 10 %	
Indicators			
Output function indicator	LED yellow	LED yellow	LED yellow
Stability indicator	LED green	LED green	
Time data			
Response time	0.5 ms	0.5 ms	2.5 ms
Switching frequency f	1 kHz	1 kHz	200 Hz
Mechanical data			
Dimensions	M12×74 mm	M12×74 mm	M12×70 mm
Connection	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
No. of wires × cross-section			
Housing material	Nickel plated brass	Nickel plated brass	Nickel plated brass
Optical surface	PMMA	PMMA	PMMA
Weight	30 g	30 g	30 g
Ambient data			
Degree of protection per IEC 60529	IP 67	IP 67	IP 67
Polarity reversal protected	yes	yes	yes
Short circuit protected	yes	yes	yes
Ambient temperature range T_a	–20...+60 °C	–20...+60 °C	–15...+55 °C
Ambient light rejection	5 kLux	5 kLux	5 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.

Wiring diagrams, characteristics and accessories see page **2.1.**12 and **2.1.**13.

	1...100 mm	1...200 mm	1...200 mm	1...400 mm	1...400 mm
					
	BOS 12M-PS-1YA-B0-C-03 BOS 12M-PO-1YA-B0-C-03	BOS 12M-PS-1YB-S4-C BOS 12M-PO-1YB-S4-C	BOS 12M-PS-1YB-B0-C-03 BOS 12M-PO-1YB-B0-C-03	BOS 12M-PS-1PD-S4-C BOS 12M-PO-1PD-S4-C	BOS 12M-PS-1PD-B0-C-03 BOS 12M-PO-1PD-B0-C-03
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %	10 %
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
	PNP-Transistor	PNP-Transistor	PNP-Transistor	PNP-Transistor	PNP-Transistor
	≤ 200 mA	≤ 200 mA	≤ 200 mA	≤ 200 mA	≤ 200 mA
	Light- or dark-on	Light- or dark-on	Light- or dark-on	Light- or dark-on	Light- or dark-on
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	fixed	fixed	fixed	Potentiometer 270°	Potentiometer 270°
	LED, red light	LED, red light	LED, red light	LED, infrared light	LED, infrared light
	660 nm	660 nm	660 nm	880 nm	880 nm
	LED yellow	LED yellow	LED yellow	LED yellow	LED yellow
	2.5 ms	2.5 ms	2.5 ms	2.5 ms	2.5 ms
	200 Hz	200 Hz	200 Hz	200 Hz	200 Hz
	M12×65 mm	M12×70 mm	M12×65 mm	M12×70 mm	M12×65 mm
	3 m cable, PVC	M12 connector, 4-pin	3 m cable, PVC	M12 connector, 4-pin	3 m cable, PVC
	3×0.34 mm²		3×0.34 mm²		3×0.34 mm²
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	PMMA	PMMA	PMMA	PMMA	PMMA
	136 g	30 g	136 g	30 g	136 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–15...+55 °C	–15...+55 °C	–15...+55 °C	–15...+55 °C	–15...+55 °C
	5 kLux	5 kLux	5 kLux	5 kLux	5 kLux

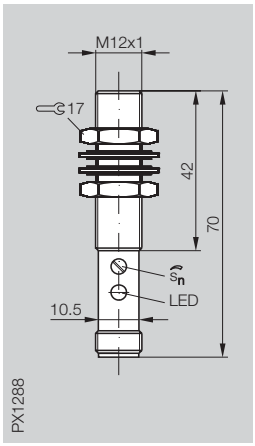
*Ordering example for NPN transistor:
BOS 12M-_ _ -1YA-S4-C

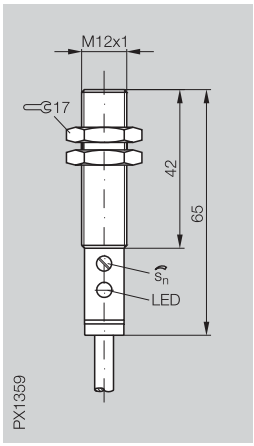
Output

NS NPN NO
NO NPN NC

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Retroreflective with polarizing filter	Range	**0...1.5 m**	**0...1.5 m**	
Through-beam	Range			

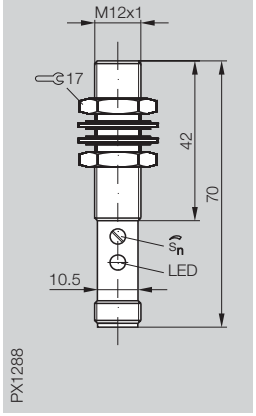
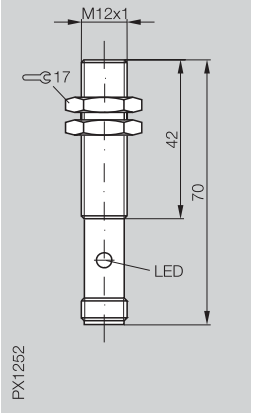
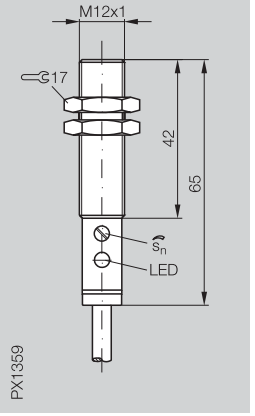
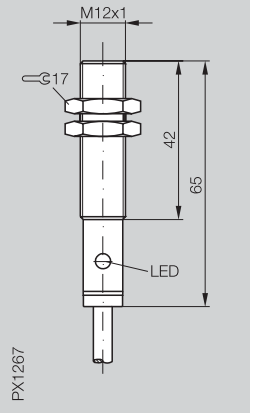




Retroreflective				
PNP	1.5 m	Polarizing filter	BOS 12M-PS-1QA-S4-C	BOS 12M-PS-1QA-B0-C-03
PNP	1.5 m	Polarizing filter	BOS 12M-PO-1QA-S4-C	BOS 12M-PO-1QA-B0-C-03
Through-beam				
PNP	5 m	Receiver		
	5 m	Emitter		
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			10 %	10 %
No-load supply current I_0 max.			≤ 20 mA	≤ 20 mA
Switching output			PNP-Transistor	PNP-Transistor
Output current			≤ 200 mA	≤ 200 mA
Switching type			Light- or dark-on	Light- or dark-on
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2.5 V
Settings			Potentiometer 270°	Potentiometer 270°
Optical data				
Emitter, light type			LED, red light	LED, red light
Wavelength			660 nm	660 nm
Indicators				
Power-on indicator				
Output function indicator			LED yellow	LED yellow
Time data				
Response time			2.5 ms	2.5 ms
Switching frequency f			200 Hz	200 Hz
Mechanical data				
Dimensions			M12×70 mm	M12×65 mm
Connection			M12 connector, 4-pin	3 m cable, PVC
No. of wires × cross-section				3×0.34 mm²
Housing material			Nickel plated brass	Nickel plated brass
Optical surface			PMMA	PMMA
Weight			30 g	136 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–15...+55 °C	–15...+55 °C
Ambient light rejection			5 kLux	5 kLux

Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**12 and **2.1.**13.

	0...5 m	**0...5 m**	**0...5 m**	**0...5 m**
				
	BLE 12M-PA-1PD-S4-C	BLS 12M-XX-1RD-S4-L	BLE 12M-PA-1PD-B0-C-03	BLS 12M-XX-1RD-B0-L-03
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
	PNP-Transistor		PNP-Transistor	
	≤ 200 mA		≤ 200 mA	
	Light- and dark-on		Light- and dark-on	
	≤ 2.5 V		≤ 2.5 V	
	Potentiometer 270°		Potentiometer 270°	
	LED, red light	LED, red light	LED, red light	LED, red light
	660 nm	660 nm	660 nm	660 nm
		LED green		LED green
	LED yellow		LED yellow	
	1 ms		1 ms	
	500 Hz		500 Hz	
	M12×70 mm	M12×70 mm	M12×65 mm	M12×65 mm
	M12 connector, 4-pin	M12 connector, 4-pin	3 m cable, PVC	3 m cable, PVC
			3×0.34 mm²	3×0.34 mm²
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	PMMA	PMMA	PMMA	PMMA
	30 g	30 g	136 g	136 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–15...+55 °C	–15...+55 °C	–15...+55 °C	–15...+55 °C
	5 kLux	5 kLux	5 kLux	5 kLux

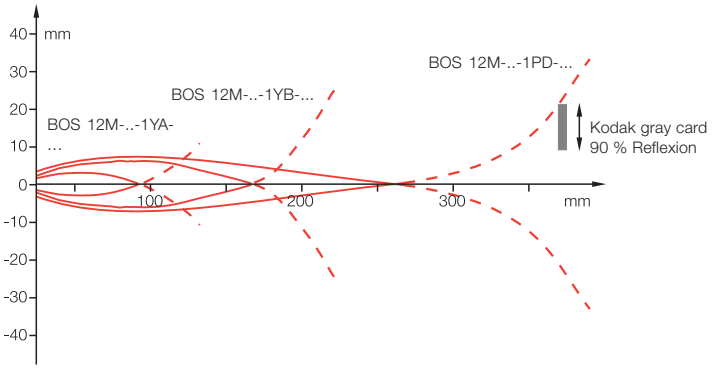
*Ordering example for NPN transistor:
BOS 12M-_ _ -1YA-S4-C

Output

NS NPN NO
NO NPN NC

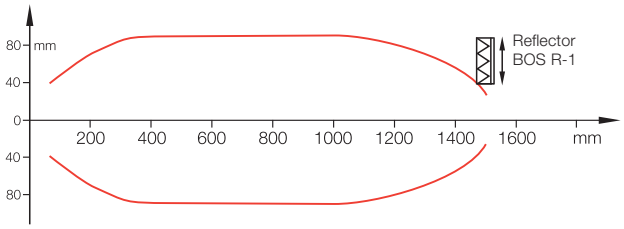
2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse BOS 12M-..-1YA/1YB/1PD-...



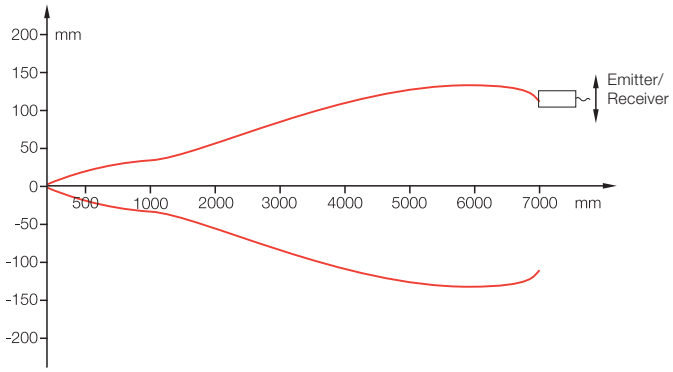
Sensing distance measured with side approach of Kodak gray card.

Retroreflective BOS 12M-..-1QA-...



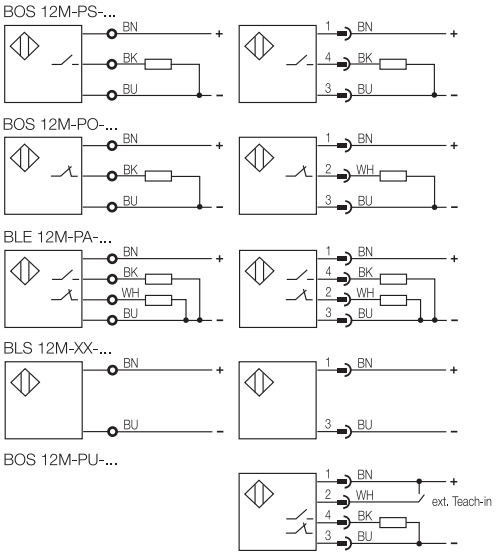
Range measured using side approach with reflector.

Through-beam BLE/BLS 12M-...



For the through-beam the maximum possible offset between emitter and receiver is measured.

Wiring diagrams



Alignment aid

The additional function indicator on the receiver of the through-beam sensor enables fast and simple alignment between emitter and receiver.

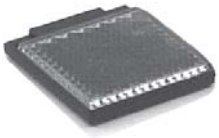
First attach the receiver and then the emitter. As soon as the emitter is located within the active range of the receiver, the function indicator on the front of the sensor extinguishes. This indicates an optical connection between emitter and receiver. It is also well visible when the sensor is flush mounted.



Recommended accessories
please order separately


Cover nut
BOS 12-SM-1


Reflector
BOS R-1


Reflector
BOS R-9


Angled mirror
BOS 12-WS-1


Mounting cuff
BOS 12.0-BS-1


Air shield
BOS 12-LT-1


Slit apertures
BOS 12-BL-1

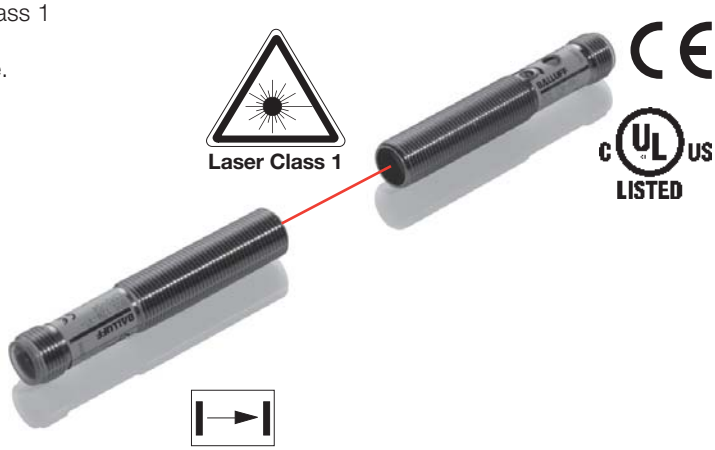

Connector
BKS-_ 19/BKS-_ 20

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

The basis of the BOS 12 laser through-beam sensor is its two different emitters. Emitter version LS11 is for small parts detection and offers a resolution of 50 µm at the focal point of 500 mm. The LS12 version is not focused and is used for long ranges up to 30 m.
The receivers can be PNP or NPN, and any emitter can be combined with any receiver.

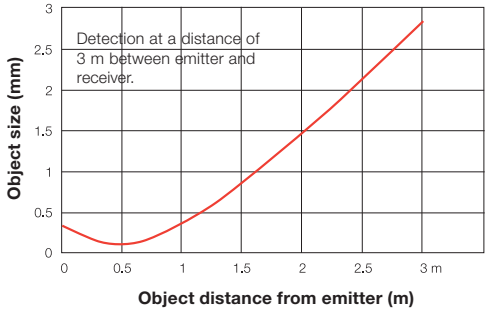
All sensors are Laser Class 1 and are available as connector or cable style.

Laser through-beam — Range

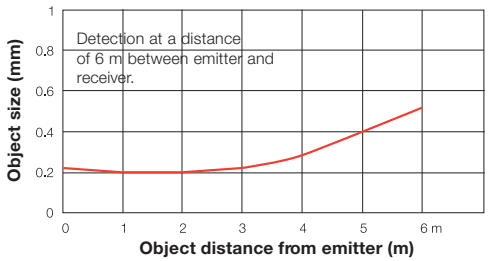


Small parts detection

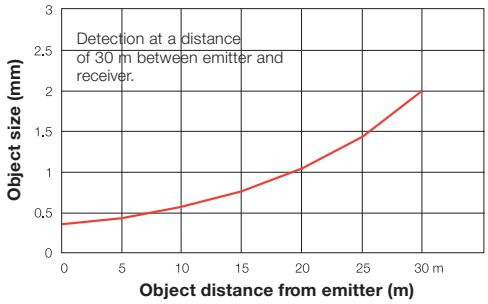
BOS 12M-XT-**LS11**-..



BOS 12M-XT-**LS12**-..



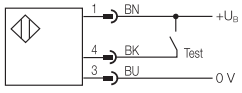
BOS 12M-XT-**LS12**-..



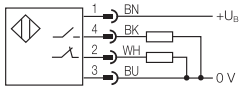
Through-beam		
Emitter	High resolution	50 µm at focus
	Long range	30 m
Receiver	PNP	
	NPN	
Electrical data		
Supply voltage U_B		
Ripple		
No-load supply current I_0 max.		
Switching output		
Output current		
Switching type		
Voltage drop U_d at I_e		
Settings		
Optical data		
Emitter, light type		
Wavelength		
Laser class		
Light spot diameter		
Indicators		
Output function indicator		
Time data		
Response time		
Switching frequency f		
Mechanical data		
Connection		
No. of wires × cross-section		
Housing material		
Optical surface		
Weight		
Ambient data		
Degree of protection per IEC 60529		
Polarity reversal protected		
Short circuit protected		
Ambient temperature range T_a		
Ambient light rejection		

Wiring diagrams

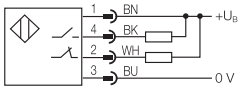
Emitter
BOS 12M-XT...



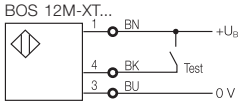
Receiver
BOS 12M-PA...



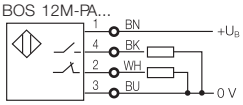
Receiver
BOS 12M-NA...



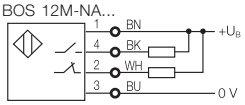
Emitter
BOS 12M-XT...

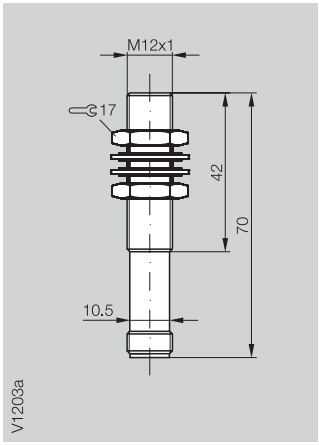
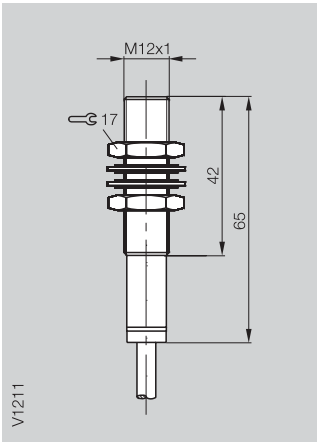
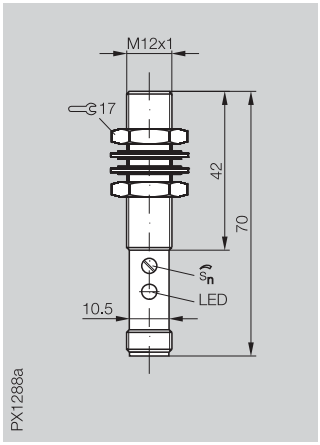
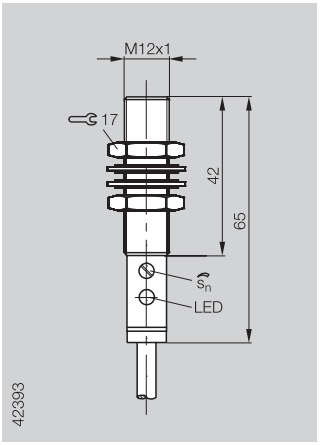


Receiver
BOS 12M-PA...



Receiver
BOS 12M-NA...



	0...3 m/0...30 m	0...3 m/0...30 m		
				
	BOS 12M-XT-LS11-S4 BOS 12M-XT-LS12-S4	BOS 12M-XT-LS11-03 BOS 12M-XT-LS12-03	BOS 12M-PA-LE10-S4 BOS 12M-NA-LE10-S4	BOS 12M-PA-LE10-03 BOS 12M-NA-LE10-03
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %
	≤ 10 mA	≤ 10 mA	≤ 15 mA	≤ 15 mA
			PNP- or NPN-Transistor	PNP- or NPN-Transistor
			≤ 200 mA	≤ 200 mA
			Light-/dark-on (complementary)	Light-/dark-on (complementary)
			≤ 2.5 V	≤ 2.5 V
			Potentiometer 270°	Potentiometer 270°
	Laser, red light	Laser, red light		
	655 nm	655 nm		
	1	1		
			LED yellow	LED yellow
			0.5 ms	0.5 ms
			1 kHz	1 kHz
	M12 connector, 4-pin	3 m cable, PVC	M12 connector, 4-pin	3 m cable, PVC
		3×0.34 mm²		4×0.34 mm²
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	Glass	Glass	PMMA	PMMA
	30 g	140 g	30 g	140 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–10...+50 °C	–10...+50 °C	–10...+50 °C	–10...+50 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

Recommended accessories
please order separately



Adjusting unit
BMS AD-M-002-D12/D12

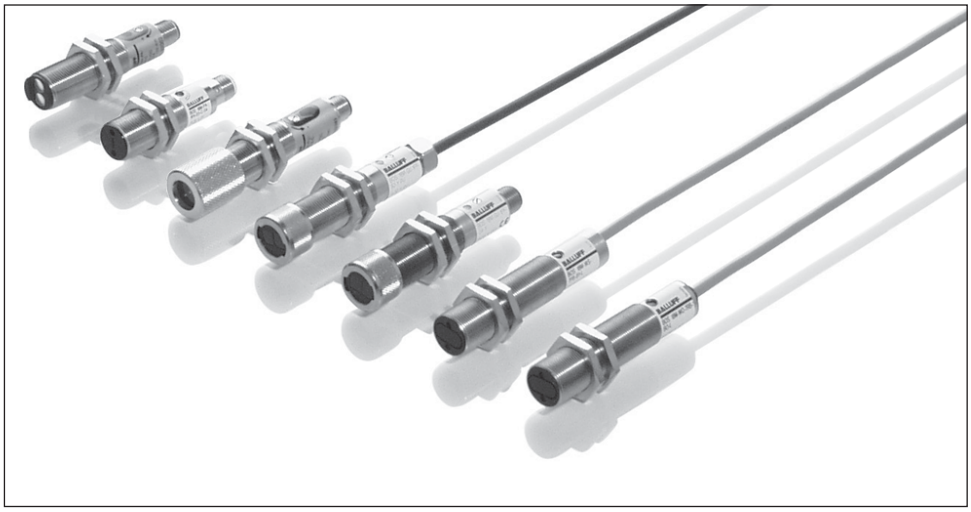


Clamp
BOS 12.0-BS-1



Connector
BKS-_ 19/BKS-_ 20

2.1
2.3
Photoelectric sensors accessories
page 2.3.2 ...
5
Connectors ...
page 5.2 ...



BOS 18M Standard

The **BOS 18M** series in metal housing (nickel plated brass) has established itself as a standard in automation technology. Long sensing distances and ranges as well as full-feature versions (e.g. background suppression or laser light) are characteristic of this series.

Features

- Supply voltage 10...30 V DC, polarity reversal protected
- Output short circuit protected
- Degree of protection IP 67
- High resistance to ambient light and pulse spikes

Applications

- Non-contact through-beam sensing
- Packaging
- Parts counting
- Small parts detection
- Assembly and handling automation
- Conveying
- Machine tool building



BOS 18M Tough

Sensors in M18 metal housing for elevated ambient requirements

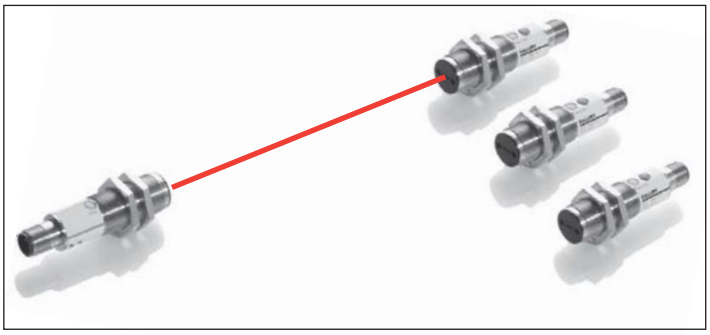
The sensors described here are classics. They have proven themselves over many years in the machine tool industry. They are tightly sealed, tough, precise and reliable.

Features

- Sealing test according to a strict Balluff factory standard
- Increased electrical isolation and EMC
- High load capacity (including capacitive loads)
- Industry compliant

Applications

- Material feed monitoring
- Workpiece monitoring
- Tool break monitoring
- Positioning tasks
- Checking for correct quantity
- Movement checking



BOS 18M Teach-in

The **BOS 18M with Teach-in** are optically, mechanically and electrically compatible with the potentiometer version, so that they can also be used in existing applications.

Diffuse, retroreflective and through-beam versions are available.
The teach-in function makes setup even simpler and more efficient.

Normally closed and normally open settings are made by simply pressing a button, requiring just one output line. The extra line is then used as a contamination output.



BOS 18M(R) Laser

The **BOS 18M(R) Laser** series is characterized by long ranges and absolute precision in small parts detection.

These sensors are Laser Class 1 and are available with axial or radial light exit. Newly added is a diffuse version with background suppression (Laser Class 2) and a sensing distance of 150 mm.

Features

- Long ranges (50 m)
- High switching frequency (1.5 kHz)
- Straight and right-angle versions

Applications

- Drill break monitoring
- Precise parts positioning
- Fast counting of objects
- High precision



The **BOS 18MR** product family has a built-in angled mirror made of scratch-resistant glass which is attached to the housing. Since the optical head does not protrude over the side, installation from the front is no problem.

Features

- Standard M18×1 housing made of metal (nickel plated brass)
- All sensors use visible red light
- Degree of protection IP 67
- Supply voltage 10...30 V DC, polarity reversal protected
- Output short circuit protected

Applications

- Roller conveyors
- Conveying lines
- Packaging

BOS 18MR Angled Head

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

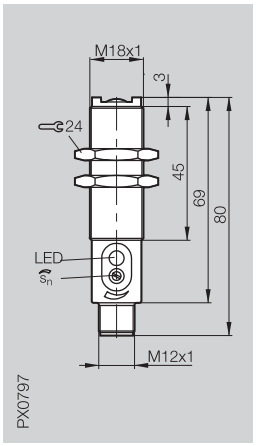
Type	Sensing distance/ range	Light exit		Light type			Output		Output function		Switching frequency	U_B	Connec-tion		Features		Page
		Straight	Right angle	Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter	Teach-in	
Diffuse with HGA																	
BOS 18M-PA-1HA-S4-C	40...120 mm	■		■			■		■	■	600 Hz	■	■				**2.1.**20
BOS 18MR-PA-1HA-S4-C	40...120 mm		■	■			■		■	■	600 Hz	■	■				**2.1.**44
BOS 18M-PS-1HA-E5-C-S4	10...120 mm	■		■			■		■		500 Hz	■	■				**2.1.**20
BOS 18MR-PS-1HA-E5-C-S4	10...120 mm		■	■			■		■		500 Hz	■	■				**2.1.**44
BOS 18M-PSV-LH22-S4	30...150 mm	■				■	■		■		500 Hz	■	■				**2.1.**31
BOS 18M-POV-LH22-S4	30...150 mm	■				■	■			■	500 Hz	■	■				**2.1.**31
BOS 18M-NSV-LH22-S4	30...150 mm	■				■		■	■		500 Hz	■	■				**2.1.**31
BOS 18M-NOV-LH22-S4	30...150 mm	■				■		■		■	500 Hz	■	■				**2.1.**31
Diffuse																	
BOS 18M-PS-1XA-E5-C-S4	0...100 mm	■			■		■		■		100 Hz	■	■				**2.1.**26
BOS 18M-PO-1XA-E5-C-S4	0...100 mm	■			■		■			■	100 Hz	■	■				**2.1.**26
BOS 18M-PS-1XA-E4-C-03	0...100 mm	■			■		■		■		100 Hz	■		■			**2.1.**26
BOS 18M-PO-1XA-E4-C-03	0...100 mm	■			■		■			■	100 Hz	■		■			**2.1.**26
BOS 18M-PA-1PA-E5-C-S4	0...100 mm	■			■		■		■	■	100 Hz	■	■				**2.1.**21
BOS 18M-PA-1PA-E4-C-03	0...100 mm	■			■		■		■	■	100 Hz	■		■			**2.1.**21
BOS 18M-PS-1XB-E5-C-S4	0...200 mm	■			■		■		■		100 Hz	■	■				**2.1.**26
BOS 18M-PO-1XB-E5-C-S4	0...200 mm	■			■		■			■	100 Hz	■	■				**2.1.**26
BOS 18M-PS-1XB-E4-C-03	0...200 mm	■			■		■		■		100 Hz	■		■			**2.1.**26
BOS 18M-PO-1XB-E4-C-03	0...200 mm	■			■		■			■	100 Hz	■		■			**2.1.**26
BOS 18M-PA-LD10-S4	0...350 mm	■				■	■		■	■	1.5 kHz	■	■				**2.1.**32
BOS 18M-PA-LD10-02	0...350 mm	■				■	■		■	■	1.5 kHz	■		■			**2.1.**32
BOS 18M-NA-LD10-S4	0...350 mm	■				■		■	■	■	1.5 kHz	■	■				**2.1.**32
BOS 18M-NA-LD10-02	0...350 mm	■				■		■	■	■	1.5 kHz	■		■			**2.1.**32
BOS 18MR-PA-LD10-S4	0...250 mm		■			■	■		■	■	1.5 kHz	■	■				**2.1.**34
BOS 18MR-PA-LD10-02	0...250 mm		■			■	■		■	■	1.5 kHz	■		■			**2.1.**34
BOS 18MR-NA-LD10-S4	0...250 mm		■			■		■	■	■	1.5 kHz	■	■				**2.1.**34
BOS 18MR-NA-LD10-02	0...250 mm		■			■		■	■	■	1.5 kHz	■		■			**2.1.**34
BOS 18M-PS-1PD-E4-C-03	0...400 mm	■			■		■		■		100 Hz	■		■			**2.1.**27
BOS 18M-PO-1PD-E4-C-03	0...400 mm	■			■		■			■	100 Hz	■		■			**2.1.**27
BOS 18M-PA-1PD-E5-C-S4	0...400 mm	■			■		■		■	■	100 Hz	■	■				**2.1.**21
BOS 18M-PA-1PD-E4-C-03	0...400 mm	■			■		■		■	■	100 Hz	■		■			**2.1.**21
BOS 18M-PU-1PD-SA5-C	0...400 mm	■			■		■		■	■	1 kHz	■	■				**2.1.**21
BOS 18M-PU-1PD-SA4-C	0...400 mm	■			■		■		■	■	1 kHz	■		■			**2.1.**22
BOS 18M-PU-1PD-S4-C	0...400 mm	■			■		■		■	■	500 Hz	■	■			■	**2.1.**41
BOS 18MR-PS-1OD-E5-C-S4	0...400 mm		■	■			■		■		1 kHz	■	■				**2.1.**45
BOS 18M-PA-1PF-E5-C-S4	0...1 m	■			■		■		■	■	200 Hz	■	■				**2.1.**22
BOS 18M-GU-1PF-S4-Y	0...1 m	■			■		■	■	■	■	1 kHz		■				**2.1.**23
Retroreflective																	
BOS 18M-PA-1QB-E5-C-S4	2 m	■		■			■		■	■	100 Hz	■	■		■		**2.1.**23
BOS 18M-PA-1QB-E4-C-03	2 m	■		■			■		■	■	100 Hz	■		■	■		**2.1.**23
BOS 18M-NA-1QB-E5-C-S4	2 m	■		■				■	■	■	100 Hz	■	■		■		**2.1.**23
BOS 18M-NA-1QB-E4-C-03	2 m	■		■				■	■	■	100 Hz	■		■	■		**2.1.**23
BOS 18M-PU-1QB-S4-C	2 m	■		■			■		■	■	500 Hz	■	■		■	■	**2.1.**41
BOS 18MR-PS-1QB-E5-C-S4	2 m		■	■			■			■	1 kHz	■	■		■		**2.1.**45

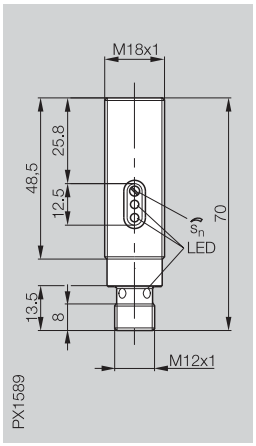
Type	Sensing distance/ range	Light exit		Light type			Output		Output function		Switching frequency	U_B	Connec-tion		Features		Page
		Straight	Right angle	Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter	Teach-in	
Retroreflective																	
BOS 18M-PS-1RB-E5-C-S4	2 m	■			■		■			■	100 Hz	■	■				**2.1**.27
BOS 18M-PO-1RB-E5-C-S4	2 m	■			■		■		■		100 Hz	■	■				**2.1**.27
BOS 18M-PS-1RB-E4-C-03	2 m	■			■		■			■	100 Hz	■		■			**2.1**.27
BOS 18M-PO-1RB-E4-C-03	2 m	■			■		■		■		100 Hz	■		■			**2.1**.27
BOS 18M-PA-1VD-E5-C-S4	4 m	■			■		■		■	■	100 Hz	■	■				**2.1**.23
BOS 18M-NA-1VD-E5-C-S4	4 m	■			■			■	■	■	100 Hz	■	■				**2.1**.23
BOS 18M-NA-1VD-E4-C-03	4 m	■			■			■	■	■	100 Hz	■		■			**2.1**.23
BOS 18M-PS-1RD-E5-C-S4	4 m	■			■		■			■	100 Hz	■	■				**2.1**.27
BOS 18M-PO-1RD-E5-C-S4	4 m	■			■		■		■		100 Hz	■	■				**2.1**.27
BOS 18M-PS-1RD-E4-C-03	4 m	■			■		■			■	100 Hz	■		■			**2.1**.27
BOS 18M-PO-1RD-E4-C-03	4 m	■			■		■		■		100 Hz	■		■			**2.1**.27
BOS 18MR-PA-LR10-S4	0,1...9 m		■			■	■		■	■	1.5 kHz	■	■		■		**2.1**.34
BOS 18MR-PA-LR10-02	0,1...9 m		■			■	■		■	■	1.5 kHz	■		■	■		**2.1**.35
BOS 18MR-NA-LR10-S4	0,1...9 m		■			■		■	■	■	1.5 kHz	■	■		■		**2.1**.34
BOS 18MR-NA-LR10-02	0,1...9 m		■			■		■	■	■	1.5 kHz	■		■	■		**2.1**.35
BOS 18M-PA-LR10-S4	0,1...16 m	■				■	■		■	■	1.5 kHz	■	■		■		**2.1**.32
BOS 18M-PA-LR10-02	0,1...16 m	■				■	■		■	■	1.5 kHz	■		■	■		**2.1**.33
BOS 18M-NA-LR10-S4	0,1...16 m	■				■		■	■	■	1.5 kHz	■	■		■		**2.1**.32
BOS 18M-NA-LR10-02	0,1...16 m	■				■		■	■	■	1.5 kHz	■		■	■		**2.1**.33
Through-beam																	
BLE 18M-PU-1PP-S4-C	0...16 m	■			■		■		■	■	500 Hz	■	■			■	**2.1**.41
BLE 18M-PS-1P-E5-C-S4	0...16 m	■			■		■			■	500 Hz	■	■				**2.1**.27
BLE 18M-PO-1P-E5-C-S4	0...16 m	■			■		■		■		100 Hz	■	■				**2.1**.27
BLE 18M-PS-1P-E4-C-03	0...16 m	■			■		■			■	100 Hz	■		■			**2.1**.27
BLE 18M-PO-1P-E4-C-03	0...16 m	■			■		■		■		100 Hz	■		■			**2.1**.27
BLE 18MR-PA-1PP-E5-C-S4	0...16 m		■	■			■		■	■	1 kHz	■	■				**2.1**.45
BLE 18M-BA-1LT-S4-C	0...50 m	■				■	■		■	■	6 kHz	■	■				**2.1**.39
BLE 18MR-BA-1LT-S4-C	0...50 m		■			■	■		■	■	6 kHz	■	■				**2.1**.39
BOS 18MR-PA-LE10-S4	0...50 m		■			■	■		■	■	1.5 kHz	■	■				**2.1**.35
BOS 18MR-PA-LE10-02	0...50 m		■			■	■		■	■	1.5 kHz	■		■			**2.1**.35
BOS 18MR-NA-LE10-S4	0...50 m		■			■		■	■	■	1.5 kHz	■	■				**2.1**.35
BOS 18MR-NA-LE10-02	0...50 m		■			■		■	■	■	1.5 kHz	■		■			**2.1**.35
BOS 18M-PA-LE10-S4	0...60 m	■				■	■		■	■	1.5 kHz	■	■				**2.1**.33
BOS 18M-PA-LE10-02	0...60 m	■				■	■		■	■	1.5 kHz	■		■			**2.1**.33
BOS 18M-NA-LE10-S4	0...60 m	■				■		■	■	■	1.5 kHz	■	■				**2.1**.33
BOS 18M-NA-LE10-02	0...60 m	■				■		■	■	■	1.5 kHz	■		■			**2.1**.33
BLS 18M-XX-1P-S4-L	0...16 m	■			■							■	■			■	**2.1**.41
BLS 18M-XX-1P-E5-L-S4	0...16 m	■			■							■	■				**2.1**.27
BLS 18M-XX-1P-E4-L-03	0...16 m	■			■							■		■			**2.1**.27
BLS 18MR-XX-1P-E5-L-S4	0...16 m		■	■								■	■				**2.1**.45
BLS 18M-XX-1LT-S4-C	0...50 m	■				■						■	■				**2.1**.39
BLS 18MR-XX-1LT-S4-C	0...50 m		■			■						■	■				**2.1**.39
BOS 18M-XT-LS10-S4	0...60 m	■				■						■	■				**2.1**.33
BOS 18M-XT-LS10-02	0...60 m	■				■						■		■			**2.1**.33
BOS 18MR-XT-LS10-S4	0...60 m		■			■						■	■				**2.1**.35
BOS 18MR-XT-LS10-02	0...60 m		■			■						■		■			**2.1**.35

AC versions on page **2.1**.42

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse with background suppression	Sensing distance	**40...120 mm**	**10...120 mm**
Diffuse	Sensing distance		

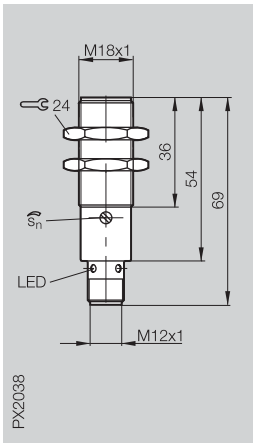
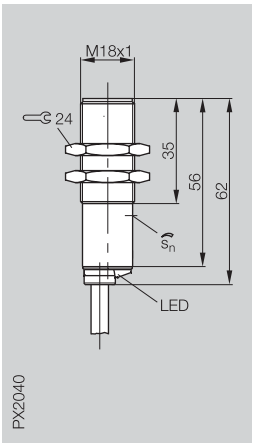
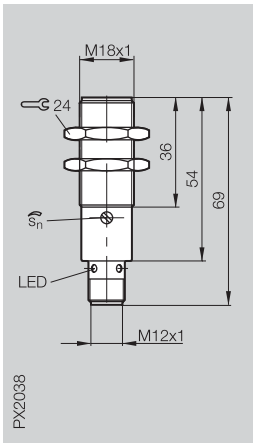
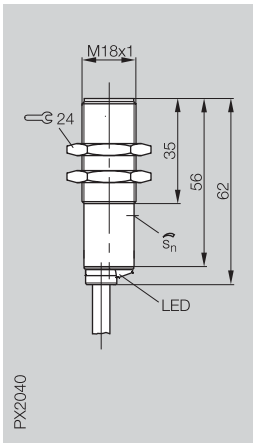
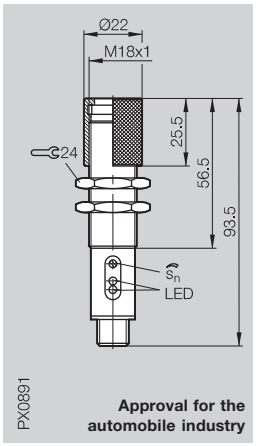




Diffuse					
PNP	40...120 mm	HGA	BOS 18M-PA-1HA-S4-C		
PNP	10...120 mm	HGA		BOS 18M-PS-1HA-E5-C-S4	
PNP	100 mm				
PNP	400 mm				
Electrical data					
Supply voltage U_B			10...30 V DC	10...36 V DC	
Ripple			10 %	20 %	
No-load supply current I_0 max.			≤ 30 mA	≤ 30 mA	
Switching output			PNP-Transistor	PNP-Transistor	
Output current			200 mA	200 mA	
Switching type			Light- and dark-on	Light-on	
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2 V	
Settings			18-turn potentiometer	Potentiometer 270°	
Optical data					
Emitter, light type			LED, red light	LED, red light	
Wavelength			660 nm	660 nm	
Indicators					
Output function indicator			LED yellow	LED yellow	
Stability indicator			no	no	
Time data					
Response time			0.8 ms	1 ms	
Switching frequency f			600 Hz	500 Hz	
Mechanical data					
Dimensions			M18×80 mm	M18×70 mm	
Connection			M12 connector, 4-pin	M12 connector, 4-pin	
No. of wires × cross-section					
Housing material			Nickel plated brass	Nickel plated brass	
Optical surface			Glass	Glass	
Weight			62 g	50 g	
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	
Polarity reversal protected			yes	yes	
Short circuit protected			yes	yes	
Ambient temperature range T_a			–15...+55 °C	–25...+55 °C	
Ambient light rejection			2 kLux	5 kLux	

Diffuse values referenced to Kodak gray card 90% Reflexion.

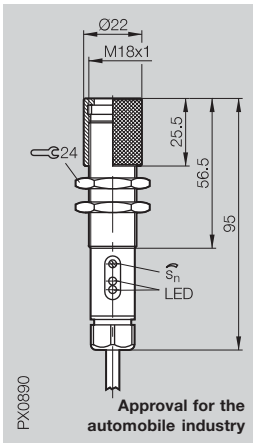
Wiring diagrams, characteristics and accessories see page **2.1.**24 and **2.1.**25.

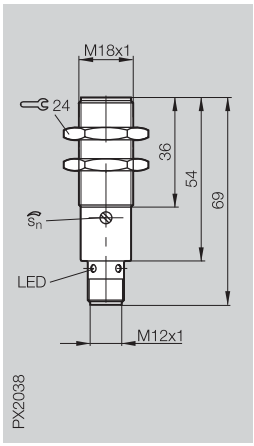
	0...100 mm	0...100 mm	0...400 mm	0...400 mm	0...400 mm
					 Approval for the automobile industry
	BOS 18M-PA-1PA-E5-C-S4	BOS 18M-PA-1PA-E4-C-03	BOS 18M-PA-1PD-E5-C-S4	BOS 18M-PA-1PD-E4-C-03	BOS 18M-PU-1PD-SA5-C
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %	10 %
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 25 mA
	PNP-Transistor	PNP-Transistor	PNP-Transistor*	PNP-Transistor*	PNP-Transistor
	200 mA	200 mA	200 mA	200 mA	200 mA
	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light-/dark-on (selectable)
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.4 V
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°	18-turn potentiometer
	LED, infrared	LED, infrared	LED, infrared	LED, infrared	LED, infrared
	880 nm	880 nm	880 nm	880 nm	880 nm
	LED yellow	LED yellow	LED yellow	LED yellow	LED yellow
	no	no	no	no	LED green/red
	5 ms	5 ms	5 ms	5 ms	0.5 ms
	100 Hz	100 Hz	100 Hz	100 Hz	1 kHz
	M18×69 mm	M18×62 mm	M18×69 mm	M18×62 mm	M18×93.5 mm
	M12 connector, 4-pin	3 m cable, PVC	M12 connector, 4-pin	3 m cable, PVC	M12 connector, 4-pin
		4×0.25 mm²		4×0.25 mm²	
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	PMMA	PMMA	PMMA	PMMA	Glass
	40 g	140 g	40 g	140 g	100 g
	IP 67	IP 67	IP 67	IP 67	IP 65
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–5...+55 °C	–5...+55 °C	–5...+55 °C	–5...+55 °C	–20...+60 °C
	5 kLux	5 kLux	5 kLux	5 kLux	2 kLux

*NPN versions on request

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse	Sensing distance	**0...400 mm**	**0...1 m**	
Retroreflective	Range			

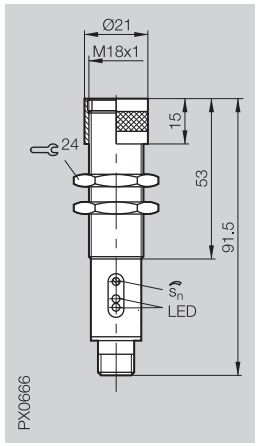
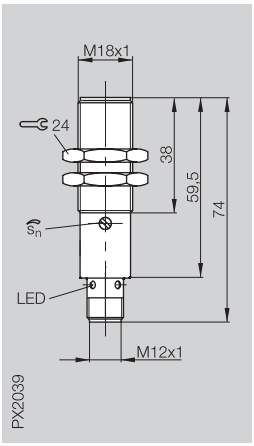
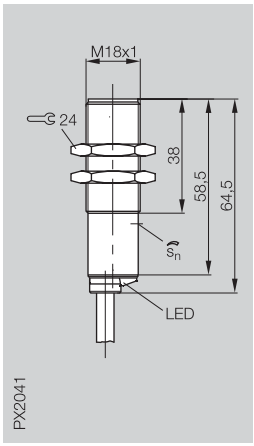
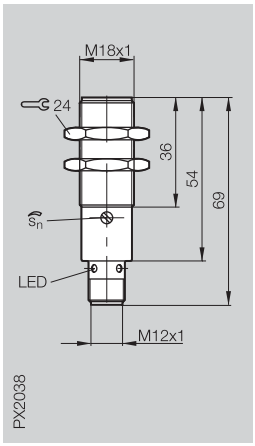
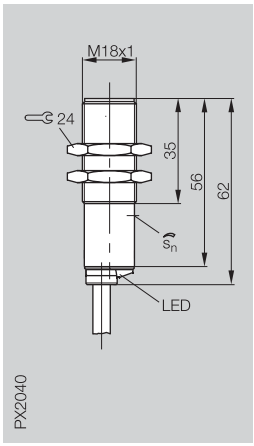




Diffuse				
PNP	400 mm		BOS 18M-PU-1PD-SA4-C	
PNP	1 m			BOS 18M-PA-1PF-E5-C-S4
PNP/NPN	1 m			
Retroreflective				
PNP	2 m	Polarizing filter		
NPN	2 m	Polarizing filter		
PNP	4 m			
NPN	4 m			
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			10 %	10 %
No-load supply current I_0 max.			≤ 25 mA	≤ 20 mA
Switching output			PNP-Transistor	PNP-Transistor
Output current			200 mA	200 mA
Switching type			Light-/dark-on (selectable)	Light- and dark-on
Voltage drop U_d at I_e			≤ 2.4 V	≤ 2.5 V
Settings			18-turn potentiometer	Potentiometer 270°
Optical data				
Emitter, light type			LED, infrared	LED, infrared
Wavelength			880 nm	880 nm
Indicators				
Output function indicator			LED yellow	LED yellow
Stability indicator			LED green/red	no
Time data				
Response time			0.5 ms	2.5 ms
Switching frequency f			1 kHz	200 Hz
Mechanical data				
Dimensions			M18×95 mm	M18×69 mm
Connection			3 m cable, PVC	M12 connector, 4-pin
No. of wires × cross-section			3×0.25 mm²	
Housing material			Nickel plated brass	Nickel plated brass
Optical surface			Glass	PMMA
Weight			200 g	40 g
Ambient data				
Degree of protection per IEC 60529			IP 65	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–20...+60 °C	–5...+55 °C
Ambient light rejection			2 kLux	5 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**24 and **2.1.**25.

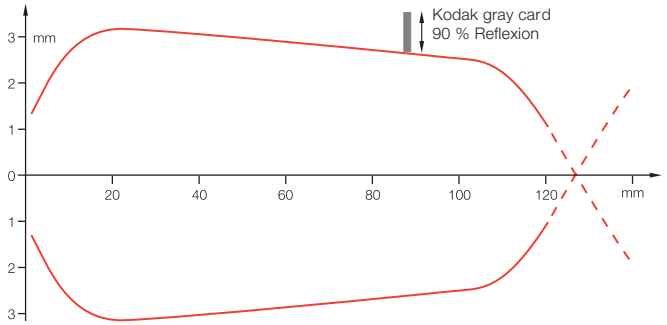
	0...1 m	**2 m**	**2 m**	**4 m**	**4 m**
					
	BOS 18M-GU-1PF-S4-Y				
		BOS 18M-PA-1QB-E5-C-S4 BOS 18M-NA-1QB-E5-C-S4	BOS 18M-PA-1QB-E4-C-03 BOS 18M-NA-1QB-E4-C-03		
				BOS 18M-PA-1VD-E5-C-S4 BOS 18M-NA-1VD-E5-C-S4	BOS 18M-NA-1VD-E4-C-03
	11...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %	10 %
	≤ 25 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
	PNP and NPN (push-pull)	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	200 mA	200 mA	200 mA	200 mA	200 mA
	Light-/dark-on (selectable)	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light- and dark-on
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	18-turn potentiometer	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	LED, infrared	LED, red light	LED, red light	LED, infrared	LED, infrared
	880 nm	660 nm	660 nm	880 nm	880 nm
	LED yellow	LED yellow	LED yellow	LED yellow	LED yellow
	LED green/red	no	no	no	no
	0.5 ms	5 ms	5 ms	5 ms	5 ms
	1 kHz	100 Hz	100 Hz	100 Hz	100 Hz
	M18×91.5 mm	M18×74 mm	M18×64.5 mm	M18×69 mm	M18×62 mm
	M12 connector, 4-pin	M12 connector, 4-pin	3 m cable, PVC	M12 connector, 4-pin	3 m cable, PVC
			3×0.34 mm²		3×0.34 mm²
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	Glass	PMMA	PMMA	PMMA	PMMA
	100 g	40 g	140 g	40 g	160 g
	IP 65	IP 67	IP 67	IP 65	IP 65
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–20...+60 °C	–15...+55 °C	–15...+55 °C	–5...+55 °C	–5...+55 °C
	1 kLux	5 kLux	5 kLux	5 kLux	5 kLux

2.1

2.3
Photoelectric sensors accessories page 2.3.2 ...

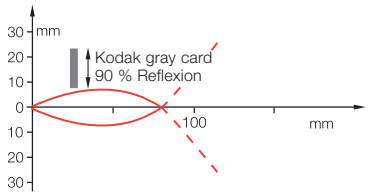
5
Connectors ... page 5.2 ...

Diffuse with background suppression BOS 18M-_A-1HA-...



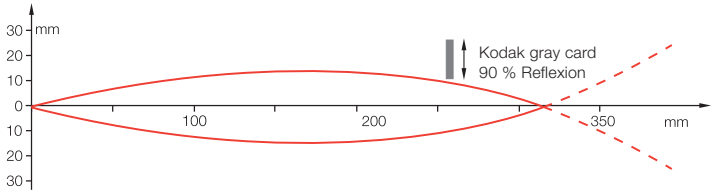
Sensing distance measured with side approach of Kodak gray card.

Diffuse BOS 18M-PA-1PA-...



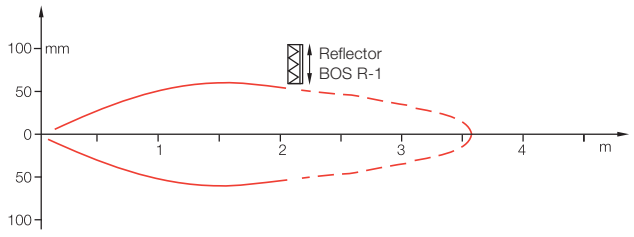
Sensing distance measured with side approach of Kodak gray card.

Diffuse BOS 18M-_A-1PD-...



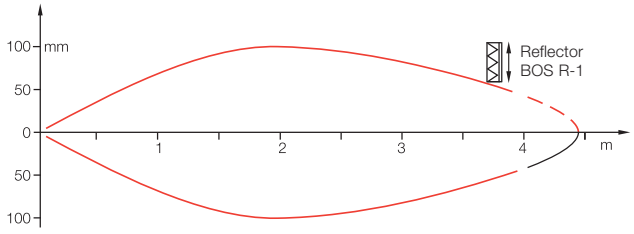
Sensing distance measured with side approach of Kodak gray card.

Retroreflective BOS 18M-_A-1QB-...



Range measured using side approach with reflector.

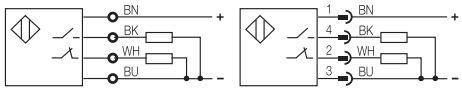
Retroreflective BOS 18M-_A-1VD-...



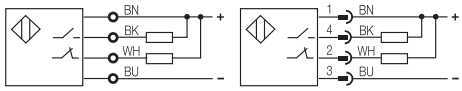
Range measured using side approach with reflector.

Wiring diagrams

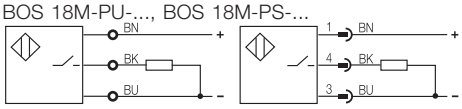
BOS 18M-PA-...



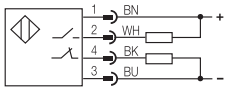
BOS 18M-NA-...



BOS 18M-PU-..., BOS 18M-PS-...



BOS 18M-GU-...



Note for BOS 18M-PU/GU-...

To invert the final stage function, move or remove the jumper.



Front view

Recommended accessories
please order separately



Round aperture
BOS 18-BL-1



Reflector
BOS R-1



Air shield
BOS 18-LT-1



Mounting clamp
BOS 18,0-KB-1



Deflection head
BOS 18-UK-10



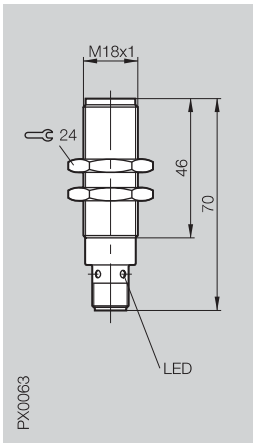
Cover nut
BOS 18-SM-2

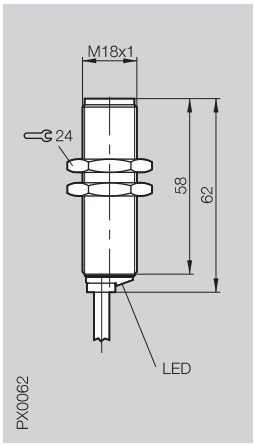


Connector
BKS-_ 19/BKS-_ 20

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse	Sensing distance	**0...100 mm/0...200 mm**	**0...100 mm/0...200 mm**	
Retroreflective	Range			
Through-beam	Range			

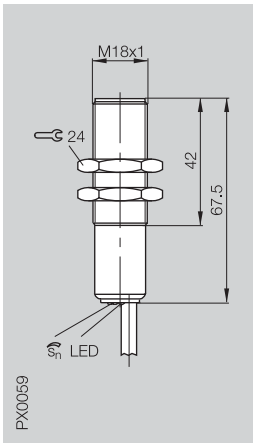
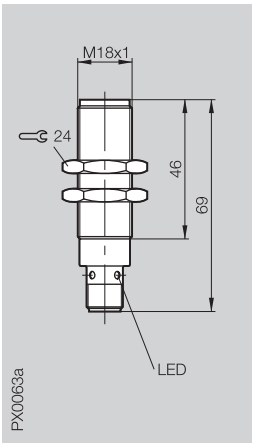
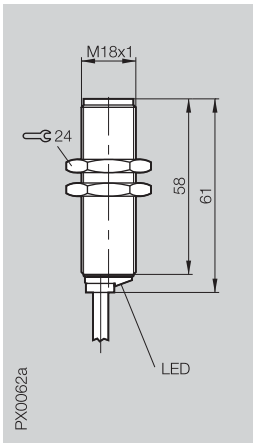
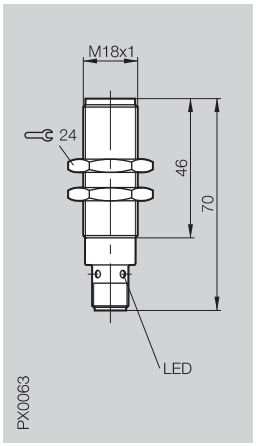
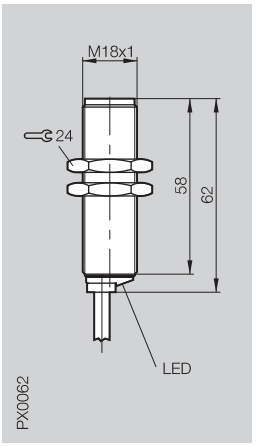




Diffuse					
PNP, light-on	100	mm		BOS 18M-PS-1XA-E5-C-S4	BOS 18M-PS-1XA-E4-C-03
PNP, dark-on	100	mm		BOS 18M-PO-1XA-E5-C-S4	BOS 18M-PO-1XA-E4-C-03
PNP, light-on	200	mm		BOS 18M-PS-1XB-E5-C-S4	BOS 18M-PS-1XB-E4-C-03
PNP, dark-on	200	mm		BOS 18M-PO-1XB-E5-C-S4	BOS 18M-PO-1XB-E4-C-03
PNP, light-on	400	mm	Poti		
PNP, dark-on	400	mm	Poti		
Retroreflective					
PNP, dark-on	2	m			
PNP, light-on	2	m			
PNP, dark-on	4	m			
PNP, light-on	4	m			
Through-beam					
PNP, dark-on	16	m	Receiver		
PNP, light-on	16	m	Receiver		
	16	m	Emitter		
Electrical data					
Supply voltage U_B				10...30 V DC	10...30 V DC
Ripple				10 %	10 %
No-load supply current I_0 max.				≤ 20 mA	≤ 20 mA
Switching output				PNP-Transistor*	PNP-Transistor*
Output current				200 mA	200 mA
Switching type				Light- or dark-on	Light- or dark-on
Voltage drop U_d at I_e				≤ 2.5 V	≤ 2.5 V
Settings				fixed	fixed
Optical data					
Emitter, light type				LED, infrared	LED, infrared
Wavelength				880 nm	880 nm
Indicators					
Power-on indicator					
Output function indicator				LED yellow	LED yellow
Time data					
Response time				5 ms	5 ms
Switching frequency f				100 Hz	100 Hz
Mechanical data					
Dimensions				M18×70 mm	M18×62 mm
Connection				M12 connector, 4-pin	3 m cable, PVC
No. of wires × cross-section					3×0.34 mm²
Housing material				Nickel plated brass	Nickel plated brass
Optical surface				PMMA	PMMA
Weight				40 g	160 g
Ambient data					
Degree of protection per IEC 60529				IP 67	IP 67
Polarity reversal protected				yes	yes
Short circuit protected				yes	yes
Ambient temperature range T_a				–5...+55 °C	–5...+55 °C
Ambient light rejection				5 kLux	5 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

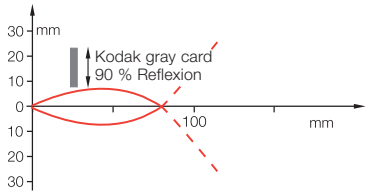
*NPN versions on request.

	0...400 mm	**2 m/4 m**	**2 m/4 m**	**0...16 m**	**0...16 m**
					
	BOS 18M-PS-1PD-E4-C-03 BOS 18M-PO-1PD-E4-C-03				
		BOS 18M-PS-1RB-E5-C-S4 BOS 18M-PO-1RB-E5-C-S4 BOS 18M-PS-1RD-E5-C-S4 BOS 18M-PO-1RD-E5-C-S4	BOS 18M-PS-1RB-E4-C-03 BOS 18M-PO-1RB-E4-C-03 BOS 18M-PS-1RD-E4-C-03 BOS 18M-PO-1RD-E4-C-03		
				BLE 18M-PS-1P-E5-C-S4 BLE 18M-PO-1P-E5-C-S4 BLS 18M-XX-1P-E5-L-S4	BLE 18M-PS-1P-E4-C-03 BLE 18M-PO-1P-E4-C-03 BLS 18M-XX-1P-E4-L-03
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %	10 %
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA (BLS ≤ 40 mA)	≤ 20 mA (BLS ≤ 40 mA)
	PNP-Transistor*	PNP-Transistor*	PNP-Transistor*	PNP-Transistor*	PNP-Transistor*
	200 mA	200 mA	200 mA	200 mA	200 mA
	Light- or dark-on	Light- or dark-on	Light- or dark-on	Light- or dark-on	Light- or dark-on
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	18-turn potentiometer	fixed	fixed	fixed	fixed
	LED, infrared	LED, infrared	LED, infrared	LED, infrared	LED, infrared
	880 nm	880 nm	880 nm	880 nm	880 nm
				LED yellow (BLS)	LED yellow (BLS)
	LED yellow	LED yellow	LED yellow	LED yellow (BLE)	LED yellow (BLE)
	5 ms	5 ms	5 ms	5 ms	5 ms
	100 Hz	100 Hz	100 Hz	100 Hz	100 Hz
	M18×67.5 mm	M18×69 mm	M18×61 mm	M18×70 mm	M18×62 mm
	3 m cable, PVC	M12 connector, 4-pin	3 m cable, PVC	M12 connector, 4-pin	3 m cable, PVC
	3×0.34 mm²		3×0.34 mm²		3×0.34 mm²
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	PMMA	PMMA	PMMA	PMMA	PMMA
	160 g	40 g	160 g	40 g	160 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–5...+55 °C	–5...+55 °C	–5...+55 °C	–5...+55 °C	–5...+55 °C
	2 kLux	2 kLux	2 kLux	2 kLux	2 kLux

Wiring diagrams, characteristics and accessories see page **2.1.**28 and **2.1.**29.

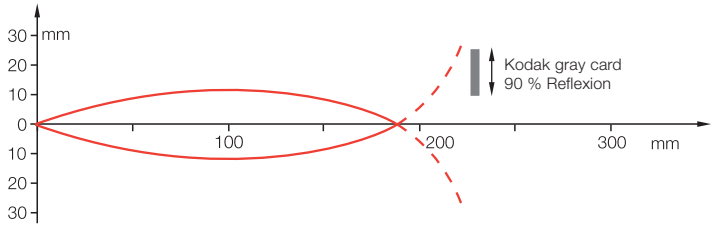
2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Diffuse BOS 18M-P_-1XA-...



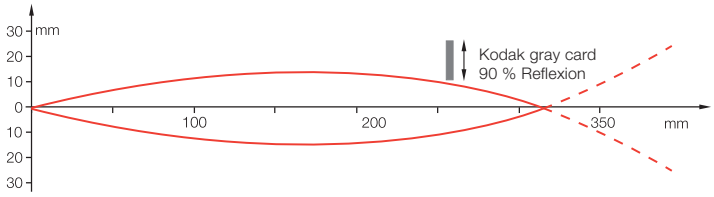
Sensing distance measured with side approach of Kodak gray card.

Diffuse BOS 18M-P_-1XB-...



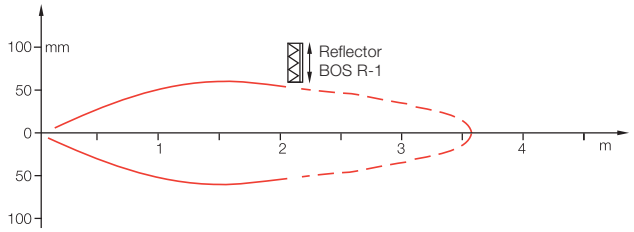
Sensing distance measured with side approach of Kodak gray card.

Diffuse BOS 18M-P_-1PD-...



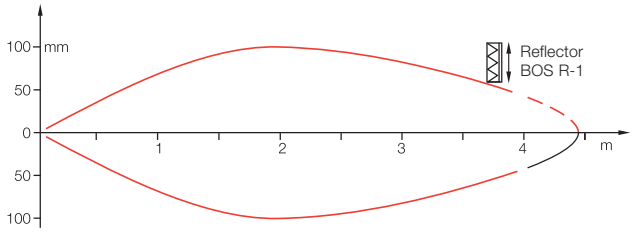
Sensing distance measured with side approach of Kodak gray card.

Retroreflective BOS 18M-P_-1RB-...



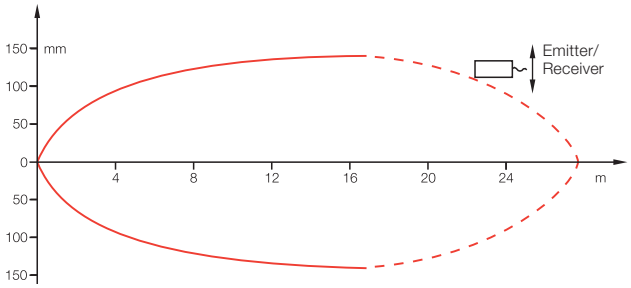
Range measured using side approach with reflector.

Retroreflective BOS 18M-P_-1RD-...



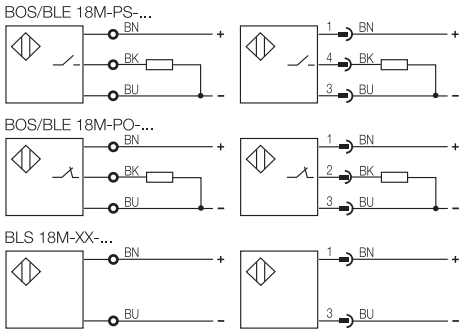
Range measured using side approach with reflector.

Through-beam BLE/BLS 18M-...



For the through-beam the maximum possible offset between emitter and receiver is measured.

Wiring diagrams



2.1

2.3
Photoelectric sensors accessories
page 2.3.2 ...

5
Connectors ...
page 5.2 ...

Recommended accessories
please order separately



Round aperture
BOS 18-BL-1

Reflector
BOS R-1

Air shield
BOS 18-LT-1

Mounting clamp
BOS 18,0-KB-1

Cover nut
BOS 18-SM-2

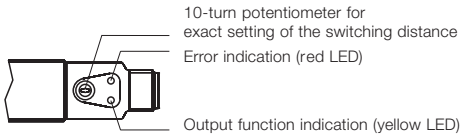
Deflection head
BOS 18-UK-10

Connector
BKS-_ 19/BKS-_ 20

The new **BOS 18M** Laser diffuse sensor with background suppression is ideal for small parts detection with objects as small as 0.1 mm in diameter. The 10-turn potentiometer enables highly precise setting of the background suppression. Incorrect measurements and contamination are indicated by an LED and the error output.



Indicators and operating elements



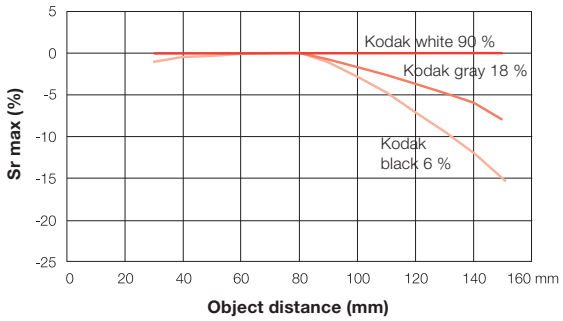
Red LED
The red LED turns on when the sensor is working in an unsafe range. The red LED flashes when there is a short circuit on the output.

Yellow LED
Output function indication: The yellow LED comes on when the output is active

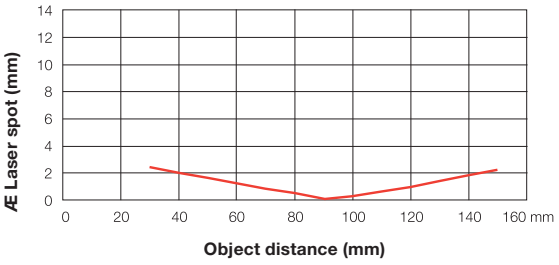
Error output
The error output is active when the sensor is working in an unsafe range.

Potentiometer
Used for precise setting of the switching point and background suppression.

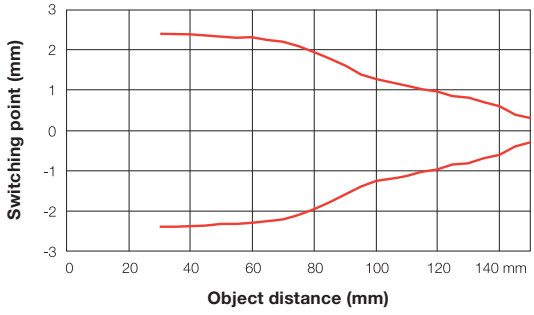
Gray scale shift



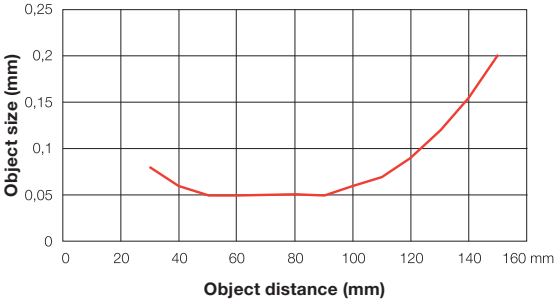
Light spot diameter at distance



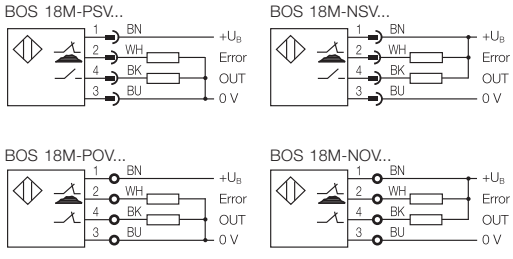
Turn-on point for lateral approach



Smallest detectable part



Wiring diagrams



Recommended accessories

please order separately

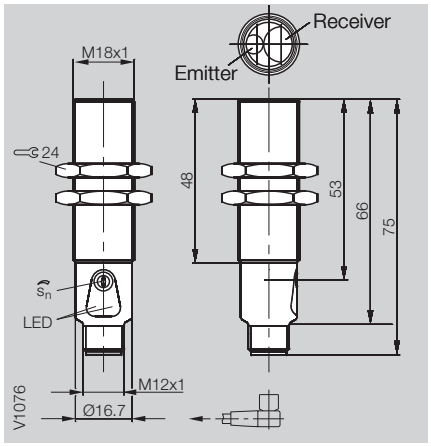


Mounting clamp
BOS 18,0-KB-1



Connector
BKS-_ 19/BKS-_ 20

Diffuse with background suppression	Sensing distance	**30...150 mm**



Diffuse with background suppression

PNP	NO	30...150 mm HGA	BOS 18M-PSV-LH22-S4
NPN	NO	30...150 mm HGA	BOS 18M-NSV-LH22-S4
PNP	NC	30...150 mm HGA	BOS 18M-POV-LH22-S4
NPN	NC	30...150 mm HGA	BOS 18M-NOV-LH22-S4

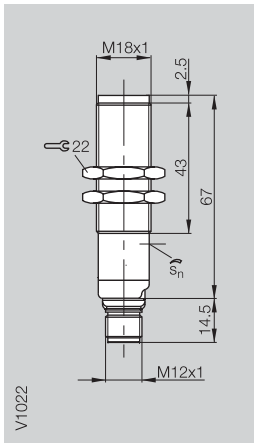
Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	10 %
No-load supply current I_0 max.	≤ 30 mA
Switching output	PNP- or NPN-Transistor
Output current	100 mA
Switching type	Light- or dark-on
Voltage drop U_d at I_e	≤ 2.5 V
Settings	10-turn potentiometer
Error output	PNP- or NPN (NC)
Optical data	
Emitter, light type	Laser, red light
Wavelength	670 nm
Laser class	2
Light spot diameter	see table
Indicators	
Output function indicator	LED yellow
Error indicator	LED red
Time data	
Response time	1 ms
Switching frequency f	500 Hz
Mechanical data	
Dimensions	M18×75 mm
Connection	M12 connector, 4-pin
Housing material	Nickel plated brass
Optical surface	PMMA
Weight	70 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–5...+55 °C
Ambient light rejection	10 kLux

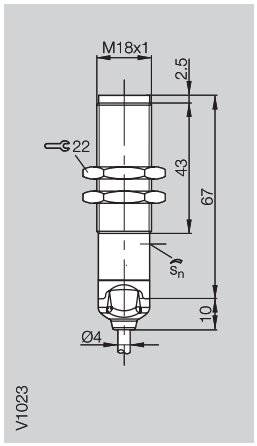
Diffuse values referenced to Kodak gray card 90% Reflexion.

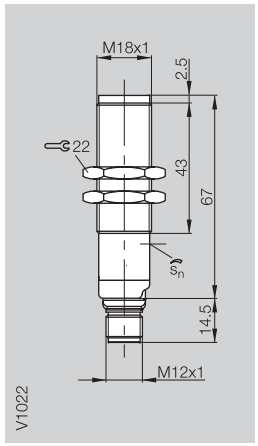
Connector orientation

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse	maximum sensing distance	**0...350 mm**	**0...350 mm**		
Retroreflective with polarizing filter	maximum range			**0.1...16 m**	
Through-beam	maximum range				

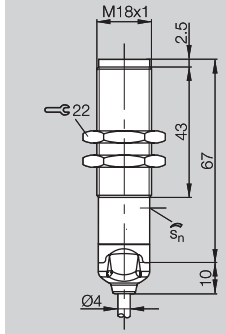
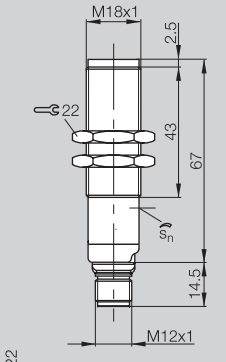
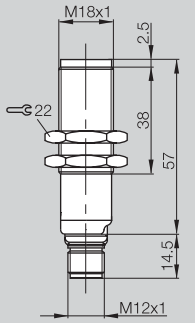
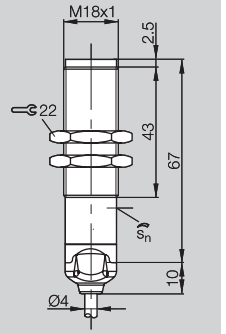
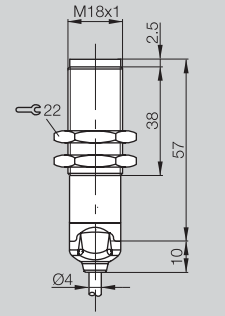






Diffuse					
PNP	350 mm		BOS 18M-PA-LD10-S4	BOS 18M-PA-LD10-02	
NPN	350 mm		BOS 18M-NA-LD10-S4	BOS 18M-NA-LD10-02	
Retroreflective					
PNP	0.1...16 m	Polarizing filter			BOS 18M-PA-LR10-S4
NPN	0.1...16 m	Polarizing filter			BOS 18M-NA-LR10-S4
Through-beam					
PNP	60 m	Receiver			
NPN	60 m	Receiver			
	60 m	Emitter			
Electrical data					
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 35 mA	≤ 35 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current			100 mA	100 mA	100 mA
Switching type			Light- and dark-on	Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V	≤ 2 V
Settings			Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
Help functions					
Optical data					
Recommended sensing distance/range			0...350 mm	0...350 mm	0.1...16 m
Emitter, light type			Laser, red light	Laser, red light	Laser, red light
Wavelength			650 nm	650 nm	650 nm
Laser class			1	1	1
Resolution			approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm	approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm	approx. 0.9 mm at 1 m approx. 2 mm at 3 m
Indicators					
Power-on indicator					
Output function indicator			LED yellow	LED yellow	LED yellow
Stability indicator			LED green	LED green	LED green
Time data					
Response time			333 µs	333 µs	333 µs
Switching frequency f			1.5 kHz	1.5 kHz	1.5 kHz
Mechanical data					
Dimensions			M18×81.5 mm	M18×77 mm	M18×81.5 mm
Connection			M12 connector, 4-pin	2 m cable, PVC	M12 connector, 4-pin
No. of wires × cross-section				4×0.14 mm²	
Housing material			CuZn chrome plated	CuZn chrome plated	CuZn chrome plated
Optical surface			PMMA	PMMA	PMMA
Weight			60 g	110 g	60 g
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	IP 67
Polarity reversal protected			yes	yes	yes
Short circuit protected			yes	yes	yes
Ambient temperature range T_a			–10...+50 °C	–10...+50 °C	–10...+50 °C
Reference standard			EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

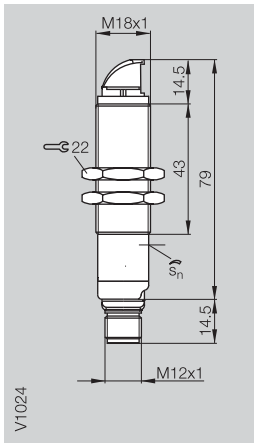
Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

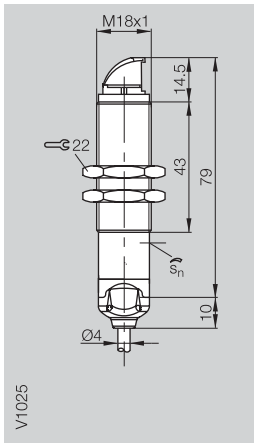
	0.1...16 m	0...60 m	0...60 m	0...60 m	0...60 m
					
	BOS 18M-PA-LR10-02 BOS 18M-NA-LR10-02				
		BOS 18M-PA-LE10-S4 BOS 18M-NA-LE10-S4		BOS 18M-PA-LE10-02 BOS 18M-NA-LE10-02	
			BOS 18M-XT-LS10-S4		BOS 18M-XT-LS10-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 30 mA	≤ 35 mA	≤ 30 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor		PNP- or NPN-Transistor	
	100 mA	100 mA		100 mA	
	Light- and dark-on	Light- and dark-on		Light- and dark-on	
	≤ 2 V	≤ 2 V		≤ 2 V	
	Potentiometer 270°	Potentiometer 270°		Potentiometer 270°	
			Test input		Test input
	0.1...16 m	0...60 m	0...60 m	0...60 m	0...60 m
	Laser, red light	Laser, red light	Laser, red light	Laser, red light	Laser, red light
	650 nm	650 nm	650 nm	650 nm	650 nm
	1	1	1	1	1
	approx. 0.9 mm at 1 m approx. 2 mm at 3 m	approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m		approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m	
		LED green	LED green	LED green	LED green
	LED yellow LED green	LED yellow		LED yellow	
	333 µs	333 µs		333 µs	
	1.5 kHz	1.5 kHz		1.5 kHz	
	M18×77 mm	M18×81.5 mm	M18×71.5 mm	M18×77 mm	M18×67 mm
	2 m cable, PVC	M12 connector, 4-pin	M12 connector, 4-pin	2 m cable, PVC	2 m cable, PVC
	4×0.14 mm²			4×0.14 mm²	4×0.14 mm²
	CuZn chrome plated	CuZn chrome plated	CuZn chrome plated	CuZn chrome plated	CuZn chrome plated
	PMMA	PMMA	PMMA	PMMA	PMMA
	110 g	60 g	60 g	110 g	110 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–10...+50 °C	–10...+50 °C	–10...+50 °C	–10...+50 °C	–10...+50 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

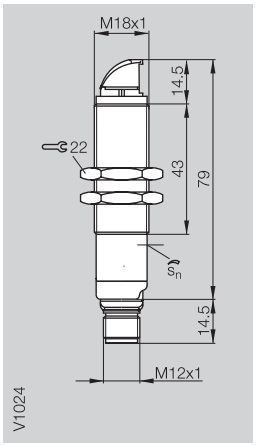
Wiring diagrams, characteristics and accessories see page **2.1.**36 and **2.1.**37.

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse	maximum sensing distance	**0...250 mm**	**0...250 mm**		
Retroreflective with polarizing filter	maximum range			**0.1...9 m**	
Through-beam	maximum range				

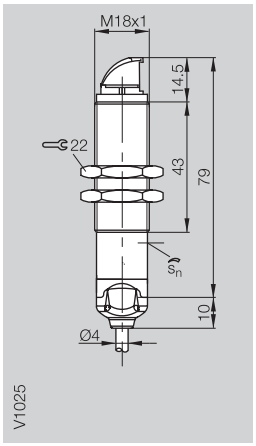
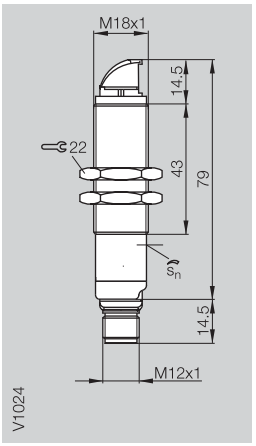
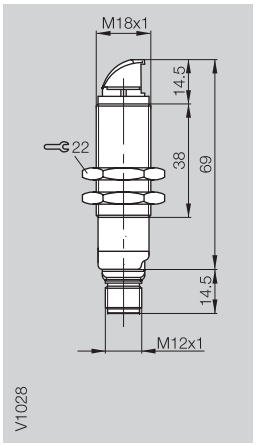
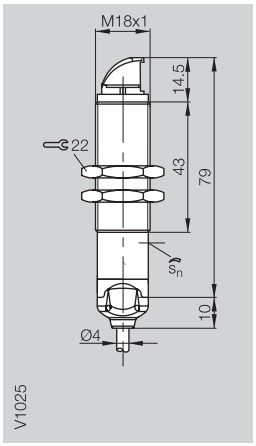
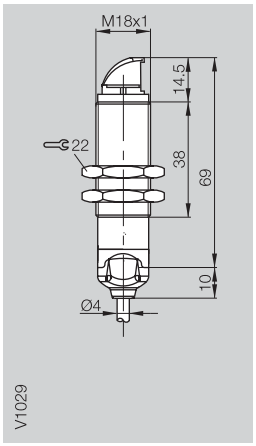






Diffuse					
PNP	250 mm		BOS 18MR-PA-LD10-S4	BOS 18MR-PA-LD10-02	
NPN	250 mm		BOS 18MR-NA-LD10-S4	BOS 18MR-NA-LD10-02	
Retroreflective					
PNP	0.1...9 m	Polarizing filter			BOS 18MR-PA-LR10-S4
NPN	0.1...9 m	Polarizing filter			BOS 18MR-NA-LR10-S4
Through-beam					
PNP	50 m	Receiver			
NPN	50 m	Receiver			
	50 m	Emitter			
Electrical data					
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 35 mA	≤ 35 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current			100 mA	100 mA	100 mA
Switching type			Light- and dark-on	Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V	≤ 2 V
Settings			Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
Help functions					
Optical data					
Recommended sensing distance/range			0...250 mm	0...250 mm	0.1...9 m
Emitter, light type			Laser, red light	Laser, red light	Laser, red light
Wavelength			650 nm	650 nm	650 nm
Laser class			1	1	1
Resolution			approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm	approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm	approx. 0.9 mm at 1 m approx. 2 mm at 3 m
Indicators					
Power-on indicator					
Output function indicator			LED yellow	LED yellow	LED yellow
Stability indicator			LED green	LED green	LED green
Time data					
Response time			333 µs	333 µs	333 µs
Switching frequency f			1.5 kHz	1.5 kHz	1.5 kHz
Mechanical data					
Dimensions			M18×93.5 mm	M18×89 mm	M18×93.5 mm
Connection			M12 connector, 4-pin	2 m cable, PVC	M12 connector, 4-pin
No. of wires × cross-section				4×0.14 mm²	
Housing material			CuZn chrome plated	CuZn chrome plated	CuZn chrome plated
Optical surface			PMMA	PMMA	PMMA
Weight			60 g	110 g	60 g
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	IP 67
Polarity reversal protected			yes	yes	yes
Short circuit protected			yes	yes	yes
Ambient temperature range T_a			–10...+50 °C	–10...+50 °C	–10...+50 °C
Reference standard			EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

	0.1...9 m	**0...50 m**	**0...50 m**	**0...50 m**	**0...50 m**
					
	BOS 18MR-PA-LR10-02 BOS 18MR-NA-LR10-02				
		BOS 18MR-PA-LE10-S4 BOS 18MR-NA-LE10-S4		BOS 18MR-PA-LE10-02 BOS 18MR-NA-LE10-02	
			BOS 18MR-XT-LS10-S4		BOS 18MR-XT-LS10-02
	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
	≤ 35 mA	≤ 35 mA	≤ 30 mA	≤ 35 mA	≤ 30 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor		PNP- or NPN-Transistor	
	100 mA	100 mA		100 mA	
	Light- and dark-on	Light- and dark-on		Light- and dark-on	
	≤ 2 V	≤ 2 V		≤ 2 V	
	Potentiometer 270°	Potentiometer 270°		Potentiometer 270°	
			Test input		Test input
	0.1...9 m	0...50 m	0...50 m	0...50 m	0...50 m
	Laser, red light	Laser, red light	Laser, red light	Laser, red light	Laser, red light
	650 nm	650 nm	650 nm	650 nm	650 nm
	1	1	1	1	1
	approx. 0.9 mm at 1 m approx. 2 mm at 3 m	approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m		approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m	
		LED green	LED green	LED green	LED green
	LED yellow LED green	LED yellow		LED yellow	
	333 µs	333 µs		333 µs	
	1.5 kHz	1.5 kHz		1.5 kHz	
	M18×89 mm	M18×93.5 mm	M18×83.5 mm	M18×89 mm	M18×79 mm
	2 m cable, PVC	M12 connector, 4-pin	M12 connector, 4-pin	2 m cable, PVC	2 m cable, PVC
	4×0.14 mm²			4×0.14 mm²	4×0.14 mm²
	CuZn chrome plated	CuZn chrome plated	CuZn chrome plated	CuZn chrome plated	CuZn chrome plated
	PMMA	PMMA	PMMA	PMMA	PMMA
	110 g	60 g	60 g	110 g	110 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–10...+50 °C	–10...+50 °C	–10...+50 °C	–10...+50 °C	–10...+50 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

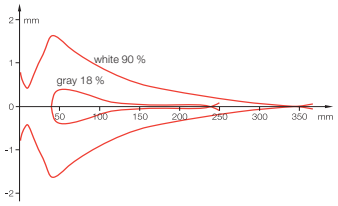
Wiring diagrams, characteristics and accessories see page **2.1.**36 and **2.1.**37.

2.1

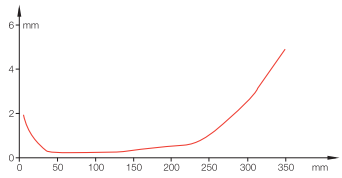
2.3
Photoelectric sensors accessories page 2.3.2 ...

5
Connectors ... page 5.2 ...

Diffuse BOS 18M-..-LD10-...

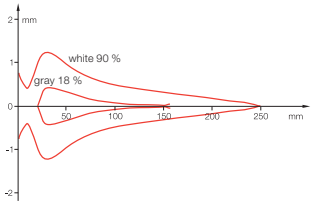


Detection range

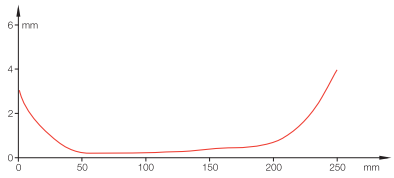


Resolution

Diffuse BOS 18MR-..-LD10-...

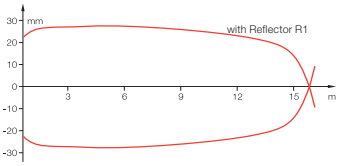


Detection range

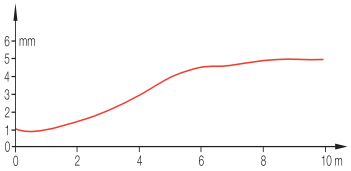


Resolution

Retroreflective BOS 18M-..-LR10-...

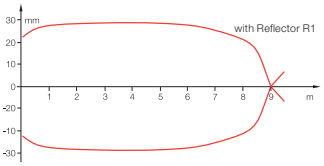


Detection range

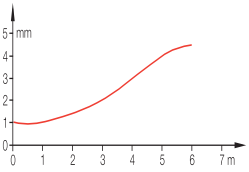


Resolution

Retroreflective BOS 18MR-..-LR10-...

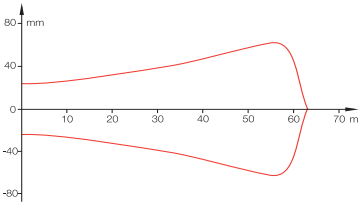


Detection range

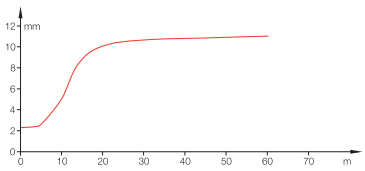


Resolution

Through-beam BOS 18M-..-LE/LS10-...

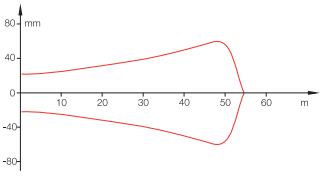


Detection range

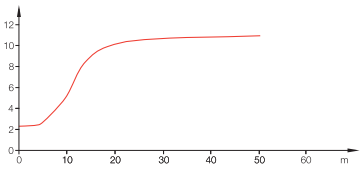


Resolution

Through-beam BOS 18MR-..-LE/LS10-...

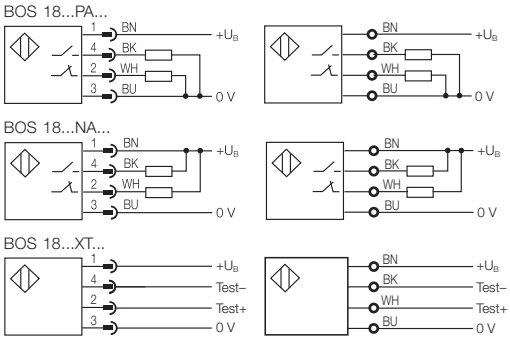


Detection range



Resolution

Wiring diagrams



Recommended accessories
please order separately



Reflector
BOS R-1



Connector
BKS-_ 19/BKS-_ 20



Mounting clamp
BOS 18,0-KB-1



Mounting bracket
BES 18-HW-1



Cover nut
BOS 18-SM-1
for BOS 18M Laser



Air shield
BOS 18-LT-1
for BOS 18M Laser

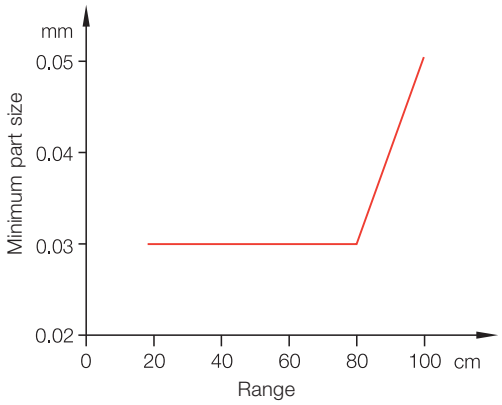
2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

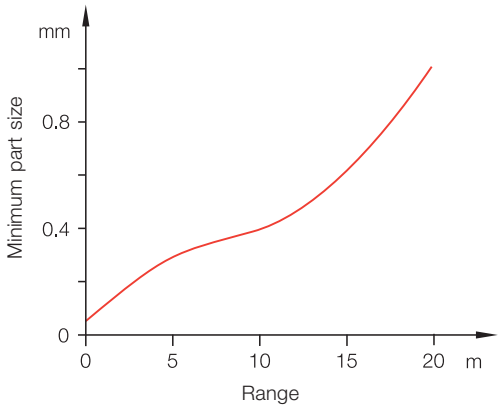
Laser through-beam range

CE

Accuracy diagram

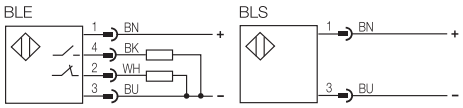
Smallest detectable part size as a function of range.





Beam spot vertical to transport direction of the object.

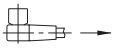
Wiring diagrams



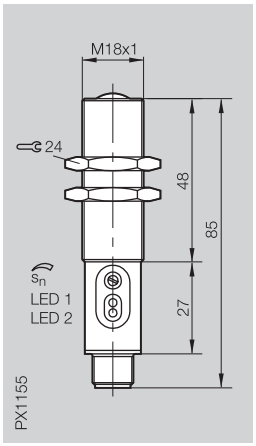
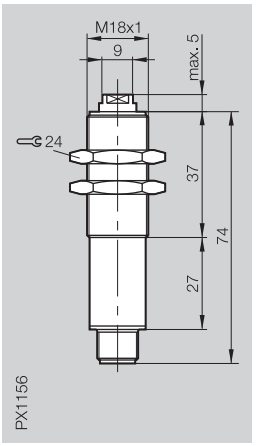
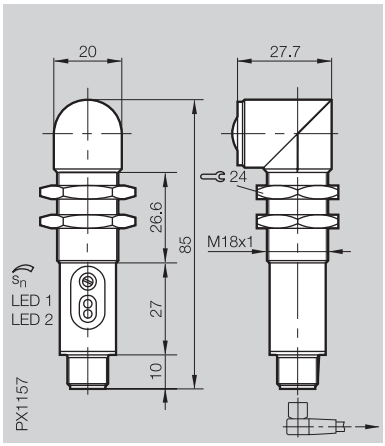
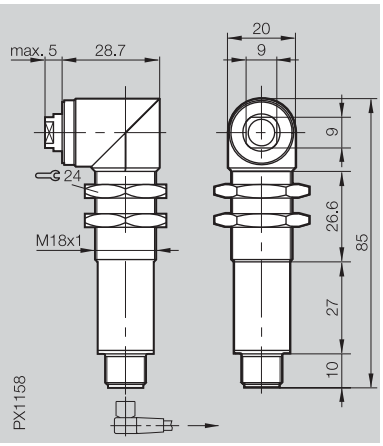
Using the included focusing tool the beam can be focused on a particular point. At this point small parts can be optimally detected.
At a distance of 20...80 cm between emitter and receiver parts with a diameter of up to 0.03 mm can be detected.



PNP	50 m	Receiver
	50 m	Emitter
Electrical data		
Supply voltage U_B		
No-load supply current I_0 max.		
Switching output		
Output current		
Switching type		
Voltage drop U_d at I_e		
Settings		
Optical data		
Emitter, light type		
Wavelength		
Laser class		
Light spot diameter		
Indicators		
Output function indicator		
Stability indicator		
Time data		
Response time		
Switching frequency f		
Mechanical data		
Connection		
Housing material		
Optical surface		
Weight		
Ambient data		
Degree of protection per IEC 60529		
Polarity reversal protected		
Short circuit protected		
Ambient temperature range T_a		
Ambient light rejection		



Connector orientation

	0...50 m	0...50 m	0...50 m	0...50 m
				
	BLE 18M-BA-1LT-S4-C	BLS 18M-XX-1LT-S4-C	BLE 18MR-BA-1LT-S4-C	BLS 18MR-XX-1LT-S4-C
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 15 mA	≤ 10 mA	≤ 15 mA	≤ 10 mA
	PNP-Transistor		PNP-Transistor	
	200 mA		200 mA	
	Light-/dark-on (complementary)		Light-/dark-on (complementary)	
	≤ 2.5 V		≤ 2.5 V	
	18-turn potentiometer		18-turn potentiometer	
		Laser, red light		Laser, red light
		650 nm		650 nm
		2		2
		focusable		focusable
	LED yellow		LED yellow	
	LED green/red		LED green/red	
	≤ 0.08 ms		≤ 0.08 ms	
	6 kHz		6 kHz	
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	Glass	Glass	Glass	Glass
	45 g	45 g	50 g	50 g
	IP 65	IP 65	IP 65	IP 65
	yes	yes	yes	yes
	yes	yes	yes	yes
	–15...+55 °C	–15...+55 °C	–15...+55 °C	–15...+55 °C
	2 kLux	2 kLux	2 kLux	2 kLux

Recommended accessories
please order separately



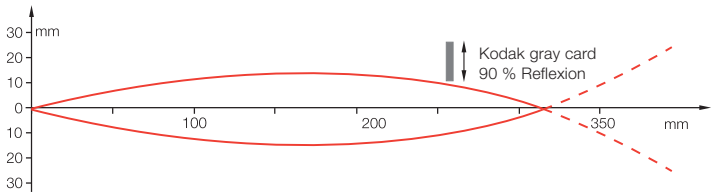
Mounting clamp
BOS 18,0-KB-1



Connector
BKS-_ 19/BKS-_ 20

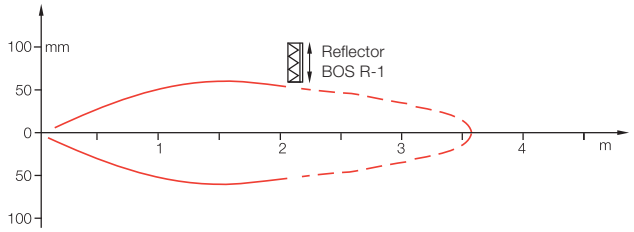
2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Diffuse BOS 18M-PU-1PD-...



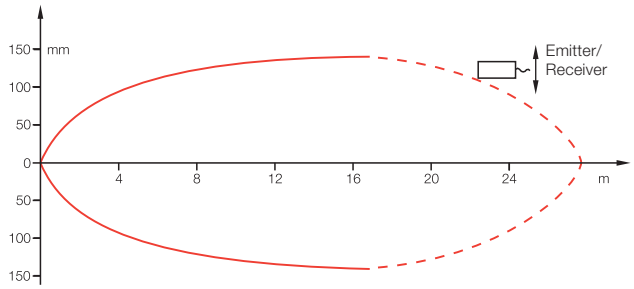
Sensing distance measured with side approach of Kodak gray card.

Retroreflective BOS 18M-...-1QB-...



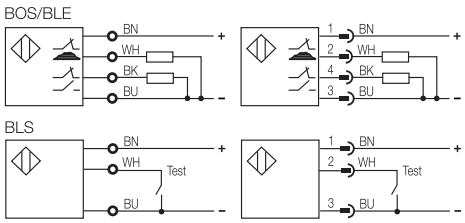
Range measured using side approach with reflector.

Through-beam BLE/BLS 18M-...



For the through-beam the maximum possible offset between emitter and receiver is measured.

Wiring diagrams

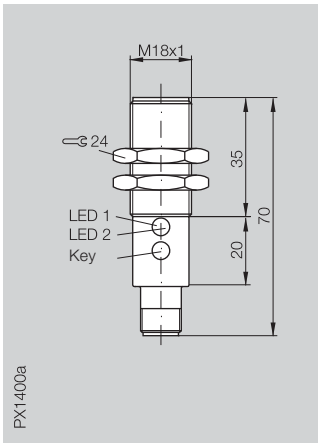
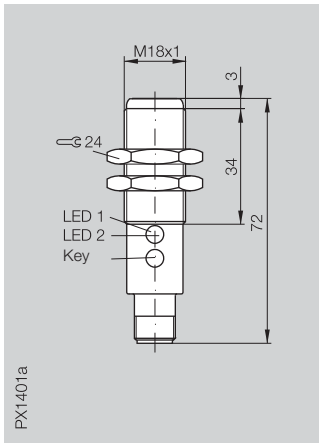
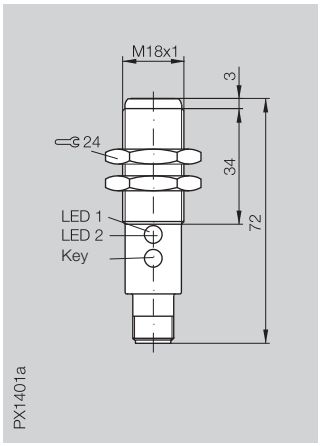
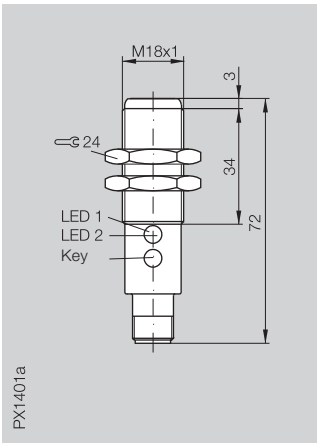


Diffuse	Sensing distance
Retroreflective	Range
Through-beam	Range

CE

Diffuse		
PNP	400 mm	Alarm output
Retroreflective		
PNP	2 m	Alarm output, polarizing filter
Through-beam		
PNP	16 m	Receiver, alarm output
	16 m	Emitter, test input
Electrical		
Supply voltage U_B		
No-load supply current I_0 max.		
Switching output		
Output current		
Switching type		
Voltage drop U_d at I_e		
Settings		
Help functions		
Optical data		
Emitter, light type		
Wavelength		
Indicators		
Power-on indicator		
Output function indicator		
Contamination indicator		
Time data		
Response time		
Switching frequency f		
Mechanical data		
Connection		
Housing material		
Material of sensing face		
Weight		
Ambient data		
Degree of protection per IEC 60529		
Polarity reversal protected		
Short circuit protected		
Ambient temperature range T_a		
Ambient light rejection		

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to Reflector R1.

	0...400 mm	2 m	0...16 m	0...16 m
				
	BOS 18M-PU-1PD-S4-C			
		BOS 18M-PU-1QB-S4-C		
			BLE 18M-PU-1PP-S4-C	
				BLS 18M-XX-1P-S4-L
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 25 mA	≤ 25 mA	≤ 25 mA	≤ 25 mA
	PNP-Transistor	PNP-Transistor	PNP-Transistor	
	200 mA	200 mA	200 mA	
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)	
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	
	Teach-in	Teach-in	Teach-in	Teach-in
	Contamination output	Contamination output	Contamination output	
	LED, infrared	LED, red light	LED, infrared	LED, infrared
	880 nm	660 nm		880 nm
				LED yellow
	LED yellow	LED yellow	LED yellow	
	LED green	LED green	LED green	
	1 ms	1 ms	1 ms	
	500 Hz	500 Hz	500 Hz	
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Nickel plated brass	Nickel plated brass	Nickel plated brass	Nickel plated brass
	PMMA	Glass	Glass	Glass
	65 g	65 g	65 g	65 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–15...+55 °C	–15...+55 °C	–15...+55 °C	–15...+55 °C
	5 kLux	5 kLux	5 kLux	5 kLux

Recommended accessories
please order separately



Reflector
BOS R-1



Mounting clamp
BOS 18,0-KB-1

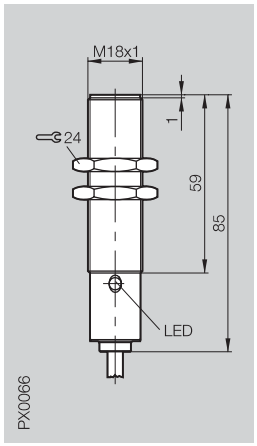


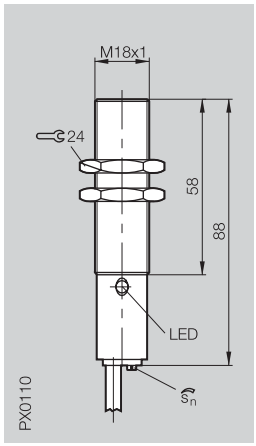
Connector
BKS-_ 19/BKS-_ 20

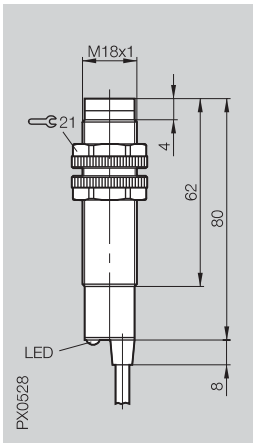
2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
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BOS 18 (AC)
Sensing distance 100 mm, 200 mm
Range 2 m, 16 m

Diffuse	Sensing distance	**0...100 mm/0...200 mm**	**0...200 mm**	
Retroreflective	Range	**2 m**		
Through-beam	Range			**0...16 m**



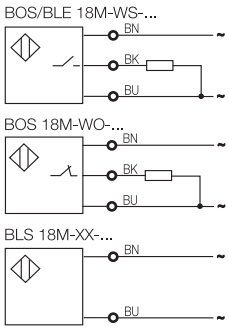




Diffuse				
Diode-jumper	100 mm	BOS 18M-WS-7XA-B0-L-03		
	200 mm	BOS 18M-WS-7XB-B0-L-03		
	200 mm Poti		BOS 18M-WS-7PB-B1-L-03	
Retroreflective				
Diode-jumper	2 m	BOS 18M-WS-7RB-B0-L-03		
Through-beam				
Diode jumper	16 m Receiver			BLE 18K-WS-7P-B0-L-03
	16 m Emitter			BLS 18K-XX-7P-B0-L-03
Electrical data				
Supply voltage U_B		20...250 V AC	20...250 V AC	20...240 V AC
No-load supply current I_0 max.		≤ 15 mA	≤ 15 mA	≤ 15 mA
Switching output		Diode jumper	Diode jumper	Diode jumper
Output current		200 mA	200 mA	200 mA
Switching type		Light- or dark-on	Light-on	Dark-on
Voltage drop U_d at I_e		≤ 4 V	≤ 4 V	≤ 4 V
Settings		no	16-turn potentiometer	no
Optical data				
Emitter, light type		LED, infrared	LED, infrared	LED, infrared
Wavelength		880 nm	880 nm	880 nm
Indicators				
Output function indicator		LED red	LED red	LED red
Time data				
Response time		50 ms	50 ms	20 ms
Switching frequency f		10 Hz	10 Hz	25 Hz
Mechanical data				
Connection		3 m cable, PVC	3 m cable, PVC	3 m cable, PVC
No. of wires × cross-section		3×0.34 mm²	3×0.34 mm²	3×0.34 mm²
Housing material		Nickel plated brass	Nickel plated brass	PA
Material of sensing face		PMMA	PMMA	PMMA
Weight		160 g	160 g	175 g
Ambient data				
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Polarity reversal protected		yes	yes	yes
Short circuit protected		no	no	no
Ambient temperature range T_a		–15...+55 °C	–15...+55 °C	–15...+55 °C
Ambient light rejection		5 kLux	5 kLux	5 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams



Recommended accessories
please order separately



Cover nut
BOS 18-SM-2

Deflection head
BOS 18-UK-10

Round aperture
BOS 18-BL-1

Reflector
BOS R-1

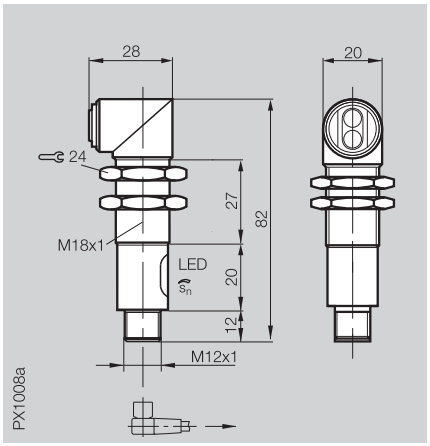
Air shield
BOS 18-LT-1

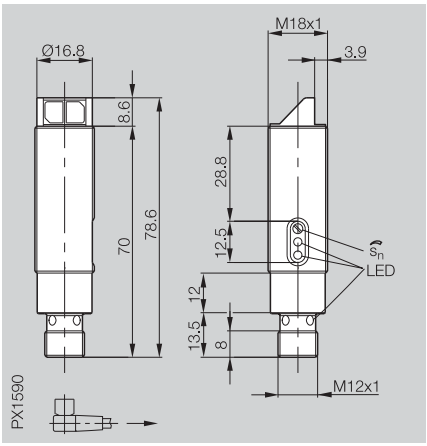
Mounting clamp
BOS 18,0-KB-1

Connector
BKS-_ 19/BKS-_ 20

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse	Sensing distance	**40...120 mm**	**10...120 mm**
Retroreflective	Range		
Through-beam	Range		

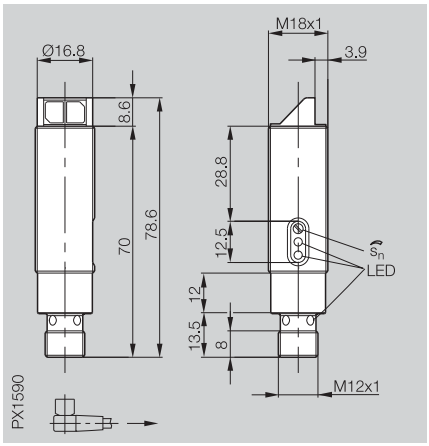
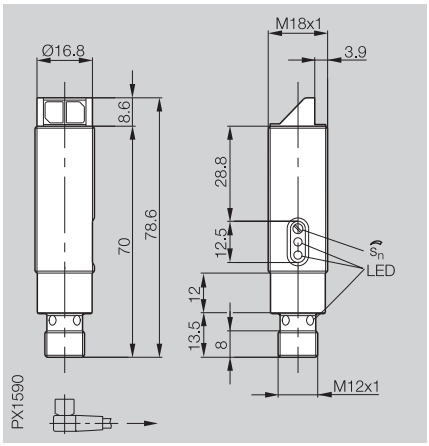
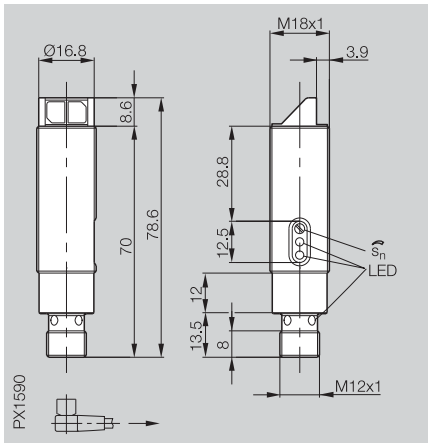




Diffuse					
PNP	40...120 mm	HGA	BOS 18MR-PA-1HA-S4-C		
PNP	10...120 mm	HGA		BOS 18MR-PS-1HA-E5-C-S4	
PNP	400 mm				
Retroreflective					
PNP	2 m	Polarizing filter			
Through-beam					
PNP	16 m	Receiver			
	16 m	Emitter, test input			
Electrical data					
Supply voltage U_B			10...30 V DC	10...36 V DC	
Ripple			10 %	20 %	
No-load supply current I_0 max.			≤ 30 mA	≤ 20 mA	
Switching output			PNP-Transistor	PNP-Transistor	
Output current			200 mA	200 mA	
Switching type			Light- and dark-on	Light-on	
Voltage drop U_d at I_e			≤ 2.5 V	≤ 2 V	
Settings			18-turn potentiometer	Potentiometer 270°	
Help functions					
Optical data					
Emitter, light type			LED, red light	LED, red light	
Wavelength			660 nm	660 nm	
Indicators					
Output function indicator			LED yellow	2 × LED yellow	
Stability indicator			no	LED green	
Time data					
Response time			0.8 ms	≤ 1 ms	
Switching frequency f			600 Hz	500 Hz	
Mechanical data					
Dimensions			M18×82 mm	M18×78.6 mm	
Connection			M12 connector, 4-pin	M12 connector, 4-pin	
Housing material			Nickel plated brass	Nickel plated brass	
Optical surface			Glass	Glass	
Weight			62 g	57 g	
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	
Polarity reversal protected			yes	yes	
Short circuit protected			yes	yes	
Ambient temperature range T_a			–15...+55 °C	–25...+55 °C	
Ambient light rejection			2 kLux	10 kLux	

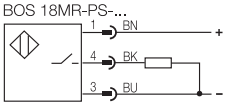
Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Connector orientation

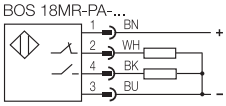
	0...400 mm	2 m	0...16 m
			
	BOS 18MR-PS-1OD-E5-C-S4		
		BOS 18MR-PS-1QB-E5-C-S4	
			BLE 18MR-PA-1PP-E5-C-S4 BLS 18MR-XX-1P-E5-L-S4
	10...36 V DC	10...36 V DC	10...36 V DC
	20 %	20 %	20 %
	≤ 20 mA	≤ 20 mA	≤ 20 mA
	PNP-Transistor	PNP-Transistor	PNP-Transistor
	200 mA	200 mA	200 mA
	Light-on	Dark-on	Light- and dark-on
	≤ 2 V	≤ 2 V	≤ 2 V
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
			Test input emitter
	LED, red light	LED, red light	LED, red light
	660 nm	660 nm	660 nm
	2 × LED yellow	2 × LED yellow	2 × LED yellow (BLE only)
	LED green	LED green	LED green (BLE only)
	≤ 0.5 ms	≤ 0.5 ms	≤ 0.5 ms
	1 kHz	1 kHz	1 kHz
	M18×78.6 mm	M18×78.6 mm	M18×78.6 mm
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Nickel plated brass	Nickel plated brass	Nickel plated brass
	Glass	Glass	Glass
	57 g	56 g	57 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–25...+55 °C	–25...+55 °C	–25...+55 °C
	10 kLux	10 kLux	10 kLux

Wiring diagrams

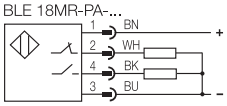
BOS 18MR-PS-...



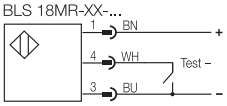
BOS 18MR-PA-...



BLE 18MR-PA-...



BLS 18MR-XX-...





Connector
BKS-_ 19/BKS-_ 20

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Photoelectric sensors from the **Opto-PROXINOX** series are made of corrosion-proof **stainless steel 1.4571** and are, therefore, not subject to wear and teach. Nor are there any compromises with the optical surface, with its 2 mm thick glass element (also plastic for the food industry). The nightmare of lost name-plates is also over:
the stainless steel sensors are laser engraved.

The housing design is identical for all the sensors in the **BOS 18E** series.
A special housing nose and optics construction provides optimum sealing and rigidity.
In addition to the usual IP 68 protection, steam cleaning is also permitted.

The **BOS 18E** series includes diffuse sensors with fixed sensing distances of 100 mm, 200 mm and 400 mm. They are manufactured to precise tolerances. This makes them ideal for rapid and uncomplicated assembly.
The use of high-visibility red light (for 100 and 200 mm) also makes them easy to align.

The through-beam model operates using infrared light. The high-energy beam can penetrate ordinary paper.
An ideal sensor for harsh environments, for example in the food processing and machine tools industry, where a sensor with large function reserves is demanded!

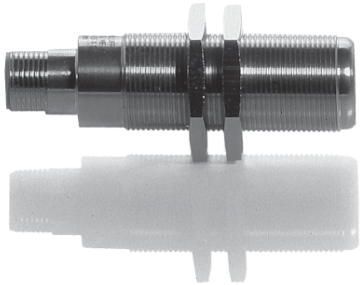
Features

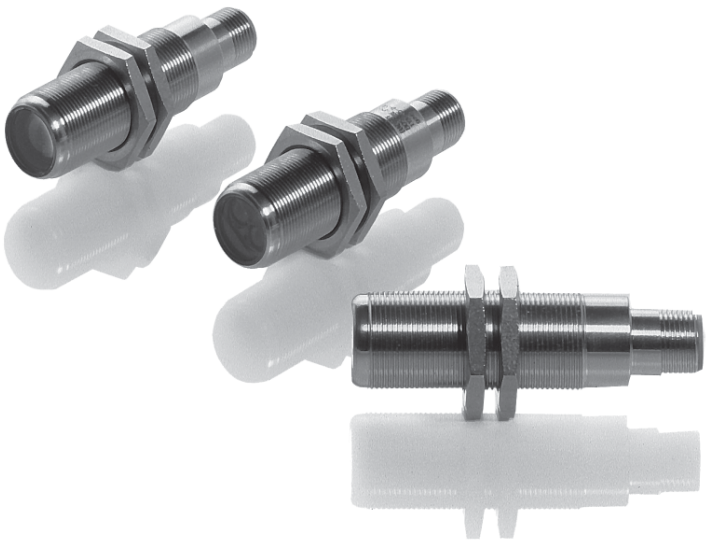
- Supply voltage 10...30 V DC, polarity reversal protected
- Output short circuit protected
- Tough stainless steel housing without holes and with stainless nuts
- Enclosure rating IP 68 (BWN Pr. 27), can also withstand steam cleaning
- Optical surface of tough 2 mm Borofloat glass or scratch-resistant PMMA, bead secured.

Applications

- Bottle and can filling
- Food processing
- Packaging
- Laundry and dry-cleaning equipment
- Machine tools
- Heavy industry
- Wherever other sensors don't measure up

Tested to BWN Pr. 27
(IP 68 for the food industry)



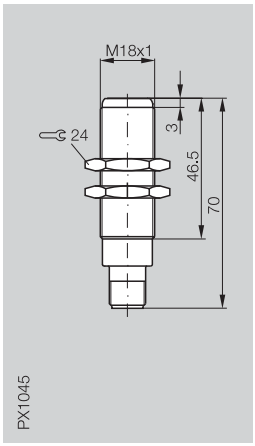


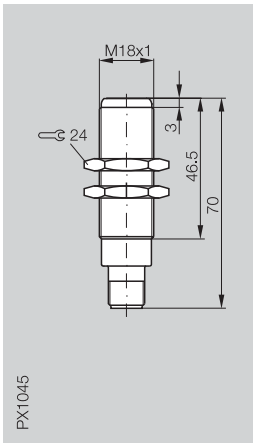
Type	Sensing distance/ range	Light type		Output		Output function		Switching frequency	U_B	Connection		Special features		Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter		
Diffuse with HGA														
BOS 18E-PS-1N2M-S4-D	0...40 mm	■		■		■		100 Hz	■	■				**2.1**.48
Diffuse														
BOS 18E-PS-1YA-E5-D-S4	0...100 mm	■		■		■		100 Hz	■	■				**2.1**.48
BOS 18E-PO-1YA-E5-D-S4	0...100 mm	■		■			■	100 Hz	■	■				**2.1**.48
BOS 18E-PS-1XA-SA1-S4	0...100 mm		■	■		■		100 Hz	■	■				**2.1**.49
BOS 18E-PS-1YB-E5-D-S4	0...200 mm	■		■		■		100 Hz	■	■				**2.1**.48
BOS 18E-PS-1XB-SA1-S4	0...200 mm		■	■		■		100 Hz	■	■				**2.1**.49
BOS 18E-PS-1YD-E5-D-S4	0...400 mm	■		■		■		100 Hz	■	■				**2.1**.48
BOS 18E-PS-1XD-SA1-S4	0...400 mm		■	■		■		100 Hz	■	■				**2.1**.49
Retroreflective														
BOS 18E-PS-1UB-E5-D-S4	2 m	■		■			■	100 Hz	■	■		■		**2.1**.49
BOS 18E-PS-1UB-SA1-D-S4	2 m	■		■			■	100 Hz	■	■		■		**2.1**.49
BOS 18E-PS-1WD-E5-D-S4	4 m	■		■			■	100 Hz	■	■				**2.1**.49
Through-beam														
BLE 18E-PS-1P-E5-D-S4	16 m		■	■			■	100 Hz	■	■				**2.1**.49
BLE 18E-PO-1P-E5-D-S4	16 m		■	■		■		100 Hz	■	■				**2.1**.49
BLE 18E-PS-1P-SA1-S4	16 m		■	■			■	100 Hz	■	■				**2.1**.49
BLS 18E-XX-1P-E5-X-S4	16 m		■						■	■				**2.1**.49
BLS 18E-XX-1P-SA1-S4	16 m		■						■	■				**2.1**.49

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

BOS 18E
Sensing distance 40 mm, 100 mm, 200 mm, 400 mm

Diffuse with background suppression	Sensing distance	**0...40 mm**	
Diffuse	Sensing distance		**0...100/0...200/0...400 mm**
Retroreflective	Range		
Through-beam	Range		



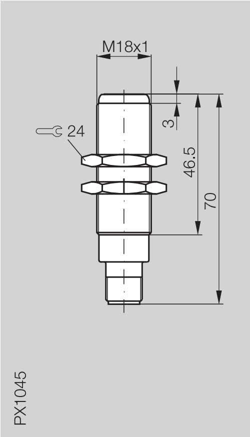
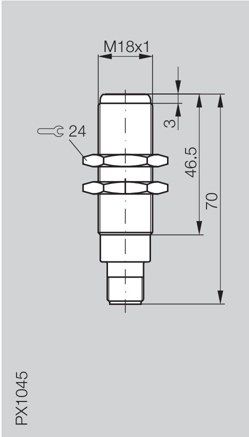
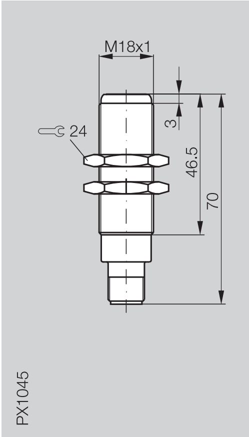
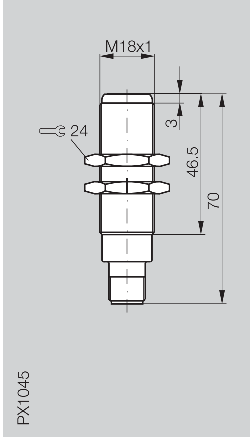
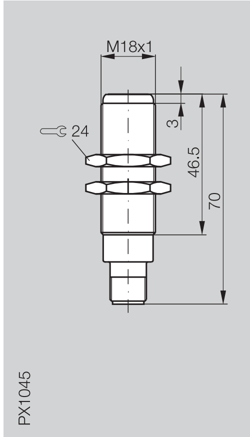


stainless steel

Diffuse					
PNP, light-on	40	mm		BOS 18E-PS-1N2M-S4-D	
PNP, light-on	100	mm			BOS 18E-PS-1YA-E5-D-S4
PNP, dark-on	100	mm			BOS 18E-PO-1YA-E5-D-S4
PNP, light-on	200	mm			BOS 18E-PS-1YB-E5-D-S4
PNP, light-on	400	mm			BOS 18E-PS-1YD-E5-D-S4
Retroreflective					
PNP, dark-on	2	m	Polarizing filter		
PNP, dark-on	4	m			
Through-beam					
PNP, dark-on	16	m	Receiver		
PNP, light-on	16	m	Receiver		
			Emitter		
Electrical data					
Supply voltage U_B				10...30 V DC	10...30 V DC
Ripple				15 %	10 %
No-load supply current I_0 max.				≤ 20 mA	≤ 20 mA
Switching output				PNP-Transistor	PNP-Transistor
Output current				200 mA	200 mA
Switching type				Light-on	Light- or dark-on
Voltage drop U_d at I_e				≤ 2.5 V	≤ 2.5 V
Settings				fixed	fixed
Optical data					
Emitter, light type				LED, red light	LED, red light
Wavelength				660 nm	660 nm
Time data					
Response time				5 ms	5 ms
Switching frequency f				100 Hz	100 Hz
Mechanical data					
Dimensions				M18×70 mm	M18×70 mm
Connection				M12 connector, 4-pin	M12 connector, 4-pin
Housing material				**Stainless steel 1.4571**	**Stainless steel 1.4571**
Optical surface				Glass	Glass
Weight				55 g	55 g
Ambient data					
Degree of protection per IEC 60529				IP 69K and IP 68 per BWN Pr. 27	IP 69K and IP 68 per BWN Pr. 27
Polarity reversal protected				yes	yes
Short circuit protected				yes	yes
Ambient temperature range T_a				–5...+75 °C	–20...+75 °C
Ambient light rejection				2 kLux	2 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**50 and **2.1.**51.

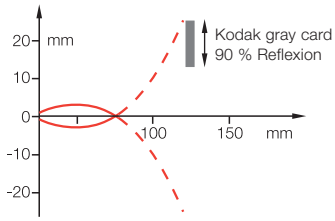
	0...100/0...200/0...400 mm				
		2 m/4 m	**2 m**		
				16 m	**16 m**
					
	BOS 18E-PS-1XA-SA1-S4				
	BOS 18E-PS-1XB-SA1-S4				
	BOS 18E-PS-1XD-SA1-S4				
		BOS 18E-PS-1UB-E5-D-S4	BOS 18E-PS-1UB-SA1-S4		
		BOS 18E-PS-1WD-E5-D-S4			
				BLE 18E-PS-1P-E5-D-S4	BLE 18E-PS-1P-SA1-S4
				BLE 18E-PO-1P-E5-D-S4	
				BLS 18E-XX-1P-E5-X-S4	BLS 18E-XX-1P-SA1-S4
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	15 %	10 %	15 %	15 %	15 %
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 15 mA (BLS ≤ 40 mA)	≤ 15 mA (BLS ≤ 35 mA)
	PNP-Transistor	PNP-Transistor	PNP-Transistor	PNP-Transistor	PNP-Transistor
	200 mA	200 mA	200 mA	200 mA	200 mA
	Light-on	Dark-on	Dark-on	Light- or dark-on	Dark-on
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	fixed	fixed	fixed	fixed	fixed
	LED, infrared	LED, red light	LED, red light	LED, infrared	LED, infrared
	880 nm	660 nm	660 nm	880 nm	880 nm
	5 ms	5 ms	5 ms	5 ms	5 ms
	100 Hz	100 Hz	100 Hz	100 Hz	100 Hz
	M18×70 mm	M18×70 mm	M18×70 mm	M18×70 mm	M18×70 mm
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Stainless steel 1.4571	**Stainless steel 1.4571**	**Stainless steel 1.4571**	**Stainless steel 1.4571**	**Stainless steel 1.4571**
	PMMA scratch-resistant	Glass	PMMA scratch-resistant	Glass	PMMA scratch-resistant
	55 g	40 g	40 g	55 g (40 g)	55 g (40 g)
	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
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–5...+75 °C	–20...+75 °C	–20...+75 °C	–5...+75 °C	–5...+75 °C
	2 kLux	2 kLux	2 kLux	2 kLux	2 kLux

2.1

2.3 Photoelectric sensors accessories page 2.3.2 ...

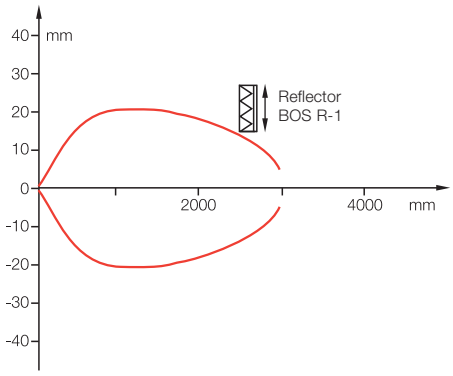
5 Connectors ... page 5.2 ...

Diffuse BOS 18E-...-1YA-...



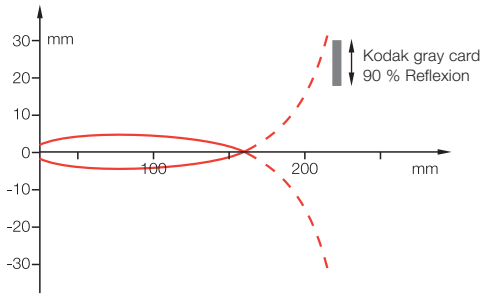
Sensing distance measured with side approach of Kodak gray card.

Retroreflective BOS 18E-...-1UB-...



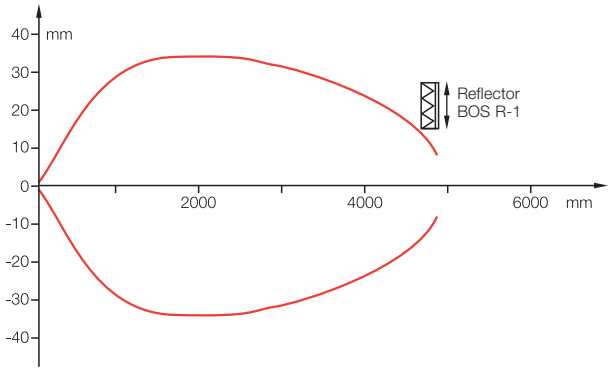
Range measured using side approach with reflector.

Diffuse BOS 18E-...-1YB-...



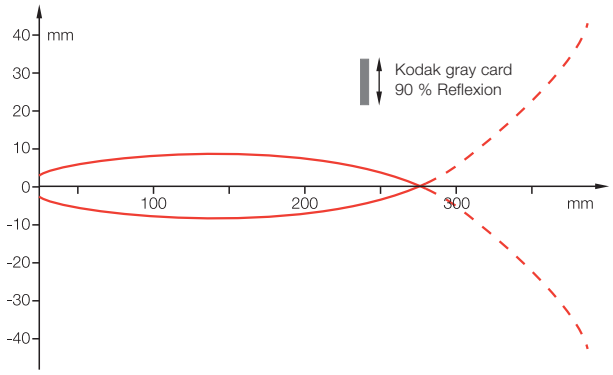
Sensing distance measured with side approach of Kodak gray card.

Retroreflective BOS 18E-...-1WD-...



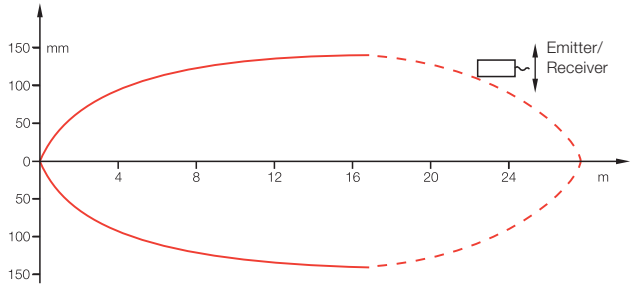
Range measured using side approach with reflector.

Diffuse BOS 18E-...-1YD-...



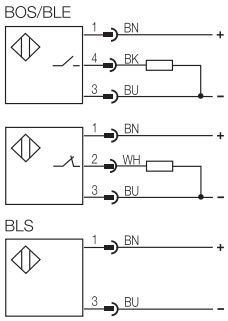
Sensing distance measured with side approach of Kodak gray card.

Through-beam BLE/BLS 18E-...



For the through-beam the maximum possible offset between emitter and receiver is measured.

Wiring diagrams



2.1
2.3
Photoelectric sensors accessories
page 2.3.2 ...
5
Connectors ...
page 5.2 ...

Recommended accessories
please order separately


Round aperture
BOS 18-BL-1


Reflector
BOS R-1


Air shield
BOS 18-LT-1


Mounting clamp
BOS 18,0-KB-1


Connector
BKS-S 20E

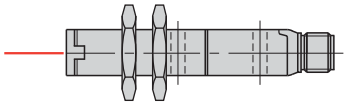
BOS 18KF – standards redefined

The redesigned 18K series doesn't just look different, it features new sensors and improved technical data.

The sensors are available with red or infrared light or as Class 1 laser type. Sensor settings are made using a potentiometer or teach-in process.

The plastic housing with flattened sides allows installation using the included M18 nuts or screws through the sensor housing.

The sensors are available as cable or M12 connector styles with PNP or NPN output.



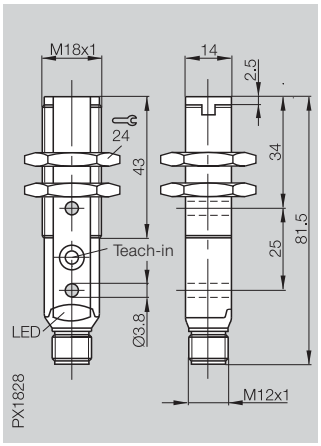


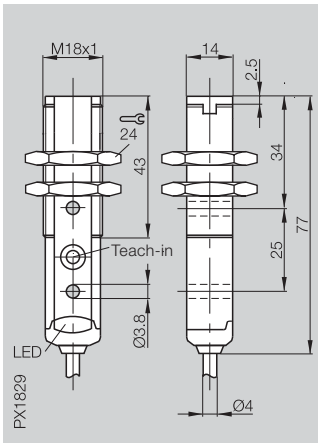
Type	Sensing distance/ range	Light type			Output		Output function		Switching frequency	U_B	Connec-tion		Special features		Page
		Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter	Teach-in	
Diffuse with HGA															
BOS 18KF-PA-1HA-S4-C	50...100 mm	■			■		■	■	500 Hz	■	■			■	**2.1.**54
BOS 18KF-NA-1HA-S4-C	50...100 mm	■				■	■	■	500 Hz	■	■			■	**2.1.**54
BOS 18KF-PA-1HA-C-02	50...100 mm	■			■		■	■	500 Hz	■		■		■	**2.1.**54
BOS 18KF-NA-1HA-C-02	50...100 mm	■				■	■	■	500 Hz	■		■		■	**2.1.**54
BOS 18KF-PA-1N1R-S4-C	100 mm	■			■		■	■	1 kHz	■	■				**2.1.**55
BOS 18KF-NA-1N1R-S4-C	100 mm	■				■	■	■	1 kHz	■	■				**2.1.**55
BOS 18KF-PA-1N1R-C-02	100 mm	■			■		■	■	1 kHz	■		■			**2.1.**55
BOS 18KF-NA-1N1R-C-02	100 mm	■				■	■	■	1 kHz	■		■			**2.1.**55
Diffuse with VGA															
BOS 18KF-PA-1GA-S4-C	40...100 mm	■			■		■	■	250 Hz	■	■			■	**2.1.**55
BOS 18KF-NA-1GA-S4-C	40...100 mm	■				■	■	■	250 Hz	■	■			■	**2.1.**55
BOS 18KF-PA-1GA-C-02	40...100 mm	■			■		■	■	250 Hz	■		■		■	**2.1.**55
BOS 18KF-NA-1GA-C-02	40...100 mm	■				■	■	■	250 Hz	■		■		■	**2.1.**55
Diffuse															
BOS 18KF-PA-1XA-S4-C	0...100 mm		■		■		■	■	1 kHz	■	■				**2.1.**56
BOS 18KF-NA-1XA-S4-C	0...100 mm		■			■	■	■	1 kHz	■	■				**2.1.**56
BOS 18KF-PA-1XA-C-02	0...100 mm		■		■		■	■	1 kHz	■		■			**2.1.**56
BOS 18KF-NA-1XA-C-02	0...100 mm		■			■	■	■	1 kHz	■		■			**2.1.**56
BOS 18KF-PA-1LOC-S4-C	0...350 mm			■	■		■	■	1.5 kHz	■	■				**2.1.**62
BOS 18KF-NA-1LOC-S4-C	0...350 mm			■		■	■	■	1.5 kHz	■	■				**2.1.**62
BOS 18KF-PA-1LOC-C-02	0...350 mm			■	■		■	■	1.5 kHz	■		■			**2.1.**62
BOS 18KF-NA-1LOC-C-02	0...350 mm			■		■	■	■	1.5 kHz	■		■			**2.1.**62

Type	Sensing distance/ range	Light type			Output		Output function		Switching frequency	U_B	Connection		Special features		Page
		Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter	Glass sensing	
Diffuse															
BOS 18KF-PA-1PD-S4-C	0...400 mm		■		■		■	■	1 kHz	■	■				**2.1**.57
BOS 18KF-NA-1PD-S4-C	0...400 mm		■			■	■	■	1 kHz	■	■				**2.1**.57
BOS 18KF-PA-1PD-C-02	0...400 mm		■		■		■	■	1 kHz	■		■			**2.1**.57
BOS 18KF-NA-1PD-C-02	0...400 mm		■			■	■	■	1 kHz	■		■			**2.1**.57
BOS 18KF-PA-1PE-S4-C	0...700 mm		■		■		■	■	1 kHz	■	■				**2.1**.57
BOS 18KF-NA-1PE-S4-C	0...700 mm		■			■	■	■	1 kHz	■	■				**2.1**.57
BOS 18KF-PA-1PE-C-02	0...700 mm		■		■		■	■	1 kHz	■		■			**2.1**.57
BOS 18KF-NA-1PE-C-02	0...700 mm		■			■	■	■	1 kHz	■		■			**2.1**.57
Retroreflective															
BOS 18KF-PA-1TB-S4-C	0.1...1.7 m	■			■		■	■	1 kHz	■	■		■	■	**2.1**.58
BOS 18KF-NA-1TB-S4-C	0.1...1.7 m	■				■	■	■	1 kHz	■	■		■	■	**2.1**.58
BOS 18KF-PA-1TB-C-02	0.1...1.7 m	■			■		■	■	1 kHz	■		■	■	■	**2.1**.58
BOS 18KF-NA-1TB-C-02	0.1...1.7 m	■				■	■	■	1 kHz	■		■	■	■	**2.1**.58
BOS 18KF-PA-1QD-S4-C	0.1...4.5 m	■			■		■	■	1 kHz	■	■		■		**2.1**.59
BOS 18KF-NA-1QD-S4-C	0.1...4.5 m	■				■	■	■	1 kHz	■	■		■		**2.1**.59
BOS 18KF-PA-1QD-C-02	0.1...4.5 m	■			■		■	■	1 kHz	■		■	■		**2.1**.59
BOS 18KF-NA-1QD-C-02	0.1...4.5 m	■				■	■	■	1 kHz	■		■	■		**2.1**.59
BOS 18KF-PA-1RE-S4-C	0.1...5 m	■			■		■	■	1 kHz	■	■				**2.1**.59
BOS 18KF-NA-1RE-S4-C	0.1...5 m	■				■	■	■	1 kHz	■	■				**2.1**.59
BOS 18KF-PA-1RE-C-02	0.1...5 m	■			■		■	■	1 kHz	■		■			**2.1**.59
BOS 18KF-NA-1RE-C-02	0.1...5 m	■				■	■	■	1 kHz	■		■			**2.1**.59
BOS 18KF-PA-1LQP-S4-C	0.1...16 m			■	■		■	■	1.5 kHz	■	■		■		**2.1**.63
BOS 18KF-NA-1LQP-S4-C	0.1...16 m			■		■	■	■	1.5 kHz	■	■		■		**2.1**.63
BOS 18KF-PA-1LQP-C-02	0.1...16 m			■	■		■	■	1.5 kHz	■		■	■		**2.1**.63
BOS 18KF-NA-1LQP-C-02	0.1...16 m			■		■	■	■	1.5 kHz	■		■	■		**2.1**.63
Through-beam															
BLE 18KF-PA-1PP-S4-C	0...20 m		■		■		■	■	250 Hz	■	■				**2.1**.60
BLE 18KF-NA-1PP-S4-C	0...20 m		■			■	■	■	250 Hz	■	■				**2.1**.60
BLE 18KF-PA-1PP-C-02	0...20 m		■		■		■	■	250 Hz	■		■			**2.1**.61
BLE 18KF-NA-1PP-C-02	0...20 m		■			■	■	■	250 Hz	■		■			**2.1**.61
BLE 18KF-PA-1LT-S4-C	0...60 m			■	■		■	■	1.5 kHz	■	■				**2.1**.64
BLE 18KF-NA-1LT-S4-C	0...60 m			■		■	■	■	1.5 kHz	■	■				**2.1**.64
BLE 18KF-PA-1LT-C-02	0...60 m			■	■		■	■	1.5 kHz	■		■			**2.1**.65
BLE 18KF-NA-1LT-C-02	0...60 m			■		■	■	■	1.5 kHz	■		■			**2.1**.65
BLS 18KF-XX-1P-S4-L	0...20 m		■							■	■				**2.1**.60
BLS 18KF-XX-1P-L-02	0...20 m		■							■		■			**2.1**.61
BLS 18KF-XX-1LT-S4-L	0...60 m			■						■	■				**2.1**.64
BLS 18KF-XX-1LT-L-02	0...60 m			■						■		■			**2.1**.65

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse with background suppression	maximum sensing distance	**50...100 mm**	**50...100 mm**
Diffuse with fore- and background suppression	maximum sensing distance		

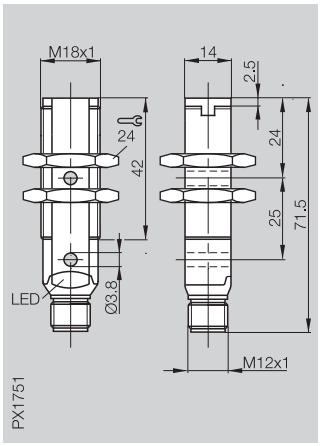
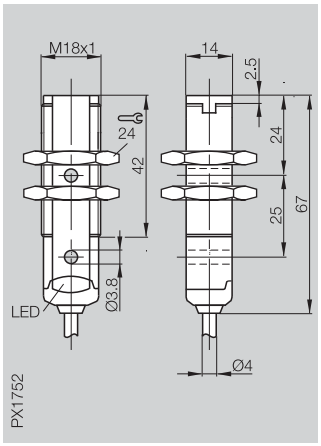
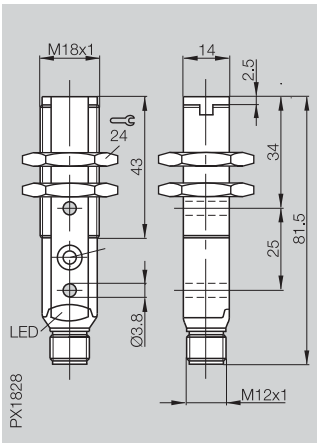
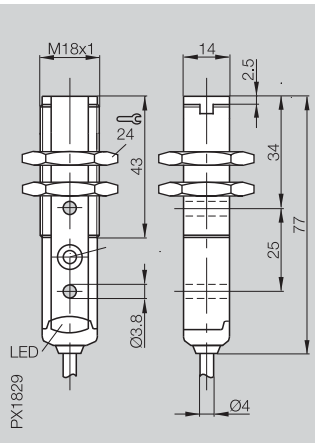




Diffuse					
PNP	50...100 mm	HGA	BOS 18KF-PA-1HA-S4-C	BOS 18KF-PA-1HA-C-02	
NPN	50...100 mm	HGA	BOS 18KF-NA-1HA-S4-C	BOS 18KF-NA-1HA-C-02	
PNP	100 mm	HGA			
NPN	100 mm	HGA			
PNP	40...100 mm	VGA + HGA			
NPN	40...100 mm	VGA + HGA			
Electrical data					
Supply voltage U_B			10...30 V DC	10...30 V DC	
Ripple			≤ 2 V	≤ 2 V	
No-load supply current I_0 max.			≤ 30 mA	≤ 30 mA	
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor	
Output current			100 mA	100 mA	
Switching type			Light- and dark-on	Light- and dark-on	
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V	
Settings			Teach-in	Teach-in	
Optical data					
Recommended sensing distance			50...100 mm	50...100 mm	
Emitter, light type			LED, red light	LED, red light	
Wavelength			630 nm	630 nm	
Light spot diameter			approx. 8 mm at 100 mm	approx. 8 mm at 100 mm	
Indicators					
Output function indicator			LED yellow	LED yellow	
Stability indicator			LED green/red	LED green/red	
Time data					
Response time			1 ms	1 ms	
Switching frequency f			500 Hz	500 Hz	
Mechanical data					
Dimensions			M18×81.5 mm	M18×77 mm	
Connection			M12 connector, 4-pin	2 m cable, PVC	
No. of wires × cross-section				4×0.14 mm²	
Housing material			PBT	PBT	
Optical surface			PMMA	PMMA	
Weight			25 g	75 g	
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	
Polarity reversal protected			yes	yes	
Short circuit protected			yes	yes	
Ambient temperature range T_a			–25...+55 °C	–25...+55 °C	
Reference standard			EN 60947-5-2	EN 60947-5-2	

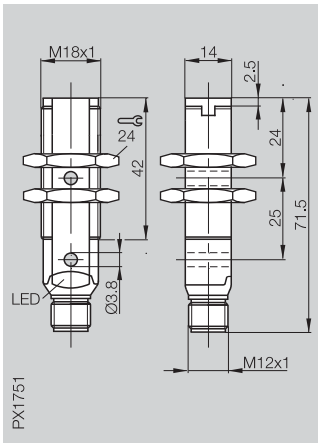
Diffuse values referenced to Kodak gray card 90% Reflexion.

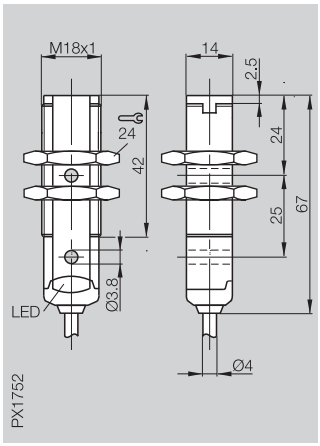
Wiring diagrams, characteristics and accessories see page **2.1.**66 to **2.1.**69.

	100 mm	**100 mm**	**40...100 mm**	**40...100 mm**
				
	BOS 18KF-PA-1N1R-S4-C BOS 18KF-NA-1N1R-S4-C	BOS 18KF-PA-1N1R-C-02 BOS 18KF-NA-1N1R-C-02	BOS 18KF-PA-1GA-S4-C BOS 18KF-NA-1GA-S4-C	BOS 18KF-PA-1GA-C-02 BOS 18KF-NA-1GA-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 30 mA	≤ 30 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light- and dark-on
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	fixed	fixed	Teach-in	Teach-in
	100 mm	100 mm	40...100 mm	40...100 mm
	LED, red light	LED, red light	LED, red light	LED, red light
	630 nm	630 nm	630 nm	630 nm
	approx. 20 mm at 100 mm	approx. 20 mm at 100 mm	approx. 8 mm at 100 mm	approx. 8 mm at 100 mm
	LED yellow LED green/red	LED yellow LED green/red	LED yellow LED green/red	LED yellow LED green/red
	0.5 ms 1 kHz	0.5 ms 1 kHz	2 ms 250 Hz	2 ms 250 Hz
	M18×71.5 mm M12 connector, 4-pin	M18×67 mm 2 m cable, PVC 4×0.14 mm²	M18×81.5 mm M12 connector, 4-pin	M18×77 mm 2 m cable, PVC 4×0.14 mm²
	PBT PMMA 25 g	PBT PMMA 75 g	PBT PMMA 25 g	PBT PMMA 75 g
	IP 67 yes yes –25...+55 °C EN 60947-5-2	IP 67 yes yes –25...+55 °C EN 60947-5-2	IP 67 yes yes –25...+55 °C EN 60947-5-2	IP 67 yes yes –25...+55 °C EN 60947-5-2

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Connectors ... page 5.2 ...

Diffuse	maximum sensing distance	**0...100 mm**	**0...100 mm**

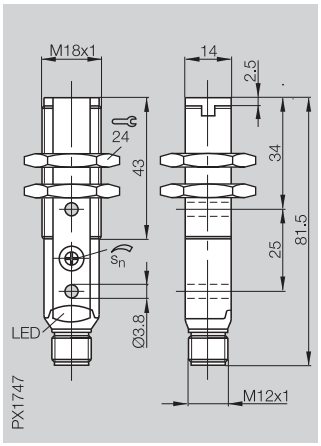
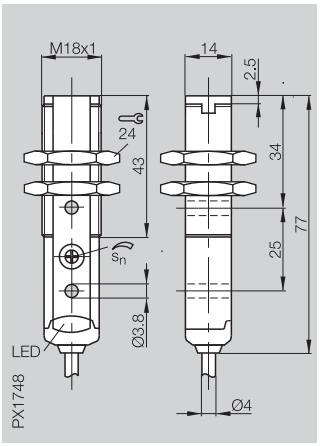
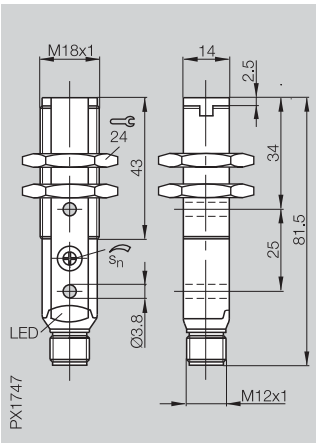
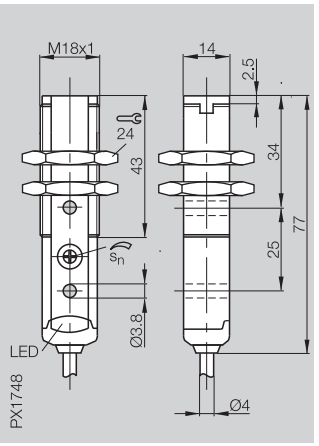




Diffuse			
PNP	100 mm	BOS 18KF-PA-1XA-S4-C	BOS 18KF-PA-1XA-C-02
NPN	100 mm	BOS 18KF-NA-1XA-S4-C	BOS 18KF-NA-1XA-C-02
PNP	400 mm		
NPN	400 mm		
PNP	700 mm		
NPN	700 mm		
Electrical data			
Supply voltage U_B		10...30 V DC	10...30 V DC
Ripple		≤ 2 V	≤ 2 V
No-load supply current I_0 max.		≤ 35 mA	≤ 35 mA
Switching output		PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current		100 mA	100 mA
Switching type		Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V
Settings			
Optical data			
Recommended sensing distance		0...100 mm	0...100 mm
Emitter, light type		LED, infrared	LED, infrared
Wavelength		880 nm	880 nm
Light spot diameter		approx. 80 mm at 100 mm	approx. 80 mm at 100 mm
Indicators			
Output function indicator		LED yellow	LED yellow
Stability indicator			
Time data			
Response time		0.5 ms	0.5 ms
Switching frequency f		1 kHz	1 kHz
Mechanical data			
Dimensions		M18×71.5 mm	M18×67 mm
Connection		M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section			4×0.14 mm²
Housing material		PBT	PBT
Optical surface		PMMA	PMMA
Weight		25 g	75 g
Ambient data			
Degree of protection per IEC 60529		IP 67	IP 67
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–25...+55 °C	–25...+55 °C
Reference standard		EN 60947-5-2	EN 60947-5-2

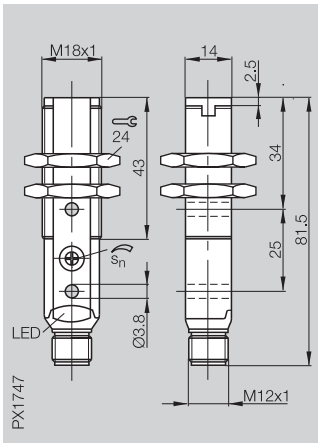
Diffuse values referenced to Kodak gray card 90% Reflexion.

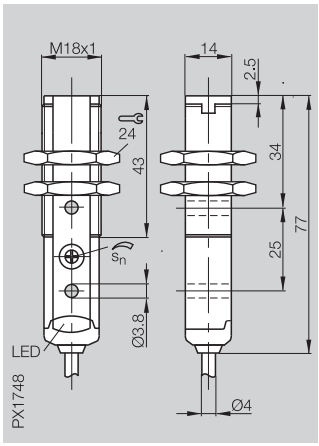
Wiring diagrams, characteristics and accessories see page **2.1.**66 to **2.1.**69.

	0...400 mm	0...400 mm	0...700 mm	0...700 mm
				
	BOS 18KF-PA-1PD-S4-C BOS 18KF-NA-1PD-S4-C	BOS 18KF-PA-1PD-C-02 BOS 18KF-NA-1PD-C-02	BOS 18KF-PA-1PE-S4-C BOS 18KF-NA-1PE-S4-C	BOS 18KF-PA-1PE-C-02 BOS 18KF-NA-1PE-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light- and dark-on
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	0...350 mm	0...350 mm	0...600 mm	0...600 mm
	LED, infrared	LED, infrared	LED, infrared	LED, infrared
	880 nm	880 nm	880 nm	880 nm
	approx. 100 mm at 300 mm	approx. 100 mm at 300 mm	approx. 200 mm at 600 mm	approx. 200 mm at 600 mm
	LED yellow LED green	LED yellow LED green	LED yellow LED green	LED yellow LED green
	0.5 ms	0.5 ms	0.5 ms	0.5 ms
	1 kHz	1 kHz	1 kHz	1 kHz
	M18×81.5 mm	M18×77 mm	M18×81.5 mm	M18×77 mm
	M12 connector, 4-pin	2 m cable, PVC	M12 connector, 4-pin	2 m cable, PVC
		4×0.14 mm²		4×0.14 mm²
	PBT	PBT	PBT	PBT
	PMMA	PMMA	PMMA	PMMA
	25 g	75 g	25 g	75 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

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Retroreflective for transparent materials	Range	**0.1...1.7 m**	**0.1...1.7 m**
Retroreflective with polarizing filter	maximum range		
Retroreflective	maximum range		

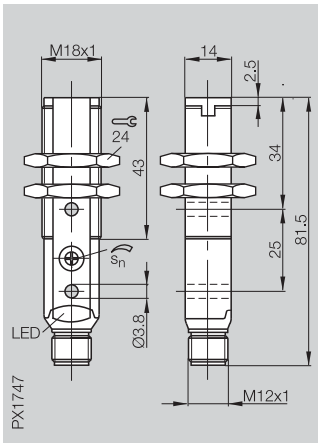
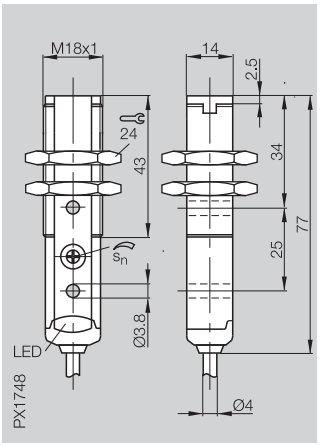
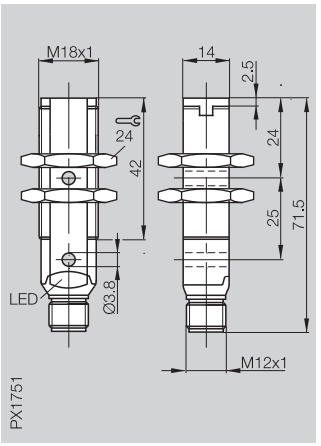
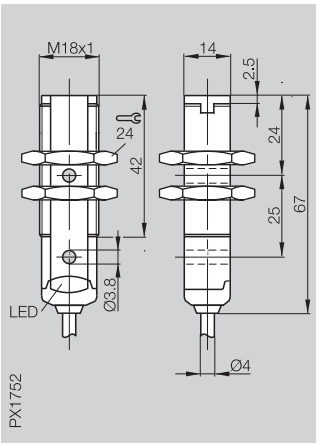




Retroreflective					
PNP	0.1...1.7 m	Polarizing filter	BOS 18KF-PA-1TB-S4-C	BOS 18KF-PA-1TB-C-02	
NPN	0.1...1.7 m	Polarizing filter	BOS 18KF-NA-1TB-S4-C	BOS 18KF-NA-1TB-C-02	
PNP	0.1...4.5 m	Polarizing filter			
NPN	0.1...4.5 m	Polarizing filter			
PNP	0.1...5 m				
NPN	0.1...5 m				
Electrical data					
Supply voltage U_B			10...30 V DC	10...30 V DC	
Ripple			≤ 2 V	≤ 2 V	
No-load supply current I_0 max.			≤ 35 mA	≤ 35 mA	
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor	
Output current			100 mA	100 mA	
Switching type			Light- and dark-on	Light- and dark-on	
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V	
Settings			Potentiometer 270°	Potentiometer 270°	
Optical data					
Recommended sensing distance			0.1...1.4 m	0.1...1.4 m	
Emitter, light type			LED, red light	LED, red light	
Wavelength			660 nm	660 nm	
Light spot diameter			approx. 45 mm at 1 m	approx. 45 mm at 1 m	
Indicators					
Output function indicator			LED yellow	LED yellow	
Stability indicator			LED green	LED green	
Time data					
Response time			0.5 ms	0.5 ms	
Switching frequency f			1 kHz	1 kHz	
Mechanical data					
Dimensions			M18×81.5 mm	M18×77 mm	
Connection			M12 connector, 4-pin	2 m cable, PVC	
No. of wires × cross-section				4×0.14 mm²	
Housing material			PBT	PBT	
Optical surface			PMMA	PMMA	
Weight			25 g	25 g	
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	
Polarity reversal protected			yes	yes	
Short circuit protected			yes	yes	
Ambient temperature range T_a			–25...+55 °C	–25...+55 °C	
Reference standard			EN 60947-5-2	EN 60947-5-2	

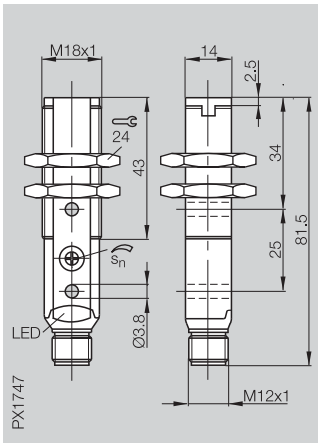
Retroreflective values referenced to R1 reflector.

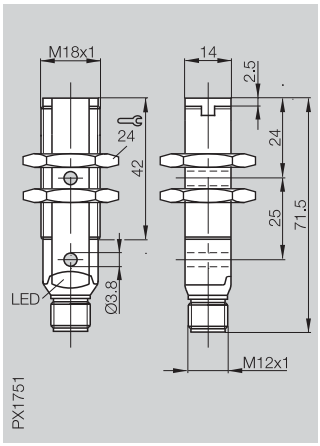
Wiring diagrams, characteristics and accessories see page **2.1.**66 to **2.1.**69.

	0.1...4.5 m	**0.1...4.5 m**	**0.1...5 m**	**0.1...5 m**
				
	BOS 18KF-PA-1QD-S4-C BOS 18KF-NA-1QD-S4-C	BOS 18KF-PA-1QD-C-02 BOS 18KF-NA-1QD-C-02	BOS 18KF-PA-1RE-S4-C BOS 18KF-NA-1RE-S4-C	BOS 18KF-PA-1RE-C-02 BOS 18KF-NA-1RE-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light- and dark-on
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	Potentiometer 270°	Potentiometer 270°	fixed	fixed
	0.1...4 m	0.1...4 m	0.1...5 m	0.1...5 m
	LED, red light	LED, red light	LED, infrared	LED, infrared
	660 nm	660 nm	880 nm	880 nm
	approx. 65 mm at 3 m	approx. 65 mm at 3 m	approx. 100 mm at 2 m	approx. 100 mm at 2 m
	LED yellow	LED yellow	LED yellow	LED yellow
	LED green	LED green	LED green	LED green
	0.5 ms	0.5 ms	0.5 ms	0.5 ms
	1 kHz	1 kHz	1 kHz	1 kHz
	M18×81.5 mm	M18×77 mm	M18×71.5 mm	M18×77 mm
	M12 connector, 4-pin	2 m cable, PVC	M12 connector, 4-pin	2 m cable, PVC
		4×0.14 mm²		4×0.14 mm²
	PBT	PBT	PBT	PBT
	PMMA	PMMA	PMMA	PMMA
	25 g	75 g	25 g	25 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

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5 Connectors ... page 5.2 ...

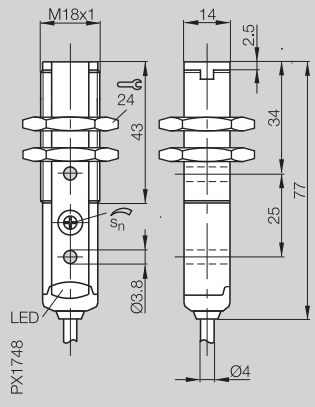
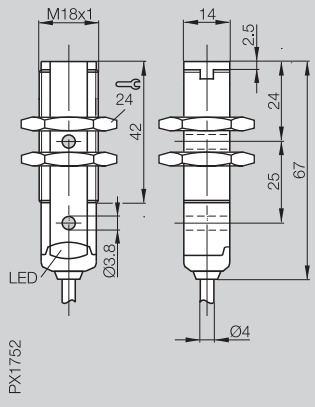
Through-beam	maximum range	**0...20 m**	**0...20 m**	





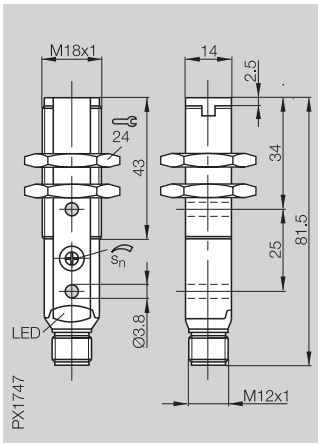
Through-beam				
PNP	20 m	Receiver	BLE 18KF-PA-1PP-S4-C	
NPN	20 m	Receiver	BLE 18KF-NA-1PP-S4-C	
	20 m	Emitter		BLS 18KF-XX-1P-S4-L
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 30 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	
Output current			100 mA	
Switching type			Light- and dark-on	
Voltage drop U_d at I_e			≤ 2 V	
Settings			Potentiometer 270°	
Help functions				Test input
Optical data				
Recommended range			0...15 m	0...15 m
Emitter, light type				LED, infrared
Wavelength				880 nm
Light spot diameter				approx. 500 mm at 15 m
Indicators				
Power-on indicator			LED green	LED green
Output function indicator			LED yellow	
Time data				
Response time			2 ms	
Switching frequency f			250 Hz	
Mechanical data				
Dimensions			M18×81.5 mm	M18×71.5 mm
Connection			M12 connector, 4-pin	M12 connector, 4-pin
No. of wires × cross-section				
Housing material			PBT	PBT
Optical surface			PMMA	PMMA
Weight			25 g	25 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–25...+55 °C	–25...+55 °C
Reference standard			EN 60947-5-2	EN 60947-5-2

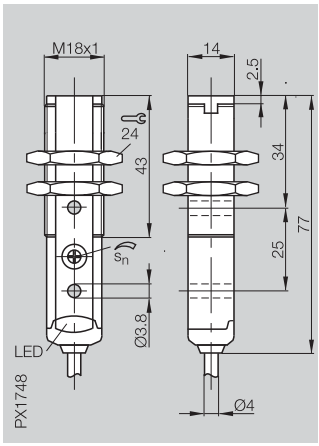
Wiring diagrams, characteristics and accessories see page **2.1.**66 to **2.1.**69.

	0...20 m	**0...20 m**			
					
	BLE 18KF-PA-1PP-C-02 BLE 18KF-NA-1PP-C-02	BLS 18KF-XX-1P-L-02			
	10...30 V DC ≤ 2 V ≤ 30 mA PNP- or NPN-Transistor 100 mA Light- and dark-on ≤ 2 V Potentiometer 270°	10...30 V DC ≤ 2 V ≤ 35 mA Test input			
	0...15 m	0...15 m LED, infrared 880 nm approx. 500 mm at 15 m			
	LED green LED yellow	LED green			
	2 ms 250 Hz				
	M18×77 mm 2 m cable, PVC 4×0.14 mm² PBT PMMA 75 g	M18×67 mm 2 m cable, PVC 4×0.14 mm² PBT PMMA 75 g			
	IP 67 yes yes –25...+55 °C EN 60947-5-2	IP 67 yes yes –25...+55 °C EN 60947-5-2			

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Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Diffuse	maximum sensing distance	**0...350 mm**	**0...350 mm**
Retroreflective with polarizing filter	maximum range		

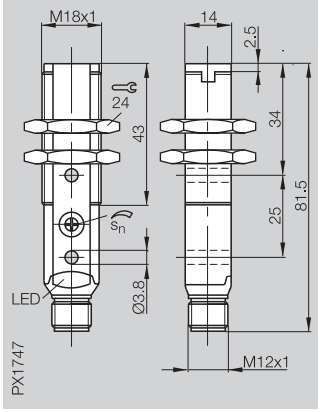
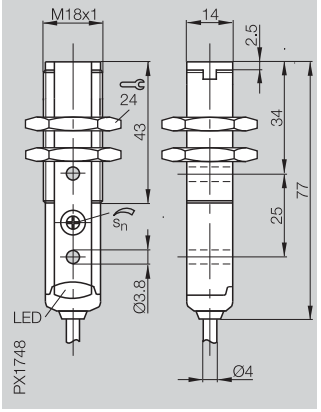




Diffuse				
PNP	350 mm		BOS 18KF-PA-1LOC-S4-C	BOS 18KF-PA-1LOC-C-02
NPN	350 mm		BOS 18KF-NA-1LOC-S4-C	BOS 18KF-NA-1LOC-C-02
Retroreflective				
PNP	0.1...16 m	Polarizing filter		
NPN	0.1...16 m	Polarizing filter		
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 35 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current			100 mA	100 mA
Switching type			Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V
Settings			Potentiometer 270°	Potentiometer 270°
Optical data				
Recommended sensing distance/range			0...350 mm	0...350 mm
Emitter, light type			Laser, red light	Laser, red light
Wavelength			650 nm	650 nm
Laser class			Class 1	Class 1
Resolution			approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm	approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm
Indicators				
Power-on indicator			LED green	LED green
Output function indicator			LED yellow	LED yellow
Time data				
Response time			333 µs	333 µs
Switching frequency f			1.5 kHz	1.5 kHz
Mechanical data				
Dimensions			M18×81.5 mm	M18×77 mm
Connection			M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section				4×0.14 mm²
Housing material			PBT	PBT
Optical surface			PMMA	PMMA
Weight			25 g	75 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–10...+50 °C	–10...+50 °C
Reference standard			EN 60947-5-2	EN 60947-5-2

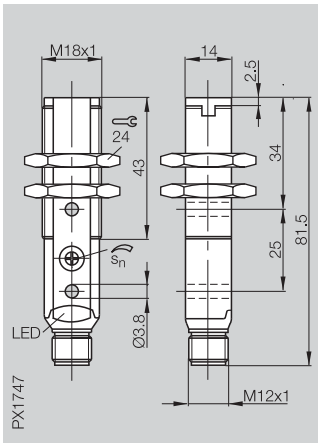
Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

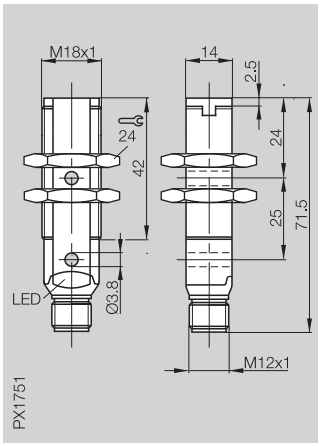
Wiring diagrams, characteristics and accessories see page **2.1.**66 to **2.1.**69.

	0.1...16 m	**0.1...16 m**
		
	BOS 18KF-PA-1LQP-S4-C BOS 18KF-NA-1LQP-S4-C	BOS 18KF-PA-1LQP-C-02 BOS 18KF-NA-1LQP-C-02
	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA
	Light- and dark-on	Light- and dark-on
	≤ 2 V	≤ 2 V
	Potentiometer 270°	Potentiometer 270°
	0.1...16 m	0.1...16 m
	Laser, red light	Laser, red light
	650 nm	650 nm
	Class 1	Class 1
	approx. 0.9 mm at 1 m approx. 2 mm at 3 m	approx. 0.9 mm at 1 m approx. 2 mm at 3 m
	LED green	LED green
	LED yellow	LED yellow
	333 µs	333 µs
	1.5 kHz	1.5 kHz
	M18×81.5 mm	M18×77 mm
	M12 connector, 4-pin	2 m cable, PVC 4×0.14 mm²
	PBT	PBT
	PMMA	PMMA
	25 g	75 g
	IP 67	IP 67
	yes	yes
	yes	yes
	–10...+50 °C	–10...+50 °C
	EN 60947-5-2	EN 60947-5-2

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2.3 Photoelectric sensors accessories page 2.3.2 ...
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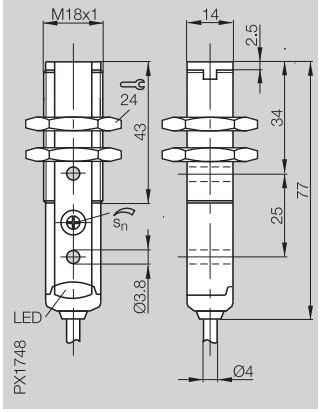
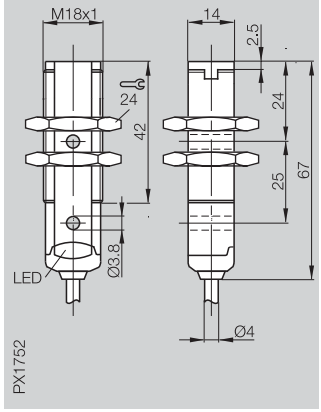
Through-beam	maximum range	**0...60 m**	**0...60 m**	





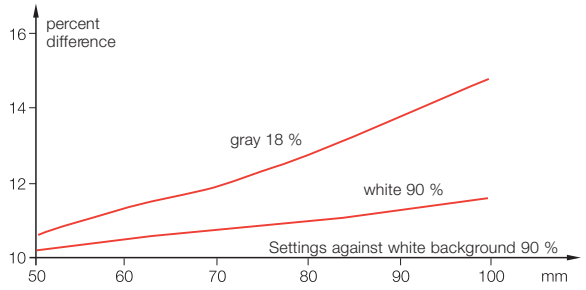
Through-beam				
PNP	60 m	Receiver	BLE 18KF-PA-1LT-S4-C	
NPN	60 m	Receiver	BLE 18KF-NA-1LT-S4-C	
	60 m	Emitter		BLS 18KF-XX-1LT-S4-L
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 30 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	
Output current			100 mA	
Switching type			Light- and dark-on	
Voltage drop U_d at I_e			≤ 2 V	
Settings			Potentiometer 270°	
Help functions				Test input
Optical data				
Recommended sensing distance/range			0...60 m	0...60 m
Emitter, light type				Laser, red light
Wavelength				650 nm
Laser class				Class 1
Resolution				approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m
Indicators				
Power-on indicator			LED green	LED green
Output function indicator			LED yellow	
Time data				
Response time			333 µs	
Switching frequency f			1.5 kHz	
Mechanical data				
Dimensions			M18×81.5 mm	M18×71.5 mm
Connection			M12 connector, 4-pin	M12 connector, 4-pin
No. of wires × cross-section				
Housing material			PBT	PBT
Optical surface			PMMA	PMMA
Weight			25 g	25 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–10...+50 °C	–10...+50 °C
Reference standard			EN 60947-5-2	EN 60947-5-2

Wiring diagrams, characteristics and accessories see page **2.1.**66 to **2.1.**69.

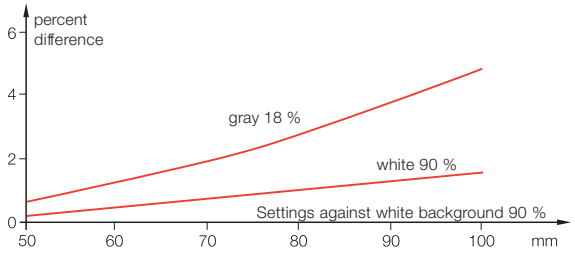
	0...60 m	**0...60 m**		
				
	BLE 18KF-PA-1LT-C-02 BLE 18KF-NA-1LT-C-02	BLS 18KF-XX-1LT-L-02		
	10...30 V DC ≤ 2 V ≤ 30 mA PNP- or NPN-Transistor 100 mA Light- and dark-on ≤ 2 V Potentiometer 270°	10...30 V DC ≤ 2 V ≤ 35 mA Test input		
	0...60 m	0...60 m Laser, red light 650 nm Class 1 approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m		
	LED green LED yellow	LED green		
	333 µs 1.5 kHz			
	M18×77 mm 2 m cable, PVC 4×0.14 mm² PBT PMMA 75 g	M18×67 mm 2 m cable, PVC 4×0.14 mm² PBT PMMA 75 g		
	IP 67 yes yes –10...+50 °C EN 60947-5-2	IP 67 yes yes –10...+50 °C EN 60947-5-2		

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Diffuse BOS 18KF-..-1HA-...



Tolerance with standard setting

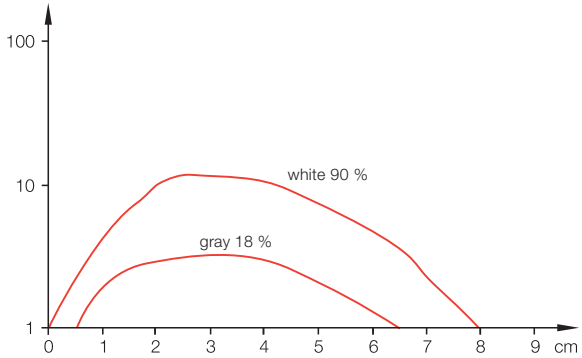


Tolerance with fine setting

Diffuse BOS 18KF-..-1N1R-...

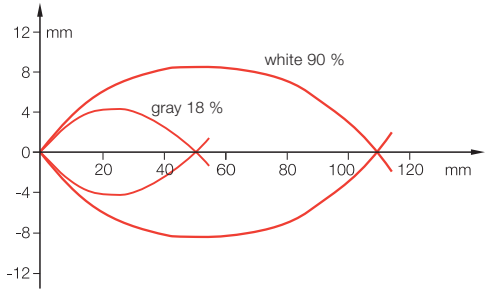


Detection range

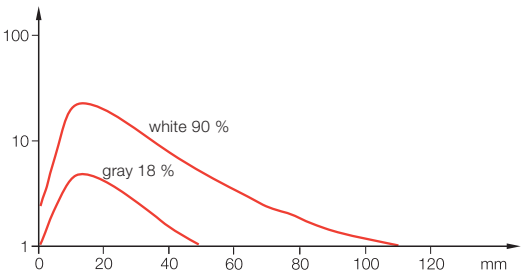


Function reserve

Diffuse BOS 18KF-..-1XA-...

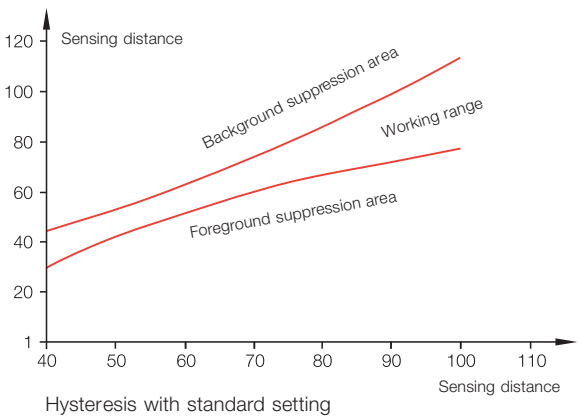


Detection range



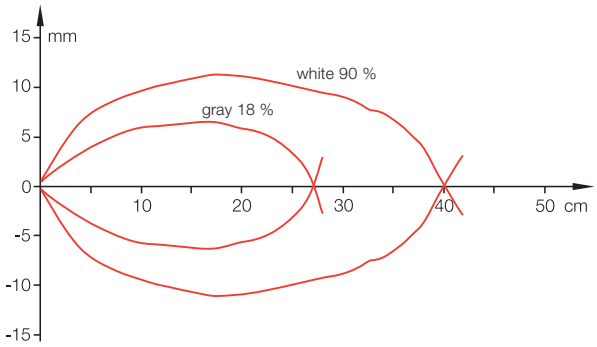
Function reserve

Diffuse BOS 18KF-..-1GA-...

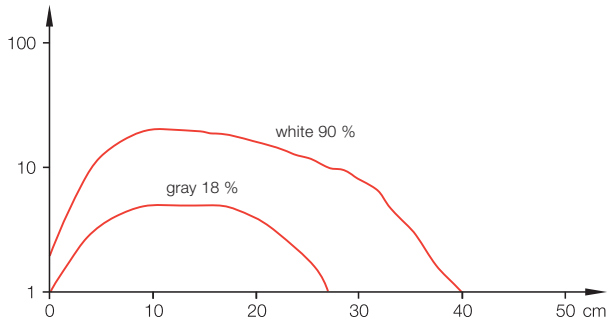


Hysteresis with standard setting

Diffuse BOS 18KF-..-1PD-...

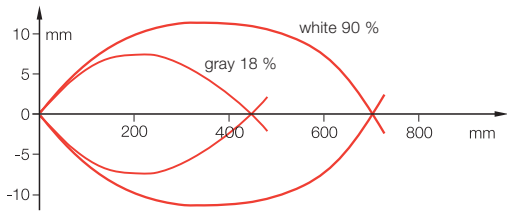


Detection range

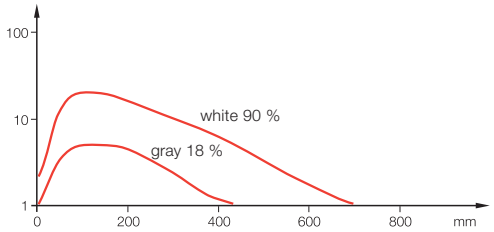


Function reserve

Diffuse BOS 18KF-..-1PE-...

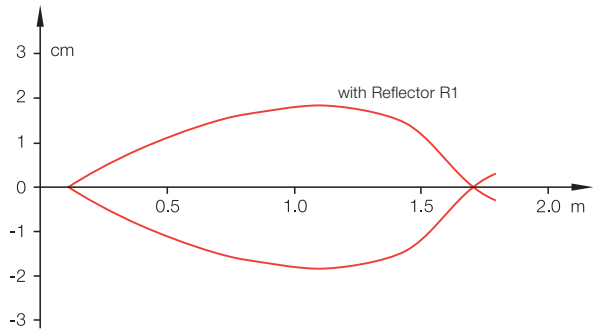


Detection range

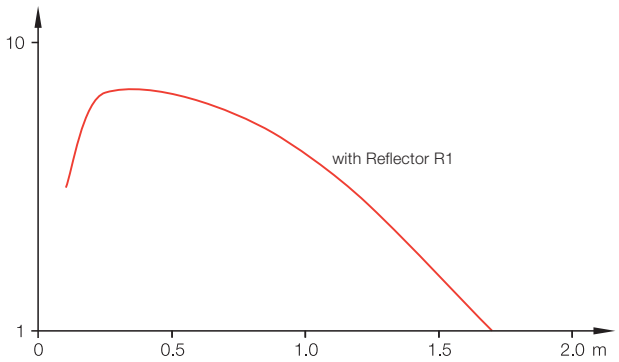


Function reserve

Retroreflective BOS 18KF-..-1TB-...

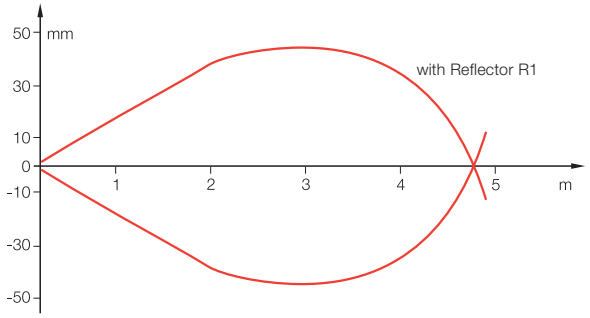


Detection range

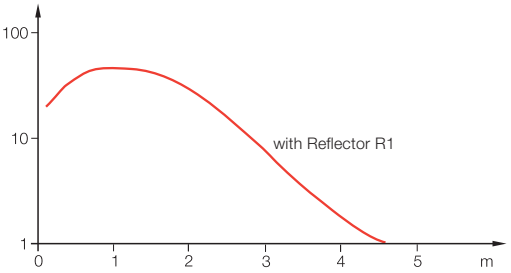


Function reserve

Retroreflective BOS 18KF-..-1QD-...



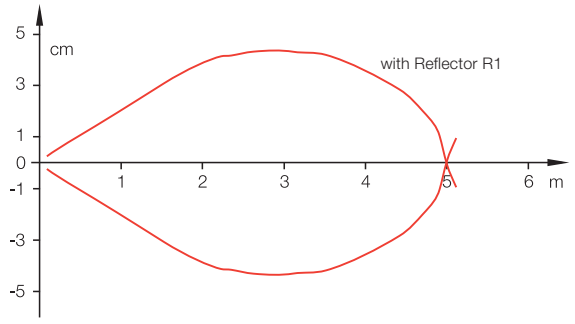
Detection range



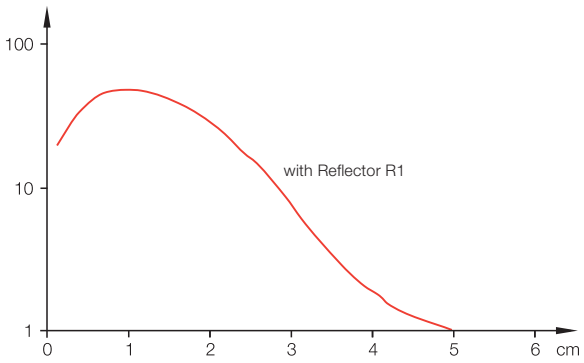
Function reserve

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Retroreflective BOS 18KF-..-1RE-...

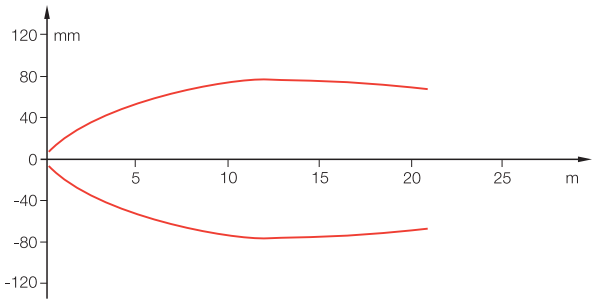


Detection range

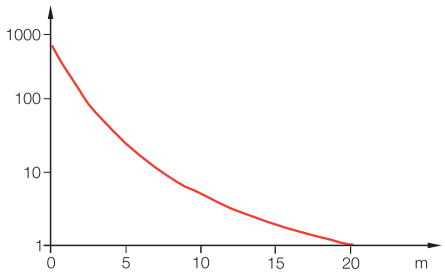


Function reserve

Through-beam BLE/BLS 18KF-..-1PP/1P-...

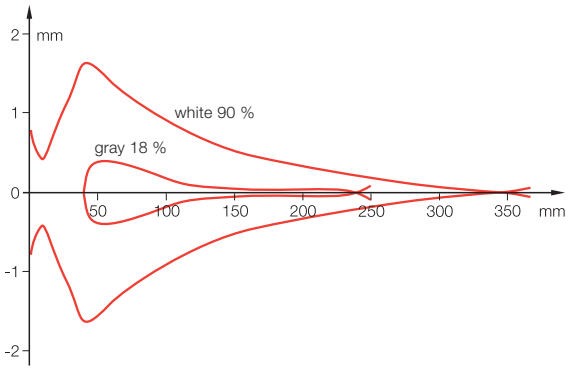


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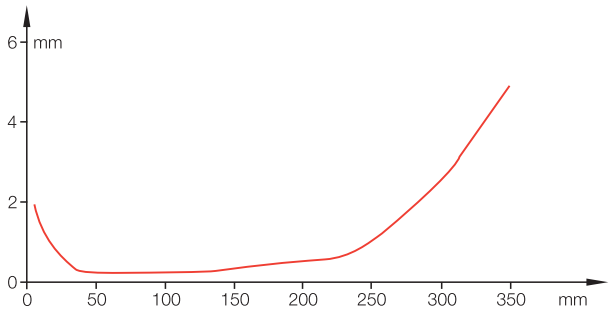


Function reserve

Diffuse BOS 18KF-..-1LOC-...

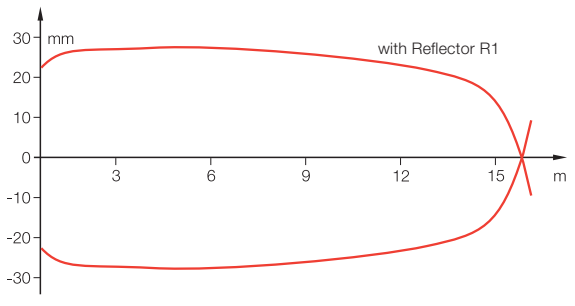


Detection range

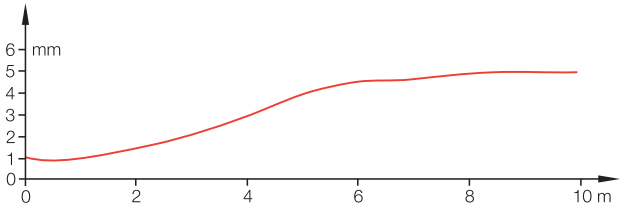


Resolution

Retroreflective BOS 18KF-..-1LQP-...

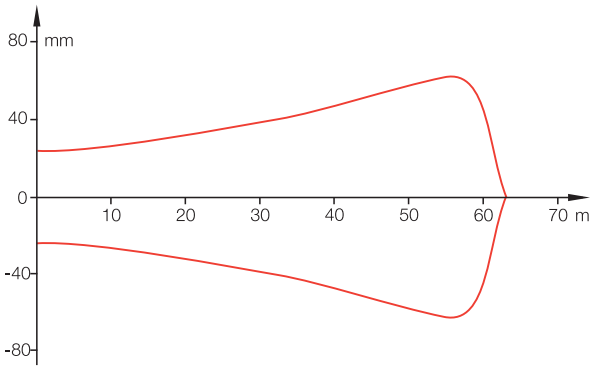


Detection range

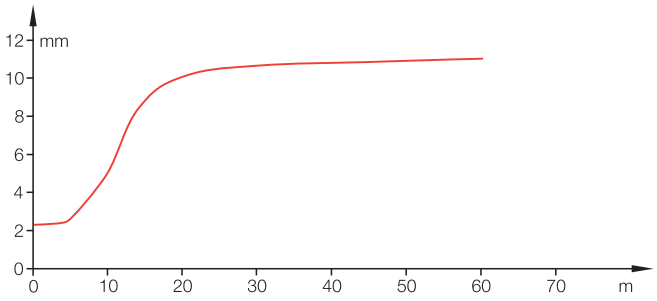


Resolution

Through-beam BLE/BLS 18KF-..-1LT-...

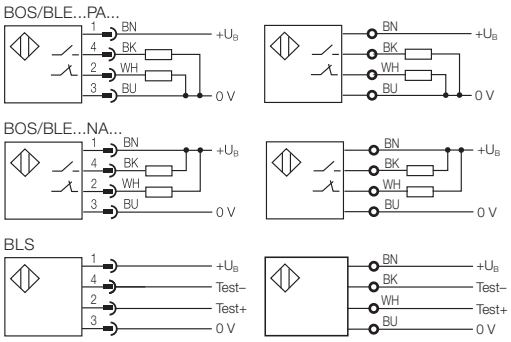


Detection range

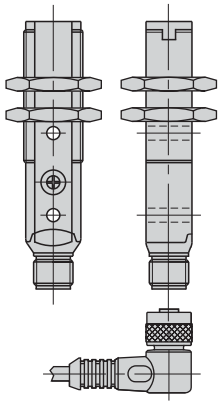


Resolution

Wiring diagrams



Connector orientation



BOS 18**KF**

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Recommended accessories

please order separately



Reflector
BOS R-1



Connector
BKS-_ 19/BKS-_ 20



Mounting clamp
BOS 18,0-KB-1



Mounting bracket
BES 18-HW-1



Round aperture
BOS 18-BL-1
for BLE/BLS 18KF



Protective end cap
BOS 18-SM-1
for BOS 18KF and
BOS 18KF Laser



Air shield
BOS 18-LT-1 for
BOS 18KF and
BOS 18KF Laser

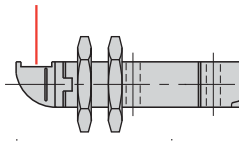
BOS 18KW – standards redefined

The redesigned 18K series doesn't just look different, it features new sensors and improved technical data.

The sensors are available with red or infrared light or as Class 1 laser type. Sensor settings are made using a potentiometer or teach-in process.

The plastic housing with flattened sides allows installation using the included M18 nuts or screws through the sensor housing.

The sensors are available as cable or M12 connector styles with PNP or NPN output.



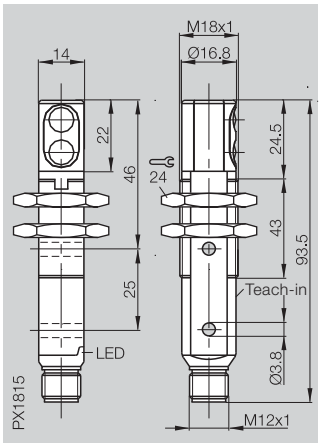


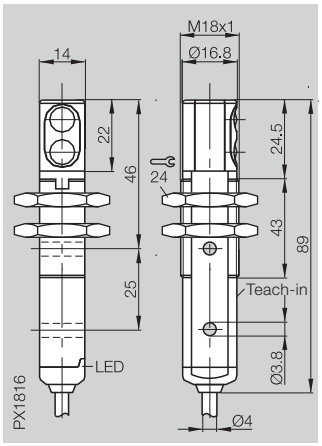
Type	Sensing distance/ range	Light type			Output		Output function		Switching frequency	U_B	Connect-ion		Special features		Page
		Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter	Teach-in	
Diffuse with HGA															
BOS 18KW-PA-1HA-S4-C	50...100 mm	■			■		■	■	500 Hz	■	■			■	**2.1.**72
BOS 18KW-NA-1HA-S4-C	50...100 mm	■				■	■	■	500 Hz	■	■			■	**2.1.**72
BOS 18KW-PA-1HA-C-02	50...100 mm	■			■		■	■	500 Hz	■		■		■	**2.1.**72
BOS 18KW-NA-1HA-C-02	50...100 mm	■				■	■	■	500 Hz	■		■		■	**2.1.**72
BOS 18KW-PA-1LOB-S4-C	100 mm	■			■		■	■	1 kHz	■	■			■	**2.1.**73
BOS 18 KW-NA-1N1R-S4-C	100 mm	■				■	■	■	1 kHz	■	■			■	**2.1.**73
BOS 18 KW-PA-1N1R-C-02	100 mm	■			■		■	■	1 kHz	■		■		■	**2.1.**73
BOS 18 KW-NA-1N1R-C-02	100 mm	■				■	■	■	1 kHz	■		■		■	**2.1.**73

Type	Sensing distance/ range	Light type			Output		Output function		Switching frequency	U_B	Connection		Special features		Page
		Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter	Teach-in	
Diffuse															
BOS 18KW-PA-1XA-S4-C	0...80 mm		■		■		■	■	1 kHz	■	■				**2.1.**73
BOS 18KW-NA-1XA-S4-C	0...80 mm		■			■	■	■	1 kHz	■	■				**2.1.**73
BOS 18KW-PA-1XA-C-02	0...80 mm		■		■		■	■	1 kHz	■		■			**2.1.**73
BOS 18KW-NA-1XA-C-02	0...80 mm		■			■	■	■	1 kHz	■		■			**2.1.**73
BOS 18KW-PA-1LOB-S4-C	0...250 mm			■	■		■	■	1.5 kHz	■	■				**2.1.**78
BOS 18KW-NA-1LOB-S4-C	0...250 mm			■		■	■	■	1.5 kHz	■	■				**2.1.**78
BOS 18KW-PA-1LOB-C-02	0...250 mm			■	■		■	■	1.5 kHz	■		■			**2.1.**78
BOS 18KW-NA-1LOB-C-02	0...250 mm			■		■	■	■	1.5 kHz	■		■			**2.1.**78
BOS 18KW-PA-1PD-S4-C	0...400 mm		■		■		■	■	1 kHz	■	■				**2.1.**74
BOS 18KW-NA-1PD-S4-C	0...400 mm		■			■	■	■	1 kHz	■	■				**2.1.**74
BOS 18KW-PA-1PD-C-02	0...400 mm		■		■		■	■	1 kHz	■		■			**2.1.**74
BOS 18KW-NA-1PD-C-02	0...400 mm		■			■	■	■	1 kHz	■		■			**2.1.**74
Retroreflective															
BOS 18KW-PA-1TB-S4-C	0.1...1.7 m	■			■		■	■	1 kHz	■	■		■		**2.1.**75
BOS 18KW-NA-1TB-S4-C	0.1...1.7 m	■				■	■	■	1 kHz	■	■		■		**2.1.**75
BOS 18KW-PA-1TB-C-02	0.1...1.7 m	■			■		■	■	1 kHz	■		■	■		**2.1.**75
BOS 18KW-NA-1TB-C-02	0.1...1.7 m	■				■	■	■	1 kHz	■		■	■		**2.1.**75
BOS 18KW-PA-1QC-S4-C	0.1...3 m	■			■		■	■	1 kHz	■	■		■		**2.1.**75
BOS 18KW-NA-1QC-S4-C	0.1...3 m	■				■	■	■	1 kHz	■	■		■		**2.1.**75
BOS 18KW-PA-1QC-C-02	0.1...3 m	■			■		■	■	1 kHz	■		■	■		**2.1.**75
BOS 18KW-NA-1QC-C-02	0.1...3 m	■				■	■	■	1 kHz	■		■	■		**2.1.**75
BOS 18KW-PA-1LQH-S4-C	0.1...9 m			■	■		■	■	1.5 kHz	■	■		■		**2.1.**79
BOS 18KW-NA-1LQH-S4-C	0.1...9 m			■		■	■	■	1.5 kHz	■	■		■		**2.1.**79
BOS 18KW-PA-1LQH-C-02	0.1...9 m			■	■		■	■	1.5 kHz	■		■	■		**2.1.**79
BOS 18KW-NA-1LQH-C-02	0.1...9 m			■		■	■	■	1.5 kHz	■		■	■		**2.1.**79
Through-beam															
BLE 18KW-PA-1PP-S4-C	0...15 m		■		■		■	■	250 Hz	■	■				**2.1.**76
BLE 18KW-NA-1PP-S4-C	0...15 m		■			■	■	■	250 Hz	■	■				**2.1.**76
BLE 18KW-PA-1PP-C-02	0...15 m		■		■		■	■	250 Hz	■		■			**2.1.**77
BLE 18KW-NA-1PP-C-02	0...15 m		■			■	■	■	250 Hz	■		■			**2.1.**77
BLE 18KW-PA-1LT-S4-C	0...50 m			■	■		■	■	1.5 kHz	■	■				**2.1.**80
BLE 18KW-NA-1LT-S4-C	0...50 m			■		■	■	■	1.5 kHz	■	■				**2.1.**80
BLE 18KW-PA-1LT-C-02	0...50 m			■	■		■	■	1.5 kHz	■		■			**2.1.**81
BLE 18KW-NA-1LT-C-02	0...50 m			■		■	■	■	1.5 kHz	■		■			**2.1.**81
BLS 18KW-XX-1P-S4-L	0...15 m		■							■	■				**2.1.**76
BLS 18KW-XX-1P-L-02	0...15 m		■							■		■			**2.1.**77
BLS 18KW-XX-1LT-S4-L	0...50 m			■						■	■				**2.1.**80
BLS 18KW-XX-1LT-L-02	0...50 m			■						■		■			**2.1.**81

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Connectors ... page 5.2 ...

Diffuse with background suppression	maximum sensing distance	**50...100 mm**	**50...100 mm**	
Diffuse	maximum sensing distance			

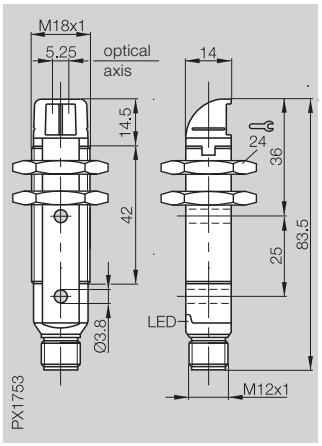
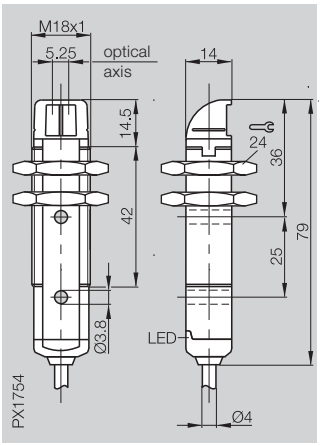
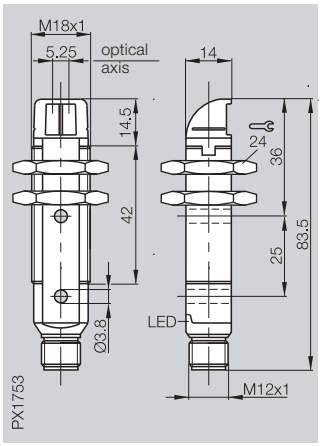
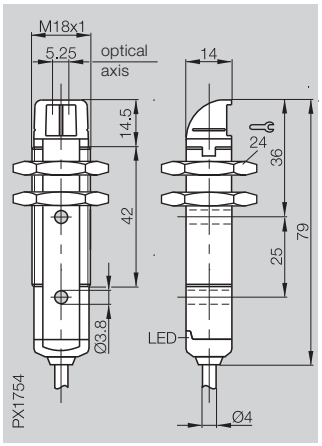




Diffuse				
PNP	50...100 mm	HGA	BOS 18KW-PA-1HA-S4-C	BOS 18KW-PA-1HA-C-02
NPN	50...100 mm	HGA	BOS 18KW-NA-1HA-S4-C	BOS 18KW-NA-1HA-C-02
PNP	100 mm	HGA		
NPN	100 mm	HGA		
PNP	0...80 mm			
NPN	0...80 mm			
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 30 mA	≤ 30 mA
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current			100 mA	100 mA
Switching type			Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V
Settings			Teach-in	Teach-in
Optical data				
Recommended sensing distance			50...100 mm	50...100 mm
Emitter, light type			LED, red light	LED, red light
Wavelength			630 nm	630 nm
Light spot diameter			approx. 10 mm at 100 mm	approx. 10 mm at 100 mm
Indicators				
Output function indicator			LED yellow	LED yellow
Stability indicator			LED green/red	LED green/red
Time data				
Response time			1 ms	1 ms
Switching frequency f			500 Hz	500 Hz
Mechanical data				
Dimensions			M18×93.5 mm	M18×89 mm
Connection			M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section				4×0.14 mm²
Housing material			PBT	PBT
Optical surface			PMMA	PMMA
Weight			25 g	75 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–25...+55 °C	–25...+55 °C
Reference standard			EN 60947-5-2	EN 60947-5-2

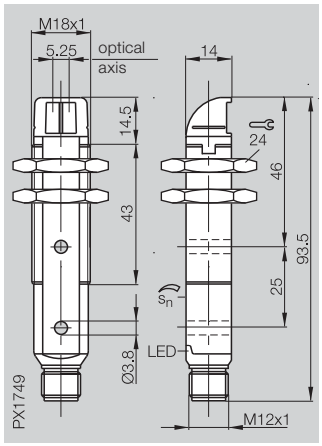
Diffuse values referenced to Kodak gray card 90% Reflexion.

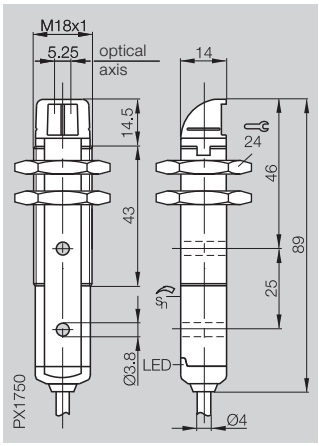
Wiring diagrams, characteristics and accessories see page **2.1.**82 and **2.1.**83.

	100 mm	**100 mm**	**0...80 mm**	**0...80 mm**
				
	BOS 18KW-PA-1N1R-S4-C BOS 18KW-NA-1N1R-S4-C	BOS 18KW-PA-1N1R-C-02 BOS 18KW-NA-1N1R-C-02	BOS 18KW-PA-1XA-S4-C BOS 18KW-NA-1XA-S4-C	BOS 18KW-PA-1XA-C-02 BOS 18KW-NA-1XA-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light- and dark-on
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	fixed	fixed	fixed	fixed
	0...80 mm	0...80 mm	0...80 mm	0...80 mm
	LED, red light	LED, red light	LED, infrared	LED, infrared
	630 nm	630 nm	880 nm	880 nm
	approx. 25 mm at 80 mm	approx. 25 mm at 80 mm	approx. 55 mm at 100 mm	approx. 55 mm at 100 mm
	LED yellow	LED yellow	LED yellow	LED yellow
	0.5 ms	0.5 ms	0.5 ms	0.5 ms
	1 kHz	1 kHz	1 kHz	1 kHz
	M18×83.5 mm	M18×79 mm	M18×83.5 mm	M18×79 mm
	M12 connector, 4-pin	2 m cable, PVC	M12 connector, 4-pin	2 m cable, PVC
		4×0.14 mm²		4×0.14 mm²
	PBT	PBT	PBT	PBT
	PMMA	PMMA	PMMA	PMMA
	25 g	75 g	25 g	75 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

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Connectors ... page 5.2 ...

Diffuse	maximum sensing distance	**0...400 mm**	**0...400 mm**
Retroreflective with glass detection	maximum range		
Retroreflective with polarizing filter	maximum range		

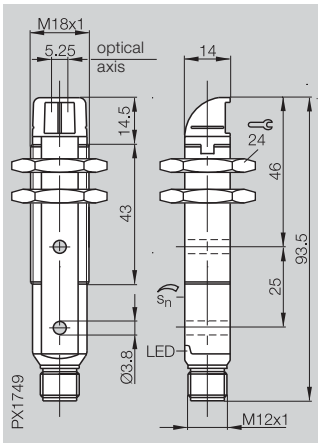
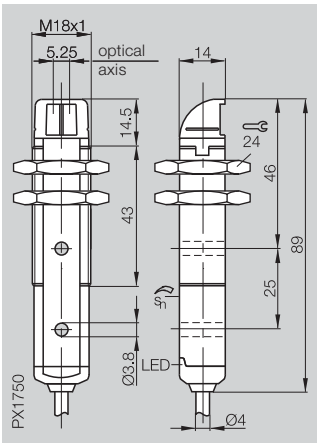
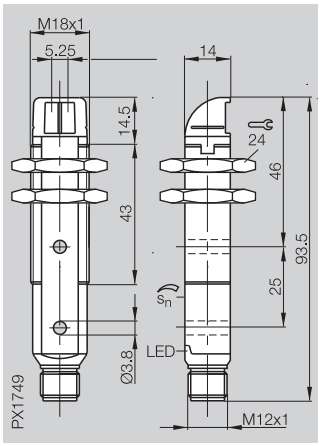
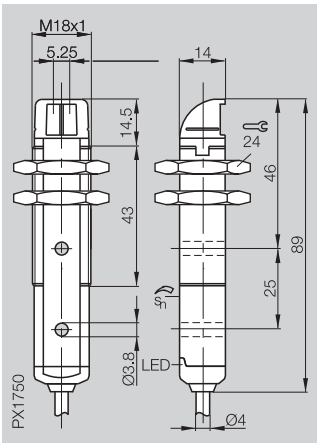




Diffuse				
PNP	400 mm		BOS 18KW-PA-1PD-S4-C	BOS 18KW-PA-1PD-C-02
NPN	400 mm		BOS 18KW-NA-1PD-S4-C	BOS 18KW-NA-1PD-C-02
Retroreflective				
PNP	0.1...1.7 m	Polarizing filter, glass detection		
NPN	0.1...1.7 m	Polarizing filter, glass detection		
PNP	0.1...3 m	Polarizing filter		
NPN	0.1...3 m	Polarizing filter		
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 35 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current			100 mA	100 mA
Switching type			Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V
Settings			Potentiometer 270°	Potentiometer 270°
Optical data				
Recommended sensing distance			0...350 mm	0...350 mm
Emitter, light type			LED, infrared	LED, infrared
Wavelength			880 nm	880 nm
Light spot diameter			approx. 35 mm at 400 mm	approx. 35 mm at 400 mm
Indicators				
Output function indicator			LED yellow	LED yellow
Stability indicator			LED green	LED green
Time data				
Response time			0.5 ms	0.5 ms
Switching frequency f			1 kHz	1 kHz
Mechanical data				
Dimensions			M18×93.5 mm	M18×89 mm
Connection			M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section				4×0.14 mm²
Housing material			PBT	PBT
Optical surface			PMMA	PMMA
Weight			25 g	75 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–25...+55 °C	–25...+55 °C
Reference standard			EN 60947-5-2	EN 60947-5-2

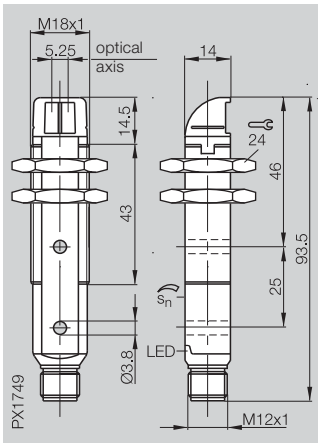
Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

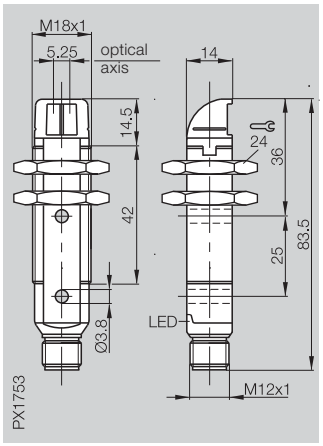
Wiring diagrams, characteristics and accessories see page **2.1.**82 and **2.1.**83.

	0.1...1.7 m	**0.1...1.7 m**	**0.1...3 m**	**0.1...3 m**
				
	BOS 18KW-PA-1TB-S4-C BOS 18KW-NA-1TB-S4-C	BOS 18KW-PA-1TB-C-02 BOS 18KW-NA-1TB-C-02	BOS 18KW-PA-1QC-S4-C BOS 18KW-NA-1QC-S4-C	BOS 18KW-PA-1QC-C-02 BOS 18KW-NA-1QC-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light- and dark-on	Light- and dark-on	Light- and dark-on	Light- and dark-on
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	0.1...1.4 m	0.1...1.4 m	0.1...2.5 m	0.1...2.5 m
	LED, red light	LED, red light	LED, red light	LED, red light
	660 nm	660 nm	660 nm	660 nm
	approx. 60 mm at 1 m	approx. 60 mm at 1 m	approx. 60 mm at 2 m	approx. 60 mm at 2 m
	LED yellow LED green	LED yellow LED green	LED yellow LED green	LED yellow LED green
	0.5 ms 1 kHz	0.5 ms 1 kHz	0.5 ms 1 kHz	0.5 ms 1 kHz
	M18×93.5 mm M12 connector, 4-pin	M18×89 mm 2 m cable, PVC 4×0.14 mm²	M18×93.5 mm M12 connector, 4-pin	M18×89 mm 2 m cable, PVC 4×0.14 mm²
	PBT PMMA 25 g	PBT PMMA 75 g	PBT PMMA 25 g	PBT PMMA 75 g
	IP 67 yes yes –25...+55 °C EN 60947-5-2	IP 67 yes yes –25...+55 °C EN 60947-5-2	IP 67 yes yes –25...+55 °C EN 60947-5-2	IP 67 yes yes –25...+55 °C EN 60947-5-2

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Connectors ... page 5.2 ...

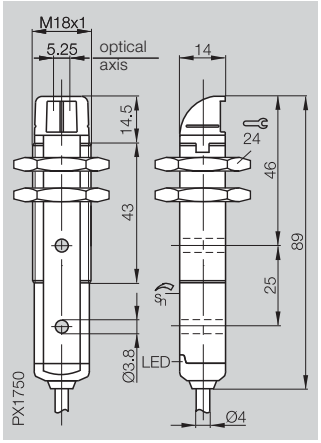
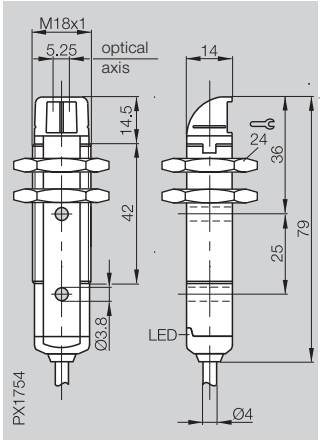
Through-beam	maximum range	**0...15 m**	**0...15 m**	





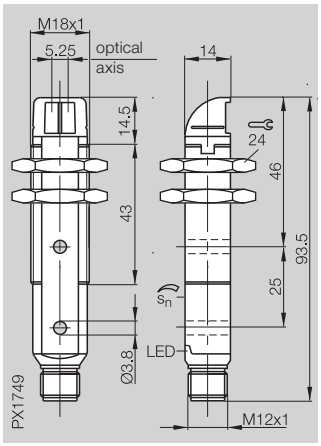
Through-beam					
PNP	15 m	Receiver	BLE 18KW-PA-1PP-S4-C		
NPN	15 m	Receiver	BLE 18KW-NA-1PP-S4-C		
	15 m	Emitter		BLS 18KW-XX-1P-S4-L	
Electrical data					
Supply voltage U_B			10...30 V DC	10...30 V DC	
Ripple			≤ 2 V	≤ 2 V	
No-load supply current I_0 max.			≤ 30 mA	≤ 35 mA	
Switching output			PNP- or NPN-Transistor		
Output current			100 mA		
Switching type			Light- and dark-on		
Voltage drop U_d at I_e			≤ 2 V		
Settings			Potentiometer 270°		
Help functions				Test input	
Optical data					
Recommended range			0...10 m	0...10 m	
Emitter, light type				LED, infrared	
Wavelength				880 nm	
Light spot diameter				approx. 470 mm at 10 m	
Indicators					
Power-on indicator			LED green	LED green	
Output function indicator			LED yellow		
Time data					
Response time			2 ms		
Switching frequency f			250 Hz		
Mechanical data					
Dimensions			M18×93.5 mm	M18×83.5 mm	
Connection			M12 connector, 4-pin	M12 connector, 4-pin	
No. of wires × cross-section					
Housing material			PBT	PBT	
Optical surface			PMMA	PMMA	
Weight			25 g	25 g	
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	
Polarity reversal protected			yes	yes	
Short circuit protected			yes	yes	
Ambient temperature range T_a			–25...+55 °C	–25...+55 °C	
Reference standard			EN 60947-5-2	EN 60947-5-2	

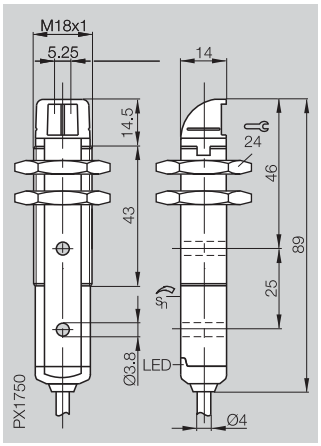
Wiring diagrams, characteristics and accessories see page **2.1.**82 and **2.1.**83.

	0...15 m	**0...15 m**			
				
	BLE 18KW-PA-1PP-C-02 BLE 18KW-NA-1PP-C-02	BLS 18KW-XX-1P-L-02			
	10...30 V DC	10...30 V DC			
	≤ 2 V	≤ 2 V			
	≤ 30 mA	≤ 35 mA			
	PNP- or NPN-Transistor				
	100 mA				
	Light- and dark-on				
	≤ 2 V				
	Potentiometer 270°				
		Test input			
	0...10 m	0...10 m			
		LED, infrared			
		880 nm			
		approx. 470 mm at 10 m			
	LED green	LED green			
	LED yellow				
	2 ms				
	250 Hz				
	M18×89 mm	M18×79 mm			
	2 m cable, PVC	2 m cable, PVC			
	4×0.14 mm²	4×0.14 mm²			
	PBT	PBT			
	PMMA	PMMA			
	75 g	75 g			
	IP 67	IP 67			
	yes	yes			
	yes	yes			
	–25...+55 °C	–25...+55 °C			
	EN 60947-5-2	EN 60947-5-2			

2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Diffuse	maximum sensing distance	**0...250 mm**	**0...250 mm**
Retroreflective with polarizing filter	maximum range		

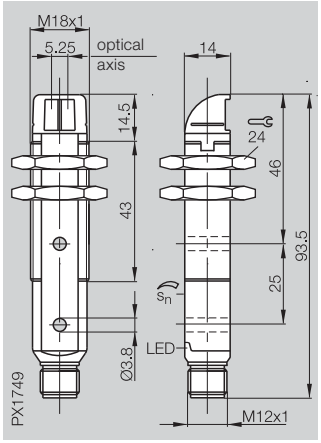
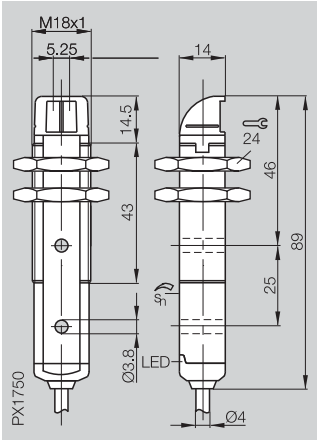




Diffuse					
PNP	250 mm			BOS 18KW-PA-1LOB-S4-C	BOS 18KW-PA-1LOB-C-02
NPN	250 mm			BOS 18KW-NA-1LOB-S4-C	BOS 18KW-NA-1LOB-C-02
Retroreflective					
PNP	0.1...9 m	Polarizing filter			
NPN	0.1...9 m	Polarizing filter			
Electrical data					
Supply voltage U_B				10...30 V DC	10...30 V DC
Ripple				≤ 2 V	≤ 2 V
No-load supply current I_0 max.				≤ 35 mA	≤ 35 mA
Switching output				PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current				100 mA	100 mA
Switching type				Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e				≤ 2 V	≤ 2 V
Settings				Potentiometer 270°	Potentiometer 270°
Optical data					
Recommended sensing distance/range				0...250 mm	0...250 mm
Emitter, light type				Laser, red light	Laser, red light
Wavelength				650 nm	650 nm
Laser class				Class 1	Class 1
Resolution				approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm	approx. 0.3 mm at 50 mm approx. 0.3 mm at 100 mm approx. 0.5 mm at 150 mm
Indicators					
Power-on indicator				LED green	LED green
Output function indicator				LED yellow	LED yellow
Time data					
Response time				333 µs	333 µs
Switching frequency f				1.5 kHz	1.5 kHz
Mechanical data					
Dimensions				M18×93.5 mm	M18×89 mm
Connection				M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section					4×0.14 mm²
Housing material				PBT	PBT
Optical surface				PMMA	PMMA
Weight				25 g	75 g
Ambient data					
Degree of protection per IEC 60529				IP 67	IP 67
Polarity reversal protected				yes	yes
Short circuit protected				yes	yes
Ambient temperature range T_a				–10...+50 °C	–10...+50 °C
Reference standard				EN 60947-5-2	EN 60947-5-2

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**82 and **2.1.**83.

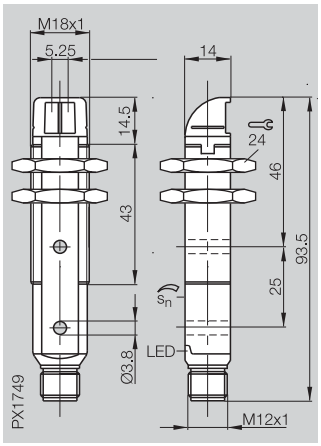
	0.1...9 m	**0.1...9 m**		
				
	BOS 18KW-PA-1LQH-S4-C BOS 18KW-NA-1LQH-S4-C	BOS 18KW-PA-1LQH-C-02 BOS 18KW-NA-1LQH-C-02		
	10...30 V DC ≤ 2 V ≤ 35 mA PNP- or NPN-Transistor 100 mA Light- and dark-on ≤ 2 V Potentiometer 270°	10...30 V DC ≤ 2 V ≤ 35 mA PNP- or NPN-Transistor 100 mA Light- and dark-on ≤ 2 V Potentiometer 270°		
	0.1...9 m Laser, red light 650 nm Class 1 approx. 0.9 mm at 1 m approx. 2 mm at 3 m	0.1...9 m Laser, red light 650 nm Class 1 approx. 0.9 mm at 1 m approx. 2 mm at 3 m		
	LED green LED yellow	LED green LED yellow		
	333 µs 1.5 kHz	333 µs 1.5 kHz		
	M18×93.5 mm M12 connector, 4-pin	M18×89 mm 2 m cable, PVC 4×0.14 mm²		
	PBT PMMA 25 g	PBT PMMA 75 g		
	IP 67 yes yes –10...+50 °C EN 60947-5-2	IP 67 yes yes –10...+50 °C EN 60947-5-2		

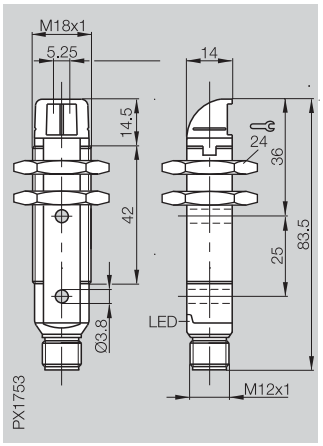
2.1

2.3
Photoelectric sensors accessories page 2.3.2 ...

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Connectors ... page 5.2 ...

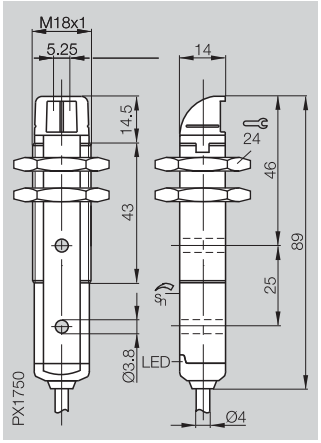
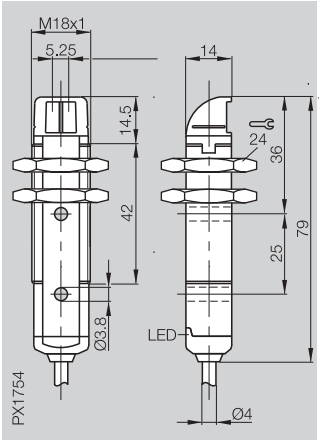
Through-beam	maximum range	**0...50 m**	**0...50 m**	





Through-beam				
PNP	50 m	Receiver	BLE 18KW-PA-1LT-S4-C	
NPN	50 m	Receiver	BLE 18KW-NA-1LT-S4-C	
	50 m	Emitter		BLS 18KW-XX-1LT-S4-L
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			≤ 2 V	≤ 2 V
No-load supply current I_0 max.			≤ 30 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	
Output current			100 mA	
Switching type			Light- and dark-on	
Voltage drop U_d at I_e			≤ 2 V	
Settings			Potentiometer 270°	
Help functions				Test input
Optical data				
Recommended sensing distance/range			0...50 m	0...50 m
Emitter, light type				Laser, red light
Wavelength				650 nm
Laser class				Class 1
Resolution				approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m
Indicators				
Power-on indicator			LED green	LED green
Output function indicator			LED yellow	
Time data				
Response time			333 µs	
Switching frequency f			1.5 kHz	
Mechanical data				
Dimensions			M18×93.5 mm	M18×83.5 mm
Connection			M12 connector, 4-pin	M12 connector, 4-pin
No. of wires × cross-section				
Housing material			PBT	PBT
Optical surface			PMMA	PMMA
Weight			25 g	25 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–10...+50 °C	–10...+50 °C
Reference standard			EN 60947-5-2	EN 60947-5-2

Wiring diagrams, characteristics and accessories see page **2.1.**82 and **2.1.**83.

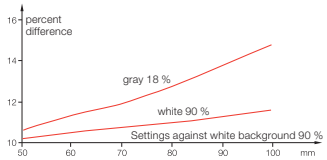
	0...50 m	**0...50 m**			
					
	BLE 18KW-PA-1LT-C-02 BLE 18KW-NA-1LT-C-02	BLS 18KW-XX-1LT-L-02			
	10...30 V DC ≤ 2 V ≤ 30 mA PNP- or NPN-Transistor 100 mA Light- and dark-on ≤ 2 V Potentiometer 270°	10...30 V DC ≤ 2 V ≤ 35 mA Test input			
	0...50 m	0...50 m Laser, red light 650 nm Class 1 approx. 2.5 mm at 5 m approx. 5 mm at 10 m approx. 10 mm at 20 m			
	LED green LED yellow	LED green			
	333 µs 1.5 kHz				
	M18×89 mm 2 m cable, PVC 4×0.14 mm² PBT PMMA 75 g	M18×79 mm 2 m cable, PVC 4×0.14 mm² PBT PMMA 75 g			
	IP 67 yes yes –10...+50 °C EN 60947-5-2	IP 67 yes yes –10...+50 °C EN 60947-5-2			

2.1

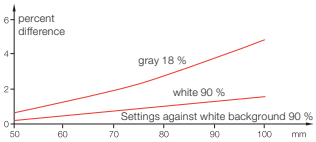
2.3
Photoelectric sensors accessories page 2.3.2 ...

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Connectors ... page 5.2 ...

Diffuse BOS 18KW-..-1HA-...

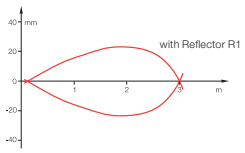


Tolerance with standard setting



Tolerance with fine setting

Retroreflective BOS 18KW-..-1QC-...

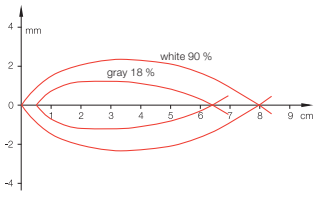


Detection range

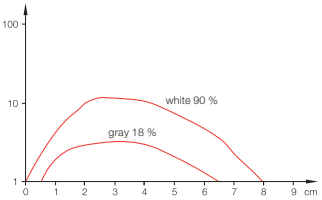


Function reserve

Diffuse BOS 18KW-..-1N1R-...

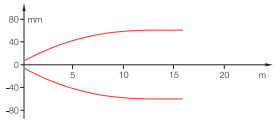


Detection range

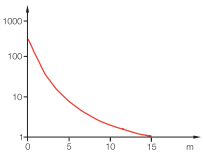


Function reserve

Through-beam BLE/BLS 18KW-..-1PP/1P-...

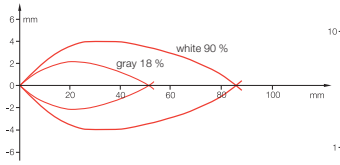


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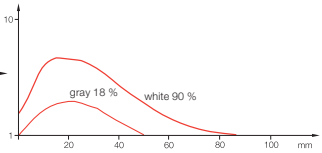


Function reserve

Diffuse BOS 18KW-..-1XA-...

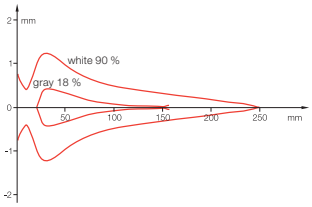


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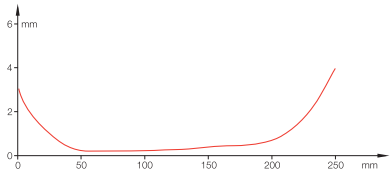


Function reserve

Diffuse BOS 18KW-..-1LOB-...

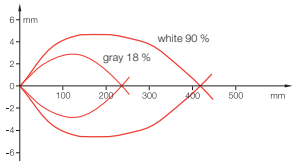


Detection range

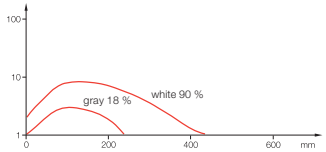


Resolution

Diffuse BOS 18KW-..-1PD-...

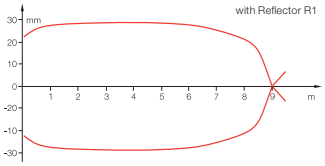


Detection range

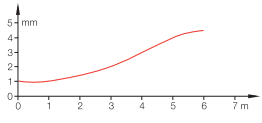


Function reserve

Retroreflective BOS 18KW-..-1LQH-...

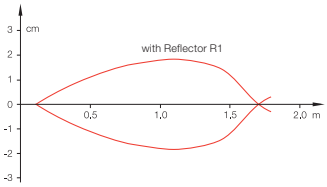


Detection range

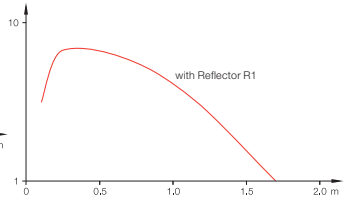


Resolution

Retroreflective BOS 18KW-..-1TB-...

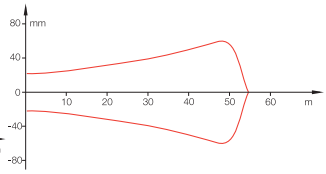


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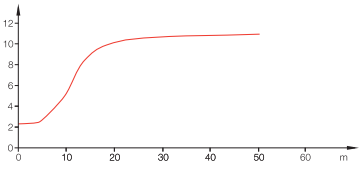


Function reserve

Through-beam BLE/BLS 18KW-..-1LT-...

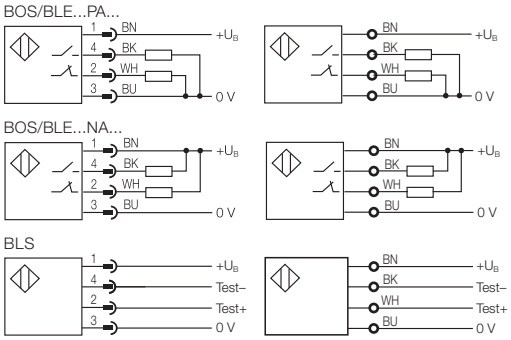


Detection range

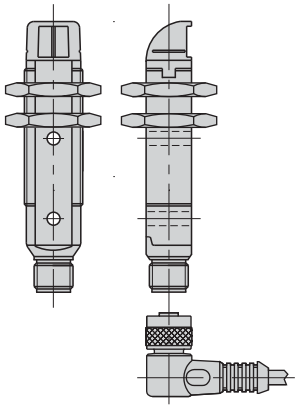


Resolution

Wiring diagrams



Connector orientation



Recommended accessories
please order separately



Mounting clamp
BOS 18,0-KB-1



Mounting bracket
BES 18-HW-1



Reflector
BOS R-1



Connector
BKS-_ 19/BKS-_ 20

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

With our **BOS 18K(R)** Balluff offers a particularly economical automation solution for detecting objects in any application.

Diffuse, retroreflective and through-beam sensors in axial and radial configuration, with PNP or NPN output, as well as cable or connector, versions are available.

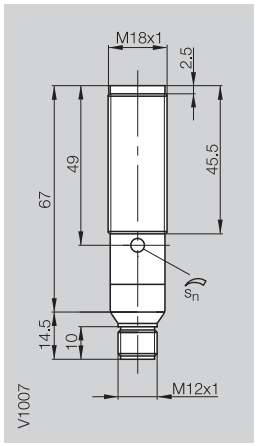


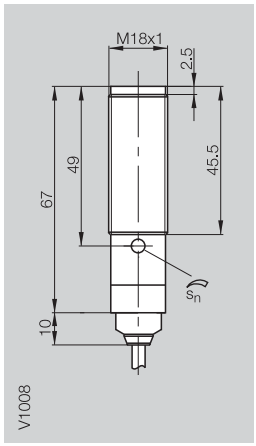
Type	Sensing distance/ range	Light exit		Light type		Output		Output function		Switching frequency	U_B	Connec-tion		Special features		Page
		Straight	Right angle	Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter		
Diffuse																
BOS 18K-PU-ID10-S4	0...300 mm	■			■	■		■	■	500 Hz	■	■				**2.1**.86
BOS 18K-NU-ID10-S4	0...300 mm	■			■		■	■	■	500 Hz	■	■				**2.1**.86
BOS 18K-PU-ID10-02	0...300 mm	■			■	■		■	■	500 Hz	■		■			**2.1**.86
BOS 18K-NU-ID10-02	0...300 mm	■			■		■	■	■	500 Hz	■		■			**2.1**.86
BOS 18KR-PU-ID10-S4	0...250 mm		■		■	■		■	■	500 Hz	■	■				**2.1**.88
BOS 18KR-NU-ID10-S4	0...250 mm		■		■		■	■	■	500 Hz	■	■				**2.1**.88
BOS 18KR-PU-ID10-02	0...250 mm		■		■	■		■	■	500 Hz	■		■			**2.1**.88
BOS 18KR-NU-ID10-02	0...250 mm		■		■		■	■	■	500 Hz	■		■			**2.1**.88
Retroreflective																
BOS 18K-PU-PR10-S4	0.1...2.2 m	■		■		■		■	■	500 Hz	■	■		■		**2.1**.86
BOS 18K-NU-PR10-S4	0.1...2.2 m	■		■			■	■	■	500 Hz	■	■		■		**2.1**.86
BOS 18K-PU-PR10-02	0.1...2.2 m	■		■		■		■	■	500 Hz	■		■	■		**2.1**.87
BOS 18K-NU-PR10-02	0.1...2.2 m	■		■			■	■	■	500 Hz	■		■	■		**2.1**.87
BOS 18KR-PU-PR10-S4	0.1...1.7 m		■	■		■		■	■	500 Hz	■	■		■		**2.1**.88
BOS 18KR-NU-PR10-S4	0.1...1.7 m		■	■			■	■	■	500 Hz	■	■		■		**2.1**.88
BOS 18KR-PU-PR10-02	0.1...1.7 m		■	■		■		■	■	500 Hz	■		■	■		**2.1**.89
BOS 18KR-NU-PR10-02	0.1...1.7 m		■	■			■	■	■	500 Hz	■		■	■		**2.1**.89
Through-beam																
BOS 18K-PU-IE10-S4	0...13 m	■			■	■		■	■	250 Hz	■	■				**2.1**.87
BOS 18K-NU-IE10-S4	0...13 m	■			■		■	■	■	250 Hz	■	■				**2.1**.87
BOS 18K-PU-IE10-02	0...13 m	■			■	■		■	■	250 Hz	■		■			**2.1**.87
BOS 18K-NU-IE10-02	0...13 m	■			■		■	■	■	250 Hz	■		■			**2.1**.87
BOS 18K-XT-IS10-S4	0...13 m	■			■							■				**2.1**.87
BOS 18K-XT-IS10-02	0...13 m	■			■								■			**2.1**.87
BOS 18KR-PU-IE10-S4	0...11 m		■		■	■		■	■	250 Hz	■	■				**2.1**.89
BOS 18KR-NU-IE10-S4	0...11 m		■		■		■	■	■	250 Hz	■	■				**2.1**.89
BOS 18KR-PU-IE10-02	0...11 m		■		■	■		■	■	250 Hz	■		■			**2.1**.89
BOS 18KR-NU-IE10-02	0...11 m		■		■		■	■	■	250 Hz	■		■			**2.1**.89
BOS 18KR-XT-IS10-S4	0...11 m		■		■							■				**2.1**.89
BOS 18KR-XT-IS10-02	0...11 m		■		■								■			**2.1**.89

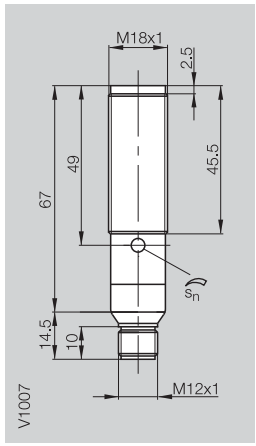
2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

BOS 18K
Sensing distance 300 mm
Range 2.2 m

Diffuse	maximum sensing distance	**0...300 mm**	**0...300 mm**	
Retroreflective with polarizing filter	maximum range			**0.1...2.2 m**
Through-beam	maximum range			



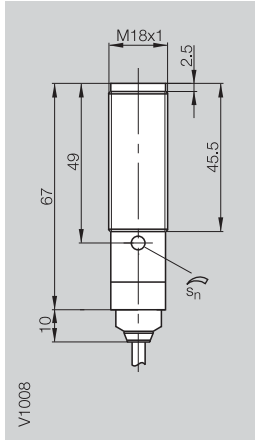
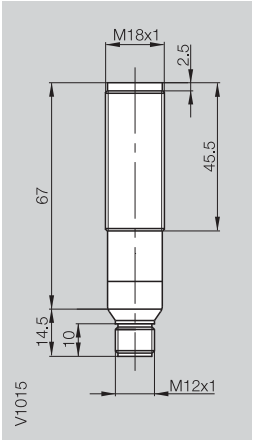
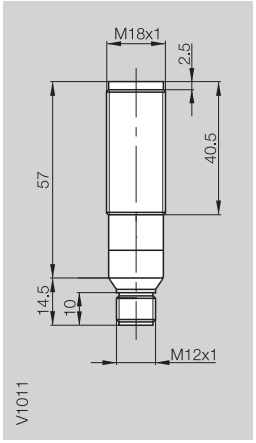
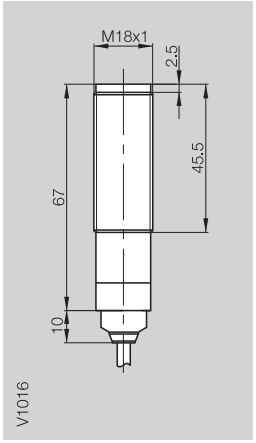
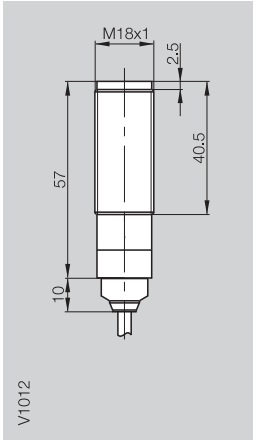




Diffuse				
PNP 300 mm		BOS 18K-PU-ID10-S4	BOS 18K-PU-ID10-02	
NPN 300 mm		BOS 18K-NU-ID10-S4	BOS 18K-NU-ID10-02	
Retroreflective				
PNP 0.1...2.2 m				BOS 18K-PU-PR10-S4
NPN 0.1...2.2 m				BOS 18K-NU-PR10-S4
Through-beam				
PNP 13 m	Receiver			
NPN 13 m	Receiver			
13 m	Emitter			
Electrical data				
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Ripple		≤ 2 V	≤ 2 V	≤ 2 V
No-load supply current I_0 max.		≤ 35 mA	≤ 35 mA	≤ 35 mA
Switching output		PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current		100 mA	100 mA	100 mA
Switching type		Light- and dark-on	Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V	≤ 2 V
Settings		Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
Optical data				
Recommended sensing distance/range		0...300 mm	0...300 mm	0.1...2 m
Emitter, light type		LED, infrared	LED, infrared	LED, red light
Wavelength		880 nm	880 nm	660 nm
Light spot diameter				
Indicators				
Power-on indicator				
Output function indicator		LED yellow	LED yellow	LED yellow
Time data				
Response time		1 ms	1 ms	1 ms
Switching frequency f		500 Hz	500 Hz	500 Hz
Mechanical data				
Dimensions		M18×81.5 mm	M18×77 mm	M18×81.5 mm
Connection		M12 connector, 4-pin	2 m cable, PVC	M12 connector, 4-pin
No. of wires × cross-section			4×0.14 mm²	
Housing material		ABS	ABS	ABS
Lens material		PMMA	PMMA	PMMA
Weight		25 g	75 g	25 g
Ambient data				
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Ambient light rejection		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a		–25...+55 °C	–25...+55 °C	–25...+55 °C

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

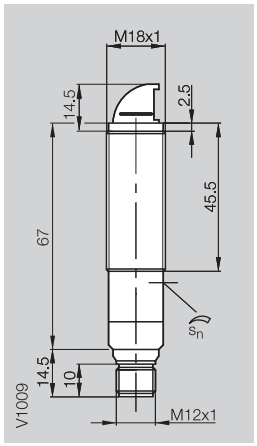
Wiring diagrams, characteristics and accessories see page **2.1.**90 and **2.1.**91.

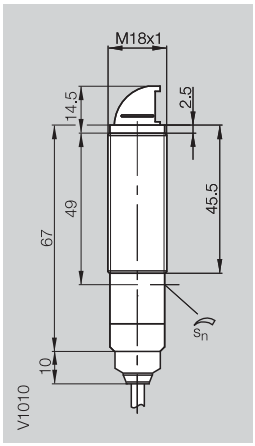
	0.1...2.2 m	**0...13 m**	**0...13 m**	**0...13 m**	**0...13 m**
					
	BOS 18K-PU-PR10-02 BOS 18K-NU-PR10-02				
		BOS 18K-PU-IE10-S4 BOS 18K-NU-IE10-S4		BOS 18K-PU-IE10-02 BOS 18K-NU-IE10-02	
			BOS 18K-XT-IS10-S4		BOS 18K-XT-IS10-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor		PNP- or NPN-Transistor	
	100 mA	100 mA		100 mA	
	Light- and dark-on	Light- and dark-on		Light- and dark-on	
	≤ 2 V	≤ 2 V		≤ 2 V	
	Potentiometer 270°	fixed	fixed	fixed	fixed
	0.1...2 m	0...12 m	0...12 m	0...12 m	0...12 m
	LED, red light		LED, infrared		LED, infrared
	660 nm		880 nm		880 nm
			LED green		LED green
	LED yellow	LED yellow		LED yellow	
	1 ms	2 ms		2 ms	
	500 Hz	250 Hz		250 Hz	
	M18×77 mm	M18×81.5 mm	M18×71.5 mm	M18×77 mm	M18×67 mm
	2 m cable, PVC	M12 connector, 4-pin	M12 connector, 4-pin	2 m cable, PVC	2 m cable, PVC
	4×0.14 mm²			4×0.14 mm²	4×0.14 mm²
	ABS	ABS	ABS	ABS	ABS
	PMMA	PMMA	PMMA	PMMA	PMMA
	75 g	25 g	25 g	75 g	75 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C

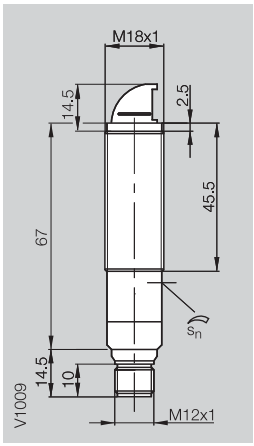
2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

BOS 18KR
Sensing distance 250 mm,
Range 1.7 m

Diffuse	maximum sensing distance	**0...250 mm**	**0...250 mm**	
Retroreflective with polarizing filter	maximum range			**0.1...1.7 m**
Diffuse	maximum range			



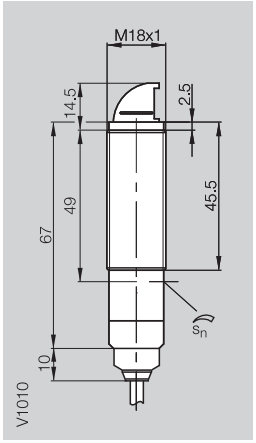
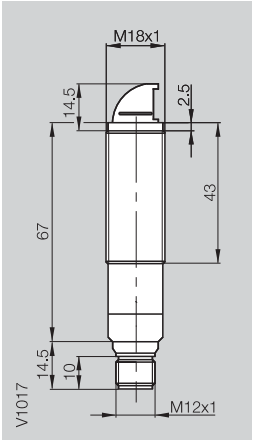
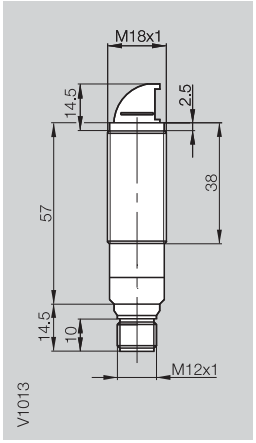
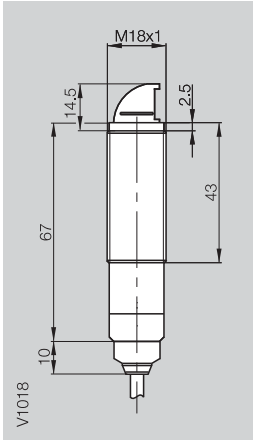
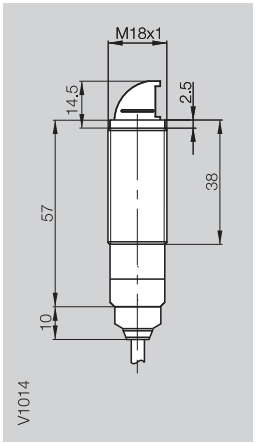




Diffuse				
PNP	250 mm	BOS 18KR-PU-ID10-S4	BOS 18KR-PU-ID10-02	
NPN	250 mm	BOS 18KR-NU-ID10-S4	BOS 18KR-NU-ID10-02	
Retroreflective				
PNP	0.1...1.7 m			BOS 18KR-PU-PR10-S4
NPN	0.1...1.7 m			BOS 18KR-NU-PR10-S4
Through-beam				
PNP	11 m Receiver			
NPN	11 m Receiver			
	11 m Emitter			
Electrical data				
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Ripple		≤ 2 V	≤ 2 V	≤ 2 V
No-load supply current I_0 max.		≤ 35 mA	≤ 35 mA	≤ 35 mA
Switching output		PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current		100 mA	100 mA	100 mA
Switching type		Light- and dark-on	Light- and dark-on	Light- and dark-on
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V	≤ 2 V
Settings		Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
Optical data				
Recommended sensing distance/range		0...250 mm	0...250 mm	0.1...1.5 m
Emitter, light type		LED, infrared	LED, infrared	LED, red light
Wavelength		880 nm	880 nm	660 nm
Light spot diameter				
Indicators				
Power-on indicator				
Output function indicator		LED yellow	LED yellow	LED yellow
Time data				
Response time		1 ms	1 ms	1 ms
Switching frequency f		500 Hz	500 Hz	500 Hz
Mechanical data				
Dimensions		M18×93.5 mm	M18×89 mm	M18×93.5 mm
Connection		M12 connector, 4-pin	2 m cable, PVC	M12 connector, 4-pin
No. of wires × cross-section			4×0.14 mm²	
Housing material		ABS	ABS	ABS
Lens material		PMMA	PMMA	PMMA
Weight		25 g	75 g	25 g
Ambient data				
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Ambient light rejection		EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a		–25...+55 °C	–25...+55 °C	–25...+55 °C

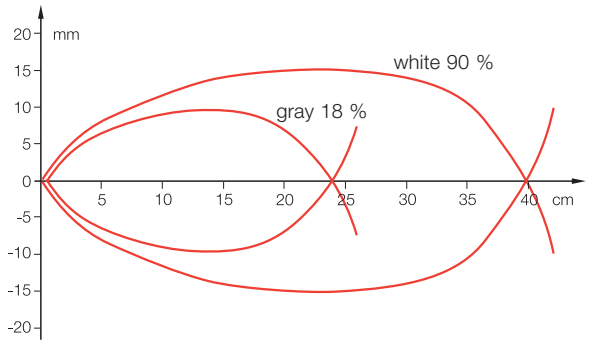
Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**90 and **2.1.**91.

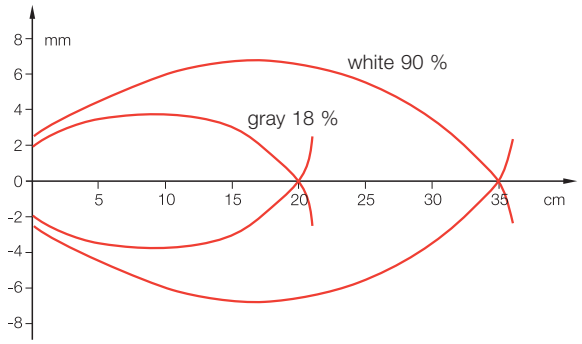
	0.1...1.7 m	**0...11 m**	**0...11 m**	**0...11 m**	**0...11 m**
					
	BOS 18KR-PU-PR10-02 BOS 18KR-NU-PR10-02				
		BOS 18KR-PU-IE10-S4 BOS 18KR-NU-IE10-S4		BOS 18KR-PU-IE10-02 BOS 18KR-NU-IE10-02	
			BOS 18KR-XT-IS10-S4		BOS 18KR-XT-IS10-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor		PNP- or NPN-Transistor	
	100 mA	100 mA		100 mA	
	Light- and dark-on	Light- and dark-on		Light- and dark-on	
	≤ 2 V	≤ 2 V		≤ 2 V	
	Potentiometer 270°	fixed	fixed	fixed	fixed
	0.1...1.5 m	0...10 m	0...10 m	0...10 m	0...10 m
	LED, red light		LED, infrared		LED, infrared
	660 nm		880 nm		880 nm
			LED green		LED green
	LED yellow	LED yellow		LED yellow	
	1 ms	2 ms		2 ms	
	500 Hz	250 Hz		250 Hz	
	M18×89 mm	M18×93.5 mm	M18×83.5 mm	M18×89 mm	M18×79 mm
	2 m cable, PVC	M12 connector, 4-pin	M12 connector, 4-pin	2 m cable, PVC	2 m cable, PVC
	4×0.14 mm²			4×0.14 mm²	4×0.14 mm²
	ABS	ABS	ABS	ABS	ABS
	PMMA	PMMA	PMMA	PMMA	PMMA
	75 g	25 g	25 g	75 g	75 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

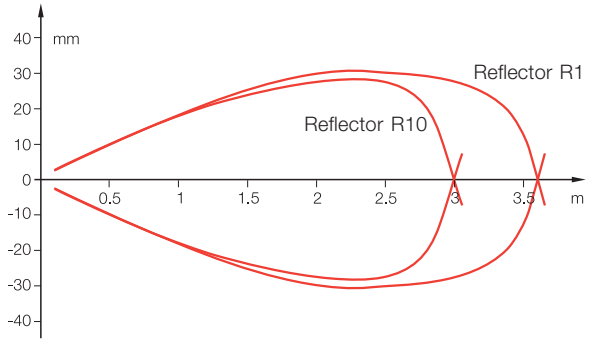
Diffuse BOS 18K-..-ID10-...



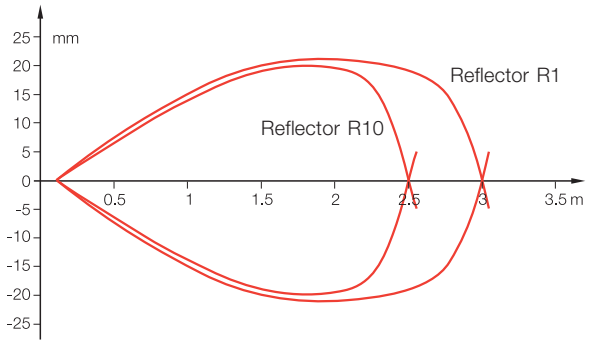
Diffuse BOS 18KR-..-ID10-...



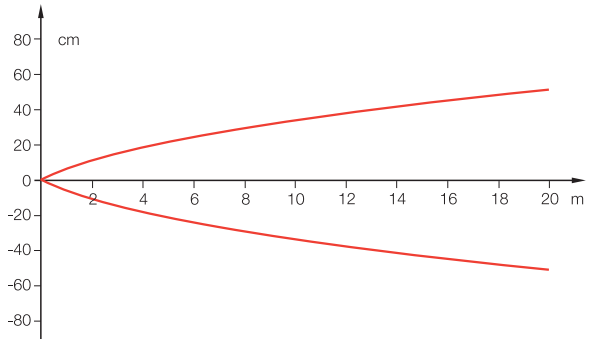
Retroreflective BOS 18K-..-PR10-...



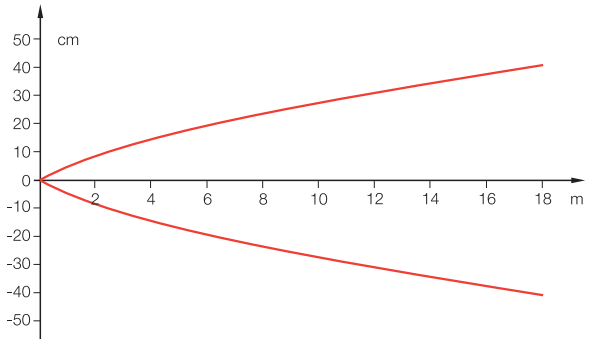
Retroreflective BOS 18KR-..-PR10-...



Through-beam BOS 18K-..-IE10-...

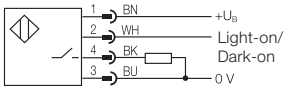


Through-beam BOS 18KR-..-IE10-...

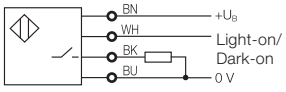


Wiring diagrams

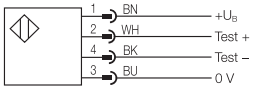
BOS 18K/KR-PU-ID10/PR10-S4



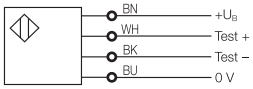
BOS 18K/KR-PU-ID10/PR10-02



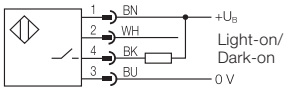
BOS 18K-XT-IS10-S4



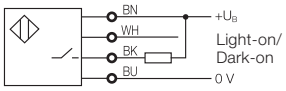
BOS 18K-XT-IS10-02



BOS 18K-NU-IE10-S4



BOS 18K-NU-IE10-02



Recommended accessories

please order separately



Mounting clamp
BOS 18,0-KB-1



Mounting bracket
BES 18-HW-1



Reflector
BOS R-10



Reflector
BOS R-1



Connector
BKS-_ 19/BKS-_ 20

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

The **BOS 30M** series combines the high optical performance of large block style sensors with the installation-friendly characteristics of tubular sensors.

The long sensing distance of 2 m provides high function reserve amongst unfavorable working conditions. A tough glass disk protects the optics from things like hot chips, and the 18-turn potentiometer enables exact sensitivity setting. In addition an integrated contamination indicator warns you in time when the optics are beginning to be affected by dirt or other effects.

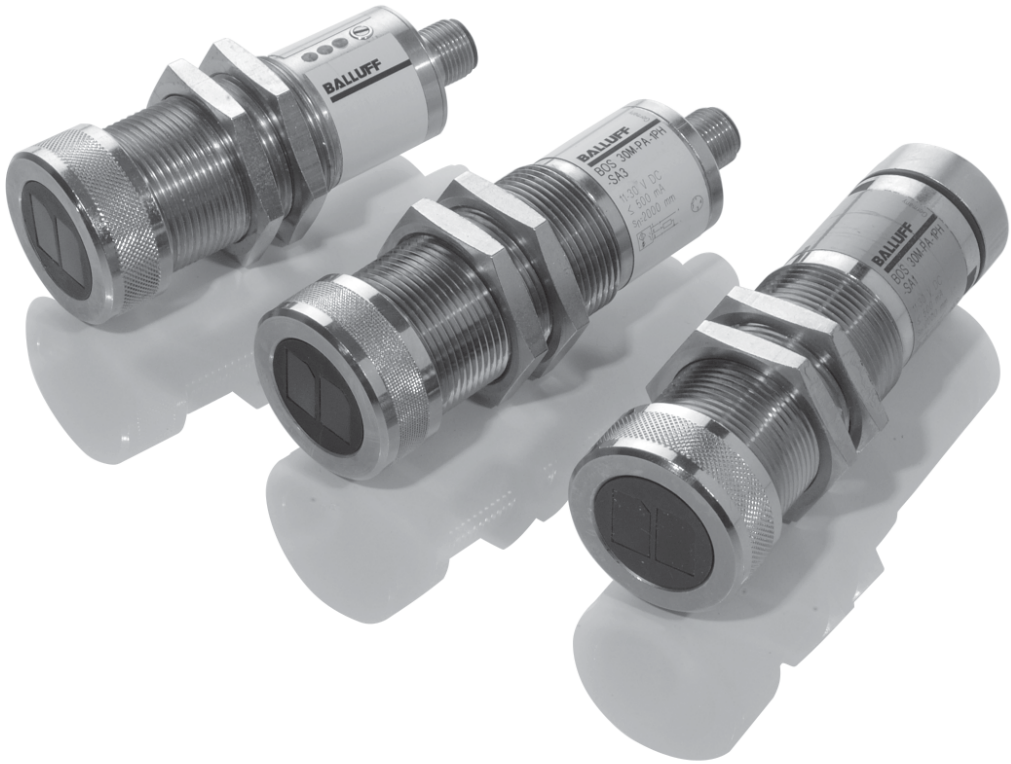
Together with special glass fiber optics BFO 18V-... Balluff offers a high-performance and tough product – particularly suitable for the automobile industry.

Features

- Long sensing distance
- Tough design (metal housing and glass protective shield)
- 18-turn potentiometer
- Normally open/normally closed option
- Compatible with special glass fiber optics
- Atomobile industry approved
- Contamination indicator

Applications

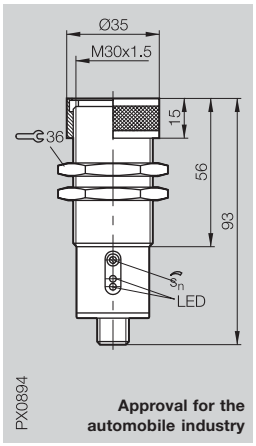
- Automobile industry
- Conveying and warehousing
- Construction machinery
- Woodworking industry
- Where harsh conditions prevail

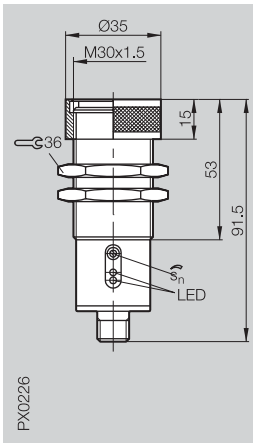


Type	Sensing distance	Light type		Output		Output function		Switching frequency	U_B	Connection		Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	BKS-S 1, 5-pin	
Diffuse												
BOS 30M-PU-1PH-SA -C	0...2 m		■	■		■	■	100 Hz	■		■	**2.1.**94
BOS 30M-PU-1PH-SA3-C	0...2 m		■	■		■	■	100 Hz	■	■		**2.1.**94
BOS 30M-GA-1PH-S4-C	0...2 m		■	■	■	■	■	100 Hz	■	■		**2.1.**94

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse	Sensing distance	**0...2 m**	**0...2 m**	

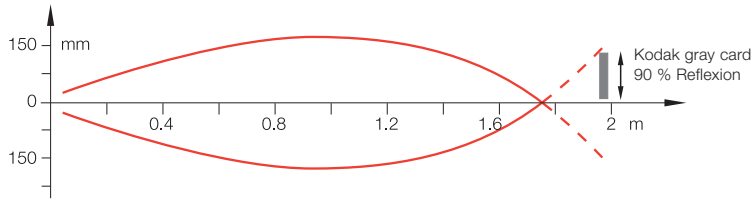




Diffuse					
PNP	2 m	Daylight filter	BOS 30M-PU-1PH-SA3-C		
PNP/NPN	2 m	Daylight filter		BOS 30M-GA-1PH-S4-C	
Electrical					
Supply voltage U_B			10...30 V DC	10...30 V DC	
Ripple			10 %	10 %	
No-load supply current I_0 max.			≤ 40 mA	≤ 40 mA	
Switching output			PNP-Transistor	PNP- and NPN-Transistor (push-pull)	
Output current			200 mA	200 mA	
Switching type			Light- and dark-on	Light- and dark-on	
Voltage drop U_d at I_e			≤ 2.4 V	≤ 2.4 V	
Settings			18-turn potentiometer	18-turn potentiometer	
Optical data					
Emitter, light type			LED, infrared	LED, infrared	
Wavelength			880 nm	880 nm	
Indicators					
Power-on indicator			LED green	LED green	
Output function indicator			LED yellow	LED yellow	
Stability indicator			LED red	LED red	
Time data					
Response time			5 ms	5 ms	
Switching frequency f			100 Hz	100 Hz	
Mechanical data					
Dimensions			M30×93 mm	M30×91.5 mm	
Connection			M12 connector, 4-pin	M12 connector, 4-pin	
Housing material			Nickel plated brass	Nickel plated brass	
Optical surface			Glass	Glass	
Weight			230 g	230 g	
Ambient data					
Degree of protection per IEC 60529			IP 65	IP 65	
Polarity reversal protected			yes	yes	
Short circuit protected			yes	yes	
Ambient temperature range T_a			–20...+60 °C	–20...+60 °C	

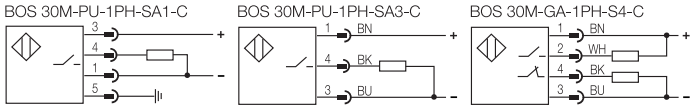
Diffuse values referenced to Kodak gray card 90% Reflexion, 400×400 mm.

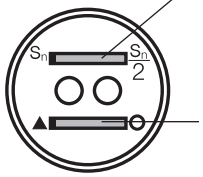
Diffuse BOS 30M-..-1PH-...



Sensing distance measured with side approach of Kodak gray card.

Wiring diagrams





Switch for halving the switching distance. The switching distance can be set more precisely. The resolution of the 18-turn potentiometer is increased.

Inverting switch for toggling the final stage version. Converts normally closed to normally open for example.

Recommended accessories
please order separately



Adapter
BFO 30-A1



Mounting clamp
BOS 30.0-KB-1



Connector
BKS-_ 19/BKS-_ 20

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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Miniaturization in the Balluff line continues at full pace. The new Opto-mini.s **BOS Q08M** sensors stand out with their ease of handling and fixed sensing distances and ranges.

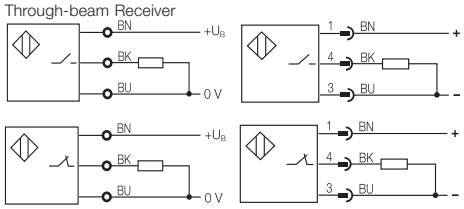
The sensor family includes diffuse types in block style housing with 8 mm side length, retroreflective and through-beam types.

These small photoelectric sensors open up possibilities in high-dynamic applications such as on robot gripper arms. Here is where components with the lightest weight, a small footprint and yet the greatest switching precision are demanded.

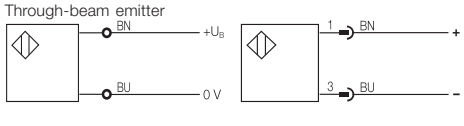


Wiring diagrams

Diffuse, Retroreflective,
Through-beam Receiver

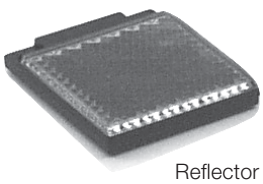


Through-beam emitter



Recommended accessories

please order separately



Reflector
BOS R-9

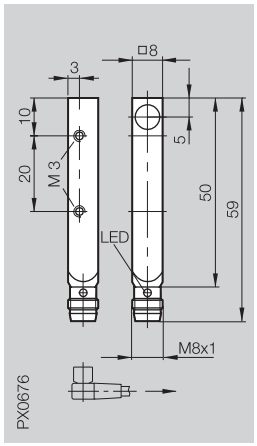


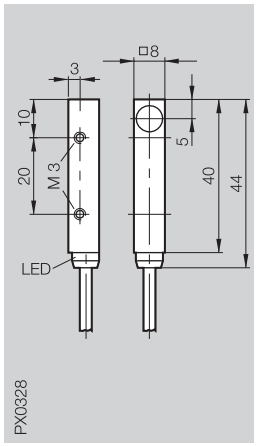
Connector
BKS-_ 48/BKS-_ 49

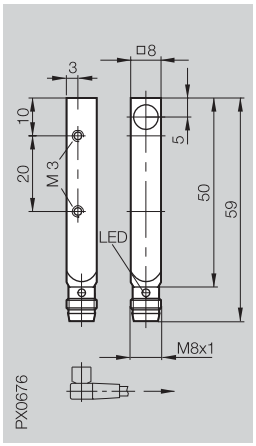
Type	Sensing distance/ range	Light type		Output		Output function		Switching frequency	U_B	Connec-tion		Special features		Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 3-pin	Cable, 3 m	Polarizing filter		
Diffuse														
BOS Q08M-PS-RD10-S49	0...55 mm	■		■		■		500 Hz	■	■				**2.1**.98
BOS Q08M-PO-RD10-S49	0...55 mm	■		■			■	500 Hz	■	■				**2.1**.98
BOS Q08M-PS-RD10-03	0...55 mm	■		■		■		500 Hz	■		■			**2.1**.98
BOS Q08M-PO-RD10-03	0...55 mm	■		■			■	500 Hz	■		■			**2.1**.98
Retroreflective														
BOS Q08M-PS-PR10-S49	25...550 mm	■		■			■	500 Hz	■	■		■		**2.1**.98
BOS Q08M-PO-PR10-S49	25...550 mm	■		■		■		500 Hz	■	■		■		**2.1**.98
BOS Q08M-PS-PR10-03	25...550 mm	■		■			■	500 Hz	■		■	■		**2.1**.99
BOS Q08M-PO-PR10-03	25...550 mm	■		■		■		500 Hz	■		■	■		**2.1**.99
Through-beam														
BOS Q08M-PS-RE10-S49	0...1.1 m	■		■			■	500 Hz	■	■				**2.1**.99
BOS Q08M-PO-RE10-S49	0...1.1 m	■		■		■		500 Hz	■	■				**2.1**.99
BOS Q08M-PS-RE10-03	0...1.1 m	■		■			■	500 Hz	■		■			**2.1**.99
BOS Q08M-PO-RE10-03	0...1.1 m	■		■		■		500 Hz	■		■			**2.1**.99
BOS Q08M-X-RS10-S49	0...1.1 m	■							■	■				**2.1**.99
BOS Q08M-X-RS10-03	0...1.1 m	■							■		■			**2.1**.99

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2.3
Photoelectric sensors accessories page 2.3.2 ...
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Diffuse	maximum sensing distance	**0...55 mm**	**0...55 mm**	
Retroreflective	maximum range			**25...550 mm**
Through-beam	maximum range			



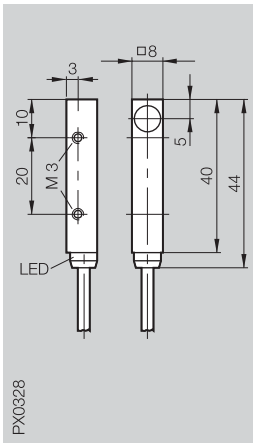
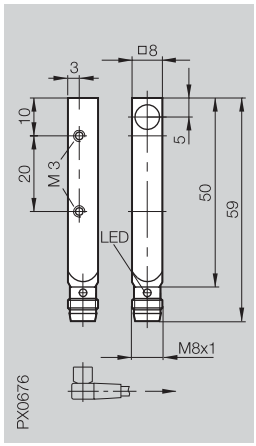
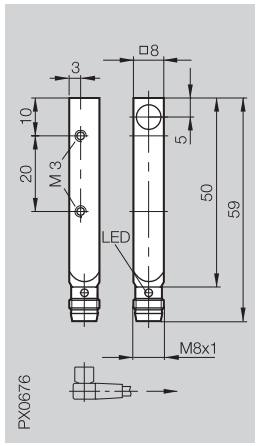
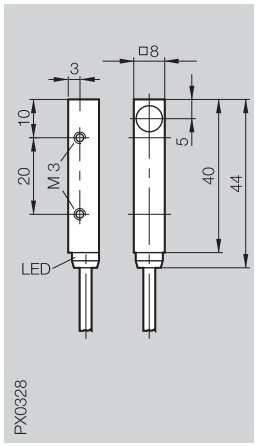
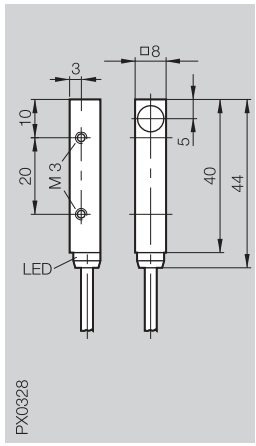




Diffuse					
PNP, NO	55 mm		BOS Q08M-PS-RD10-S49	BOS Q08M-PS-RD10-03	
PNP, NC	55 mm		BOS Q08M-PO-RD10-S49	BOS Q08M-PO-RD10-03	
Retroreflective					
PNP, NO	25...550 mm	Polarizing filter			BOS Q08M-PS-PR10-S49
PNP, NC	25...550 mm	Polarizing filter			BOS Q08M-PO-PR10-S49
Through-beam					
PNP, NO	1.1 m	Receiver			
PNP, NC	1.1 m	Receiver			
	1.1 m	Emitter			
Electrical data					
Supply voltage U_B			10...30 V DC	10...30 V DC	10...30 V DC
Ripple			10 %	10 %	10 %
No-load supply current I_0 max.			≤ 20 mA	≤ 20 mA	≤ 20 mA
Switching output			PNP-Transistor	PNP-Transistor	PNP-Transistor
Output current			100 mA	100 mA	100 mA
Switching type			Light- or dark-on	Light- or dark-on	Light- or dark-on
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V	≤ 2 V
Settings			fixed	fixed	fixed
Optical data					
Recommended sensing distance/range			0...50 mm	0...50 mm	25...500 mm
Emitter, light type			LED, red light	LED, red light	LED, red light
Wavelength			640 nm	640 nm	640 nm
Indicators					
Output function indicator			LED red	LED red	LED red
Time data					
Response time			1 ms	1 ms	1 ms
Switching frequency f			500 Hz	500 Hz	500 Hz
Mechanical data					
Dimensions			8×59×8 mm	8×44×8 mm	8×59×8 mm
Connection			M8 connector, 3-pin	3 m Cable PUR	M8 connector, 3-pin
No. of wires × cross-section				3×0.14 mm²	
Housing material			Nickel plated Gd-Zn	Nickel plated Gd-Zn	Nickel plated Gd-Zn
Optical surface			PMMA	PMMA	PMMA
Weight			13 g	47 g	13 g
Ambient data					
Degree of protection per IEC 60529			IP 67	IP 67	IP 67
Polarity reversal protected			yes	yes	yes
Short circuit protected			yes	yes	yes
Ambient temperature range T_a			–10...+60 °C	–10...+60 °C	–10...+60 °C
Ambient light rejection per			EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R9 reflector.

Connector orientation

	25...550 mm	**0...1.1 m**	**0...1.1 m**	**0...1.1 m**	**0...1.1 m**
					
	BOS Q08M-PS-PR10-03 BOS Q08M-PO-PR10-03				
		BOS Q08M-PS-RE10-S49 BOS Q08M-PO-RE10-S49	BOS Q08M-X-RS10-S49	BOS Q08M-PS-RE10-03 BOS Q08M-PO-RE10-03	BOS Q08M-X-RS10-03
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %	10 %	10 %
	≤ 20 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA	≤ 15 mA
	PNP-Transistor	PNP-Transistor		PNP-Transistor	
	100 mA	100 mA		100 mA	
	Light- or dark-on	Light- or dark-on		Light- or dark-on	
	≤ 2 V	≤ 2 V		≤ 2 V	
	fixed	fixed	fixed	fixed	fixed
	25...500 mm	0...1 m	0...1 m	0...1 m	0...1 m
	LED, red light		LED, red light		LED, red light
	640 nm		640 nm		640 nm
	LED red	LED red		LED red	
	1 ms	1 ms		1 ms	
	500 Hz	500 Hz		500 Hz	
	8×44×8 mm	8×59×8 mm	8×59×8 mm	8×44×8 mm	8×44×8 mm
	3 m Cable PUR	M8 connector, 3-pin	M8 connector, 3-pin	3 m Cable PUR	3 m Cable PUR
	3×0.14 mm²			3×0.14 mm²	2×0.14 mm²
	Nickel plated Gd-Zn	Nickel plated Gd-Zn	Nickel plated Gd-Zn	Nickel plated Gd-Zn	Nickel plated Gd-Zn
	PMMA	PMMA	PMMA	PMMA	PMMA
	47 g	13 g	13 g	47 g	47 g
	IP 67	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
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Requirements such as extremely tight mounting spaces under the most difficult of conditions are easily handled by the sub-mini **BOS 2K**.

The electronic circuitry is housed in a plastic enclosure just 20.6×12.5×7.6 mm. Metal sleeves in the housing ensure secure and simple mounting.

The laser-like, visible light spot makes precise small-parts detection possible.

Unmatched ranges up to 1.2 m and fast response times ensure compatibility with dynamic applications.

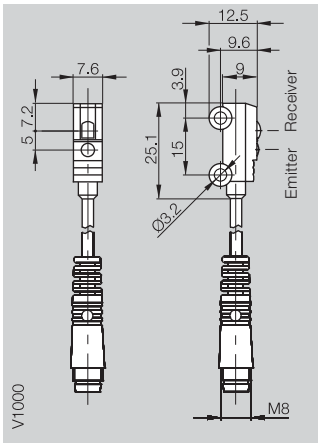
The BOS 2K series is a complete family with diffuse, retroreflective and through-beam models, as well as diffuse with background suppression. That means this series offers the complete functionality demanded of a modern sensor family.

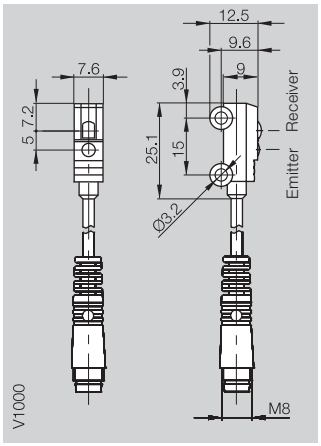


Type	Sensing/ scan range	Light type		Output		Output-function		Switching frequency	U_B	Connection				Special features		Page
		Red light		PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 3-pin	M8 connector, 4-pin	Cable		Polarizing filter		
Diffuse with HGA																
BOS 2K-PS-RH10-00,2-S49	1...15 mm	■		■		■		800 Hz	■	■						**2.1**.102
BOS 2K-PO-RH10-00,2-S49	1...15 mm	■		■			■	800 Hz	■	■						**2.1**.102
BOS 2K-PS-RH10-00,2-S75	1...15 mm	■		■		■		800 Hz	■		■					**2.1**.102
BOS 2K-PS-RH10-02	1...15 mm	■		■		■		800 Hz	■			■				**2.1**.103
BOS 2K-NS-RH10-02	1...15 mm	■			■	■		800 Hz	■			■				**2.1**.103
BOS 2K-NO-RH10-02	1...15 mm	■			■		■	800 Hz	■			■				**2.1**.103
BOS 2K-PS-RH11-00,2-S49	1...30 mm	■		■		■		800 Hz	■	■						**2.1**.103
BOS 2K-PS-RH11-00,2-S75	1...30 mm	■		■		■		800 Hz	■		■					**2.1**.103
BOS 2K-PS-RH11-02	1...30 mm	■		■		■		800 Hz	■			■				**2.1**.103
BOS 2K-PO-RH11-02	1...30 mm	■		■			■	800 Hz	■			■				**2.1**.103
BOS 2K-NS-RH11-02	1...30 mm	■			■	■		800 Hz	■			■				**2.1**.103
Diffuse																
BOS 2K-PS-RD10-00,2-S49	1...55 mm	■		■		■		800 Hz	■	■						**2.1**.104
BOS 2K-PS-RD10-00,2-S75	1...55 mm	■		■		■		800 Hz	■		■					**2.1**.104
BOS 2K-PS-RD10-02	1...55 mm	■		■		■		800 Hz	■			■				**2.1**.104
BOS 2K-NS-RD10-02	1...55 mm	■			■	■		800 Hz	■			■				**2.1**.104
Retroreflective																
BOS 2K-PS-PR10-00,2-S49	45...800 mm	■		■			■	800 Hz	■	■				■		**2.1**.105
BOS 2K-PO-PR10-00,2-S49	45...800 mm	■		■		■		800 Hz	■	■				■		**2.1**.105
BOS 2K-PS-PR10-00,2-S75	45...800 mm	■		■			■	800 Hz	■		■			■		**2.1**.105
BOS 2K-PS-PR10-02	45...800 mm	■		■			■	800 Hz	■			■		■		**2.1**.105
BOS 2K-PO-PR10-02	45...800 mm	■		■		■		800 Hz	■			■		■		**2.1**.105
BOS 2K-NS-PR10-02	45...800 mm	■			■		■	800 Hz	■			■		■		**2.1**.105
BOS 2K-NO-PR10-02	45...800 mm	■			■	■		800 Hz	■			■		■		**2.1**.105
Through-beam																
BOS 2K-PS-RE10-00,2-S49	0...1.2 m	■		■			■	200 Hz	■	■						**2.1**.106
BOS 2K-PS-RE10-00,2-S75	0...1.2 m	■		■			■	200 Hz	■		■					**2.1**.107
BOS 2K-PS-RE10-02	0...1.2 m	■		■			■	200 Hz	■			■				**2.1**.107
BOS 2K-PO-RE10-02	0...1.2 m	■		■		■		200 Hz	■			■				**2.1**.107
BOS 2K-NS-RE10-02	0...1.2 m	■			■		■	200 Hz	■			■				**2.1**.107
BOS 2K-X-RS10-00,2-S49	0...1.2 m	■							■	■						**2.1**.106
BOS 2K-X-RS10-00,2-S75	0...1.2 m	■							■		■					**2.1**.107
BOS 2K-X-RS10-02	0...1.2 m	■							■			■				**2.1**.107

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Photoelectric Sensors Accessories
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Connectors ...
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Diffuse with background suppression	maximum sensing distance	**1...15 mm**	**1...15 mm**	

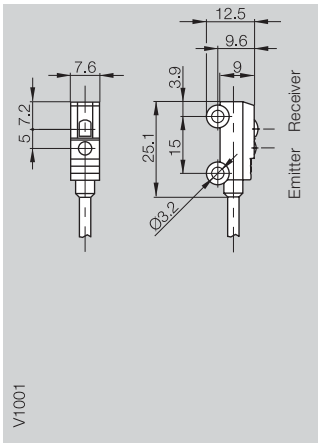
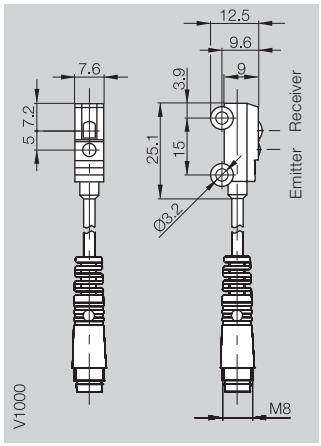
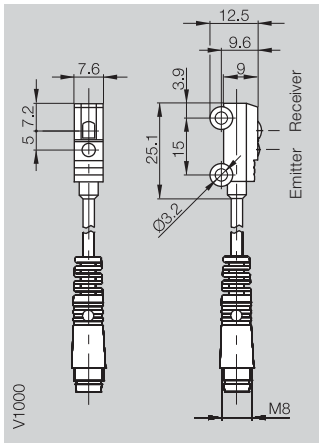
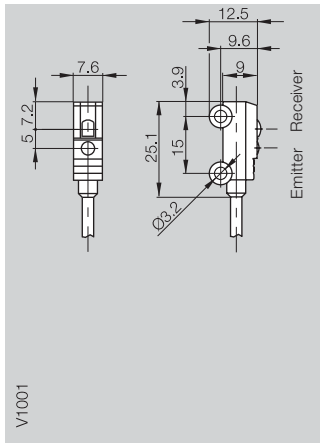




Diffuse with background suppression				
PNP NO	1...15 mm	BOS 2K-PS-RH10-00,2-S49	BOS 2K-PS-RH10-00,2-S75	
PNP NC	1...15 mm	BOS 2K-PO-RH10-00,2-S49		
NPN NO	1...15 mm			
NPN NC	1...15 mm			
PNP NO	1...30 mm			
PNP NC	1...30 mm			
NPN NO	1...30 mm			
Electrical data				
Supply voltage U_B		10...30 V DC	10...30 V DC	
Ripple		≤ 5 V pp	≤ 5 V pp	
No-load supply current I_0 max.		≤ 20 mA	≤ 20 mA	
Switching output		PNP- or NPN-Transistor	PNP-Transistor	
Output current		50 mA	50 mA	
Switching type		Light- or dark-on	Light-on	
Voltage drop U_d at I_e		≤ 2 V		
Settings		fixed	fixed	
Optical data				
Recommended range		1...15 mm	1...15 mm	
Emitter, light type		Pin-Point LED, red light	Pin-Point LED, red light	
Wavelength		640 nm	640 nm	
Light spot diameter		approx. 1.2 mm at 8 mm approx. 2.5 mm at 15 mm	approx. 1.2 mm at 8 mm approx. 2.5 mm at 15 mm	
Indicators				
Output function indicator		LED red	LED red	
Time data				
Response time		0.6 ms	0.6 ms	
Switching frequency f		800 Hz	800 Hz	
Mechanical data				
Dimensions		12.5×20.6×7.6 mm	12.5×20.6×7.6 mm	
Connection		M8 connector, 3-pin	M8 connector, 4-pin	
No. of wires × cross-section				
Housing material		ABS	ABS	
Lens material		PMMA	PMMA	
Weight		20 g	20 g	
Ambient data				
Degree of protection per IEC 60529		IP 67	IP 67	
Polarity reversal protected		yes	yes	
Short circuit protected		yes	yes	
Ambient light rejection		EN 60947-5-2	EN 60947-5-2	
Ambient temperature range T_a		–20...+50 °C	–20...+50 °C	

Diffuse values referenced to Kodak gray card 90% Reflexion.

Wiring diagrams, characteristics and accessories see page **2.1.**108 and **2.1.**109.

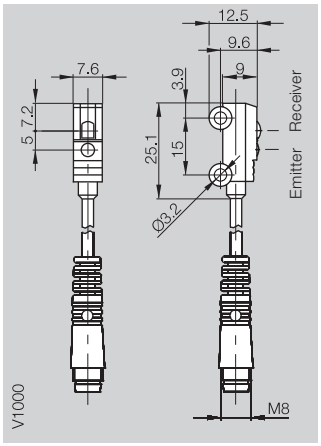
	1...15 mm	1...30 mm	1...30 mm	1...30 mm
				
	BOS 2K-PS-RH10-02 BOS 2K-NS-RH10-02 BOS 2K-NO-RH10-02	BOS 2K-PS-RH11-00,2-S49	BOS 2K-PS-RH11-00,2-S75	BOS 2K-PS-RH11-02 BOS 2K-PO-RH11-02 BOS 2K-NS-RH11-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 5 V pp	≤ 5 V pp	≤ 5 V pp	≤ 5 V pp
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
	PNP- or NPN-Transistor	PNP-Transistor	PNP-Transistor	PNP- or NPN-Transistor
	50 mA	50 mA	50 mA	50 mA
	Light- or dark-on	Light-on	Light-on	Light- or dark-on
	≤ 2 V			
	fixed	fixed	fixed	fixed
	1...15 mm	1...30 mm	1...30 mm	1...30 mm
	Pin-Point LED, red light	Pin-Point LED, red light	Pin-Point LED, red light	Pin-Point LED, red light
	640 nm	640 nm	640 nm	640 nm
	approx. 1.2 mm at 8 mm approx. 2.5 mm at 15 mm	approx. 1.0 mm at 15 mm approx. 4.5 mm at 30 mm	approx. 1.0 mm at 15 mm approx. 4.5 mm at 30 mm	approx. 1.0 mm at 15 mm approx. 4.5 mm at 30 mm
	LED red	LED red	LED red	LED red
	0.6 ms	0.6 ms	0.6 ms	0.6 ms
	800 Hz	800 Hz	800 Hz	800 Hz
	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm
	2 m cable, PVC	M8 connector, 3-pin	M8 connector, 4-pin	2 m cable, PVC
	3×0.09 mm²			3×0.09 mm²
	ABS	ABS	ABS	ABS
	PMMA	PMMA	PMMA	PMMA
	18 g	20 g	20 g	18 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	–20...+50 °C	–20...+50 °C	–20...+50 °C	–20...+50 °C

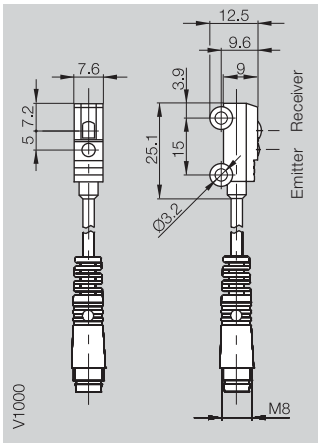
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2.3
Photoelectric Sensors Accessories
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Connectors ...
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Diffuse	maximum sensing distance	**1...55 mm**	**1...55 mm**
Retroreflective with polarizing filter	maximum range		

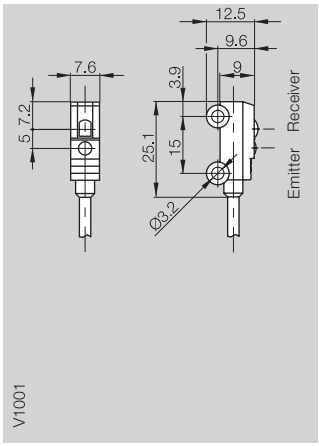
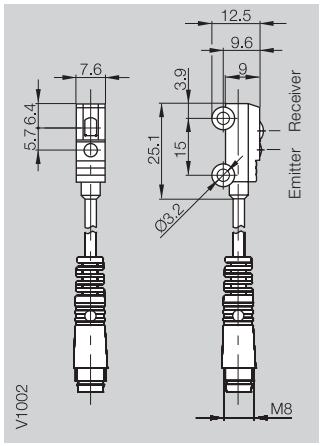
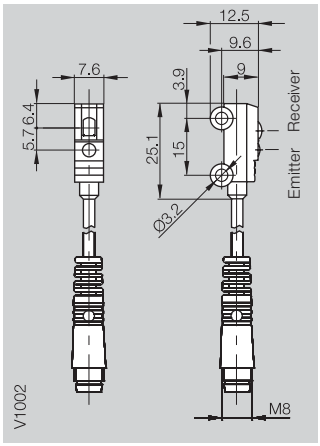
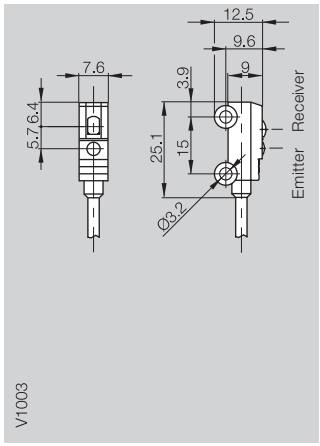




	Diffuse				
	PNP NO	1...55 mm		BOS 2K-PS-RD10-00,2-S49	BOS 2K-PS-RD10-00,2-S75
	NPN NO	1...55 mm			
	Retroreflective				
	PNP NO	45...800 mm	Polarizing filter		
	PNP NC	45...800 mm	Polarizing filter		
	NPN NO	45...800 mm	Polarizing filter		
	NPN NC	45...800 mm	Polarizing filter		
	Electrical data				
	Supply voltage U_B			10...30 V DC	10...30 V DC
	Ripple			≤ 5 V	≤ 5 V
	No-load supply current I_0 max.			≤ 20 mA	≤ 20 mA
	Switching output			PNP-Transistor	PNP-Transistor
	Output current			50 mA	50 mA
	Switching type			Light-on	Light-on
	Voltage drop U_d at I_e			≤ 2 V	≤ 2 V
	Settings			fixed	fixed
	Optical data				
	Recommended sensing distance/range			1...55 mm	1...55 mm
	Emitter, light type			Pin-Point LED, red light	Pin-Point LED, red light
	Wavelength			640 nm	640 nm
	Light spot diameter			approx. 3.5 mm at 50 mm	approx. 3.5 mm at 50 mm
	Indicators				
	Output function indicator			LED red	LED red
	Time data				
	Response time			0.6 ms	0.6 ms
	Switching frequency f			800 Hz	800 Hz
	Mechanical data				
	Dimensions			12.5×20.6×7.6 mm	12.5×20.6×7.6 mm
	Connection			M8 connector, 3-pin	M8 connector, 4-pin
	No. of wires × cross-section				
	Housing material			ABS	ABS
	Lens material			PMMA	PMMA
	Weight			20 g	20 g
	Ambient data				
	Degree of protection per IEC 60529			IP 67	IP 67
	Polarity reversal protected			yes	yes
	Short circuit protected			yes	yes
	Ambient light rejection			EN 60947-5-2	EN 60947-5-2
	Ambient temperature range T_a			–20...+50 °C	–20...+50 °C

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R9 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**108 and **2.1.**109.

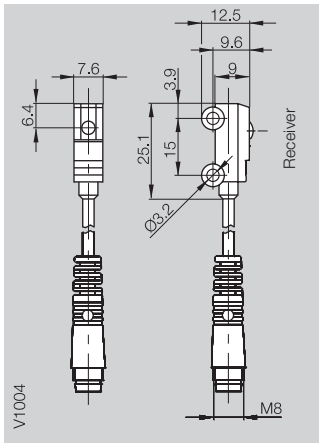
	1...55 mm	**45...800 mm**	**45...800 mm**	**45...800 mm**
				
	BOS 2K-PS-RD10-02 BOS 2K-NS-RD10-02			
		BOS 2K-PS-PR10-00,2-S49 BOS 2K-PO-PR10-00,2-S49	BOS 2K-PS-PR10-00,2-S75	BOS 2K-PS-PR10-02 BOS 2K-PO-PR10-02 BOS 2K-NS-PR10-02 BOS 2K-NO-PR10-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 5 V	≤ 5 V	≤ 5 V	≤ 5 V
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 20 mA
	PNP- or NPN-Transistor	PNP-Transistor	PNP-Transistor	PNP- or NPN-Transistor
	50 mA	50 mA	50 mA	50 mA
	Light-on	Light- or dark-on	Dark-on	Light- or dark-on
	≤ 2 V	≤ 2 V	≤ 2 V	≤ 2 V
	fixed	fixed	fixed	fixed
	1...55 mm	25...500 mm	25...500 mm	25...500 mm
	Pin-Point LED, red light	Pin-Point LED, red light	Pin-Point LED, red light	Pin-Point LED, red light
	640 nm	640 nm	640 nm	640 nm
	approx. 3.5 mm at 50 mm	approx. 10 mm at 100 mm	approx. 10 mm at 100 mm	approx. 10 mm at 100 mm
	LED red	LED red	LED red	LED red
	0.6 ms	0.6 ms	0.6 ms	0.6 ms
	800 Hz	800 Hz	800 Hz	800 Hz
	12,5×20,6×7,6 mm	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm
	2 m cable, PVC	M8 connector, 3-pin	M8 connector, 4-pin	2 m cable, PVC
	3×0.09 mm²			3×0.09 mm²
	ABS	ABS	ABS	ABS
	PMMA	PMMA	PMMA	PMMA
	18 g	20 g	20 g	18 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	–20...+50 °C	–20...+50 °C	–20...+50 °C	–20...+50 °C

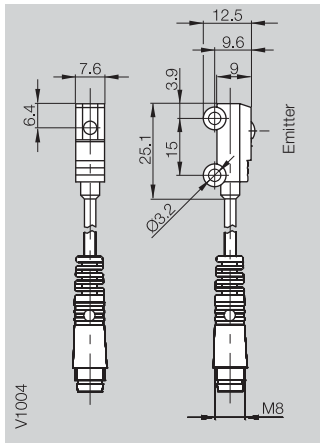
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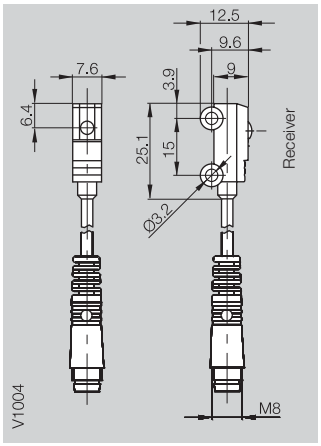
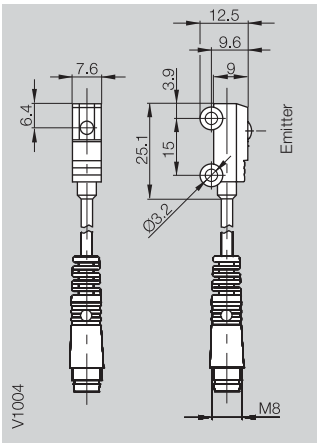
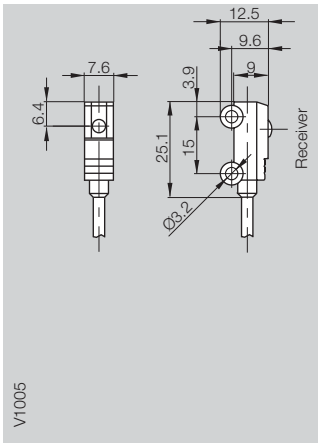
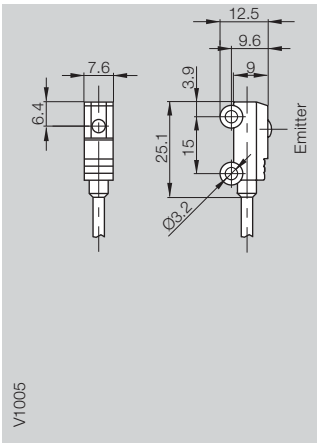
Through-beam	maximum range	**0...1,2 m**	**0...1,2 m**	





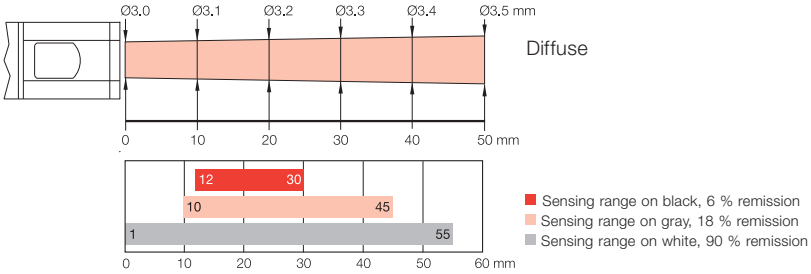
Through-beam				
PNP NO	1.2 m	Receiver	BOS 2K-PS-RE10-00,2-S49	
PNP NC	1.2 m	Receiver		
NPN NO	1.2 m	Receiver		
	1.2 m	Emitter		BOS 2K-X-RS10-00,2-S49
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			≤ 5 V	≤ 5 V
No-load supply current I_0 max.			≤ 10 mA	≤ 20 mA
Switching output			PNP-Transistor	
Output current			50 mA	
Switching type			Dark-on	
Voltage drop U_d at I_e			≤ 2 V	
Settings			fixed	
Optical data				
Recommended range			0...1 m	0...1 m
Emitter, light type			Red light	Pin-Point LED, red light
Wavelength			640 nm	640 nm
Light spot diameter				
Indicators				
Output function indicator			LED red	
Time data				
Response time			2.5 ms	
Switching frequency f			200 Hz	
Mechanical data				
Dimensions			12.5×20.6×7.6 mm	12.5×20.6×7.6 mm
Connection			M8 connector, 3-pin	M8 connector, 3-pin
No. of wires × cross-section				
Housing material			ABS	ABS
Lens material			PMMA	PMMA
Weight			20 g	20 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient light rejection			EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a			–20...+50 °C	–20...+50 °C

Wiring diagrams, characteristics and accessories see page **2.1.**108 and **2.1.**109.

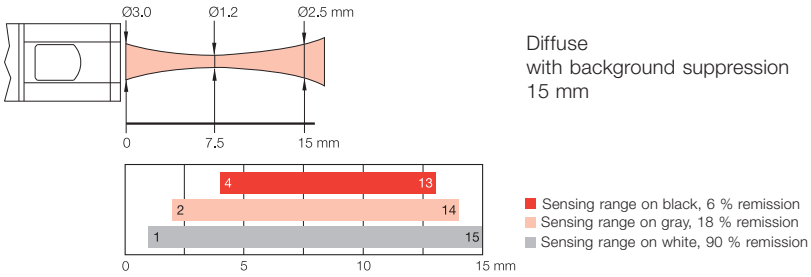
	0...1,2 m	**0...1,2 m**	**0...1,2 m**	**0...1,2 m**
				
	BOS 2K-PS-RE10-00,2-S75	BOS 2K-X-RS10-00,2-S75	BOS 2K-PS-RE10-02 BOS 2K-PO-RE10-02 BOS 2K-NS-RE10-02	BOS 2K-X-RS10-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 5 V	≤ 5 V	≤ 5 V	≤ 5 V
	≤ 10 mA	≤ 20 mA	≤ 10 mA	≤ 20 mA
	PNP-Transistor		PNP- or NPN-Transistor	
	50 mA		50 mA	
	Dark-on		Light- or dark-on	
	≤ 2 V		≤ 2 V	
	fixed		fixed	
	0...1 m	0...1 m	0...1 m	0...1 m
	Red light	Pin-Point LED, red light	Red light	Pin-Point LED, red light
	640 nm	640 nm	640 nm	640 nm
	LED red		LED red	
	2.5 ms		2.5 ms	
	200 Hz		200 Hz	
	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm	12.5×20.6×7.6 mm
	M8 connector, 4-pin	M8 connector, 4-pin	2 m cable, PVC	2 m cable, PVC
			3×0.09 mm²	3×0.09 mm²
	ABS	ABS	ABS	ABS
	PMMA	PMMA	PMMA	PMMA
	20 g	20 g	18 g	18 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	–20...+50 °C	–20...+50 °C	–20...+50 °C	–20...+50 °C

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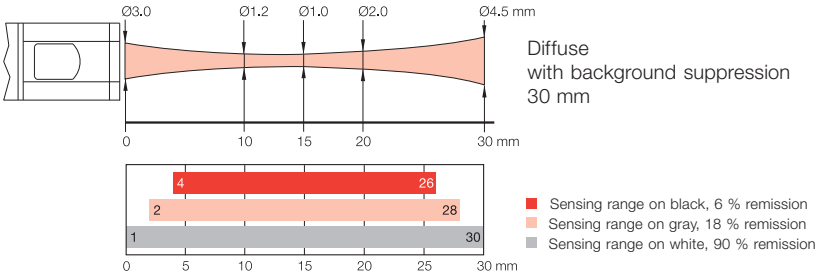
Light spot diameter Diffuse, 50 mm



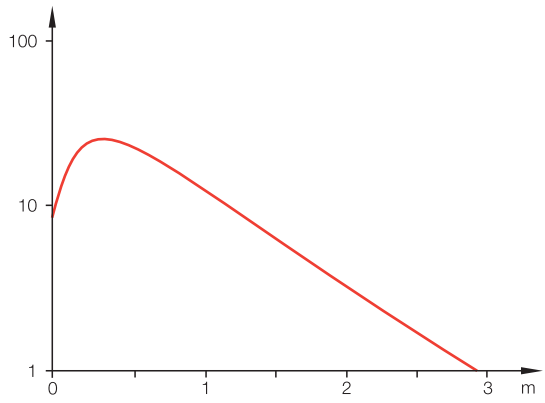
Light spot diameter Diffuse with background suppression, 15 mm



Light spot diameter Diffuse with background suppression, 30 mm

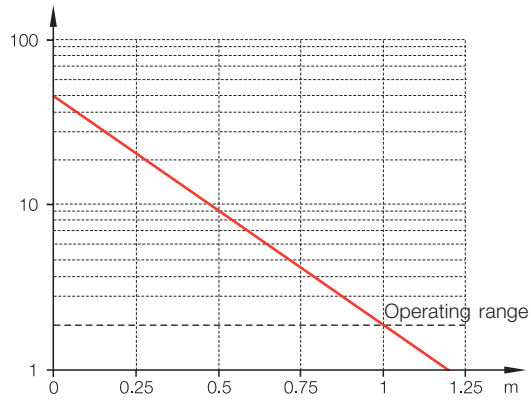


Retroreflective



Function reserve

Through-beam

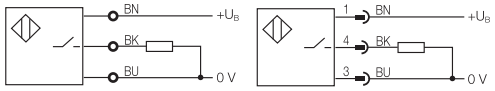


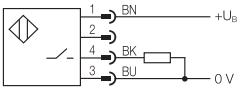
Function reserve

Wiring diagrams

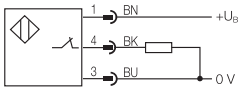
Diffuse

PNP light-on

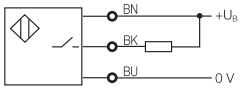




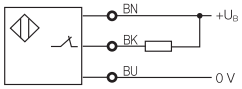
PNP dark-on



NPN light-on

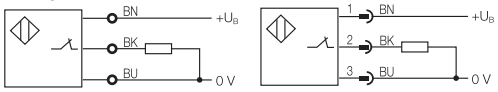


NPN dark-on

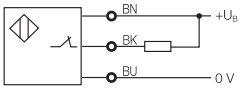


Retroreflective, through-beam receiver

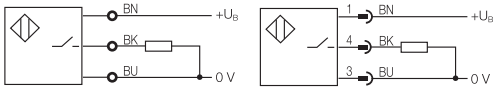
PNP light-on



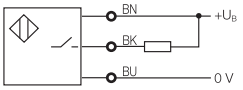
NPN light-on



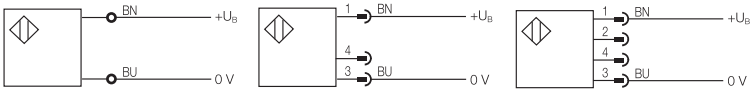
PNP dark-on



NPN dark-on



Through-beam emitter



Recommended accessories

please order separately

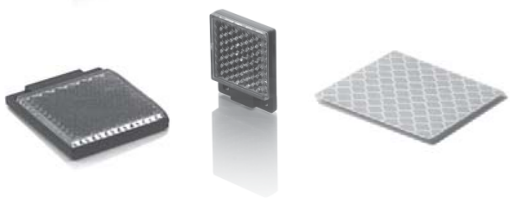
Mounting brackets

BOS 2-HW-1
BOS 2-HW-2
BOS 2-HW-3
(from left
to right)



Reflectors

BOS R-9
BOS R-26
BOS R-30
(from left
to right)



Connectors

BKS-S 74
BKS-S 48
(from left
to right)



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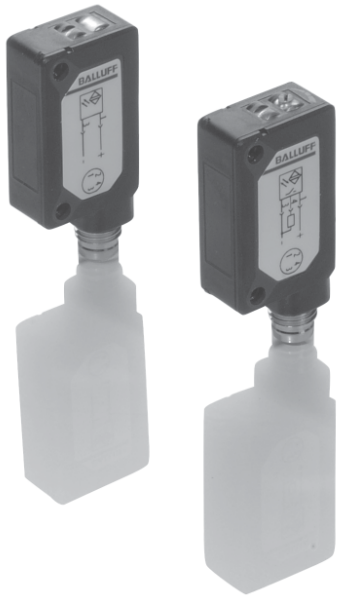
Small sensors are easier to install and are even sometimes the only alternative. The optical performance of these miniature sensors is astounding. Choose between integrated cable or an M8 connector for connecting these sensors.

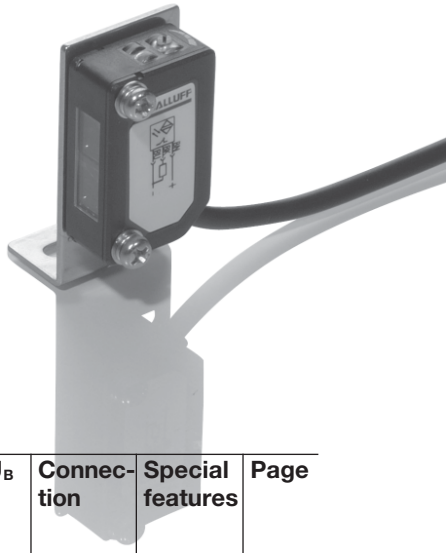
This series includes various diffuse sensors with background suppression, diffuse with narrow spot geometry, energetic diffuse, retroreflective models with polarizing filter and through-beam sensors.

The new **BOS 5K** series features:

- A small, compact form factor
- Emphasis on essential, basic functions
- Attractive price position in the lower price segment
- Large range of accessories for increased functionality





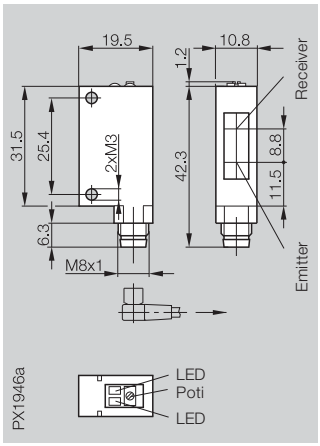


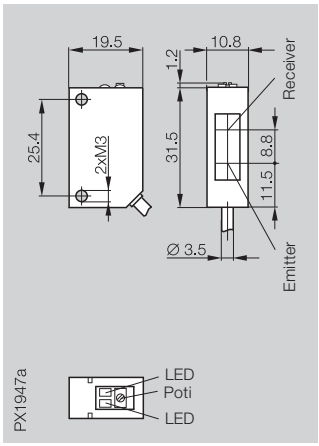
Type	Tast-/ Reichweite	Light type		Output		Output function		Switching frequency	U_B	Connection		Special features		Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 4-pin	Cable	Polarizing filter		
Diffuse with HGA														
BOS 5K-PS-RH12-S75	40...200 mm	■		■		■		500 Hz	■	■				**2.1.**112
BOS 5K-PO-RH12-S75	40...200 mm	■		■			■	500 Hz	■	■				**2.1.**112
BOS 5K-PS-RH12-02	40...200 mm	■		■		■		500 Hz	■		■			**2.1.**112
BOS 5K-PO-RH12-02	40...200 mm	■		■			■	500 Hz	■		■			**2.1.**112
BOS 5K-NS-RH12-S75	40...200 mm	■			■	■		500 Hz	■	■				**2.1.**112
BOS 5K-NO-RH12-S75	40...200 mm	■			■		■	500 Hz	■	■				**2.1.**112
BOS 5K-NS-RH12-02	40...200 mm	■			■	■		500 Hz	■		■			**2.1.**112
BOS 5K-NO-RH12-02	40...200 mm	■			■		■	500 Hz	■		■			**2.1.**112

Type	Tast-/ Reichweite	Light type		Output		Output function		Switching frequency	U_B	Connec-tion		Special features		Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 4-pin	Cable	Polarizing filter		
Diffuse														
BOS 5K-PS-ID10-S75	0...900 mm		■	■		■		500 Hz	■	■				**2.1**.113
BOS 5K-PO-ID10-S75	0...900 mm		■	■			■	500 Hz	■	■				**2.1**.113
BOS 5K-PS-ID10-02	0...900 mm		■	■		■		500 Hz	■		■			**2.1**.113
BOS 5K-PO-ID10-02	0...900 mm		■	■			■	500 Hz	■		■			**2.1**.113
BOS 5K-NS-ID10-S75	0...900 mm		■		■	■		500 Hz	■	■				**2.1**.113
BOS 5K-NO-ID10-S75	0...900 mm		■		■		■	500 Hz	■	■				**2.1**.113
BOS 5K-NS-ID10-02	0...900 mm		■		■	■		500 Hz	■		■			**2.1**.113
BOS 5K-NO-ID10-02	0...900 mm		■		■		■	500 Hz	■		■			**2.1**.113
Diffuse small beam														
BOS 5K-PS-RD11-S75	50...200 mm	■		■		■		500 Hz	■	■				**2.1**.113
BOS 5K-PO-RD11-S75	50...200 mm	■		■			■	500 Hz	■	■				**2.1**.113
BOS 5K-PS-RD11-02	50...200 mm	■		■		■		500 Hz	■		■			**2.1**.113
BOS 5K-PO-RD11-02	50...200 mm	■		■			■	500 Hz	■		■			**2.1**.113
BOS 5K-NS-RD11-S75	50...200 mm	■			■	■		500 Hz	■	■				**2.1**.113
BOS 5K-NO-RD11-S75	50...200 mm	■			■		■	500 Hz	■	■				**2.1**.113
BOS 5K-NS-RD11-02	50...200 mm	■			■	■		500 Hz	■		■			**2.1**.113
BOS 5K-NO-RD11-02	50...200 mm	■			■		■	500 Hz	■		■			**2.1**.113
Retroreflective														
BOS 5K-PS-RR10-S75	0,1...4 m	■		■			■	500 Hz	■	■		■		**2.1**.114
BOS 5K-PO-RR10-S75	0,1...4 m	■		■		■		500 Hz	■	■		■		**2.1**.114
BOS 5K-PO-RR10-S75-S	0,1...4 m	■		■		■		500 Hz	■	■		■		**2.1**.114
BOS 5K-PS-RR10-02	0,1...4 m	■		■			■	500 Hz	■		■	■		**2.1**.115
BOS 5K-PO-RR10-02	0,1...4 m	■		■		■		500 Hz	■		■	■		**2.1**.115
BOS 5K-NS-RR10-S75	0,1...4 m	■			■		■	500 Hz	■	■		■		**2.1**.114
BOS 5K-NO-RR10-S75	0,1...4 m	■			■	■		500 Hz	■	■		■		**2.1**.114
BOS 5K-NO-RR10-S75-S	0,1...4 m	■			■	■		500 Hz	■	■		■		**2.1**.114
BOS 5K-NS-RR10-02	0,1...4 m	■			■		■	500 Hz	■		■	■		**2.1**.115
BOS 5K-NO-RR10-02	0,1...4 m	■			■	■		500 Hz	■		■	■		**2.1**.115
Through-beam														
BOS 5K-PS-IX10-S75	0...10 m		■	■			■	500 Hz	■	■				**2.1**.115
BOS 5K-PO-IX10-S75	0...10 m		■	■		■		500 Hz	■	■				**2.1**.115
BOS 5K-PO-IX10-S75-S	0...10 m		■	■		■		500 Hz	■	■				**2.1**.115
BOS 5K-PS-IX10-02	0...10 m		■	■			■	500 Hz	■		■			**2.1**.115
BOS 5K-PO-IX10-02	0...10 m		■	■		■		500 Hz	■		■			**2.1**.115
BOS 5K-NS-IX10-S75	0...10 m		■		■		■	500 Hz	■	■				**2.1**.115
BOS 5K-NO-IX10-S75	0...10 m		■		■	■		500 Hz	■	■				**2.1**.115
BOS 5K-NO-IX10-S75-S	0...10 m		■		■	■		500 Hz	■	■				**2.1**.115
BOS 5K-NS-IX10-02	0...10 m		■		■		■	500 Hz	■		■			**2.1**.115
BOS 5K-NO-IX10-02	0...10 m		■		■	■		500 Hz	■		■			**2.1**.115

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Photoelectric Sensors Accessories
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Diffuse with background suppression	Sensing distance	**50...200 mm**	**50...200 mm**
Diffuse	Sensing distance		
Diffuse small beam	Sensing distance		

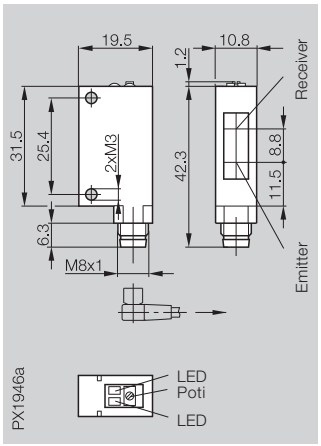
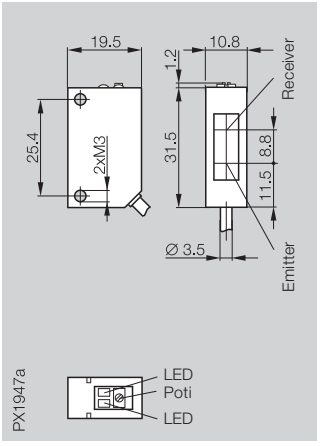
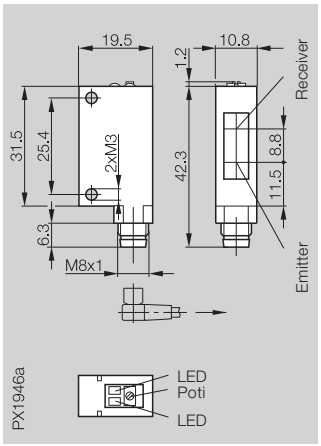
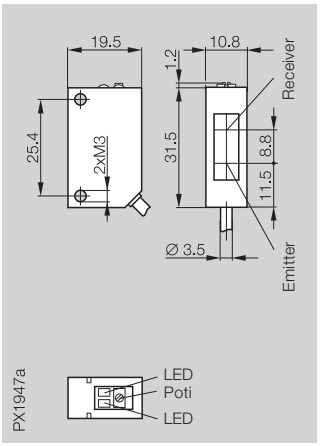




Diffuse with HGA			
PNP, NO	50...200 mm	BOS 5K-PS-RH12-S75	BOS 5K-PS-RH12-02
NPN, NO	50...200 mm	BOS 5K-NS-RH12-S75	BOS 5K-NS-RH12-02
PNP, NC	50...200 mm	BOS 5K-PO-RH12-S75	BOS 5K-PO-RH12-02
NPN, NC	50...200 mm	BOS 5K-NO-RH12-S75	BOS 5K-NO-RH12-02
Diffuse			
PNP, NO	900 mm		
NPN, NO	900 mm		
PNP, NC	900 mm		
NPN, NC	900 mm		
Diffuse small beam			
PNP, NO	50...200 mm		
NPN, NO	50...200 mm		
PNP, NC	50...200 mm		
NPN, NC	50...200 mm		
Electrical data			
Operating voltage U_B		10...30 V DC	10...30 V DC
Ripple		≤ 2 V DC	≤ 2 V DC
No-load supply current I_0 max.		≤ 30 mA	≤ 30 mA
Switching output		PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current		100 mA	100 mA
Switching type		Light- or dark-on	Light- or dark-on
Voltage drop U_d at I_e		≤ 1.2 V DC	≤ 1.2 V DC
Settings		Potentiometer 270°	Potentiometer 270°
Optical data			
Emitter, light type		LED, red light	LED, red light
Wavelength		660 nm	660 nm
Indicators			
Output function indicator		LED yellow	LED yellow
Stability indicator		LED green	LED green
Time data			
Response time		1 ms	1 ms
Switching frequency f		500 Hz	500 Hz
Mechanical data			
Dimensions		19.5×31.5×10.8 mm	19.5×31.5×10.8 mm
Connection		M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section			3×0.2 mm²
Housing material		PC/PBT	PC/PBT
Optical surface		PC	PC
Weight		10 g	50 g
Ambient data			
Degree of protection per IEC 60529		IP 67	IP 67
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–25...+55 °C	–25...+55 °C
Ambient light rejection		5 kLux (artificial light)/10 kLux (sunlight)	5 kLux (artificial light)/10 kLux (sunlight)

Diffuse values referenced to Kodak gray card 90% Reflexion.

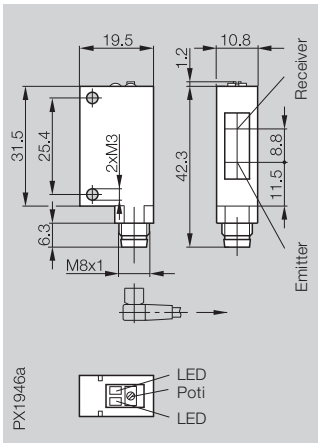
Wiring diagrams, characteristics and accessories see page **2.1.**116 and **2.1.**117.

	0...900 mm	**0...900 mm**	**50...200 mm**	**50...200 mm**
				
	BOS 5K-PS-ID10-S75 BOS 5K-NS-ID10-S75 BOS 5K-PO-ID10-S75 BOS 5K-NO-ID10-S75	BOS 5K-PS-ID10-02 BOS 5K-NS-ID10-02 BOS 5K-PO-ID10-02 BOS 5K-NO-ID10-02		
			BOS 5K-PS-RD11-S75 BOS 5K-NS-RD11-S75 BOS 5K-PO-RD11-S75 BOS 5K-NO-RD11-S75	BOS 5K-PS-RD11-02 BOS 5K-NS-RD11-02 BOS 5K-PO-RD11-02 BOS 5K-NO-RD11-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V DC	≤ 2 V DC	≤ 2 V DC	≤ 2 V DC
	≤ 30 mA	≤ 30 mA	≤ 30 mA	≤ 30 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light- or dark-on	Light- or dark-on	Light- or dark-on	Light- or dark-on
	≤ 1.2 V DC	≤ 1.2 V DC	≤ 1.2 V DC	≤ 1.2 V DC
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	LED, infrared	LED, infrared	LED, red light	LED, red light
	880 nm	880 nm	660 nm	660 nm
	LED yellow	LED yellow	LED yellow	LED yellow
	LED green	LED green	LED green	LED green
	1 ms	1 ms	1 ms	1 ms
	500 Hz	500 Hz	500 Hz	500 Hz
	19.5×31.5×10.8 mm	19.5×31.5×10.8 mm	19.5×31.5×10.8 mm	19.5×31.5×10.8 mm
	M8 connector, 4-pin	2 m cable, PVC	M8 connector, 4-pin	2 m cable, PVC
		3×0.2 mm²		3×0.2 mm²
	PC/PBT	PC/PBT	PC/PBT	PC/PBT
	PC	PC	PC	PC
	10 g	50 g	10 g	50 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–25...+55 °C	–25...+55 °C	–25...+55 °C	–25...+55 °C
	5 kLux (artificial light)/10 kLux (sunlight)	5 kLux (artificial light)/10 kLux (sunlight)	5 kLux (artificial light)/10 kLux (sunlight)	5 kLux (artificial light)/10 kLux (sunlight)

 Connector orientation

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5 Connectors ... Page 5.2 ...

Retroreflective	Range	**0,1...4 m**
Through-beam	Range	

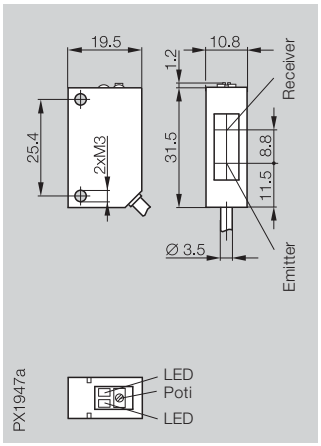
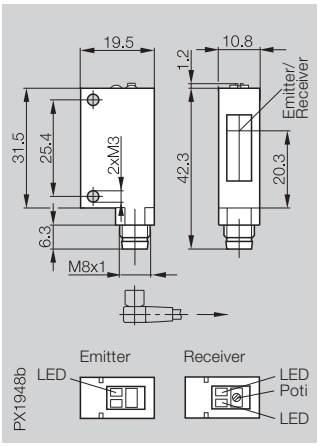
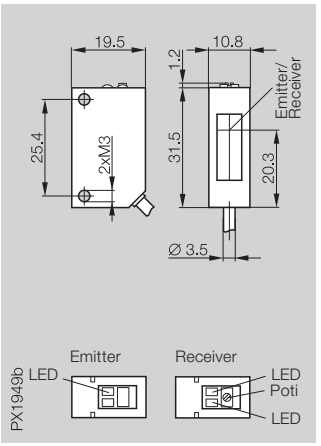


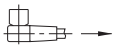
Retroreflective					
PNP, NO	0,1...4 m	Polarizing filter			BOS 5K-PS-RR10-S75
NPN, NO	0,1...4 m	Polarizing filter			BOS 5K-NS-RR10-S75
PNP, NC	0,1...4 m	Polarizing filter			BOS 5K-PO-RR10-S75
NPN, NC	0,1...4 m	Polarizing filter			BOS 5K-NO-RR10-S75
PNP, NC	0,1...4 m	Polarizing filter	Special output configuration		BOS 5K-PO-RR10-S75-S
NPN, NC	0,1...4 m	Polarizing filter	Special output configuration		BOS 5K-NO-RR10-S75-S
Through-beam					
PNP, NO	10 m	Emitter + Receiver			
NPN, NO	10 m	Emitter + Receiver			
PNP, NC	10 m	Emitter + Receiver			
NPN, NC	10 m	Emitter + Receiver			
PNP, NC	10 m	Emitter + Receiver	Special output configuration		
NPN, NC	10 m	Emitter + Receiver	Special output configuration		

Electrical data	
Operating voltage U_B	10...30 V DC
Ripple	≤ 2 V DC
No-load supply current I_0 max.	≤ 30 mA
Switching output	PNP- or NPN-Transistor
Output current	100 mA
Switching type	Light- or dark-on
Voltage drop U_d at I_e	≤ 1.2 V DC
Settings	Potentiometer 270°
Optical data	
Emitter, light type	LED, red light
Wavelength	660 nm
Indicators	
Power-on indicator	
Output function indicator	LED yellow
Stability indicator	LED green
Time data	
Response time	1 ms
Switching frequency f	500 Hz
Mechanical data	
Dimensions	19.5×31.5×10.8 mm
Connection	M8 connector, 4-pin
No. of wires × cross-section	
Housing material	PC/PBT
Optical surface	PMMA
Weight	10 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–25...+55 °C
Ambient light rejection	5 kLux (artificial light)/10 kLux (sunlight)

Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**116 and **2.1.**117.

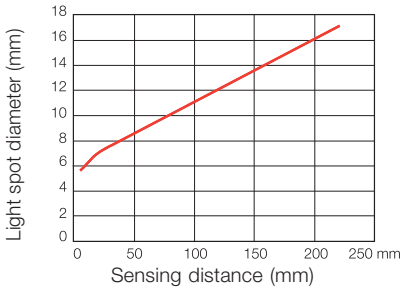
0,1...4 m	**0...10 m**	**0...10 m**
		
BOS 5K-PS-RR10-02 BOS 5K-NS-RR10-02 BOS 5K-PO-RR10-02 BOS 5K-NO-RR10-02		
	BOS 5K-PS-IX10-S75 BOS 5K-NS-IX10-S75 BOS 5K-PO-IX10-S75 BOS 5K-NO-IX10-S75 BOS 5K-PO-IX10-S75-S BOS 5K-NO-IX10-S75-S	BOS 5K-PS-IX10-02 BOS 5K-NS-IX10-02 BOS 5K-PO-IX10-02 BOS 5K-NO-IX10-02
10...30 V DC ≤ 2 V DC ≤ 30 mA PNP- or NPN-Transistor 100 mA Light- or dark-on ≤ 1.2 V DC Potentiometer 270°	10...30 V DC ≤ 2 V DC ≤ 20 mA (Receiver), ≤ 15 mA (Emitter) PNP- or NPN-Transistor 100 mA Light- or dark-on ≤ 1.2 V DC Potentiometer 270°	10...30 V DC ≤ 2 V DC ≤ 20 mA (Receiver), ≤ 15 mA (Emitter) PNP- or NPN-Transistor 100 mA Light- or dark-on ≤ 1.2 V DC Potentiometer 270°
LED, red light 660 nm	LED, infrared 880 nm	LED, infrared 880 nm
LED yellow LED green	LED green (emitter) LED yellow (receiver) LED green (receiver)	LED green (emitter) LED yellow (receiver) LED green (receiver)
1 ms 500 Hz	≤ 1 ms 500 Hz	≤ 1 ms 500 Hz
19.5×31.5×10.8 mm 2 m cable, PVC 3×0.2 mm² PC/PBT PMMA 50 g	19.5×31.5×10.8 mm M8 connector, 4-pin PC/PBT PC 10 g each	19.5×31.5×10.8 mm 2 m cable, PVC 3(2)×0,2 mm² (emitter) PC/PBT PC 50 g each
IP 67 yes yes –25...+55 °C 5 kLux (artificial light)/10 kLux (sunlight)	IP 67 yes yes –25...+55 °C 5 kLux (artificial light)/10 kLux (sunlight)	IP 67 yes yes –25...+55 °C 5 kLux (artificial light)/10 kLux (sunlight)

 Connector orientation

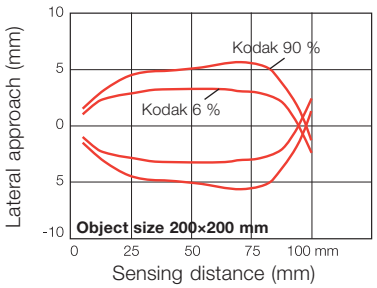
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Diffuse with background suppression BOS 5K-_ _-RH12-_ _

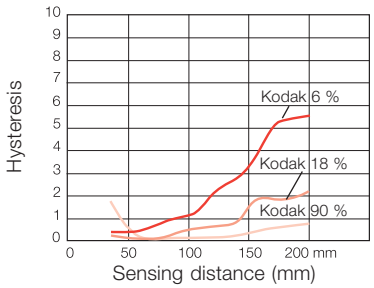
Light spot diameter



Characteristic response curve (HGA 100 mm)

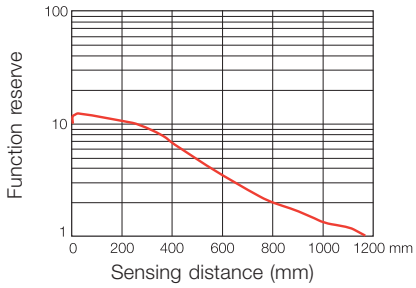


Sensing distance vs. hysteresis

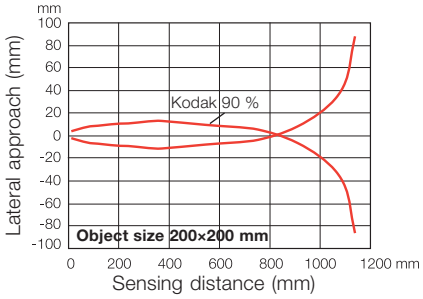


Diffuse BOS 5K-_ _-ID10-_ _

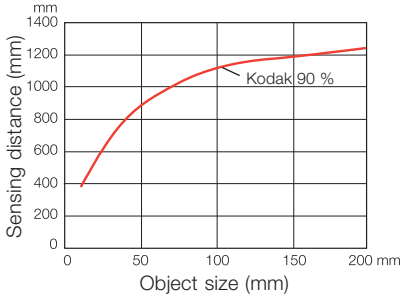
Receiving characteristics



Characteristic response curve

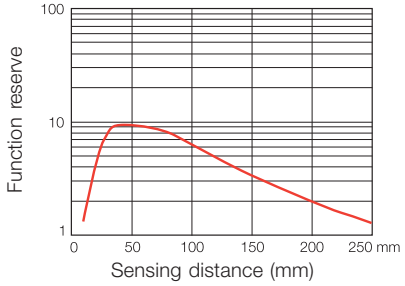


Object size vs. Sensing distance

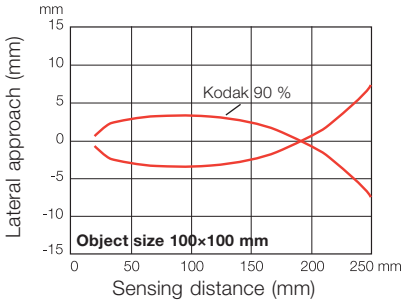


Diffuse small beam BOS 5K-_ _-RD11-_ _

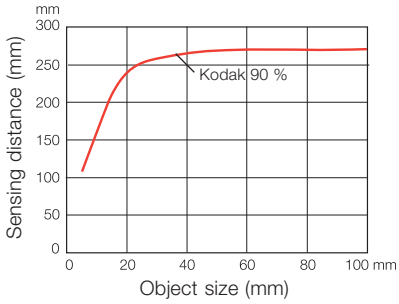
Receiving characteristics



Characteristic response curve

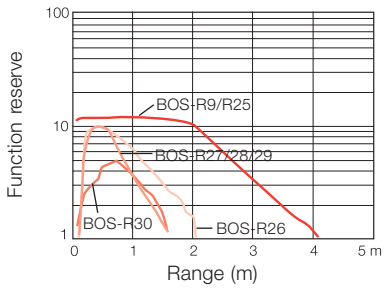


Object size vs. Sensing distance

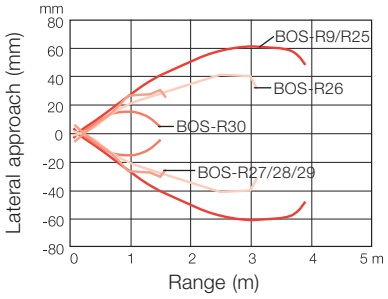


Reflexionslichtschranke BOS 5K-_ _-RR10-_ _

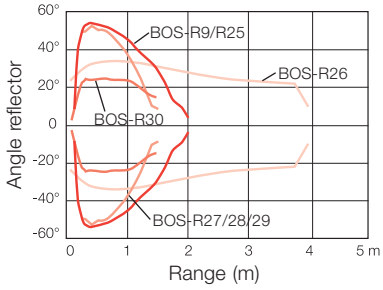
Receiving characteristics



Characteristic response curve

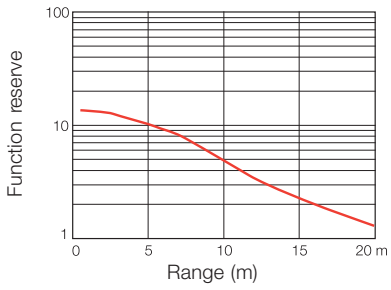


Angle offset

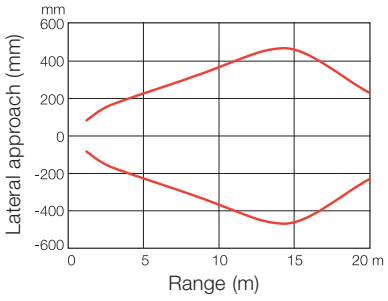


Einweglichtschranke BOS 5K-_ _-IX10-_ _

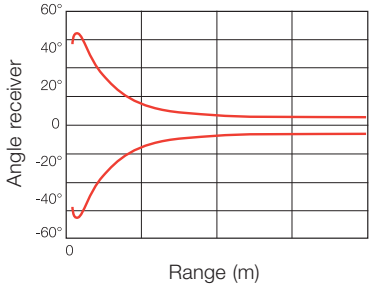
Receiving characteristics



Characteristic response curve

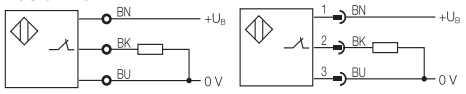


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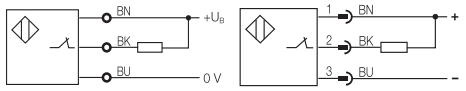


Wiring diagrams

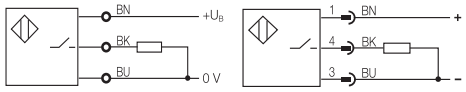
BOS 5K-PO-...



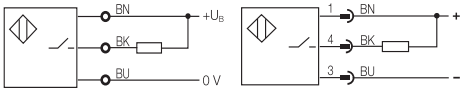
BOS 5K-NO-...



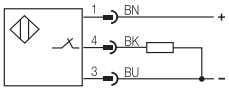
BOS 5K-PS-...



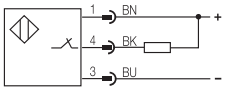
BOS 5K-NS-...



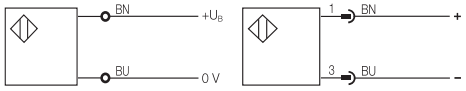
BOS 5K-PO-...S75-S



BOS 5K-NO-...S75-S

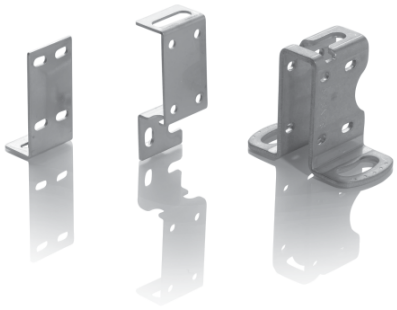


Through-beam emitter

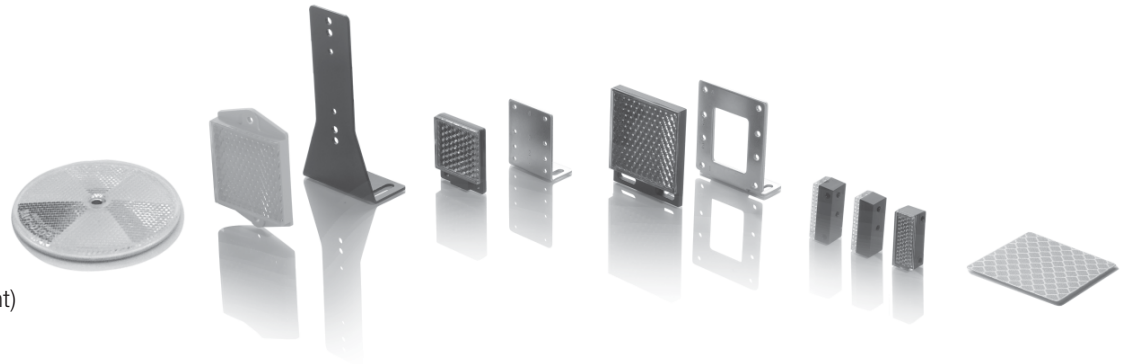


Recommended accessories
please order separately

Mounting brackets
BOS 5-HW-1
BOS 5-HW-2
BOS 5-HW-3
(from left to right)



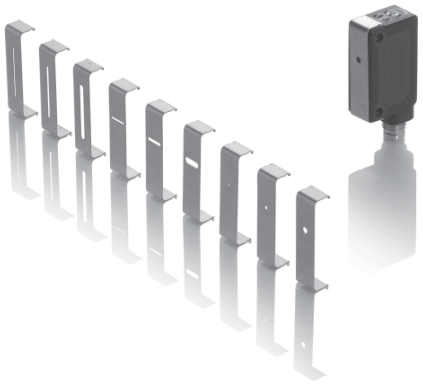
Reflectors,
Reflector mounting bracket
BOS R-1
BOS R-25
BOS 5-HW-4
BOS R-26
BOS 5-HW-5
BOS R-9
BOS 5-HW-6
BOS R-27
BOS R-28
BOS R-29
BOS R-30
(from left to right)



Slit apertures, vertical
BOS 5-BL-1
BOS 5-BL-2
BOS 5-BL-3

Slit apertures, horizontal
BOS 5-BL-4
BOS 5-BL-5
BOS 5-BL-6

Round apertures
BOS 5-BL-7
BOS 5-BL-8
BOS 5-BL-9
(from left to right)



Connector
BKS-S 74/BKS-S 75



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Photoelectric
Sensors
Accessories
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Its high performance specs allow the **BOS 6K** to be used virtually anywhere. These sensors are particularly useful for tight mounting spaces. The small size allows better integration into the machine.
Red light and background suppression make the sensor extremely user-friendly.

In addition, several laser versions are available for absolute small parts detection.
Automatic calibration using the control lines means the sensor can be installed at virtually inaccessible locations. Dynamic teach-in means less and less attention needs to be paid to the sensors.

Features

- Teach-in button plus control line
- Dynamic teach-in possible (i. e., without stopping the machine)
- Multi-function display visible from any direction
- Key disabling
- Versions with 3- or 4-pin M8 connector or with 2 m cable
- Solid construction with IP 67 rating
- Red light and laser versions

Applications

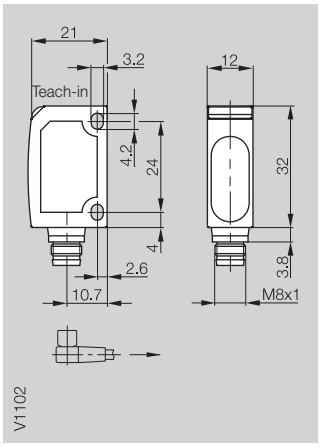
- Packaging machinery
- Handling and assembly
- Specialty machines
- Printing and paper machines

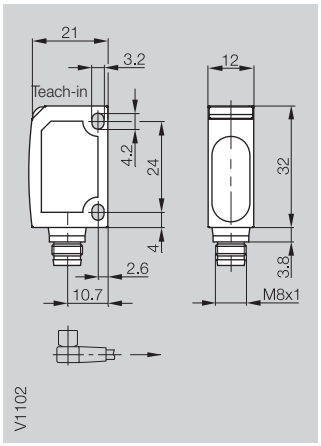
Type	Sensing/ Range	Light type		Output		Output function		Switching frequency	U_B	Connection			Special features		Page
		Red light	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 4-pin	M8 connector, 3-pin	Cable	Polarizing filter		
Diffuse with HGA															
BOS 6K-PU-1HA-S75-C	25...100 mm	■		■		■	■	1 kHz	■	■					**2.1.**120
BOS 6K-NU-1HA-S75-C	25...100 mm	■			■	■	■	1 kHz	■	■					**2.1.**120
BOS 6K-PU-1HA-S49-C	25...100 mm	■		■		■	■	1 kHz	■		■				**2.1.**120
BOS 6K-PU-1HA-C-02	25...100 mm	■		■		■	■	1 kHz	■			■			**2.1.**121
BOS 6K-NU-1HA-C-02	25...100 mm	■			■	■	■	1 kHz	■			■			**2.1.**121
BOS 6K-PU-1LHA-S75-C	20...60 mm		■	■		■	■	1 kHz	■	■					**2.1.**126
BOS 6K-NU-1LHA-S75-C	20...60 mm		■		■	■	■	1 kHz	■	■					**2.1.**126
BOS 6K-PU-1LHA-C-02	20...60 mm		■	■		■	■	1 kHz	■			■			**2.1.**126
BOS 6K-NU-1LHA-C-02	20...60 mm		■		■	■	■	1 kHz	■			■			**2.1.**126
BOS 6K-PU-1LHA-SA1-S75-C	30...110 mm		■	■		■	■	1 kHz	■	■					**2.1.**127
BOS 6K-NU-1LHA-SA1-S75-C	30...110 mm		■		■	■	■	1 kHz	■	■					**2.1.**127
BOS 6K-PU-1LHA-SA1-C-02	30...110 mm		■	■		■	■	1 kHz	■			■			**2.1.**127
BOS 6K-NU-1LHA-SA1-C-02	30...110 mm		■		■	■	■	1 kHz	■			■			**2.1.**127

Type	Sensing/ Range	Light type		Output		Output function		Switching frequency	U_B	Connection			Special features		Page
		Red light	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 4-pin	M8 connector, 3-pin	Cable	Polarizing filter	Glass sensing	
Diffuse															
BOS 6K-PU-1OC-S75-C	20...300 mm	■		■		■	■	1 kHz	■	■					**2.1**.121
BOS 6K-NU-1OC-S75-C	20...300 mm	■			■	■	■	1 kHz	■	■					**2.1**.121
BOS 6K-PU-1OC-S49-C	20...300 mm	■		■		■	■	1 kHz	■		■				**2.1**.121
BOS 6K-PU-1OC-C-02	20...300 mm	■		■		■	■	1 kHz	■			■			**2.1**.121
BOS 6K-NU-1OC-C-02	20...300 mm	■			■	■	■	1 kHz	■			■			**2.1**.121
Retroreflective															
BOS 6K-PU-1TA-S75-C	0...500 mm	■		■		■	■	1 kHz	■	■			■	■	**2.1**.122
BOS 6K-NU-1TA-S75-C	0...500 mm	■			■	■	■	1 kHz	■	■			■	■	**2.1**.122
BOS 6K-PU-1TA-C-02	0...500 mm	■		■		■	■	1 kHz	■			■	■	■	**2.1**.122
BOS 6K-NU-1TA-C-02	0...500 mm	■			■	■	■	1 kHz	■			■	■	■	**2.1**.122
BOS 6K-PU-1QA-S75-C	50...700 mm	■		■		■	■	1 kHz	■	■			■	■	**2.1**.123
BOS 6K-NU-1QA-S75-C	50...700 mm	■			■	■	■	1 kHz	■	■			■	■	**2.1**.123
BOS 6K-PU-1QA-S49-C	50...700 mm	■		■		■	■	1 kHz	■		■		■	■	**2.1**.123
BOS 6K-PU-1QA-C-02	50...700 mm	■		■		■	■	1 kHz	■			■	■	■	**2.1**.123
BOS 6K-NU-1QA-C-02	50...700 mm	■			■	■	■	1 kHz	■			■	■	■	**2.1**.123
BOS 6K-PU-1LQA-S75-C	0,05...1,5 m		■	■		■	■	4 kHz	■	■			■		**2.1**.127
BOS 6K-NU-1LQA-S75-C	0,05...1,5 m		■		■	■	■	4 kHz	■	■			■		**2.1**.127
BOS 6K-PU-1LQA-C-02	0,05...1,5 m		■	■		■	■	4 kHz	■			■	■		**2.1**.127
BOS 6K-NU-1LQA-C-02	0,05...1,5 m		■		■	■	■	4 kHz	■			■	■		**2.1**.127
BOS 6K-PU-1QC-S75-C	0,05...3 m	■		■		■	■	1 kHz	■	■			■		**2.1**.124
BOS 6K-NU-1QC-S75-C	0,05...3 m	■			■	■	■	1 kHz	■	■			■		**2.1**.124
BOS 6K-PU-1QC-S49-C	0,05...3 m	■		■		■	■	1 kHz	■		■		■		**2.1**.124
BOS 6K-PU-1QC-C-02	0,05...3 m	■		■		■	■	1 kHz	■			■	■		**2.1**.125
BOS 6K-NU-1QC-C-02	0,05...3 m	■			■	■	■	1 kHz	■			■	■		**2.1**.125
Through-beam															
BLE 6K-PU-1E-S75-C	0...6,5 m	■		■		■	■	500 Hz	■	■					**2.1**.125
BLE 6K-NU-1E-S75-C	0...6,5 m	■			■	■	■	500 Hz	■	■					**2.1**.125
BLE 6K-PU-1E-S49-C	0...6,5 m	■		■		■	■	500 Hz	■		■				**2.1**.125
BLE 6K-PU-1E-C-02	0...6,5 m	■		■		■	■	500 Hz	■			■			**2.1**.125
BLE 6K-NU-1E-C-02	0...6,5 m	■			■	■	■	500 Hz	■			■			**2.1**.125
BLS 6K-XX-1E-S75-C	0...6,5 m	■							■	■					**2.1**.125
BLS 6K-XX-1E-S49-C	0...6,5 m	■							■		■				**2.1**.125
BLS 6K-XX-1E-C-02	0...6,5 m	■							■			■			**2.1**.125

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2.3
Photoelectric Sensors Accessories
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Diffuse with background suppression	maximum sensing distance	**25...100 mm**	**25...100 mm**	
Diffuse	maximum sensing distance			



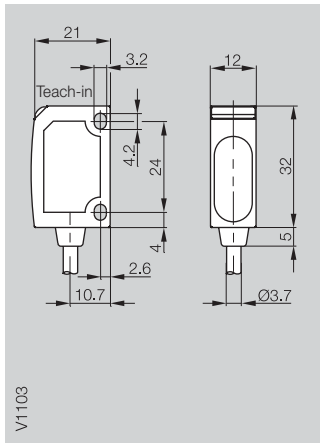
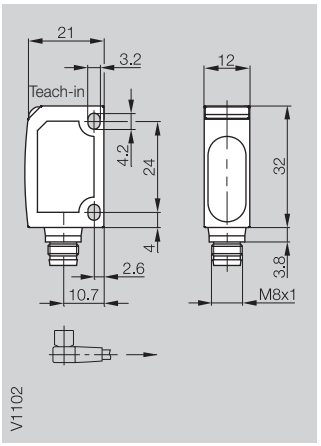
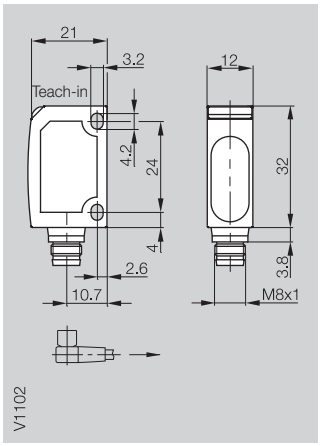
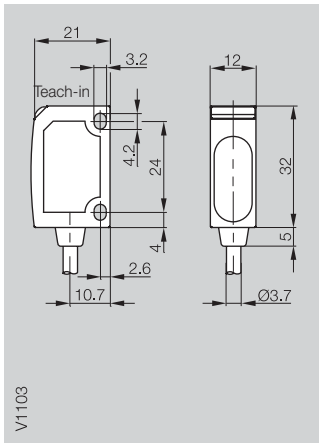


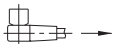
Diffuse				
PNP	25...100 mm	HGA	BOS 6K-PU-1HA-S75-C	BOS 6K-PU-1HA-S49-C
NPN	25...100 mm	HGA	BOS 6K-NU-1HA-S75-C	
PNP	20...300 mm			
NPN	20...300 mm			
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
No-load supply current I_0 max.			≤ 35 mA	≤ 35 mA
Switching output			PNP- or NPN-Transistor	PNP-Transistor
Output current			100 mA	100 mA
Switching type			Light-/dark-on (selectable)	Light-/dark-on (selectable)
Voltage drop U_d at I_e			≤ 2.4 V	≤ 2.4 V
Settings			teach-in	teach-in
Optical data				
Recommended sensing distance			25...100 mm	25...100 mm
Emitter, light type			LED, red light	LED, red light
Wavelength			660 nm	660 nm
Light spot diameter			ca. 5×5 mm at 60 mm	ca. 5×5 mm at 60 mm
Distance hysteresis (18 %/18 %)			≤ 5 %	≤ 5 %
Gray value shift (90 %/18 %)			≤ 10 %	≤ 10 %
Indicators				
Switching state indicator			LED yellow	LED yellow
Stability indicator			LED green	LED green
Time data				
Response time			0.5 ms	0.5 ms
Switching frequency f			1 kHz	1 kHz
Mechanical data				
Dimensions			21×32×12 mm	21×32×12 mm
Connection			M8 connector, 4-pin	M8 connector, 3-pin
No. of wires × cross-section				
Housing material			impact-resistant ABS	impact-resistant ABS
Optical surface			PMMA	PMMA
Weight			40 g	40 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–20...+60 °C	–20...+60 °C
Ambient light rejection			5 kLux	5 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.

Wiring diagrams, characteristics and accessories see page **2.1.**128 and **2.1.**129.

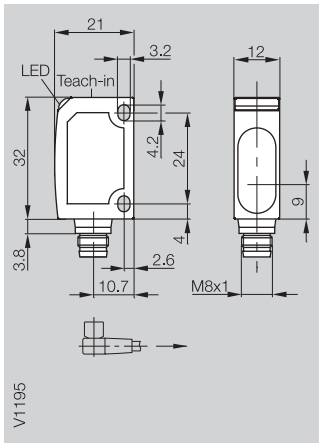
[1] U_{imp} = 500 V

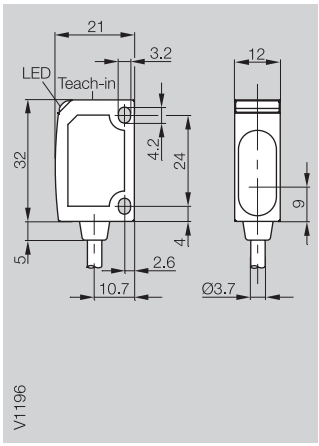
	25...100 mm	**20...300 mm**	**20...300 mm**	**20...300 mm**
				
	BOS 6K-PU-1HA-C-02 BOS 6K-NU-1HA-C-02	BOS 6K-PU-1OC-S75-C BOS 6K-NU-1OC-S75-C	BOS 6K-PU-1OC-S49-C	BOS 6K-PU-1OC-C-02 BOS 6K-NU-1OC-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	≤ 2.4 V	≤ 2.4 V	≤ 2.4 V	≤ 2.4 V
	teach-in	teach-in	teach-in	teach-in
	25...100 mm	20...300 mm	20...300 mm	20...300 mm
	LED, red light	LED, red light	LED, red light	LED, red light
	660 nm	660 nm	660 nm	660 nm
	ca. 5×5 mm at 60 mm	ca. 12×12 mm at 160 mm	ca. 12×12 mm at 160 mm	ca. 12×12 mm at 160 mm
	≤ 5 %	≤ 10 %	≤ 10 %	≤ 10 %
	≤ 10 %			
	LED yellow	LED yellow	LED yellow	LED yellow
	LED green	LED green	LED green	LED green
	0.5 ms	0.5 ms	0.5 ms	0.5 ms
	1 kHz	1 kHz	1 kHz	1 kHz
	21×32×12 mm	21×32×12 mm	21×32×12 mm	21×32×12 mm
	2 m cable, PVC	M8 connector, 4-pin	M8 connector, 3-pin	2 m cable, PVC
	4×0.14 mm²			4×0.14 mm²
	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS
	PMMA	PMMA	PMMA	PMMA
	120 g	40 g	40 g	120 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–20...+60 °C	–20...+60 °C	–20...+60 °C	–20...+60 °C
	5 kLux	5 kLux	5 kLux	5 kLux

 Connector orientation

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Photoelectric Sensors Accessories
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Retroreflective with polarizing filter	maximum range	**0...500 mm**	**0...500 mm**



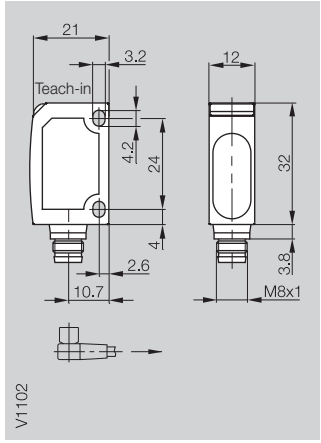
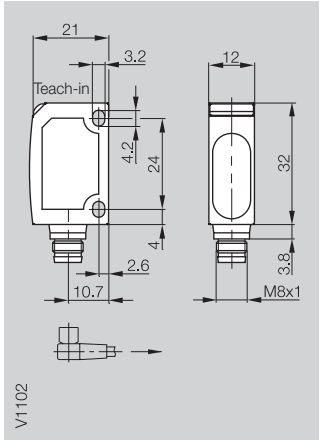
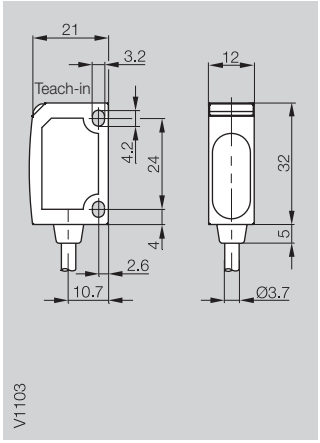


Retroreflective			
PNP	0...500 mm Polarizing filter, glass detection, autocollimation	BOS 6K-PU-1TA-S75-C	BOS 6K-PU-1TA-C-02
NPN	0...500 mm Polarizing filter, glass detection, autocollimation	BOS 6K-NU-1TA-S75-C	BOS 6K-NU-1TA-C-02
PNP	50...700 mm Polarizing filter, glass detection		
NPN	50...700 mm Polarizing filter, glass detection		
Electrical data			
Supply voltage U_B		10...30 V DC	10...30 V DC
No-load supply current I_0 max.		≤ 25 mA	≤ 25 mA
Switching output		PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current		100 mA	100 mA
Switching type		Light-/dark-on (selectable)	Light-/dark-on (selectable)
Voltage drop U_d at I_e		≤ 2.4 V	≤ 2.4 V
Settings		teach-in	teach-in
Optical data			
Recommended range		0...500 mm	0...500 mm
Emitter, light type		LED, red light	LED, red light
Wavelength		660 nm	660 nm
Light spot diameter		20×20 mm up to 500 mm	20×20 mm up to 500 mm
Indicators			
Switching state indicator		LED yellow	LED yellow
Stability indicator		LED green	LED green
Time data			
Response time		0.5 ms	0.5 ms
Switching frequency f		1 kHz	1 kHz
Mechanical data			
Dimensions		21×32×12 mm	21×32×12 mm
Connection		M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section			4×0.14 mm²
Housing material		impact-resistant ABS	impact-resistant ABS
Optical surface		PMMA	PMMA
Weight		40 g	120 g
Ambient data			
Degree of protection per IEC 60529		IP 67	IP 67
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–20...+60 °C	–20...+60 °C
Ambient light rejection		5 kLux	5 kLux
		Only usable with R22 reflector	

Retroreflective values referenced to R9/R22 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**128 and **2.1.**129.

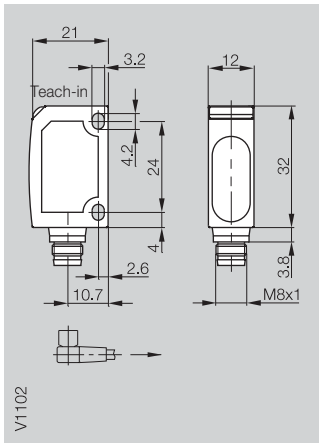
[1] U_{imp} = 500 V

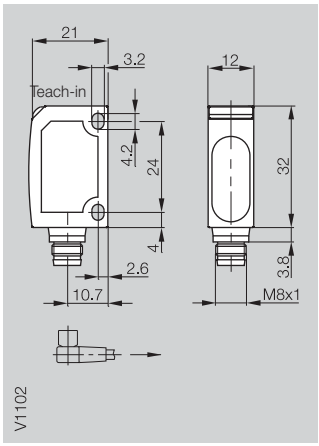
50...700 mm	**50...700 mm**	**50...700 mm**	
			
BOS 6K-PU-1QA-S75-C BOS 6K-NU-1QA-S75-C	BOS 6K-PU-1QA-S49-C	BOS 6K-PU-1QA-C-02 BOS 6K-NU-1QA-C-02	
10...30 V DC	10...30 V DC	10...30 V DC	
≤ 35 mA	≤ 35 mA	≤ 35 mA	
PNP- or NPN-Transistor	PNP-Transistor	PNP- or NPN-Transistor	
100 mA	100 mA	100 mA	
Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)	
≤ 2.4 V	≤ 2.4 V	≤ 2.4 V	
teach-in	teach-in	teach-in	
0...500 mm	0...500 mm	0...500 mm	
LED, red light	LED, red light	LED, red light	
660 nm	660 nm	660 nm	
20×20 mm up to 500 mm	20×20 mm up to 500 mm	20×20 mm up to 500 mm	
LED yellow	LED yellow	LED yellow	
LED green	LED green	LED green	
0.5 ms	0.5 ms	0.5 ms	
1 kHz	1 kHz	1 kHz	
21×32×12 mm	21×32×12 mm	21×32×12 mm	
M8 connector, 4-pin	M8 connector, 3-pin	2 m cable, PVC	
		4×0.14 mm²	
impact-resistant ABS	impact-resistant ABS	impact-resistant ABS	
PMMA	PMMA	PMMA	
40 g	40 g	120 g	
IP 67	IP 67	IP 67	
yes	yes	yes	
yes	yes	yes	
–20...+60 °C	–20...+60 °C	–20...+60 °C	
5 kLux	5 kLux	5 kLux	

 Connector orientation

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Retroreflective with polarizing filter		maximum range	**0,05...3 m**	**0,05...3 m**
Through-beam		maximum range		



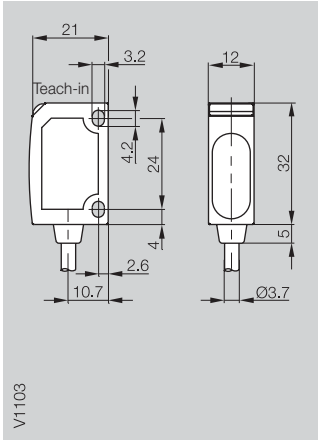
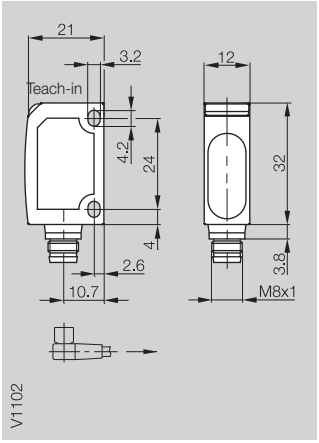
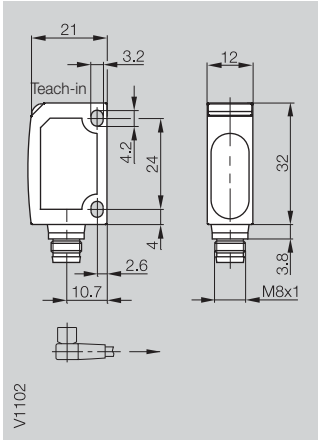
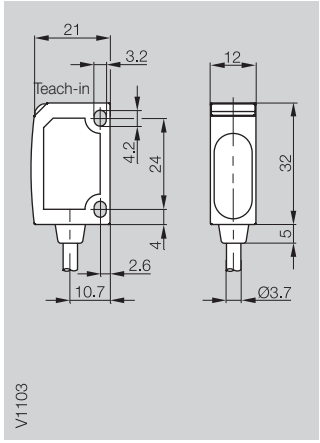


Retroreflective				
PNP	0,05...3 m	Polarizing filter	BOS 6K-PU-1QC-S75-C	BOS 6K-PU-1QC-S49-C
NPN	0,05...3 m	Polarizing filter	BOS 6K-NU-1QC-S75-C	
Through-beam				
PNP	6,5 m	Receiver		
NPN	6,5 m	Receiver		
	6,5 m	Emitter		
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
No-load supply current I_0 max.			≤ 25 mA	≤ 25 mA
Switching output			PNP- or NPN-Transistor	PNP-Transistor
Output current			100 mA	100 mA
Switching type			Light-/dark-on (selectable)	Light-/dark-on (selectable)
Voltage drop U_d at I_e			≤ 2.4 V	≤ 2.4 V
Settings			teach-in	teach-in
Optical data				
Recommended range			0.05...2.5 m	0.05...2.5 m
Emitter, light type			LED, red light	LED, red light
Wavelength			660 nm	660 nm
Light spot diameter			ca. 75×75 mm at 1.5 m	ca. 75×75 mm at 1.5 m
Indicators				
Switching state indicator			LED yellow	LED yellow
Stability indicator			LED green	LED green
Time data				
Response time			0.5 ms	0.5 ms
Switching frequency f			1 kHz	1 kHz
Mechanical data				
Dimensions			21×32×12 mm	21×32×12 mm
Connection			M8 connector, 4-pin	M8 connector, 3-pin
No. of wires × cross-section				
Housing material			impact-resistant ABS	impact-resistant ABS
Optical surface			PMMA	PMMA
Weight			10 g	10 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–20...+60 °C	–20...+60 °C
Ambient light rejection			EN 60947-5-2	EN 60947-5-2

Retroreflective values referenced to R9 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**128 and **2.1.**129.

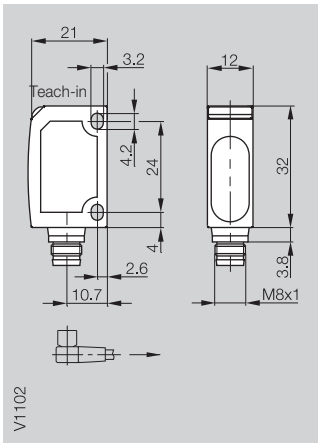
[1] U_{imp} = 500 V

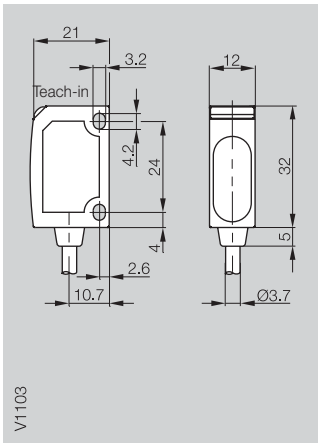
	0,05...3 m	**0...6,5 m**	**0...6,5 m**	**0...6,5 m**
				
	BOS 6K-PU-1QC-C-02 BOS 6K-NU-1QC-C-02			
		BLE 6K-PU-1E-S75-C BLE 6K-NU-1E-S75-C BLS 6K-XX-1E-S75-C	BLE 6K-PU-1E-S49-C BLS 6K-XX-1E-S49-C	BLE 6K-PU-1E-C-02 BLE 6K-NU-1E-C-02 BLS 6K-XX-1E-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 25 mA	≤ 25 mA	≤ 25 mA	≤ 25 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	≤ 2.4 V	≤ 2.4 V	≤ 2.4 V	≤ 2.4 V
	teach-in	teach-in	teach-in	teach-in
	0.05...2.5 m	0...6 m	0...6 m	0...6 m
	LED, red light	LED, red light	LED, red light	LED, red light
	660 nm	660 nm	660 nm	660 nm
	ca. 75×75 mm at 1.5 m			
	LED yellow	LED yellow	LED yellow	LED yellow
	LED green	LED green	LED green	LED green
	0.5 ms	1 ms	1 ms	1 ms
	1 kHz	500 Hz	500 Hz	500 Hz
	21×32×12 mm	21×32×12 mm	21×32×12 mm	21×32×12 mm
	2 m cable, PVC	M8 connector, 4-pin	M8 connector, 3-pin	2 m cable, PVC
	4×0.14 mm²			4×0.14 mm²
	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS
	PMMA	PMMA	PMMA	PMMA
	40 g	10 g	10 g	40 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–20...+60 °C	–20...+60 °C	–20...+60 °C	–20...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

Connector orientation

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Diffuse with background suppression	maximum sensing distance	**20...60 mm**	**20...60 mm**
Retroreflective with polarizing filter	maximum range		



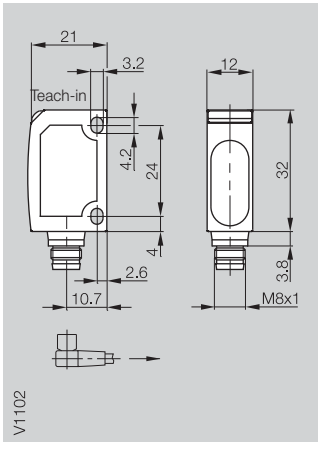
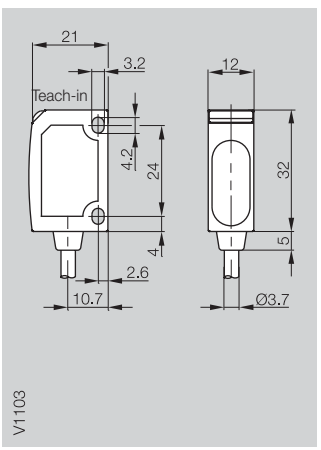
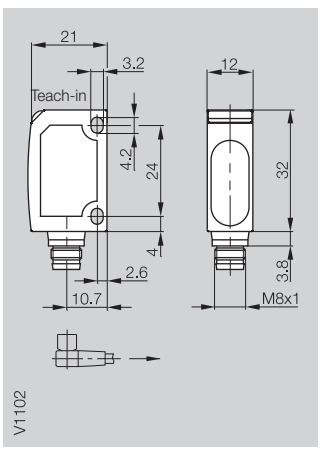
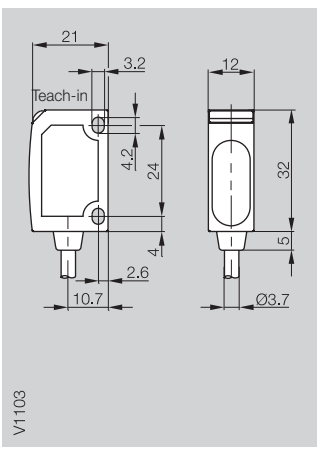


Diffuse				
PNP	20...60 mm	HGA	BOS 6K-PU-1LHA-S75-C	BOS 6K-PU-1LHA-C-02
NPN	20...60 mm	HGA	BOS 6K-NU-1LHA-S75-C	BOS 6K-NU-1LHA-C-02
PNP	30...110 mm	HGA		
NPN	30...110 mm	HGA		
Reflexionslichtschranke				
PNP	0.05...1.5 m	Polarizing filter		
NPN	0.05...1.5 m	Polarizing filter		
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
No-load supply current I_0 max.			≤ 25 mA	≤ 25 mA
Switching output			PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output current			100 mA	100 mA
Switching type			Light-/dark-on (selectable)	Light-/dark-on (selectable)
Voltage drop U_d at I_e			≤ 2.4 V	≤ 2.4 V
Settings			teach-in	teach-in
Optical data				
Recommended sensing distance/range			20...60 mm	20...60 mm
Emitter, light type			Laser, red light	Laser, red light
Wavelength			650 nm	650 nm
Laser class			1	1
Light spot diameter			0.5 mm at focus (35 mm)	0.5 mm at focus (35 mm)
Distance hysteresis (18 %/18 %)			≤ 2 % up to focal point, ≤ 6 % up to end	≤ 2 % up to focal point, ≤ 6 % up to end
Gray value shift (90 %/18 %)			≤ 7 %	≤ 7 %
Indicators				
Switching state indicator			LED yellow	LED yellow
Stability indicator			LED green	LED green
Time data				
Response time			0.5 ms	0.5 ms
Switching frequency f			1 kHz	1 kHz
Mechanical data				
Dimensions			21×32×12 mm	21×32×12 mm
Connection			M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section				4×0.14 mm²
Housing material			impact-resistant ABS	impact-resistant ABS
Optical surface			PMMA	PMMA
Weight			10 g	40 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient temperature range T_a			–20...+60 °C	–20...+60 °C
Ambient light limit			EN 60947-5-2	EN 60947-5-2

Diffuse values referenced to Kodak gray card 18% Reflexion.
Retroreflective values referenced to R22 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**128 and **2.1.**129.

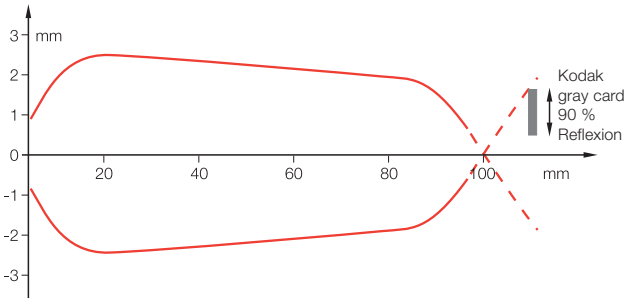
[1] U_{imp} = 500 V

	30...110 mm	**30...110 mm**		
			0,05...1,5 m	**0,05...1,5 m**
				
	BOS 6K-PU-1LHA-SA1-S75-C BOS 6K-NU-1LHA-SA1-S75-C	BOS 6K-PU-1LHA-SA1-C-02 BOS 6K-NU-1LHA-SA1-C-02		
			BOS 6K-PU-1LQA-S75-C BOS 6K-NU-1LQA-S75-C	BOS 6K-PU-1LQA-C-02 BOS 6K-NU-1LQA-C-02
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 25 mA	≤ 25 mA	≤ 25 mA	≤ 25 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA	100 mA
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	≤ 2.4 V	≤ 2.4 V	≤ 2.4 V	≤ 2.4 V
	teach-in	teach-in	teach-in	teach-in
	30...110 mm	30...110 mm	0.05...1 m	0.05...1 m
	Laser, red light	Laser, red light	Laser, red light	Laser, red light
	650 nm	650 nm	650 nm	650 nm
	2	2	1	1
	0,7 mm at focus (85 mm ± 15 mm)	0,7 mm at focus (85 mm ± 15 mm)	1 mm in 300 mm	1 mm in 300 mm
	≤ 5 % up to focal point, ≤ 7 % up to end	≤ 5 % up to focal point, ≤ 7 % up to end		
	≤ 7 %	≤ 7 %		
	LED yellow	LED yellow	LED yellow	LED yellow
	LED green	LED green	LED green	LED green
	0.5 ms	0.5 ms	0.5 ms	0.5 ms
	1 kHz	1 kHz	4 kHz	4 kHz
	21×32×12 mm	21×32×12 mm	21×32×12 mm	21×32×12 mm
	M8 connector, 4-pin	2 m cable, PVC	M8 connector, 4-pin	2 m cable, PVC
		4×0.14 mm²		4×0.14 mm²
	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS
	PMMA	PMMA	PMMA	PMMA
	10 g	40 g	10 g	40 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–20...+60 °C	–20...+60 °C	–20...+60 °C	–20...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

Connector orientation

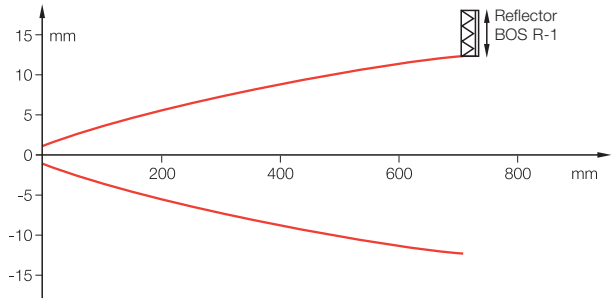
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Diffuse BOS 6K-..-1HA-...



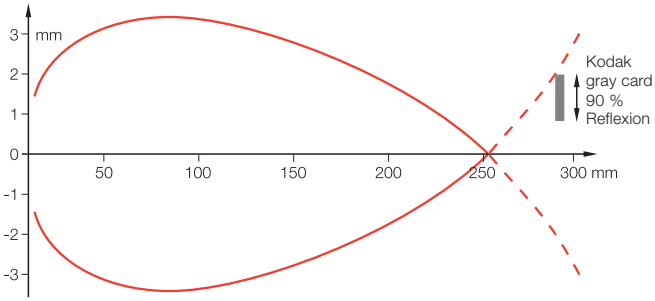
Range measured with side approach of Kodak gray card.

Retroreflective BOS 6K-..-1QA-...



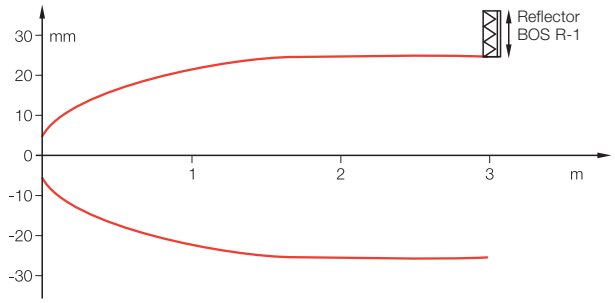
Range measured with side approach of reflector.

Diffuse BOS 6K-..-1OC-...



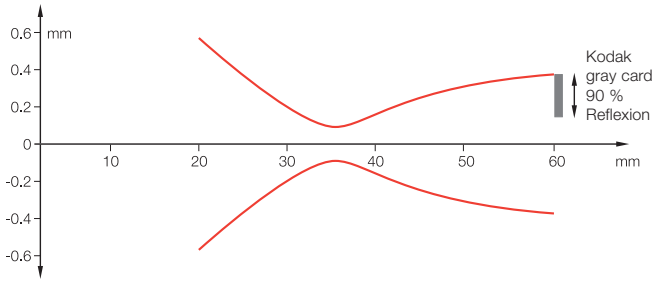
Range measured with side approach of Kodak gray card.

Retroreflective BOS 6K-..-1QC-...



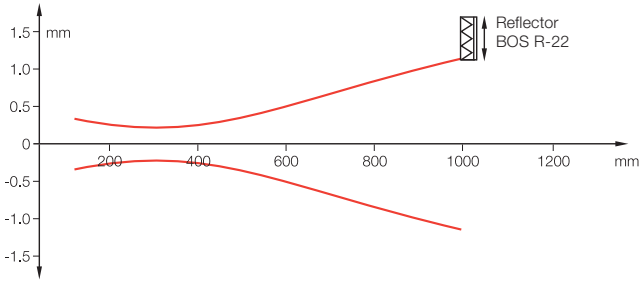
Range measured with side approach of reflector.

Diffuse BOS 6K-...-1LHA-...



Range measured with side approach of Kodak gray card.

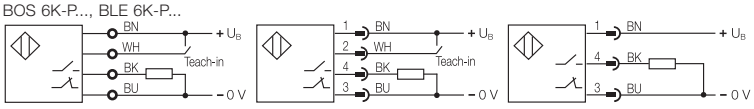
Retroreflective BOS 6K-...-1LQA-...



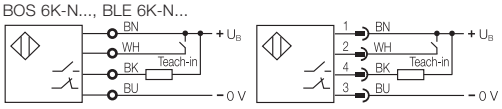
Range measured with side approach of reflector.

Wiring diagrams

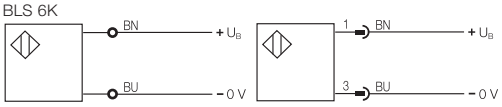
BOS 6K-P..., BLE 6K-P...



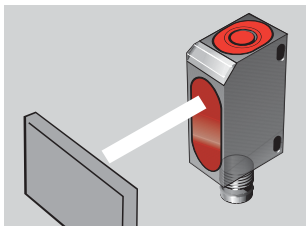
BOS 6K-N..., BLE 6K-N...



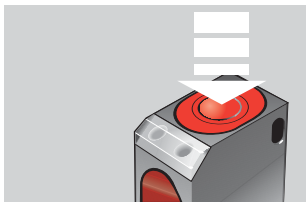
BLS 6K



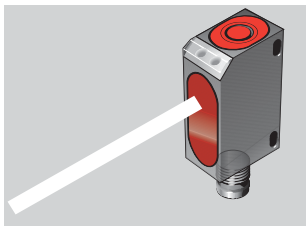
Diffuse



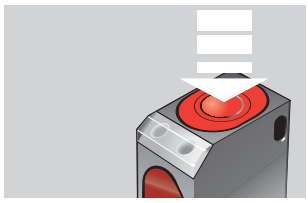
Align sensor with the object.



Press button for approx. 3 sec. until both LED's blink together.

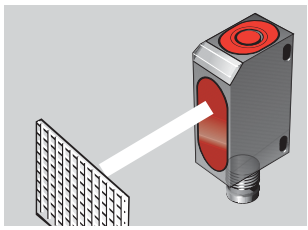


Remove object from beam path.

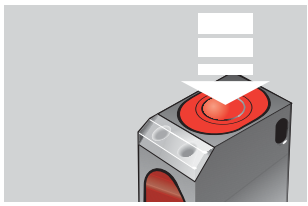


Hold down button for 1 sec. Green LED blinks briefly and then comes full on. The sensor is ready.
If both LEDs blink together, repeat your settings.

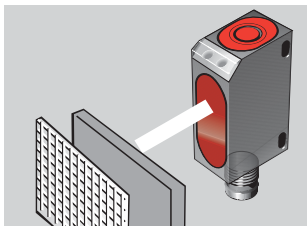
Retroreflective/through-beam



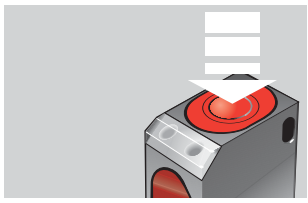
Direct sensor at reflector/ receiver.



Press button for approx. 3 sec. until both LED's blink together.



Bring objects into detection range.



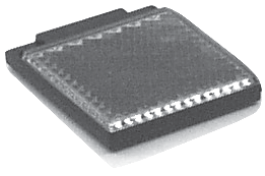
Hold down button for 1 sec. Green LED blinks briefly and then comes full on. The sensor is ready.
If both LEDs blink together, repeat your settings.

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Photoelectric Sensors Accessories
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Recommended accessories
please order separately



Reflector
BOS R-1



Reflector
BOS R-9



Reflector
BOS R-22



Mounting bracket
BOS 6-HW-1



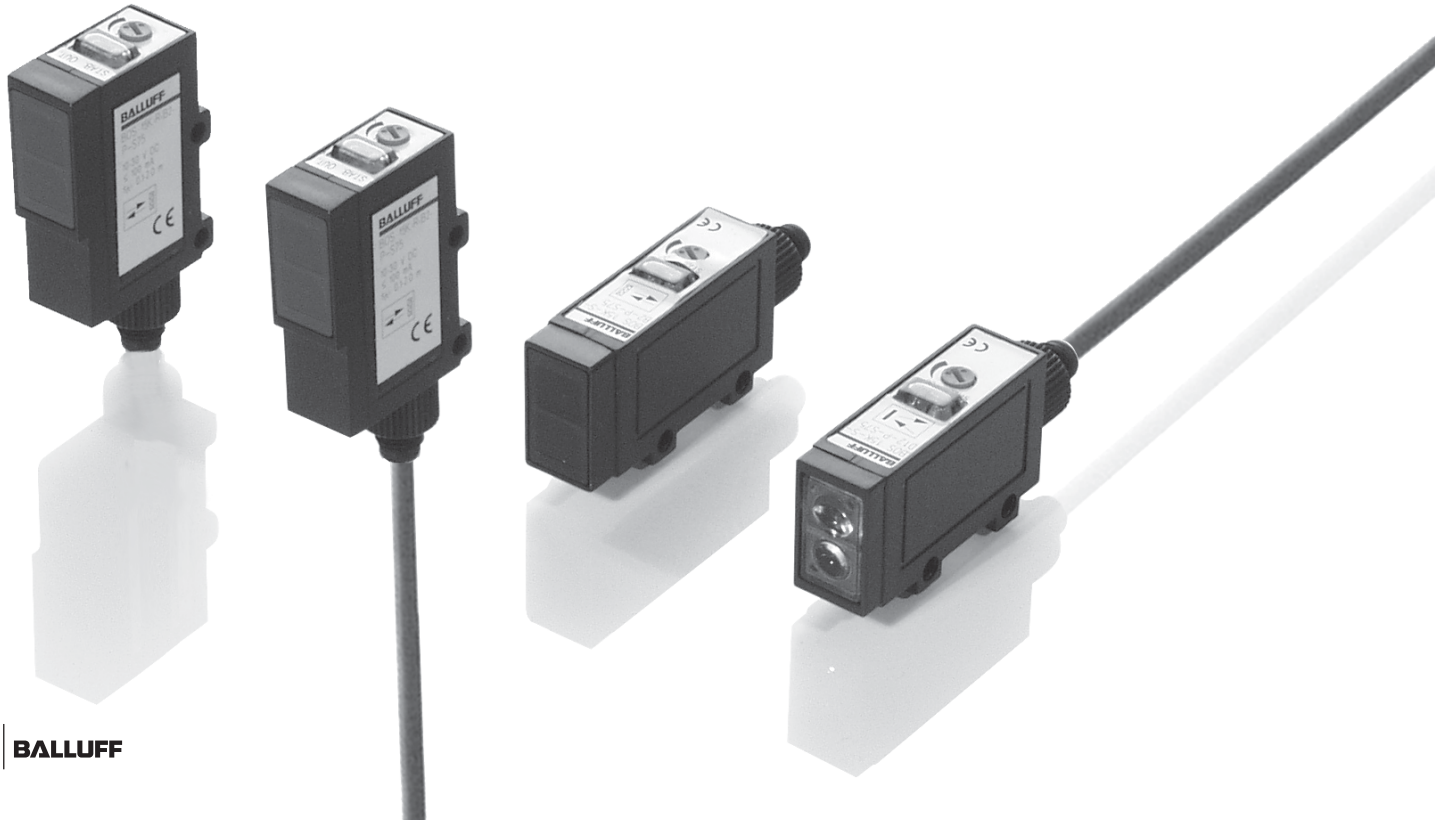
Connector
BKS-S 74/BKS-S 75

BOS 15K

Somewhat larger and available in two mechanical versions (straight and right-angle), the BOS 15K is the ideal size for the most common applications in packaging machines and handling and assembly systems.
The familiar sensitivity setting using an easily accessible potentiometer, along with the number of versions, make this sensor ideal for installation in machines and systems of small and medium size.

Features

- Two housing versions (straight and angled)
- Potentiometer for sensitivity setting
- Cross-talk protection
- NO/NC switching using an input line
- Through-beam with test input and alarm output

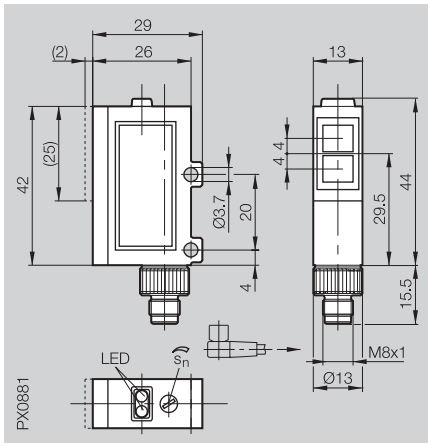


Type	Sensing/ Range	Light exit		Light type		Output			Output function		Switching frequency	U_B	Connec-tion		Special features		Page
		Straight	Right-angle	Red light	Infrared	PNP-Transistor	NPN-Transistor	Alarm output	Light-on	Dark-on		10...30 V DC	M8 connector, 4-pin	Cable , 2 m	Polarizing filter	Test input	
Diffuse																	
BOS 15K-R-C10-P-S75	0...100 mm		■		■	■			■	■	500 Hz	■	■				**2.1**.132
BOS 15K-S-C10-P-S75	0...100 mm	■			■	■			■	■	500 Hz	■	■				**2.1**.133
BOS 15K-R-C10-02	0...100 mm		■		■	■	■		■	■	500 Hz	■		■			**2.1**.133
BOS 15K-S-C10-02	0...100 mm	■			■	■	■		■	■	500 Hz	■		■			**2.1**.133
BOS 15K-R-C50-P-S75	0...500 mm		■			■			■	■	500 Hz	■	■				**2.1**.132
BOS 15K-S-C50-P-S75	0...500 mm	■				■			■	■	500 Hz	■	■				**2.1**.133
BOS 15K-R-C50-02	0...500 mm		■			■	■		■	■	500 Hz	■		■			**2.1**.133
BOS 15K-S-C50-02	0...500 mm	■				■	■		■	■	500 Hz	■		■			**2.1**.133
BOS 15K-R-D12-P-S75	12 mm		■	■		■			■	■	800 Hz	■	■				**2.1**.132
BOS 15K-S-D12-P-S75	12 mm	■		■		■			■	■	800 Hz	■	■				**2.1**.133
BOS 15K-R-D12-02	12 mm		■	■		■	■		■	■	800 Hz	■		■			**2.1**.133
BOS 15K-S-D12-02	12 mm	■		■		■	■		■	■	800 Hz	■		■			**2.1**.133
Retroreflective																	
BOS 15K-R-B2-P-S75	0,1...2 m		■	■		■			■	■	500 Hz	■	■		■		**2.1**.132
BOS 15K-S-B2-P-S75	0,1...2 m	■		■		■			■	■	500 Hz	■	■		■		**2.1**.133
BOS 15K-R-B2-02	0,1...2 m		■	■		■	■		■	■	500 Hz	■		■	■		**2.1**.133
BOS 15K-S-B2-02	0,1...2 m	■		■		■	■		■	■	500 Hz	■		■	■		**2.1**.133
Through-beam																	
BLE 15K-R-F5-P-S75	0...5 m		■		■	■			■	■	250 Hz	■	■				**2.1**.132
BLE 15K-S-F5-P-S75	0...5 m	■			■	■			■	■	250 Hz	■	■				**2.1**.133
BLE 15K-R-F5-02	0...5 m		■		■	■	■	■	■	■	250 Hz	■		■			**2.1**.133
BLE 15K-S-F5-02	0...5 m	■			■	■	■	■	■	■	250 Hz	■		■			**2.1**.133
BLS 15K-R-G5-S75	0...5 m		■		■							■	■			■	**2.1**.132
BLS 15K-S-G5-S75	0...5 m	■			■							■	■			■	**2.1**.133
BLS 15K-R-G5-02	0...5 m		■		■							■		■		■	**2.1**.133
BLS 15K-S-G5-02	0...5 m	■			■							■		■		■	**2.1**.133

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BOS 15K
Sensing distance 12 mm, 100 mm, 500 mm
Range 2 m, 5 m

Diffuse	Sensing distance	**12 mm/0...100 mm/0...500 mm**
Retroreflective	Range	**0,1...2 m**
Through-beam	Range	**0...5 m**



Diffuse					
PNP/NPN, PNP	100 mm			Infrared light	BOS 15K-R-C10-P-S75
PNP/NPN, PNP	500 mm			Infrared light	BOS 15K-R-C50-P-S75
PNP/NPN, PNP	12 mm			Red light, focused	BOS 15K-R-D12-P-S75
Retroreflective					
PNP/NPN, PNP	0,1...2 m			Red light, polarizing filter	BOS 15K-R-B2-P-S75
Through-beam					
PNP/NPN, PNP	5 m		Receiver	Infrared light	BLE 15K-R-F5-P-S75
	5 m		Emitter	Infrared light	BLS 15K-R-G5-S75

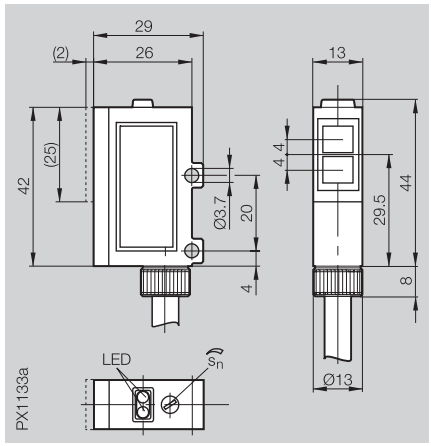
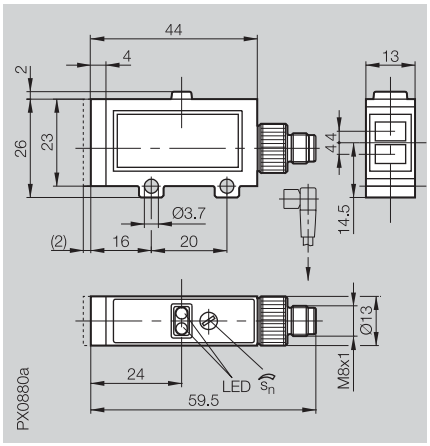
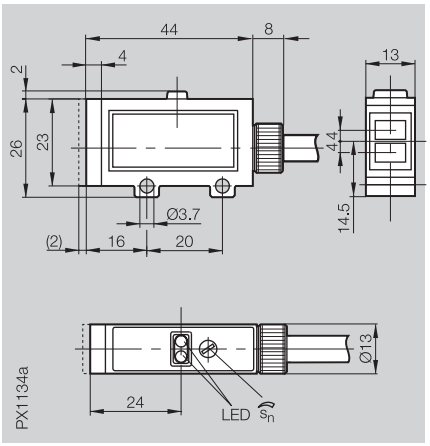
Electrical	
Supply voltage U_B	10...30 V DC
Ripple	2 V DC
No-load current I_0 max.	≤ 30 mA
Switching output	PNP-Transistor
Output current	≤ 100 mA
Switching type	Light-/dark-on (selectable)
Voltage drop U_d at I_e	≤ 1.5 V
Settings	Potentiometer 270°
Help function	Test input for BLS
Indicators	
Power-on indicator	LED red (BLS)
Output function indicator	LED red
Stability indicator	LED green
Time data	
Response time	≤ 1 ms (BLE ≤ 2ms)
Switching frequency f	500 Hz (BLE 250 Hz)
Mechanical data	
Dimensions	29×42×13 mm
Connection	M8 connector, 4-pin
No. of wires × cross-section	
Housing material	ABS
Optical surface	PMMA
Weight	20 g
Ambient data	
Degree of protection per IEC 60529	IP 66
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–15...+55 °C
Ambient light rejection	3 kLux/10 kLux sunlight

For through-beam types the emitter and receiver are located in the lower optics.

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**134 und **2.1.**135.

Connector orientation

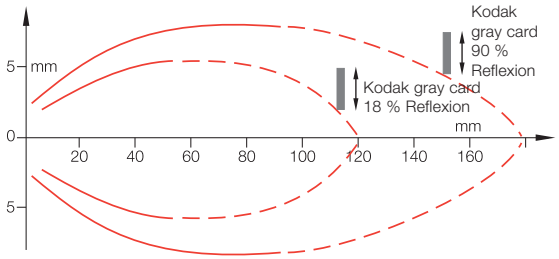
	12 mm/0...100 mm/0...500 mm **0,1...2 m** **0...5 m**	**12 mm/0...100 mm/0...500 mm** **0,1...2 m** **0...5 m**	**12 mm/0...100 mm/0...500 mm** **0,1...2 m** **0...5 m**
			
	BOS 15K-R-C10-02 BOS 15K-R-C50-02 BOS 15K-R-D12-02	BOS 15K-S-C10-P-S75 BOS 15K-S-C50-P-S75 BOS 15K-S-D12-P-S75	BOS 15K-S-C10-02 BOS 15K-S-C50-02 BOS 15K-S-D12-02
	BOS 15K-R-B2-02	BOS 15K-S-B2-P-S75	BOS 15K-S-B2-02
	BLE 15K-R-F5-02 BLS 15K-R-G5-02	BLE 15K-S-F5-P-S75 BLS 15K-S-G5-S75	BLE 15K-S-F5-02 BLS 15K-S-G5-02
	10...30 V DC 2 V DC ≤ 30 mA PNP- and NPN-Transistor selectable ≤ 100 mA Light-/dark-on (selectable) ≤ 1.5 V Potentiometer 270° Test input for BLS	10...30 V DC 2 V DC ≤ 30 mA PNP-Transistor ≤ 100 mA Light-/dark-on (selectable) ≤ 1.5 V Potentiometer 270° Test input for BLS	10...30 V DC 2 V DC ≤ 30 mA PNP- and NPN-Transistor selectable ≤ 100 mA Light-/dark-on (selectable) ≤ 1.5 V Potentiometer 270° Test input for BLS
	LED red (BLS) LED red LED green	LED red (BLS) LED red LED green	LED red (BLS) LED red LED green
	≤ 1 ms (BLE ≤ 2ms) 500 Hz (BLE 250 Hz)	≤ 1 ms (BLE ≤ 2ms) 500 Hz (BLE 250 Hz)	≤ 1 ms (BLE ≤ 2ms) 500 Hz (BLE 250 Hz)
	29×42×13 mm 2 m cable, PVC 4/5/6×0.34 mm² ABS PMMA 90 g	44×26×13 mm M8 connector, 4-pin ABS PMMA 20 g	44×26×13 mm 2 m cable, PVC 4/5/6×0.34 mm² ABS PMMA 90 g
	IP 66 yes yes –15...+55 °C 3 kLux/10 kLux sunlight	IP 66 yes yes –15...+55 °C 3 kLux/10 kLux sunlight	IP 66 yes yes –15...+55 °C 3 kLux/10 kLux sunlight

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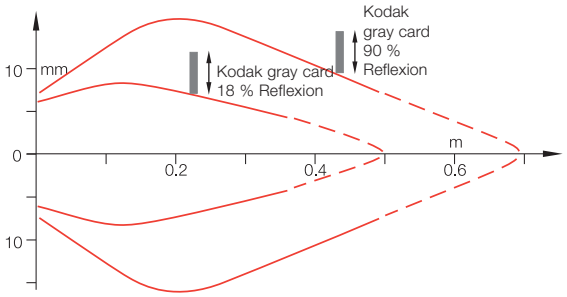
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Diffuse BOS 15K-..-C10-...



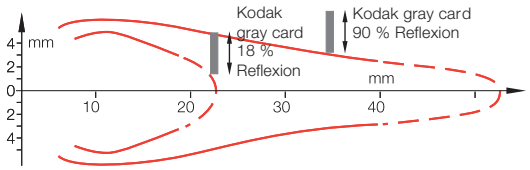
Range measured with side approach of Kodak gray card.

Diffuse BOS 15K-..-C50-...



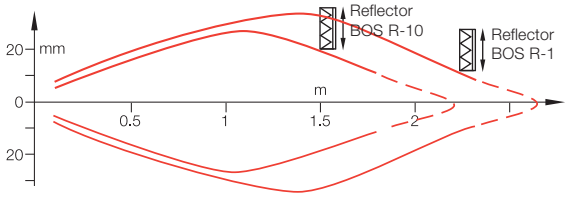
Range measured with side approach of Kodak gray card.

Diffuse with focused beam BOS 15K-..-D12-...



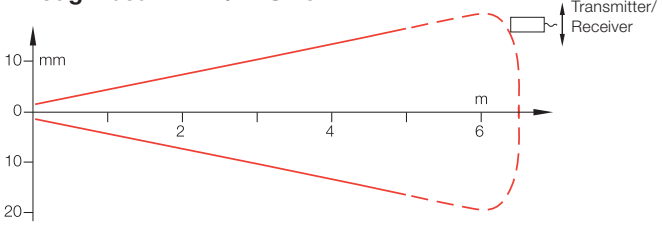
Range measured with side approach of Kodak gray card.

Retroreflective BOS 15K-..-B2-...



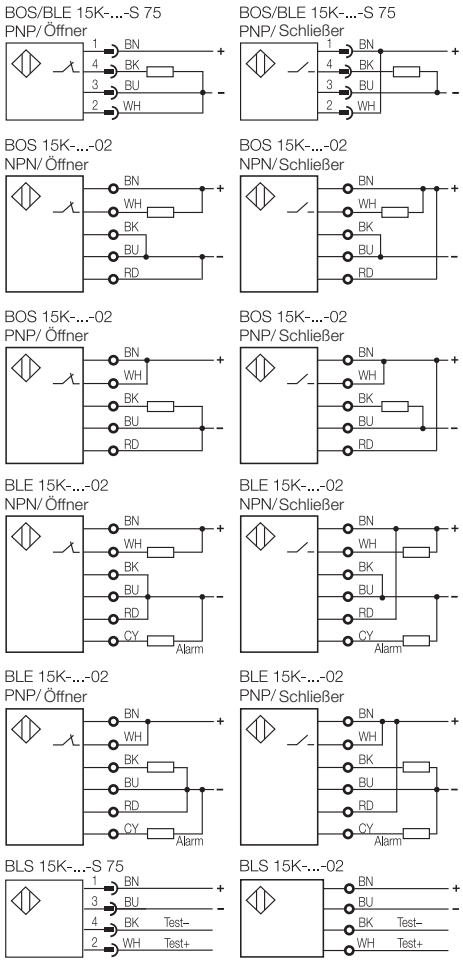
Range measured with side approach of reflector.

Through-beam BLE/BLS 15K-...



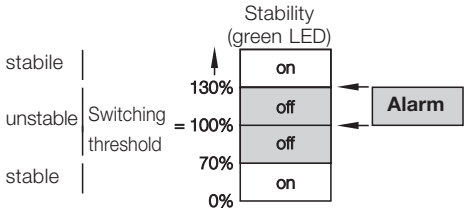
For the through-beam sensor the maximum possible offset between emitter and receiver is measured.

Wiring diagrams



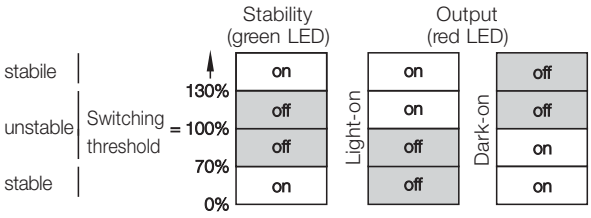
Alarm output for receiver (cable version only)

The receiver is equipped with an alarm output.
This signal output (PNP open collector 30 mA) is used to trigger a warning signal when there are function disturbances which can be caused by contamination or mechanical maladjustment.
The alarm output is activated if the receive signal remains in the alarm range for at least 3 sec.



Green Stability indicator

The "threshold energy" at which a signal change on the output is effected is defined as 100 %.
The switching state is considered stable when the input energy exceeds or falls below the "threshold energy" by 30 %. The green LED then comes on.
This results in the "safe" range,
– when the input signal exceeds a minimum of 130 % of the threshold energy
– when the input signal falls below a minimum of 70 % of the threshold energy.



Test input for emitter

The test input interrupts the light pulses from the emitter and thereby enables a function check of the sensor.
The receiver output must switch each time when the test input shows a voltage of 10...30 V DC (Test+) or 0 V DC (Test–) .
Contamination or maladjustment on the optical axis causes the emitter signal to reach the receiver only weakly, if at all.
Therefore the output will not switch, even though the test input is activated.
The test function is a kind of remote monitoring of the sensor, thereby providing preventive system checking.

Recommended accessories
please order separately



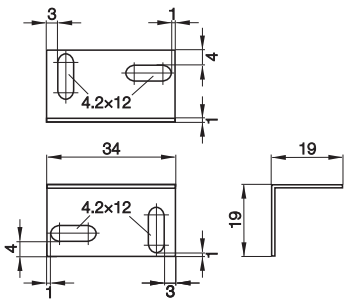
Connector
BKS-S 74/BKS-S 75

Slit apertures
(supplied with through-beam sensors)

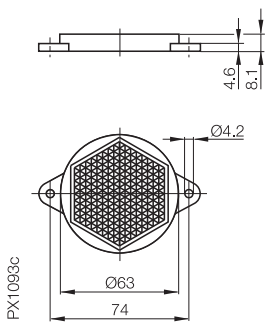


Slit width	0.5 mm	1 mm	2 mm
Range	0.5 m	1 m	2 m
Object size	> 0.5 mm	> 1 mm	> 2 mm

Mounting bracket
(supplied)



Reflector BOS R-10
(supplied with retroreflective sensors)



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BOS 21M – a complete family in a compact, tough metal housing. Comprehensive functionality, use of the most modern sensor technologies and innovative manufacturing technology leave nothing to be desired for versatile application in robotics and automation, packaging, assembly and handling.

Teach-in switches and potentiometers assure fast startup as well as simple and economical operation of the sensor.

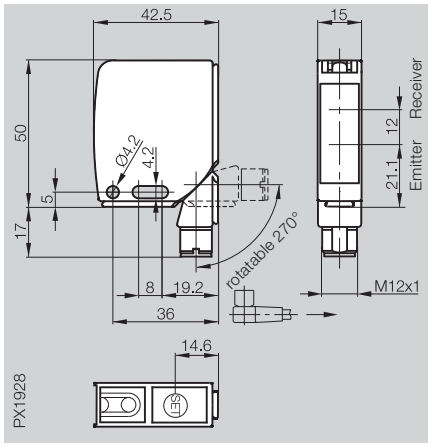
A wide range of accessories such as mounting brackets, stands, dovetail clamps etc. enable variable attachment of the products in any position.



Type	Sensing distance/ range	Light type			Output		Output function		Switching frequency	U_B	Connec-tion	Special features				Page
		Red light	Infrared	Laser light	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Teach-in	Polarizing filter	Autocollimation	Glass sensing	
Diffuse with HGA																
BOS 21M-PUS-LH12-S4	50...100 mm			■	■		■	■	1 kHz	■	■	■				**2.1**.142
BOS 21M-NUS-LH12-S4	50...100 mm			■		■	■	■	1 kHz	■	■	■				**2.1**.142
BOS 21M-PUS-RH12-S4	70...200 mm	■			■		■	■	1 kHz	■	■	■				**2.1**.138
BOS 21M-NUS-RH12-S4	70...200 mm	■				■	■	■	1 kHz	■	■	■				**2.1**.138
BOS 21M-PUS-RV13-S4	70...200 mm	■			■		■	■	1 kHz	■	■	■				**2.1**.139
BOS 21M-NUS-RV13-S4	70...200 mm	■				■	■	■	1 kHz	■	■	■				**2.1**.139
Diffuse																
BOS 21M-PA-RD10-S4	0.01...1 m	■			■		■	■	500 Hz	■	■					**2.1**.139
BOS 21M-NA-RD10-S4	0.01...1 m	■				■	■	■	500 Hz	■	■					**2.1**.139
BOS 21M-PA-ID10-S4	0.05...2 m		■		■		■	■	500 Hz	■	■					**2.1**.139
BOS 21M-NA-ID10-S4	0.05...2 m		■			■	■	■	500 Hz	■	■					**2.1**.139
BOS 21M-PA-LD10-S4	0...600 mm			■	■		■	■	2 kHz	■	■					**2.1**.143
BOS 21M-NA-LD10-S4	0...600 mm			■		■	■	■	2 kHz	■	■					**2.1**.143
Retroreflective																
BOS 21M-PA-PR10-S4	0.1...8 m	■			■		■	■	1 kHz	■	■		■			**2.1**.140
BOS 21M-NA-PR10-S4	0.1...8 m	■				■	■	■	1 kHz	■	■		■			**2.1**.140
BOS 21M-PA-LR10-S4	0.1...20 m			■	■		■	■	2 kHz	■	■		■			**2.1**.143
BOS 21M-NA-LR10-S4	0.1...20 m			■		■	■	■	2 kHz	■	■		■			**2.1**.143
BOS 21M-PA-PK10-S4	0...4 m	■			■		■	■	1 kHz	■	■		■	■		**2.1**.141
BOS 21M-NA-PK10-S4	0...4 m	■				■	■	■	1 kHz	■	■		■	■		**2.1**.141
BOS 21M-PA-PT10-S4	0...2 m	■			■		■	■	1 kHz	■	■		■	■	■	**2.1**.141
BOS 21M-NA-PT10-S4	0...2 m	■				■	■	■	1 kHz	■	■		■	■	■	**2.1**.141
Through-beam																
BOS 21M-PA-IE10-S4	0...20 m		■		■		■	■	500 Hz	■	■					**2.1**.141
BOS 21M-NA-IE10-S4	0...20 m		■			■	■	■	500 Hz	■	■					**2.1**.141
BOS 21M-PA-LE10-S4	0...60 m			■	■		■	■	1.5 kHz	■	■					**2.1**.143
BOS 21M-NA-LE10-S4	0...60 m			■		■	■	■	1.5 kHz	■	■					**2.1**.143
BOS 21M-XT-IS11-S4	0...20 m		■							■	■					**2.1**.141
BOS 21M-XT-LS11-S4	0...60 m			■						■	■					**2.1**.143

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Diffuse with background suppression	Sensing distance	**70...200 mm**
Diffuse with foreground suppression	Sensing distance	
Diffuse	Sensing distance	



Diffuse

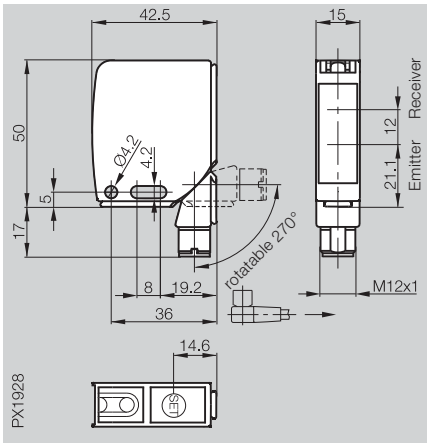
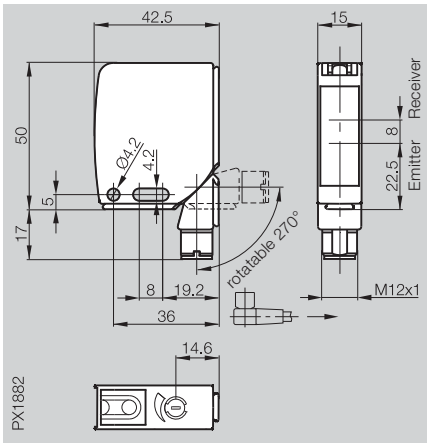
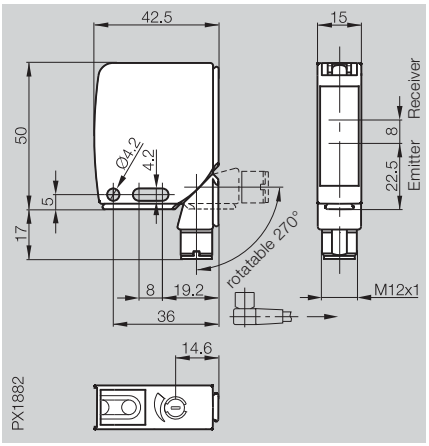
PNP	70...200 mm	HGA	BOS 21M-PUS-RH12-S4
NPN	70...200 mm	HGA	BOS 21M-NUS-RH12-S4
PNP	70...200 mm	VGA + HGA	
NPN	70...200 mm	VGA + HGA	
PNP	0.01...1 m		
NPN	0.01...1 m		
PNP	0.05...2 m		
NPN	0.05...2 m		

Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	≤ 2 V DC
No-load supply current I_0 max.	≤ 50 mA
Switching output	PNP- or NPN-Transistor
Output current	100 mA
Switching type	Light-/dark-on (selectable)
Voltage drop U_d at I_e	2 V
Settings	Teach-in
Optical data	
Recommended sensing distance	70...200 mm
Emitter, light type	LED, red light
Wavelength	670 nm
Indicators	
Output function indicator	LED yellow
Stability indicator	LED green/red
Time data	
Response time	0.5 ms
Switching frequency f	1 kHz
Mechanical data	
Dimensions	42.5×50×15 mm
Connection	M12 connector, 4-pin
Housing material	GD-Zn/Al
Optical surface	PMMA
Weight	76 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–10...+50 °C
Ambient light rejection	10 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.

Wiring diagrams, characteristics and accessories see page **2.1.**144 to **2.1.**147.

Connector orientation

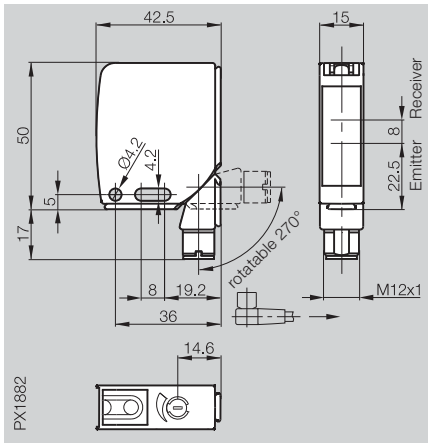
	70...200 mm	**0.01...1 m**	**0.05...2 m**
			
	BOS 21M-PUS-RV13-S4 BOS 21M-NUS-RV13-S4	BOS 21M-PA-RD10-S4 BOS 21M-NA-RD10-S4	BOS 21M-PA-ID10-S4 BOS 21M-NA-ID10-S4
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V DC	≤ 2 V DC	≤ 2 V DC
	≤ 50 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA
	Light-/dark-on (selectable)	Light-/dark-on (push-pull)	Light-/dark-on (push-pull)
	2 V	2 V	2 V
	Teach-in	Potentiometer 270°	Potentiometer 270°
	70...200 mm	0.01...1 m	0.05...2 m
	LED, red light	LED, red light	LED, infrared
	670 nm	650 nm	880 nm
	LED yellow	LED yellow	LED yellow
	LED green	LED green	LED green
	0.5 ms	1 ms	1 ms
	1 kHz	500 Hz	500 Hz
	42.5×50×15 mm	42.5×50×15 mm	42.5×50×15 mm
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	GD-Zn/Al	GD-Zn/Al	GD-Zn/Al
	PMMA	PMMA	PMMA
	76 g	76 g	76 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–10...+50 °C	–25...+55 °C	–25...+55 °C
	10 kLux	10 kLux	10 kLux

2.1

2.3
Photoelectric sensors accessories page 2.3.2 ...

5
Connectors ... page 5.2 ...

Retroreflective with polarizing filter	Range	**0.1...8 m**
Retroreflective Autocollimation	Range	
Retroreflective for glass sensing	Range	
Through-beam	Range	



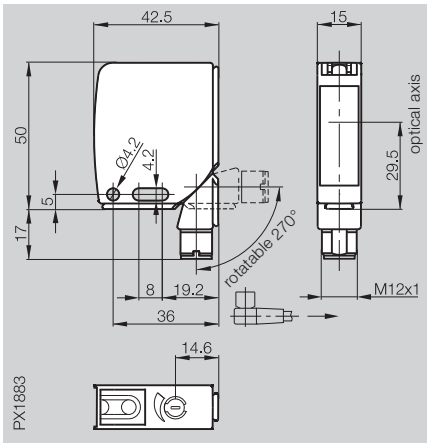
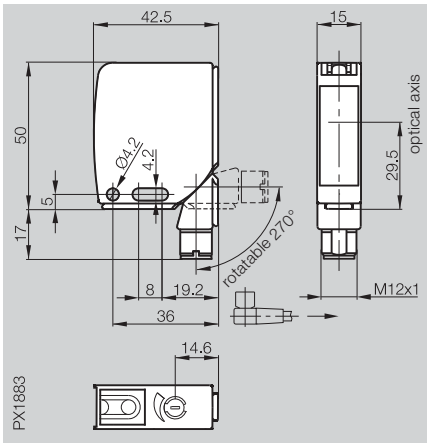
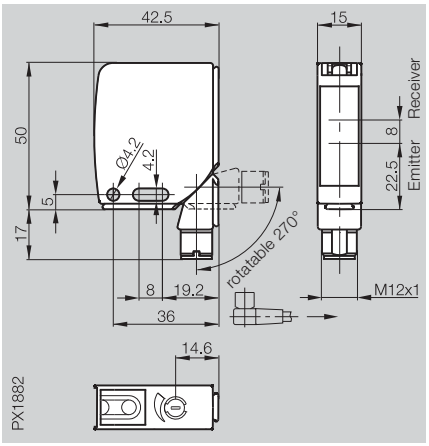
Retroreflective				
PNP	0.1...8 m	Polarizing filter	BOS 21M-PA-PR10-S4	
NPN	0.1...8 m	Polarizing filter	BOS 21M-NA-PR10-S4	
PNP	4 m	Polarizing filter, autocollimation		
NPN	4 m	Polarizing filter, autocollimation		
PNP	2 m	Polarizing filter, autocollimation, glass sensing		
NPN	2 m	Polarizing filter, autocollimation, glass sensing		
Through-beam				
PNP	20 m	Receiver		
NPN	20 m	Receiver		
	20 m	Emitter		

Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	≤ 2 V DC
No-load supply current I_0 max.	≤ 35 mA
Switching output	PNP- or NPN-Transistor
Output current	100 mA
Switching type	Light-/dark-on (push-pull)
Voltage drop U_d at I_e	2 V
Settings	Potentiometer 270°
Help functions	
Optical data	
Recommended range	0.1...8 m
Emitter, light type	LED, red light
Wavelength	650 nm
Indicators	
Power-on indicator	
Output function indicator	LED yellow
Stability indicator	LED green
Time data	
Response time	0.5 ms
Switching frequency f	1 kHz
Mechanical data	
Dimensions	42.5×50×15 mm
Connection	M12 connector, 4-pin
Housing material	GD-Zn/Al
Optical surface	PMMA
Weight	76 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–25...+55 °C
Ambient light rejection	10 kLux

Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**144 to **2.1.**147.

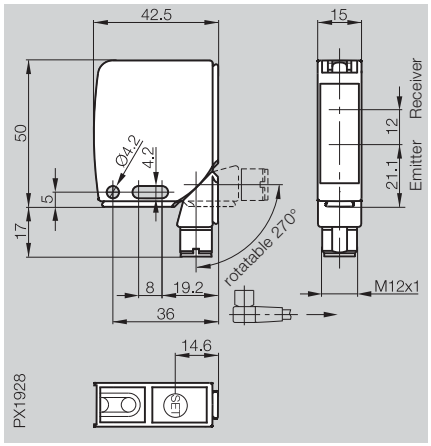
Connector orientation

	0...4 m	0...2 m	0...20 m
			
	BOS 21M-PA-PK10-S4 BOS 21M-NA-PK10-S4	BOS 21M-PA-PT10-S4 BOS 21M-NA-PT10-S4	BOS 21M-PA-IE10-S4 BOS 21M-NA-IE10-S4 BOS 21M-XT-IS11-S4
	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 2 V DC	≤ 2 V DC	≤ 2 V DC
	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	100 mA	100 mA	100 mA
	Light-/dark-on (push-pull)	Light-/dark-on (push-pull)	Light-/dark-on (push-pull)
	2 V	2 V	2 V
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
			Test input (emitter)
	0...4 m	0...2 m	0...20 m
	LED, red light	LED, red light	LED, infrared
	650 nm	650 nm	880 nm
			LED green (emitter)
	LED yellow	LED yellow	LED yellow (receiver)
	LED green		LED green (receiver)
	0.5 ms	0.5 ms	1 ms
	1 kHz	1 kHz	500 Hz
	42.5×50×15 mm	42.5×50×15 mm	42.5×50×15 mm
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	GD-Zn/Al	GD-Zn/Al	GD-Zn/Al
	Glass	Glass*	PMMA
	78 g	78 g	75 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–25...+55 °C	–25...+55 °C	–25...+55 °C
	10 kLux	10 kLux	10 kLux

*also available with PMMA

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse with background suppression	Sensing distance	**50...100 mm**
Diffuse	Sensing distance	
Retroreflective with polarizing filter	Range	
Through-beam	Range	

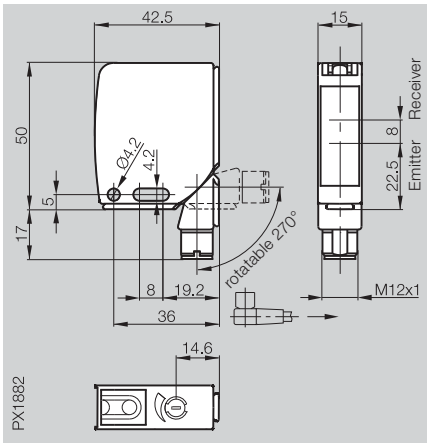
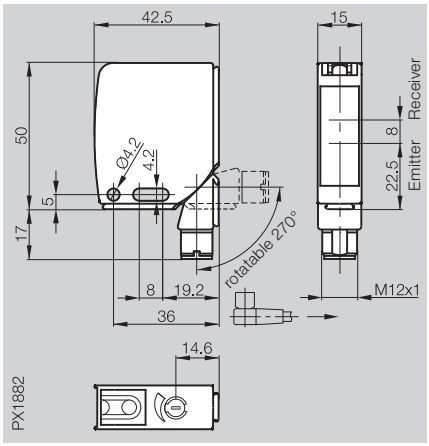
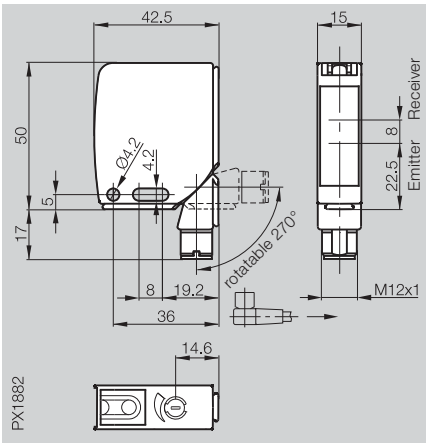


	Diffuse			
	PNP	50...100 mm	HGA	BOS 21M-PUS-LH12-S4
	NPN	50...100 mm	HGA	BOS 21M-NUS-LH12-S4
	PNP	600 mm		
	NPN	600 mm		
	Retroreflective			
	PNP	0.1...20 m	Polarizing filter	
	NPN	0.1...20 m	Polarizing filter	
	Through-beam			
	PNP	60 m	Receiver	
	NPN	60 m	Receiver	
		60 m	Emitter	

Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	≤ 2 V DC
No-load supply current I_0 max.	60 mA
Switching output	PNP- or NPN-Transistor
Output current	100 mA
Switching type	Light-/dark-on (selectable)
Voltage drop U_d at I_e	2 V
Settings	Teach-in
Help functions	
Optical data	
Recommended sensing distance/range	50...100 mm
Emitter, light type	Laser, red light
Wavelength	650 nm
Laser class	1
Indicators	
Power-on indicator	
Output function indicator	LED yellow
Stability indicator	LED green/red
Time data	
Response time	0.5 ms
Switching frequency f	1 kHz
Mechanical data	
Dimensions	42.5×50×15 mm
Connection	M12 connector, 4-pin
Housing material	GD-Zn/Al
Optical surface	PMMA
Weight	77 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–10...+50 °C
Ambient light rejection	5 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

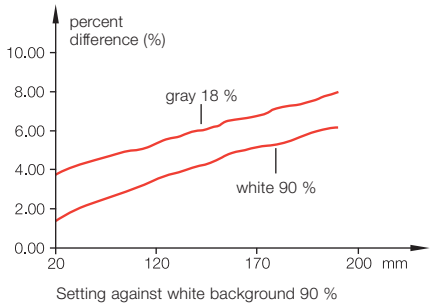
Connector orientation

0...600 mm	**0.1...20 m**	**0...60 m**
		
BOS 21M-PA-LD10-S4 BOS 21M-NA-LD10-S4	BOS 21M-PA-LR10-S4 BOS 21M-NA-LR10-S4	BOS 21M-PA-LE10-S4 BOS 21M-NA-LE10-S4 BOS 21M-XT-LS11-S4
10...30 V DC	10...30 V DC	10...30 V DC
≤ 2 V DC	≤ 2 V DC	≤ 2 V DC
35 mA	35 mA	35 mA
PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
100 mA	100 mA	100 mA
Light-/dark-on (push-pull)	Light-/dark-on (push-pull)	Light-/dark-on (push-pull)
2 V	2 V	2 V
Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
		Test input (emitter)
0...600 mm	0.1...20 m	0...60 mm
Laser, red light	Laser, red light	Laser, red light
650 nm	650 nm	650 nm
1	1	1
LED green	LED green	LED green
LED yellow	LED yellow	LED yellow
0.25 ms	0.25 ms	0.33 ms
2 kHz	2 kHz	1.5 kHz
42.5×50×15 mm	42.5×50×15 mm	42.5×50×15 mm
M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
GD-Zn/Al	GD-Zn/Al	GD-Zn/Al
PMMA	PMMA	PMMA
77 g	77 g	76 g
IP 67	IP 67	IP 67
yes	yes	yes
yes	yes	yes
–10...+50 °C	–10...+50 °C	–10...+50 °C
5 kLux	5 kLux	5 kLux

Wiring diagrams, characteristics and accessories see page **2.1.**144 to **2.1.**147.

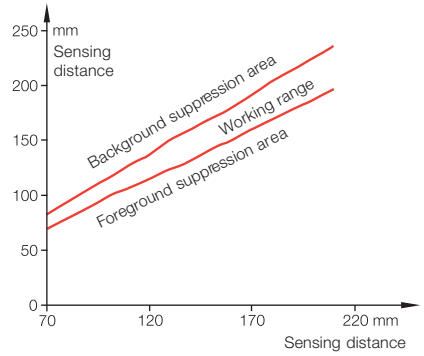
2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Diffuse with background suppression
BOS 21M-_US-RH12-S4



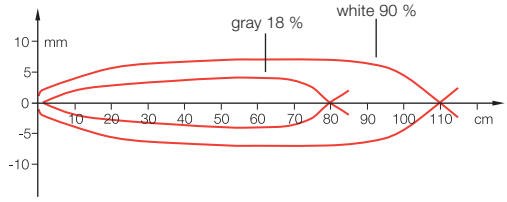
Detection range

Diffuse with fore- and background suppression
BOS 21M-_US-RV13-S4

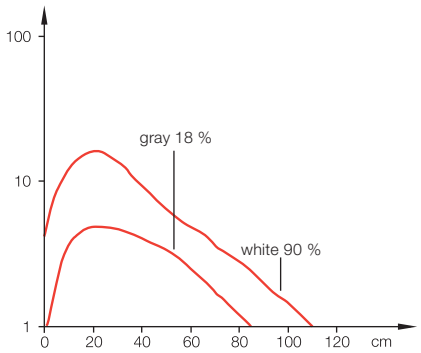


Detection range

Diffuse
BOS 21M-_A-RD10-S4

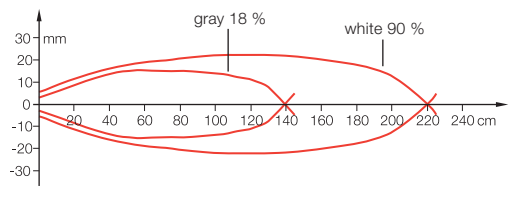


Detection range

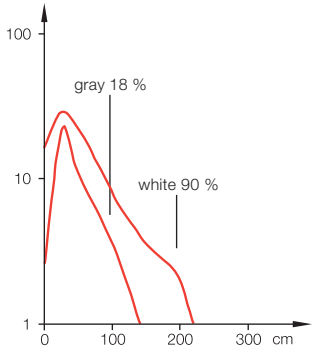


Function reserve

Diffuse long range
BOS 21M-_A-ID10-S4

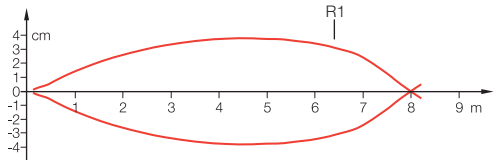


Detection range

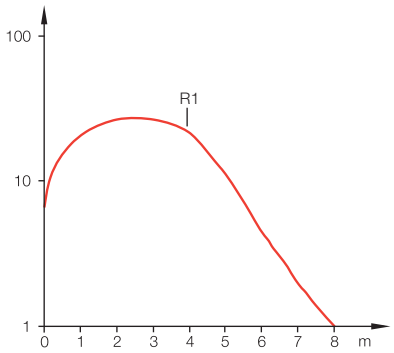


Function reserve

Retroreflective polarized
BOS 21M-_A-PR10-S4

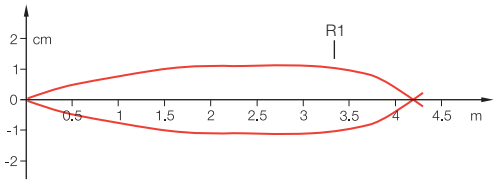


Detection range

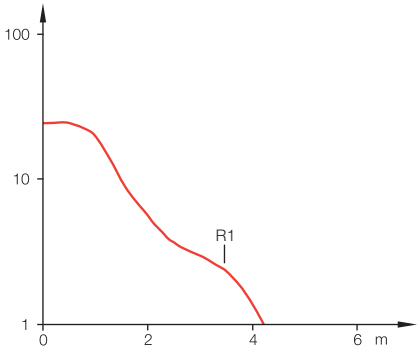


Function reserve

Retroreflective autocollimation
BOS 21M-_A-PK10-S4

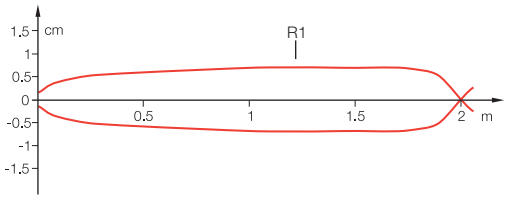


Detection range

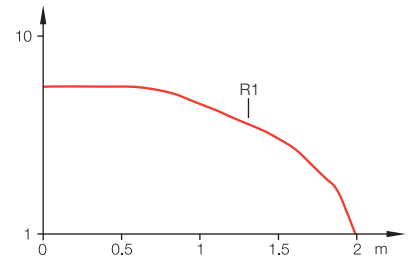


Function reserve

Retroreflective glass sensing
BOS 21M-_A-PT10-S4

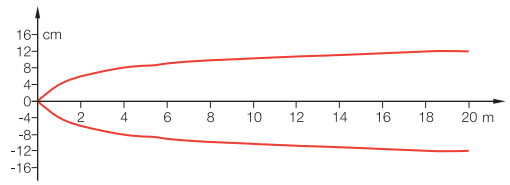


Detection range

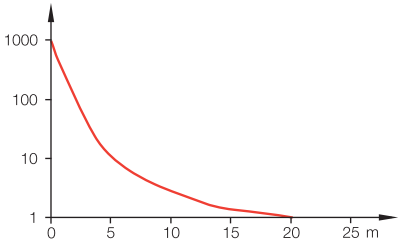


Resolution

Through-beam
BOS 21M-_A-IE10-S4



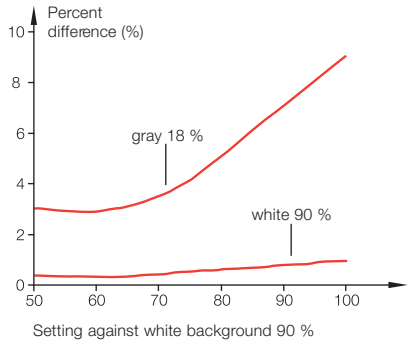
Detection range



Function reserve

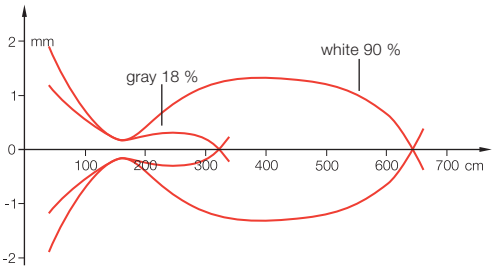
2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Laser diffuse with background suppression
BOS 21M-_US-LH12-S4

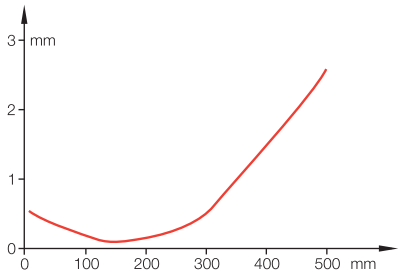


Tolerance with standard setting

Laser diffuse
BOS 21M-_A-LD10-S4

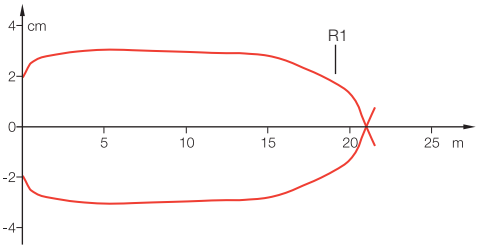


Detection range

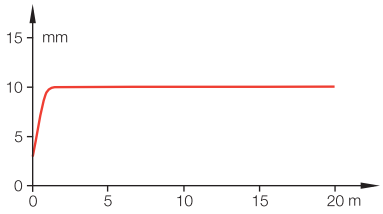


Resolution

Laser retroreflective polarized
BOS 21M-_A-LR10-S4

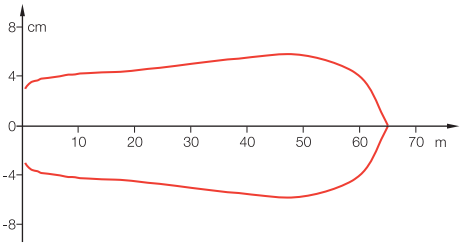


Detection range

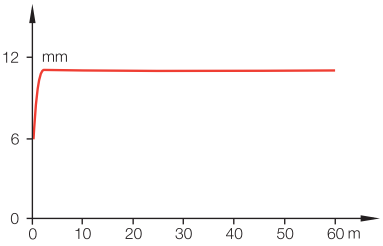


Resolution

Laser through-beam
BOS 21M-_A-LE10-S4



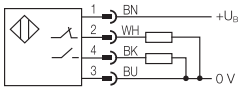
Detection range



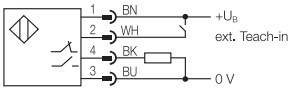
Resolution

Wiring diagrams

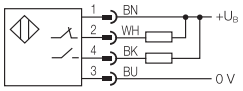
BOS 21M-PA-...



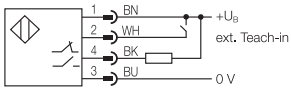
BOS 21M-PUS-...



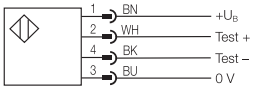
BOS 21M-NA-...



BOS 21M-NUS-...



BOS 21M-XT-...



Recommended accessories

please order separately



Mounting clamp
BOS 21-KH-1



Mounting clamp
BOS 21-KH-2



Mounting bracket
BOS 21-HW-1



Mounting bracket
BOS 21-HW-2



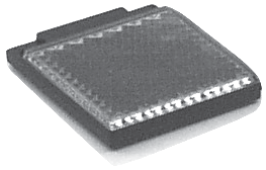
Adapter plate
BOS 21-AD-1



Holding system
BOS 21-HS-1



Reflector
BOS R-1



Reflector
BOS R-9



Connector
BKS-_ 19/BKS-_ 20

2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

The **BOS 26K** series represents the logical development of an already successful design: a uniform housing for all sensor types used. This makes the BOS 26K series compatible with series BOS 25K and complements it with new kinds of sensors with particular specifications and features:

- Laser sensors
- New, high-performance red light and infrared sensors
- Additional optical and mechanical functions.

The BOS 26K series is ideally suited wherever greater demands are made in terms of precision, handling, high sensing distance or range, as well as small-parts detection.

The retroreflective models feature autocollimation, i.e., the emitter and receiver beams coincide geometrically.
Advantage: Exact switching points for any desired side-approaching object in the entire beam path

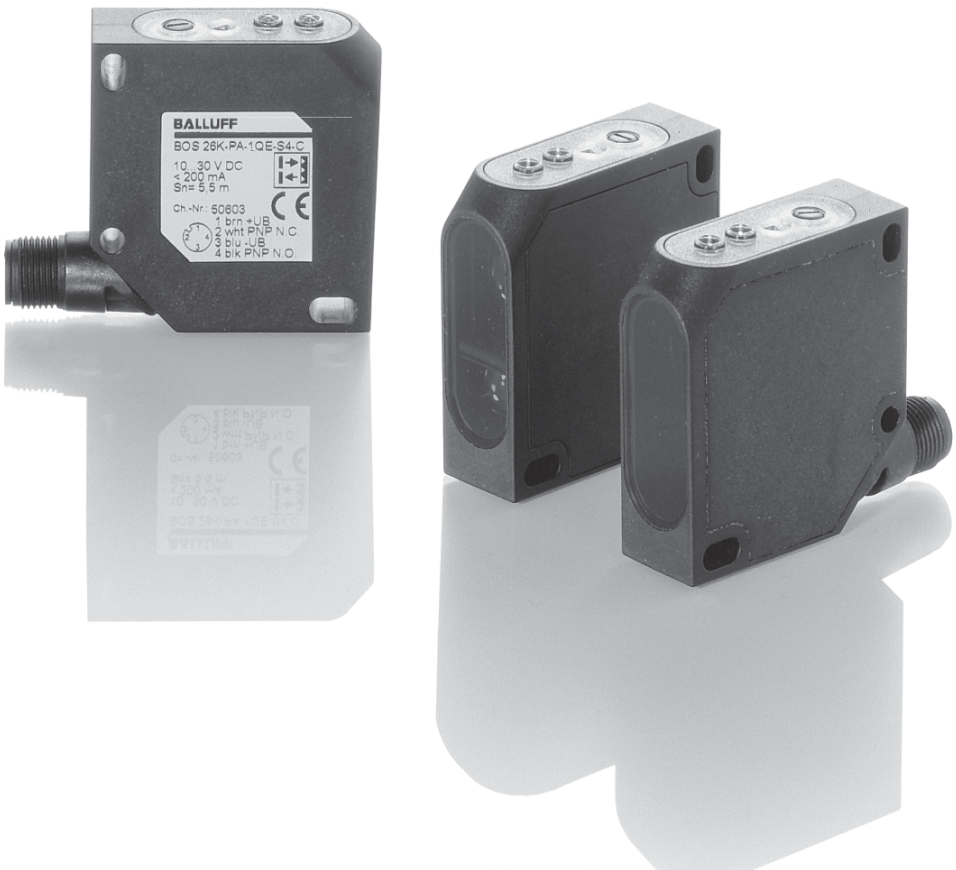
The diffuse model with background suppression **BOS 26K-..-1LHB,** with its focused light beam, can detect objects precisely in virtually any color between 30 and 150 mm. The focusing feature enables a spot size of just 0.1 mm at a distance of 80 mm.

Features

- Rotatable M12 connector
- Precise setting mechanism with two revolutions (720°)
- Clear character display for sensitivity setting
- Switching state and contamination display visible any direction
- Complementary PNP or NPN output
- High switching frequency for laser version

Applications

- Precise small part detection
- Positioning tasks
- Detail checking
- Conveyor inspection (background suppression)
- Conveying
- Automation
- Handling equipment, Robotics
- Machine tool building
- Specialty machines

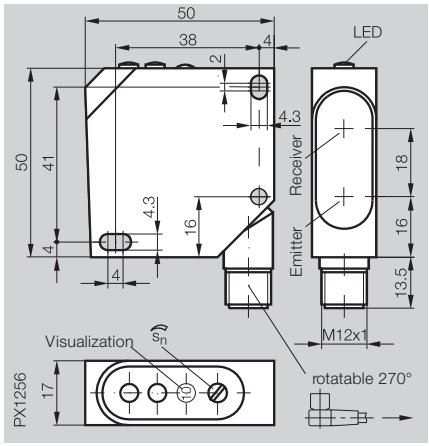


Type	Sensing distance/ Range	Light type			Output		Output function		Switching frequency	U_B	Connection		Help functions			Page
		Red light	Infrared	Laser	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin		Polarizing filter	Autocollimation	Alarm output	
Diffuse with HGA																
BOS 26K-PA-1LHA-SA1-S4-C	40...60 mm			■	■		■	■	2.5 kHz	■	■					**2.1.**152
BOS 26K-NA-1LHA-SA1-S4-C	40...60 mm			■		■	■	■	2.5 kHz	■	■					**2.1.**152
BOS 26K-PA-1LHB-S4-C	30...150 mm			■	■		■	■	2.5 kHz	■	■					**2.1.**153
BOS 26K-NA-1LHB-S4-C	30...150 mm			■		■	■	■	2.5 kHz	■	■					**2.1.**153
BOS 26K-PA-1HC-S4-C	30...300 mm	■			■		■	■	1 kHz	■	■					**2.1.**150
BOS 26K-NA-1HC-S4-C	30...300 mm	■				■	■	■	1 kHz	■	■					**2.1.**150
BOS 26K-PA-1LHC-S4-C	50...300 mm			■	■		■	■	2.5 kHz	■	■					**2.1.**153
BOS 26K-NA-1LHC-S4-C	50...300 mm			■		■	■	■	2.5 kHz	■	■					**2.1.**153
BOS 26K-PA-1IE-S4-C	150...600 mm		■		■		■	■	800 Hz	■	■					**2.1.**151
BOS 26K-NA-1IE-S4-C	150...600 mm		■			■	■	■	800 Hz	■	■					**2.1.**151
Retroreflective																
BOS 26K-PA-1QE-S4-C	0...5.5 m	■			■		■	■	1 kHz	■	■		■	■		**2.1.**151
BOS 26K-NA-1QE-S4-C	0...5.5 m	■				■	■	■	1 kHz	■	■		■	■		**2.1.**151
BOS 26K-PO-1QE-SA1-C	0...5.5 m	■			■		■		1 kHz	■	■		■	■	■	**2.1.**151
BOS 26K-PA-1LQP-S4-C	0...20 m			■	■		■	■	2.5 kHz	■	■		■	■		**2.1.**153
BOS 26K-NA-1LQP-S4-C	0...20 m			■		■	■	■	2.5 kHz	■	■		■	■		**2.1.**153

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BOS 26K
Sensing distance 300 mm

Diffuse with background suppression	Sensing distance	**30...300 mm**
Retroreflective with polarizing filter	Range	

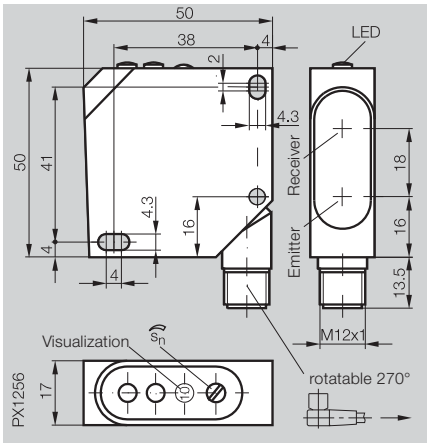
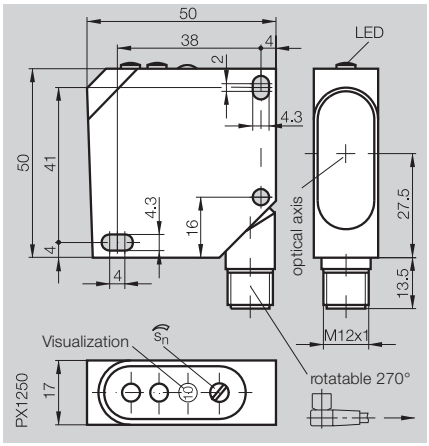
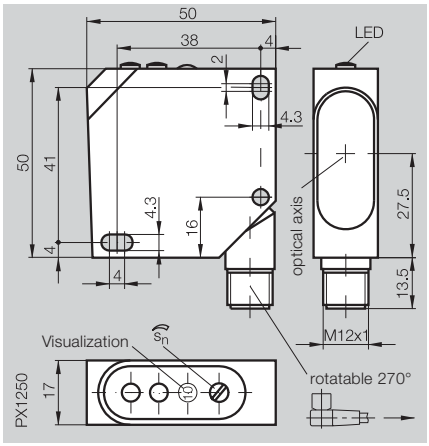


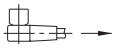
	Diffuse			
	PNP	30...300 mm	HGA	BOS 26K-PA-1HC-S4-C
	NPN	30...300 mm	HGA	BOS 26K-NA-1HC-S4-C
	PNP	150...600 mm	HGA	
	NPN	150...600 mm	HGA	
	Retroreflective			
	PNP	5.5 m	Autocollimation	
	NPN	5.5 m	Autocollimation	

Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	10 %
No-load supply current I_0 max.	≤ 35 mA
Switching output	PNP- or NPN-Transistor
Output current	200 mA
Switching type	Light-/dark-on (complementary)
Voltage drop U_d at I_e	≤ 2.4 V
Settings	2-turn potentiometer with indicator
Help functions	
Optical data	
Emitter, light type	LED, red light, pulsed
Wavelength	660 nm
Light spot diameter	approx. 8 mm at 200 mm
Distance hysteresis (18 %/18 %)	5 %
Gray value shift (90 %/18 %)	8 %
Indicators	
Power-on indicator	LED green
Output function indicator	LED yellow
Stability indicator	LED red
Time data	
Response time	0.5 ms
Switching frequency f	1 kHz
Mechanical data	
Dimensions	50×50×17 mm
Connection	M12 connector, 4-pin
Housing material	Impact-resistant ABS
Optical surface	PMMA
Weight	35 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–20...+60 °C
Ambient light rejection per	EN 60947-5-2

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**154 and **2.1.**155.

150...600 mm	**0...5.5 m**	**0...5.5 m**
		
BOS 26K-PA-1IE-S4-C BOS 26K-NA-1IE-S4-C	BOS 26K-PA-1QE-S4-C BOS 26K-NA-1QE-S4-C	BOS 26K-PO-1QE-SA1-C
10...30 V DC	10...30 V DC	10...30 V DC
10 %	10 %	10 %
≤ 70 mA	≤ 30 mA	≤ 30 mA
PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP-Transistor
200 mA	200 mA	200 mA
Light-/dark-on (complementary)	Light-/dark-on (complementary)	Light-on
≤ 2.4 V	≤ 2.4 V	≤ 2.4 V
2-turn potentiometer with indicators	2-turn potentiometer with indicator	2-turn potentiometer with indicator
		Contamination output
LED, infrared, pulsed	LED, red light, pulsed	LED, red light, pulsed
880 nm	660 nm	660 nm
approx. 20 mm at 400 mm		
5 %		
12 %		
LED green	LED green	LED green
LED yellow	LED yellow	LED yellow
LED red	LED red	LED red
0.625 ms	0.5 ms	0.5 ms
800 Hz	1 kHz	1 kHz
50×50×17 mm	50×50×17 mm	50×50×17 mm
M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
Impact-resistant ABS	Impact-resistant ABS	Impact-resistant ABS
PMMA	PMMA	PMMA
35 g	35 g	35 g
IP 67	IP 67	IP 67
yes	yes	yes
yes	yes	yes
–20...+60 °C	–20...+60 °C	–20...+60 °C
EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

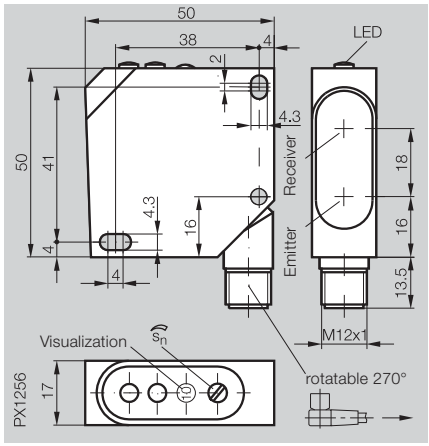
 Connector orientation

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Diffuse with background suppression	Sensing distance	**40...60 mm**
Retroreflective with polarizing filter	Range	



	Diffuse		
	PNP 40...60 mm	HGA	BOS 26K-PA-1LHA-SA1-S4-C
	NPN 40...60 mm	HGA	BOS 26K-NA-1LHA-SA1-S4-C
	PNP 30...150 mm	HGA	
	NPN 30...150 mm	HGA	
	PNP 50...300 mm	HGA	
	NPN 50...300 mm	HGA	
	Retroreflective		
	PNP 20 m	Autocollimation	
	NPN 20 m	Autocollimation	
	Electrical data		
	Supply voltage U_B		10...30 V DC
	Ripple		10 %
	No-load supply current I_0 max.		≤ 50 mA
	Switching output		PNP- or NPN-Transistor
	Output current		200 mA
	Switching type		Light-/dark-on (complementary)
	Voltage drop U_d at I_e		≤ 2.4 V
	Settings		2-turn potentiometer with indicators
	Optical data		
	Emitter, light type		Laser, red light
	Wavelength		670 nm
	Laser class		2
	Light spot diameter		see table
	Distance hysteresis (18 %/18 %)		**≤ 50 µm**
	Gray value shift (90 %/18 %)		1 %
	Indicators		
	Power-on indicator		LED green
	Output function indicator		LED yellow
	Stability indicator		LED red
	Time data		
	Response time		0.2 ms
	Switching frequency f		2.5 kHz
	Mechanical data		
	Dimensions		50×50×17 mm
	Connection		M12 connector, 4-pin
	Housing material		Impact-resistant ABS
	Optical surface		PMMA
	Weight		40 g
	Ambient data		
	Degree of protection per IEC 60529		IP 67
	Polarity reversal protected		yes
	Short circuit protected		yes
	Ambient temperature range T_a		–20...+45 °C
	Ambient light rejection		EN 60947-5-2

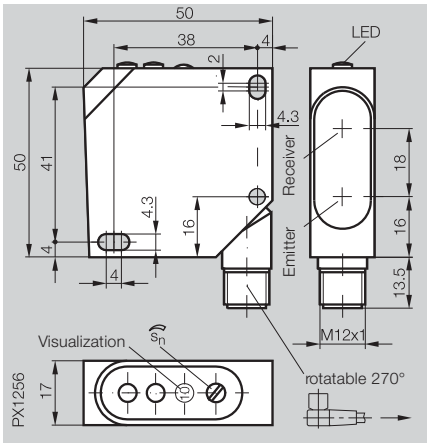
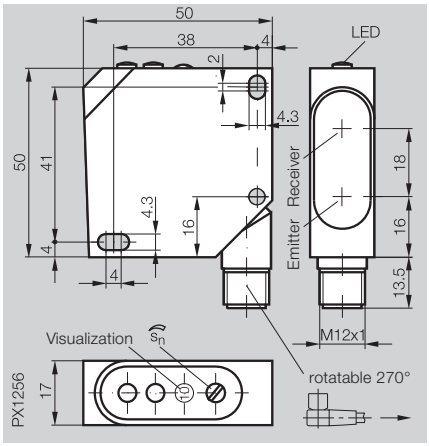
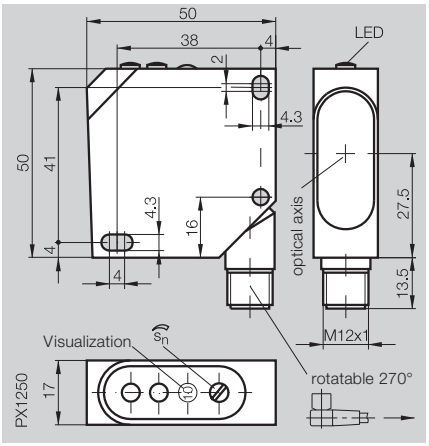
Diffuse sensor values referenced to Kodak gray card 90 % Reflexion. Retroreflective sensor values referenced to R22 reflector.

Light spot diameter [mm]

Sensing distance	40	45	50	55	60
Light spot-Ø	0.25	0.7	1.1	1.5	1.8

Wiring diagrams, characteristics and accessories see page **2.1.**154 and **2.1.**155.

Connector orientation

	30...150 mm	50...300 mm	0...20 m
			
	BOS 26K-PA-1LHB-S4-C BOS 26K-NA-1LHB-S4-C	BOS 26K-PA-1LHC-S4-C BOS 26K-NA-1LHC-S4-C	BOS 26K-PA-1LQP-S4-C BOS 26K-NA-1LQP-S4-C
	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %
	≤ 50 mA	≤ 50 mA	≤ 40 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	200 mA	200 mA	200 mA
	Light-/dark-on (complementary)	Light-/dark-on (complementary)	Light-/dark-on (complementary)
	≤ 2.5 V	≤ 2.4 V	≤ 2.4 V
	2-turn potentiometer with indicator	2-turn potentiometer with indicator	2-turn potentiometer with indicator
	Laser, red light	Laser, red light	Laser, red light
	670 nm	670 nm	670 nm
	2	2	1
	see table	3×1 mm at 300 mm	15 mm in 12 m
	5 %	2 %	
	8 %	5 %	
	LED green	LED green	LED green
	LED yellow	LED yellow	LED yellow
	LED red	LED red	LED red
	0.2 ms	0.2 ms	0.2 ms
	2.5 kHz	2.5 kHz	2.5 kHz
	50×50×17 mm	50×50×17 mm	50×50×17 mm
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Impact-resistant ABS	Impact-resistant ABS	Impact-resistant ABS
	PMMA	PMMA	PMMA
	40 g	40 g	40 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–15...+45 °C	–20...+45 °C	–20...+45 °C
	5 kLux	5 kLux	5 kLux

Light spot diameter [mm]

Sensing distance	30	60	80	100	150
Light spot Ø	1.8	0.7	0.1	1.1	2.5

Light spot diameter [mm]

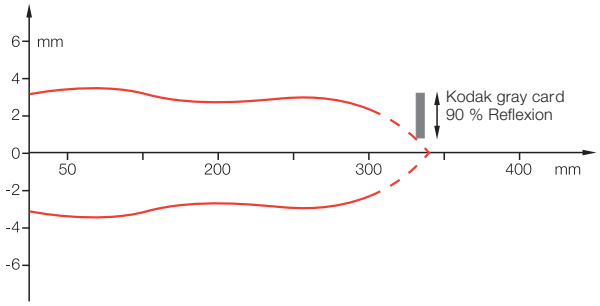
Sensing distance	50	100	200
Light spot Ø	5×1.8	4×1.5	3.8×1.2

Light spot diameter [mm]

Range (m)	4	12	20
Light spot-Ø	5	15	24

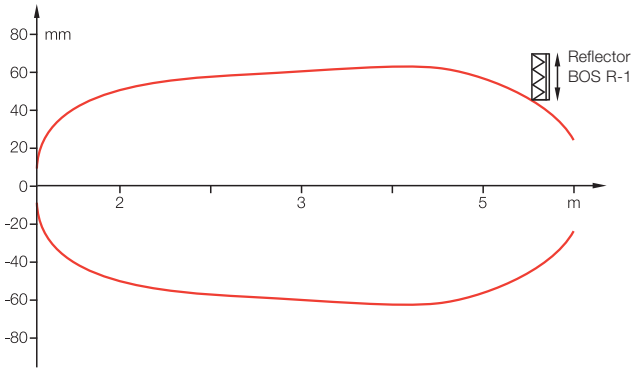
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Diffuse BOS 26K-..-1HC-...



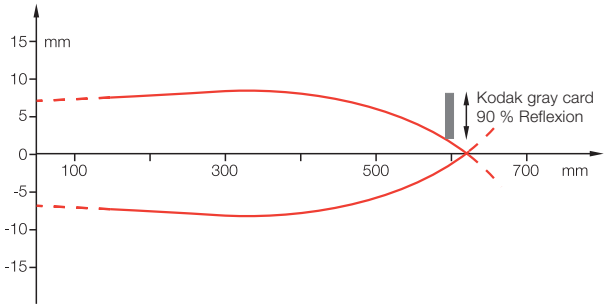
Sensing distance measured with side approach of Kodak gray card.

Retroreflective BOS 26K-..-1QE-...



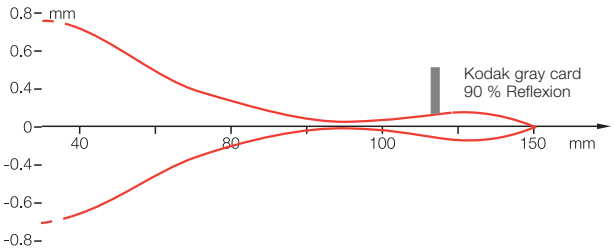
Range measured using side approach with reflector.

Diffuse BOS 26K-..-1IE-...



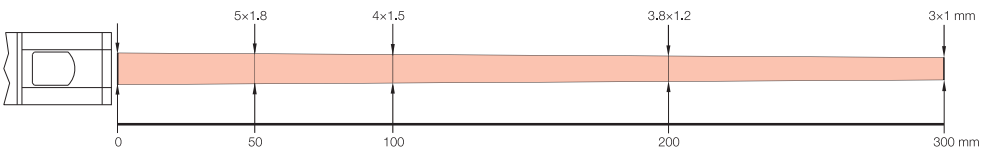
Sensing distance measured with side approach of Kodak gray card.

Diffuse BOS 26K-..-1LHB-...

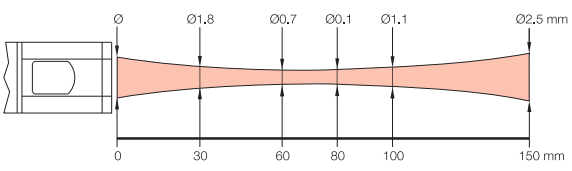


Sensing distance measured with side approach of Kodak gray card.

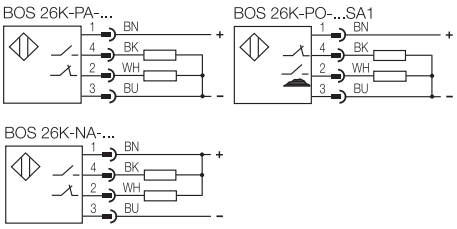
Light beam geometry BOS 26K...1LHC



Light beam geometry BOS 26K...1LHB



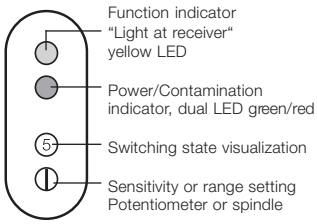
Wiring diagrams



Contamination indicator

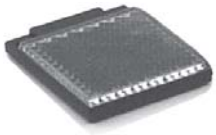
The BOS 26K has 2 display LED's: yellow for indicating function and green/red for indicating status and contamination. Should the received light drop below a certain level, this will be indicated by a red LED. This allows contamination or maladjustment to be detected early.

Indicators and operating elements



Recommended accessories

please order separately



Reflector
BOS R-9



Reflector
BOS R-1



Adapter plate
BOS 21-AD-1



Laser reflector
BOS R-22



Laser reflector
BOS R-12



Laser reflector
BOS R-13



Mounting bracket
BOS 26-HW-1



Connector
BKS-_ 19/BKS-_ 20

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The **BOS 36K** series is ergonomic, compact (55×65×20 mm), and the connector is rotatable.
The performance data are outstanding for a sensor this size.
An easily accessible potentiometer is used for setting the sensitivity. The diffuse model with background suppression uses teach-in setting and visible red light. This virtually precludes any incorrect setting.

Features

- Push-pull output 200 mA, short circuit protected
- Function and stability indicators
- Degree of protection IP 66
- Compact plastic housing (ABS)
- Red light (background suppression and retroreflective)
- Teach-in (button background suppression)
- M12 connector, rotatable

Applications

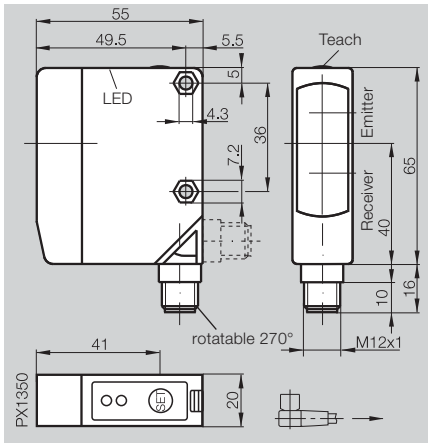
- Wherever a higher performance is needed
- Conveying and warehousing
- Packaging machinery
- Access control
- Lift-type vehicles (not for safety applications)
- Wood industry
- Ceramics industry
- Automobile industry
- Gate and door control



Type	Sensing distance/ range	Light type		Output		Output function		Switching frequency	U_B	Connec-tion		Special features			Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	Polarizing filter	Teach-in	Test input	
Diffuse with HGA															
BOS 36K-PA-1HD-S4-C	100...500 mm	■		■		■	■	500 Hz	■	■			■		**2.1**.158
Diffuse															
BOS 36K-PA-1PH-S4-C	0,01...2 m		■	■		■	■	500 Hz	■	■					**2.1**.159
Retroreflective															
BOS 36K-PA-1QH-S4-C	0,1...8 m	■		■		■	■	500 Hz	■	■		■			**2.1**.159
Through-beam															
BLE 36K-PA-1PT-S4-C	0...50 m		■	■		■	■	500 Hz	■	■					**2.1**.159
BLS 36K-XX-1T-S4-C	0...50 m		■						■	■				■	**2.1**.159

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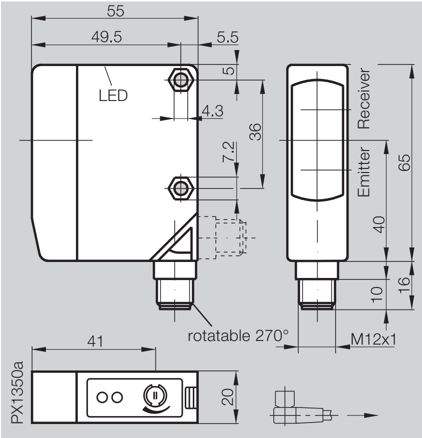
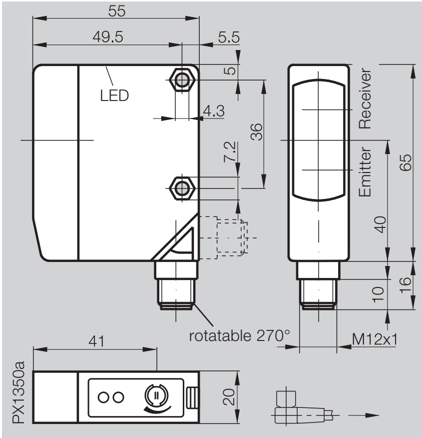
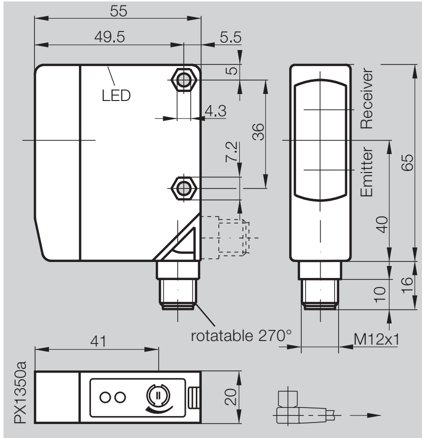
Diffuse with background suppression	Sensing distance	**100...500 mm**
Diffuse	Sensing distance	
Retroreflective with polarizing filter	Range	
Through-beam	Range	



Diffuse				
PNP	100...500	mm	HGA, Teach-in	BOS 36K-PA-1HD-S4-C
PNP	0.01...2	m		
Retroreflective				
PNP	0.1...8	m	Polarizing filter	
Through-beam				
PNP	50	m	Receiver	
	50	m	Emitter	
Electrical data				
Supply voltage U_B				10...30 V DC
Ripple				2 V DC
No-load supply current I_0 max.				≤ 50 mA
Switching output				PNP-Transistor
Output current				200 mA
Switching type				Light/Dark (push-pull)
Voltage drop U_d at I_e				≤ 2 V
Settings				Teach-in
Help function				
Optical data				
Emitter, light type				LED, red light
Wavelength				660 nm
Light spot diameter				approx. 15 mm at 250 mm
Distance hysteresis (18 %/18 %)				20 %
Gray value shift (90 %/18 %)				8 %
Indicators				
Power-on indicator				
Output function indicator				LED yellow
Stability indicator				LED green/red
Time data				
Response time				1 ms
Switching frequency f				500 Hz
Mechanical data				
Dimensions				55×65×20 mm
Connection				M12 connector, 4-pin
Housing material				impact-resistant ABS
Optical surface				PMMA
Weight				50 g
Ambient data				
Degree of protection per IEC 60529				IP 66
Polarity reversal protected				yes
Short circuit protected				yes
Ambient temperature range T_a				–10...+55 °C
Ambient light rejection				5 kLux

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**160 and **2.1.**161.

	0.01...2 m		
		0.1...8 m	
			0...50 m
			
	BOS 36K-PA-1PH-S4-C		
		BOS 36K-PA-1QH-S4-C	
			BLE 36K-PA-1PT-S4-C
			BLS 36K-XX-1T-S4-C
	10...30 V DC	10...30 V DC	10...30 V DC
	2 V DC	2 V DC	2 V DC
	≤ 40 mA	≤ 40 mA	≤ 40 mA
	PNP-Transistor	PNP-Transistor	PNP-Transistor
	200 mA	200 mA	200 mA
	Light/Dark (push-pull)	Light/Dark (push-pull)	Light/Dark (push-pull)
	≤ 2 V	≤ 2 V	≤ 2 V
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
			Test input (BLS)
	LED, infrared	LED, red light	LED, infrared
	880 nm	660 nm	880 nm
			LED green (BLS)
	LED yellow	LED yellow	LED yellow (BLE)
	LED green	LED green	LED green (BLE)
	1 ms	1 ms	1 ms
	500 Hz	500 Hz	500 Hz
	55×65×20 mm	55×65×20 mm	55×65×20 mm
	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS
	PMMA	PMMA	PMMA
	50 g	50 g	50 g
	IP 66	IP 66	IP 66
	yes	yes	yes
	yes	yes	yes
	–25...+55 °C	–25...+55 °C	–25...+55 °C
	5 kLux	5 kLux	5 kLux

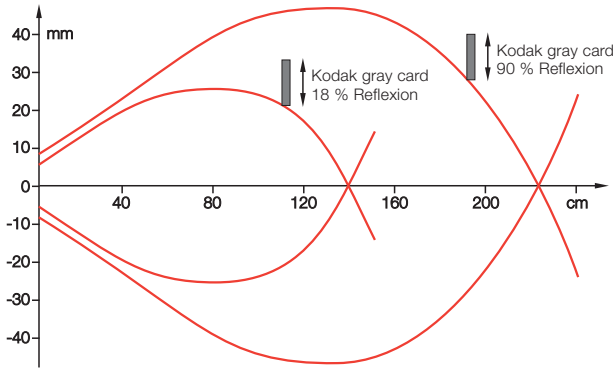
Connector orientation

2.1

2.3
Photoelectric sensors accessories page 2.3.2 ...

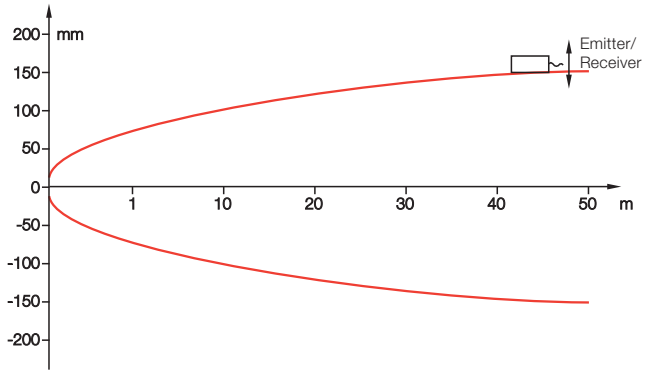
5
Connectors ... page 5.2 ...

Diffuse BOS 36K-PA-1PH-S 4-C



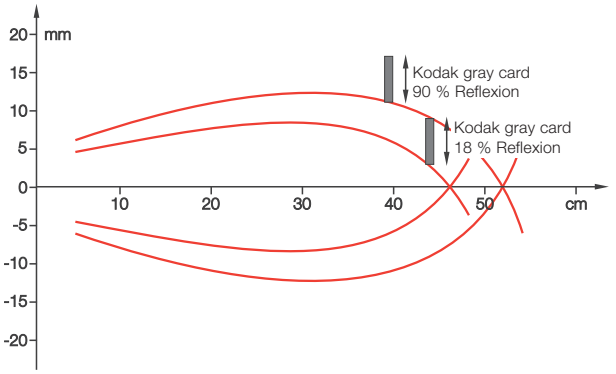
Sensing distance measured with side approach of Kodak gray card.

Through-beam BLE/BLS 36K-...



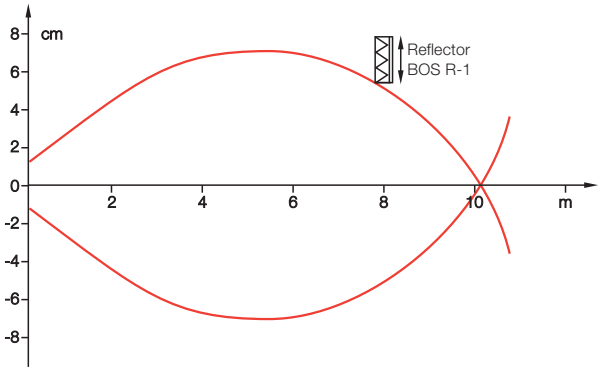
For the through-beam the maximum possible offset between emitter and receiver is measured.

Diffuse BOS 36K-PA-1HD-S 4-C



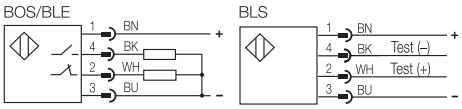
Sensing distance measured with side approach of Kodak gray card.

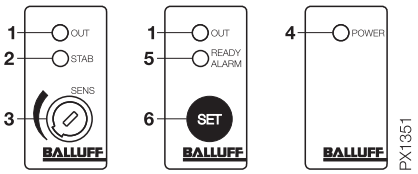
Retroreflective BOS 36K-PA-1QH-S 4-C



Range measured using side approach with reflector.

Wiring diagrams





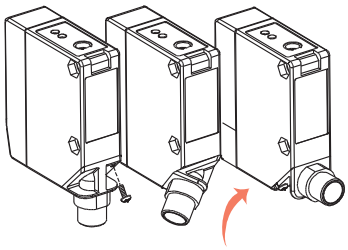
BOS 36K...PH/QH
BLE 36K

BOS 36K...HD

BLS 36K

Indicators and operating elements

1 **Output** (yellow LED)
Yellow LED indicates output function.
2 **Contamination display** (green LED)
The green LED indicates when the received signal is 30 % above the switching threshold needed for switching.
3 **Potentiometer for sensitivity setting**
4 **Power indicator** (green LED)
5 **READY/ALARM** (2-color green/red LED)
6 **SET** (setting button)



Connector 270° rotatable

2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Recommended accessories
please order separately



Reflector
BOS R-1



Mounting bracket
BOS 36-HW-1



Connector
BKS-_ 19/BKS-_ 20

Only power helps in the long run! This is especially true under harsh conditions. This is why our **BOS 65K** has a 3 A output at 264 V AC/DC and a very long sensing range. It also comes with setup help, test input, alarm output and time functions. The same tough plastic housing series, with large wiring chamber, is offered with each of the following optical types:

- Diffuse
- Diffuse with background suppression
- Retroreflective with polarizing filter
- Through-beam

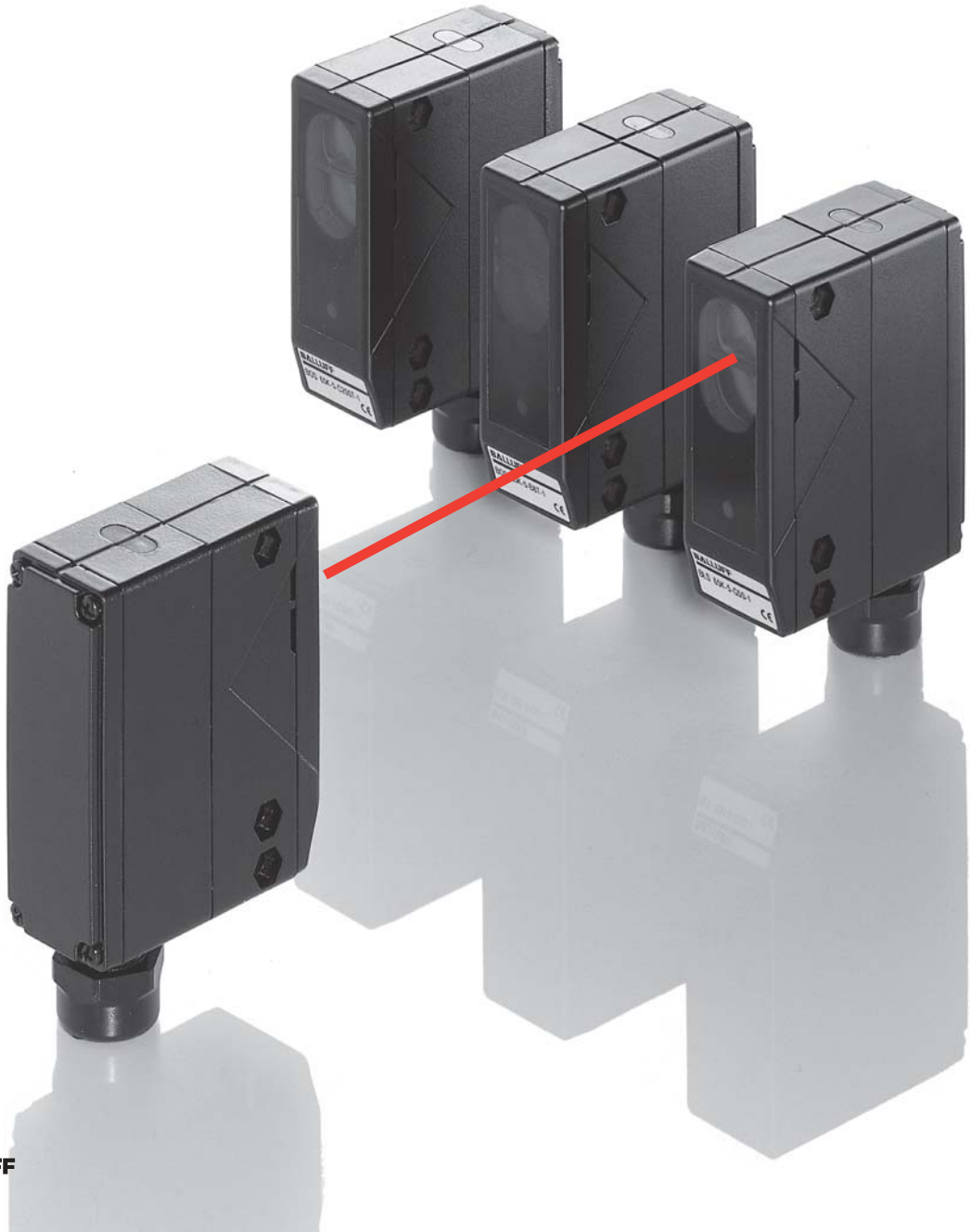
The supply voltage can be 10...30 V DC or 17...264 V AC/DC in the universal version.
All DC versions come standard with PNP and NPN transistor outputs, and have an alarm output and test input. The universal voltage versions have a relay output. The retro- and through-beam versions use both visible red and infrared light.

Features

- Universal voltage model 17...264 V AC/DC with relay output
- DC 10...30 V with transistor output (PNP/NPN)
- Light switching/dark switching
- DC version standard with alarm output and test input
- Version with various time functions (2 times settable)
- Wiring chamber with PG 11 cord seal

Applications

- Conveying
- Machine tool building
- Packaging
- Assembly and handling automation
- Gate controls
- Inventory control



Type	Sensing distance/ range	Light type		Output			Output function		Switching frequency	U_B		Connection		Help functions			Page
		Red light	Infrared	PNP-Transistor	NPN-Transistor	Relay	Light-on	Dark-on		10...30 V DC	17...264 V AC	M12 connector, 4-pin	Wiring chamber	Polarizing filter	Alarm output	Test input	
Diffuse with HGA																	
BOS 65K-5-M110T-1	0.2...1.1 m		■	■	■		■	■	500 Hz	■			■		■	■	**2.1**.165
BOS 65K-5-M110T-2P-S4	0.2...1.1 m		■	■			■	■	500 Hz	■		■			■		**2.1**.165
BOS 65K-1-M110T-1	0.2...1.1 m		■			■	■	■	10 Hz		■		■				**2.1**.165
Diffuse																	
BOS 65K-5-C200T-1	0.05...2 m		■	■	■		■	■	500 Hz	■			■		■	■	**2.1**.165
BOS 65K-5-C200T-2P-S4	0.05...2 m		■	■			■	■	500 Hz	■		■			■		**2.1**.165
BOS 65K-1-C200T-1	0.05...2 m		■			■	■	■	10 Hz		■		■				**2.1**.165
Retroreflective																	
BOS 65K-5-B8T-1	0.3...8 m	■		■	■		■	■	500 Hz	■			■	■	■	■	**2.1**.165
BOS 65K-5-B8T-2P-S4	0.3...8 m	■		■			■	■	500 Hz	■		■		■	■		**2.1**.165
BOS 65K-1-B8T-1	0.3...8 m	■				■	■	■	10 Hz		■		■	■			**2.1**.165
Through-beam																	
BLE 65K-5-F50T-1	0...50 m		■	■	■		■	■	500 Hz	■			■		■		**2.1**.165
BLE 65K-5-F50T-2P-S4	0...50 m		■	■	■		■	■	500 Hz	■		■			■		**2.1**.165
BLE 65K-1-F50T-1	0...50 m		■			■	■	■	10 Hz		■		■				**2.1**.165
BLS 65K-5-G50-1	0...50 m		■							■			■			■	**2.1**.165
BLS 65K-5-G50-2-S4	0...50 m		■							■		■				■	**2.1**.165
BLS 65K-1-G50-1	0...50 m		■								■		■				**2.1**.165

2.1
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Diffuse with background suppression	maximum sensing distance
Diffuse	maximum sensing distance
Retroreflective	maximum range
Through-beam	maximum range

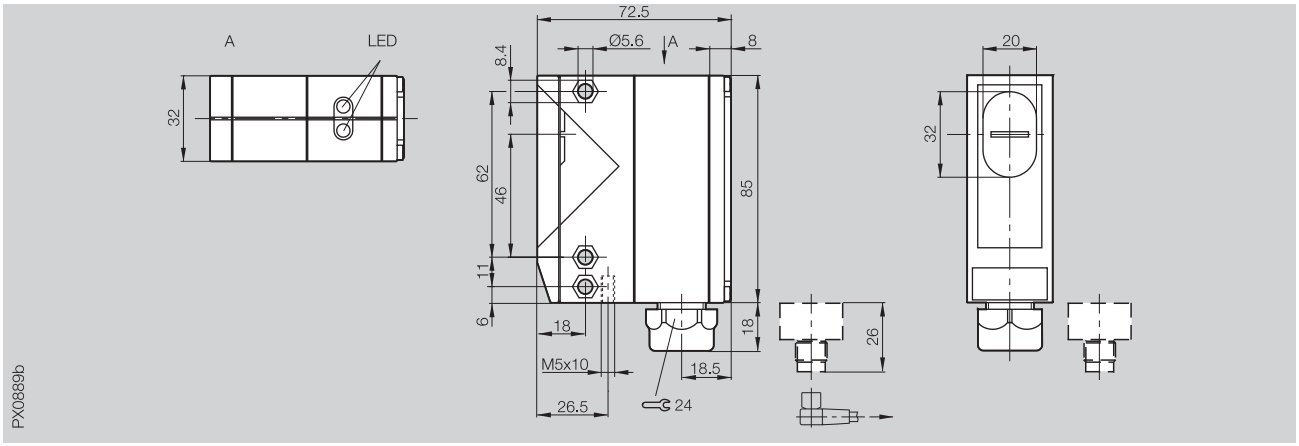
CE

Diffuse			
PNP/NPN	0.2...1.1 m	HGA, time function	
	0.05...2 m	Time function	
Relay	0.2...1.1 m	HGA, time function	
	0.05...2 m	Time function	
Retroreflective			
PNP/NPN	0.3...8 m	Polarizing filter, red light, time function	
Relay	0.3...8 m	Polarizing filter, red light, time function	
Through-beam			
PNP/NPN	50 m	Receiver, time function	
	50 m	Emitter	
Relay	50 m	Receiver, time function	
	50 m	Emitter	
Electrical data			
Supply voltage U_B			
No-load supply current I_0 max.			
Switching output			
Output current			
Switching type			
Voltage drop U_d at I_e			
Alarm output			
Settings			
Help function			
Indicators			
Power-on indicator			
Output function indicator			
Stability indicator			
Time data			
Response time			
Switching frequency f			
Time function			
Mechanical data			
Dimensions			
Connection			
max. conductor cross-section			
Housing material			
Optical surface			
Weight			
Ambient data			
Degree of protection per IEC 60529			
Polarity reversal protected			
Short circuit protected			
Ambient temperature range T_a			
Ambient light rejection			

Diffuse values referenced to Kodak gray card 90% Reflexion.
Retroreflective values referenced to R1 reflector.

Wiring diagrams, characteristics and accessories see page **2.1.**166 and **2.1.**167.

	0.2...1.1 m	**0.2...1.1 m**	**0.2...1.1 m**
	0.05...2 m	**0.05...2 m**	**0.05...2 m**
	0.3...8 m	**0.3...8 m**	**0.3...8 m**
	0...50 m	**0...50 m**	**0...50 m**

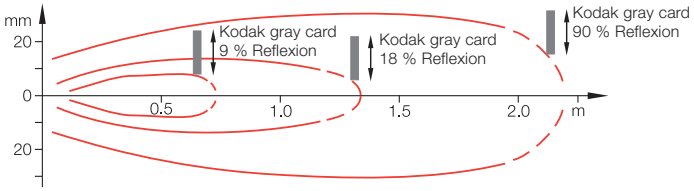


	BOS 65K-5-M110T-1	BOS 65K-5-M110T-2P-S4	
	BOS 65K-5-C200T-1	BOS 65K-5-C200T-2P-S4	
			BOS 65K-1-M110T-1
			BOS 65K-1-C200T-1
	BOS 65K-5-B8T-1	BOS 65K-5-B8T-2P-S4	
			BOS 65K-1-B8T-1
	BLE 65K-5-F50T-1	BLE 65K-5-F50T-2P-S4	
	BLS 65K-5-G50-1	BLS 65K-5-G50-2-S4	
			BLE 65K-1-F50T-1
			BLS 65K-1-G50-1
	10...30 V DC	10...30 V DC	17...264 V AC/DC
	≤ 40 mA	≤ 40 mA	
	PNP and NPN Transistor	PNP-Transistor	Relay 3A, 250 V AC/24 V DC
	200 mA	200 mA	
	Light and dark (reversible)	Light and dark (reversible)	Light and dark (reversible)
	≤ 2 V	≤ 1.5 V	0 V
	PNP-Transistor, 200 mA	PNP-Transistor, 200 mA	
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	Test input (except BLE)	Test input (for BLS)	
	LED green (only for BLS)	LED green (only for BLS)	LED green (only for BLS)
	LED red	LED red	LED red
	LED green	LED green	LED green
	1 ms	1 ms	20 ms
	500 Hz	500 Hz	10 Hz
	selectable 0.02…12 sec.	selectable 0.02…12 sec.	selectable 0.02…12 sec.
	72.5×85×32 mm	72.5×85×32 mm	72.5×85×32 mm
	Wiring chamber	M12 connector, 4-pin	Wiring chamber
	0.75 mm²		0.75 mm²
	PC	PC	PC
	PMMA	PMMA	PMMA
	160 g	180 g	160 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	no
	–20...+55 °C	–20...+55 °C	–20...+55 °C
	3 kLux	3 kLux	3 kLux

Connector orientation

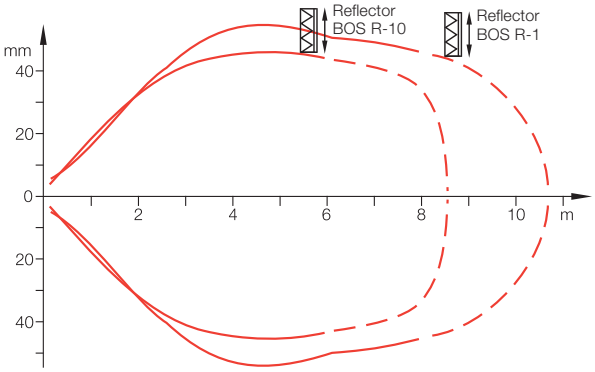
2.1
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

Diffuse BOS 65K-.-C200T-...



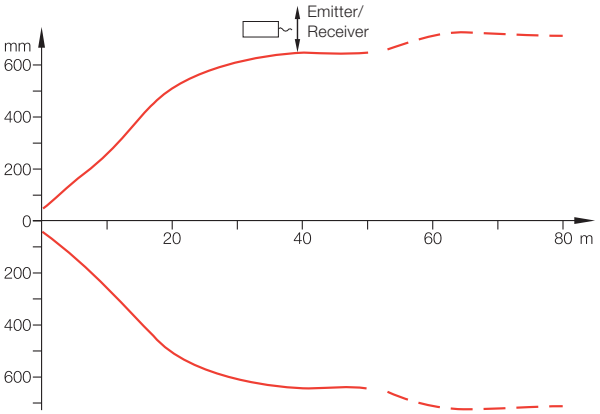
Sensing distance measured with side approach of Kodak gray card.

Retroreflective with polarizing filter BOS 65K-.-B8T-...



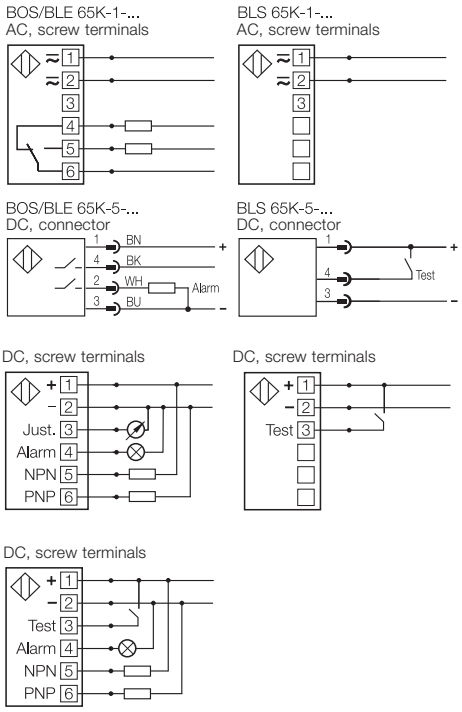
Range measured using side approach with reflector.

Through-beam BLE/BLS 65K-...



For the through-beam the maximum possible offset between emitter and receiver is measured.

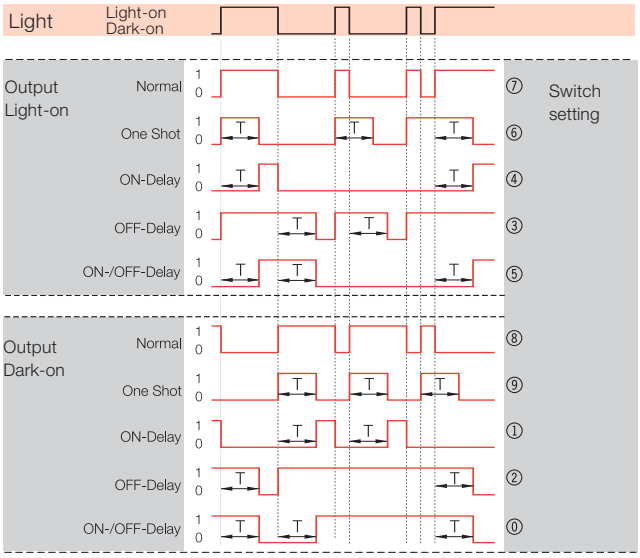
Wiring diagrams





Access to the operating elements by removing the cover (rear).

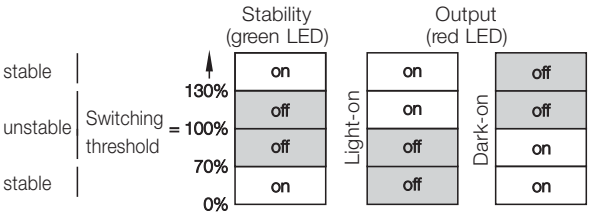
Programmable time functions



Green stability display

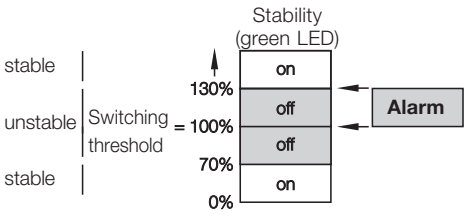
The “threshold energy”, which results in a signal change on output, is defined as 100 %.
The switching state is considered stable when the input energy exceeds or falls below the “threshold energy” by 30 %. The green LED illuminates.

The “safe” range is therefore reached when
- the input signal exceeds at least 130% of the threshold energy
- the input signal falls below at least 70 % of the threshold energy.



Alarm output for receiver, diffuse and retroreflective (DC)

The alarm output (PNP 200 ma) for DC versions generates a warning signal for malfunctions due to contamination or mechanical maladjustment.
The alarm output is activated if the signal received remains in the alarm range for at least 3 s.



Test input for emitter, diffuse and retroreflective (DC)

The test input interrupts the light pulses from the emitter and thereby allows it to be tested for function.
When using the test input the input must be set to 10...30 V.
The output must change every time there is 10...30 V DC on the test input.

Contamination or maladjustment on the optical axis causes the emitter signal to reach the receiver only weakly, if at all.
Therefore the output will not change even though the test input is activated. The test function provides a remote check of the through-beam type and serves as a preventive system check.

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Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Recommended accessories
please order separately



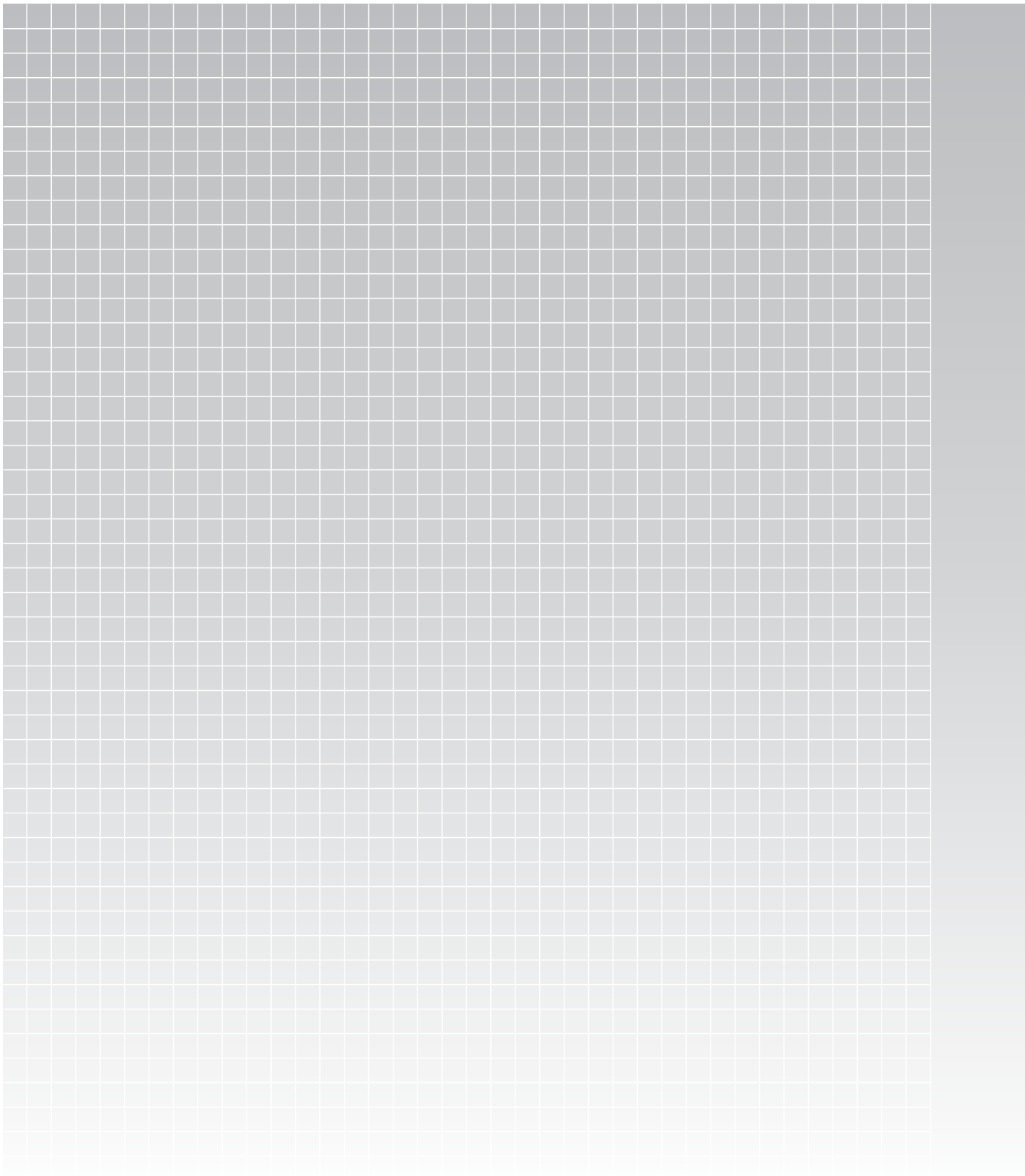
Reflector
BOS R-1

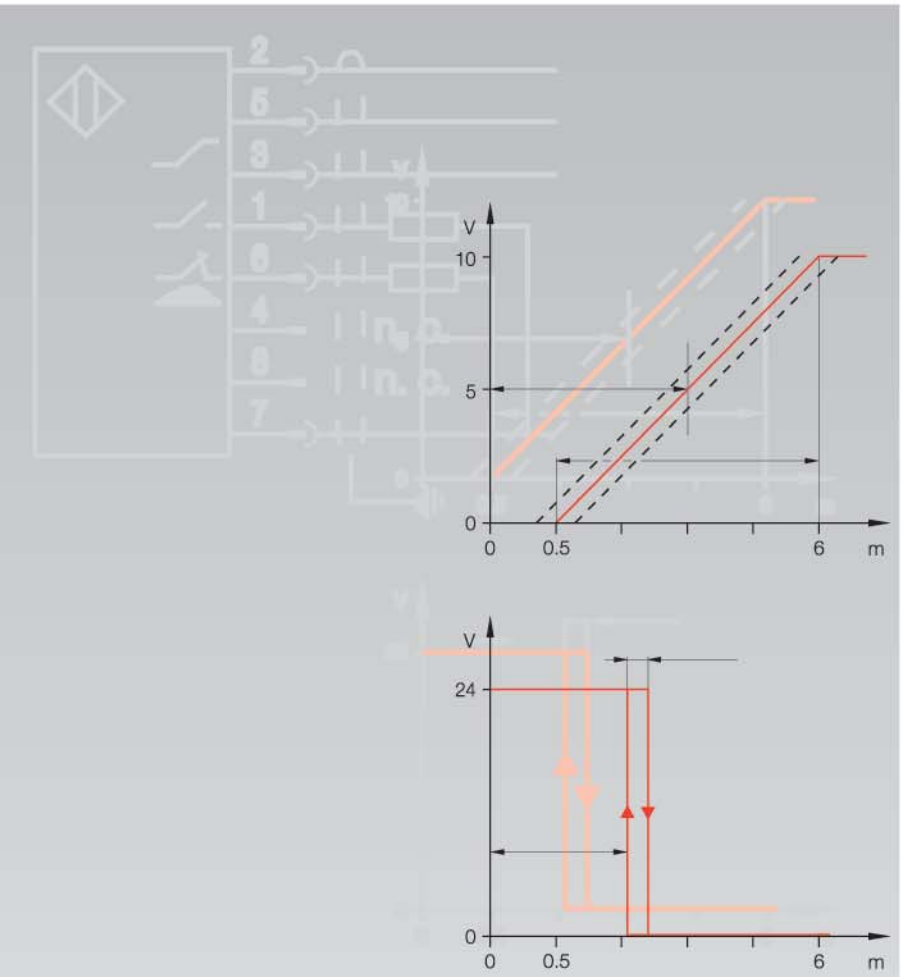


Mounting bracket
BOS 65-HW-1



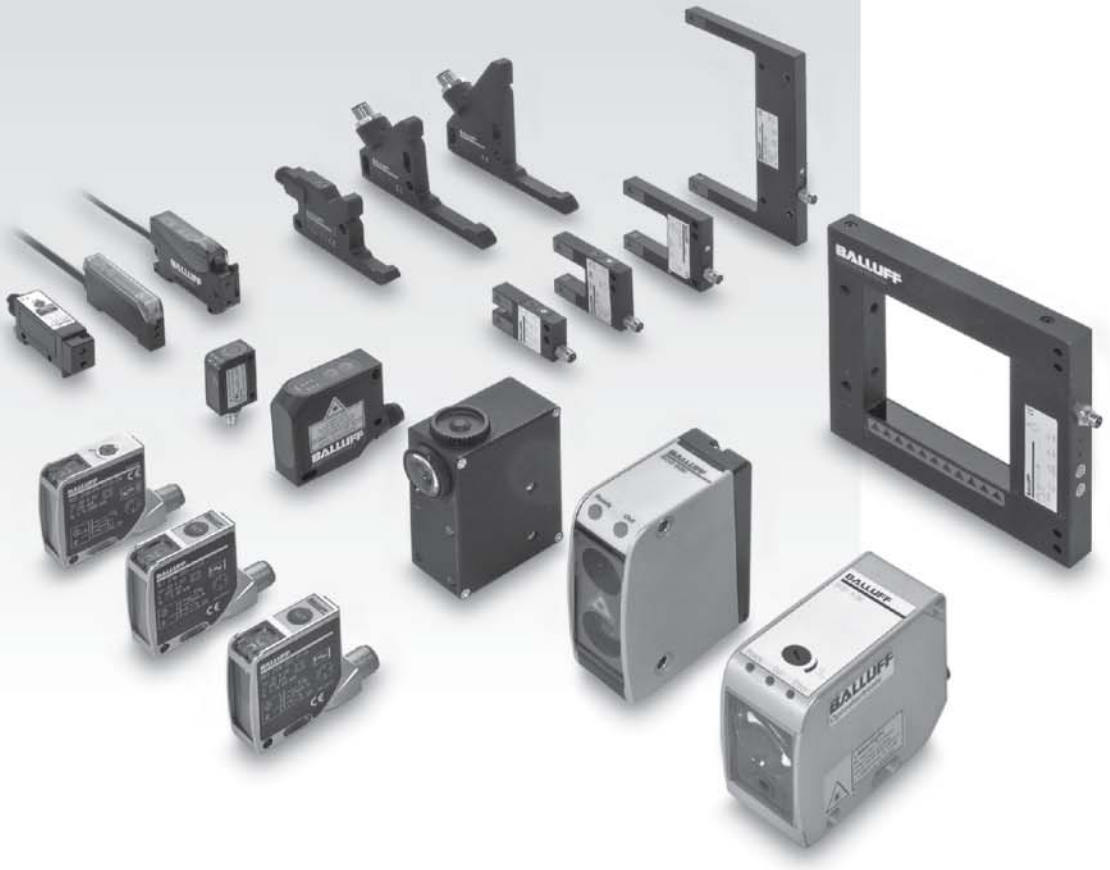
Connector
BKS-_ 19/BKS-_ 20





Photoelectric Sensors for Special Applications

2.2.2 **BFB/BOS**
Fiber optic base units
2.2.16 **BFO**
Plastic fiber optics
2.2.26 **BFO 18**
Glass fiber optics
2.2.32 **BOD**
Distance sensors
2.2.54 **BKT**
Contrast sensor
2.2.66 **BLT**
Luminescence sensor
2.2.76 **BFS**
Color sensors
2.2.82 **BGL**
Laser slot sensors
2.2.92 **BWL**
Angle sensors
2.2.100 **BOWA**
Dynamic optical windows
2.2.104 **BLG**
Light grids



When there's no space for a photoelectric sensor, there is only one solution: user fiber optics!

If there are no particular demands for toughness an ambient temperature or chemical resistance, then plastic fiber optics are the right choice.

A wide range of special base units with various performance and function features is available when using the fiber optics. From the simple version with potentiometer to the high-end unit with display.

Applications

- Small parts detection
- Suitable for tight mounting conditions
- Inspecting parts features
- Counting (e.g. counting drops)
- Precise parts positioning
- Assembly and handling
- Robotics

BFB 75K...



BOS 6K...



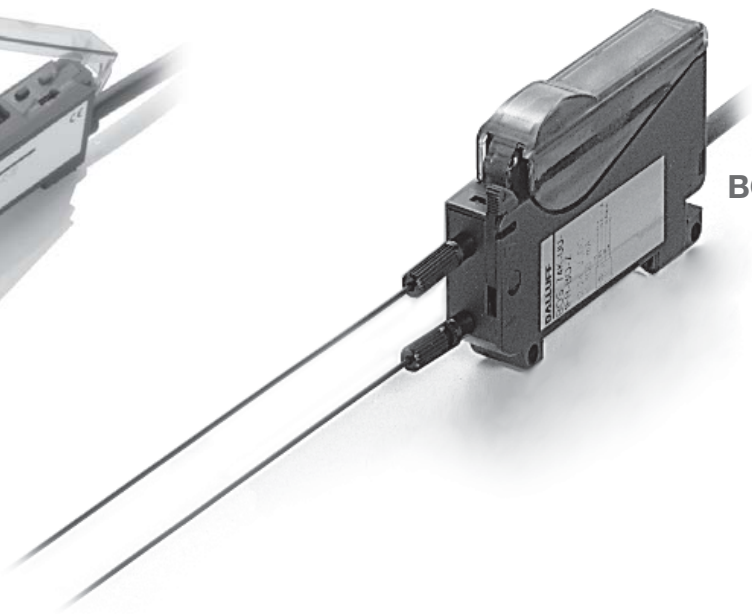
BOS 18KF...



BOS 73K...



BOS 74K...



Type	Light type		Output				Output function		Switching frequency	U_B		Connection				Special features		Page
	Red light		PNP-Transistor	NPN-Transistor	Analog output	Alarm output	Light-on	Dark-on		10...30 V DC	11...26 V DC	M8 connector, 3-pin	M8 connector, 4-pin	M12 connector, 4-pin	Cable	Teach-in	Display	
Fiber optic base units																		
BFB 75K-001-P-S75	■		■				■	■	1.5 kHz	■			■			■		**2.2.**5
BFB 75K-001-N-S75	■			■			■	■	1.5 kHz	■			■			■		**2.2.**5
BFB 75K-001-P-02	■		■				■	■	1.5 kHz	■					■	■		**2.2.**5
BFB 75K-001-N-02	■			■			■	■	1.5 kHz	■					■	■		**2.2.**5
BFB 75K-002-P-S75	■		■				■	■	8 kHz	■			■			■	■	**2.2.**7
BFB 75K-002-N-S75	■			■			■	■	8 kHz	■			■			■	■	**2.2.**7
BFB 75K-003-P-02	■		■		■		■	■	8 kHz	■					■	■	■	**2.2.**7
BFB 75K-003-N-02	■			■	■		■	■	8 kHz	■					■	■	■	**2.2.**7
BOS 73K-PU-1FR-C-02	■		■			■	■	■	1 kHz		■		■			■	■	**2.2.**9
BOS 73K-PU-1FR-C-S75-00,1	■		■			■	■	■	1 kHz		■				■	■	■	**2.2.**9
BOS 74K-UU-1FR-B0-Z-S49-00,2	■		■	■			■	■	1 kHz	■		■						**2.2.**11
BOS 74K-UU-1FR-B0-Z-02	■		■	■		■	■	■	1 kHz	■					■			**2.2.**11
BOS 74K-UU-1FS-B0-Z-02	■		■	■		■	■	■	8 kHz	■					■			**2.2.**11
BOS 6K-PU-1FR-S75-C	■		■				■	■	1 kHz	■			■			■		**2.2.**13
BOS 6K-PU-1FR-C-02	■		■				■	■	1 kHz	■					■	■		**2.2.**13
BOS 6K-NU-1FR-S75-C	■			■			■	■	1 kHz	■			■			■		**2.2.**13
BOS 6K-NU-1FR-C-02	■			■			■	■	1 kHz	■					■	■		**2.2.**13
BOS 18KF-PA-1FR-S4-C	■		■				■	■	1 kHz	■				■				**2.2.**15
BOS 18KF-PA-1FR-C-02	■		■				■	■	1 kHz	■					■			**2.2.**15
BOS 18KF-NA-1FR-S4-C	■			■			■	■	1 kHz	■				■				**2.2.**15
BOS 18KF-NA-1FR-C-02	■			■			■	■	1 kHz	■					■			**2.2.**15

2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

The **BFB 75K-001…** is considered the basic model of the new series of fiber optic base units **BFB 75K** for DIN rail mount.
As an economical sensor it is ideally suited for standard applications.
Ease of setting using a teach-in procedure on the sensor or via an external teach line make the sensor especially user-friendly.

Features

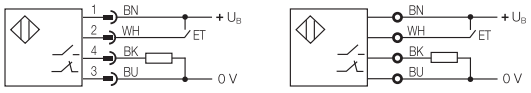
- Red light
- Teach-in
- Connector and cable versions



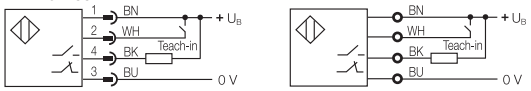
Mounting notes for fiber optics
The resistance of the sealing ring must be overcome when connecting the fiber optics to the base unit.

Wiring diagrams

BFB 75K-001-P



BFB 75K-001-N



Control panel

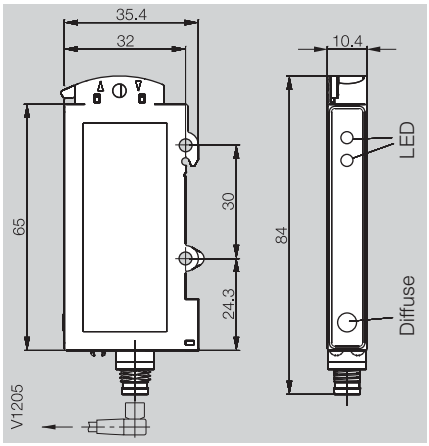


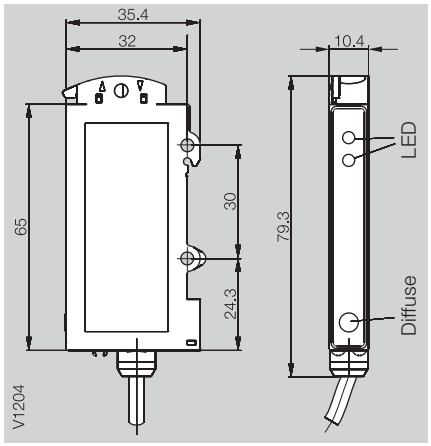
Recommended accessories
please order separately



Connector
BKS-S 74/BKS-S 75

Series	BFB 75K	BFB 75K
Plastic fiber optic base unit	for plastic fiber optics with outside diameter 2.2 mm	for plastic fiber optics with outside diameter 2.2 mm
Sensing distance/range	depends on fiber optic cable	depends on fiber optics





Base unit		
PNP	BFB 75K-001-P-S75	BFB 75K-001-P-02
NPN	BFB 75K-001-N-S75	BFB 75K-001-N-02
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	≤ 10 %	≤ 10 %
No-load supply current I_0 max.	≤ 20 mA	≤ 20 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	100 mA	100 mA
Voltage drop U_d at I_e	≤ 1.5 V	≤ 1.5 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	660 nm	660 nm
Light spot diameter	depends on fiber optics	depends on fiber optics
Time data		
Response time		
Switching frequency f	1.5 kHz	1.5 kHz
Indicators		
Power-on indicator	LED green	LED green
Switching state indicator	LED yellow	LED yellow
Mechanical data		
Connection	M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	ABS	ABS
Optical surface	depends on fiber optic cable	depends on fiber optic cable
Weight	20 g	50 g
Ambient data		
Degree of protection per IEC 60529	IP 64	IP 64
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–20...+60 °C	–20...+60 °C

Connector orientation

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2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

The BFB **75K-002...** offers perfect performance as a high-end amplifier with 12-bit resolution, a 4-digit display and a switching frequency of up to 8 kHz. Various operating modes such as Fine or High Distance allows the sensor to be better adapted to the respective application. Configurable time functions, window programming and fine adjustment of a switching point round out the sensor.

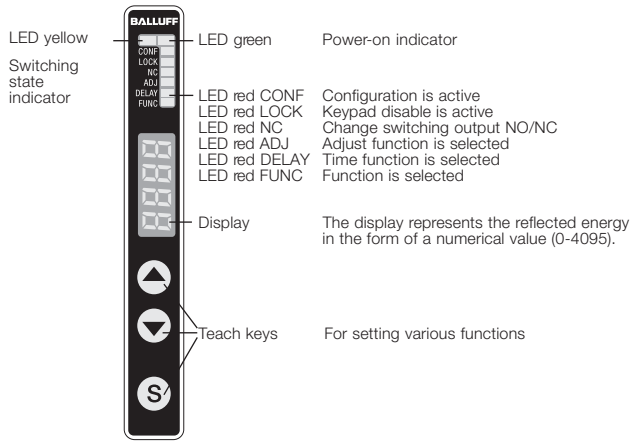
An additional analogue output makes the **BFB 75K-003...** version a great all-rounder. It provides an output signal proportional to remission or to the distance from the target. All functions of the BFB 75K-02 are also included.



Operating mode	Standard	High Resolution	High switching frequency	Long range
Sensing distance*	150 mm	70 mm	70 mm	300 mm
Switching frequency	1 kHz	125 Hz	8 kHz	125 Hz

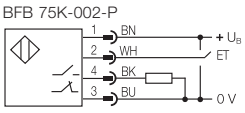
*depending on fiber optics used

Control panel

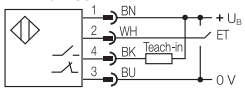


Wiring diagrams

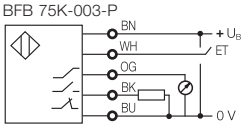
BFB 75K-002-P



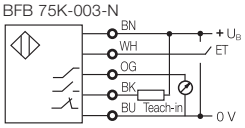
BFB 75K-002-N



BFB 75K-003-P



BFB 75K-003-N



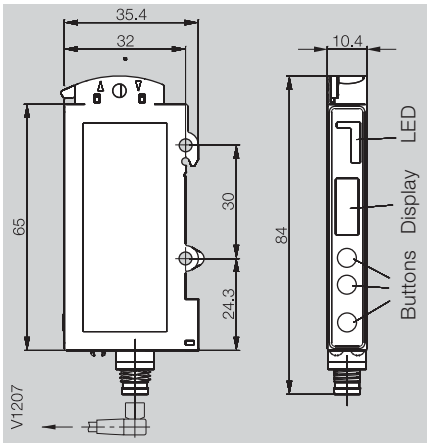
Recommended accessories

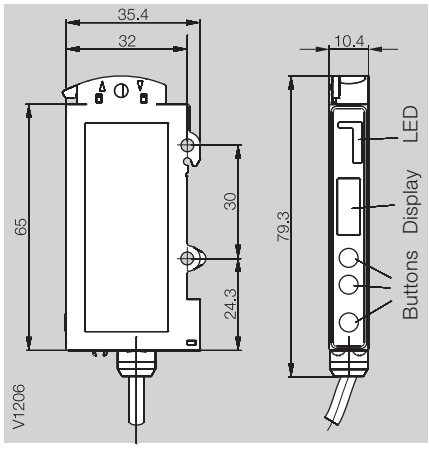
please order separately



Connector
BKS-S 74/BKS-S 75

Series		BFB 75K	BFB 75K
Plastic fiber optic base unit		for plastic fiber optics with outside diameter 2.2 mm	for plastic fiber optics with outside diameter 2.2 mm
Sensing distance/range		depends on fiber optics	depends on fiber optics





Base unit			
PNP		BFB 75K-002-P-S75	BFB 75K-003-P-02
NPN		BFB 75K-002-N-S75	BFB 75K-003-N-02
Electrical data			
Supply voltage U_B		10...30 V DC	10...30 V DC
Ripple		≤ 10 %	≤ 10 %
No-load supply current I_0 max.		≤ 25 mA	≤ 25 mA
Analog output			**0...10 V (max. 2 mA)**
Switching output		PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type		Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current		100 mA	100 mA
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V
Settings		Teach-in	Teach-in
Optical data			
Emitter, light type		LED, red light	LED, red light
Wavelength		630 nm	630 nm
Light spot diameter		depends on fiber optics	depends on fiber optics
Time data			
Switching frequency f	Standard	1 kHz	1 kHz
	Fast Mode	8 kHz	8 kHz
Time function		On- and/or off-delay	On- and/or off-delay
		1...2000 ms adjustable	1...2000 ms adjustable
Indicators			
Power-on indicator		LED green	LED green
Switching state indicator		LED yellow	LED yellow
Status indicator		6× LED red	6× LED red
Display		4-digit	4-digit
Mechanical data			
Connection		M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section			5×0.14 mm²
Housing material		ABS	ABS
Optical surface		depends on fiber optic cable	depends on fiber optic cable
Weight		20 g	50 g
Ambient data			
Degree of protection per IEC 60529		IP 64	IP 64
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–20...+60 °C	–20...+60 °C

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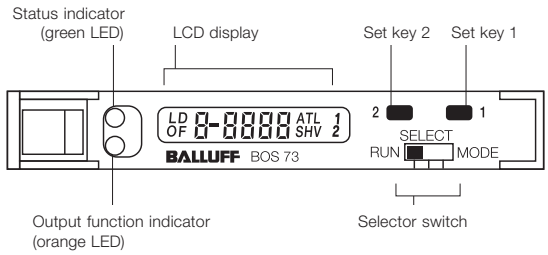
The **BOS 73K** with indicators simplifies operation of the sensor and gives an accurate overview of the settings. The display shows sensitivity, signal strength as well as ancillary functions. The switching point and hysteresis can be automatically acquired but also manually set. The powerful red light emitter permits very long sensing distances and ranges.
A switching and alarm output is also provided, and time functions can also be set.
Two transmission channels are provided for using multiple sensors without mutual interference.

Features

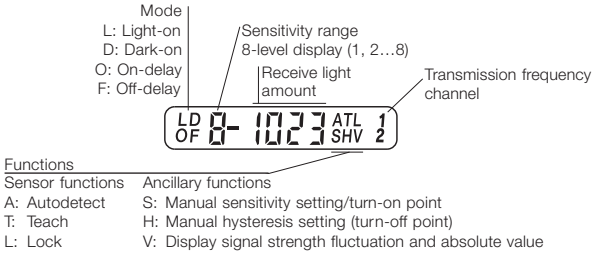
- LCD display with backlighting
- Teach-in calibration
- Powerful red light emitter for long ranges
- Contamination output
- All time functions can be set from 10…120 ms
- Two transmission channels



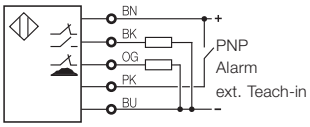
Control panel

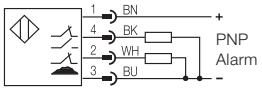


Display



Wiring diagrams



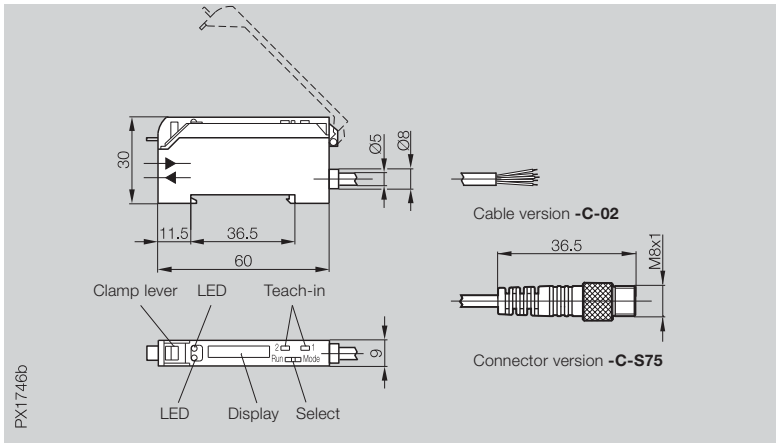


Recommended accessories
please order separately



Connector
BKS-S 74/BKS-S 75

Series	BOS 73K
Plastic fiber optic base unit	for plastic fiber optics with outside diameter 2.2 mm
Sensing distance/range	depends on fiber optics



Base unit

PNP		BOS 73K-PU-1FR-C-02	BOS 73K-PU-1FR-C-S75-00,1
Electrical data			
Supply voltage U_B		11...26 V DC	
Ripple		≤ 10 %	
No-load supply current I_0 max.		≤ 50 mA	
Switching output		PNP-Transistor, open collector	
Switching type		Light-/dark-on (selectable)	
Output current	Switching output	100 mA	
	Alarm output	50 mA	
Voltage drop U_d at I_e		≤ 2 V	
Settings		teach-in/manually using buttons	
Optical data			
Emitter, light type		LED, red light	
Wavelength		660 nm	
Light spot diameter		depends on fiber optics	
Time data			
Response time		Channel 1: 0.5 ms Channel 2: 0.6 ms	
Switching frequency f (standard)		Channel 1: 1 kHz Channel 2: 833 kHz	
Time function		On- and/or off-delay 10…120 ms selectable	
Indicators			
Output function indicator		LED orange	
Stability indicator		LED green	
Display		Backlit LCD	
Mechanical data			
Connection		2 m cable, PVC	M8 connector, 4-pin
No. of wires × cross-section		5×0.2 mm²	
Housing material		PC	
Optical surface		depends on fiber optic cable	
Weight (incl. holder)		80 g	
Ambient data			
Degree of protection per IEC 60529		IP 54	
Polarity reversal protected		yes	
Short circuit protected		yes	
Ambient temperature range T_a		–25...+55 °C	
Ambient light rejection		Artificial light ≤ 10 kLux, sunlight ≤ 20 kLux	

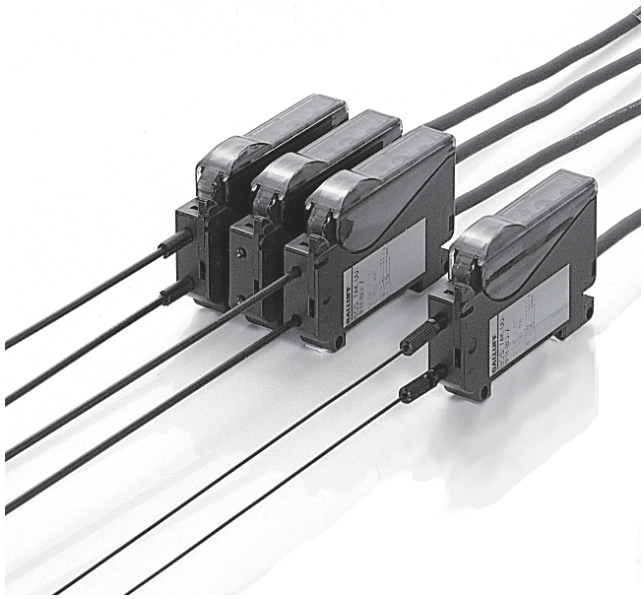
Mounting materials included!

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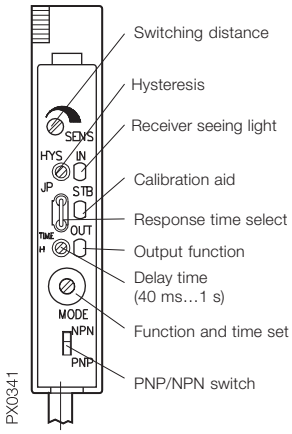
The **BOS 74K** offers maximum performance and adjusting flexibility (time functions, switching hysteresis) in various models for mastering even difficult applications.

Features

- Extended range
- 12-turn potentiometer for sensitivity setting
- Contamination indicator and alarm output
- Adjustable switching hysteresis
- Time functions (can be set from 40 ms…1 s)
- High-frequency version available (8 kHz)



Indicators and operating elements



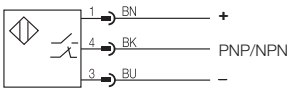
BOS 74K function table

Position	KV	EV	AV	WF	HS	DS	AE	AA
0			■			■	■	
1				■		■	■	
2	■					■	■	
3		■				■	■	
4			■		■		■	
5				■	■		■	
6	■				■		■	
7		■			■		■	
8			■			■		■
9				■		■		■
A	■					■		■
B		■				■		■
C			■		■			■
D				■	■			■
E	■				■			■
F		■			■			■

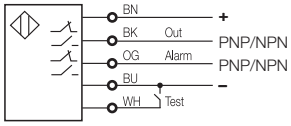
Function
KV: No delay
EV: On-delay
AV: Off-delay
WF: Wipe function
HS: Light-on
DS: Dark-on
AE: Alarm output NO
AA: Alarm output normally closed
■: Enabled

Wiring diagrams

BOS 74K...S49-0,2



BOS 74K...Z-02



Recommended accessories
please order separately

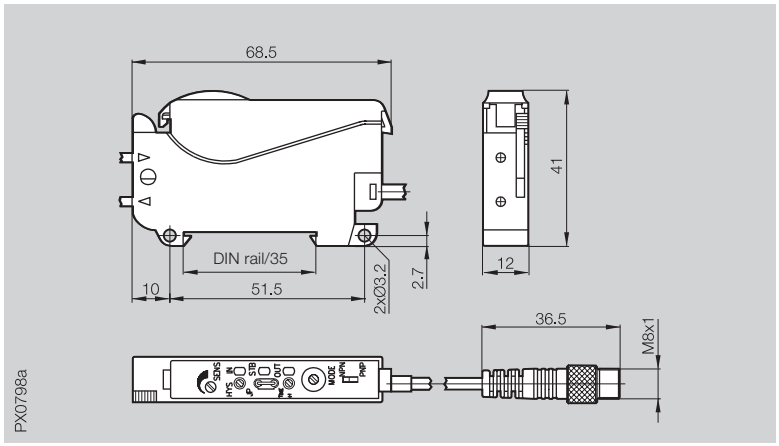


Mounting bracket
BOS 74-HW-1



Connector
BKS-_ 48/BKS-_ 49

Series	BOS 74K	BOS 74K	BOS 74K
Plastic fiber optic base unit	for plastic fiber optics with outside diameter 2.2 mm	for plastic fiber optics with outside diameter 2.2 mm	for plastic fiber optics with outside diameter 2.2 mm
Sensing distance/range	depends on fiber optic cable	depends on fiber optic cable	depends on fiber optic cable



Base unit

PNP/NPN		BOS 74K-UU-1FR-B0-Z-S49-00,2	BOS 74K-UU-1FR-B0-Z-02	
PNP/NPN	High-speed*			BOS 74K-UU-1FS-B0-Z-02
Electrical data				
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Ripple		≤ 10 %	≤ 10 %	≤ 10 %
No-load supply current I_0 max.		≤ 40 mA	≤ 40 mA	≤ 40 mA
Switching output		PNP and NPN Transistor	PNP and NPN Transistor	PNP and NPN Transistor
Switching type		Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	Switching output	200 mA	200 mA	200 mA
	Alarm output		50 mA	50 mA
Voltage drop U_d at I_e		≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
Settings		12-turn potentiometer	12-turn potentiometer	12-turn potentiometer
Help functions			Test input	Test input
Optical data				
Emitter, light type		LED, red light	LED, red light	LED, red light
Wavelength		660 nm	660 nm	660 nm
Light spot diameter		depends on fiber optic cable	depends on fiber optic cable	depends on fiber optic cable
Time data				
Response time		≤ 500 µs	≤ 500 µs	≤ 60 µs
Switching frequency f		1 kHz	1 kHz	8 kHz
Time functions		On-/off-delay selectable 40 ms…1 s	On-/off-delay selectable 40 ms…1 s	On-/off-delay selectable 40 ms…1 s
Indicators				
Output function indicator		LED red	LED red	LED red
Stability indicator		LED green	LED green	LED green
Receive indicator		LED yellow	LED yellow	LED yellow
Mechanical data				
Connection		0,2 m cable with M8 connector, 3-pin	2 m cable, PVC	2 m cable, PVC
No. of wires × cross-section			5×0.25 mm²	5×0.25 mm²
Housing material		PBT	PBT	PBT
Optical surface		depends on fiber optics	depends on fiber optics	depends on fiber optics
Weight		50 g	125 g	125 g
Ambient data				
Degree of protection per IEC 60529		IP 66	IP 66	IP 66
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Ambient light rejection		10 kLux	10 kLux	10 kLux
Ambient temperature range T_a		–10...+60 °C	–10...+60 °C	–10...+60 °C

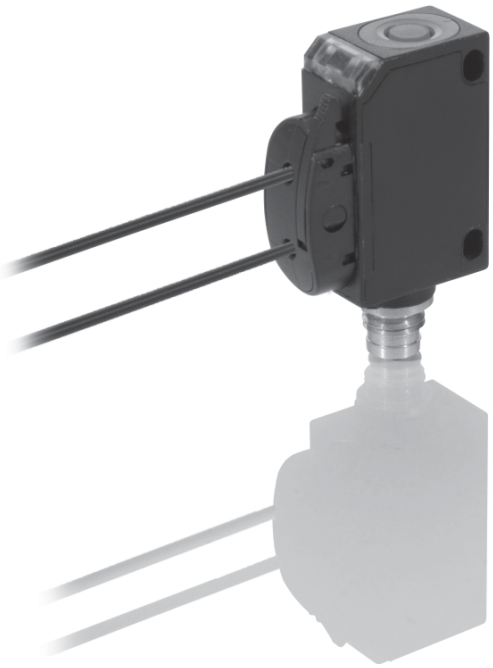
*Range reduced by 30 %

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Series **BOS 6K** has been expanded to add a fiber optic base unit. The familiar teach-in concept has also been retained here. Together with the Series BFO fiber optics, an enclosure rating of IP 67 is provided.

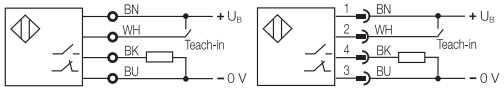
Features

- Teach-in
- Contamination indicator
- Control line for ext. Teach-in
- Key disable

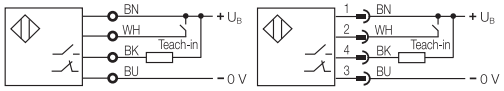


Wiring diagrams

BOS 6K-PU-...



BOS 6K-NU-...



Recommended accessories
please order separately

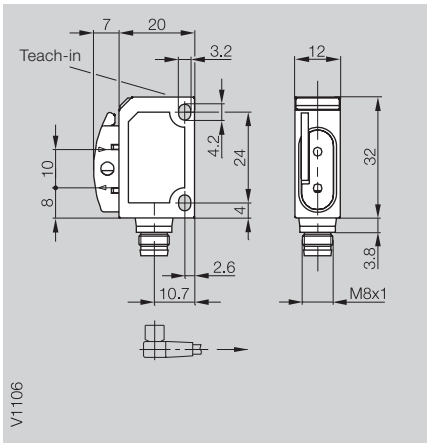


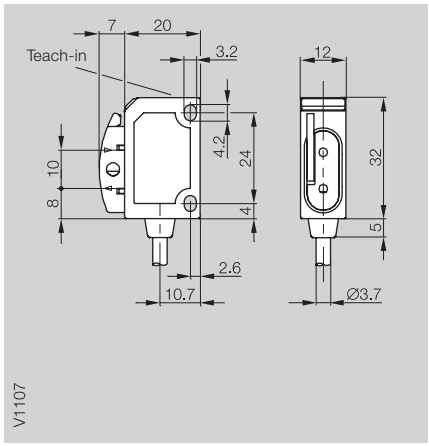
Mounting bracket
BOS 6-HW-1



Connector
BKS-S 74/BKS-S 75

Series	BOS 6K	BOS 6K
Plastic fiber optic base unit	for plastic fiber optics with outside diameter 2.2 mm	for plastic fiber optics with outside diameter 2.2 mm
Sensing distance/range	depends on fiber optics	depends on fiber optics





Base unit		
PNP	BOS 6K-PU-1FR-S75-C	BOS 6K-PU-1FR-C-02
NPN	BOS 6K-NU-1FR-S75-C	BOS 6K-NU-1FR-C-02
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	≤ 15 % of U_B	≤ 15 % of U_B
No-load supply current I_0 max.	≤ 25 mA	≤ 25 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	100 mA	100 mA
Voltage drop U_d at I_e	≤ 2.4 V	≤ 2.4 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	660 nm	660 nm
Light spot diameter	depends on range/sensing distance	depends on range/sensing distance
Time data		
Response time	0.5 ms	0.5 ms
Switching frequency f	1 kHz	1 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Stability indicator	LED green	LED green
Mechanical data		
Connection	M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	ABS	ABS
Lens material	depends on fiber optic cable	depends on fiber optic cable
Weight	10 g	40 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–20...+60 °C	–20...+60 °C

Connector orientation

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2.3
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Connectors ... page 5.2 ...

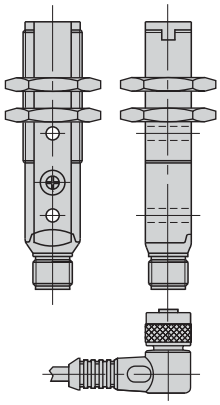
The **BOS 18KF** fiber optic base unit represents a further addition to the Balluff standard series.
Ease of operation and installation make this sensor a highlight, with the practical feature of DIN rail mounting.

Features

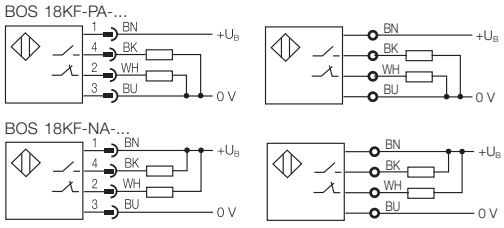
- Sensitivity setting with a 270° potentiometer
- Cover nut for fiber optic cable adapting



Connector orientation



Wiring diagrams



Recommended accessories
please order separately



Mounting clamp
BOS 18,0-KB-1

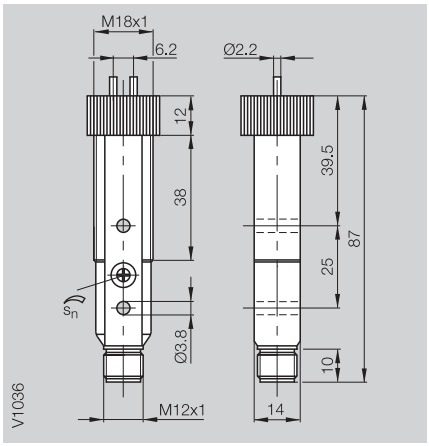


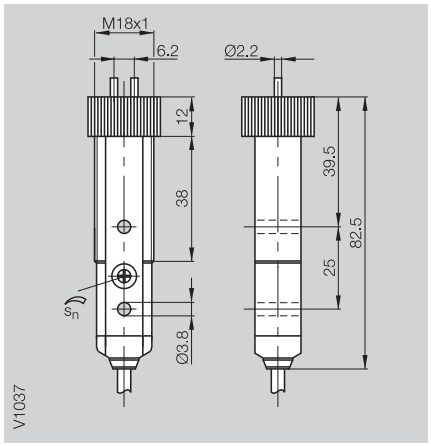
Mounting bracket
BES 18-HW-1



Connector
BKS-_ 19/BKS-_ 20

Series	BOS 18KF	BOS 18KF
Plastic fiber optic base unit	for plastic fiber optics with outside diameter 2.2 mm	for plastic fiber optics with outside diameter 2.2 mm
Sensing distance/range	depends on fiber optics	depends on fiber optics





Base unit		
PNP	BOS 18KF-PA-1FR-S4-C	BOS 18KF-PA-1FR-C-02
NPN	BOS 18KF-NA-1FR-S4-C	BOS 18KF-NA-1FR-C-02
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	≤ 2 V	≤ 2 V
No-load supply current I_0 max.	≤ 35 mA	≤ 35 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type	Light- and dark-on	Light- and dark-on
Output current	100 mA	100 mA
Voltage drop U_d at I_e	≤ 2 V	≤ 2 V
Settings	Potentiometer 270°	Potentiometer 270°
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	660 nm	660 nm
Light spot diameter	depends on range/sensing distance	depends on range/sensing distance
Time data		
Response time	0.5 ms	0.5 ms
Switching frequency f	1 kHz	1 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Stability indicator	LED green	LED green
Mechanical data		
Connection	M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	PBT	PBT
Lens material	depends on fiber optic cable	depends on fiber optic cable
Weight	25 g	75 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–25...+55 °C	–25...+55 °C

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There are basically two types of fiber optics: diffuse or through-beam.
The diffuse models have an integrated emitter and receiver at the cable end.
The through-beams use two separate cables.

It's easy to see why fiber optics are so commonly used: The variety of end configurations, with straight or angled light exit, flexible optical head or coaxial fibers, the various fiber diameters and the ability to trim them to the desired length.

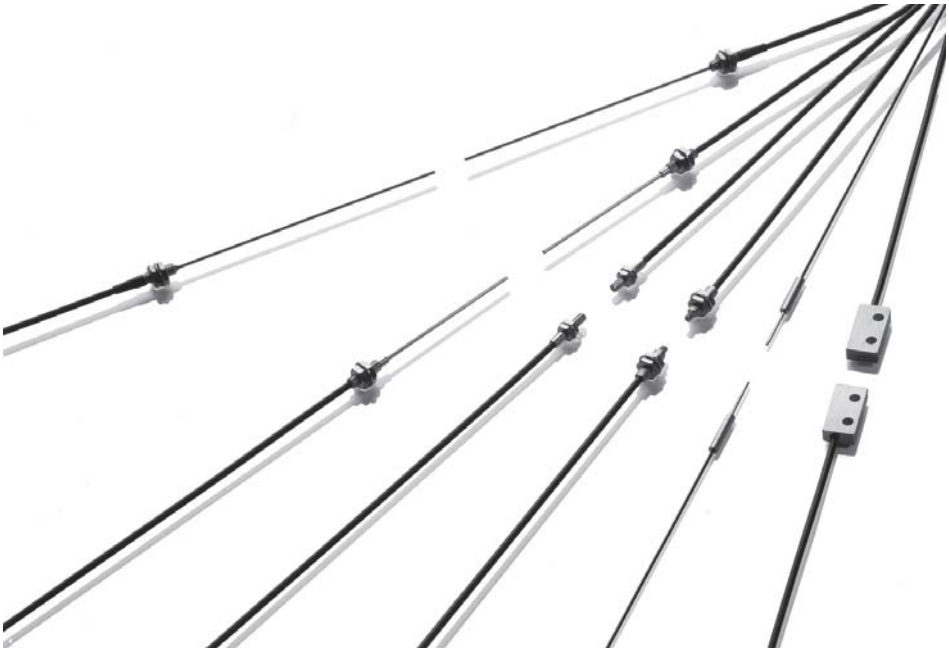
Another plus

For the ultimate in flexibility, fiber optics for user assembly are also available: any desired combinations are possible with the trim-to-length duplex cable and various end fittings.

Applications

- Small parts detection
- For tight mounting spaces
- Checking small parts features
- Counting (e.g. counting drops)
- Precise parts positioning
- Handling and assembly
- Robotics

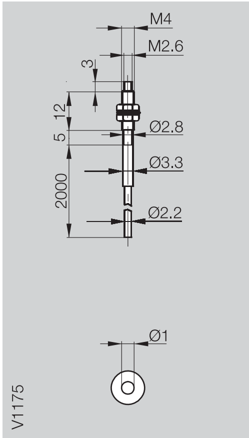


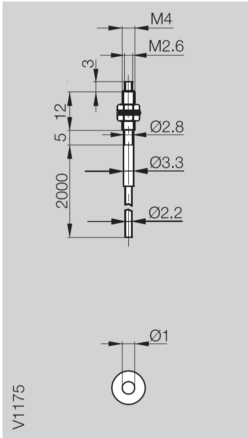


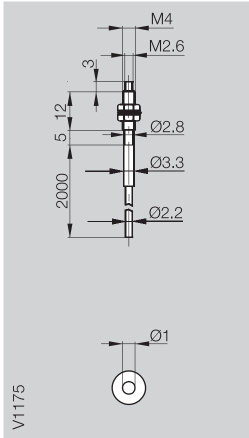
Type	Optical head	Light exit		Fiber arrangement			Core diameter				Features			Page
		Straight	90°	Standard	Coaxial	Light grid	1.5 mm	1.0 mm	0.5 mm	0.25 mm	Bendable optical tip	Extended temperature range	Highly flexible	
Through-beam fiber optics														
BFO D22-LA-KB-EAK-10-02	M4	■		■				■						**2.2.**18
BFO D22-LAH-KB-EAK-10-02	M4	■		■				■					■	**2.2.**18
BFO D22-LAT-KB-EAK-10-02	M4	■		■				■				■		**2.2.**18
BFO D22-LAP-KB-EAK-15-02	M4	■		■			■							**2.2.**19
BFO D22-LAS-EB-EAK-10-02	M4	■		■				■						**2.2.**19
BFO D22-LA-TB-EAK-10-02	M4	■		■				■			■			**2.2.**19
BFO D22-LA-NB-PZK-10-02	M4	■		■				■			■			**2.2.**19
BFO D22-LA-RB-EAK-10-02	M3	■		■				■						**2.2.**18
BFO N22-LA-FB-EAK-05-01	M2	■		■					■					**2.2.**18
BFO D10-LA-CB-EAK-05-02	Ø2	■		■					■					**2.2.**18
BFO D22-LA-QB-PAK-05-02	Ø3		■	■				■						**2.2.**19
BFO D13-LA-QB-EAK-05-02	Ø3		■	■					■					**2.2.**19
BFO D13-LA-WB-EAK-05-02	Ø2		■	■				■						**2.2.**19
BFO D22-LA-AD-EAK-52-02	20×10	■				■				■				**2.2.**20
BFO D22-LA-BD-EAK-52-02	15×15		■			■				■				**2.2.**20
BFO D25-LA-CD-EAK-110-02	19×25	■				■				■				**2.2.**20
BFO D25-LA-ED-EAK-250-02	19×38		■			■				■				**2.2.**20
BFO D13-LG-05-EAK-30-02	15×41		■							■				**2.2.**20
BFO D13-LG-10-EAK-30-02	20×32		■							■				**2.2.**20
Diffuse fiber optics														
BFO D22-XA-LB-EAK-20-02	M6	■		■				■						**2.2.**22
BFO D22-XAH-LB-EAK-20-02	M6	■		■				■					■	**2.2.**22
BFO D22-XAT-LB-EAK-20-02	M6	■		■				■				■		**2.2.**22
BFO D22-XAP-LB-EAK-30-02	M6	■		■			■							**2.2.**23
BFO D22-XA-DB-EAK-20-01	M6	■		■				■						**2.2.**23
BFO D22-XB-LB-EAK-15-02	M6	■			■			■						**2.2.**23
BFO D22-XBF-LB-EAK-15-02	M6	■			■			■					■	**2.2.**23
BFO D22-XA-SB-EAK-20-02	M6	■		■				■			■			**2.2.**23
BFO D22-XA-UB-EAK-20-02	M4	■		■				■						**2.2.**22
BFO D22-XB-UB-EAK-15-02	M4	■			■			■						**2.2.**22
BFO D13-XB-KB-EAK-10-02	M4	■			■				■					**2.2.**22
BFO D10-XA-HB-EAK-10-02	M3	■		■					■		■			**2.2.**23
BFO D10-XA-RB-EAK-10-02	M3	■		■					■					**2.2.**23
BFO D13-XB-RB-EAK-10-02	M3	■			■				■					**2.2.**23
BFO D10-XA-GB-EAK-10-02	M3	■		■					■		■			**2.2.**23
BFO D13-XA-JB-EAK-20-02	Ø3	■		■				■						**2.2.**23
BFO D22-XA-MB-PAK-10-02	Ø3		■	■					■					**2.2.**24
BFO D22-XA-CD-EAK-110-02	19×25	■				■				■				**2.2.**24
BFO D22-XA-ED-EAK-250-02	19×38		■			■				■				**2.2.**24

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	BFO D22-LA-KB-EAK-10-02	BFO D22-LAH-KB-EAK-10-02	BFO D22-LAT-KB-EAK-10-02
Optical head	M4 thread	M4 thread	M4 thread
Features	Standard	Highly flexible	Temperature-rated
Ø Jacket	2.2 mm	2.2 mm	2.2 mm
Ø Core	1 mm	1 mm	1 mm

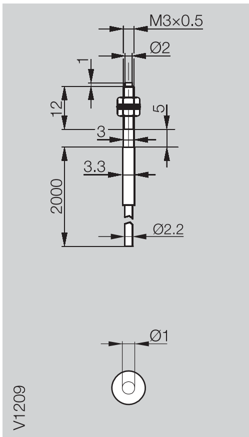


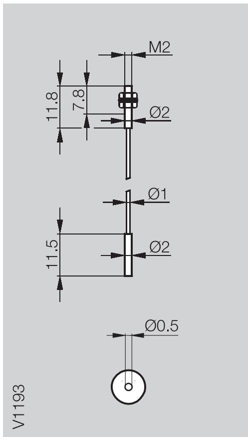


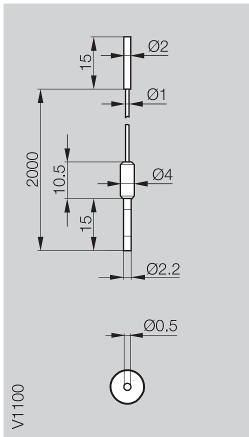


Ordering code		BFO D22-LA-KB-EAK-10-02	BFO D22-LAH-KB-EAK-10-02	BFO D22-LAT-KB-EAK-10-02
Fiber bending radius		≥ 25 mm	≥ 2 mm	≥ 25 mm
Head bending radius				
Temperature range		–55...+70 °C	–40...+70 °C	–55...+115 °C
Range	with BFB 75K-001	500 mm	400 mm	600 mm
	with BFB 75K-002**	500 mm	400 mm	600 mm
	with BOS 73K	500 mm	400 mm	500 mm
	with BOS 74K*	220 mm	190 mm	220 mm
	with BOS 6K	220 mm	200 mm	230 mm
	with BOS 18KF	120 mm	90 mm	120 mm

	BFO D22-LA-RB-EAK-10-02	BFO N22-LA-FB-EAK-05-01	BFO D10-LA-CB-EAK-05-02
Optical head	M3 thread	M2 thread	Ø 2 mm
Features	Standard	Precision	Precision
Ø Jacket	2.2 mm	1.0 mm	1.0 mm
Ø Core	1 mm	0.5 mm	0.5 mm

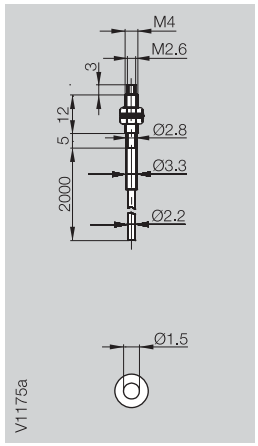
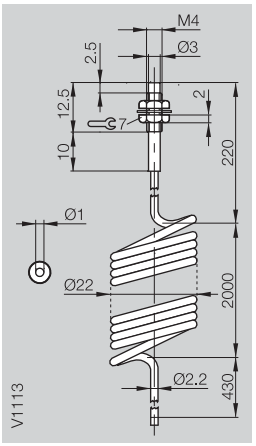
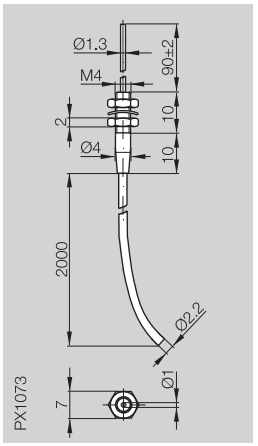
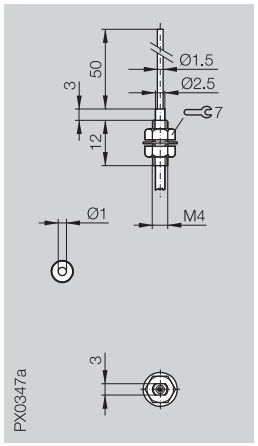
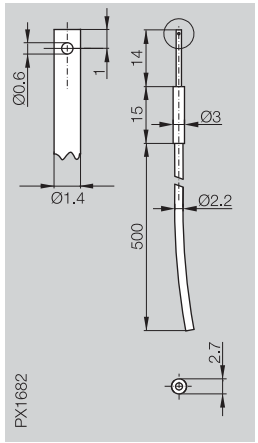
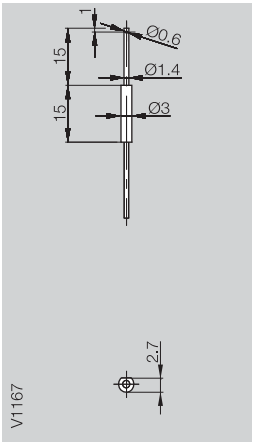
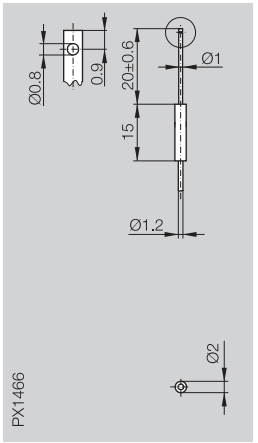






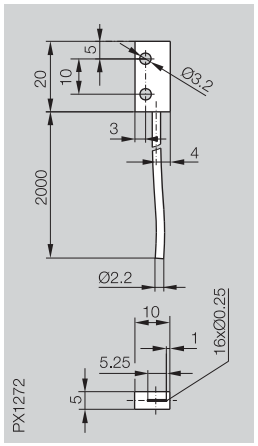
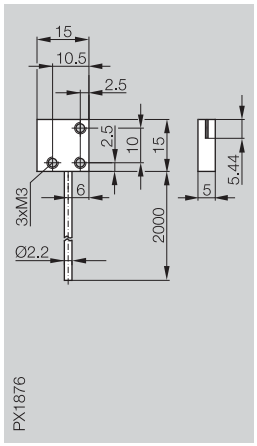
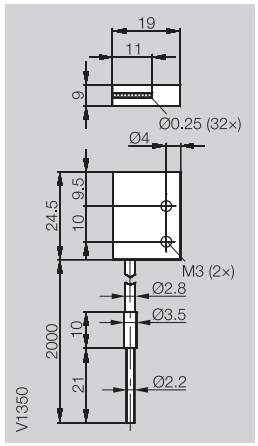
Ordering code		BFO D22-LA-RB-EAK-10-02	BFO N22-LA-FB-EAK-05-01	BFO D10-LA-CB-EAK-05-02
Fiber bending radius		≥ 25 mm	≥ 10 mm	≥ 15 mm
Temperature range		–55...+70 °C	–30...+60 °C	–55...+70 °C
Range	with BFB 75K-001	500 mm	140 mm	130 mm
	with BFB 75K-002**	500 mm	140 mm	130 mm
	with BOS 73K	450 mm	130 mm	120 mm
	with BOS 74K*	200 mm	60 mm	50 mm
	with BOS 6K	220 mm	50 mm	
	with BOS 18KF	100 mm	20 mm	

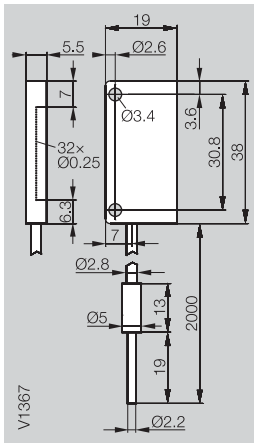
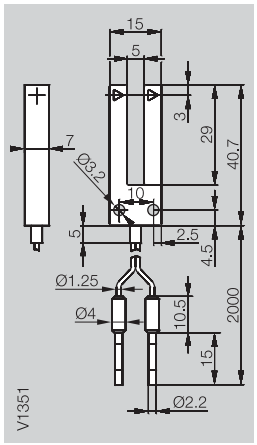
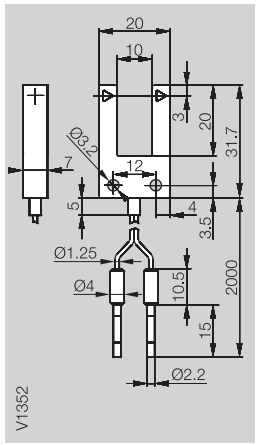
*When using base unit BOS 74K-UU-1FS-.. the sensing distance is reduced by 30 %.
**Range in Standard Mode.

M4 thread	M4 thread	M4 thread	M4 thread	
Long range	Spiral fibers	Bendable optical tip	Bendable optical tip	
2.2 mm	2.2 mm	2.2 mm	2.2 mm	
1.5 mm	1 mm	1 mm	1 mm	
				
BFO D22-LAP-KB-EAK-15-02	BFO D22-LAS-EB-EAK-10-02	BFO D22-LA-TB-EAK-10-02	BFO D22-LA-NB-PZK-10-02	
≥ 40 mm	≥ 25 mm	≥ 25 mm	≥ 25 mm	
		≥ 10 mm	≥ 10 mm	
–55...+70 °C	–30...+60 °C	–30...+60 °C	–55...+70 °C	
800 mm	400 mm	450 mm	500 mm	
800 mm	400 mm	450 mm	500 mm	
800 mm	350 mm	400 mm	500 mm	
500 mm	190 mm	200 mm	230 mm	
500 mm	190 mm	200 mm	250 mm	
250 mm	100 mm	110 mm	120 mm	
Ø 3 mm	Ø 3 mm	Ø 2 mm		
Light exit on side	Light exit on side	Light exit on side		
2.2 mm	1.3 mm	1.3 mm		
1 mm	1 mm	0.5 mm		
				
BFO D22-LA-QB-PAK-05-02	BFO D13-LA-WB-EAK-05-02	BFO D13-LA-QB-EAK-05-02		
≥ 25 mm	≥ 25 mm	≥ 15 mm		
–40...+70 °C	–40...+70 °C	–35...+65 °C		
120 mm	75 mm	110 mm		
120 mm	75 mm	110 mm		
115 mm	70 mm	105 mm		
60 mm	35 mm	50 mm		
65 mm				
35 mm	20 mm	25 mm		

One fiber optic cable each for remitter and receiver are included per packing unit.

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Optical head		20×10 mm	15×15 mm	19×25 mm
Features		Light grid	Light grid	Light grid
Jacket Ø		2.2 mm	2.2 mm	2.8 mm
Ø Core		16×0.25 mm	16×0.25 mm	32×0.25 mm
				
Ordering code		BFO D22-LA-AD-EAK-52-02	BFO D22-LA-BD-EAK-52-02	BFO D25-LA-CD-EAK-110-02
Fiber bending radius		≥ 25 mm	≥ 25 mm	≥ 60 mm
Temperature range		–35...+65 °C	–55...+70 °C	–55...+70 °C
Range	with BFB 75K-001	450 mm	400 mm	600 mm
	with BFB 75K-002**	450 mm	400 mm	600 mm
	with BOS 73K	400 mm	350 mm	600 mm
	with BOS 74K*	200 mm	210 mm	370 mm
	with BOS 6K	220 mm	180 mm	350 mm
	with BOS 18KF	130 mm	110 mm	230 mm

Optical head		19×38 mm	15×41 mm	20×32 mm
Features		Light grid	Fork	Fork
Ø Jacket		2.8 mm	2×1.25 mm	2×1.25 mm
Ø Core		32×0.25 mm	2×0.25 mm	2×0.25 mm
				
Ordering code		BFO D25-LA-ED-EAK-250-02	BFO D13-LG-05-EAK-30-02	BFO D13-LG-10-EAK-30-02
Fiber bending radius		≥ 60 mm	≥ 10 mm	≥ 10 mm
Temperature range		–55...+70 °C	–55...+70 °C	–55...+70 °C
Range	with BFB 75K-001	550 mm	5 mm	10 mm
	with BFB 75K-002**	550 mm	5 mm	10 mm
	with BOS 73K	550 mm	5 mm	10 mm
	with BOS 74K*	350 mm	5 mm	10 mm
	with BOS 6K	360 mm	5 mm	10 mm
	with BOS 18KF	210 mm	5 mm	10 mm

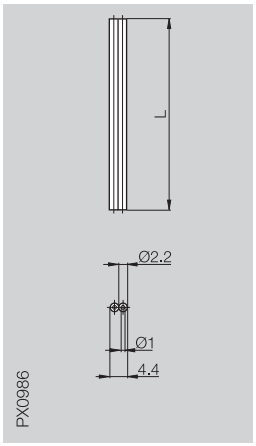
*When using base unit BOS 74K-UU-1FS-.. the sensing distance is reduced by 30 %.
**Range in Standard Mode.

Individual solutions with user-assembled plastic fiber optics

If “off-the-rack” solutions are not what you’re looking for, we have a better idea. Fiber optics can be user-cut to the desired length from a 20 m roll. This way you only use as much plastic fiber optics cable as you actually need. A considerable saving, especially if multiple sensors are used.
For simple applications you may not need an end piece. A simple clamp will suffice. Or for convenience and flexibility, select from among the available end pieces. The plastic fiber optic cable is simply crimped into the end piece. Tedious gluing is eliminated. The end piece can be removed at any time.

Housing size	**2.2×4.4 mm duplex cable**
Through-beam	
Range for L = 2 m	**150 mm**
Cable length	20 m



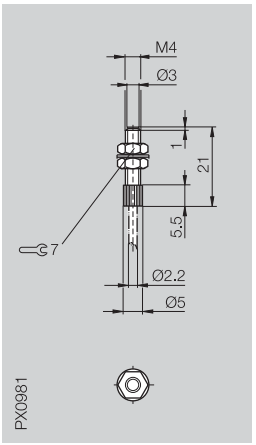


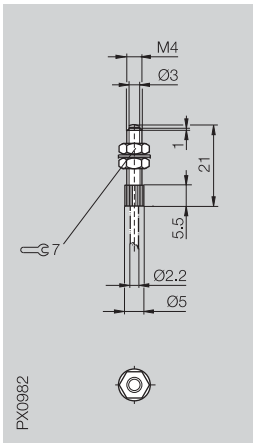
Ordering code	BFO D22-LD-EAK-10-20
Ambient temperature range T_a	–40...+85 °C
Pull force on fiber optics and connection parts at 20 °C	6 N
Core Ø	2×1 mm
Jacket Ø	2.2 mm

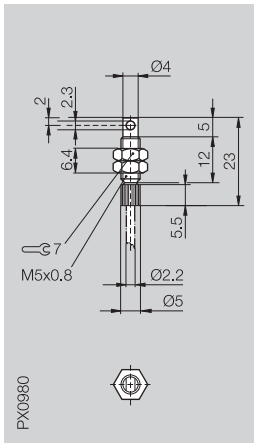
Cutting tool BFO CT is included.

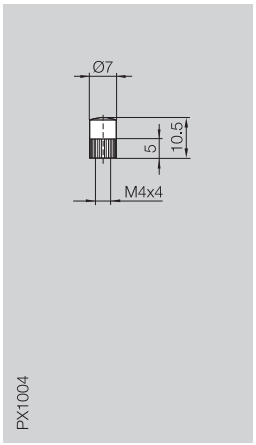
Range when used with 2 m plastic fiber cable.

Housing size	**M4**	**M4**	**Ø 4 mm**	**Ø 7 mm**
Features	End piece without lens	End piece with lens	90° end piece	Lens
Used with	BFO D22-LD-EAK-10-..	BFO D22-LD-EAK-10-..	BFO D22-LD-EAK-10-..	BFO D22-LA-BC-10
Range	**150 mm**	**450 mm**	**150 mm**	**1500 mm**







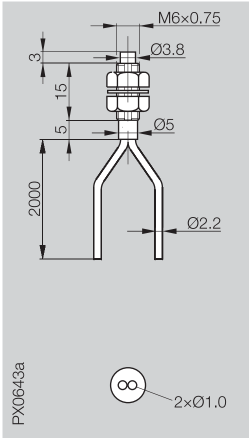


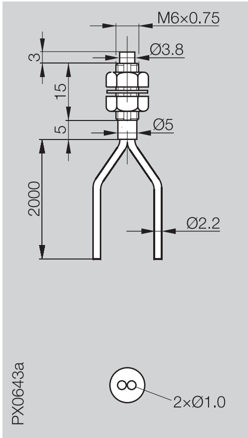
Ordering code	BFO D22-LA-BC-10	BFO D22-LA-CC-30	BFO D22-LA-AC-20	BFO 04-PK-1
Material				
– Optical surface	Plastic (fibers)	Glass	Glass	Glass
– Threaded tube	Stainless steel	Stainless steel	Stainless steel	Stainless steel

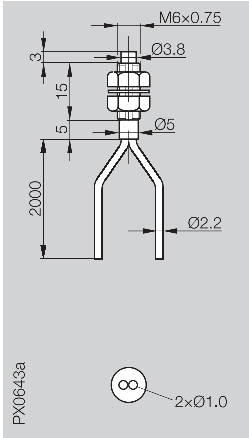


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Optical head		M6 thread	M6 thread	M6 thread
Features		Standard	Highly flexible	Temperature-rated
Ø Jacket		2×2.2 mm	2×2.2 mm	2×2.2 mm
Ø Core		2×1 mm	2×1 mm	2×1 mm

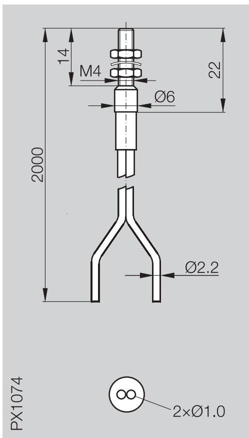


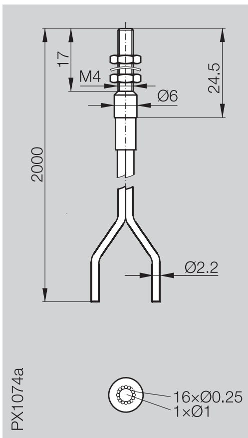


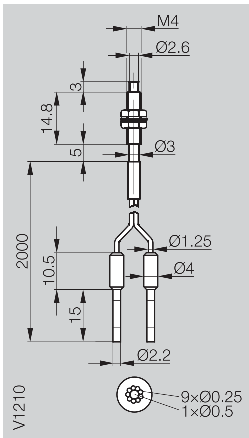


Ordering code		BFO D22-XA-LB-EAK-20-02	BFO D22-XAH-LB-EAK-20-02	BFO D22-XAT-LB-EAK-20-02
Fiber bending radius		≥ 25 mm	≥ 2 mm	≥ 25 mm
Head bending radius				
Temperature range		–55...+70 °C	–40...+70 °C	–55...+115 °C
Sensing distance	with BFB 75K-001	150 mm	120 mm	130 mm
	with BFB 75K-002**	150 mm	120 mm	130 mm
	with BOS 73K	150 mm	120 mm	130 mm
	with BOS 74K*	80 mm	60 mm	80 mm
	with BOS 6K	100 mm	70 mm	90 mm
	with BOS 18KF	50 mm	30 mm	50 mm

Optical head		M4 thread	M4 thread	M4 thread
Features		Standard	Coaxial	Coaxial
Ø Jacket		2×2.2 mm	2×2.2 mm	2×1.25 mm
Ø Core		2×1 mm	1×1 mm/16×0.25 mm	1×0.5 mm/9×0.25 mm

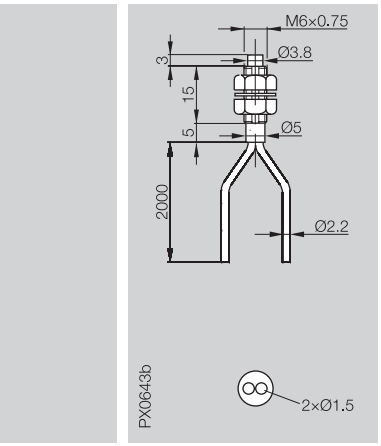
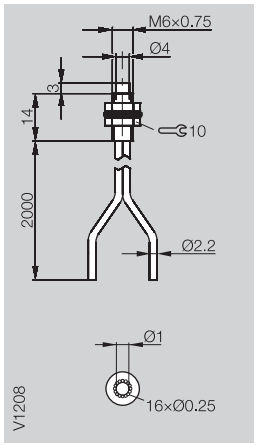
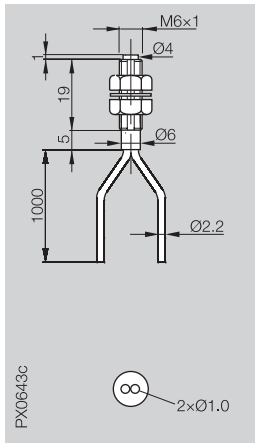
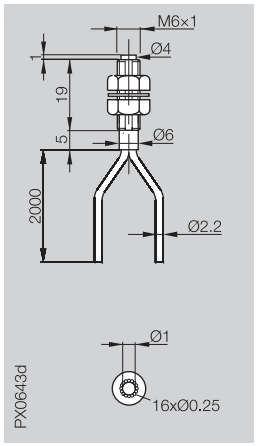
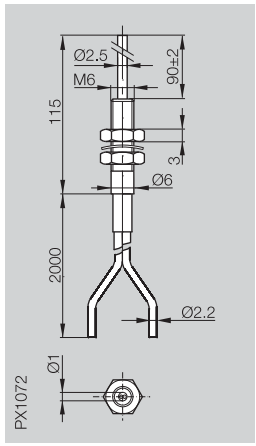
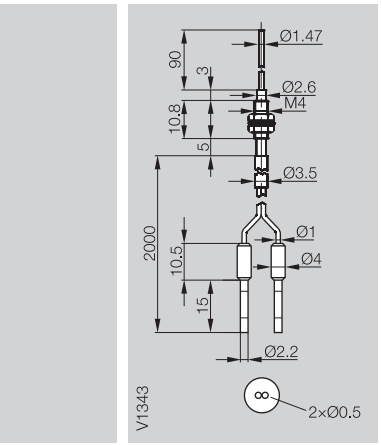
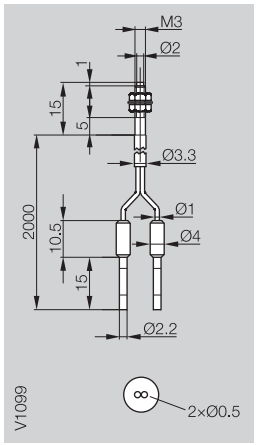
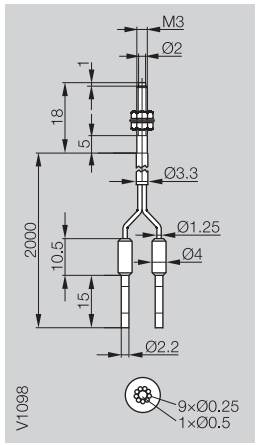
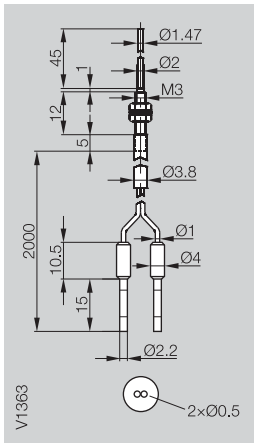
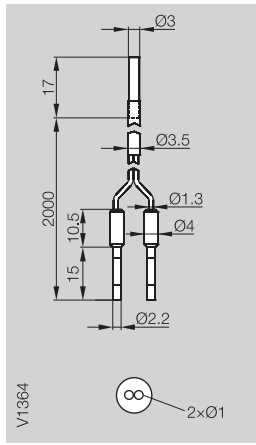




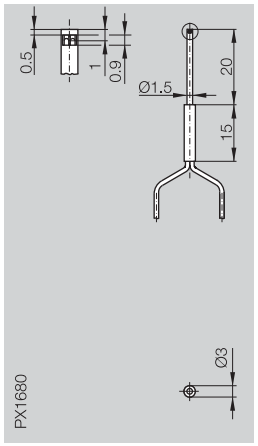
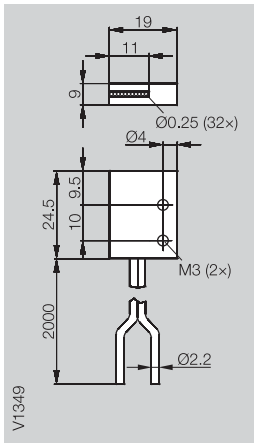
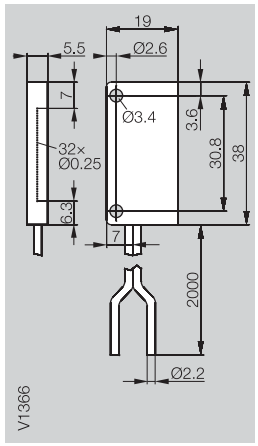


Ordering code		BFO D22-XA-UB-EAK-20-02	BFO D22-XB-UB-EAK-15-02	BFO D13-XB-KB-EAK-10-02
Fiber bending radius		≥ 25 mm	≥ 25 mm	≥ 15 mm
Head bending radius				
Temperature range		–35...+65 °C	–40...+60 °C	–55...+70 °C
Sensing distance	with BFB 75K-001	120 mm	130 mm	60 mm
	with BFB 75K-002**	120 mm	130 mm	60 mm
	with BOS 73K	120 mm	130 mm	60 mm
	with BOS 74K*	70 mm	80 mm	30 mm
	with BOS 6K	80 mm	90 mm	
	with BOS 18KF	40 mm	50 mm	20 mm

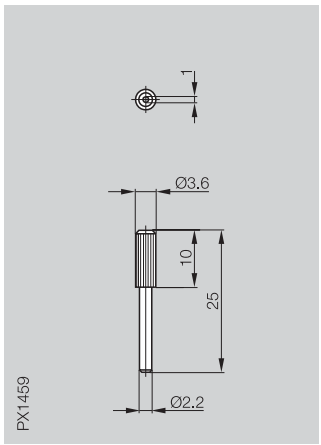
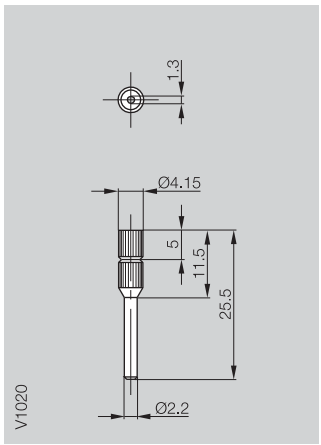
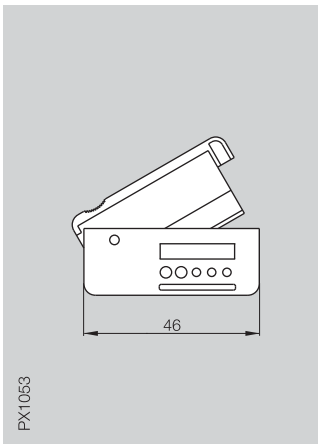
*When using base unit BOS 74K-UU-1FS-.. the sensing distance is reduced by 30 %.
**Sensing distance in Standard Mode.

	M6 thread	M6 thread	M6×1 thread	M6×1 thread	M6 thread
	Long range	Coaxial	Standard	Coaxial, flexible	Bendable optical tip
	2×2.2 mm	2×2.2 mm	2×2.2 mm	2×2.2 mm	2×2.2 mm
	2×1.5 mm	1×1 mm/16×0.25 mm	2×1 mm	1×1 mm/16×0.25 mm	2×1 mm
					
	BFO D22-XAP-LB-EAK-30-02	BFO D22-XB-LB-EAK-15-02	BFO D22-XA-DB-EAK-20-01	BFO D22-XBF-LB-EAK-15-02	BFO D22-XA-SB-EAK-20-02
	≥ 40 mm	≥ 25 mm	≥ 25 mm	≥ 5 mm	≥ 25 mm
					≥ 15 mm
	–55...+70 °C	–55...+70 °C	–40...+60 °C	–40...+60 °C	–35...+65 °C
	180 mm	120 mm	140 mm	110 mm	130 mm
	180 mm	120 mm	140 mm	110 mm	130 mm
	180 mm	120 mm	140 mm	120 mm	130 mm
	130 mm	70 mm	90 mm	60 mm	80 mm
	130 mm	80 mm	100 mm	70 mm	90 mm
	100 mm	50 mm	50 mm	30 mm	40 mm
	M4 thread	M3 thread	M3 thread	M3 thread	Ø 3 mm
	Bendable optical tip	Standard	Coaxial	Bendable optical tip	Standard
	2×1 mm	2×1 mm	2×1.25 mm	2×1 mm	2×2.2 mm
	2×0.5 mm	2×0.5 mm	1×0.5 mm/9×0.25 mm	2×0.5 mm	2×1 mm
					
	BFO D10-XA-HB-EAK-10-02	BFO D10-XA-RB-EAK-10-02	BFO D13-XB-RB-EAK-10-02	BFO D10-XA-GB-EAK-10-02	BFO D13-XA-JB-EAK-20-02
	≥ 15 mm	≥ 15 mm	≥ 15 mm	≥ 15 mm	≥ 25 mm
	≥ 10 mm			≥ 10 mm	
	–55...+70 °C	–55...+70 °C	–40...+60 °C	–35...+65 °C	–55...+70 °C
	50 mm	50 mm	60 mm	50 mm	130 mm
	50 mm	50 mm	60 mm	50 mm	130 mm
	40 mm	40 mm		40 mm	130 mm
	20 mm	20 mm	30 mm	20 mm	80 mm
	10 mm	10 mm	20 mm	10 mm	50 mm

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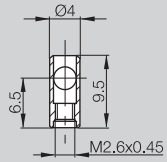
Optical head		Ø 3 mm	19×25 mm	19×38 mm
Features		Light exit on side	Light grid	Light grid
Ø Jacket		2×1 mm	2.2 mm	2.2 mm
Ø Core		2×0.5 mm	32×0.25 mm	**32×0.25 mm**
				
Ordering code		BFO D22-XA-MB-PAK-10-02	BFO D22-XA-CD-EAK-110-02	BFO D22-XA-ED-EAK-250-02
Fiber bending radius		≥ 25 mm	≥ 25 mm	≥ 25 mm
Temperature range		–40...+70 °C	–55...+70 °C	–55...+70 °C
Sensing distance	with BFB 75K-001	35 mm	100 mm	90 mm
	with BFB 75K-002**	35 mm	100 mm	90 mm
	with BOS 73K	25 mm	100 mm	90 mm
	with BOS 74K*	10 mm	60 mm	50 mm
	with BOS 6K		70 mm	60 mm
	with BOS 18KF		40 mm	30 mm

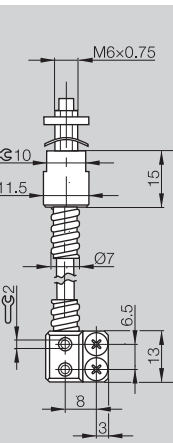
*When using base unit BOS 74K-UU-1FS-.. the sensing distance is reduced by 30 %.
**Sensing distance in Standard Mode.

Description	**Adapter**	**Adapter**	**Cutting Tool**
Use	for plastic fiber optics Ø 1 mm for connecting to fiber optic base units	for plastic fiber optics Ø 1.3 mm for connecting to fiber optic base units	for trimming Plastic Fiber Optics Ø 1 mm to Ø 2.2 mm
			
Ordering code	BFO D10-LA-DC-10	BFO D13-LA-EC-10	BFO CT





	Lens for through-beam fiber optics M2.6×0.45	90° Rotatable head for through-beam fiber optics M2.6×0.45	Focusing lens for coaxial diffuse fiber optics M4×0.7
				
Ordering code	BFO 02-PK-1	BFO 02-UK-1	BFO 04-FL-1
Range/sensing distance with corresponding fiber optic cable	×10	×0.7	19 mm ±2 mm
Packaging unit	2 pcs.	2 pcs.	1 pc.

	Focusing lens for coaxial diffuse fiber optics M4×0.7	Metal corrugated tube (stainless steel) for fiber optics M6×0.75	Metal corrugated tube (stainless steel) for fiber optics M4×0.7
				
Ordering code	BFO 04-FL-2	BFO 06-FS-1	BFO 04-FS-1
Range/sensing distance with corresponding fiber optic cable	7 mm ±2 mm		
Packaging unit	1 pc.	1 pc.	1 pc.

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Series **BFO 18** glass fiber optic cables are designed for series BOS 18M tubular sensors and are used wherever a high level of function reserve or chemical resistance is required. Extreme temperatures are also no problem.

Various straight or right-angle versions are available with polyurethane jacket, corrugated metal armor or silicon protective jacket.

Construction from the outside in

UZG type
Polyurethane jacket
Strain relief
Glass fiber bundle

- Flexible
- Excellent chemical resistance
- Does not get brittle from oils and coolant emulsions
- Temperature range –20...+85 °C

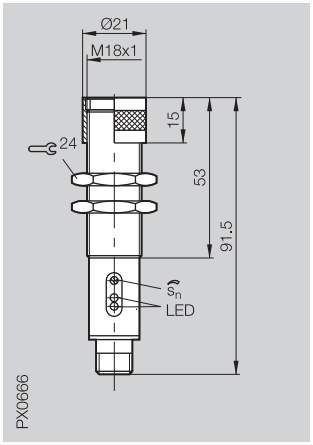
MZG type
Corrugated metal armor
Strain relief
Glass fiber bundle

- High temperature-rated –20...+170 °C (if not flexed up to+250 °C)
- Flexible
- Crush-resistant
- Resistant to hot chips

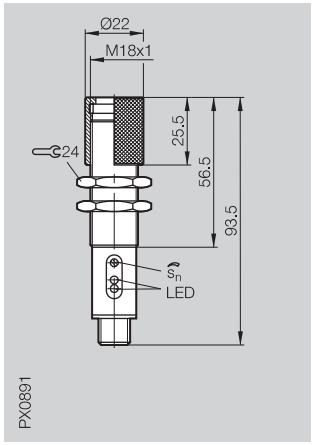
SMG type
Silicon protection jacket
Corrugated metal armor with strain relief
Glass fiber bundle

- Extended temperature range –40...+150 °C
- Very flexible
- Crush-resistant

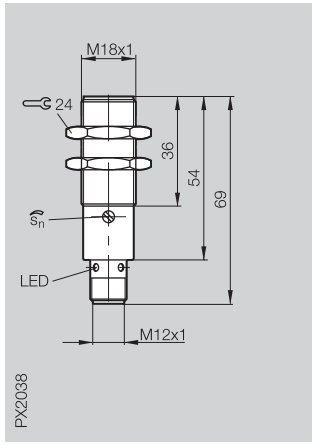
Recommended diffuse base units
(see page **2.1.**23/24/25 and **2.1.**94)



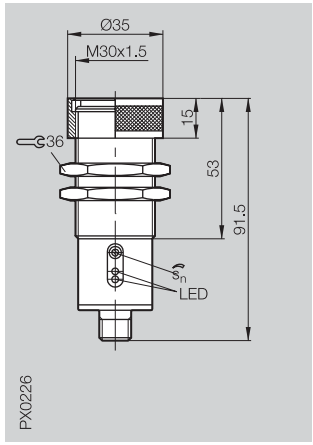
BOS 18M-GU-1PF-...



BOS 18M-PU-1PD-SA...



BOS 18M-PA-1PF-...,
BOS 18M-PA-1PD-...

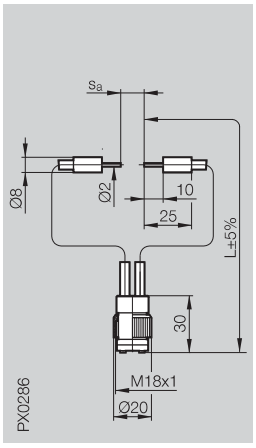


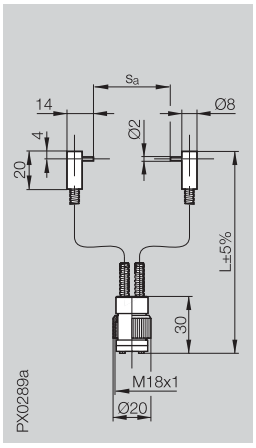
BOS 30M-GA-1PH-...

Type	Max. sensing distance	Version		Light exit		Auto-mobile approval	Page
		Through-beam	Diffuse	Straight	Right angle		
Fiber optics							
BFO 18A-LGG-...-10...	400 mm	■		■			**2.2.**28
BFO 18A-LFF-...-10...	400 mm	■			■		**2.2.**28
BFO 18A-LAA-...-20...	700 mm	■		■			**2.2.**29
BFO 18A-LCC-...-20...	700 mm	■		■			**2.2.**29
BFO 18A-LEE-...-20...	700 mm	■			■		**2.2.**29
BFO 18V-LCC-...-23...	2000 mm	■		■		■	**2.2.**29
BFO 18V-LDD-...-23...	2000 mm	■			■	■	**2.2.**29
BFO 18A-XAG-...-15...	50 mm		■	■			**2.2.**30
BFO 18A-XAF-...-15...	50 mm		■		■		**2.2.**30
BFO 18A-XAA-...-30...	100 mm		■	■			**2.2.**31
BFO 18A-XAC-...-30...	100 mm		■	■			**2.2.**31
BFO 18A-XAE-...-30...	100 mm		■		■		**2.2.**31
BFO 18V-XAC-...-30...	200 mm		■	■		■	**2.2.**31
BFO 18V-XAD-...-30...	200 mm		■		■	■	**2.2.**31

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Through-beam with	BOS 18M-...-PD-...	Range	**100 mm**	**100 mm**	
	BOS 18M-...-1PF-...	Range	**400 mm**	**400 mm**	
	BOS 30M-...	Range			





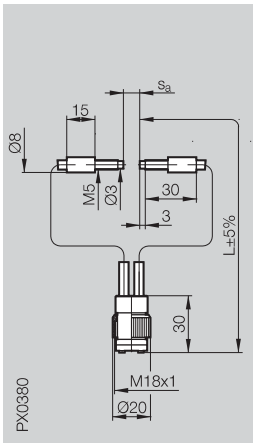
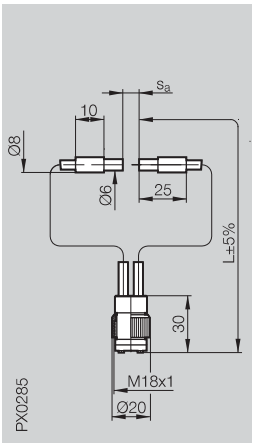
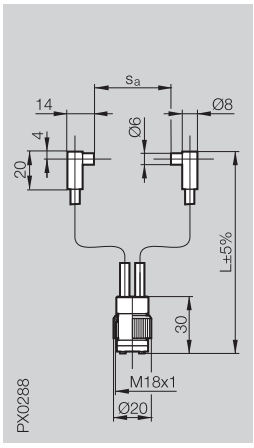
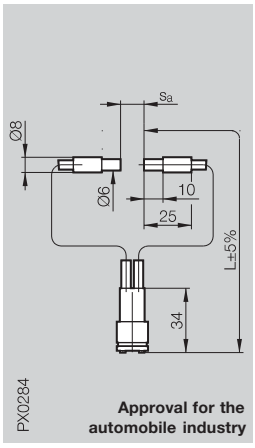
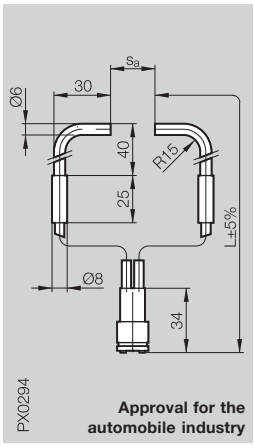
Ordering code	Type	UZG		
	Type	MZG	BFO 18A-LGG-MZG-10-	BFO 18A-LFF-MZG-10-
	Type	SMG	BFO 18A-LGG-SMG-10-	BFO 18A-LFF-SMG-10-

Diameter of glass fiber bundle		1 mm	1 mm
Max. pull force on fiber optics and connection parts		80 N	80 N
Min. bending radius		60 mm	60 mm
For use with	BOS 18M-PA-1PD-...	yes	yes
	BOS 18M-PU-1PD-SA1.../-SA4.../-SA5...	yes (remove adapter disk)	yes (remove adapter disk)
	BOS 18M-GU-1PF-...	yes (remove adapter disk)	yes (remove adapter disk)
	BOS 18M-PA-1PF-...	yes	yes
	BOS 30M-...	no	no

Please append the desired length L of the fiber optics cable to the ordering code.
Corrections from 0.5 m to max. 2 m possible. Example:
BFO 18...-20-**0.5** for **0.5 m** fiber length
BFO 18...-20-**2** for **2 m** fiber length

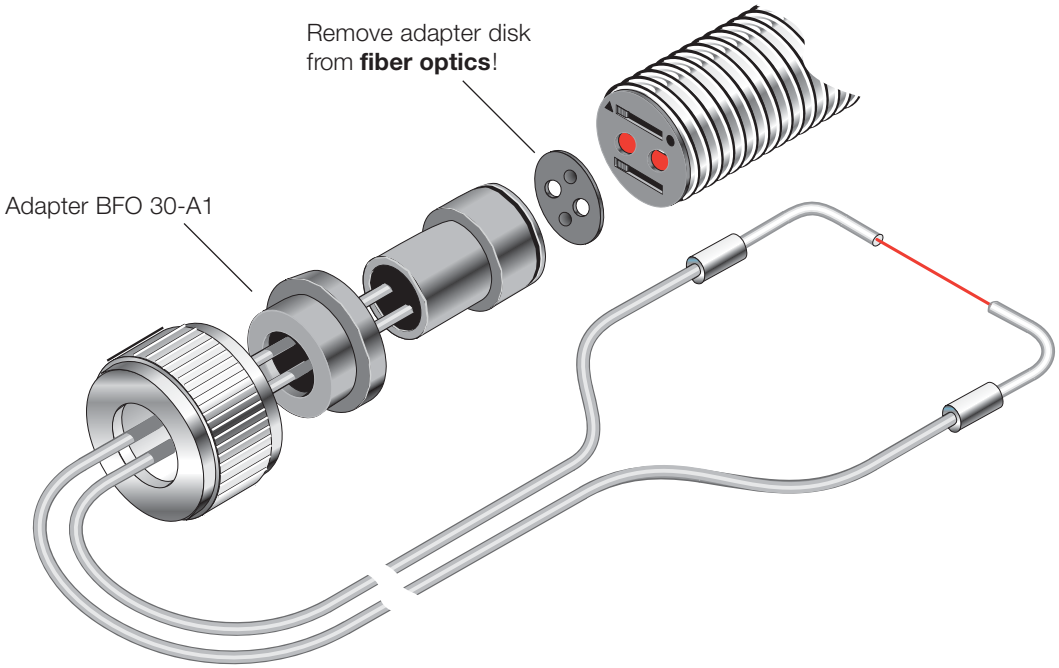
Note!
With a through-beam fiber optic cable, the normally open signal of the base unit is converted into a normally closed signal!



	200 mm **700 mm**	**200 mm** **700 mm**	**200 mm** **700 mm**	**200 mm** **2000 mm**	**200 mm** **2000 mm**
					
	BFO 18A-LAA-UZG-20- BFO 18A-LAA-MZG-20-	BFO 18A-LCC-UZG-20- BFO 18A-LCC-SMG-20-	BFO 18A-LEE-UZG-20- BFO 18A-LEE-MZG-20- BFO 18A-LEE-SMG-20-	BFO 18V-LCC-MZG-23- BFO 18V-LCC-SMG-23-	BFO 18V-LDD-MZG-23- BFO 18V-LDD-SMG-23-
	2 mm	2 mm	2 mm	2 mm	2 mm
	80 N	80 N	80 N	80 N	80 N
	60 mm	60 mm	60 mm	60 mm	60 mm
	yes	yes	yes	no	no
	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)
	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)	no	no
	yes	yes	yes	no	no
	no	no	no	yes (remove adapter disk)	yes (remove adapter disk)

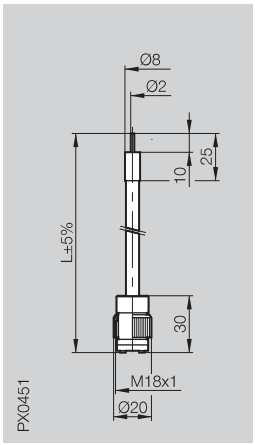
For BOS 30M-... use Adapter BFO 30-A1!
see page **2.3.**17

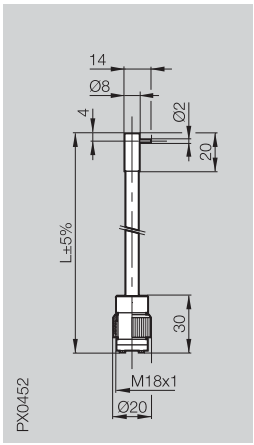
Installation note
BOS 30M with BFO 18V



2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Diffuse with	BOS 18M-...-PD-.../BOS 18M-...-1PF-...	Sensing distance	**10 mm/50 mm**	**10 mm/50 mm**
	BOS 30M-...	Sensing distance		
Retroreflective with	BOS 18M-...-PD-.../BOS 18M-...-1PF-...	Range	**300 mm/1000 mm**	**300 mm/1000 mm**
	BOS 30M-...	Range		





Ordering code	Type	UZG		
	Type	MZG	BFO 18A-XAG-MZG-15-	BFO 18A-XAF-MZG-15-
	Type	SMG		BFO 18A-XAF-SMG-15-

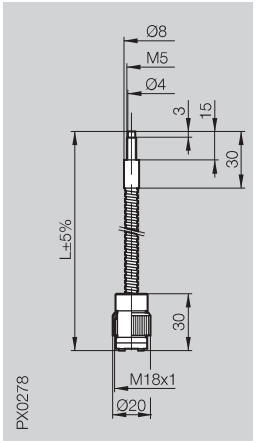
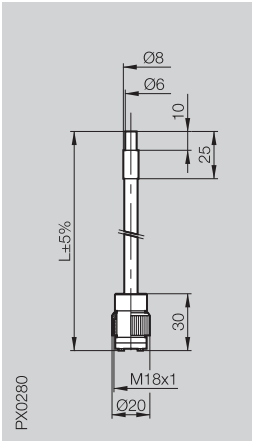
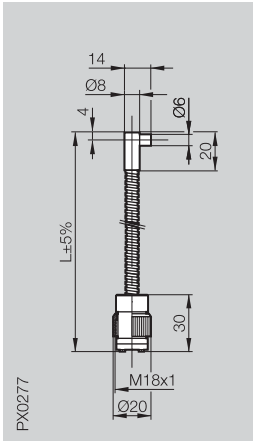
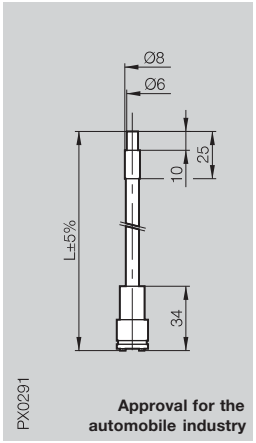
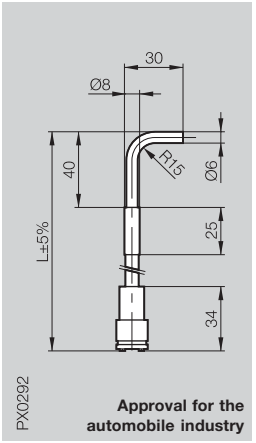
Diameter of glass fiber bundle		1.5 mm	1.5 mm
Max. pull force on fiber optics and connection parts		80 N	80 N
Min. bending radius		60 mm	60 mm
For use with	BOS 18M-PA-1PD-...	yes	yes
	BOS 18M-PU-1PD-SA1.../-SA4.../-SA5...	yes (remove adapter disk)	yes (remove adapter disk)
	BOS 18M-GU-1PF-S4-Y	yes (remove adapter disk)	yes (remove adapter disk)
	BOS 18M-PA-1PF-...	yes	yes
	BOS 30M-...	no	no
Sensing distance with	BOS 18M-PA-1PD-...	10 mm	10 mm
	BOS 18M-PU-1PD-SA1.../-SA4.../-SA5...	10 mm	10 mm
	BOS 18M-...-1PF-...	50 mm	50 mm
	BOS 30M-...		
Range with	BOS 18M-PA-1PD-...	300 mm	300 mm
	BOS 18M-PU-1PD-SA1.../-SA4.../-SA5...	300 mm	300 mm
	BOS 18M-...-1PF-...	1000 mm	1000 mm
	BOS 30M-...		

Sensing distances referenced to Kodak gray card 90 % Reflexion.

Diffuse with glass fiber optics used as retroreflective:
Ranges are referenced to BOS R-1 reflector.

When using as a retroreflective type, twice the switching distance must be used as the object dead zone.

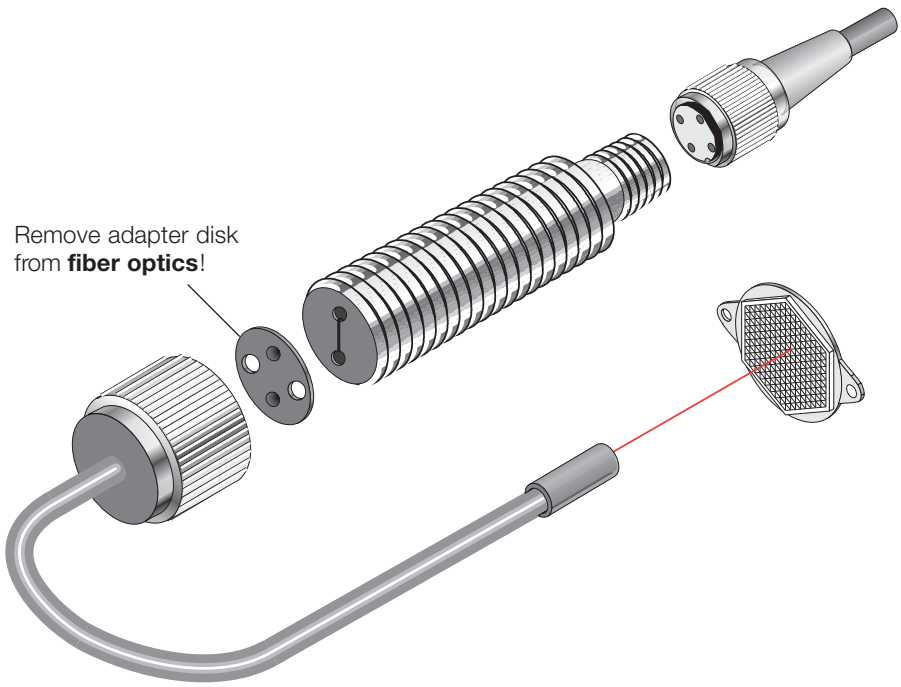
Please append the desired length L of the fiber optics cable to the ordering code!
Corrections from 0.5 m to max. 2 m possible.
Example:
BFO 18...-30-**0.5** for **0.5 m** fiber length
BFO 18...-30-**2** for **2 m** fiber length

	20 mm/100 mm	**20 mm/100 mm**	**20 mm/100 mm**	**20 mm**	**20 mm**
				200 mm	**200 mm**
	500 mm/1000 mm	**500 mm/1000 mm**	**500 mm/1000 mm**	**500 mm**	**500 mm**
				2000 mm	**2000 mm**
				 **Approval for the automobile industry**	 **Approval for the automobile industry**
	BFO 18A-XAA-UZG-30-		BFO 18A-XAE-UZG-30-		
	BFO 18A-XAA-MZG-30-		BFO 18A-XAE-MZG-30-	BFO 18V-XAC-MZG-30-	BFO 18V-XAD-MZG-30-
	BFO 18A-XAA-SMG-30-	BFO 18A-XAC-SMG-30-	BFO 18A-XAE-SMG-30-	BFO 18V-XAC-SMG-30-	BFO 18V-XAD-SMG-30-
	3 mm	3 mm	3 mm	3 mm	3 mm
	80 N	80 N	80 N	80 N	80 N
	60 mm	60 mm	60 mm	60 mm	60 mm
	yes	yes	yes	no	no
	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)
	yes (remove adapter disk)	yes (remove adapter disk)	yes (remove adapter disk)	no	no
	yes	yes	yes	no	no
	no	no	no	yes (remove adapter disk)	yes (remove adapter disk)
	20 mm	20 mm	20 mm		
	20 mm	20 mm	20 mm	20 mm	20 mm
	100 mm	100 mm	100 mm		
				200 mm	200 mm
	500 mm	500 mm	500 mm		
	500 mm	500 mm	500 mm	500 mm	500 mm
	1000 mm	1000 mm	1000 mm		
				2000 mm	2000 mm

For BOS 30M-... use Adapter BFO 30-A1!
see page **2.3.**17

Installation note

When using the
BOS 18M-GU-1PF-S4-Y
or BOS 18M-PU-1PD-SA...
please remove the
adapter disk from
the **fiber optic cable**!



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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Optical distance sensors are used when distances of objects need to be measured or monitored or their precise position determined.

Distance measurement is based on the principles of triangulation or speed of flight measurement.

PSD elements or CCD arrays are used for the receiving elements, with the emitter consisting of a red light or laser light source.

Analog current and voltage values, serial interfaces and digital outputs are available to the user.

Applications

- Control tasks (grinding machines)
- Sensing
- Object positioning
- Level detection



Type	Working range	Reso-lution	Light type		Analog Output			Output			U_B			Connection				Page
			Red light	Laser light	0...10 V	1...10 V	4...20 mA	Interface RS485	PNP-Transistor	Alarm output	10...30 V DC	15...30 V DC	18...30 V DC	M8 connector, 4-pin	M12 connector, 5-pin	M12 connector, 8-pin	Cable	
Distance sensor																		
BOD 6K-RA01-S75-C	20...80 mm	n.a.	■		■				■			■		■				**2.2.**35
BOD 6K-RA01-C-02	20...80 mm	n.a.	■		■				■			■					■	**2.2.**35
BOD 18KF-RA01-S4-C	50...100 mm	1 mm	■		■						■					■		**2.2.**37
BOD 18KF-RA01-C-02	50...100 mm	1 mm	■		■						■						■	**2.2.**37
BOD 26K-LA01-S4-C	45...85 mm	80 µm		■	■								■			■		**2.2.**39
BOD 26K-LA01-C-06	45...85 mm	80 µm		■	■								■				■	**2.2.**39
BOD 26K-LA02-S4-C	45...85 mm	20 µm		■	■								■			■		**2.2.**39
BOD 26K-LA02-C-06	45...85 mm	20 µm		■	■								■				■	**2.2.**39
BOD 26K-LB04-S115-C	30...100 mm	70 µm		■			■		■				■			■		**2.2.**41
BOD 26K-LBR04-S115-C	30...100 mm	70 µm		■			■	■	■				■			■		**2.2.**41
BOD 26K-LB05-S115-C	80...300 mm	220 µm		■			■		■				■			■		**2.2.**43
BOD 26K-LBR05-S115-C	80...300 mm	220 µm		■			■	■	■				■			■		**2.2.**43
BOD 26K-LB06-S92-C	30...100 mm	70 µm		■			■		■				■		■			**2.2.**45
BOD 26K-LB07-S92-C	80...300 mm	220 µm		■			■		■				■		■			**2.2.**45
BOD 63M-LA01-S115	500...6000 mm	2 mm		■	■				■	■		■				■		**2.2.**47
BOD 63M-LB01-S115	500...6000 mm	2 mm		■			■		■	■		■				■		**2.2.**47
BOD 66M-RA01-S92-C	100...600 mm	0.5 mm	■			■			■				■			■		**2.2.**51
BOD 66M-RB01-S92-C	100...600 mm	0.5 mm	■				■		■				■			■		**2.2.**51
BOD 66M-LA04-S92-C	200...2000 mm	5 mm		■		■			■				■			■		**2.2.**53
BOD 66M-LB04-S92-C	200...2000 mm	5 mm		■			■		■				■			■		**2.2.**53

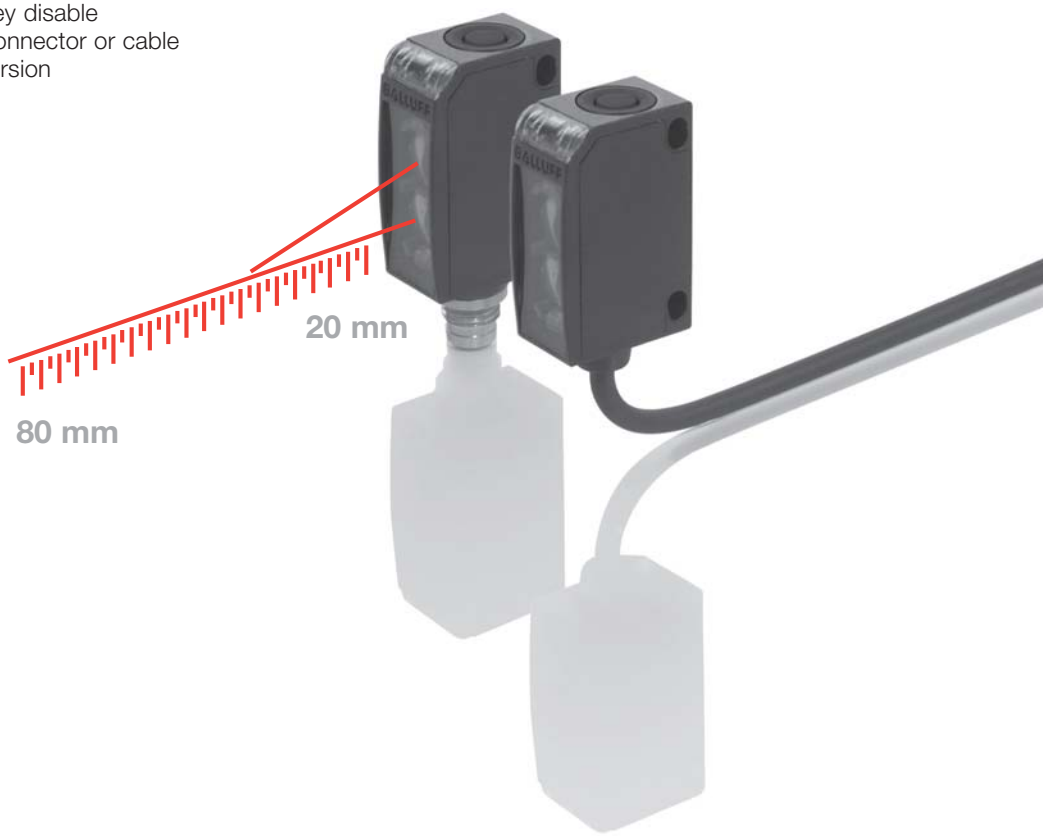
2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

The **BOD 6K** provides a distance-proportional analog output signal with falling voltage over a fixed measuring range of 20 to 80 mm.

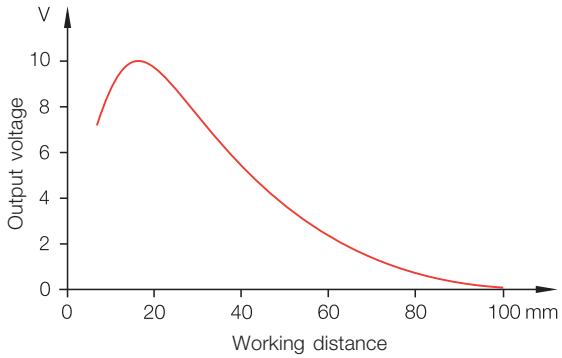
With an output, adjustable using teach-in, the sensor can also be used as a diffuse type with background suppression.

Features

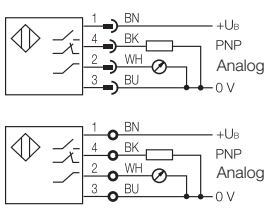
- Fixed measuring range between 20...80 mm
- Analog output 0...10 V
- Adjustable background suppression
- Output PNP, NO/NC
- Teach-in
- Key disable
- Connector or cable version



Analog output BOD 6K-RA01



Wiring diagram



Recommended accessories
please order separately

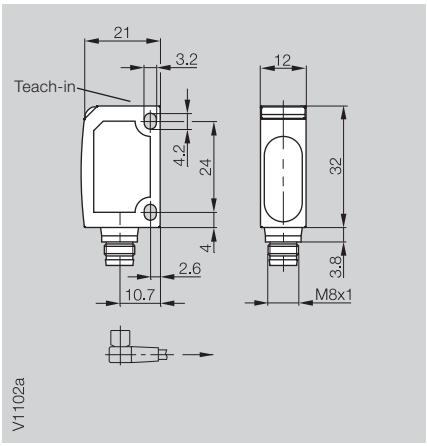


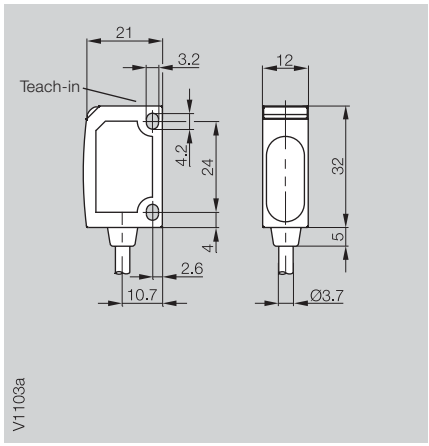
Mounting bracket
BOS 6-HW-1



Connector
Straight BKS-S 74
Right-angle BKS-S 75

Series	BOD 6K	BOD 6K
Working range	**20...80 mm**	**20...80 mm**
Measuring range	**60 mm**	**60 mm**





Distance sensor

PNP	BOD 6K-RA01-S75-C	BOD 6K-RA01-C-02
Electrical data		
Supply voltage U_B	15...30 V DC	15...30 V DC
Ripple	≤ 15 % of U_B	≤ 15 % of U_B
No-load supply current I_0 max.	≤ 30 mA at 24 V DC	≤ 30 mA at 24 V DC
Analog output	0...10 V (max. 3 mA)	0...10 V (max. 3 mA)
Cutoff frequency	200 Hz	200 Hz
Switching output	PNP-Transistor	PNP-Transistor
Switching type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	100 mA	100 mA
Voltage drop U_d at I_e	≤ 2.4 V	≤ 2.4 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	660 nm	660 nm
Light spot diameter	5×5 mm at 60 mm	5×5 mm at 60 mm
Time data		
On-/off-delay	0.5 ms	0.5 ms
Switching frequency f	1 kHz	1 kHz
Indicators		
Power-on indicator	LED green	LED green
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	21×32×12 mm	21×32×12 mm
Connection	M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	ABS	ABS
Optical surface	PMMA	PMMA
Weight	40 g	120 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–20...+60 °C	–20...+60 °C
Ambient light rejection	5 kLux	5 kLux

Measurement values referenced to Kodak gray card 90% Reflexion, 100×100 mm.

Connector orientation

2.2
2.3 Photoelectric sensors accessories page 2.3.2 ...
5 Connectors ... page 5.2 ...

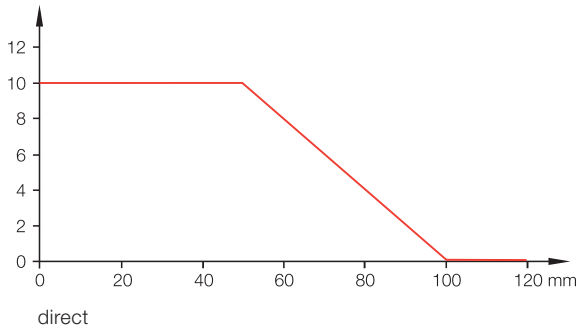
The **BOD 18KF** provides an analog signal proportional to the distance of the object. At the same time the distance is visualized by the light intensity of the yellow LED.
The red LED turns on when the target is outside the measuring range.

Features

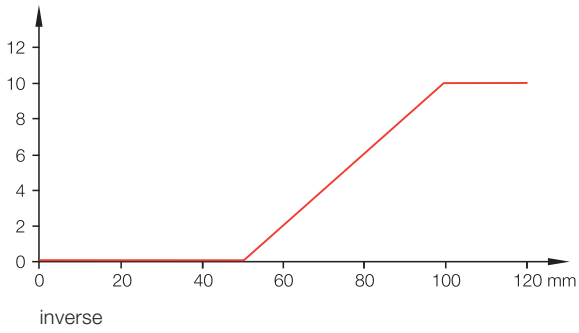
- Fixed measuring range between 50...100 mm
- Analog output 0...10 V
- Output curve can be rising or falling (direct/inverse)
- Resolution 1 mm
- Connector or cable version



Analog output

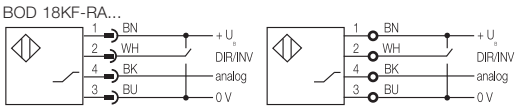


direct

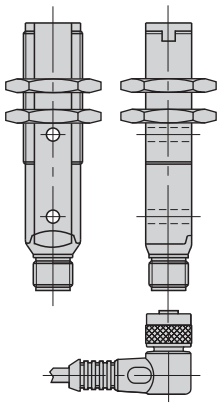


inverse

Wiring diagrams



Connector orientation



Recommended accessories

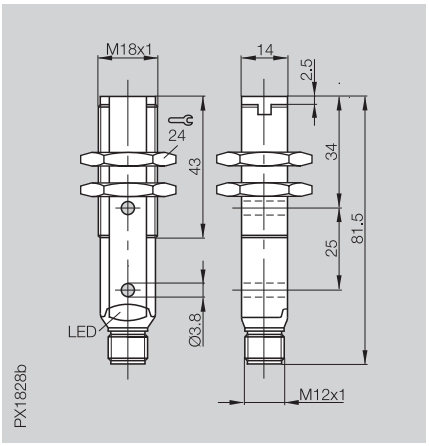
please order separately

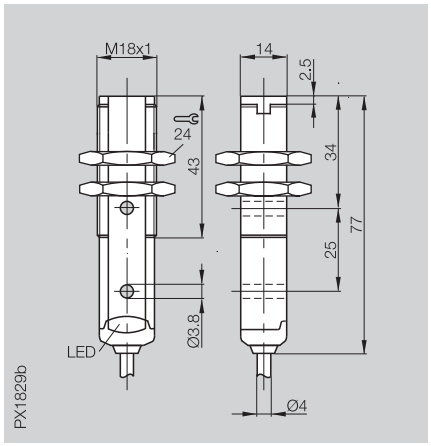

Mounting clamp
BOS 18,0-KB-1


Mounting bracket
BES 18-HW-1


Connector
Straight BKS-_ 19
Right-angle BKS-_ 20

Series	BOD 18KF	BOD 18KF
Working range	**50...100 mm**	**50...100 mm**
Measuring range	**50 mm**	**50 mm**





Distance sensor

PNP	BOD 18KF-RA01-S4-C	BOD 18KF-RA01-C-02
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	≤ 2 V	≤ 2 V
No-load supply current I_0 max.	≤ 30 mA	≤ 30 mA
Analog output	0...10 V	0...10 V
Output curve	Rising/falling	Rising/falling
Settings	fixed	fixed
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	630 nm	630 nm
Light spot diameter	approx. 8 mm at 100 mm	approx. 8 mm at 100 mm
Resolution	1 mm/200 mV	1 mm/200 mV
Time data		
Limit frequency f	150 Hz	150 Hz
Indicators		
Output function*	LED yellow	LED yellow
Measuring range**	LED red	LED red
Mechanical data		
Dimensions	M18×81.5 mm	M18×77 mm
Connection	M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	PBT	PBT
Lens material	PMMA	PMMA
Weight	25 g	75 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–25...+55 °C	–25...+55 °C

Measurement values referenced to Kodak gray card 90% Reflexion, 100×100 mm.

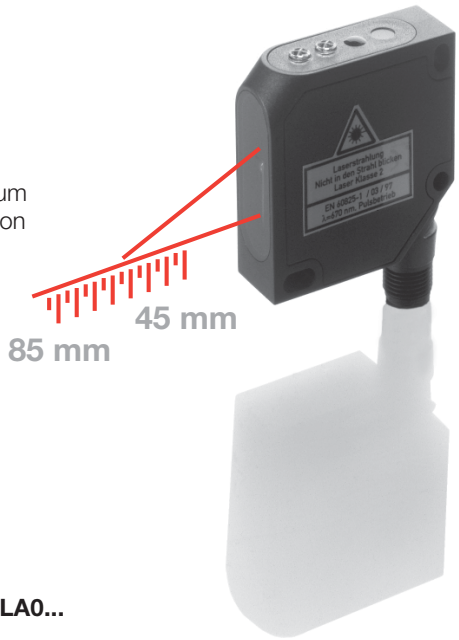
*Proportional to output
**Turns on when object is outside the measuring range

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2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Series	
Working range	
Measuring range	

Features

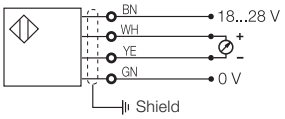
- Fixed measuring range between 45...85 mm
- Analog output 0...10 V
- Resolution 20 µm or 80 µm
- Connector or cable version

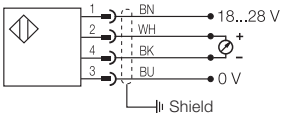


Analog output BOD 26K-LA0...



Wiring diagrams





Recommended accessories
please order separately



Mounting bracket
BOS 26-HW-1



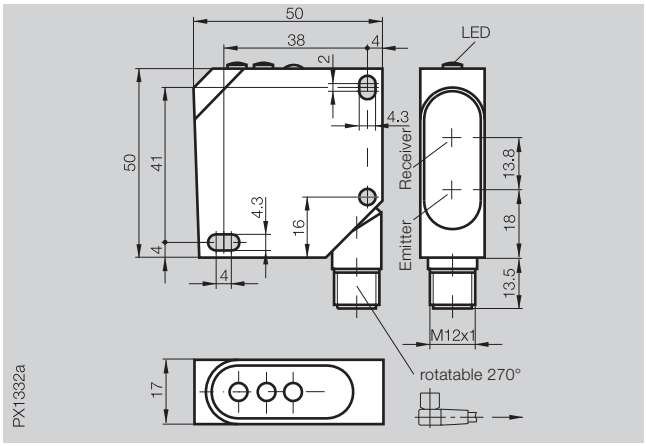
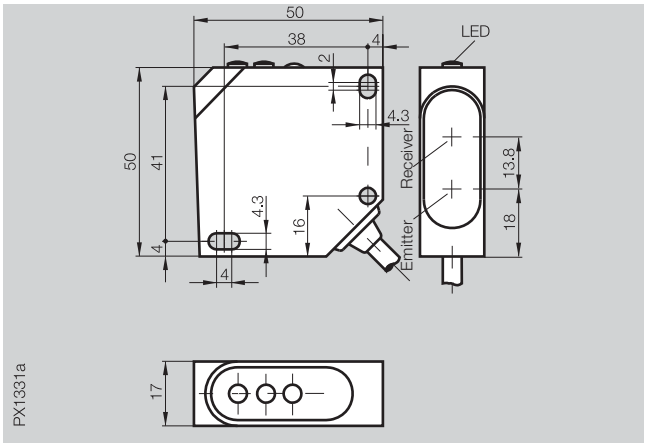
Connector
BKS-S 19-14-PU-05

Distance sensor

Electrical data	
Supply voltage U_B	
Ripple	
No-load supply current I_0 max.	
Analog output	
Settings	
Optical data	
Emitter, light type	
Wavelength	
Laser class	
Light spot diameter	
Temperature drift	
Resolution	
Linearity	
Time data	
Cutoff frequency	
Rise time (from 10 % to 90 %)	
Fall-off time (from 90 % to 10 %)	
Indicators	
Power-on indicator	
Contamination indicator	
Mechanical data	
Dimensions	
Connection	
No. of wires × cross-section	
Housing material	
Optical surface	
Weight	
Ambient data	
Degree of protection per IEC 60529	
Polarity reversal protected	
Short circuit protected	
Ambient light rejection	
Ambient temperature range T_a	

Measured values referenced to Kodak gray card 90 % Reflexion.

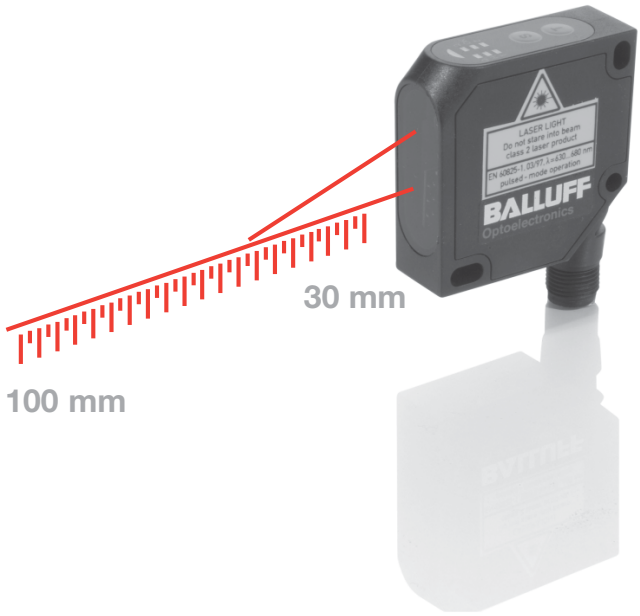
Connector orientation

	BOD 26K **45...85 mm** **40 mm**	BOD 26K **45...85 mm** **40 mm**
		
	BOD 26K-LA01-S4-C	BOD 26K-LA02-S4-C	BOD 26K-LA01-C-06	BOD 26K-LA02-C-06
	18...28 V DC	18...28 V DC	18...28 V DC	18...28 V DC
	10 %	10 %	10 %	10 %
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	0...10 V (max. 3 mA)	0...10 V (max. 3 mA)	0...10 V (max. 3 mA)	0...10 V (max. 3 mA)
	fixed	fixed	fixed	fixed
	Laser, red light	Laser, red light	Laser, red light	Laser, red light
	670 nm	670 nm	670 nm	670 nm
	2	2	2	2
	≤ 0.8 mm at 65 mm	≤ 0.8 mm at 65 mm	≤ 0.8 mm at 65 mm	≤ 0.8 mm at 65 mm
	18 µm/°C	18 µm/°C	18 µm/°C	18 µm/°C
	80 µm	**20 µm**	**80 µm**	**20 µm**
	≤ 1 %	≤ 1 %	≤ 1 %	≤ 1 %
	400 Hz	**40 Hz**	**400 Hz**	**40 Hz**
	3 ms	30 ms	3 ms	30 ms
	2 ms	20 ms	2 ms	20 ms
	LED green	LED green	LED green	LED green
	LED red	LED red	LED red	LED red
	50×50×17 mm	50×50×17 mm	50×50×17 mm	50×50×17 mm
	M12 connector, 4-pin	M12 connector, 4-pin	6 m cable, PVC	6 m cable, PVC
			4×0.25 mm²	4×0.25 mm²
	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS	impact-resistant ABS
	PMMA	PMMA	PMMA	PMMA
	40 g	40 g	600 g	600 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2
	0...+45 °C	0...+45 °C	0...+45 °C	0...+45 °C

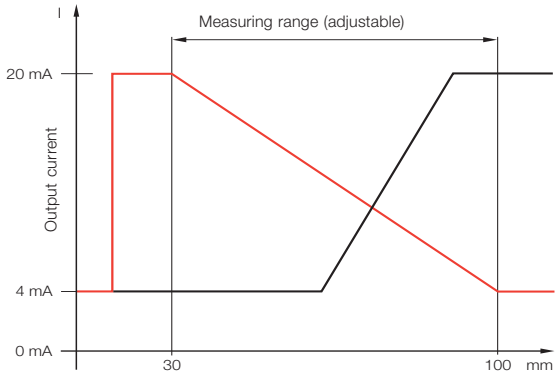
2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Features

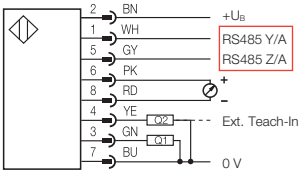
- Adjustable measuring range between 30...100 mm
- Analog output 4...20 mA adjustable: rising or falling
- Option with RS485-Interface (for Master-slave mode) and for visualization on a PC (additional software required)
- 2 switching outputs with adjustable switch points
- Teach-in
- Adjustable averaging
- Numerous additional functions



Analog output BOD 26K-LB(R)04...

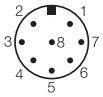


Wiring diagram



only type
BOD 26K-LB**R**...

Connector diagram



Recommended accessories

please order separately

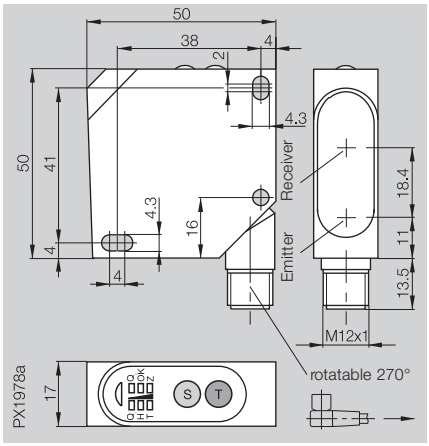


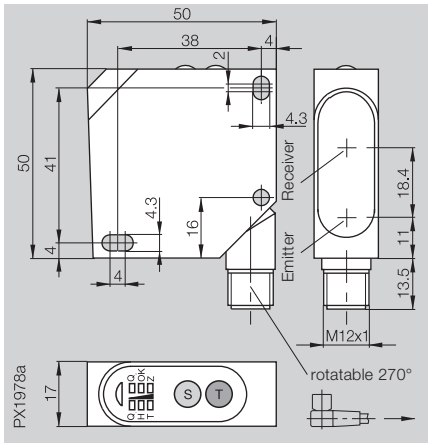
Mounting bracket
BOS 26-HW-1



Connector
Straight, 5 m
BKS-S139-PU-05
Right-angle, 5 m
BKS-S138-PU-05

Series	BOD 26K	BOD 26K
Working range	**30...100 mm**	**30...100 mm**
Measuring range	**adjustable max. 70 mm**	**adjustable max. 70 mm**





Distance sensor

PNP	BOD 26K-LB04-S115-C	BOD 26K-LBR04-S115-C
Electrical data		
Supply voltage U_B	18...30 V DC	18...30 V DC
Ripple	10 %	10 %
No-load supply current I_0 max.	≤ 40 mA	≤ 40 mA
Analog output	4...20 mA	4...20 mA
Interface		**RS485**
Switching output	2 × PNP-Transistor	2 × PNP-Transistor
Output current	100 mA	100 mA
Switching type	Light- or dark-on	Light- or dark-on
Settings	Teach-in	Teach-in
Additional functions		Master-slave mode
Optical data		
Emitter, light type	Laser, red light	Laser, red light
Wavelength	650 nm	650 nm
Laser class	2	2
Light spot diameter	3.25 mm at 100 mm	3.25 mm at 100 mm
Resolution	≤ 70 µm	≤ 70 µm
Linearity	≤ 175 µm	≤ 175 µm
Time data		
Switching frequency f	1 kHz	1 kHz
Time functions	50 ms pulse extension	50 ms pulse extension
Indicators		
Power-on indicator	LED green	LED green
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	50×50×17 mm	50×50×17 mm
Connection	M12 connector, 8-pin	M12 connector, 8-pin
Housing material	impact-resistant ABS	impact-resistant ABS
Optical surface	PMMA	PMMA
Weight	43 g	43 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–10...+60 °C	–10...+60 °C

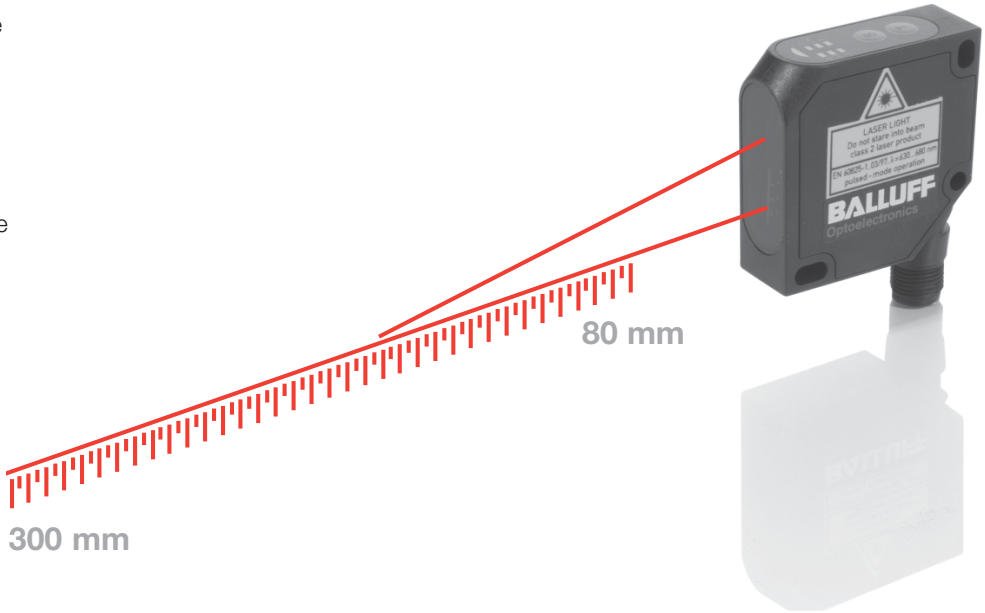
Measured values referenced to Kodak gray card 90 % Reflexion.

Connector orientation

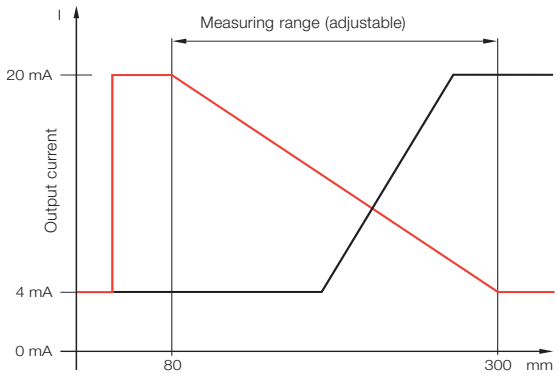
2.2
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Features

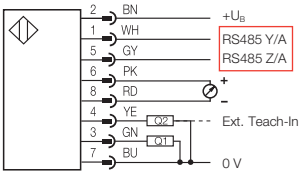
- Measuring range adjustable between 80...300 mm
- Analog output 4...20 mA adjustable: rising or falling
- Option with RS485-Interface (for Master-slave mode) and for visualization on a PC (additional software required)
- 2 switching outputs with adjustable switch points
- Teach-in
- Adjustable averaging
- Numerous additional functions



Analog output BOD 26K-LB(R)05...

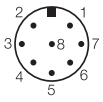


Wiring diagram



only type
BOD 26K-LB**R**...

Connector diagram



Recommended accessories

please order separately

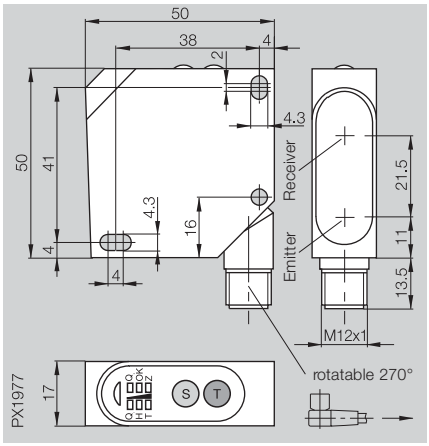


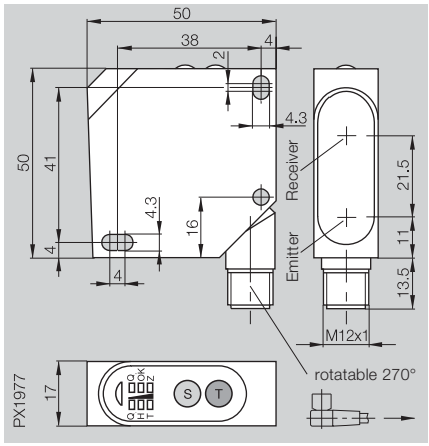
Mounting bracket
BOS 26-HW-1



Connector
Straight, 5 m
BKS-S139-PU-05
Right-angle, 5 m
BKS-S138-PU-05

Series	BOD 26K	BOD 26K
Working range	**80...300 mm**	**80...300 mm**
Measuring range	**adjustable max. 220 mm**	**adjustable max. 220 mm**





Distance sensor

PNP	BOD 26K-LB05-S115-C	BOD 26K-LBR05-S115-C
Electrical data		
Supply voltage U_B	18...30 V DC	18...30 V DC
Ripple	10 %	10 %
No-load supply current I_0 max.	≤ 40 mA	≤ 40 mA
Analog output	4...20 mA	4...20 mA
Interface		**RS485**
Switching output	2 × PNP-Transistor	2 × PNP-Transistor
Output current	100 mA	100 mA
Switching type	Light- or dark-on	Light- or dark-on
Settings	Teach-in	Teach-in
Additional functions		Master-slave mode
Optical data		
Emitter, light type	Laser, red light	Laser, red light
Wavelength	650 nm	650 nm
Laser class	2	2
Light spot diameter	4.5 mm at 300 mm	4.5 mm at 300 mm
Resolution	≤ 220 µm	≤ 220 µm
Linearity	≤ 550 µm	≤ 550 µm
Time data		
Switching frequency f	1 kHz	1 kHz
Time functions	50 ms pulse extension	50 ms pulse extension
Indicators		
Power-on indicator	LED green	LED green
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	50×50×17 mm	50×50×17 mm
Connection	M12 connector, 8-pin	M12 connector, 8-pin
Housing material	impact-resistant ABS	impact-resistant ABS
Optical surface	PMMA	PMMA
Weight	43 g	43 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–10...+60 °C	–10...+60 °C

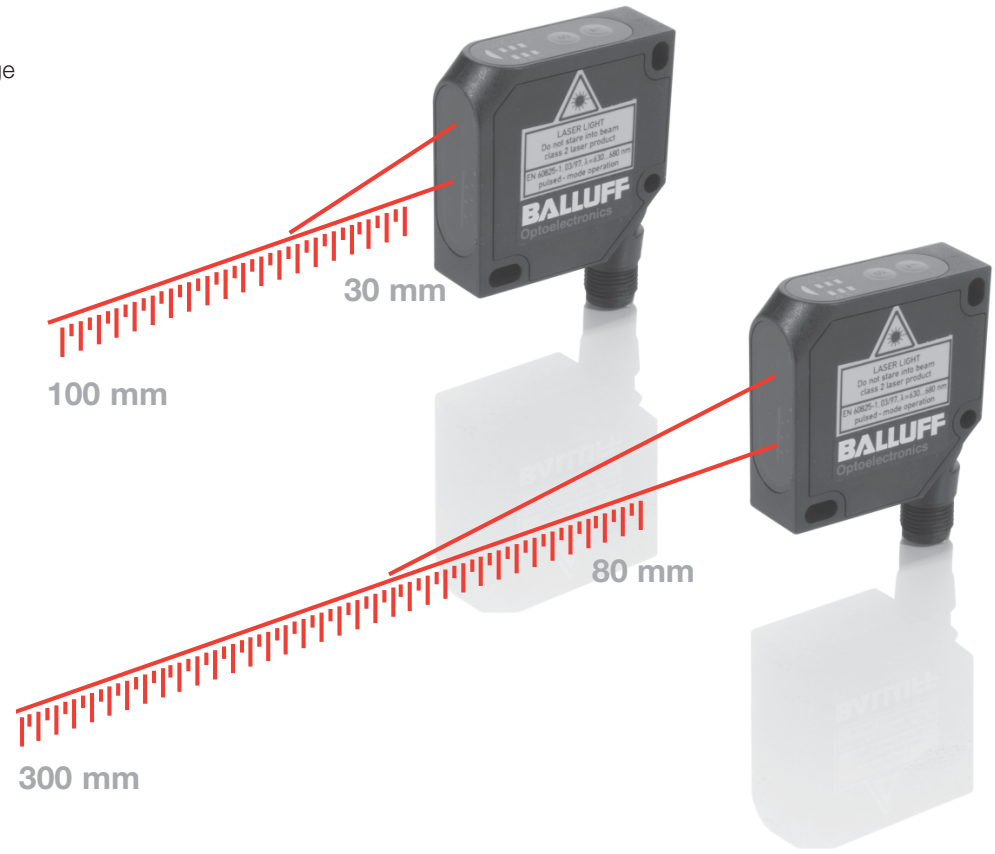
Measured values referenced to Kodak gray card 90 % Reflexion.

Connector orientation

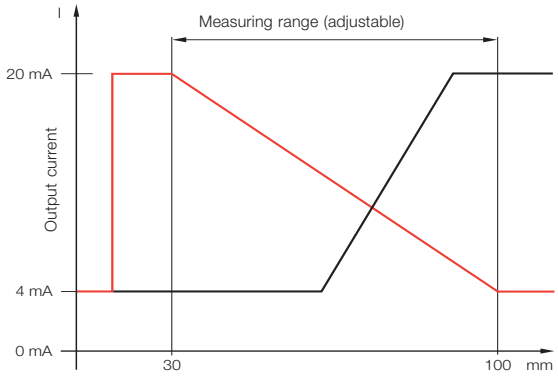
2.2
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Features

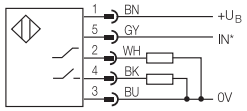
- Adjustable measuring range
- Analog output 4...20 mA adjustable: rising or falling
- 1 switching output with adjustable switch points
- Teach-in
- Laser beam can be turned off



Analog output BOD 26K-LB06...



Wiring diagram

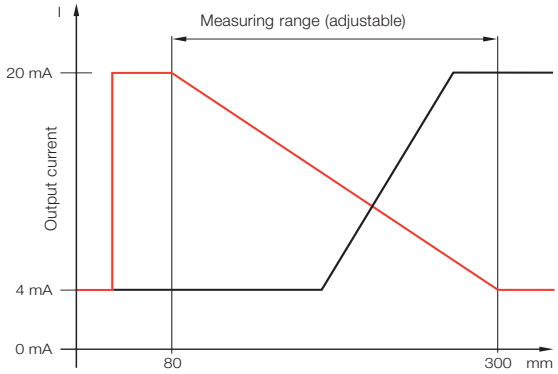


*Laser shut-off (+UB)
Key disable (0V)

Connector diagram



Analog output BOD 26K-LB(R)07...



Recommended accessories
please order separately

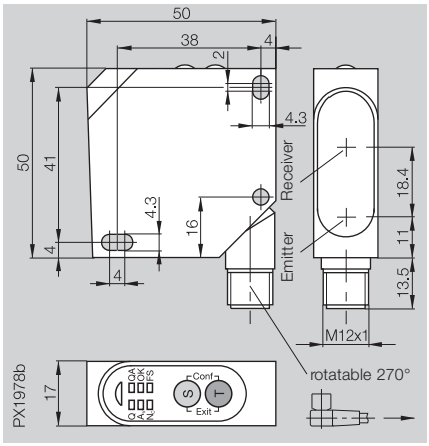


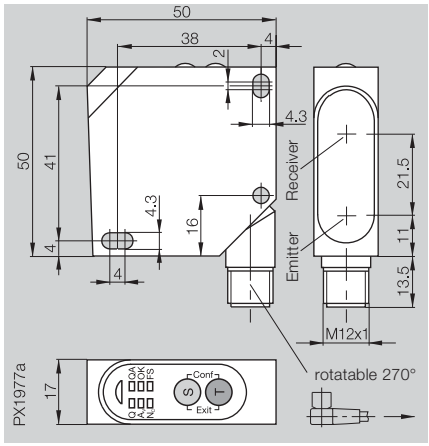
Mounting bracket
BOS 26-HW-1



Connector
Straight BKS-S137-17-PU-05
Right-angle BKS-S134-17

Series	BOD 26K	BOD 26K
Working range	**30...100 mm**	**80...300 mm**
Measuring range	**adjustable max. 70 mm**	**adjustable max. 220 mm**





Distance sensor

PNP	BOD 26K-LB06-S92-C	BOD 26K-LB07-S92-C
Electrical data		
Supply voltage U_B	18...30 V DC	18...30 V DC
Ripple	10 %	10 %
No-load supply current I_0 max.	≤ 40 mA	≤ 40 mA
Analog output	4...20 mA	4...20 mA
Switching output	1 × PNP-Transistor	1 × PNP-Transistor
Output current	100 mA	100 mA
Switching type	Light- or dark-on	Light- or dark-on
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	Laser, red light	Laser, red light
Wavelength	650 nm	650 nm
Laser class	2	2
Light spot diameter	3.25 mm at 100 mm	4.5 mm at 300 mm
Resolution	≤ 70 µm	≤ 220 µm
Linearity	≤ 175 µm	≤ 550 µm
Time data		
Switching frequency f	1 kHz	1 kHz
Time functions	50 ms pulse extension	50 ms pulse extension
Indicators		
Power-on indicator	LED green	LED green
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	50×50×17 mm	50×50×17 mm
Connection	M12 connector, 5-pin	M12 connector, 5-pin
Housing material	impact-resistant ABS	impact-resistant ABS
Optical surface	PMMA	PMMA
Weight	43 g	43 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–10...+60 °C	–10...+60 °C

Measured values referenced to Kodak gray card 90 % Reflexion.

Connector orientation

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The **BOD 63M** in its tough metal housing has a working range of 200...2000/6000 mm. It features adjustable background fade-out and an analog output of 0...10 V or 4...20 mA.

Speed of light measurement enables longer ranges than triangulation-based or energetic diffuse sensors.

The switching outputs are set using a multi-turn potentiometer.

This innovative sensor technology is used in applications where traditional methods meet either technological or economical limits. Such applications include detecting small objects at great distances and operating in difficult conditions. e.g. if sensing must be performed "externally" in process with high temperatures or in robotic cells.

Features

- Small laser spot for detecting small objects over large distances
- Virtually independent of the reflective properties of the target object within a particular sensing range
- Background suppression (HGA) over the entire working range
- Analog, binary and alarm output
- Laser beam can be turned off

Applications

- Exact detection tasks over long distances (e.g. due to design limitations or heat at the target location)
- Detecting objects with changing colors, shiny surfaces or unfavorable angle to the light beam
- Flexible solutions for position sensing, level detection and monitoring, distance and height measurement, quality assurance applications



Laser class
(see page **2.0.**18)

The emitter meets Laser Class 2 per EN 60825-1:2001-11. This means no additional safety measures are necessary.

Install the device so that the laser warning label is easily visible.



Recommended accessories
please order separately

Connector
Straight, 5 m
BKS-S139-PU-05
Right-angle, 5 m
BKS-S138-PU-05





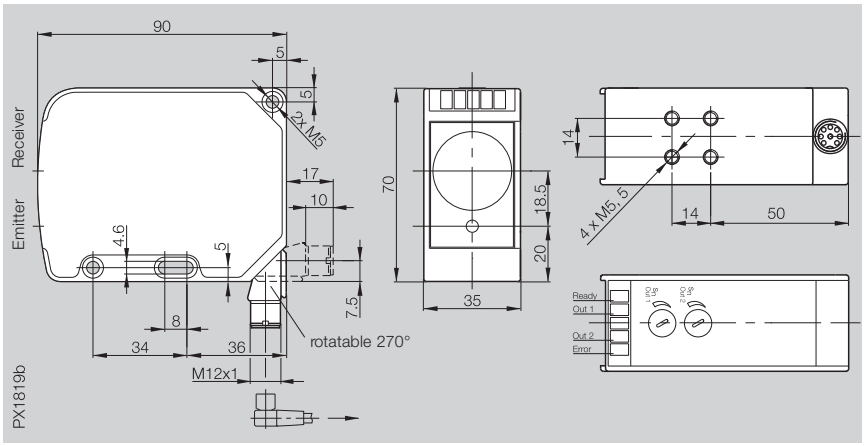
Mounting bracket
BOD 63-HW-1



IO-Link

These sensors are also available as IO-Link types. Please request our separate IO-Link brochure!

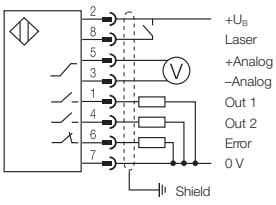
Series	BOD 63M	BOD 63M
Working range	**200...2000 mm**	**200...2000 mm**
Measuring range	**1800 mm**	**1800 mm**



Ordering code		BOD 63M-LA02-S115	BOD 63M-LB02-S115
Electrical data			
Supply voltage U_B		15...30 V DC	15...30 V DC
No-load current I_0 max. at U_e 24 V DC		≤ 75 mA	≤ 75 mA
Analog output		**0...10 V**	**4...20 mA**
Switching outputs		2× PNP normally open	2× PNP normally open
Error output		PNP normally closed	PNP normally closed
Output current	Switching output	200 mA	200 mA
	Error output	200 mA	200 mA
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V
Settings		4-turn potentiometer	4-turn potentiometer
Optical data			
Emitter, light type		Laser, red light	Laser, red light
Wavelength		660 nm	660 nm
Laser class		2 per EN 60825	2 per EN 60825
Light spot diameter		10 mm	10 mm
Resolution		≤ 1 mm	≤ 1 mm
Gray value shift		≤ 2 %	≤ 2 %
Repeat accuracy per BWN		≤ ±3 mm	≤ ±3 mm
Temperature drift		≤ 0.6 mm/°C	≤ 0.6 mm/°C
Linearity		≤ ±2%	≤ ±2%
Switching hysteresis		≤ 10 mm	≤ 10 mm
Time data			
Ready delay		≤ 20 ms	≤ 20 ms
Response time		≤ 2 ms	≤ 2 ms
Switching frequency f		≥ 250 Hz	≥ 250 Hz
Indicators			
Supply voltage		LED green	LED green
Switching output		2× LED yellow	2× LED yellow
Stability indicator		LED red	LED red
Mechanical data			
Dimensions		90×70×35 mm	90×70×35 mm
Connection		M12 connector, 8-pin	M12 connector, 8-pin
Housing material		Anodized Al	Anodized Al
Optical surface		Glass	Glass
Weight incl. holder		260 g	260 g
Ambient data			
Degree of protection per IEC 60529		IP 67	IP 67
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–10...+60 °C	–10...+60 °C
Ambient light rejection		≤ 10 kLux	≤ 10 kLux

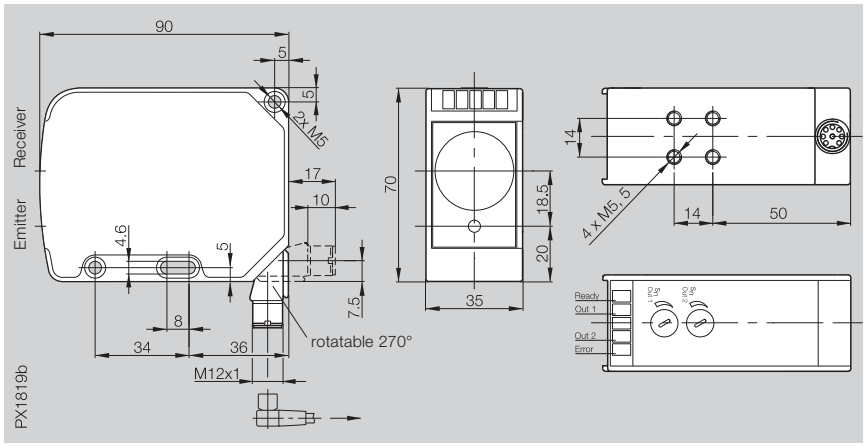
Connector orientation

Wiring diagram



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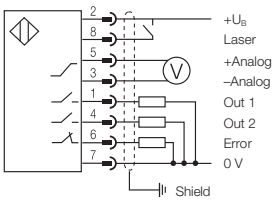
Series	BOD 63M	BOD 63M
Working range	**200...6000 mm**	**200...6000 mm**
Measuring range	**5800 mm**	**5800 mm**



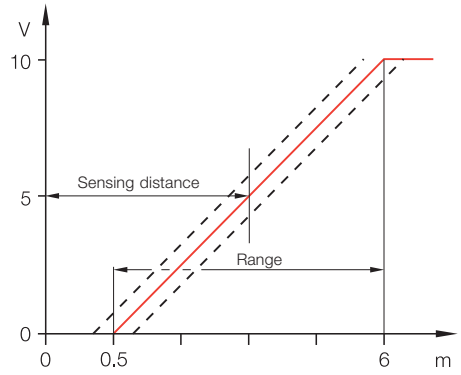
Ordering code		BOD 63M-LA04-S115	BOD 63M-LB04-S115
Electrical data			
Supply voltage U_B		15...30 V DC	15...30 V DC
No-load current I_0 max. at U_e 24 V DC		≤ 75 mA	≤ 75 mA
Analog output		**0...10 V**	**4...20 mA**
Switching outputs		2× PNP normally open	2× PNP normally open
Error output		PNP normally closed	PNP normally closed
Output current	Switching output	200 mA	200 mA
	Error output	200 mA	200 mA
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V
Settings		4-turn potentiometer	4-turn potentiometer
Optical data			
Emitter, light type		Laser, red light	Laser, red light
Wavelength		660 nm	660 nm
Laser class		2 per EN 60825	2 per EN 60825
Light spot diameter		10 mm	10 mm
Resolution		≤ 1 mm	≤ 1 mm
Gray value shift		≤ 1.5 %	≤ 1.5 %
Repeat accuracy per BWN		≤ ±4 mm	≤ ±4 mm
Temperature drift		≤ 1.5 mm/°C	≤ 1.5 mm/°C
Linearity		≤ ±1%	≤ ±1%
Switching hysteresis		≤ 15 mm	≤ 15 mm
Time data			
Ready delay		≤ 20 ms	≤ 20 ms
Response time		≤ 2 ms	≤ 2 ms
Switching frequency f		≥ 250 Hz	≥ 250 Hz
Indicators			
Supply voltage		LED green	LED green
Switching output		2× LED yellow	2× LED yellow
Stability indicator		LED red	LED red
Mechanical data			
Dimensions		90×70×35 mm	90×70×35 mm
Connection		M12 connector, 8-pin	M12 connector, 8-pin
Housing material		Anodized Al	Anodized Al
Optical surface		Glass	Glass
Weight incl. holder		260 g	260 g
Ambient data			
Degree of protection per IEC 60529		IP 67	IP 67
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–10...+60 °C	–10...+60 °C
Ambient light rejection		≤ 10 kLux	≤ 10 kLux

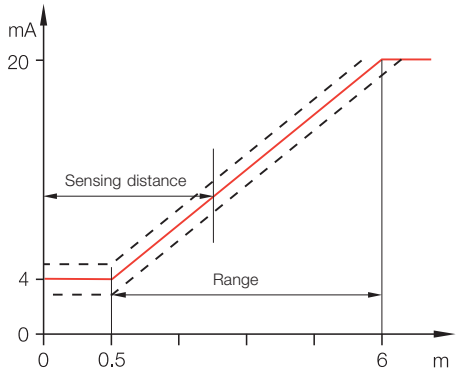
Connector orientation

Wiring diagram

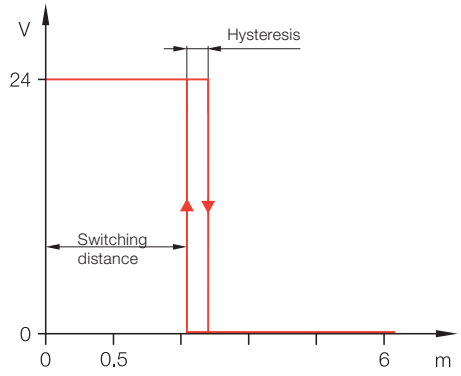


Analog output

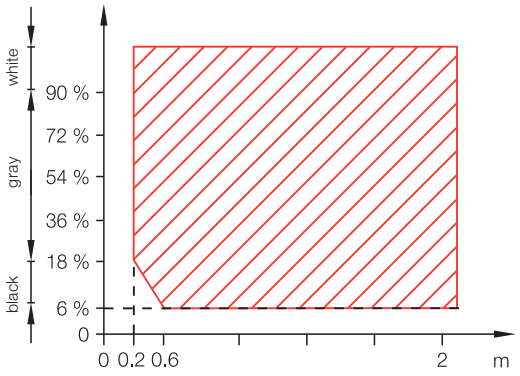




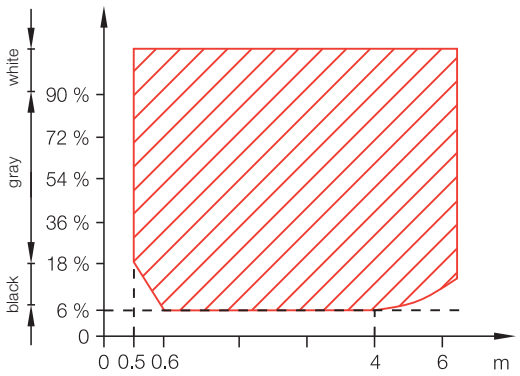
Switching output



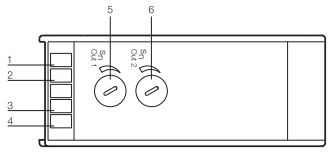
Measuring range BOD 63M-LA/LB02... depending on object reflection



Measuring range BOD 63M-LA/LB04... depending on object reflection

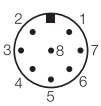


Indicators and operating elements



1 Power (green)
2 Switching output Out 1 (yellow)
3 Switching output Out 2 (yellow)
4 Stability indicator (red)
5 Potentiometer Out 1, 4 turns
6 Potentiometer Out 2, 4 turns

Connector diagram



Pin outs	Cable color	
1	white	Out 1
2	brown	$+U_B$
3	green	–Analog output
4	yellow	Out 2
5	gray	+Analog output
6	pink	Stability indicator
7	blue	0 V
8	red	Laser shut-off
Knurled ring	Braided shield	Shield

2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

Distance measurements with high resolution are achieved using triangulation and modern CCD technology.

The **BOD 66M-R_01** with analog voltage or current output and an additional switching output can measure or monitor distance and, at the same time, operate as a diffuse type with background suppression for object detection.

The BOD 66M-R_01 uses red light over a measuring range of 100...600 mm at a resolution of 0.5 mm.

Features

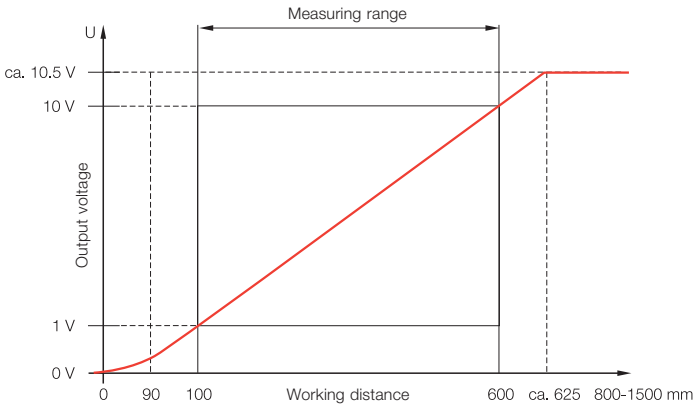
- Extremely color- and ambient light insensitive
- Working range 100...600 mm
- Resolution 0.5 mm
- Analog output with voltage (1...10 V) or current (4...20 mA)
- PNP output teachable
- Tough metal housing
- Scratch-resistant glass optics

Applications

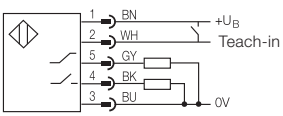
- Level monitoring
- Positioning tasks
- Winding diameter measurement
- Profile measurement
- Sag control



Analog output BOD 66M-R...



Wiring diagram

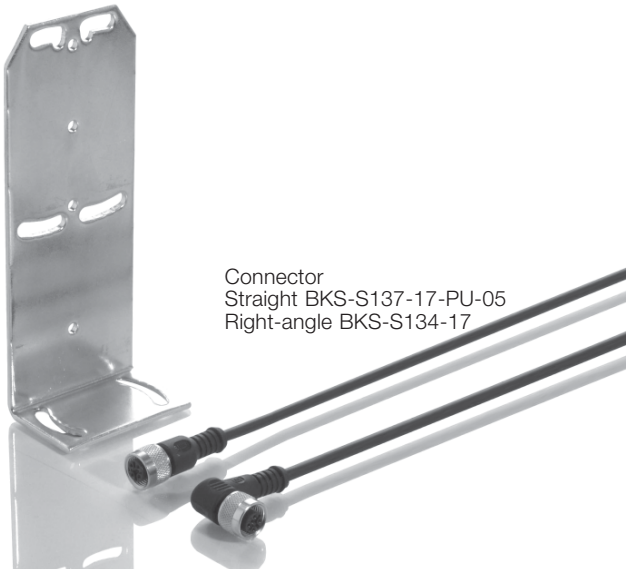


Connector diagram



Recommended accessories

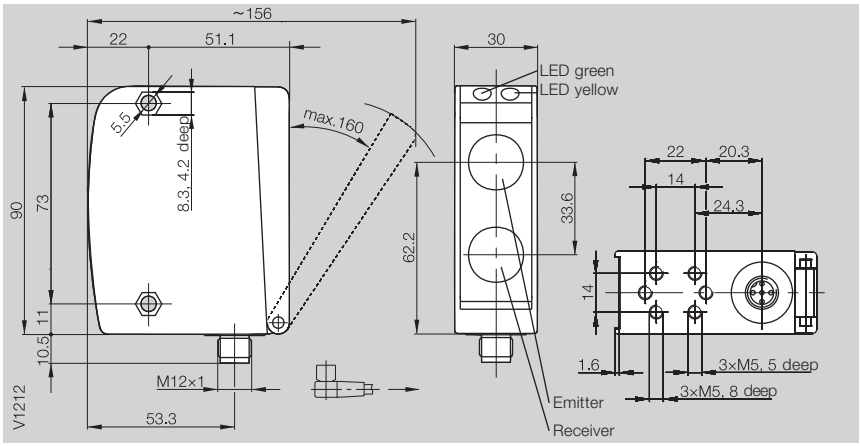
please order separately



Connector
Straight BKS-S137-17-PU-05
Right-angle BKS-S134-17

Mounting bracket
BOD 66-HW-1

Series	BOD 66M	BOD 66M
Working range	**100...600 mm**	**100...600 mm**
Measuring range	**500 mm**	**500 mm**



Distance sensor

PNP	BOD 66M-RA01-S92-C	BOD 66M-RB01-S92-C
Electrical data		
Supply voltage U_B	18...30 V DC	18...30 V DC
Ripple	≤ 15 % of U_B	≤ 15 % of U_B
No-load supply current I_0 max.	≤ 150 mA	≤ 150 mA
Analog output	**1...10 V**	**4...20 mA**
Switching output	PNP-Transistor	PNP-Transistor
Switching type	Light-on	Light-on
Output current	250 mA	250 mA
Voltage drop U_d at I_e	≤ 2 V	≤ 2 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	660 nm	660 nm
Light spot diameter	ca. 10 mm	ca. 10 mm
Resolution	≤ 0.5 mm	≤ 0.5 mm
Gray value shift (90 %/6 %)	≤ 1 %	≤ 1 %
Repeat accuracy	± 0.5 %	± 0.5 %
Temperature drift	0.2 mm/°C	0.2 mm/°C
Absolute measuring accuracy**	±2 % (of the measured distance)	±2 % (of the measured distance)
Time data		
On-/off-delay	≤ 100 ms	≤ 100 ms
Ready delay	≤ 300 ms	≤ 300 ms
Switching frequency f	20...100 Hz*	20...100 Hz*
Indicators		
Power-on indicator	LED green	LED green
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	73×90×30 mm	73×90×30 mm
Connection	M12 connector, 5-pin	M12 connector, 5-pin
Housing material	anodized Al	anodized Al
Optical surface	Glass	Glass
Weight	250 g	250 g
Ambient data		
Degree of protection per IEC 60529	IP 65	IP 65
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–20...+50 °C	–20...+50 °C
Ambient light rejection	≤ 5 kLux	≤ 5 kLux

*depending on object reflectivity
**Target ≥ 50×50 mm²

Connector orientation

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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

The **BOD 66M-L_04** features an analog as well as an additional switching output.
It measures object position over a range of 200...2000 mm. The switching output (with background fade-out) can also be set in the same range using a tech-in procedure. Forward-looking laser and CCD technology ensure accuracy and reliability.

Features

- Laser class 2
- Small light spot over the entire range
- CCD array for high color independence and ambient light rejection
- Analog current or voltage output over 200...2000 mm
- PNP output, teach-in
- Tough metal housing
- Scratch-resistant glass optics

Applications

- Background suppression up to 2 m
- Analog measurement up to 2 m of distance
- Positioning tasks

Laser class

(see page **2.0.**18)

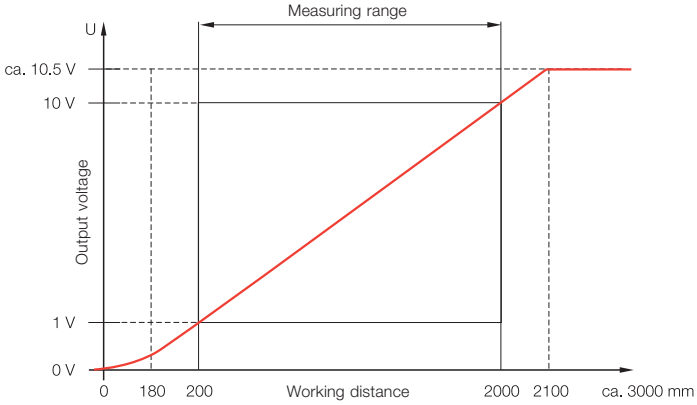
The emitter meets Laser Class 2 per EN 60825-1:2001-11. This means no additional safety measures are necessary.

Install the device so that the laser warning label is easily visible.

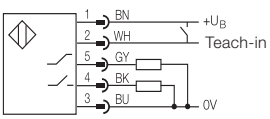




Analog output BOD 66M-L...



Wiring diagram

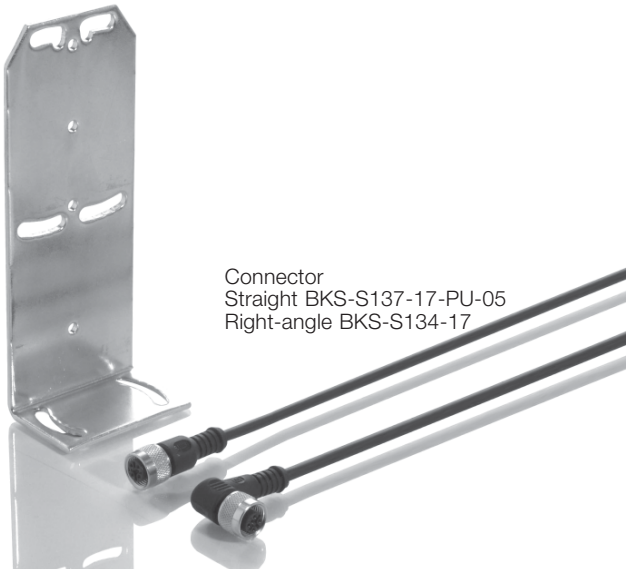


Connector diagram



Recommended accessories

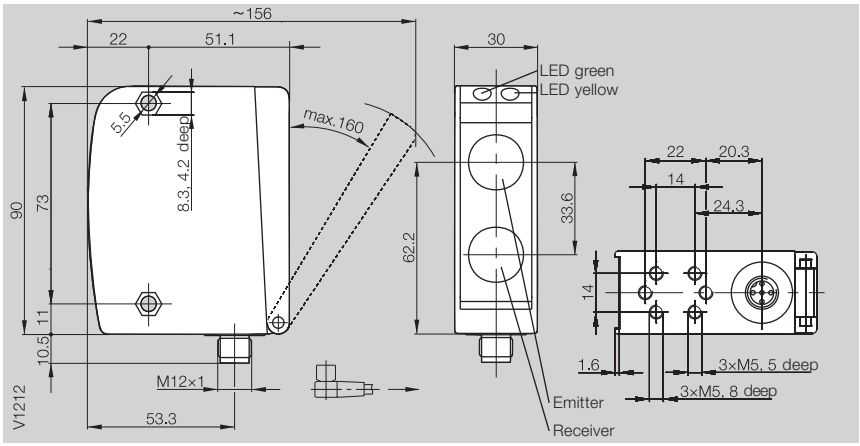
please order separately



Mounting bracket
BOD 66-HW-1

Connector
Straight BKS-S137-17-PU-05
Right-angle BKS-S134-17

Series	BOD 66M	BOD 66M
Working range	**200...2000 mm**	**200...2000 mm**
Measuring range	**1800 mm**	**1800 mm**



Distance sensor

PNP	BOD 66M-LA04-S92-C	BOD 66M-LB04-S92-C
Electrical data		
Supply voltage U_B	18...30 V DC	18...30 V DC
Ripple	≤ 15 % of U_B	≤ 15 % of U_B
No-load supply current I_0 max.	≤ 150 mA	≤ 150 mA
Analog output	**1...10 V**	**4...20 mA**
Switching output	PNP-Transistor	PNP-Transistor
Switching type	Light-on	Light-on
Output current	250 mA	250 mA
Voltage drop U_d at I_e	≤ 2 V	≤ 2 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	Laser, red light	Laser, red light
Wavelength	660 nm	660 nm
Laser class	2	2
Light spot diameter	3 × 12 mm² at 2 m	3 × 12 mm² at 2 m
Resolution	≤ 5 mm	≤ 5 mm
Gray value shift (90 %/6 %)	≤ 1 %	≤ 1 %
Repeat accuracy	± 0.5 %	± 0.5 %
Temperature drift	0.6 mm/°C	0.6 mm/°C
Absolute measuring accuracy**	±2 % (of the measured distance)	±2 % (of the measured distance)
Time data		
On-/off-delay	≤ 100 ms	≤ 100 ms
Ready delay	≤ 300 ms	≤ 300 ms
Switching frequency f	10...100 Hz*	10...100 Hz*
Indicators		
Power-on indicator	LED green	LED green
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	73×90×30 mm	73×90×30 mm
Connection	M12 connector, 5-pin	M12 connector, 5-pin
Housing material	anodized Al	anodized Al
Optical surface	Glass	Glass
Weight	250 g	250 g
Ambient data		
Degree of protection per IEC 60529	IP 65	IP 65
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–20...+50 °C	–20...+50 °C
Ambient light rejection	≤ 5 kLux	≤ 5 kLux

*depending on object reflectivity
**Target ≥ 50×50 mm²

Connector orientation

2.2
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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Contrast sensors are high-resolution diffuse sensors that distinguish objects based on their gray values. Color, brightness and reflectivity have a strong effect on the measuring result.

When gray values differ only slightly the measuring distance should be kept equal. The resolution of the sensor decreases with increasing range.

A variety of models with various light types and functions are available.

Applications

- Sensing markings on packaging material
- Synchronizing cutting or separating processes
- Checking for adhesive, ink and color
- Position checking of printing templates
- Sensing objects based on contrast



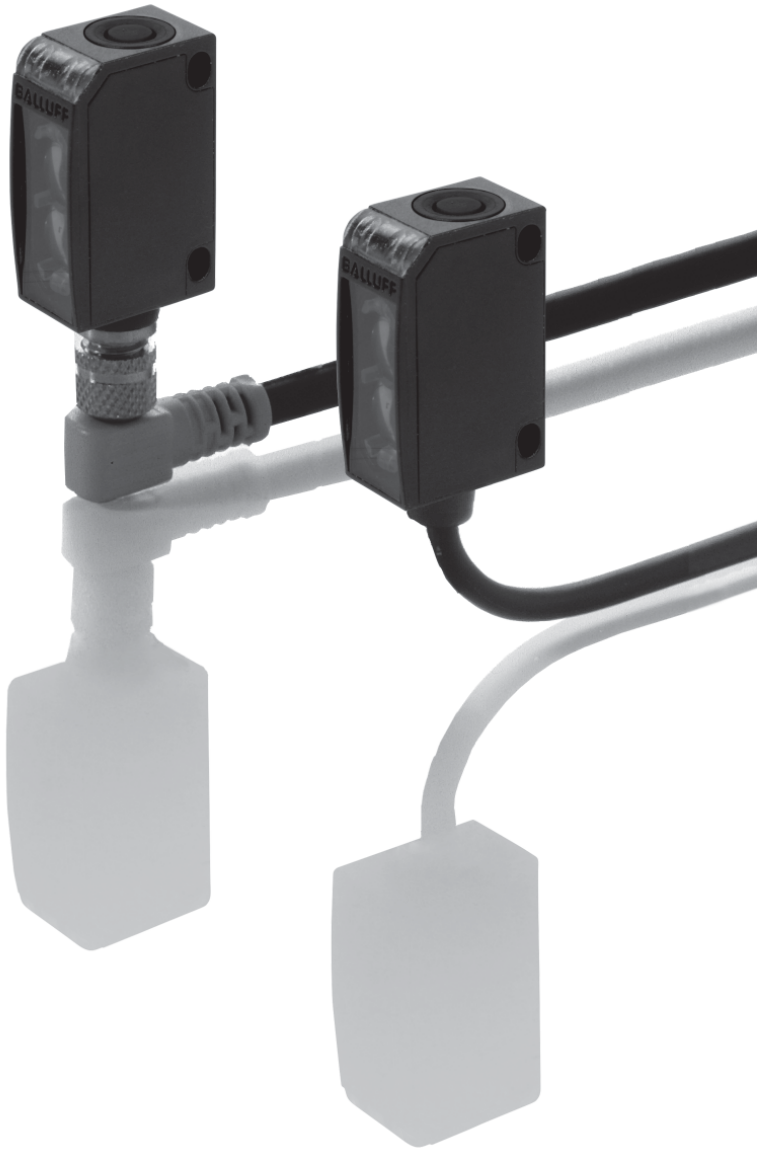
Type	Range	Light type			Output			Output function		Switching frequency	U_B	Connection			Special features		Page
		White light	Red and green light	Laser light	PNP-Transistor	NPN-Transistor	Analog output	Light-on	Dark-on		10...30 V DC	M8 connector, 4-pin	M12 connector, 4-pin	Cable	for adapting fiber optics		
Contrast Sensor																	
BKT 6K-001-P-S75	40...150 mm			■	■			■	■	1 kHz	■	■					**2.2.**57
BKT 6K-001-N-S75	40...150 mm			■		■		■	■	1 kHz	■	■					**2.2.**57
BKT 6K-001-P-02	40...150 mm			■	■			■	■	1 kHz	■			■			**2.2.**57
BKT 6K-001-N-02	40...150 mm			■		■		■	■	1 kHz	■			■			**2.2.**57
BKT 18KF-001-P-S4	10 mm	■			■			■	■	5 kHz	■		■				**2.2.**59
BKT 18KF-001-N-S4	10 mm	■				■		■	■	5 kHz	■		■				**2.2.**59
BKT 18KF-001-P-02	10 mm	■			■			■	■	5 kHz	■			■			**2.2.**59
BKT 18KF-001-N-02	10 mm	■				■		■	■	5 kHz	■			■			**2.2.**59
BKT 21M-002-P-S4	19 mm	■			■			■	■	5 kHz	■		■				**2.2.**61
BKT 21M-002-N-S4	19 mm	■				■		■	■	5 kHz	■		■				**2.2.**61
BKT M-15-U-S4	6...12 mm*		■		■	■	■	■	■	10 kHz	■		■				**2.2.**63
BKT M-15L-U-S4	6...12 mm*		■		■	■	■	■	■	10 kHz	■		■				**2.2.**63
BKT M-11-U-03	6...12 mm*		■		■	■	■	■	■	10 kHz	■			■			**2.2.**63
BKT M-11L-U-03	6...12 mm*		■		■	■	■	■	■	10 kHz	■			■			**2.2.**63
BKT M-15C-U-S4	6...12 mm*	■			■	■	■	■	■	20 kHz	■		■				**2.2.**65
BKT M-45-U-S4	0...3 mm	■			■	■	■	■	■	20 kHz	■		■		■		**2.2.**65

*Longer ranges using interchangeable optics

2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

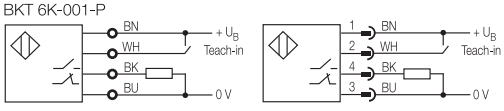
The **BKT 6K** laser contrast sensor is designed for reliable detection of small-area contrast differences. Even the narrowest lines can be definitively sensed over the optimum working range of 70...100 mm. Larger areas are capable of being detected outside this range.

Programming the sensor is easy using a teach-in button or control line.

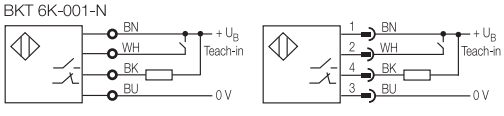


Wiring diagrams

BKT 6K-001-P



BKT 6K-001-N



Recommended accessories

please order separately

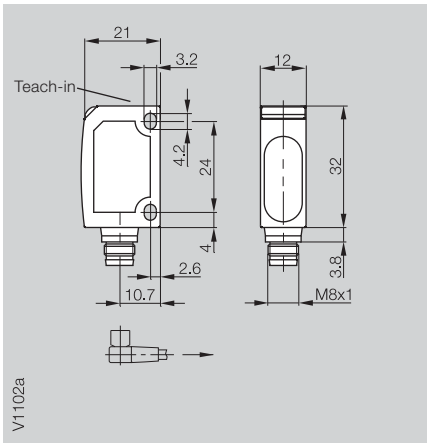


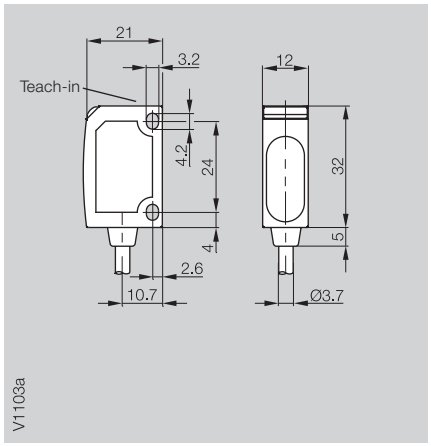
Mounting bracket
BOS 6-HW-1



Connector
Straight BKS-S 74
Right-angle BKS-S 75

Series	BKT 6K	BKT 6K
Working distance	**40...150 mm***	**40...150 mm***





Contrast Sensor		
PNP	BKT 6K-001-P-S75	BKT 6K-001-P-02
NPN	BKT 6K-001-N-S75	BKT 6K-001-N-02
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	10 %	10 %
No-load supply current I_0 max.	≤ 25 mA	≤ 25 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	100 mA	100 mA
Voltage drop U_d at I_e	≤ 2.4 V	≤ 2.4 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	Laser, red light	Laser, red light
Wavelength	650 nm	650 nm
Laser class	2	2
Light spot diameter	0.7 mm at focus (85 mm ±15 mm)	0.7 mm at focus (85 mm ±15 mm)
Time data		
Response time	0.5 ms	0.5 ms
Switching frequency f	1 kHz	1 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Stability indicator	LED green	LED green
Mechanical data		
Connection	M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	impact-resistant ABS	impact-resistant ABS
Optical surface	PMMA	PMMA
Weight	40 g	120 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–20...+60 °C	–20...+60 °C

*Optimum working range for small markings: 70...100 mm

Contrast sensor values referenced to Kodak gray card 90% Reflexion, 100×100 mm.

Connector orientation

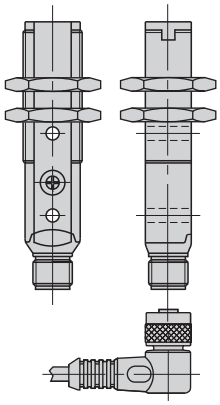
2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

The **BKT 18KF** contrast sensor uses white light and can be programmed with the push of a button. It detects colored markings as well as gray levels on various surfaces. In the standard setting the sensor operates using dark-on.

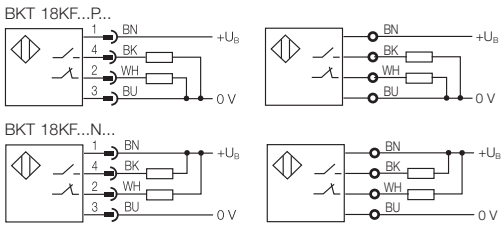
A precise setting is available for slight contrast differences. The output function can also be selected in this setting.



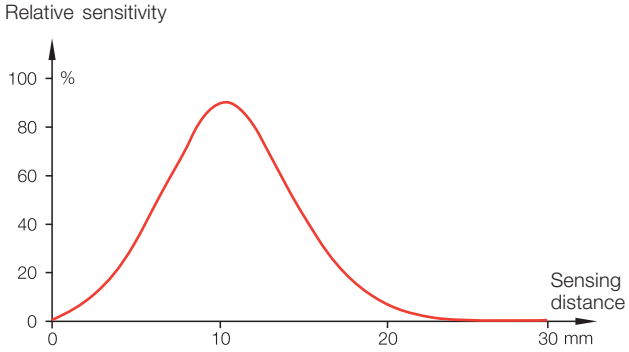
Connector orientation



Wiring diagrams



Function diagram



Recommended accessories
please order separately



Mounting clamp
BOS 18,0-KB-1

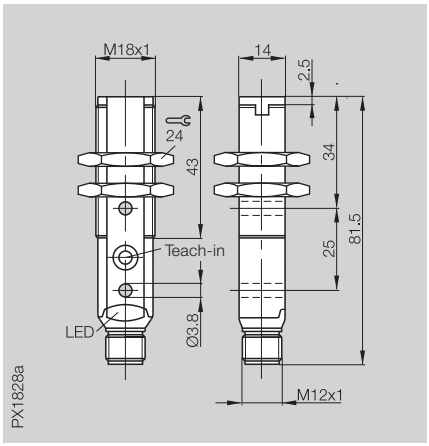


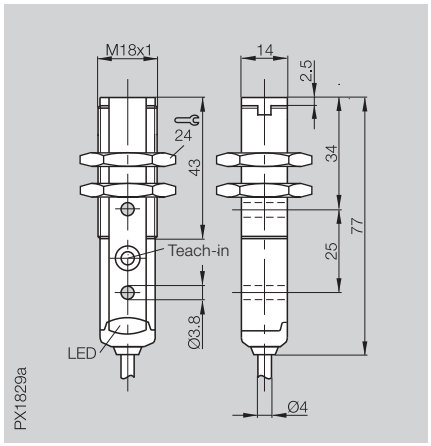
Mounting bracket
BES 18-HW-1



Connector
Straight BKS-_ 19
Right-angle BKS-_ 20

Series	BKT	BKT
Working distance	**10 mm ±2 mm**	**10 mm ±2 mm**





Contrast Sensor		
PNP	BKT 18KF-001-P-S4	BKT 18KF-001-P-02
NPN	BKT 18KF-001-N-S4	BKT 18KF-001-N-02
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	≤ 2 V	≤ 2 V
No-load supply current I_0 max.	≤ 25 mA	≤ 25 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type	Light- and dark-on	Light- and dark-on
Output current	100 mA	100 mA
Voltage drop U_d at I_e	≤ 2 V	≤ 2 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	LED, white light	LED, white light
Wavelength	400...700 nm	400...700 nm
Light spot diameter	approx. 4.5 mm at 10 mm	approx. 4.5 mm at 10 mm
Time data		
Response time	100 µs	100 µs
Switching frequency f	5 kHz	5 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Operating/error indicator	LED green/red	LED green/red
Mechanical data		
Dimensions	M18×81.5 mm	M18×77 mm
Connection	M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	PBT	PBT
Lens material	PMMA	PMMA
Weight	25 g	75 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–25...+55 °C	–25...+55 °C

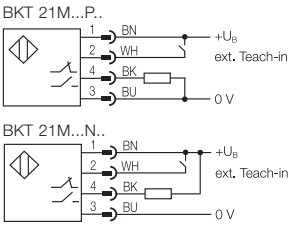
2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

The **BKT 21M** contrast sensor uses white light and can be programmed with the push of a button. It detects colored markings as well as gray levels on various surfaces. In its standard setting the sensor is dark-switching (markings with less light intensity are detected as the background).

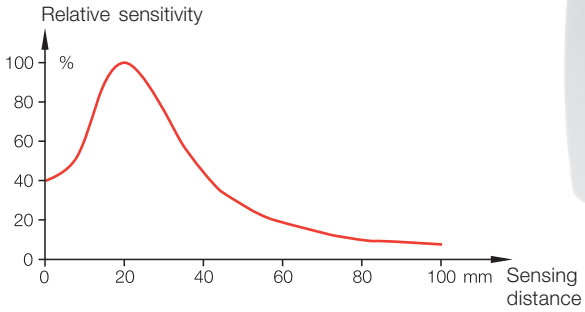
A precise setting is available for slight contrast differences. The output function can also be selected in this setting.



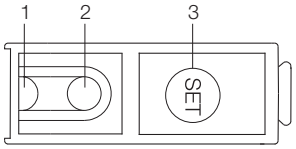
Wiring diagrams



Function diagram



Indicators and operating elements



1 Output function indicator (yellow)
2 Operating/error indicator (green/red)
3 SET key

Recommended accessories
please order separately



Mounting clamp
BOS 21-KH-1



Mounting clamp
BOS 21-KH-2



Mounting bracket
BOS 21-HW-1

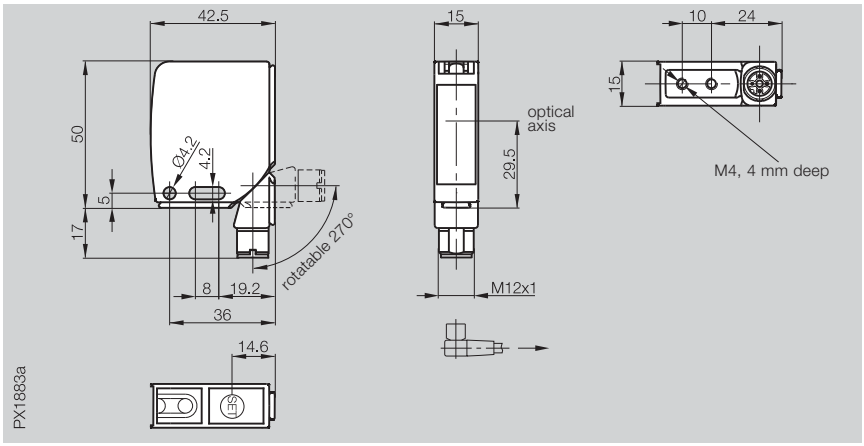


Mounting bracket
BOS 21-HW-2



Connector
Straight BKS-_ 19
Right-angle BKS-_ 20

Series	BKT
Working distance	**19 mm ±2 mm**



Contrast Sensor

PNP	BKT 21M-002-P-S4
NPN	BKT 21M-002-N-S4
Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	≤ 2 V DC
No-load supply current I_0 max.	≤ 30 mA
Switching output	PNP- or NPN-Transistor
Output current	100 mA
Switching type	Light-/dark-on (settable in precise mode)
Voltage drop U_d at I_e	≤ 2 V
Settings	Teach-in
Additional functions	Key disabling possible
Optical data	
Emitter, light type	LED, white light
Wavelength	400...700 nm
Light spot diameter	3.5 mm in 19 mm
Time data	
Response time	0.1 ms
Switching frequency f	5 kHz
Time functions	20 ms off-delay
Indicators	
Output function indicator	LED yellow
Operating/error indicator	LED green/red
Mechanical data	
Dimensions	42.5×50×15 mm
Connection	M12 connector, 4-pin
Housing material	GD-Zn/Al
Optical surface	Glass
Weight	80 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient light rejection	EN 60947-5-2
Ambient temperature range T_a	–25...+55 °C

Connector orientation

2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

In this device the microprocessor takes over the entire setup process. The latter monitors and synchronizes the emitter, receiver and output circuits, for optimum switching frequency, repeatability and insensitivity to interference and ambient light.
The user needs only to press two keys for setting the sensor for the marking and the background.
Remote control of the key functions and remote selection of 4 previously stored contrast ratios is available in the cable version depending on lead selection.

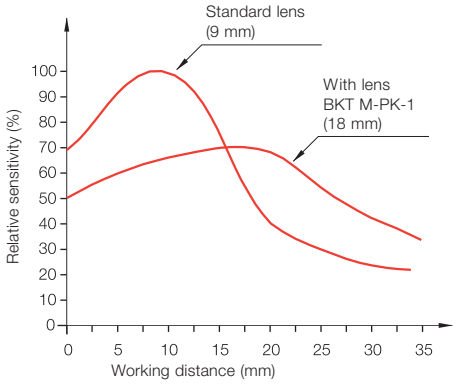
It is also possible to enable a turn-off delay or to disable the keys.
The sensor output is switched between NPN and PNP. All models have an analog output whose signal is proportional to the light intensity reflected from the target.
The sensor lens can be placed in two positions, for setting the exit surface straight or rotated 90° from the sensor axis.

Features

- Optional vertical or horizontal light spot
- Automatic selection of red or green emitter light
- Automatic setting of light-on/dark-on
- Remote key functions and 4 storable programs (cable version)
- Time delay and key lock
- Interchangeable optics (straight and 90°)
- Analog output

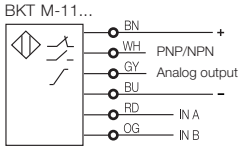


Function diagram

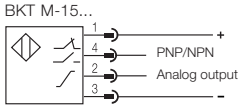


Wiring diagrams

BKT M-11...



BKT M-15...



Recommended accessories
please order separately

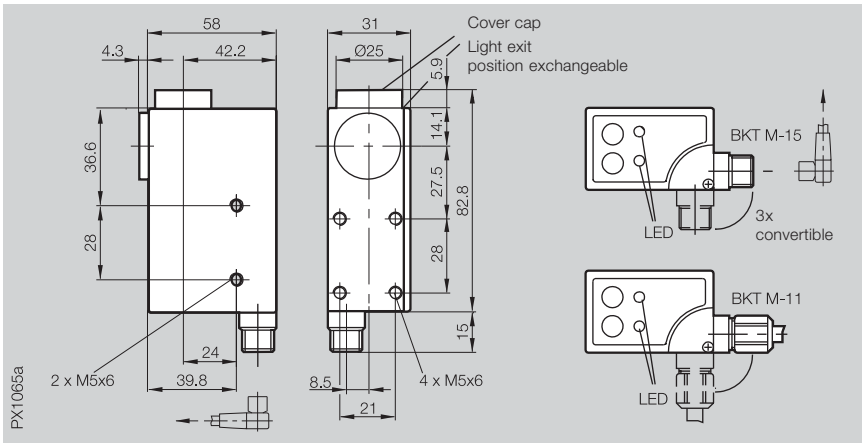


Lens
BKT M-PK-1



Connector
Straight BKS-S 19-3
Right-angle BKS-S 20-3

Series	BKT	BKT
Working distance	**9 mm ±3 mm**	**9 mm ±3 mm**
Working distance with lens PK-1	**18 mm ±4 mm**	**18 mm ±4 mm**



Contrast Sensor

PNP/NPN	vertical spot	⊖	BKT M-15-U-S4	BKT M-11-U-03
PNP/NPN	horizontal spot	ⓘ	BKT M-15L-U-S4	BKT M-11L-U-03
Electrical data				
Supply voltage U_B			10...30 V DC	10...30 V DC
Ripple			2 V DC	2 V DC
No-load supply current I_0 max.			≤ 80 mA	≤ 80 mA
Switching output			PNP- and NPN-Transistor (selectable)	PNP- and NPN-Transistor (selectable)
Output current			200 mA	200 mA
Switching type			Light-/dark-on (selectable)	Light-/dark-on (selectable)
Voltage drop U_d at I_e			≤ 2 V	≤ 2 V
Analog output			0...5.5 V DC*	0...5.5 V DC*
Settings			Teach-in	Teach-in
Additional functions			Key disabling possible	Key disabling possible
Optical data				
Emitter, light type			LED red/green	LED red/green
Wavelength			630 nm/526 nm	630 nm/526 nm
Light spot diameter			1.5×5 mm**	1.5×5 mm**
Time data				
Response time			50 µs	50 µs
Switching frequency f			10 kHz	10 kHz
Time function			20 ms off-delay selectable	20 ms off-delay selectable
Indicators				
Ready indicator			LED green	LED green
Output function indicator			LED red	LED red
Mechanical data				
Connection			M12 connector, 4-pin	3 m cable, PVC
No. of wires × cross-section				6×0.34 mm² with shield
Housing material			GD-Zn	GD-Zn
Optical surface			Glass	Glass
Weight			310 g	600 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient light rejection			EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a			–10...+55 °C	–10...+55 °C

*2.5 V DC with Kodak gray card 90% Reflexion
**2×7 mm with BKT M-PK1

Connector orientation

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2.3
Photoelectric sensors accessories page 2.3.2 ...
5
Connectors ... page 5.2 ...

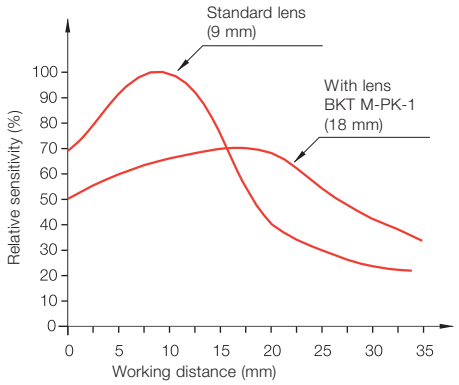
BKT M
Contrast sensor with white light

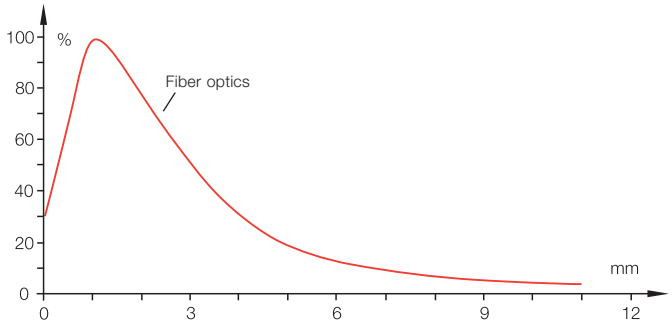
The Series **BKT M...** contrast sensors are also available with white light. Models with a round light spot or with a fiber optic port are available.

Features

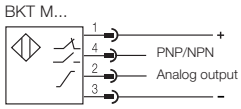
- Round light spot
- White light
- Automatic setting of light-on/dark-on
- Time delay and key lock selectable
- Interchangeable optics (straight and 90°)
- Analog output

Function diagrams





Wiring diagram



Recommended accessories
please order separately



Fiber optics
BFO KTS-XBH-MZG-00-1

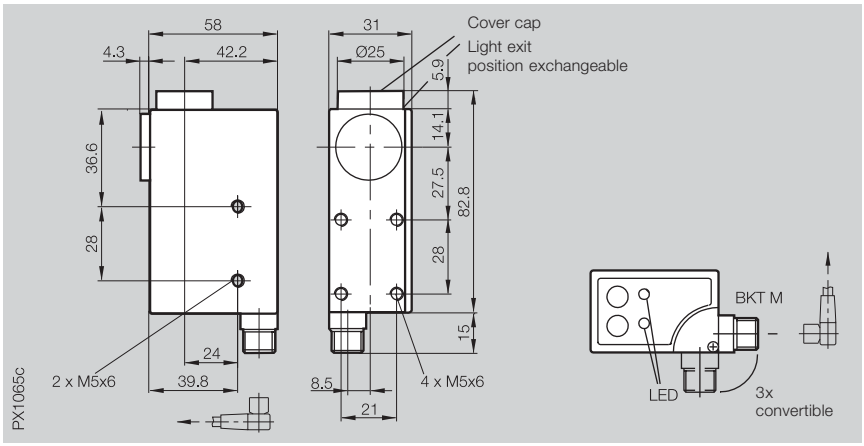


Lens
BKT M-PK-1



Connector
Straight BKS-S 19-3
Right-angle BKS-S 20-3

Series	BKT	BKT
Working distance		**9 mm ±3 mm**
Working distance with lens PK-1		**18 mm ±4 mm**
Working distance with fiber optics (diffuse)	**0...3 mm**	



Contrast Sensor

PNP/NPN for fiber optics	BKT M-45-U-S4	
PNP/NPN round spot		BKT M-15C-U-S4
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	2 V DC	2 V DC
No-load supply current I_0 max.	≤ 80 mA	≤ 80 mA
Switching output	PNP- and NPN-Transistor (selectable)	PNP- and NPN-Transistor (selectable)
Output current	200 mA	200 mA
Switching type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Voltage drop U_d at I_e	≤ 2 V	≤ 2 V
Analog output	0...5.5 V DC*	0...5.5 V DC*
Settings	Teach-in	Teach-in
Additional functions	Key disabling possible	Key disabling possible
Optical data		
Emitter, light type	LED white	LED white
Wavelength	400...700 nm	400...700 nm
Time data		
Response time	25 µs	25 µs
Switching frequency f	20 kHz	20 kHz
Time function	20 ms off-delay selectable	20 ms off-delay selectable
Indicators		
Ready indicator	LED green	LED green
Output function indicator	LED red	LED red
Mechanical data		
Connection	M12 connector, 4-pin	M12 connector, 4-pin
Housing material	GD-Zn	GD-Zn
Optical surface	Glass	Glass
Weight	310 g	310 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–10...+55 °C	–10...+55 °C

*2.5 V DC with Kodak gray card 90 % Reflexion

Connector orientation

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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Photoelectric sensors usually detect the target or the desired target features themselves. When this isn't possible, markings are applied to the object and these are detected by the sensor. But what do you do when you can't apply visible markings to the object? Very simple: apply invisible markings!

How does that work? You use so-called fluorescent materials (contained in special chalks, inks, paints, etc.), which are only visible in ultraviolet (UV) light. The fluorescent materials change the invisible UV light into visible light. This effect is called photoluminescence. The visible light can then be detected as normal by the receiver portion of the sensor.

Applications

- Logistics (marking, selecting)
- Assembly (guiding, monitoring, sorting)
- Packaging machines (to monitor cutting, folding)
- Ceramics (e.g., parts positioning)
- Wood industry (e.g., controlling the glue bead)
- Pharmaceuticals (control tasks in the manufacturing process)
- Textiles (e.g., cut guiding)
- Food industry



Type	Sensing distance	Light type		Output			Output function		Switching frequency	U_B	Connection		Page
		UV light		PNP-Transistor	NPN-Transistor	Analog output	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	Cable	
Luminescence Sensor													
BLT 18KF-001-P-S4	8...20 mm	■		■			■	■	1 kHz	■	■		**2.2.**69
BLT 18KF-001-N-S4	8...20 mm	■			■		■	■	1 kHz	■	■		**2.2.**69
BLT 18KF-001-P-02	8...20 mm	■		■			■	■	1 kHz	■		■	**2.2.**69
BLT 18KF-001-N-02	8...20 mm	■			■		■	■	1 kHz	■		■	**2.2.**69
BLT 21M-001-P-S4	0...40 mm	■		■			■	■	2 kHz	■	■		**2.2.**71
BLT 21M-001-N-S4	0...40 mm	■			■		■	■	2 kHz	■	■		**2.2.**71
BLT M-15-U-S4	9...18 mm	■		■	■	■	■	■	1 kHz	■	■		**2.2.**73
BLT M-11-U-03	9...18 mm	■		■	■	■	■	■	1 kHz	■		■	**2.2.**73
BLT M-55-U-S4	20...40 mm	■		■	■	■	■	■	2 kHz	■	■		**2.2.**75

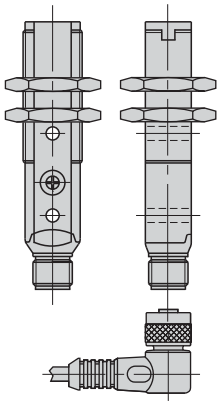
2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

The **BLT 18KF** luminescence sensor detects any type of luminescent markings on any surface and automatically adjusts to ambient conditions. Setting is accomplished by pressing a key (markings with greater luminescence are detected as the background).

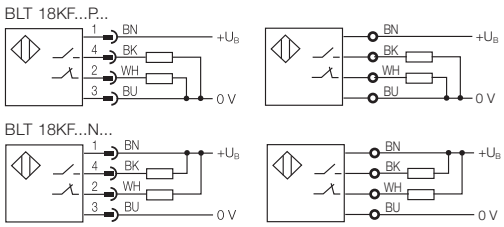
A precise setting is available for weakly luminescent markings. In this setting the output function can also be selected.



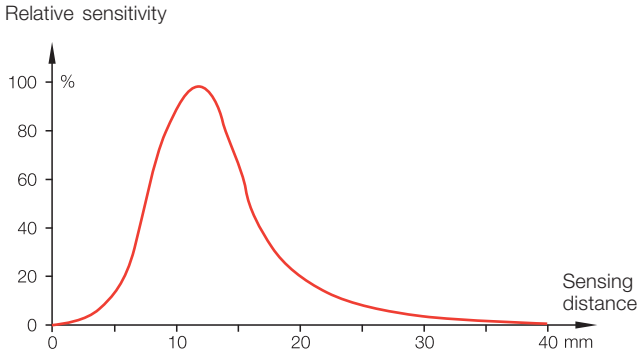
Connector orientation



Wiring diagrams



Function diagram



Recommended accessories

please order separately



Mounting clamp
BOS 18,0-KB-1

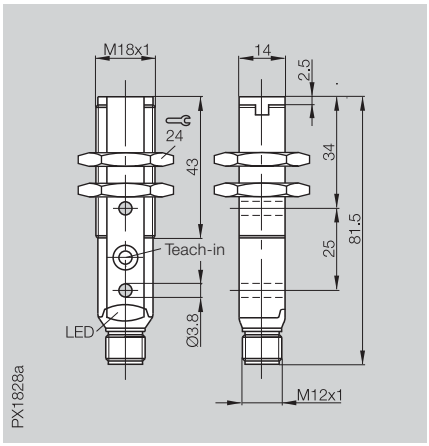


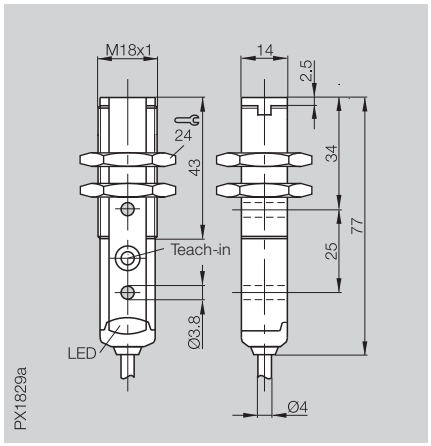
Mounting bracket
BES 18-HW-1



Connector
Straight BKS-_ 19
Right-angle BKS-_ 20

Series	BLT	BLT
Working range	**8...20 mm**	**8...20 mm**





Luminescence Sensor		
PNP	BLT 18KF-001-P-S4	BLT 18KF-001-P-02
NPN	BLT 18KF-001-N-S4	BLT 18KF-001-N-02
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	≤ 2 V	≤ 2 V
No-load supply current I_0 max.	≤ 25 mA	≤ 25 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type	Light- and dark-on	Light- and dark-on
Output current	100 mA	100 mA
Voltage drop U_d at I_e	≤ 2 V	≤ 2 V
Settings	Teach-in	Teach-in
Optical data		
Emitter, light type	LED, UV	LED, UV
Wavelength	370 nm	370 nm
Light spot diameter	approx. 3 mm at 20 mm	approx. 3 mm at 20 mm
Time data		
Response time	0.5 ms	0.5 ms
Switching frequency f	1 kHz	1 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Operating/Error indicator	LED green/red	LED green/red
Mechanical data		
Dimensions	M18×81.5 mm	M18×77 mm
Connection	M12 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	PBT	PBT
Lens material	PMMA	PMMA
Weight	25 g	75 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–25...+55 °C	–25...+55 °C

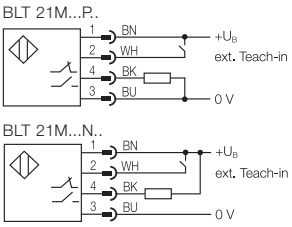
2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

BLT 21M luminescence sensors detect all kinds of luminescent markings on any background. The sensor is calibrated with the simple push of a button. In the standard setting the sensor is light-switching (markings with greater luminescence are recognized as the background).

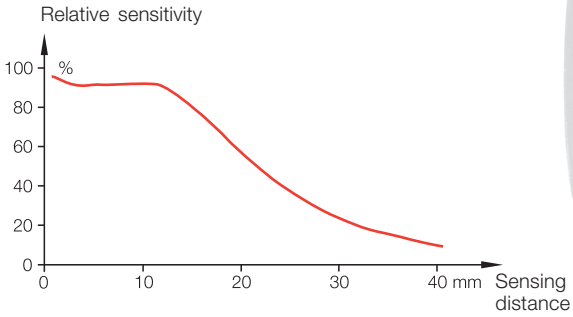
A precise setting is available for weakly luminescent markings. In this setting the output function can also be selected.



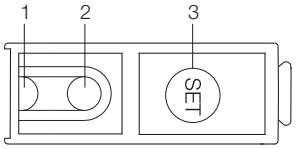
Wiring diagrams



Function diagram



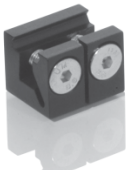
Indicators and operating elements



1 Output function indicator (yellow)
2 Operating/Error indicator (green/red)
3 SET key

Recommended accessories
please order separately


Mounting clamp
BOS 21-KH-1

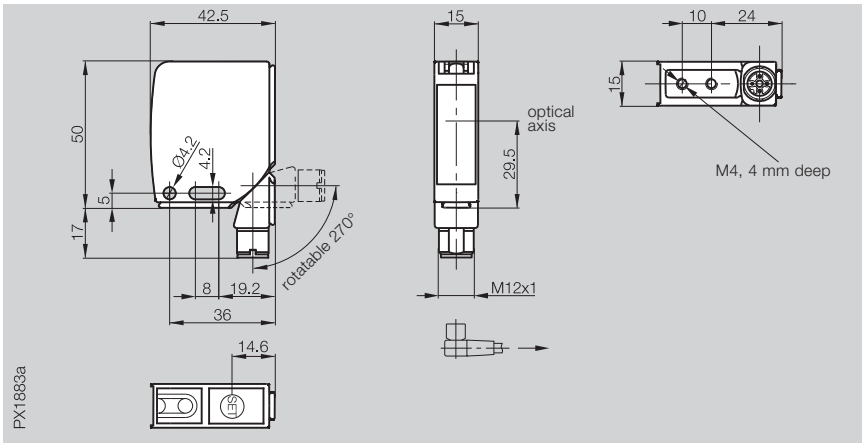

Mounting clamp
BOS 21-KH-2


Mounting bracket
BOS 21-HW-1


Mounting bracket
BOS 21-HW-2


Connector
Straight BKS-_ 19
Right-angle BKS-_ 20

Series	BLT
Working range	**0...40 mm**



Luminescence Sensor

PNP	BLT 21M-001-P-S4
NPN	BLT 21M-001-N-S4
Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	≤ 2 V DC
No-load supply current I_0 max.	≤ 30 mA
Switching output	PNP- or NPN-Transistor
Output current	100 mA
Switching type	Light-/dark-on (settable in precise mode)
Voltage drop U_d at I_e	≤ 2 V
Settings	Teach-in
Additional functions	Key disabling possible
Optical data	
Emitter, light type	LED, UV
Wavelength	370 nm
Light spot diameter	ca. 1.5 mm at 10 mm
Time data	
Response time	250 µs
Switching frequency f	2 kHz
Time functions	20 ms off-delay
Indicators	
Output function indicator	LED yellow
Operating/error indicator	LED green/red
Mechanical data	
Dimensions	42.5×50×15 mm
Connection	M12 connector, 4-pin
Housing material	GD-Zn/Al
Optical surface	Glass
Weight	80 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient light rejection per	EN 60947-5-2
Ambient temperature range T_a	–10...+55 °C

Connector orientation

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2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

The Balluff luminescence sensor is equipped with a modern UV source so that no external UV lamp is needed. A microcontroller handles the evaluation using a teach-in procedure.
By simply pressing a key the BLT learns the difference between the fluorescent marking and the background. If the difference is too slight and can not be reliably discriminated, this is indicated by an error message (flashing LED). The sensing distance is typically 9 to 18 mm. Additional lenses are available to increase the sensing distance.

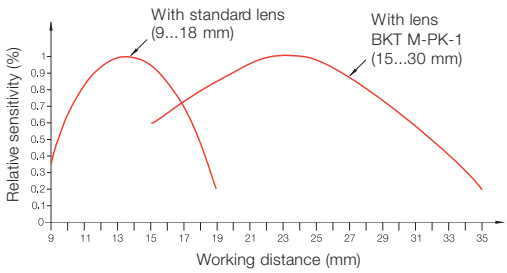
Configuring two internal DIP switches allows you to set a turn-off delay of 20 ms or disable the keys. The PNP/NPN output is also adjustable. An analog signal proportional to the light reflected by the marking rounds out the functionality of the BLT.

Features

- UV source:
  LED, 100,000 hour life
- Push-button setting
- Automatic setting
  of light-on/dark-on
- Time delay selectable
- Analog output
  0...7 V DC standard
- M12 connector rotatable
  (3 positions)
- Key disabling possible

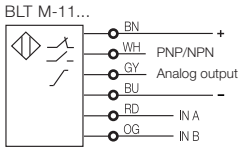


Function diagram

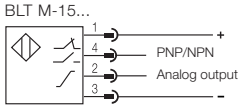


Wiring diagrams

BLT M-11...



BLT M-15...



Recommended accessories

please order separately

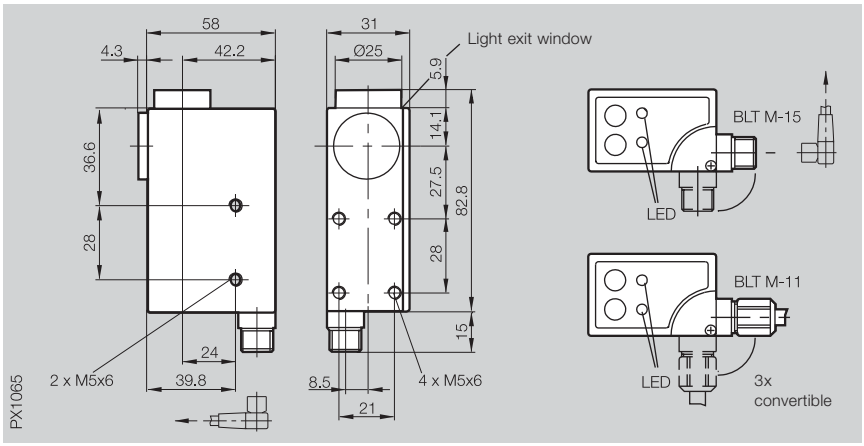


Lens
BKT M-PK-1



Connector
Straight BKS-S 19-3
Right-angle BKS-S 20-3

Series	BLT	BLT
Working range	**9...18 mm**	**9...18 mm**
Working range with lens PK-1	**15...30 mm**	**15...30 mm**
Working range with fiber optic cable	**0...30 mm**	**0...30 mm**



Luminescence Sensor

PNP/NPN	BLT M-15-U-S4	BLT M-11-U-03
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	2 V DC	2 V DC
No-load supply current I_0 max.	≤ 80 mA	≤ 80 mA
Switching output	PNP- and NPN-Transistor (selectable)	PNP- and NPN-Transistor (selectable)
Switching type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	200 mA	200 mA
Voltage drop U_d at I_e	≤ 2 V	≤ 2 V
Analog output	0...7 V DC	0...7 V DC
Settings	Teach-in	Teach-in
Additional functions	Key disabling possible	Key disabling possible
Optical data		
Emitter, light type	LED, UV	LED, UV
Wavelength	380 nm	380 nm
Light spot diameter	5 mm at focal point	5 mm at focal point
Time data		
Response time	0.5 ms	0.5 ms
Switching frequency f	1 kHz	1 kHz
Time functions	20 ms off-delay selectable	20 ms off-delay selectable
Indicators		
Ready indicator	LED green	LED green
Output function indicator	LED red	LED red
Mechanical data		
Connection	M12 connector, 4-pin	3 m cable, PVC
No. of wires × cross-section		6×0.34 mm² with shield
Housing material	GD-Zn	GD-Zn
Optical surface	Glass	Glass
Weight	310 g	450 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–10...+55 °C	–10...+55 °C

Connector orientation

Please note! Lenses not interchangeable for BLT M.

2.2
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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

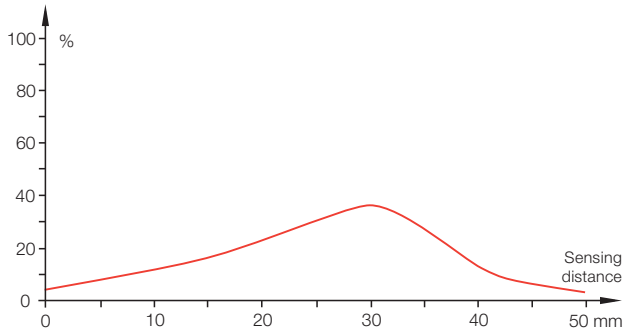
The Balluff **BLT M-55-...** luminescence sensor is equipped with a high-power UV LED, so that long sensing distances are possible using the appropriate lenses. For tight mounting conditions an adaptable fiber optic cable provides additional solution options.

Features

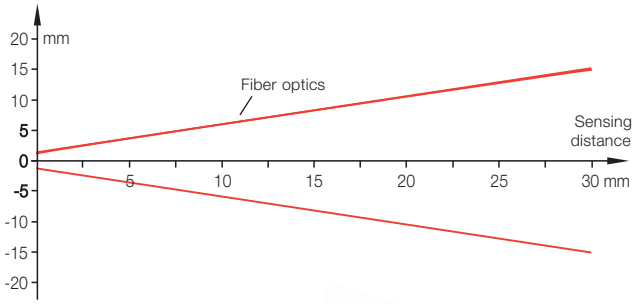
- High-Power UV LED
- High switching frequency of 2 kHz
- Fiber optic cable compatibility
- Push-button setting
- Analog output 0...7 V DC standard

Function diagrams

Relative sensitivity

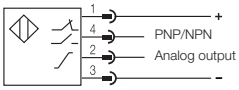


Detection range



Wiring diagram

BLT M-55-...



Recommended accessories

please order separately

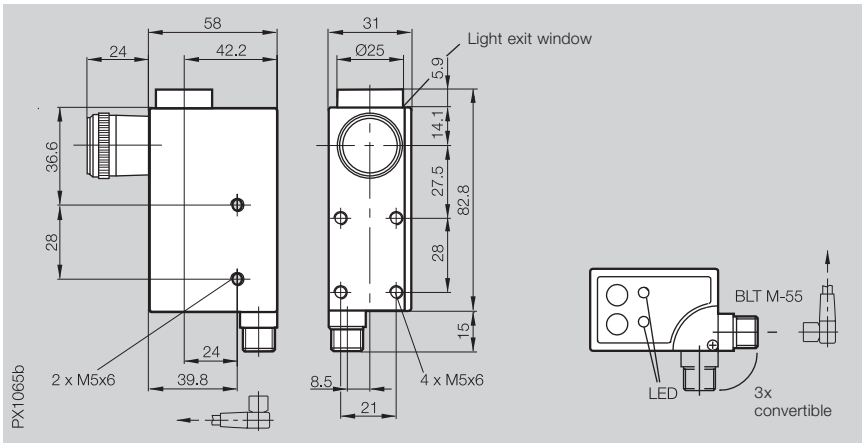


Fiber optic cable
BFO LTS-...-TAF-00-_ _



Connector
Straight BKS-S 19-3
Right-angle BKS-S 20-3

Series	BLT
Working range	**20...40 mm**
Working range with fiber optic cable	**0...30 mm**



Luminescence Sensor

PNP/NPN	BLT M-55-U-S4
Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	2 V DC
No-load supply current I_0 max.	≤ 80 mA
Switching output	PNP- and NPN-Transistor (selectable)
Switching type	Light-/dark-on (selectable)
Output current	200 mA
Voltage drop U_d at I_e	≤ 2 V
Analog output	0...7 V DC
Settings	Teach-in
Additional functions	Key disabling possible
Optical data	
Emitter, light type	LED, HP-UV
Wavelength	370 nm
Light spot diameter	3 mm at focal point
Time data	
Response time	250 µs
Switching frequency f	2 kHz
Time functions	20 ms off-delay selectable
Indicators	
Ready indicator	LED green
Output function indicator	LED red
Mechanical data	
Connection	M12 connector, 4-pin
Housing material	GD-Zn
Optical surface	Glass
Weight	310 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient light rejection	EN 60947-5-2
Ambient temperature range T_a	–10...+55 °C

Connector orientation

Please note! Lenses not interchangeable for BLT M.

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The series **BFS 26K** and **BFS 27K** color sensors operate using pulsed white light, making them particularly insensitive to ambient light. The light reflected back from the object is received and processed by three different receivers (red, green, blue).

Applications

Color sensors open up a wide field of various applications, such as in the packaging industry, robotics, automation, quality assurance or in the process industry.

Simplify and speed up automated processes using these versatile color sensors – for detecting color shades in carpets or textiles, as well as color markings on packaging or labels.

With dimensions of just 50×50×17 mm and a rotatable connector, the **BFS 26K** fits in tight areas and can be programmed either using a control line or by means of 2 keys via teach-in.

The various light spot geometry configurations of the respective sensors (round, rectangular or square) allow even the smallest color markings to be reliably discriminated.

Numerous special functions such as color scanning, pulse expansion and blanking input provide additional application flexibility.

Features

- Microcontroller-based
- Pulsed white light
- Various light spot geometries
- Teach-in and external teach-in
- M12 connector rotatable by 270°
- 3 different colors can be identified at the same time
- 5-stage adjustable color tolerance





The **BFS 27K** with a clearly organized operating panel and large display enables simple teaching of various colors and selection of all functions using teach-in.

Modes C (color type) and C+I (color type + intensity) as well as 10 tolerance levels can be set separately for all 3 channels. Pulse extension of 0..40 ms can also be selected and is applied to all channels.

Balluff sensorware allows the set functions to be visualized over the RS 485 interface.

Features

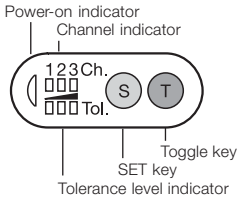
- Display
- Autocollimation
- Versions with high switching frequency or for dark colors
- Color type or color type + intensity modes
- Serial interface RS485

Type	Sensing distance	Light type		Output			Output function		Switching frequency	U_B		Connection		Special features			Page
		White light		3 × PNP-Transistor	3 × NPN-Transistor	Interface RS485	Light-on			10...30 V DC	12...28 V DC	M12 connector, 8-pin		Reflector mode	Color intensity measurement	Color scan	
Color Sensors																	
BFS 26K-PS-L01-S115	12...32 mm	■		■			■		500 Hz		■	■		■		■	**2.2.**79
BFS 26K-PS-L02-S115-C	15...30 mm	■		■			■		500 Hz		■	■				■	**2.2.**79
BFS 26K-PS-L03-S115-C	18...22 mm	■		■			■		500 Hz		■	■				■	**2.2.**79
BFS 27K-PS-L01-S115	5...45 mm	■		■			■		1.5 kHz	■		■			■		**2.2.**81
BFS 27K-NS-L01-S115	5...45 mm	■			■		■		1.5 kHz	■		■			■		**2.2.**81
BFS 27K-PSR-L01-S115	5...45 mm	■		■		■	■		1.5 kHz	■		■			■		**2.2.**81
BFS 27K-NSR-L01-S115	5...45 mm	■			■	■	■		1.5 kHz	■		■			■		**2.2.**81
BFS 27K-PS-L02-S115	5...45 mm	■		■			■		500 Hz	■		■			■		**2.2.**81
BFS 27K-NS-L02-S115	5...45 mm	■			■		■		500 Hz	■		■			■		**2.2.**81
BFS 27K-PSR-L02-S115	5...45 mm	■		■		■	■		500 Hz	■		■			■		**2.2.**81
BFS 27K-NSR-L02-S115	5...45 mm	■			■	■	■		500 Hz	■		■			■		**2.2.**81

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Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

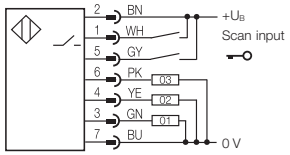
Series	
Working range	Diffuse mode
Working range	Reflector mode

Indicators and operating elements

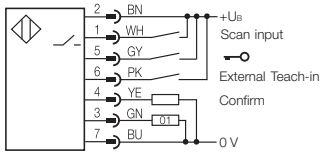


Wiring diagrams

Two modes are available.
1. Normal mode “factory setting”

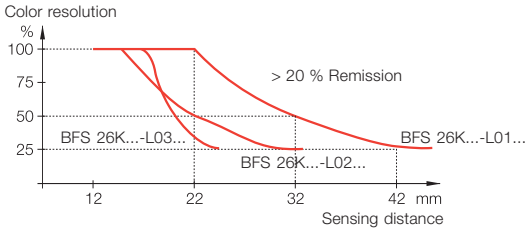


2. External Teach-in setting using „special functions“



Disabling input:
> 12 V = keys disabled
< 3 V = keys not disabled

Color resolution/Sensing distance diagram



Recommended accessories
please order separately



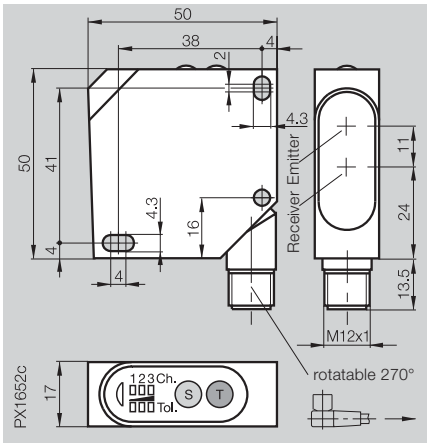
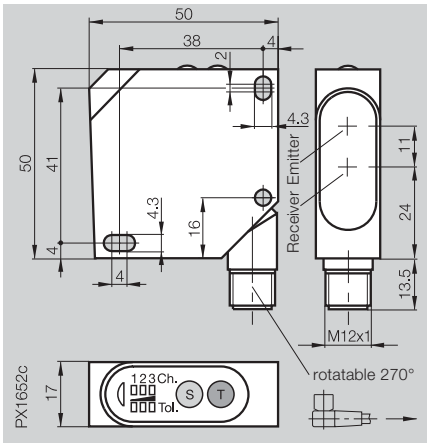
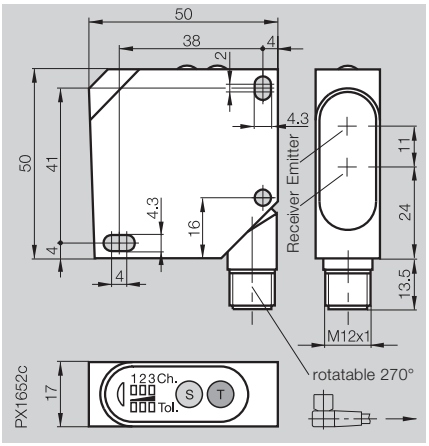
Mounting bracket
BOS 26-HW-1



Connector
BKS-S139-PU-05

Color sensor	
PNP	
Electrical data	
Supply voltage U_B	
Ripple	
No-load supply current I_0 max.	
Switching output	
Output current	
Switching type	
Voltage drop U_d at I_e	
Settings	
Optical data	
Emitter, light type	
Light spot geometry	
Light spot diameter	
Sensing distance tolerance	
Color resolution tolerance	
Indicators	
Power-on indicator	
Output function indicator Ch. 1...Ch. 3	
Output function indicator Tol. 1...Tol. 5	
Time data	
Ready delay	
Response time	
Switching frequency f	
Time functions	
Mechanical data	
Dimensions	
Connection	
Housing material	
Optical surface	
Weight	
Ambient data	
Degree of protection per IEC 60529	
Polarity reversal protected	
Short circuit protected	
Ambient temperature range T_a	
Ambient light rejection per	

Connector orientation

BFS 26K **12...32 mm** **50...200 mm**	BFS 26K **15...30 mm**	BFS 26K **18...22 mm**
		
BFS 26K-PS-L01-S115	BFS 26K-PS-L02-S115-C	BFS 26K-PS-L03-S115-C
12...28 V DC	12...28 V DC	12...28 V DC
10 %	10 %	10 %
≤ 40 mA	≤ 40 mA	≤ 40 mA
3 × PNP-Transistor	3 × PNP-Transistor	3 × PNP-Transistor
100 mA	100 mA	100 mA
Light-on	Light-on	Light-on
≤ 2.4 V	≤ 2.4 V	≤ 2.4 V
Teach-in	Teach-in	Teach-in
Pulsed white light	Pulsed white light	Pulsed white light
round	square	rectangular
∅ 4 mm at 22 mm sensing distance	2×2 mm at 22 mm sensing distance	5×1 mm at 22 mm sensing distance
±6 mm for Tol. 3	±5 mm for Tol. 3	±2 mm for Tol. 3
settable in 5 levels	settable in 5 levels	settable in 5 levels
LED green	LED green	LED green
3 × LED yellow	3 × LED yellow	3 × LED yellow
3 × LED red	3 × LED red	3 × LED red
300 ms	300 ms	300 ms
1 ms	1 ms	1 ms
500 Hz	500 Hz	500 Hz
50 ms turn-off delay selectable	50 ms turn-off delay selectable	50 ms turn-off delay selectable
50×50×17 mm	50×50×17 mm	50×50×17 mm
M12 connector, 8-pin	M12 connector, 8-pin	M12 connector, 8-pin
impact-resistant ABS	impact-resistant ABS	impact-resistant ABS
PMMA	PMMA	PMMA
40 g	40 g	40 g
IP 67	IP 67	IP 67
yes	yes	yes
yes	yes	yes
–10...+55 °C	–10...+55 °C	–10...+55 °C
EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

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Variants

The BFS 27K-...-**L01** with a switching frequency of 1.5 kHz is designed for color detection in fast processes, such as packaging in the food industry or of pharmaceutical products.

The BFS 27K-...-**L02** variant features excellent color sensitivity with dark colors. This makes it outstanding for quality assurance and for parts detection.

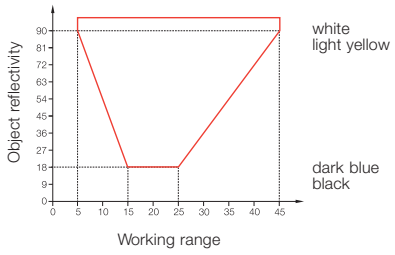
Operating modes

C Color type
In C mode the sensor uses increased depth of field (contrast).
This is used for detecting colors on shiny, highly reflective or matte surfaces.

C+I Color type + intensity
In the C+I setting color intensity is also evaluated. This allows even the finest color nuances to be discriminated. Even the finest gray levels can be detected.

Function diagrams

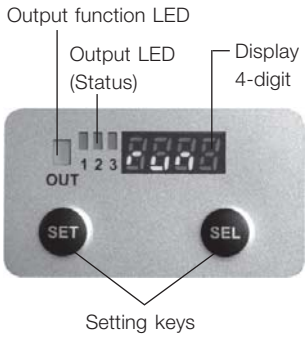
BFS 27K-...-L01



BFS 27K-...-L02

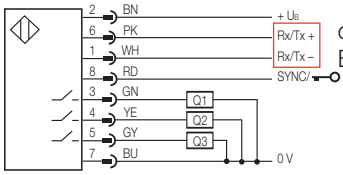


Operating panel and display



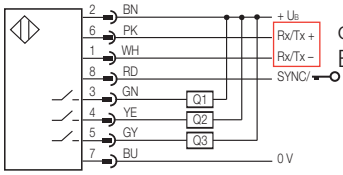
Wiring diagrams

BFS 27K-PS...
PNP



only type
BFS 27K-PS**R**...

BFS 27K-NS...
NPN



only type
BFS 27K-NS**R**...

Recommended accessories
please order separately



Mounting bracket
BOS 35-HW-1



Adapter plate
BOS 21-AD-1

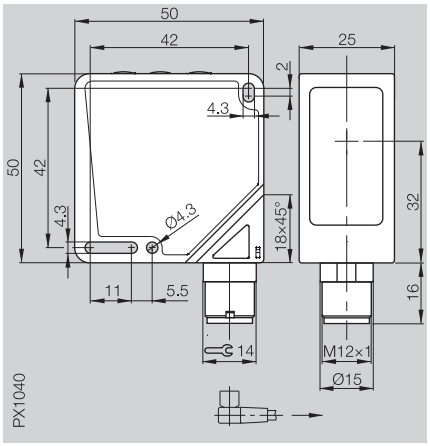


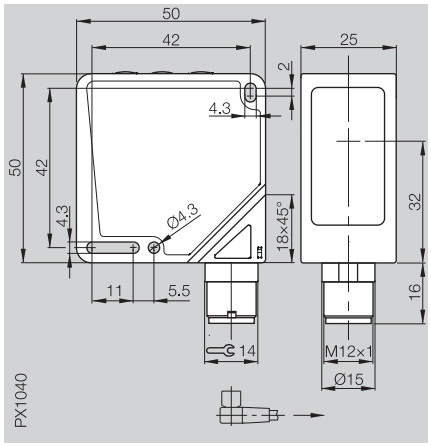
Mounting clamp
with ball joint
BOS 18,0-KB-1



Connector
right-angle, 5 m
BKS-S138-PU-05
straight, 5 m
BKS-S139-PU-05

Series	BFS 27K	BFS 27K
Working range	**5...45 mm***	**5...45 mm***





Color sensor			
PNP		BFS 27K-PS-L01-S115	BFS 27K-PS-L02-S115
NPN		BFS 27K-NS-L01-S115	BFS 27K-NS-L02-S115
PNP	with RS485	BFS 27K-PS**R**-L01-S115	BFS 27K-PS**R**-L02-S115
NPN	with RS485	BFS 27K-NS**R**-L01-S115	BFS 27K-NS**R**-L02-S115
Electrical data			
Supply voltage U_B		10...30 V DC	10...30 V DC
Ripple		≤ 2 V	≤ 2 V
No-load supply current I_0 max.		≤ 60 mA	≤ 60 mA
Switching output		3 × PNP- or NPN-Transistor	3 × PNP- or NPN-Transistor
Output current		100 mA	100 mA
Switching type		Light-on	Light-on
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V
Settings		Teach-in	Teach-in
Optical data			
Emitter, light type		LED, white light	LED, white light
Wavelength		400...700 nm	400...700 nm
Light spot diameter		≥ 4 mm	≥ 4 mm
Tolerance levels		10 per channel (can be set)	10 per channel (can be set)
Indicators			
Display		4-digit 7-segment display green	4-digit 7-segment display green
Output function indicator		LED yellow	LED yellow
Output indicator		3 × LED green	3 × LED green
Time data			
Response time		335 µs	5 ms (standard), 1 ms (fast)
Switching frequency f		1.5 kHz	100 Hz (standard), 500 Hz (fast)
Time functions		Pulse lengthening 0...40 ms	Pulse lengthening 0...40 ms
Mechanical data			
Dimensions		50×50×25 mm	50×50×25 mm
Connection		M12 connector, 8-pin	M12 connector, 8-pin
Housing material		ABS	ABS
Optical surface		Glass	Glass
Weight		100 g	100 g
Ambient data			
Degree of protection per IEC 60529		IP 67	IP 67
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–10...+55 °C	–10...+55 °C

*see function diagrams

Connector orientation

Software

The software for the **R** model (RS485) can be downloaded for free at our homepage **www.balluff.de**.

www.balluff.de
└ Document type
└ Software/Descriptions
└ Software for the BFS 27K

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Through-beam sensors are unsurpassed in their accuracy, ability to discriminate small parts and fine detail, as well as their operating reliability. The only disadvantages are in installation and setup. The goal of eliminating these objections has led to the concept of the slot sensor.

A full range of slot sensors with a variety of slot openings and dimensions ensures that virtually any sensing task can be handled while still using standard product.

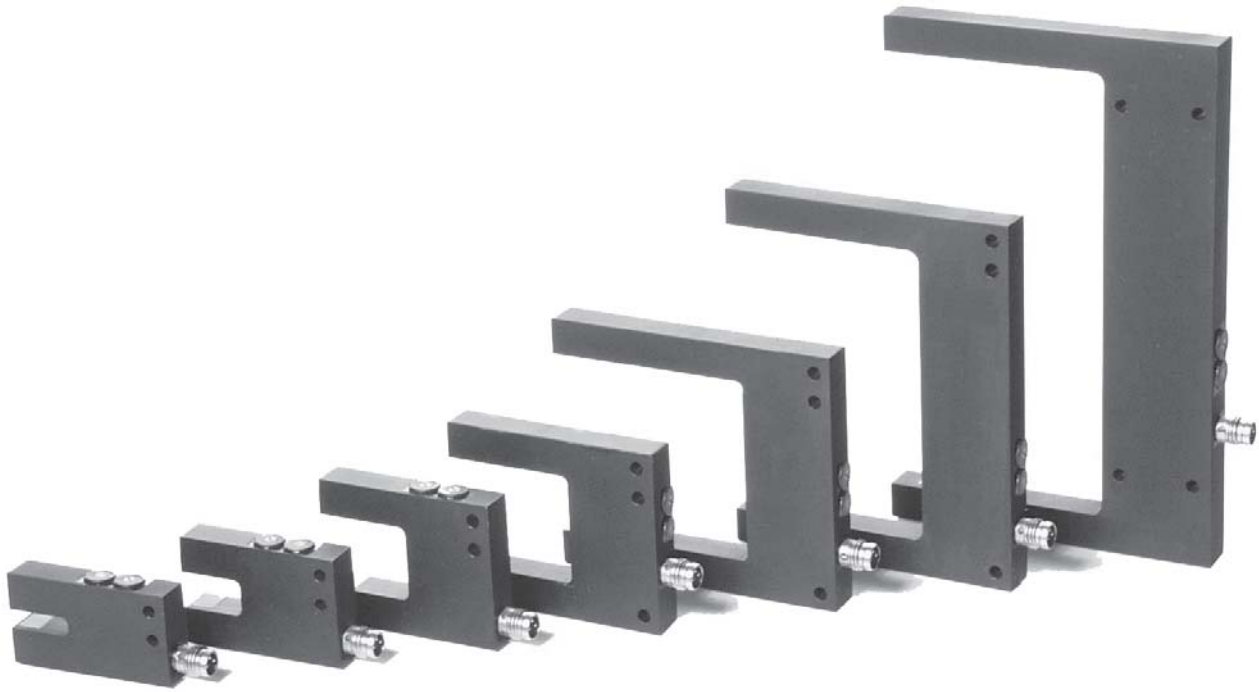
Laser slot sensors are the logical extension of this proven concept. They are unbeatable when it comes to accuracy, detail discrimination and operating reliability. Balluff laser slot sensors are ideal for precise positioning as well as reliable detection of fast-moving processes and small parts. This opens a vast range of applications in robotics and automation.

Features

- Integrated processing electronics
- Easy to use and adjust
- Only one cable connection needed
- Tough metal housing
- Glass optical surface
- High switching frequency
- Adjustable sensitivity
- High resolution
- NO/NC toggle switch
- LED indicator 360° visible
- Choose from red or laser light
- Identical housing dimensions for both light versions
- Slot arm 10×10 mm, even for large slot openings
- Side-by-side allowed
- Laser Class 1

Applications

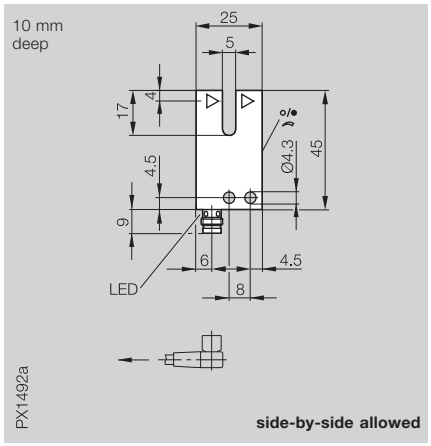
- Parts sensing on conveyor and feed belts
- Label sensing on transparent backing material
- Dimension checking
- Counting parts in assembly lines
- Tool break monitoring
- Position monitoring
- Feed control on automatic assembly equipment
- Checking for completeness (e.g. connector pins)
- Level monitoring of containers
- Handling and assembly

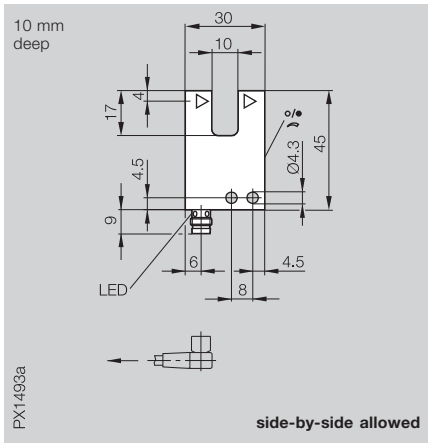


Type	Slot opening	Resolution	Light type				Output		Output function		Switching frequency	U_B	Connection		Page
			Red light	Laser light	Infrared	Red and green light	PNP-Transistor	NPN-Transistor	Light-on	Dark-on		10...30 V DC	M8 connector, 3-pin		
Slot Sensors															
BGL 5A-001-S49	5 mm	0.3 mm	■				■		■	■	3 kHz	■	■		**2.2.**84
BGL 5A-002-S49	5 mm	0.3 mm	■					■	■	■	3 kHz	■	■		**2.2.**84
BGL 10A-001-S49	10 mm	0.3 mm	■				■		■	■	3 kHz	■	■		**2.2.**84
BGL 10A-002-S49	10 mm	0.3 mm	■					■	■	■	3 kHz	■	■		**2.2.**84
BGL 20A-001-S49	20 mm	0.3 mm	■				■		■	■	1.5 kHz	■	■		**2.2.**85
BGL 20A-002-S49	20 mm	0.3 mm	■					■	■	■	1.5 kHz	■	■		**2.2.**85
BGL 30A-001-S49	30 mm	0.3 mm	■				■		■	■	1.5 kHz	■	■		**2.2.**85
BGL 30A-002-S49	30 mm	0.3 mm	■					■	■	■	1.5 kHz	■	■		**2.2.**85
BGL 30A-003-S49	30 mm	50 µm		■			■		■	■	5 kHz	■	■		**2.2.**88
BGL 30A-004-S49	30 mm	50 µm		■				■	■	■	5 kHz	■	■		**2.2.**88
BGL 50A-001-S49	50 mm	0.4 mm	■				■		■	■	1.5 kHz	■	■		**2.2.**85
BGL 50A-002-S49	50 mm	0.4 mm	■					■	■	■	1.5 kHz	■	■		**2.2.**85
BGL 50A-003-S49	50 mm	80 µm		■			■		■	■	5 kHz	■	■		**2.2.**89
BGL 50A-004-S49	50 mm	80 µm		■				■	■	■	5 kHz	■	■		**2.2.**89
BGL 80A-001-S49	80 mm	0.4 mm	■				■		■	■	1.5 kHz	■	■		**2.2.**86
BGL 80A-002-S49	80 mm	0.4 mm	■					■	■	■	1.5 kHz	■	■		**2.2.**86
BGL 80A-003-S49	80 mm	0.1 mm		■			■		■	■	5 kHz	■	■		**2.2.**89
BGL 80A-004-S49	80 mm	0.1 mm		■				■	■	■	5 kHz	■	■		**2.2.**89
BGL 120A-001-S49	120 mm	0.5 mm	■				■		■	■	1.5 kHz	■	■		**2.2.**87
BGL 120A-002-S49	120 mm	0.5 mm	■					■	■	■	1.5 kHz	■	■		**2.2.**87
BGL 120A-003-S49	120 mm	0.15 mm		■			■		■	■	5 kHz	■	■		**2.2.**89
BGL 120A-004-S49	120 mm	0.15 mm		■				■	■	■	5 kHz	■	■		**2.2.**89
BGL 180A-001-S49	180 mm	0.6 mm	■				■		■	■	1.5 kHz	■	■		**2.2.**87
BGL 180A-002-S49	180 mm	0.6 mm	■					■	■	■	1.5 kHz	■	■		**2.2.**87
BGL 220A-001-S49	220 mm	0.6 mm	■				■		■	■	1.5 kHz	■	■		**2.2.**87
BGL 220A-002-S49	220 mm	0.6 mm	■					■	■	■	1.5 kHz	■	■		**2.2.**87
BGL 21-AV	2 mm	0.25 mm			■		■	■	■	■	7.5 kHz	■	■		**2.2.**91
BGL 21-AS	2 mm	0.25 mm			■		■	■	■	■	15 kHz	■	■		**2.2.**91
BGL 21-AR	2 mm	0.5 mm			■		■	■	■	■	7.5 kHz	■	■		**2.2.**91
BGL 21-AH	2 mm	0.5 mm				■	■	■	■	■	7.5 kHz	■	■		**2.2.**91

2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Series	BGL	BGL
Slot opening	**5 mm**	**10 mm**
Slot depth	17 mm	17 mm

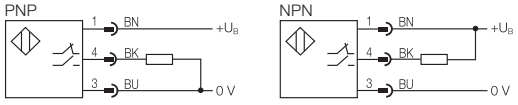


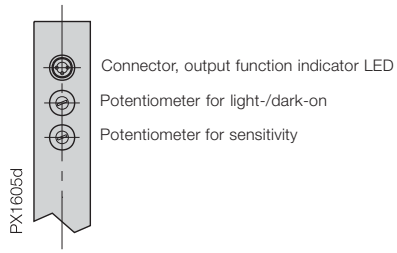


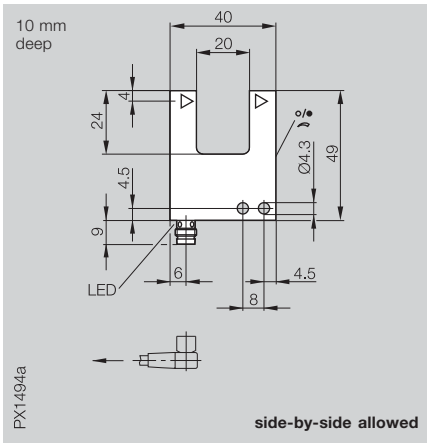
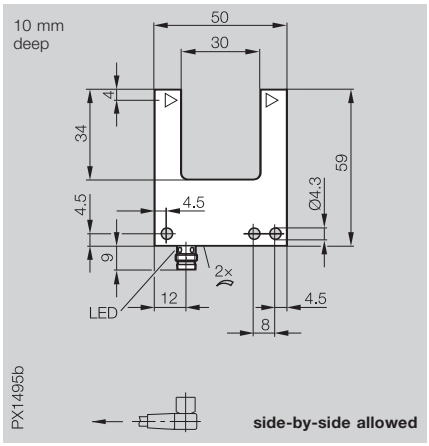
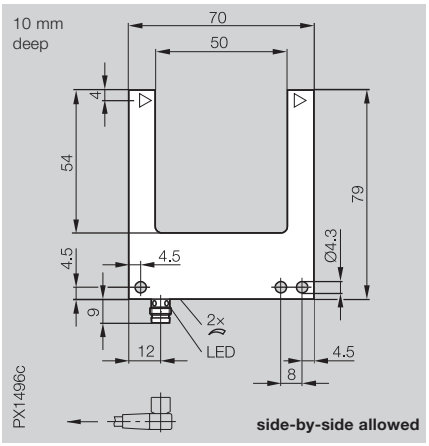
Slot sensor		
PNP	BGL 5A-001-S49	BGL 10A-001-S49
NPN	BGL 5A-002-S49	BGL 10A-002-S49
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	10 %	10 %
No-load supply current I_0 max.	< 35 mA	< 35 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Switching type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	200 mA	200 mA
Voltage drop U_d at I_e	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP)/≤ 2.5 V (NPN)
Settings	Potentiometer 270°	Potentiometer 270°
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	640 nm	640 nm
Resolution (smallest discernible part)	0.3 mm	0.3 mm
Repeat accuracy	20 µm	20 µm
Switching hysteresis	≤ 0.1 mm	≤ 0.1 mm
Time data		
Response time	0.2 ms	0.2 ms
Switching frequency f	3 kHz	3 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	25×45×10 mm	30×45×10 mm
Connection	M8 connector, 3-pin	M8 connector, 3-pin
Housing material	GD-Zn	GD-Zn
Optical surface	Glass	Glass
Weight	20 g	23 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–10...+60 °C	–10...+60 °C
Ambient light rejection per	EN 60947-5-2	EN 60947-5-2

Connector orientation

Wiring diagrams





	BGL **20 mm** 24 mm	BGL **30 mm** 34 mm	BGL **50 mm** 54 mm
			
	BGL 20A-001-S49 BGL 20A-002-S49	BGL 30A-001-S49 BGL 30A-002-S49	BGL 50A-001-S49 BGL 50A-002-S49
	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %
	< 35 mA	< 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	200 mA	200 mA	200 mA
	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP), ≤ 2.5 V (NPN)
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	LED, red light	LED, red light	LED, red light
	640 nm	640 nm	640 nm
	0.3 mm	0.3 mm	0.4 mm
	20 µm	20 µm	40 µm
	≤ 0.1 mm	≤ 0.1 mm	≤ 0.15 mm
	0.33 ms	0.33 ms	0.33 ms
	1.5 kHz	1.5 kHz	1.5 kHz
	LED yellow	LED yellow	LED yellow
	40×49×10 mm	50×59×10 mm	70×79×10 mm
	M8 connector, 3-pin	M8 connector, 3-pin	M8 connector, 3-pin
	GD-Zn	GD-Zn	GD-Zn
	Glass	Glass	Glass
	28 g	36 g	107 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

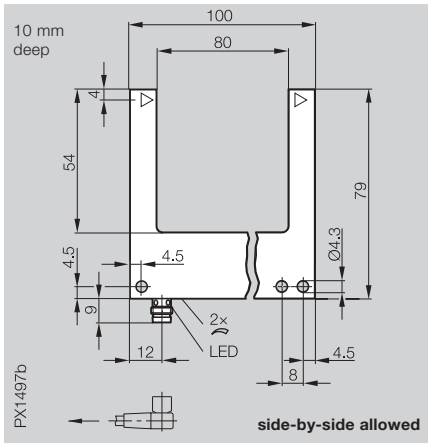
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Connectors ... page 5.2 ...

Recommended accessories
please order separately

Connector
Straight BKS-_ 48
Right-angle BKS-_ 49



Series	BGL
Slot opening	**80 mm**
Slot depth	54 mm

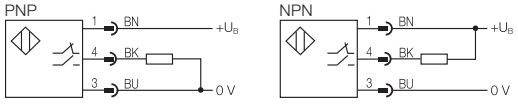


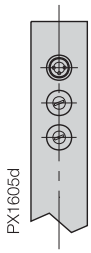
Slot sensor

PNP	BGL 80A-001-S49
NPN	BGL 80A-002-S49
Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	10 %
No-load supply current I_0 max.	≤ 35 mA
Switching output	PNP- or NPN-Transistor
Output current	Light-/dark-on (selectable)
Switching type	200 mA
Voltage drop U_d at I_e	≤ 3 V (PNP), ≤ 2.5 V (NPN)
Settings	Potentiometer 270°
Optical data	
Emitter, light type	LED, red light
Wavelength	640 nm
Resolution (smallest discernible part)	0.4 mm
Repeat accuracy	60 µm
Switching hysteresis	≤ 0.2 mm
Time data	
Response time	0.33 ms
Switching frequency f	1.5 kHz
Indicators	
Output function indicator	LED yellow
Mechanical data	
Dimensions	100×79×10 mm
Connection	M8 connector, 3-pin
Housing material	GD-Zn
Optical surface	Glass
Weight	140 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–10...+60 °C
Ambient light rejection per	EN 60947-5-2

Connector orientation

Wiring diagrams

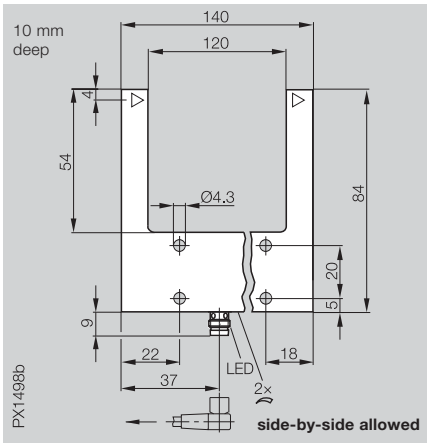
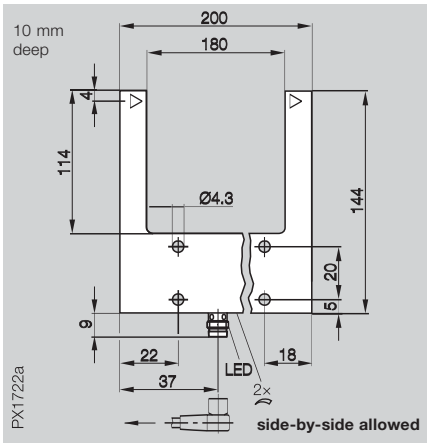
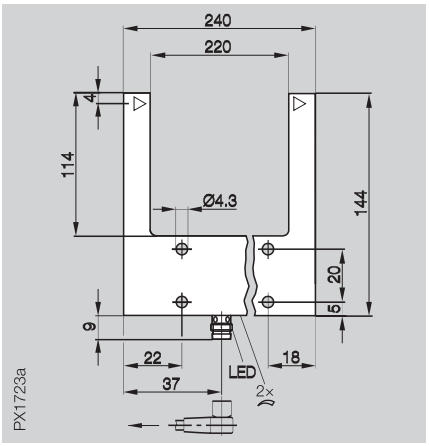




Connector, output function indicator LED

Potentiometer for light-/dark-on

Potentiometer for sensitivity

	BGL	BGL	BGL
	120 mm	**180 mm**	**220 mm**
	54 mm	114 mm	114 mm
			
	BGL 120A-001-S49 BGL 120A-002-S49	BGL 180A-001-S49 BGL 180A-002-S49	BGL 220A-001-S49 BGL 220A-002-S49
	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %
	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	200 mA	200 mA	200 mA
	≤ 3 V (PNP), ≤ 2.5 V (NPN)	≤ 3 V (PNP), ≤ 2.5 V (NPN)	≤ 3 V (PNP), ≤ 2.5 V (NPN)
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	LED, red light	LED, red light	LED, red light
	640 nm	640 nm	640 nm
	0.5 mm	0.6 mm	0.6 mm
	80 µm	80 µm	80 µm
	≤ 0.2 mm	≤ 0.2 mm	≤ 0.2 mm
	0.33 ms	0.33 ms	0.33 ms
	1.5 kHz	1.5 kHz	1.5 kHz
	LED yellow	LED yellow	LED yellow
	140×84×10 mm	200×144×10 mm	240×144×10 mm
	M8 connector, 3-pin	M8 connector, 3-pin	M8 connector, 3-pin
	GD-Zn	GD-Zn	GD-Zn
	Glass	Glass	Glass
	118 g	190 g	220 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

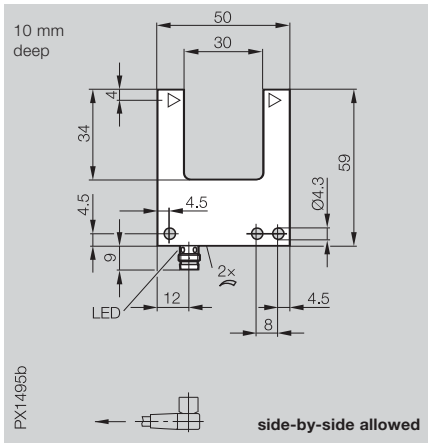
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Recommended accessories
please order separately

Connector
Straight BKS-_ 48
Right-angle BKS-_ 49

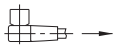


Series	BGL
Slot opening	**30 mm**
Slot depth	34 mm

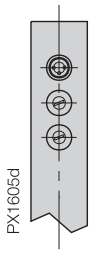


Slot sensor

PNP	BGL 30A-003-S49
NPN	BGL 30A-004-S49
Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	10 %
No-load supply current I_0 max.	≤ 20 mA
Switching output	PNP- or NPN-Transistor
Output current	200 mA
Switching type	Light-/dark-on (selectable)
Voltage drop U_d at I_e	≤ 3 V (PNP), ≤ 2.5 V (NPN)
Settings	Potentiometer 270°
Optical data	
Emitter, light type	Laser, red light
Wavelength	650 nm
Laser class	1
Resolution (smallest discernible part)	50 µm
Repeat accuracy	10 µm
Switching hysteresis	≤ 20 µm
Time data	
Response time	0.16 ms
Switching frequency f	5 kHz
Indicators	
Output function indicator	LED yellow
Mechanical data	
Dimensions	50×59×10 mm
Connection	M8 connector, 3-pin
Housing material	GD-Zn
Optical surface	Glass
Weight	66 g
Ambient data	
Degree of protection per IEC 60529	IP 67
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–10...+60 °C
Ambient light rejection	5 kLux



Connector orientation

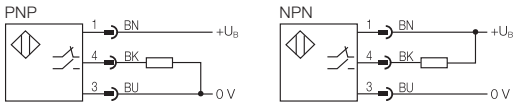


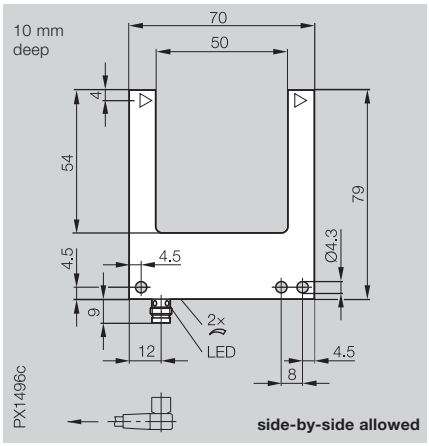
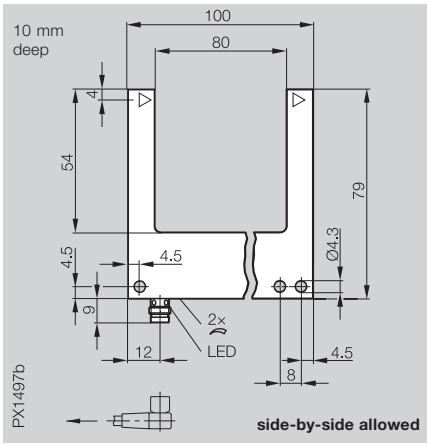
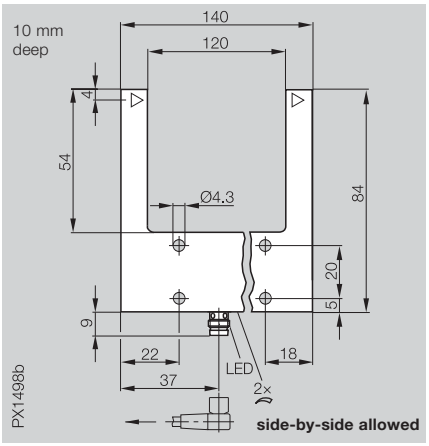
Connector, output function indicator LED

Potentiometer for light-/dark-on

Potentiometer for sensitivity

Wiring diagrams



	BGL	BGL	BGL
	50 mm	**80 mm**	**120 mm**
	54 mm	54 mm	54 mm
			
	BGL 50A-003-S49 BGL 50A-004-S49	BGL 80A-003-S49 BGL 80A-004-S49	BGL 120A-003-S49 BGL 120A-004-S49
	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %
	≤ 20 mA	≤ 20 mA	≤ 20 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	200 mA	200 mA	200 mA
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	≤ 3 V (PNP), ≤ 2.5 V (NPN)	≤ 3 V (PNP), ≤ 2.5 V (NPN)	≤ 3 V (PNP), ≤ 2.5 V (NPN)
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	Laser, red light	Laser, red light	Laser, red light
	650 nm	650 nm	650 nm
	1	1	1
	80 µm	0.1 mm	0.15 mm
	10 µm	10 µm	15 µm
	≤ 25 µm	≤ 30 µm	≤ 50 µm
	0.16 ms	0.16 ms	0.16 ms
	5 kHz	5 kHz	5 kHz
	LED yellow	LED yellow	LED yellow
	70×79×10 mm	100×79×10 mm	140×84×10 mm
	M8 connector, 3-pin	M8 connector, 3-pin	M8 connector, 3-pin
	GD-Zn	GD-Zn	GD-Zn
	Glass	Glass	Glass
	110 g	135 g	210 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C
	5 kLux	5 kLux	5 kLux

Recommended accessories
please order separately

Connector
Straight BKS-_ 48
Right-angle BKS-_ 49



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Photoelectric sensors accessories page 2.3.2 ...
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Series	
Slot opening	
Slot depth	

The **BGL 21 slot sensor** is a photoelectric sensor using a microcontroller for the setup process and function monitoring. All the user needs to do is press a button to access all the data needed for the sensor setting.
Both the top and bottom side of the sensor have an adjustment aid printed for indicating the position in which the object must be located.

The internal microcontroller monitors all settings to ensure optimum switching frequency, repeat accuracy and rejection of optical interference and ambient light.

The **BGL 21-AH** has red and green emitter diodes which are advantageous for detecting colored markings. Which color of emitter light is more appropriate for the particular task is automatically determined during setup.

Models **BGL 21-AR** and **BGL 21-AS** with infrared emitter enable detection of labels or holes on endless material.

The **BGL 21-AV** with low hysteresis detects even transparent films or see-through labels on transparent backing material.

Features

- Fast, fully automatic sensor calibration
- Control panel has just one button and two LED's
- Very short response time and high repeat accuracy
- High rejection of mutual optical interference and ambient light
- NPN/PNP output on separate pins with overload protection
- M8 connector block can be rotated 90°
- Metal housing

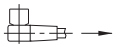
Applications

- Detecting markings on backing material
- Label detection
- Monitoring web tracking
- Belt break monitoring
- Hole checking in thin materials (< 2 mm)

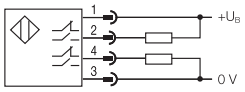


Slot sensor
PNP/NPN
Object property*

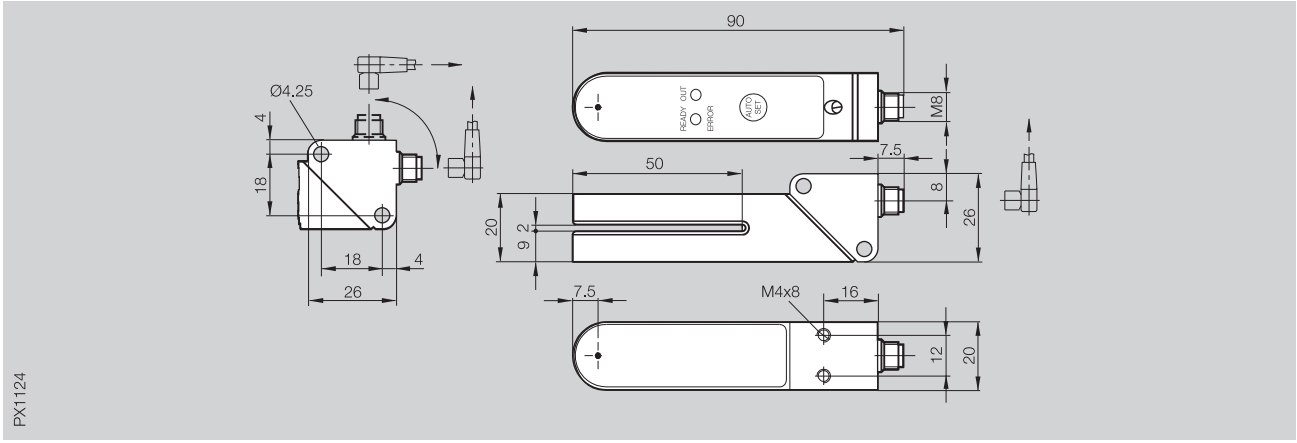
Electrical data	
Supply voltage U_B	
Ripple	
No-load supply current I_0 max.	
Switching output	
Switching type	
Output current	
Voltage drop U_d at I_e	
Settings	
Optical data	
Emitter, light type	
Wavelength	
Resolution (smallest discernible part)	
Time data	
Response time	
Switching frequency f	
Indicators	
Output function indicator	
Function ready/error indicator	
Mechanical data	
Dimensions	
Connection	
Housing material	
Optical surface	
Weight	
Ambient data	
Degree of protection per IEC 60529	
Polarity reversal protected	
Short circuit protected	
Ambient temperature range T_a	
Ambient light rejection	


Connector orientation

Wiring diagram



	BGL	BGL	BGL	BGL
	2 mm	**2 mm**	**2 mm**	**2 mm**
	50 mm	50 mm	50 mm	50 mm



	BGL 21-AH	BGL 21-AV	BGL 21-AS	BGL 21-AR
	Colored and transparent on colored or neutral substrate	Transparent or see-through on transparent substrate	Opaque on see-through or transparent substrate	Opaque on see-through or transparent substrate
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	2 V	2 V	2 V	2 V
	≤ 55 mA	≤ 55 mA	≤ 55 mA	≤ 55 mA
	PNP and NPN Transistor	PNP and NPN Transistor	PNP and NPN Transistor	PNP and NPN Transistor
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	100 mA	100 mA	100 mA	100 mA
	≤ 1.2 V	≤ 1.2 V	≤ 1.2 V	≤ 1.2 V
	Teach-in	Teach-in	Teach-in	Teach-in
	LED, red light/green light	LED, infrared	LED, infrared	LED, infrared
	635 nm/535 nm	880 nm	880 nm	880 nm
	0.5 mm	0.25 mm	0.25 mm	0.5 mm
	133 µs	133 µs	66 µs	133 µs
	7.5 kHz	7.5 kHz	15 kHz	7.5 kHz
	LED yellow	LED yellow	LED yellow	LED yellow
	LED red/green	LED red/green	LED red/green	LED red/green
	90×26×20 mm	90×26×20 mm	90×26×20 mm	90×26×20 mm
	M8 connector, 4-pin	M8 connector, 4-pin	M8 connector, 4-pin	M8 connector, 4-pin
	Anodized Al	Anodized Al	Anodized Al	Anodized Al
	Glass	Glass	Glass	Glass
	100 g	100 g	100 g	100 g
	IP 65	IP 65	IP 65	IP 65
	yes	yes	yes	yes
	yes	yes	yes	yes
	0...+55 °C	0...+55 °C	0...+55 °C	0...+55 °C
	3 kLux (artificial light)/ 10 kLux (sunlight)	3 kLux (artificial light)/ 10 kLux (sunlight)	3 kLux (artificial light)/ 10 kLux (sunlight)	3 kLux (artificial light)/ 10 kLux (sunlight)

*Object transparent	Impinging light fully penetrates the object
Object transparent	Impinging light penetrates the object partially or is reflected
Object opaque	Impinging light does not penetrate the object

Recommended accessories
please order separately

Connector
Straight BKS-S 74
Right-angle BKS-S 75



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The Balluff **BWL Standard** angle sensors are a further development of the BGL slot sensors. With virtually identical technical data, these use a new form factor to solve even more applications. The form factor and beam geometry enable approach and detection of objects from virtually any direction.
Red light and laser versions are of course available.

Applications

- Assembly and handling
- Robotic systems
- Position and location control

Advantages

- High accuracy
- Visible light spot for easy alignment
- Can be installed even in tight mounting conditions



The Balluff **BWL Automotive** angle sensor is a powerful through-beam designed for harsh industrial use. Its housing is tough and allows for variable mounting options.

Objects are reliably detected, even under extremely difficult conditions.
A powerful infrared emitter ensures high function reserve. This product represents an elegant solution for a variety of applications. Various form factors provide for optimum flexibility.

Applications

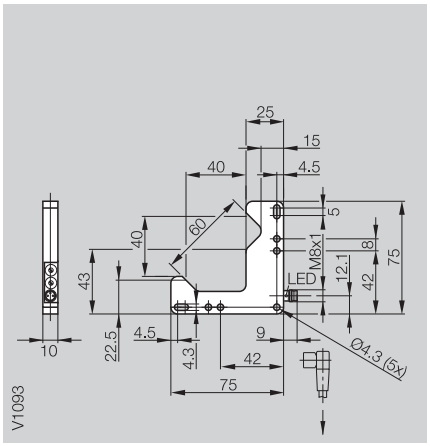
- Robotic systems
- Position and location control

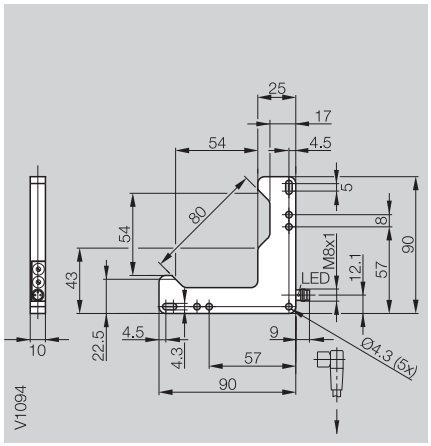


Type	Optical axis	Light type			Output		Output function		Switching frequency	U_B	Connection		Page
		Infrared	Red light	Laser	PNP-Transistor	NPN-Transistor	Dark-on	Light-on		10...30 V DC	M8 connector, 3-pin	M12 connector, 4-pin	
Angle sensors Standard													
BWL 4040D-R011-S49	40/40 mm		■		■		■	■	1.5 kHz	■	■		**2.2.**94
BWL 4040D-R012-S49	40/40 mm		■			■	■	■	1.5 kHz	■	■		**2.2.**94
BWL 4040D-L011-S49	40/40 mm			■	■		■	■	5 kHz	■	■		**2.2.**96
BWL 4040D-L012-S49	40/40 mm			■		■	■	■	5 kHz	■	■		**2.2.**96
BWL 5454D-R011-S49	54/54 mm		■		■		■	■	1.5 kHz	■	■		**2.2.**94
BWL 5454D-R012-S49	54/54 mm		■			■	■	■	1.5 kHz	■	■		**2.2.**94
BWL 5454D-L011-S49	54/54 mm			■	■		■	■	5 kHz	■	■		**2.2.**96
BWL 5454D-L012-S49	54/54 mm			■		■	■	■	5 kHz	■	■		**2.2.**96
BWL 6868D-R011-S49	68/68 mm		■		■		■	■	1.5 kHz	■	■		**2.2.**95
BWL 6868D-R012-S49	68/68 mm		■			■	■	■	1.5 kHz	■	■		**2.2.**95
BWL 6868D-L011-S49	68/68 mm			■	■		■	■	5 kHz	■	■		**2.2.**97
BWL 6868D-L012-S49	68/68 mm			■		■	■	■	5 kHz	■	■		**2.2.**97
BWL 9090D-R011-S49	90/90 mm		■		■		■	■	1.5 kHz	■	■		**2.2.**95
BWL 9090D-R012-S49	90/90 mm		■			■	■	■	1.5 kHz	■	■		**2.2.**95
BWL 9090D-L011-S49	90/90 mm			■	■		■	■	5 kHz	■	■		**2.2.**97
BWL 9090D-L012-S49	90/90 mm			■		■	■	■	5 kHz	■	■		**2.2.**97
BWL 110110D-R011-S49	110/110 mm		■		■		■	■	1.5 kHz	■	■		**2.2.**95
BWL 110110D-R012-S49	110/110 mm		■			■	■	■	1.5 kHz	■	■		**2.2.**95
BWL 110110D-L011-S49	110/110 mm			■	■		■	■	5 kHz	■	■		**2.2.**97
BWL 110110D-L012-S49	110/110 mm			■		■	■	■	5 kHz	■	■		**2.2.**97
Angle sensors Automotive													
BWL 2222B-001-S4	22/22 mm	■			■		■		1 kHz	■		■	**2.2.**98
BWL 2222C-001-S4	22/22 mm	■			■		■		1 kHz	■		■	**2.2.**98
BWL 4241A-001-S4	43/43 mm	■			■		■		1 kHz	■		■	**2.2.**99
BWL 4241A-001-S49	43/43 mm	■			■		■		1 kHz	■	■		**2.2.**99
BWL 4260A-001-S4	42/62 mm	■			■		■		1 kHz	■		■	**2.2.**99
BWL 4260A-001-S49	42/62 mm	■			■		■		1 kHz	■	■		**2.2.**99

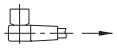
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Connectors ... page 5.2 ...

Series	BWL	BWL
Optical axis	**40/40 mm**	**54/54 mm**

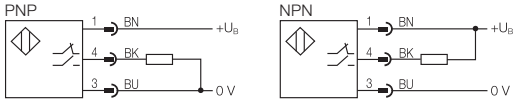


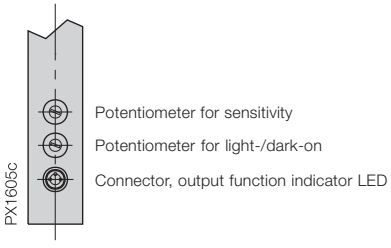


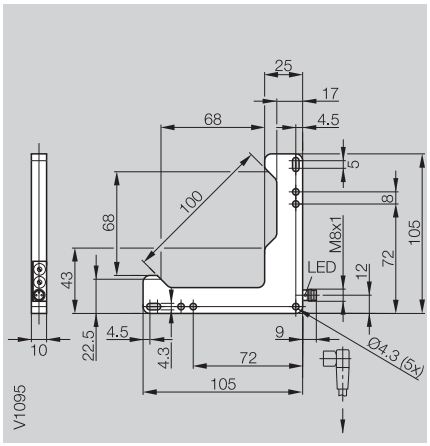
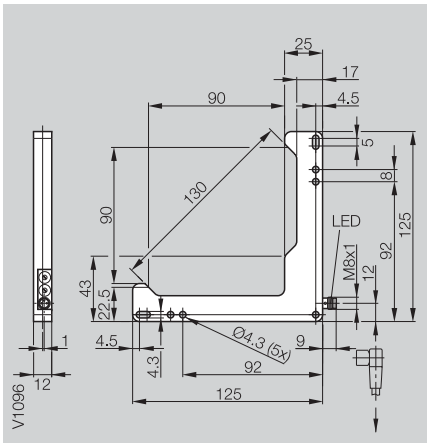
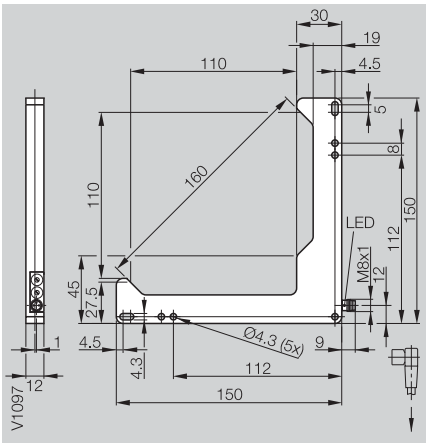
Angle Sensor		
PNP	BWL 4040D-R011-S49	BWL 5454D-R011-S49
NPN	BWL 4040D-R012-S49	BWL 5454D-R012-S49
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	10 %	10 %
No-load supply current I_0 max.	≤ 35 mA	≤ 35 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	200 mA	200 mA
Voltage drop U_d at I_e	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP)/≤ 2.5 V (NPN)
Settings	Potentiometer 270°	Potentiometer 270°
Optical data		
Emitter, light type	LED, red light	LED, red light
Wavelength	640 nm	640 nm
Resolution (smallest discernible part)	0.4 mm	0.4 mm
Repeat accuracy	≤ 40 µm	≤ 60 µm
Switching hysteresis	≤ 0.15 mm	≤ 0.2 mm
Time data		
Response time	0.33 ms	0.33 ms
Switching frequency f	1.5 kHz	1.5 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions		
Connection	M8 connector, 3-pin	M8 connector, 3-pin
Housing material	GD-Zn	GD-Zn
Optical surface	Glass	Glass
Weight	94 g	125 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–10...+60 °C	–10...+60 °C
Ambient light rejection per	EN 60947-5-2	EN 60947-5-2


Connector orientation

Wiring diagrams





	BWL **68/68 mm**	BWL **90/90 mm**	BWL **110/110 mm**
			
	BWL 6868D-R011-S49 BWL 6868D-R012-S49	BWL 9090D-R011-S49 BWL 9090D-R012-S49	BWL 110110D-R011-S49 BWL 110110D-R012-S49
	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %
	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	200 mA	200 mA	200 mA
	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP), ≤ 2.5 V (NPN)
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	LED, red light	LED, red light	LED, red light
	640 nm	640 nm	640 nm
	0.5 mm	0.6 mm	0.6 mm
	≤ 80 µm	≤ 80 µm	≤ 80 µm
	≤ 0.2 mm	≤ 0.2 mm	≤ 0.2 mm
	0.33 ms	0.33 ms	0.33 ms
	1.5 kHz	1.5 kHz	1.5 kHz
	LED yellow	LED yellow	LED yellow
	M8 connector, 3-pin	M8 connector, 3-pin	M8 connector, 3-pin
	GD-Zn	GD-Zn	GD-Zn
	Glass	Glass	Glass
	150 g	233 g	334 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

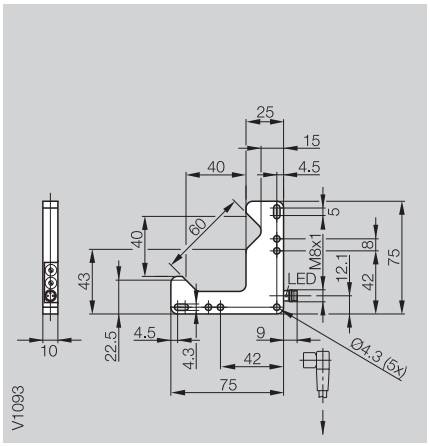
Recommended accessories
please order separately

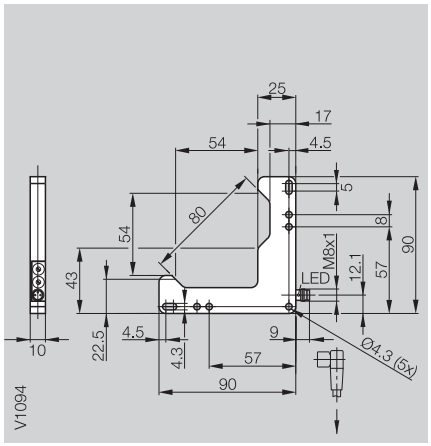
Connector
Straight BKS-_ 48
Right-angle BKS-_ 49



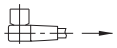
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Series	BWL	BWL
Optical axis	**40/40 mm**	**54/54 mm**

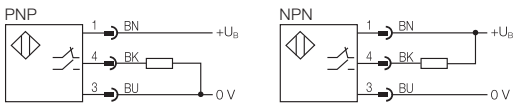


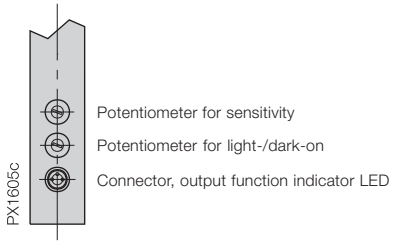


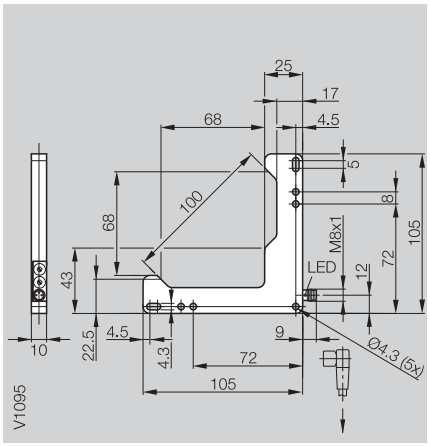
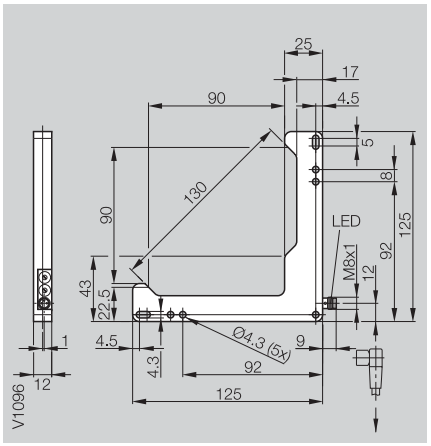
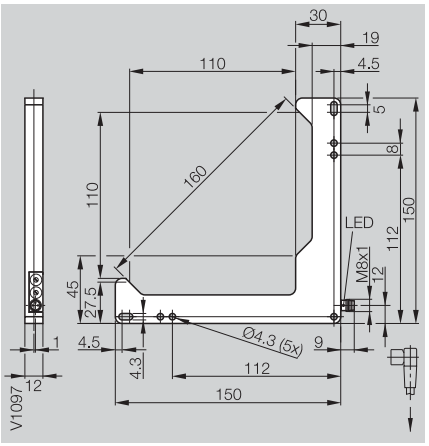
Angle sensor		
PNP	BWL 4040D-L011-S49	BWL 5454D-L011-S49
NPN	BWL 4040D-L012-S49	BWL 5454D-L012-S49
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	10 %	10 %
No-load supply current I_0 max.	≤ 35 mA	≤ 35 mA
Switching output	PNP- or NPN-Transistor	PNP- or NPN-Transistor
Output type	Light-/dark-on (selectable)	Light-/dark-on (selectable)
Output current	200 mA	200 mA
Voltage drop U_d at I_e	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP)/≤ 2.5 V (NPN)
Settings	Potentiometer 270°	Potentiometer 270°
Optical data		
Emitter, light type	Laser, red light	Laser, red light
Wavelength	640 nm	640 nm
Laser class	1	1
Resolution (smallest discernible part)	80 µm	0.1 mm
Repeat accuracy	≤ 10 µm	≤ 10 µm
Switching hysteresis	≤ 25 µm	≤ 35 µm
Time data		
Response time	0.16 ms	0.16 ms
Switching frequency f	5 kHz	5 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions		
Connection	M8 connector, 3-pin	M8 connector, 3-pin
Housing material	GD-Zn	GD-Zn
Optical surface	Glass	Glass
Weight	94 g	125 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–10...+60 °C	–10...+60 °C
Ambient light rejection per	EN 60947-5-2	EN 60947-5-2


Connector orientation

Wiring diagrams





	BWL **68/68 mm**	BWL **90/90 mm**	BWL **110/110 mm**
			
	BWL 6868D-L011-S49 BWL 6868D-L012-S49	BWL 9090D-L011-S49 BWL 9090D-L012-S49	BWL 110110D-L011-S49 BWL 110110D-L012-S49
	10...30 V DC	10...30 V DC	10...30 V DC
	10 %	10 %	10 %
	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP- or NPN-Transistor	PNP- or NPN-Transistor	PNP- or NPN-Transistor
	Light-/dark-on (selectable)	Light-/dark-on (selectable)	Light-/dark-on (selectable)
	200 mA	200 mA	200 mA
	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP)/≤ 2.5 V (NPN)	≤ 3 V (PNP), ≤ 2.5 V (NPN)
	Potentiometer 270°	Potentiometer 270°	Potentiometer 270°
	Laser, red light	Laser, red light	Laser, red light
	640 nm	640 nm	640 nm
	1	1	1
	0.12 mm	0.15 mm	0.2 mm
	≤ 15 µm	≤ 15 µm	≤ 20 µm
	≤ 40 µm	≤ 50 µm	≤ 70 µm
	0.16 ms	0.16 ms	0.16 ms
	5 kHz	5 kHz	5 kHz
	LED yellow	LED yellow	LED yellow
	M8 connector, 3-pin	M8 connector, 3-pin	M8 connector, 3-pin
	GD-Zn	GD-Zn	GD-Zn
	Glass	Glass	Glass
	150 g	233 g	334 g
	IP 67	IP 67	IP 67
	yes	yes	yes
	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

LED yellow

50×59×10 mm
M8 connector, 3-pin
GD-Zn

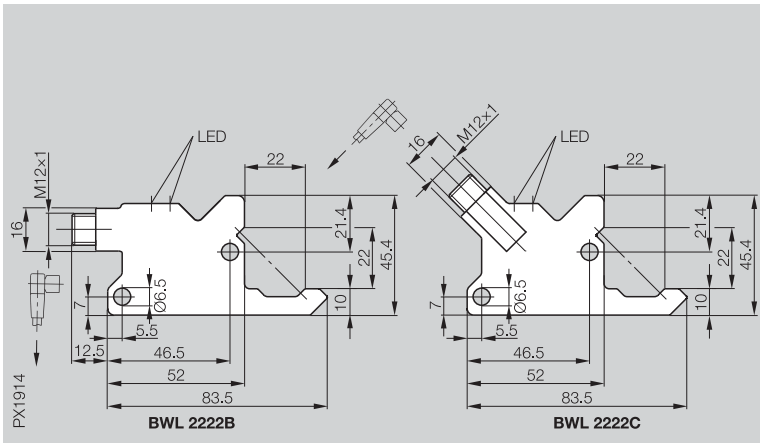
Recommended accessories
please order separately

Connector
Straight BKS-_ 48
Right-angle BKS-_ 49



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Series	BWL	BWL
Optical axis	22 mm/22 mm	22 mm/22 mm

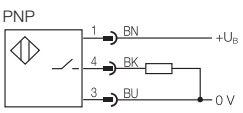


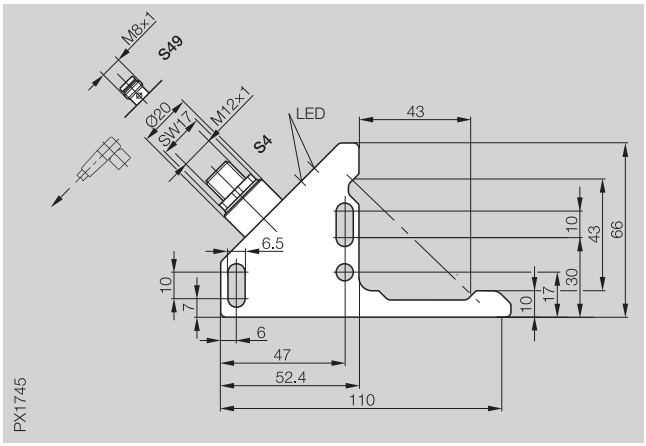
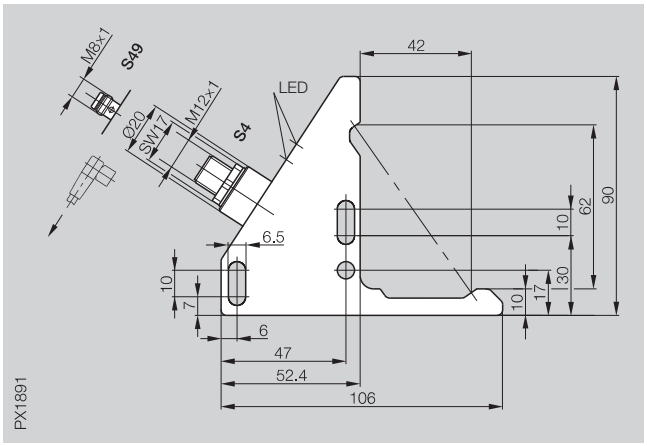
Angle sensor

PNP	BWL 2222B-001-S4	BWL 2222C-001-S4
Electrical data		
Supply voltage U_B	10...30 V DC	10...30 V DC
Ripple	15 %	15 %
No-load supply current I_0 max.	≤ 35 mA	≤ 35 mA
Switching output	PNP-Transistor	PNP-Transistor
Output current	≤ 200 mA	≤ 200 mA
Switching type	Dark-on	Dark-on
Voltage drop U_d at I_e	≤ 2.5 V	≤ 2.5 V
Optical data		
Emitter, light type	LED, infrared	LED, infrared
Wavelength	880 nm	880 nm
Time data		
Ready delay	100 ms	100 ms
Response time	≤ 0.5 ms	≤ 0.5 ms
Switching frequency f	1 kHz	1 kHz
Indicators		
Power-on indicator	LED green	LED green
Output function indicator	LED yellow	LED yellow
Mechanical data		
Dimensions	45.4×83.5×10.7 mm	45.4×83.5×10.7 mm
Connection	M12 connector, 4-pin	M12 connector, 4-pin
Housing material	corrosion-resistant steel	corrosion-resistant steel
Optical surface	PMMA	PMMA
Weight	106 g	99 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–10...+60 °C	–10...+60 °C
Ambient light rejection per	EN 60947-5-2	EN 60947-5-2

Connector orientation

Wiring diagram



	BWL 43 mm/43 mm	BWL 43 mm/43 mm	BWL 42 mm/62 mm	BWL 42 mm/62 mm
				
	BWL 4241A-001-S4	BWL 4241A-001-S49	BWL 4260A-001-S4	BWL 4260A-001-S49
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	15 %	15 %	15 %	15 %
	≤ 35 mA	≤ 35 mA	≤ 35 mA	≤ 35 mA
	PNP-Transistor	PNP-Transistor	PNP-Transistor	PNP-Transistor
	≤ 200 mA	≤ 200 mA	≤ 200 mA	≤ 200 mA
	Dark-on	Dark-on	Dark-on	Dark-on
	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V	≤ 2.5 V
	LED, infrared	LED, infrared	LED, infrared	LED, infrared
	880 nm	880 nm	880 nm	880 nm
	100 ms	100 ms	100 ms	100 ms
	≤ 0.5 ms	≤ 0.5 ms	≤ 0.5 ms	≤ 0.5 ms
	1 kHz	1 kHz	1 kHz	1 kHz
	LED green	LED green	LED green	LED green
	LED yellow	LED yellow	LED yellow	LED yellow
	66×110×10.7 mm	66×110×10.7 mm	90×106×10.7 mm	90×106×10.7 mm
	M12 connector, 4-pin	M8 connector, 3-pin	M12 connector, 4-pin	M8 connector, 3-pin
	corrosion-resistant steel	corrosion-resistant steel	corrosion-resistant steel	corrosion-resistant steel
	PMMA	PMMA	PMMA	PMMA
	148 g	124 g	181 g	155 g
	IP 67	IP 67	IP 67	IP 67
	yes	yes	yes	yes
	yes	yes	yes	yes
	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C
	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2	EN 60947-5-2

Recommended accessories
please order separately

Connector
Straight BKS-_ 19
Right-angle BKS-_ 20



Connector
Straight BKS-_ 48
Right-angle BKS-_ 49



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BOWA
Dynamic Optical Windows

Dynamic optical windows are an extension of the slot sensors. Instead of one light beam as with the slot sensors, the dynamic optical windows use a number of parallel light beams. This arrangement makes it possible to sense objects not just at a point, but over a range (window).

A special optical arrangement ensures consistently high resolution at each place in the window.

The BOWA sensors are dynamic, which means that parts are detected in the active area when they are moving.

Features

- High resolution across the entire area
- Dynamic operation
- Only moving objects are detected, so feed trays etc. do not affect the measurement
- Detects small parts down to 0.8 mm
- Adjustable output signal duration
- Adjustable sensitivity
- Three window sizes
- Standard M8 connector

Applications

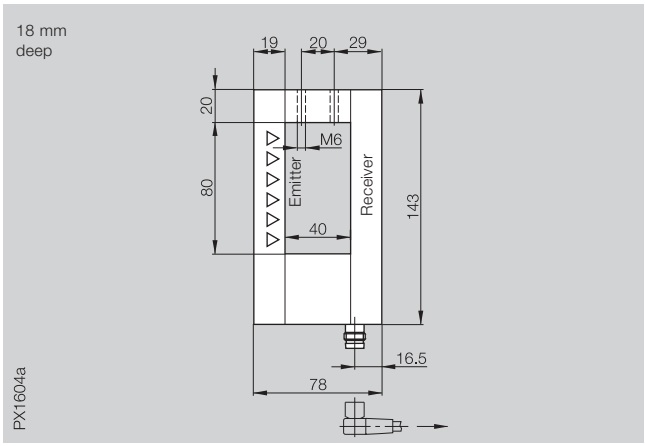
- Compressed air feeding of small parts
- Thread break monitoring
- Eject monitoring
- Counting/separating parts



Type	Active range	Resolution	Light type		Output		Output function		Working principle		U_B	Connection		Page
			Infrared		PNP-Transistor			Dark-on	Dynamic		10...30 V DC	M8 connector, 3-pin		
Dynamic Optical Windows														
BOWA 0408-PS-C-S49	40×80 mm	0.8 mm	■		■			■	■		■	■		**2.2**.102
BOWA 0808-PS-C-S49	80×80 mm	1 mm	■		■			■	■		■	■		**2.2**.103
BOWA 1208-PS-C-S49	120×80 mm	1.5 mm	■		■			■	■		■	■		**2.2**.103

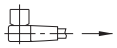
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Series	BOWA
Active area	**40×80 mm**



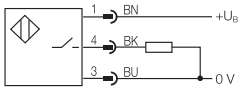
Dynamic optical window

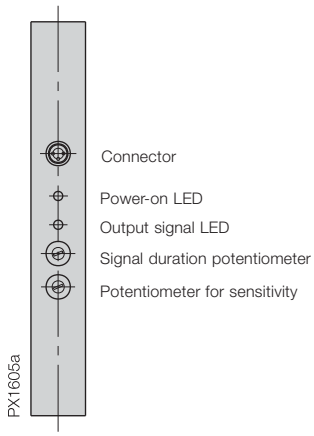
PNP	BOWA 0408-PS-C-S49
Electrical data	
Supply voltage U_B	10...30 V DC
Ripple	10 %
No-load supply current I_0 max.	≤ 85 mA
Switching output	PNP-Transistor
Switching type	Dark-on
Output current	200 mA
Voltage drop U_d at I_e	≤ 3.5 V
Settings	2× potentiometers 270°
Optical data	
Emitter, light type	LED, infrared
Wavelength	880 nm
Resolution (smallest discernible part)	0.8 mm
Time data	
Ready delay	≤ 100 ms
Turn-on delay	0.2 ms
Signal duration	10...300 ms adjustable
Switching frequency f	3...100 Hz
Indicators	
Power-on indicator	LED green
Output function indicator	LED red
Mechanical data	
Dimensions	143×78×18 mm
Connection	M8 connector, 3-pin
Housing material	Anodized Al
Optical surface	PMMA
Weight	280 g
Ambient data	
Degree of protection per IEC 60529	IP 65
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–10...+55 °C
Ambient light rejection per	EN 60947-5-2

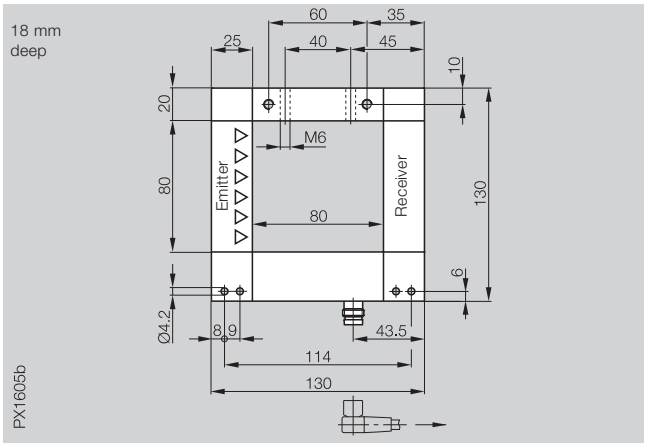
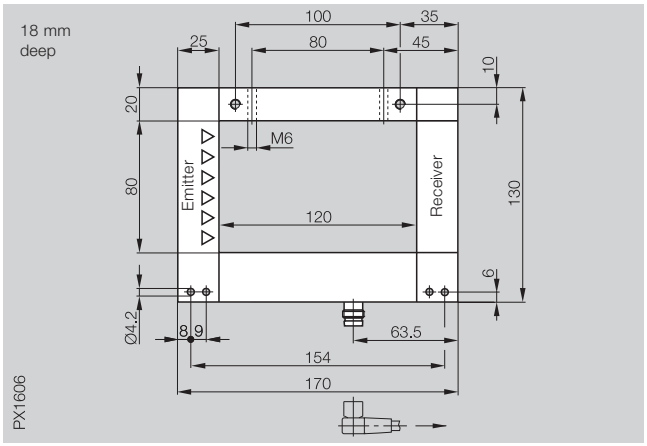
 Connector orientation

Note when using for ambient light:
The receiver is located on the connector side.

Wiring diagram





BOWA **80×80 mm**	BOWA **120×80 mm**
	
BOWA 0808-PS-C-S49	BOWA 1208-PS-C-S49
10...30 V DC	10...30 V DC
10 %	10 %
≤ 125 mA	≤ 150 mA
PNP-Transistor	PNP-Transistor
Dark-on	Dark-on
200 mA	200 mA
≤ 3.5 V	≤ 3.5 V
2× potentiometers 270°	2× potentiometers 270°
LED, infrared	LED, infrared
880 nm	880 nm
1 mm	1.5 mm
≤ 100 ms	≤ 100 ms
0.2 ms	0.2 ms
10...300 ms adjustable	10...300 ms adjustable
3...100 Hz	3...100 Hz
LED green	LED green
LED red	LED red
130×130×18 mm	130×170×18 mm
M8 connector, 3-pin	M8 connector, 3-pin
Anodized Al	Anodized Al
PMMA	PMMA
400 g	480 g
IP 65	IP 65
yes	yes
yes	yes
–10...+55 °C	–10...+55 °C
EN 60947-5-2	EN 60947-5-2

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2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

Recommended accessories
please order separately

Connector
Straight BKS-_ 48
Right-angle BKS-_ 49



Light grids are available in various measuring field heights of 100, 150 and 300 mm and include both long and short ranges. This means reliable detection of wide and very large objects is no longer a problem. The light grids with a measuring field height of 100 and 150 mm can be ordered with low or high resolution.

The light grid can be simply and quickly installed using the supplied mounting bracket. Alignment and installation is user-friendly and problem-free.

The system features an analog voltage output for direct representation of the height or width of an object. An additional switching output indicates whether the object is within the monitored range.

Features

- Easy to connect
- Easy to install
- Ready to use
- No cumbersome parameter setting
- Ranges 150 mm...2.1 m
- Measuring field heights 100, 150, 300 mm
- Analog output

Applications

- Counting parts
- Height measurement and height checking
- Presence detection
- Slack and position checking
- Pallet checking
- Web monitoring
- Position and material monitoring

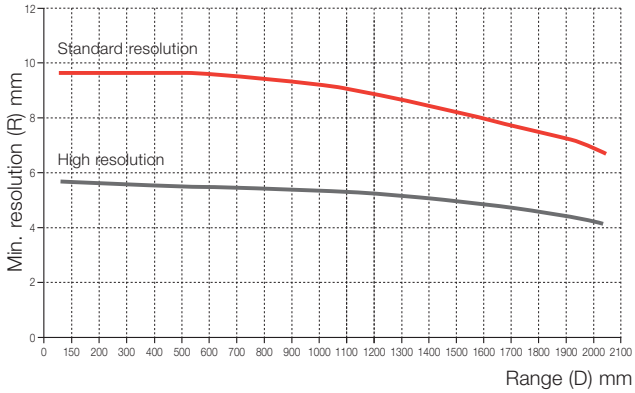


Type	Measuring field height	Range		Reso-lution		Light type		Output		Output function		U_B	Connec-tion		Page
		0.15...2.1 m		5 mm	7 mm	Infrared		PNP-Transistor	Analog 0...10 V	Dark-on		24 V DC	M12 connector		
Light grid															
BLG 1-010-210-050-PV01-SX	100 mm	■		■		■		■	■	■		■	■		**2.2.**107
BLG 1-010-210-070-PV01-SX	100 mm	■			■	■		■	■	■		■	■		**2.2.**107
BLG 1-015-210-050-PV01-SX	150 mm	■		■		■		■	■	■		■	■		**2.2.**107
BLG 1-015-210-070-PV01-SX	150 mm	■			■	■									**2.2.**107
BLG 1-030-210-070-PV01-SX	300 mm	■			■	■		■	■	■		■	■		**2.2.**107

2.2
2.3
Photoelectric sensors accessories page 2.3.2 ...
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Connectors ... page 5.2 ...

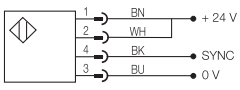
Resolution Diagram

Range 0.15...2.1 m

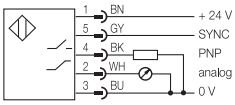


Wiring diagrams

Transmitter

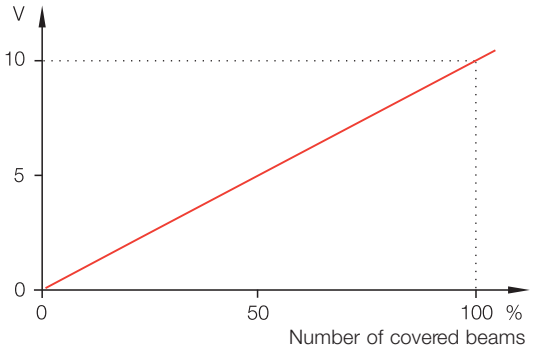


Output sensor





Analog output



Mounting bracket
(included)



Recommended accessories
please order separately

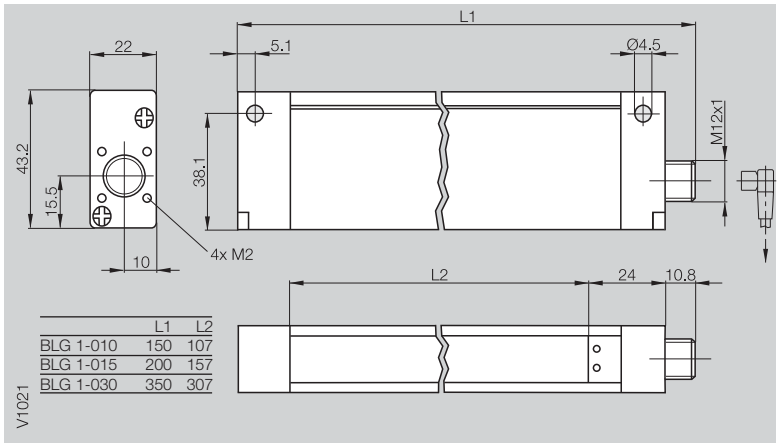
Emitter:
4-pin connector
Straight BKS-_ 19
Right-angle BKS-_ 20



Receiver:
5-pin connector
Straight BKS-S137-17-PU-05
Right-angle BKS-S134-17



Series	BLG	BLG	BLG
Measuring field height	**100 mm**	**150 mm**	**300 mm**

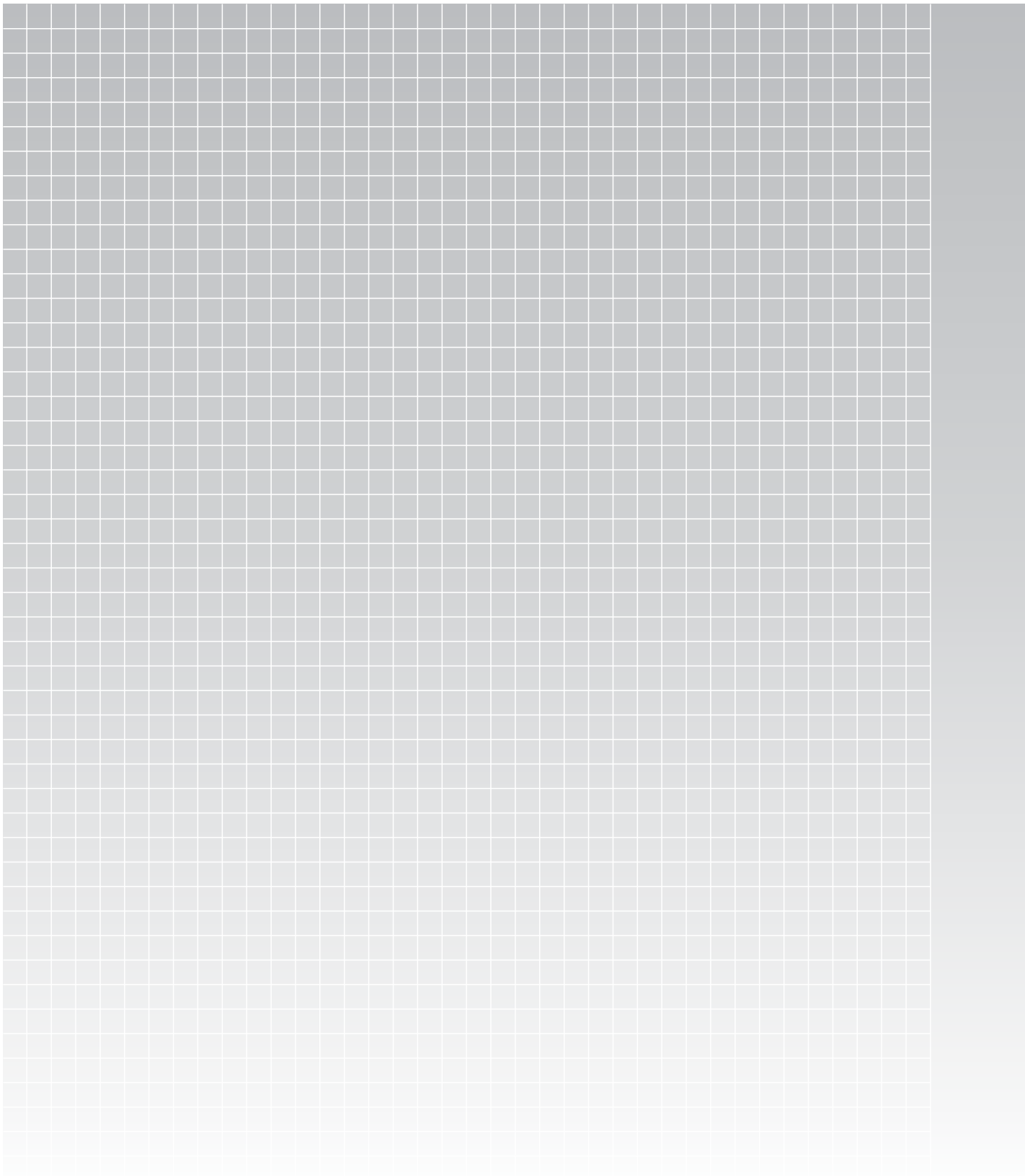


Light grid 0.15...2.1 m range

PNP	Resolution 7 mm	BLG 1-010-210-070-PV01-SX	BLG 1-015-210-070-PV01-SX	BLG 1-030-210-070-PV01-SX
	Resolution 5 mm	BLG 1-010-210-050-PV01-SX	BLG 1-015-210-050-PV01-SX	
Electrical data				
Supply voltage U_B		24 V DC	24 V DC	24 V DC
Ripple		15 %	15 %	15 %
No-load	Emitter	≤ 150 mA	≤ 150 mA	≤ 150 mA
supply current I_0 max.	Receiver	≤ 50 mA no-load	≤ 50 mA no-load	≤ 50 mA no-load
Switching output		PNP-Transistor	PNP-Transistor	PNP-Transistor
Output current		100 mA	100 mA	100 mA
Switching type		Dark-on	Dark-on	Dark-on
Voltage drop U_d at I_e		≤ 1.5 V/10 mA	≤ 1.5 V/10 mA	≤ 1.5 V/10 mA
Analog output		0...10 V	0...10 V	0...10 V
Settings		fixed	fixed	fixed
Optical data				
Emitter, light type		LED, infrared	LED, infrared	LED, infrared
Wavelength		880 nm	880 nm	880 nm
Indicators				
Power-on indicator emitter/receiver		LED green	LED green	LED green
Output function indicator receiver		LED orange	LED orange	LED orange
Mechanical data				
Dimensions		see drawing	see drawing	see drawing
Connection type	Emitter	M12 connector, 4-pin	M12 connector, 4-pin	M12 connector, 4-pin
	Receiver	M12 connector, 5-pin	M12 connector, 5-pin	M12 connector, 5-pin
Housing material		Al black anodized	Al black anodized	Al black anodized
Optical surface		PMMA	PMMA	PMMA
Weight		300 g	340 g	510 g
Ambient data				
Degree of protection per IEC 60529		IP 65	IP 65	IP 65
Short circuit protected		yes	yes	yes
Ambient temperature range T_a		0...+55 °C	0...+55 °C	0...+55 °C

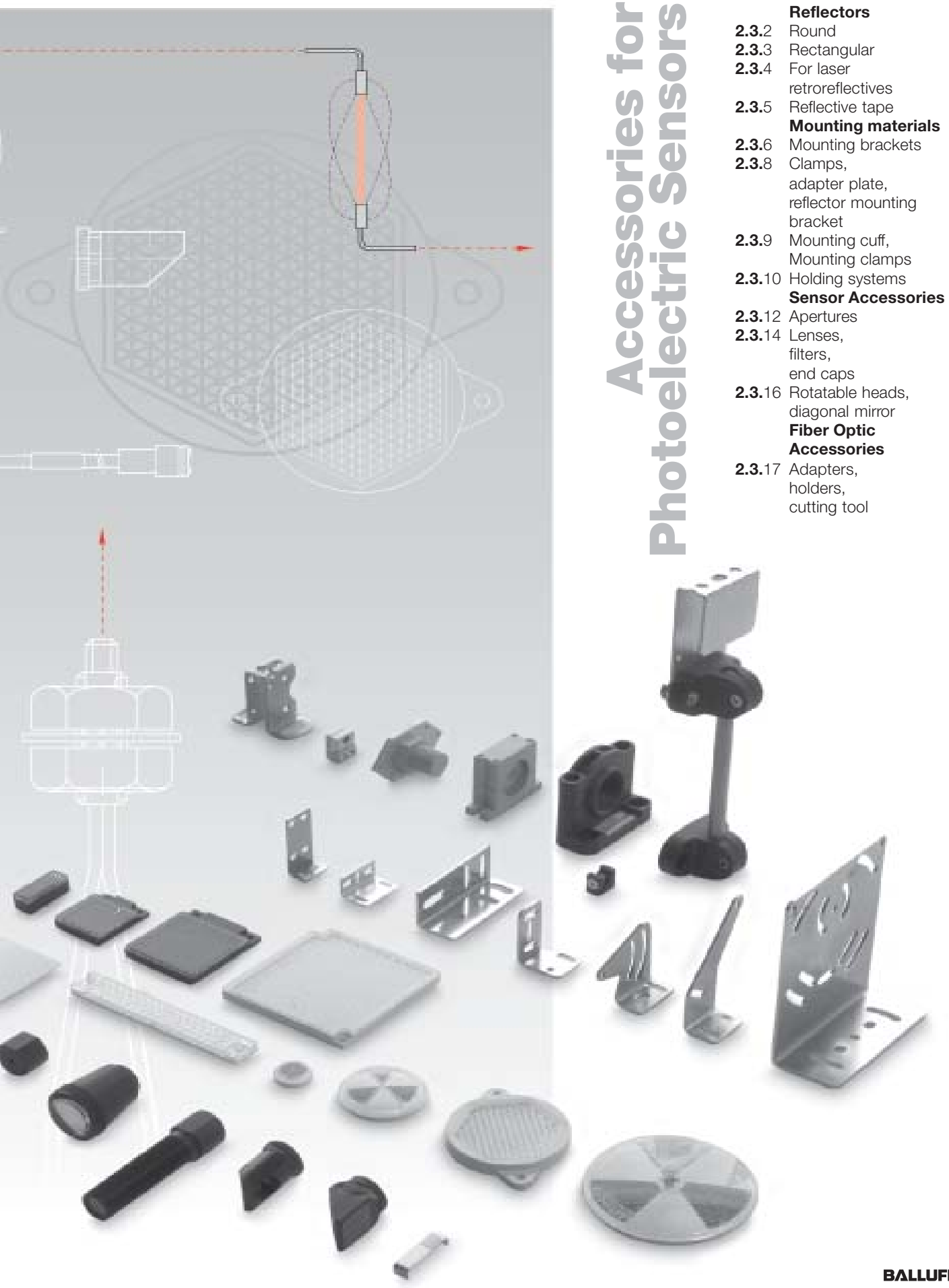
Connector orientation

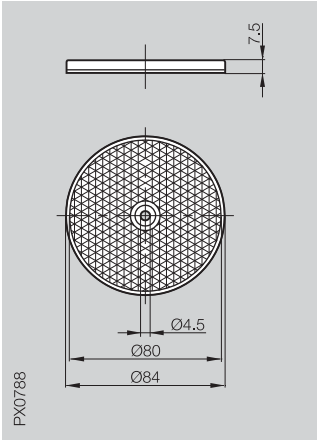
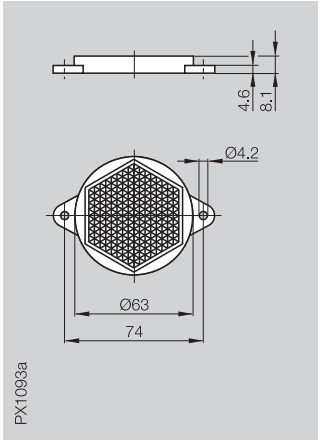
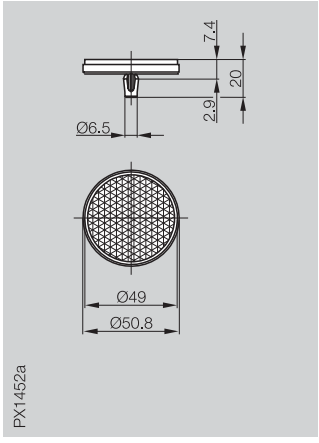
2.2
2.3 Photoelectric sensors accessories page 2.3.2 ...
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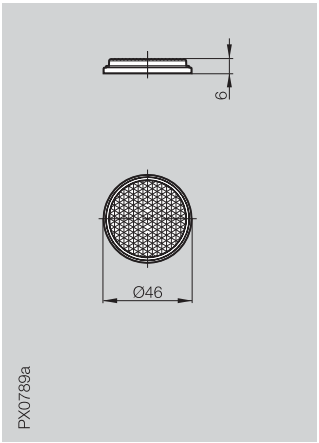
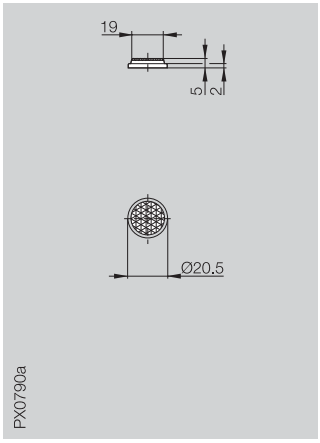
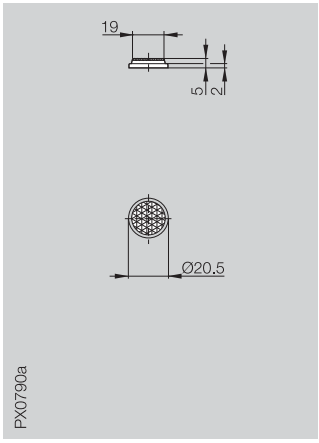


Accessories for Photoelectric Sensors

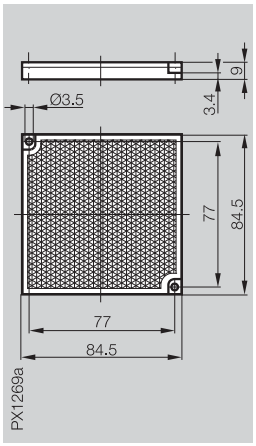
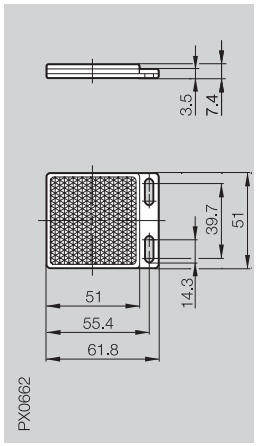
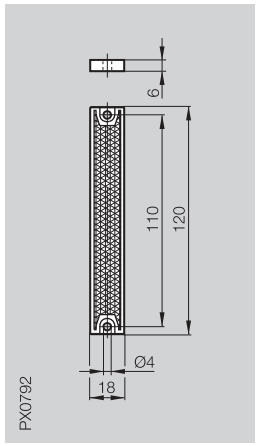
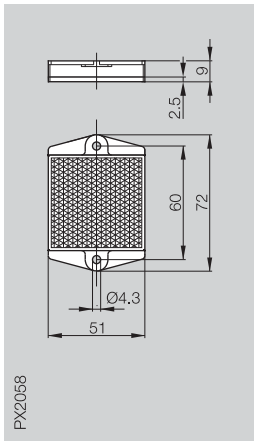
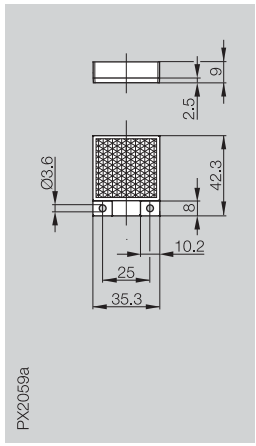
Reflectors
2.3.2 Round
2.3.3 Rectangular
2.3.4 For laser retroreflectives
2.3.5 Reflective tape
Mounting materials
2.3.6 Mounting brackets
2.3.8 Clamps, adapter plate, reflector mounting bracket
2.3.9 Mounting cuff, Mounting clamps
2.3.10 Holding systems
Sensor Accessories
2.3.12 Apertures
2.3.14 Lenses, filters, end caps
2.3.16 Rotatable heads, diagonal mirror
Fiber Optic Accessories
2.3.17 Adapters, holders, cutting tool

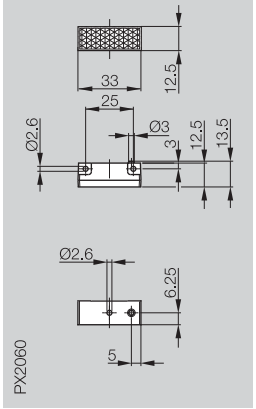
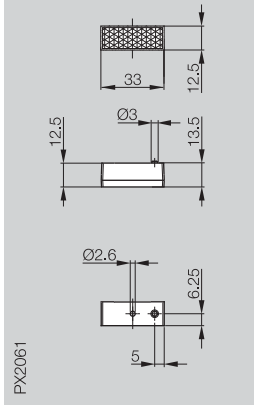
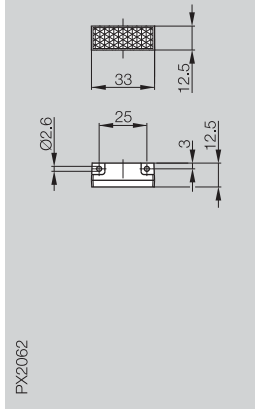
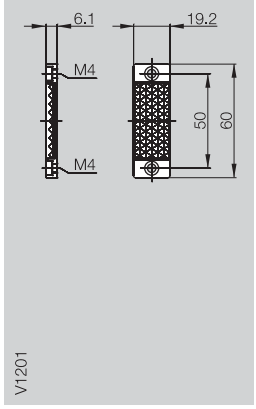


Size	**Reflector ∅ 84 mm**	**Reflector ∅ 63**	**Reflector ∅ 51 mm**	
Attachment	M4 screw	two M4 screws	Rivet with mounting tabs	
				
Ordering code	BOS R-1	BOS R-10	BOS R-14	
Material	PMMA	PMMA	PC	
Mounting accessories	BOS 21-AD-1			
Special features	Standard reflector		Chemical resistant	
Temperature range	0...+65 °C	0...+65 °C	0...+100 °C	
Reference sensing range	100 %	60 %	60 %	

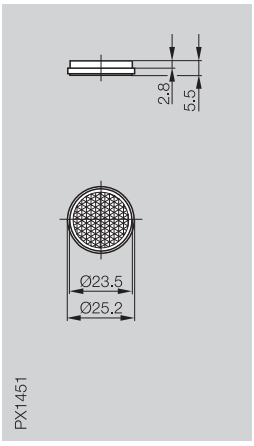
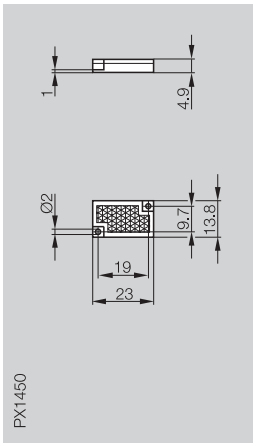
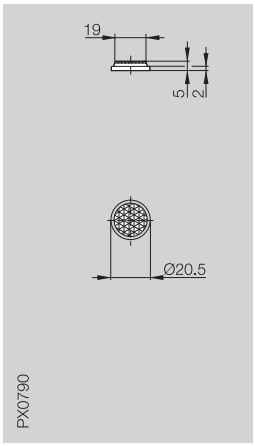
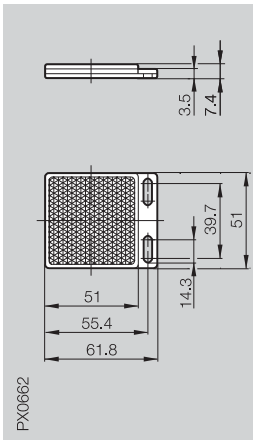
Size	**Reflector ∅ 46 mm**	**Reflector ∅ 20 mm**	**Reflector ∅ 20 mm**	
Attachment	glue	glue	glue	
				
Ordering code	BOS R-2	BOS R-3	BOS R-15	
Material	PMMA	PMMA	ABS/PMMA	
Mounting accessories				
Special features			Resistant to chemicals	
Temperature range	0...+65 °C	0...+65 °C	0...+110 °C	
Reference sensing range	60 %	25 %	25 %	

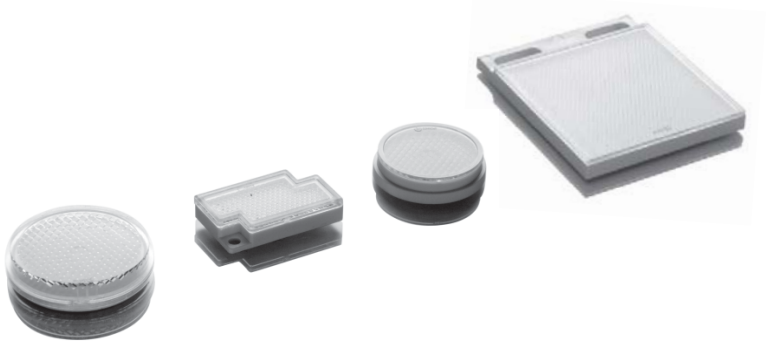


Reflector 84×84 mm	**Reflector 51×62 mm**	**Reflector 18×120 mm**	**Reflector 51×72 mm**	**Reflector 35×42 mm**
two M3 screws	two M4 screws	two M4 screws	two M4 screws	two M3 screws
				
BOS R-11	BOS R-9	BOS R-5	BOS R-25	BOS R-26
PMMA	PMMA	PMMA	PMMA	PMMA
	BOS 5-HW-6		BOS 5-HW-4	BOS 5-HW-5
High-performance reflector				
0...+50 °C	0...+50 °C	0...+50 °C	0...+50 °C	0...+50 °C
125 %	100 %	40 %	100 %	60 %

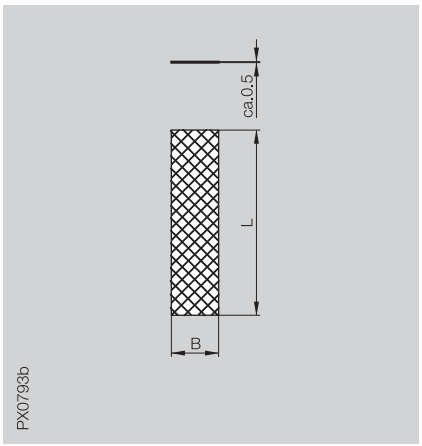
Reflector 33×12 mm	**Reflector 33×12 mm**	**Reflector 33×12 mm**	**Reflector 19×60 mm**	
Screws	Rear screws	Side screws	two M4 screws	
				
BOS R-27	BOS R-28	BOS R-29	BOS R-33	
PMMA	PMMA	PMMA	PMMA	
BOS 5-HW-1/2		BOS 5-HW-1/2		
0...+50 °C	0...+50 °C	0...+50 °C	–20...+85 °C	
40 %	40 %	40 %	50 %	

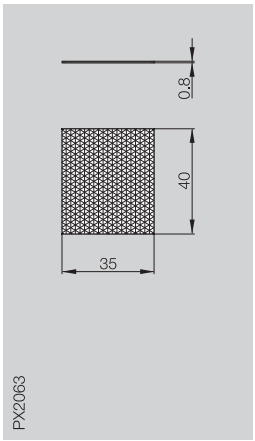


Size	**Reflector ∅ 25 mm**	**Reflector 14×23 mm**	**Reflector ∅ 20 mm**	**Reflector 51×62 mm**
Attachment	glue	two M2 screws	glue	two M4 screws
				
Ordering code	BOS R-13	BOS R-12	BOS R-16	BOS R-22
Material	PMMA	ABS/PMMA	ABS/PMMA	ABS/PMMA
Mounting accessories				BOS 5-HW-6
Special features		Miniature reflector for laser retroreflectives	Miniature reflector for laser retroreflectives	
Temperature range	0...+55 °C	0...+55 °C	–20...+60 °C	–10...+60 °C
when used with laser through-beam sensors BOS 6K/BOS 18K_/BOS 26K/BOS 21M				
Range with				
BOS 6K-PU-1LQA-...	2 m	2 m	2 m	2 m
BOS 18KF-PA-1LQP-...	16 m	10 m	11 m	16 m
BOS 18KW-PA-1LQH-...	9 m	6 m	7 m	9 m
BOS 26K-PA-1LQK-...	16 m	7 m	7 m	25 m
BOS 21M-PA-LR10-...	15 m	7 m	7 m	20 m



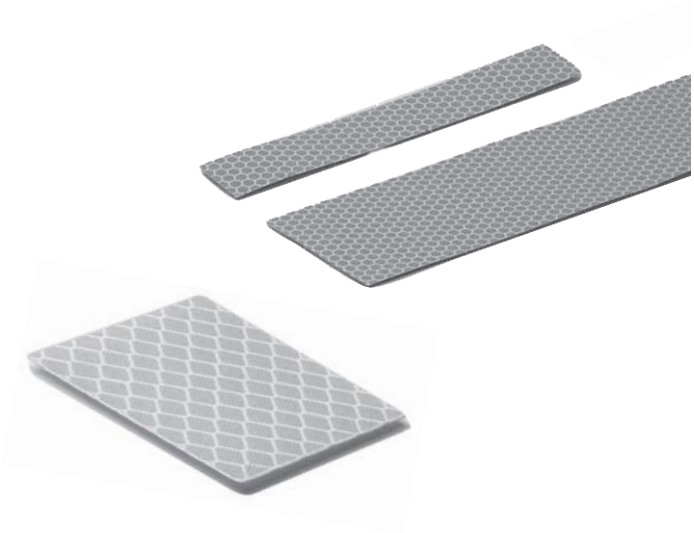
Size	**Reflective tape see below**	**Reflective tape 40×35 mm**
Attachment	self-adhesive	self-adhesive

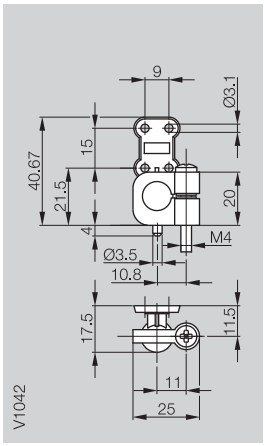
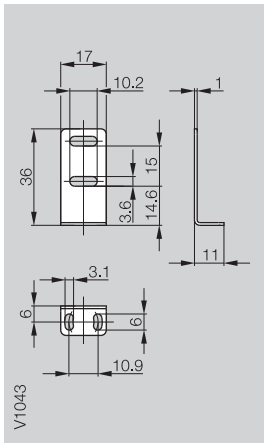
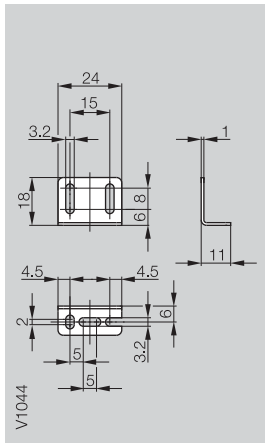
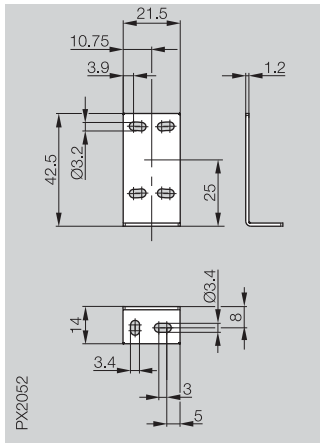


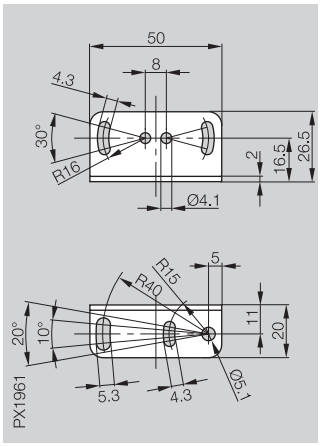
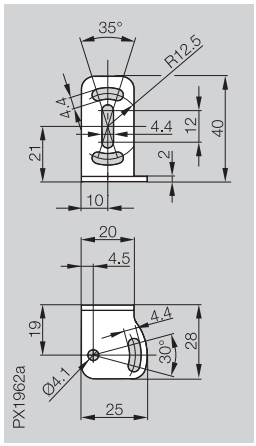
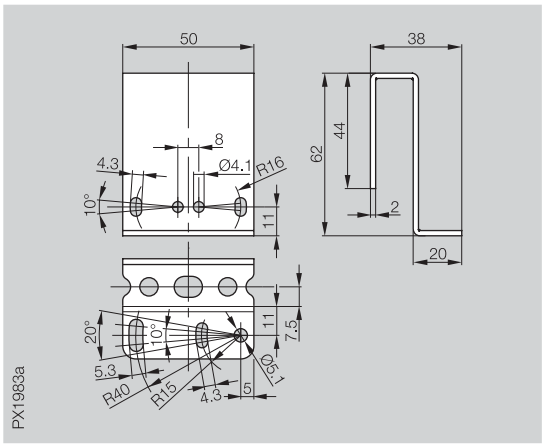


Ordering code	BOS R-6-... (not for polarized light) BOS R-7-... (also for polarized light) BOS R-8-... (also for polarized light)	BOS R-30 (also for polarized light)
Reference sensing range	40 % (for 100×50 mm)	

Dimensions L×W	Ordering code
45 m×50 mm	BOS R-6-45
250 mm×50 mm	BOS R-6-0,25
22 m×50 mm	BOS R-7-22
250 mm×50 mm	BOS R-7-0,25
22 m×25 mm	BOS R-8-22
250 mm×25 mm	BOS R-8-0,25

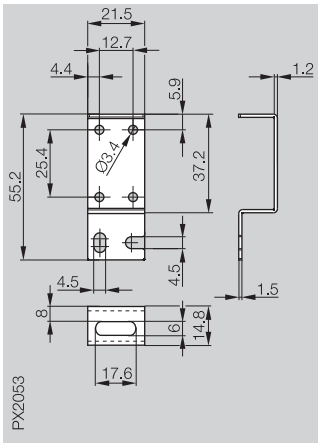


Description Use	**Mounting bracket** for BOS 2K	**Mounting bracket** for BOS 2K	**Mounting bracket** for BOS 2K	**Mounting bracket** for BOS 5K
					
Ordering code	BOS 2-HW-1	BOS 2-HW-2	BOS 2-HW-3	BOS 5-HW-1	

Description Use	**Mounting bracket** for BOS 21M	**Mounting bracket** for BOS 21M	**Mounting bracket** for BOS 21M
			
Ordering code	BOS 21-HW-1	BOS 21-HW-2	BOS 21-HW-3

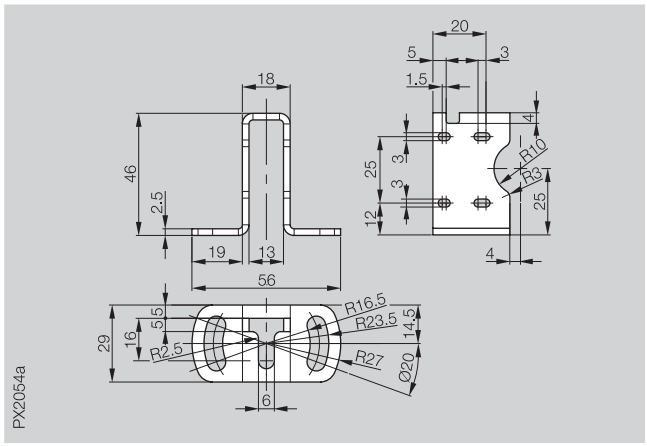


Mounting bracket
for BOS 5K



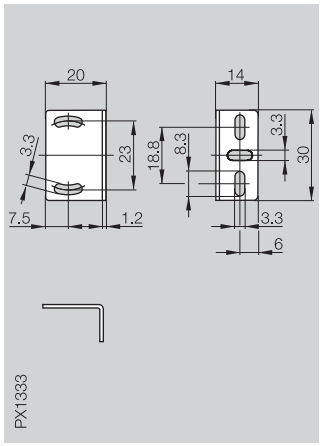
BOS 5-HW-2

Mounting bracket
for BOS 5K



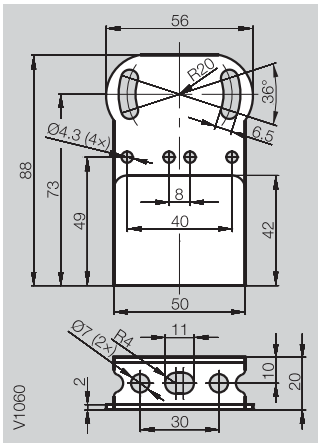
BOS 5-HW-3

Mounting bracket
for BOS 6K and BOS 21M



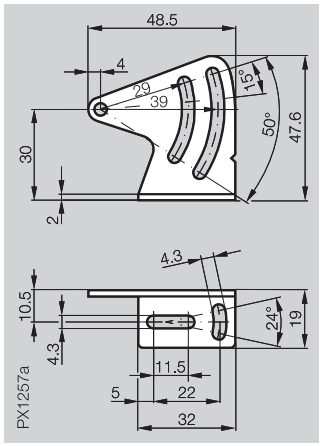
BOS 6-HW-1

Mounting bracket
for BOS 21M



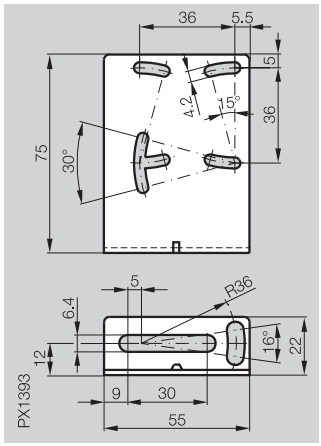
BOS 21-HW-4

Mounting bracket
for BOS 26K, BOS 25K and BOS 21M



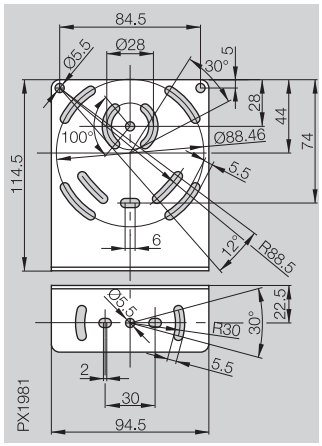
BOS 26-HW-1

Mounting bracket
for BOS 36K



BOS 36-HW-1

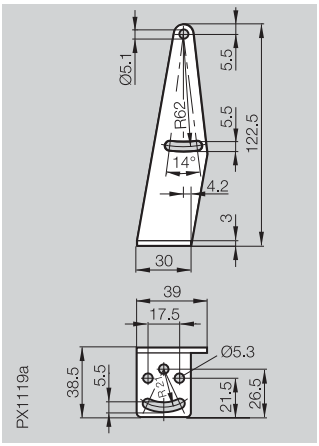
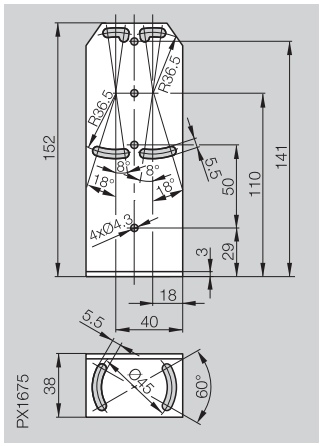
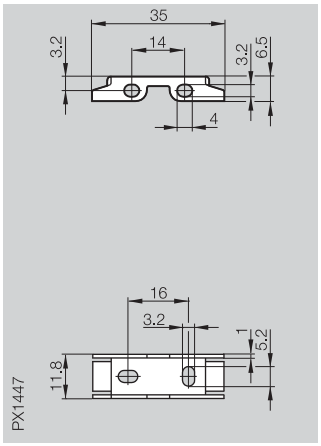
Mounting bracket
for BOD 63M

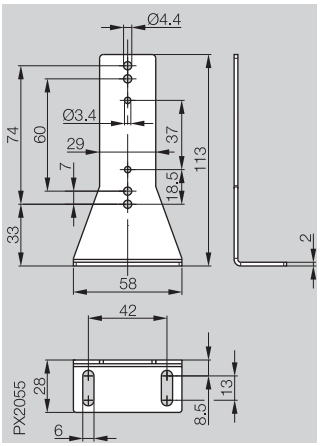
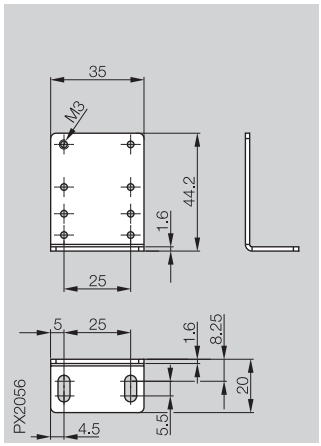
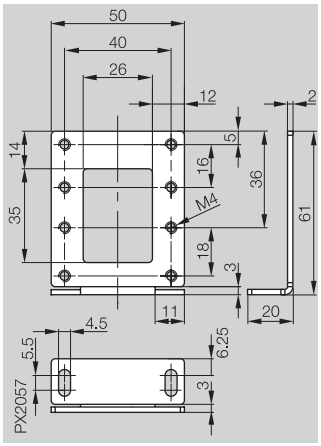


BOD 63-HW-1

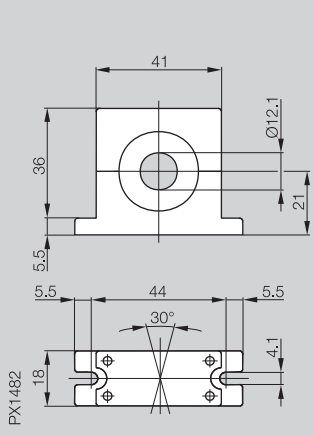
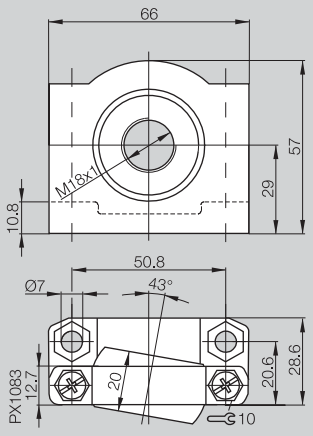
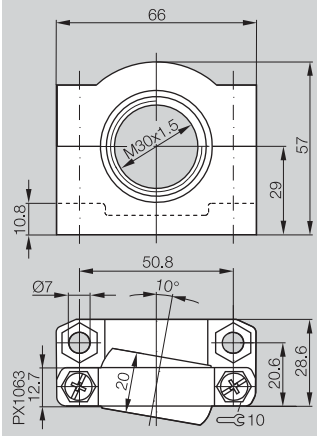


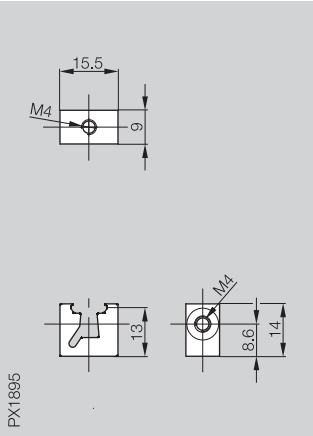
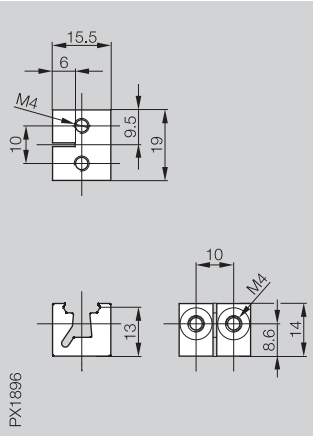
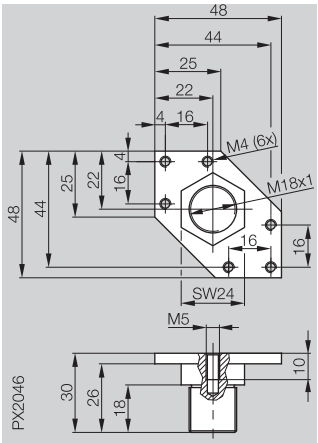
2.3
5
Holders ...
page 5.2 ...

Description Use	**Mounting bracket** for BOS 65K	**Mounting bracket** for BOD 66M	**Mounting bracket** for BOS 74K
			
Ordering code	BOS 65-HW-1	BOD 66-HW-1	BOS 74-HW-1

Description Use	**Mounting bracket** for reflector BOS R-10 and BOS R-25	**Mounting bracket** for reflector BOS R-26	**Mounting bracket** for reflector BOS R-9 and BOS R-22
			
Ordering code	BOS 5-HW-4	BOS 5-HW-5	BOS 5-HW-6



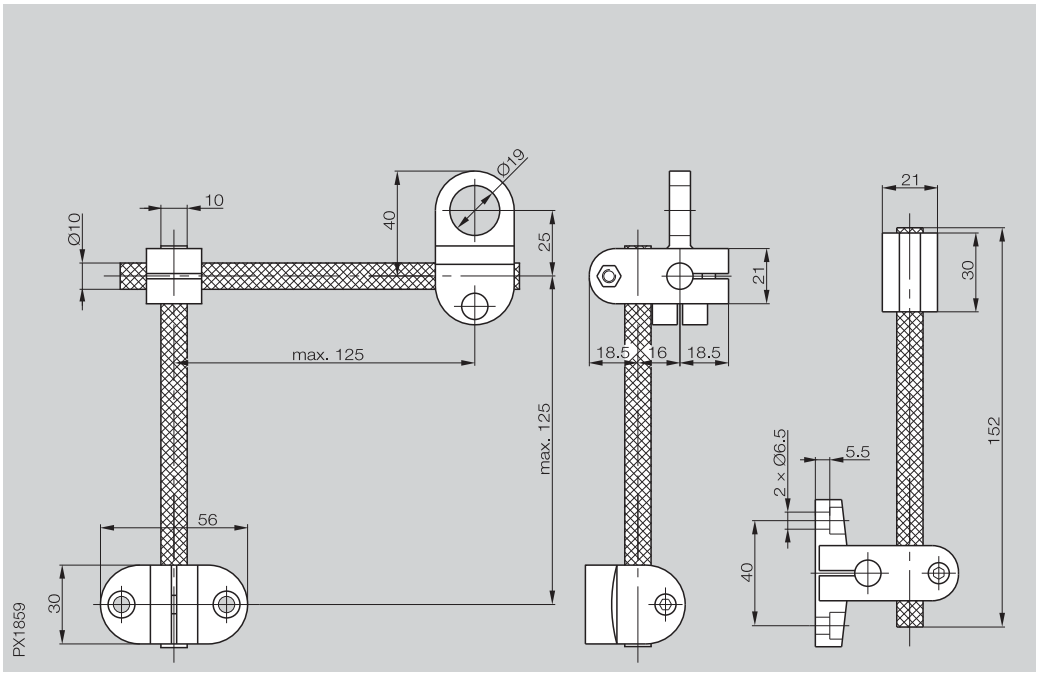
Description Use	**Mounting cuff** for tubular sensors with M12 outside thread	**Mounting clamp with ball joint** for tubular sensors with M18 outside thread	**Mounting clamp with ball joint** for tubular sensors with M30 outside thread
			
Ordering code	BOS 12,0-BS-1	BOS 18,0-KB-1	BOS 30,0-KB-1

Description Use	**Clamp** for BOS 21M	**Clamp** for BOS 21M	**Adapter plate** for BOS 21M, BOS 25K, BOS 26K and BOS R-1
			
Ordering code	BOS 21-KH-1	BOS 21-KH-2	BOS 21-AD-1



2.3
5
Holders ... page 5.2 ...

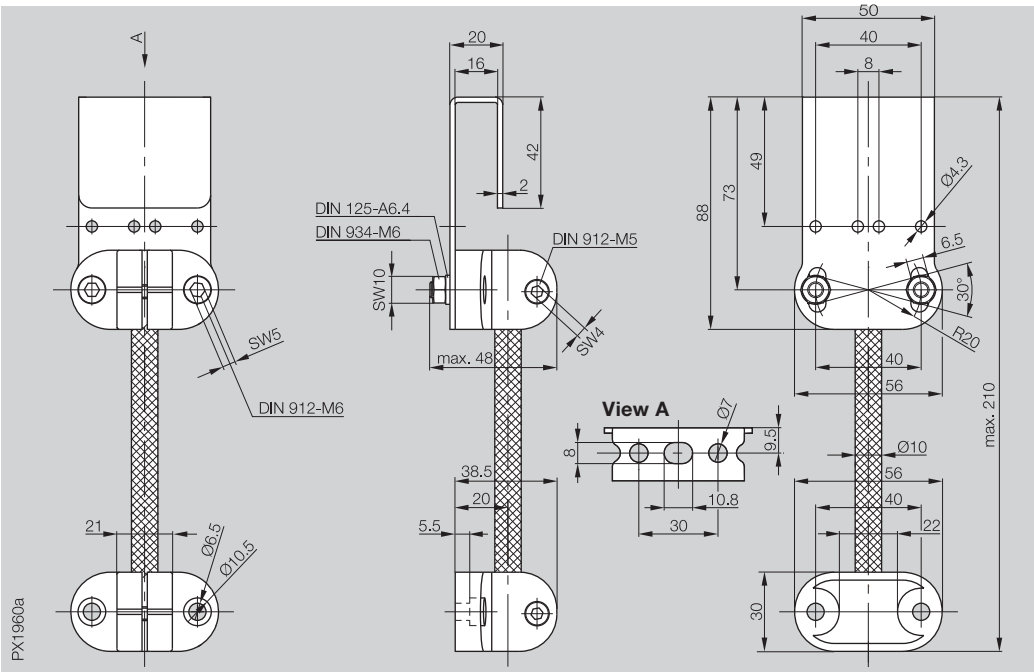
Description	**Holding system**
Use	for flexible installation, for all tubular sensors with M18 outside thread may be combined with other Balluff accessories



Ordering code	BOS 18-HS-1



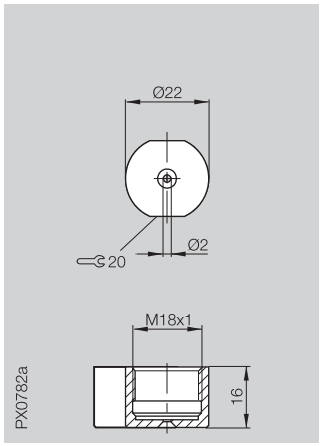
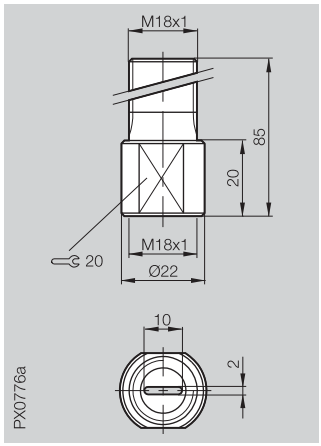
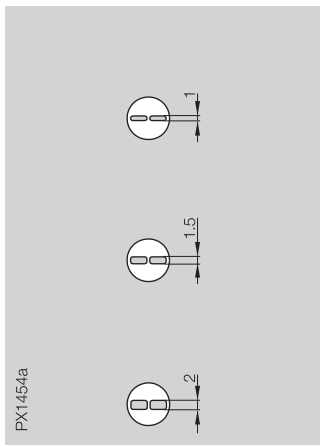
Description	**Holding system**
Use	for flexible installation, for sensors in series BOS 21M may be combined with other Balluff accessories



Ordering code	BOS 21-HS-1





Description	**Round aperture**	**Double slit aperture**	**Slit aperture**
Use	for BLE/BLS 18	for BLE/BLS 18	for BLE/BLS 12M
			
Ordering code	BOS 18-BL-1	BOS 18-BL-2	BOS 12-BL-1

The round and slit apertures restrict the beam diameter. This allows you to detect small parts over a large range. The emitter and receiver must be exactly aligned with each other.

Aperture on emitter	Aperture on receiver	Range in m
○		8
	○	8
○	○	2



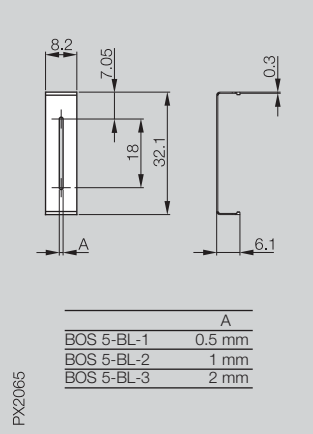
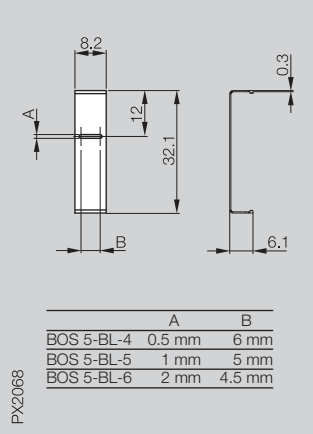
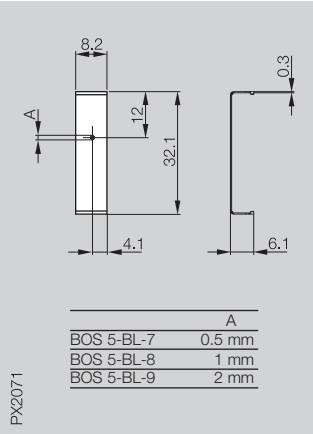
Advantages:
- Small parts detection, i.e. 1 mm drill, aperture on emitter only
- Through-beams may be mounted close to one another
- Highly reflective parts directly next to the light path do not interfere

Aperture position emitter	Aperture position receiver	Range in m
▯	▯	3
▯	▯	2
▯	▯	2



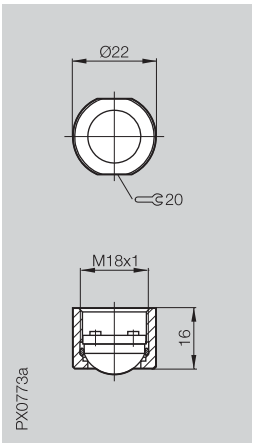
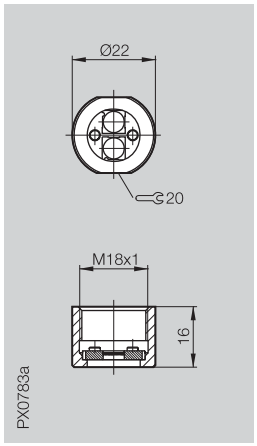
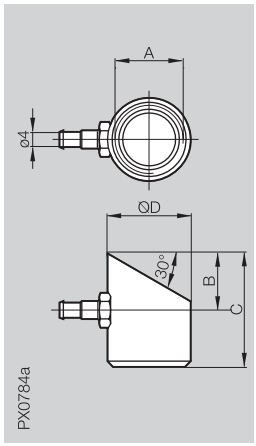
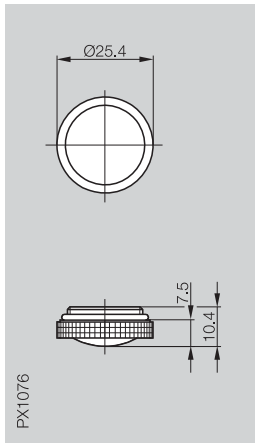
Slit width in mm	Range in m	Object size in mm
1	0.5	> 1
1.5	1	> 1.5
2	2	> 2



Description	Slit aperture vertical	Slit aperture horizontal	Round aperture
Use	for through-beams BOS 5K	for through-beams BOS 5K	for through-beams BOS 5K
	 BOS 5-BL-1: A 0.5 mm BOS 5-BL-2: A 1 mm BOS 5-BL-3: A 2 mm	 BOS 5-BL-4: A 0.5 mm, B 6 mm BOS 5-BL-5: A 1 mm, B 5 mm BOS 5-BL-6: A 2 mm, B 4.5 mm	 BOS 5-BL-7: A 0.5 mm BOS 5-BL-8: A 1 mm BOS 5-BL-9: A 2 mm
Ordering code	BOS 5-BL-1 BOS 5-BL-2 BOS 5-BL-3	BOS 5-BL-4 BOS 5-BL-5 BOS 5-BL-6	BOS 5-BL-7 BOS 5-BL-8 BOS 5-BL-9



Plano-convex lens, polarizing filters, air shield

Description	**Plano-convex lens**	**Polarizing filter**	**Air shield**	**Lens**	
Use	for all BOS 18 diffuse sensors for background suppression and small parts detection	only for BOS 18M-..-1RD-...	for BOS 12/BOS 18 for 4 mm I. D. tube	for BKT and BLT for extending range	
					
Ordering code	BOS 18-PK-1	BOS 18-PF-1	BOS 1_-LT-1	BKT M-PK-1	

Advantages:
- Sensing range adjustable 0...40 mm
- Low switching point shift, e.g. for different colors or surface properties
- Background fade-out allows detection of objects in front of a reflective background
- Small parts detection down to 0.05 mm using focusing plano-convex lens with a working range of approx. 0...13 mm

Housing material:
PA 6
Plano-convex lens:
Glass

Polarizing filters are used for reliably sensing highly reflective objects. They prevent faulty switching. Reflecting or shiny parts will not cause faulty switching. The polarizing filters guarantee that only the light reflected back by the reflector is detected.
They reduce the sensing range by 50%.

Housing material:
PA 6
Polarizing filter:
IR polarizer

The air shield with a compressed air source prevents premature contamination of the optics.

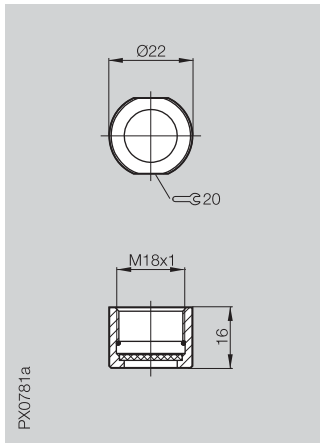
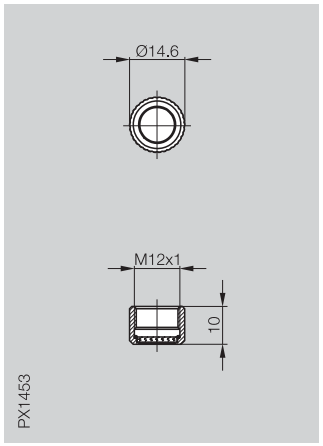
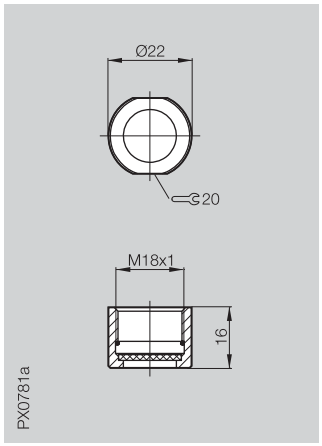
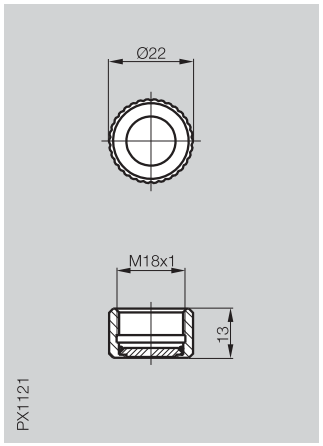
	BOS 12-LT-1	BOS 18-LT-1
A	M12×1	M18×1
B	14	15
C	25	30
D	14	22

Using the supplementary lens increases the range of the BKT from 9 mm to 18 mm.
This corresponds to a working range of 15...30 mm when using with the BLT.







	Neutral density filter for BOS 18	**Cover nut** for BOS 12	**Cover nut** for BOS 18	**Cover nut** for BOS 18 with flat front surface
				
	BOS 18-NF-_*	BOS 12-SM-1	BOS 18-SM-1	BOS 18-SM-2

*1 = 50 % transmission
2 = 75 % transmission

Neutral density filters weaken the infalling light, without changing its spectral characteristics.
The neutral filter is made of glass with a vacuum coated material layer. This is hard, non-peeling and resistant to aging.
Clean the filter using standard commercial optical cleaners.

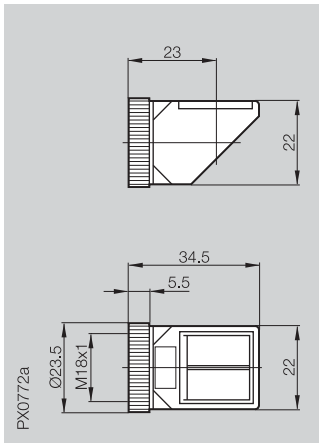
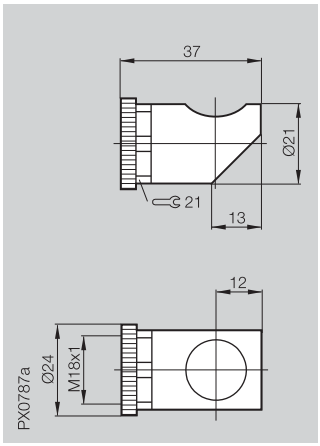
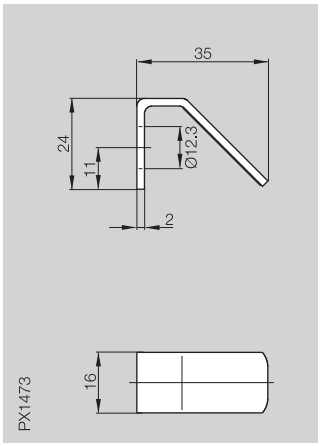
Housing material:
PA 6

The protective end cap is made with tempered glass and can be used with all M12 photoelectric switches. These caps are used to protect the optics from mechanical or thermal damage. Sparks from welding will not damage the hardened glass lens.

The protective end cap is made with tempered glass and can be used with all M18 photoelectric switches. These caps are used to protect the optics from mechanical or thermal damage. Sparks from welding will not damage the hardened glass lens.

The protective cap can be used in combination with all BOS 18M and BOS 18K sensors. It protects the optics from the effects of welding splatter, for example.
For increased protection the BOS 18-SM-2 is made of metal, providing even better protection for the sensor optics. The heat protecting glass closes off flush with the front surface of the cover nut. This means no dust deposits can form which would otherwise result in a loss of range. A ring between the sensor and protective glass makes sure the system is sealed.



Description	**90° Rotatable head**	**90° Rotatable head**	**Diagonal mirror**
Use	for diffuse, retroreflective and through-beams BOS 18 (except laser)	for diffuse, retroreflective and through-beams BOS 18	for diffuse and through-beams BOS 12
			
Ordering code	BOS 18-UK-_*	BOS 18-UK-10	BOS 12-WS-1

*1 = see table
2 = see table

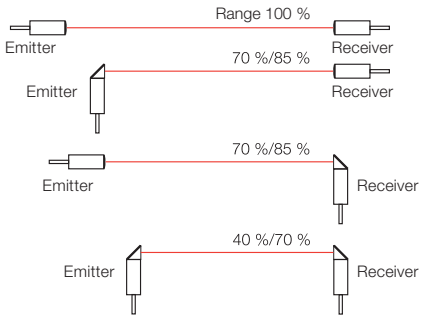


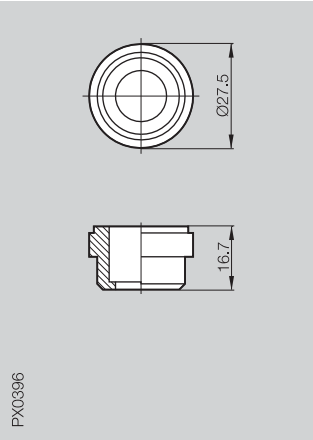
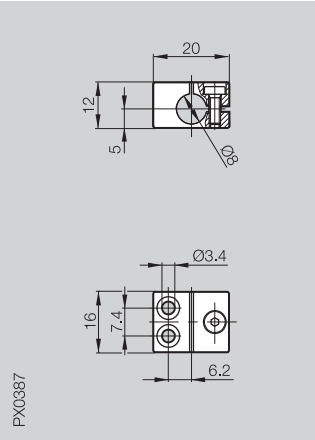
When using the diagonal mirror the sensing range is reduced by 30 % for the M12 diffuse and M12 through-beam sensors. Not suitable for retroreflective sensors.

Rotatable heads, suitable combinations

All BOS 18 photoelectric sensors can be equipped with a 90° rotatable head. The table shows the appropriate rotatable head for each switch type and indicates the corresponding reduction factor (RF) to apply to the range.
In the case of a through-beam sensor both the emitter and receiver can be fitted with a 90° rotatable head. Each rotatable head reduces the range by approx. 15 % to 30 %.

Diffuse			**BOS 18-UK-1**	**BOS 18-UK-2**	**BOS 18-UK-10**
BOS 18...-XA-...	100	mm	RF = 45 %		RF = 50 %
BOS 18...-XB-...	200	mm	RF = 25 %		RF = 50 %
BOS 18...-PB-...	200	mm	RF = 25 %		RF = 50 %
BOS 18...-XD-...	400	mm		RF = 25 %	RF = 30 %
BOS 18...-PD-...	400	mm		RF = 25 %	RF = 30 %
Retroreflective					
BOS 18...-RB-...	2	m		RF = 20 %	RF = 20 %
BOS 18...-RD-...	4	m		RF = 20 %	RF = 20 %
Through-beam					
BLE 18...-P-...	16	m		RF = 15 %	RF = 30 %
BLS 18...-XX-...	16	m		RF = 15 %	RF = 30 %

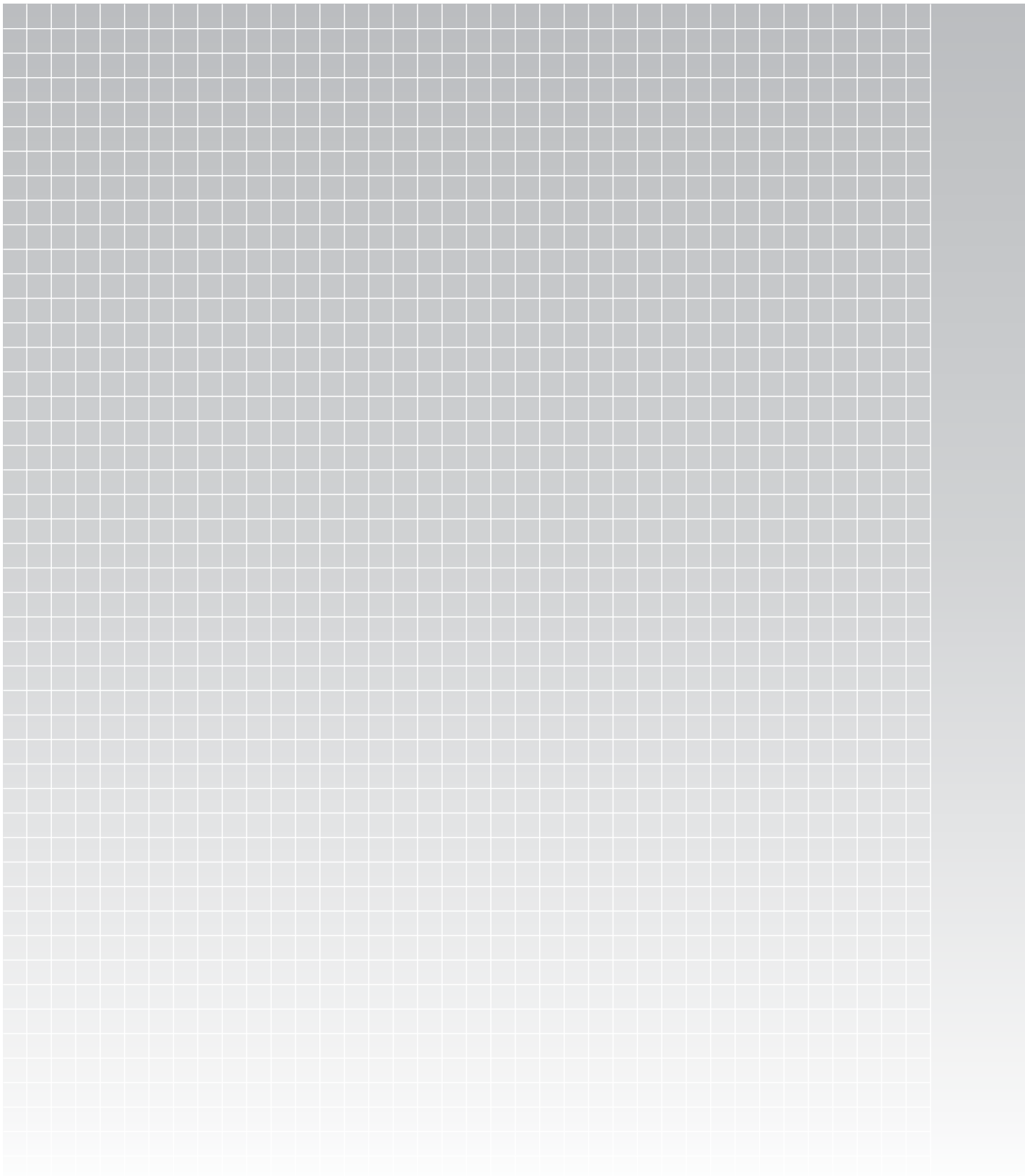


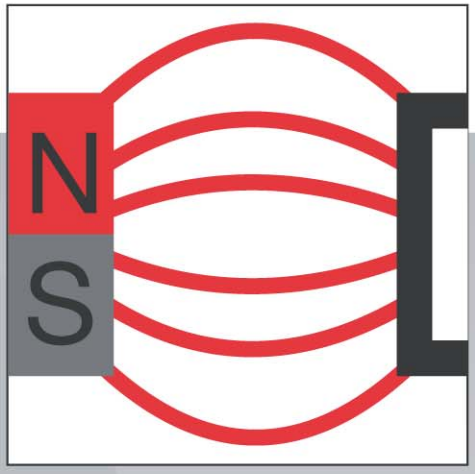
Description	**Adapter**	**Holder**	
Use	for glass fiber optics BFO 18V for connecting to BOS 30M	for glass fiber optics and sensors with a corresponding diameter	
			
Ordering code	BFO 30-A1	BFO 08,0-KB-1	





2.3

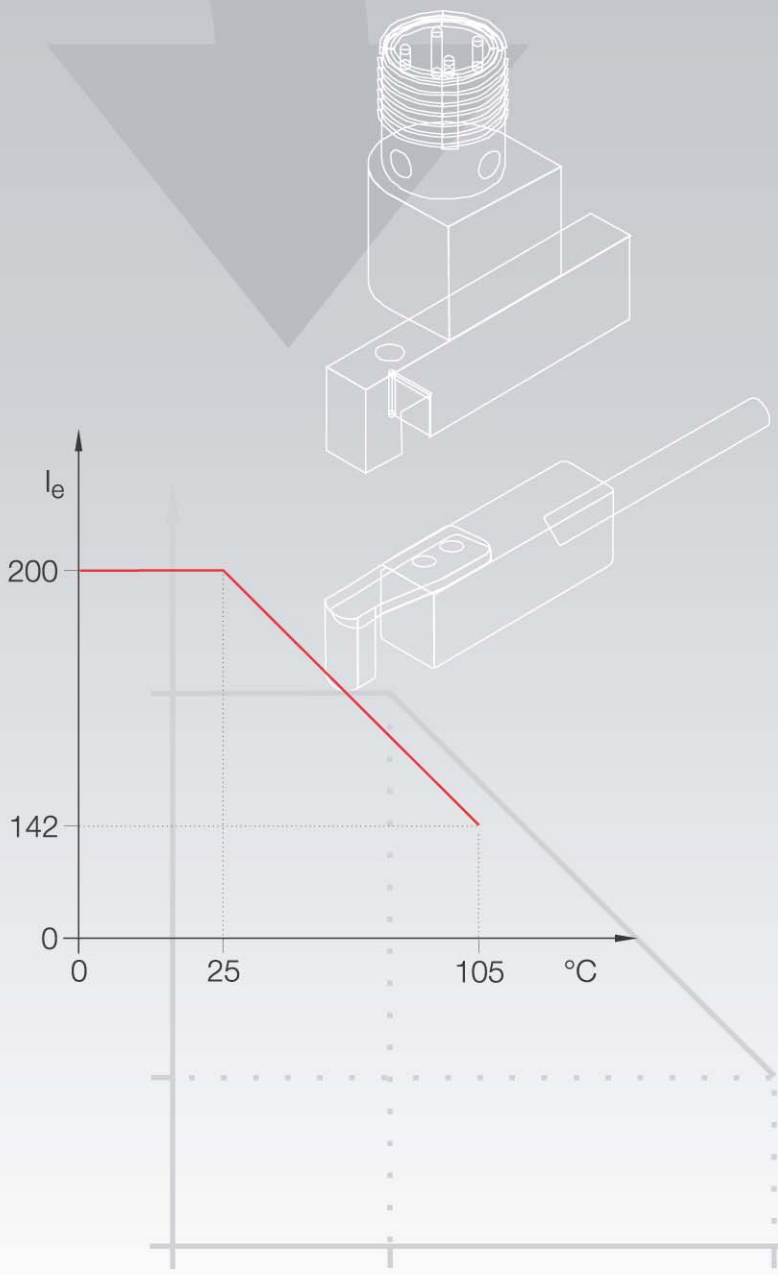




Sensors for Pneumatic Cylinders

Magnetic field sensors respond to an external magnetic field.
Their main area of application is sensing piston positions in pneumatic cylinders.

3.0.2 Product overview
3.0.4 General description, principles of operation
3.0.5 Installation notes
3.0.6 Ambient notes
3.0.7 Selection guide for connectors and cables
3.0.10 Hose clamp matrix



3.0

Series	BMF 103	BMF 273	BMF 303	BMF 305K	BMF 305M
					
	mini.s	**mini.s**	**mini.s**	**All-rounder**	**Special**
for cylinder types					
C-slot	HW-41/HW-42	■	HW-28/HW-30	HW-32 (Norgren)	HW-32 (Norgren)
T-slot	HW-43		HW-33/40/51	HW-17/20/22/23/26	HW-17/20/22/23/26
Trapezoidal slot			HW-44	HW-25	HW-25
Trapezoidal guide				HW-27	HW-27
Round cylinder			HW-59/HW-61/ HW-80	HW-24	HW-24
Tie rod cylinder				HW-21+HW-8/ HW-21+HW-10	HW-21+HW-8/ HW-21+HW-10
for flush mounting		■	■		
without mounting bracket		■			
Connections					
Connector					M8 and M12
Cable and connector	M5 and M8	M8	M5 and M8	M8 and M12	
Cable	■	■	■	■	
Output types					
PNP NO 3-wire	10...30 V	10...30 V	10...30 V	10...30 V	10...30 V
PNP NC 3-wire	10...30 V	10...30 V	10...30 V	10...30 V	
NPN NO 3-wire	10...30 V	10...30 V	10...30 V	10...30 V	
NPN NC 3-wire		10...30 V	10...30 V	10...30 V	
PNP NO Weld-immune 3-wire					10...30 V
PNP NO Reed 3-wire				10...30 V	
Non-polarized AC/DC Reed 2-wire				6...240 V AC/DC	
Housing					
Plastic	LCP	PBT	LCP	LCP	
Metal					Al
Characteristics					
Short circuit protected	■	■	■	■	■
Polarity reversal protected	■	■	■	■	■
CE	■	■	■	■	■
UL	■	■	■	■	■
Unique features					
	Optimized for short-stroke cylinders, compact design	Can be inserted in C-slot from above, integrated holder	Integrated in C-slot, mini design	Universal sensor	Universal sensor, metal housing, weld-immune, temperature rated
Page	**3.1.**2	**3.1.**4	**3.1.**6	**3.1.**8	**3.1.**9

	BMF 307	BMF 315K	BMF 315M	BMF 21	BMF 32	BMF 10E
						
	Compact	**Compact**	**Special**	**Classic**	**Classic**	**Special**
	■	■	■			
					HW-12/14/18	
	HW-73	HW-73	HW-73	HW-11	Hose clamp	HW-49 and hose clamp
				HW-8/HW-10/ HW-10E	HW-13/HW-15	HW-49 and hose clamp
	■	■	■			
	■	■	■		■	
				M8	M8 and M12	M8
	M8	M8 and M12	M8 and M12			
	■	■	■	■		
	10...30 V	10...30 V	10...30 V	10...30 V	10...30 V	10...30 V
	10...30 V	10...30 V				
	10...30 V	10...30 V		10...30 V	10...30 V	
	10...30 V	10...30 V				
			10...30 V		10...30 V	
	4...30 V AC/DC					
	LCP	PA 66		PBT		
			Al		Al	Stainless steel 1.4571
	■	■	■	■	■	■
	■	■	■	■	■	■
	■	■	■	■	■	■
	■	■	■	■	■	■
	integrated holder	Can be inserted in T-slot from above, integrated holder	Can be inserted in T-slot from above, Integrated holder, metal housing, weld-immune, temperature rated	for tie rod cylinders	For tie rod cylinders, metal housing, weld immune	for the foods industry
	3.1.15	**3.1.**17	**3.1.**18	**3.1.**20	**3.1.**22	**3.1.**24

Use

Magnetic field, electronic sensors in the BMF series detect the piston position in pneumatic and hydraulic cylinders and grippers.

Depending on the model, the sensor housing will be made of plastic, aluminum, brass or stainless steel.

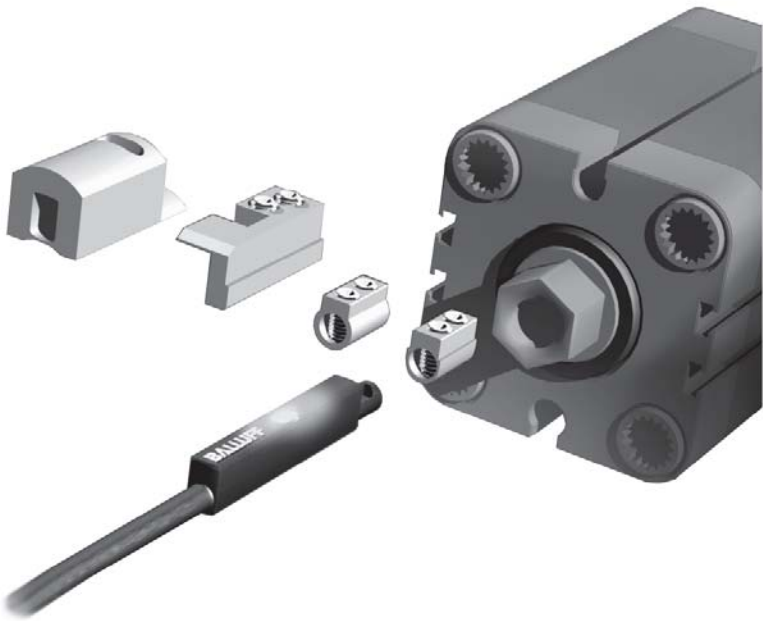
Balluff offers a comprehensive variety of BMF form factors and mounting brackets for your pneumatic cylinders. Most require only one sensor model with various mounting brackets for the different cylinder manufacturers and sizes. This reduces your inventory costs. Mounting with our brackets allows sensors to be replaced without losing your switchpoints.

Function

Permanent magnets are installed in the piston ring of the pneumatic cylinder which are sensed by the magnetic field sensor through the cylinder wall. As the piston approaches, the sensor changes its output signal state.

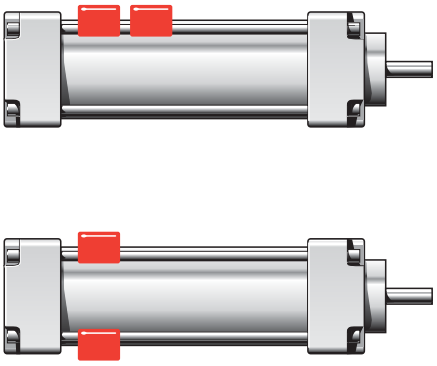
Advantages

- Reliable, bounce-free switching
- Long service life
- Non-contact, wear-free piston sensing
- Resensitized to contamination
- Detects piston position through the cylinder wall
- Space-saving design, small sizes and shapes
- Can be installed on any
- cylinder using the appropriate mounting bracket
- Significantly greater switching distances for the same size
- Switches through alloy and aluminum walls without a reduction in switching distance
- Magnet can be flush mounted in steel
- Polarity reversal protected
- Supply voltage 10...30 V DC
- Responds to both magnetic field directions equally
- Solid-state, wear-free
- Insensitive to vibration
- Short circuit protected
- Housing material is highly resistant to aggressive media



**Mounting distances
Adjustment
and installation**

The response travel of a magnetic field sensitive sensor is virtually independent of the field strength of typical piston magnets. This design and operating principle eliminates multiple switchpoints.
When using more than one of the magnetic field switches, these BMF sensors can be mounted directly next to or beside each other.

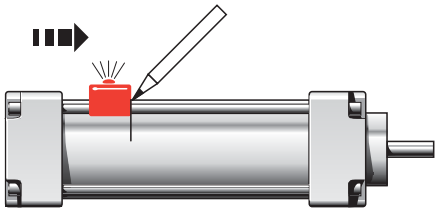


**Adjustment
and installation**

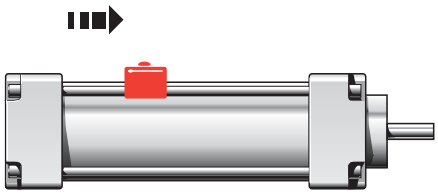
1. Set piston to end position.



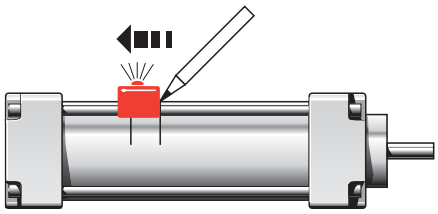
2. Slide sensor (with power on) until 1st turn-on point (LED on). Mark edge of sensor on cylinder.



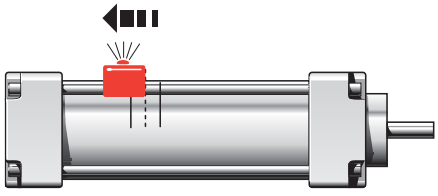
3. Continue to slide the sensor until the output is off (LED off).



4. Slide sensor back to 2nd turn-on point. Mark edge of sensor on cylinder.



5. Fasten sensor down with edge is between the two marked points.

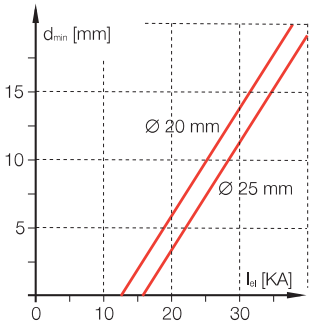


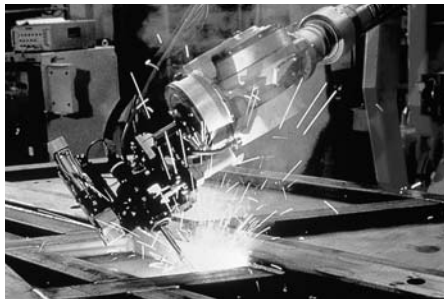
3.0

Using in AC welding environments

The BMF 305M/ 315M/32M-..-**W**-.. magnetic field sensors can be operated in external fields up to a field strength of E_{max} = 200 kA/m. This limit is often exceeded in the direct vicinity of high current lines, e.g. welding equipment.

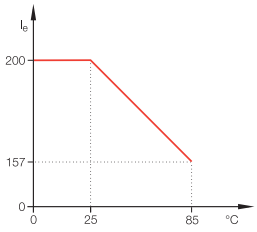
The sensor should therefore be mounted at a distance d_{min} from such lines, as shown in the diagram below showing the relationship between current and conductor diameter.



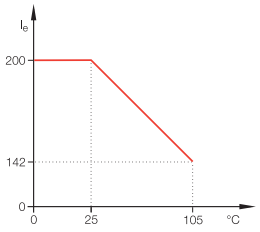


Temperature load curve

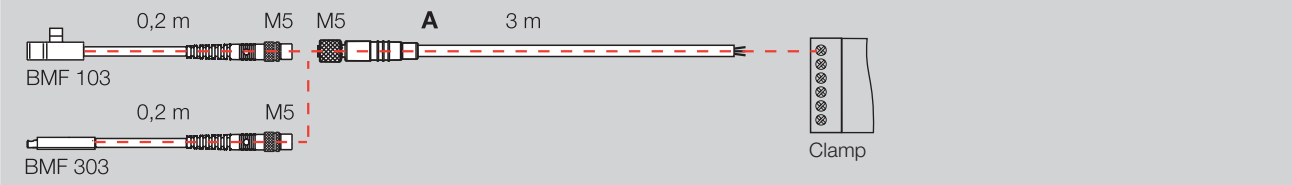
For series BMF 10E, BMF 21, BMF 32, BMF 305, BMF 307, BMF 315



For series BMF 305M...SA4 and BMF 315M...SA3 (extended temperature range) –25...+105 °C

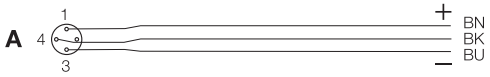


Wiring versions M5 (BMF-...-S26)
Select the appropriate cables from the BMF sensor for your controller.



	Type/version	Fastening	Material	Length	Ordering code
A	Straight coupling M5 with molded-in cable	Threaded ring M5	PUR	3 m	BKS-B25-1-PU-03

Connector wiring M5 (BMF-...-S26)



Top view of socket/pins

Wire colors
Coding
per DIN IEC 60757

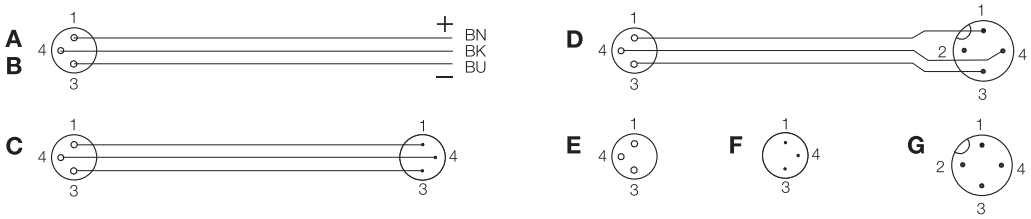
BN	brown
BK	black
BU	blue

BKS-S4-TM1-01
BKS-S49-TM1-02



BSB-04-P01P/4-M02K-HKP-_ _

Straight M5 coupling M8 (BMF-...-S49)



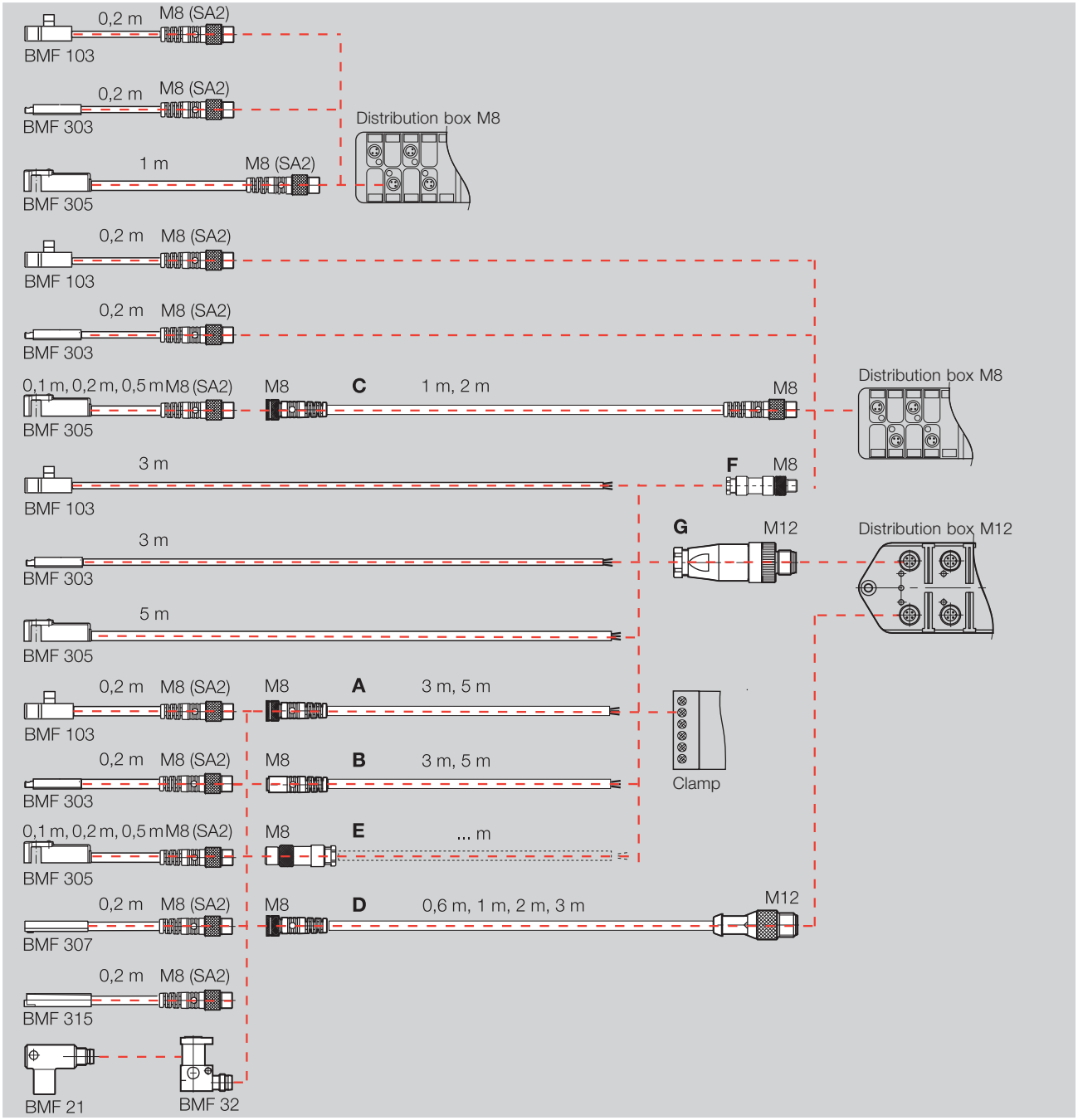
Top view of socket/pins

Wire colors
Coding
per DIN IEC 60757

BN	brown
BK	black
BU	blue

3.0

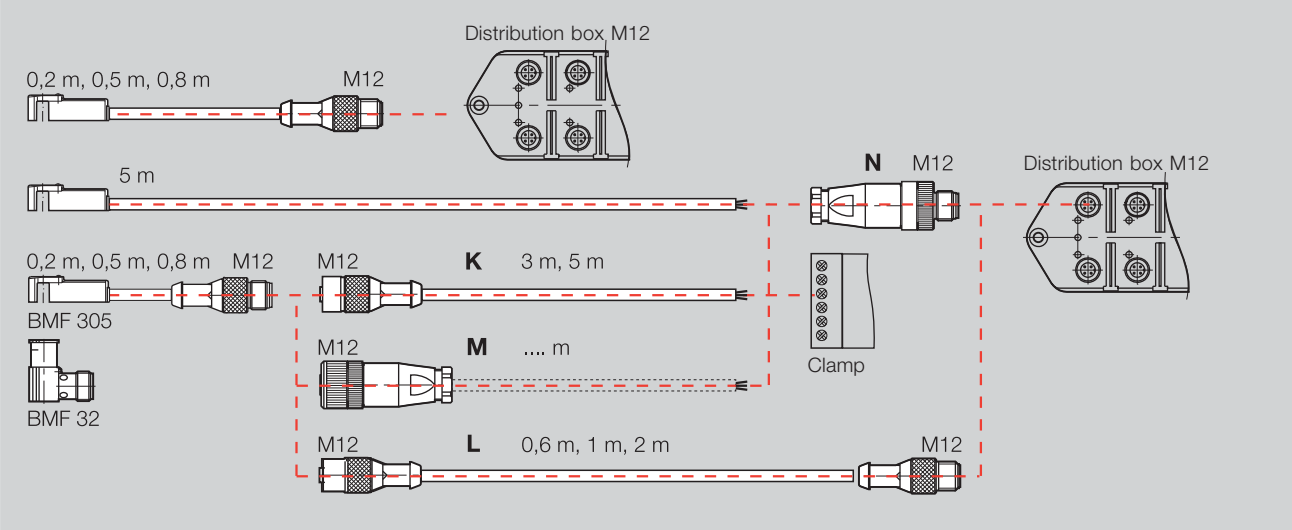
Wiring versions for M8 (BMF-...-S4)
Select the appropriate cables from the BMF sensor for your controller.



	Type/version	Fastening	Material	Length	Ordering code
A	Straight coupling M8 with molded-in cable	threaded ring M8 self-securing	PVC	3 m	BKS-_ 48-1-03
			PVC	5 m	BKS-_ 48-1-05
			PUR	3 m	BKS-_ 48-1-PU-03
			PUR	5 m	BKS-_ 48-1-PU-05
B	Straight coupling M8 with molded-in cable	ratchet (for M8)	PVC	3 m	BKS-S 41-1-03
			PVC	5 m	BKS-S 41-1-05
			PUR	3 m	BKS-S 41-1-PU-03
			PUR	5 m	BKS-S 41-1-PU-05
C	Straight coupling M8 with cable and straight connector M8	threaded ring M8, threaded ring M8	PUR	1 m	BKS-B 48-1/GS49-PU-01
			PUR	2 m	BKS-B 48-1/GS49-PU-02
D	Straight coupling M8 with cable and straight connector M12	threaded ring M8, threaded ring M12, self-securing	PUR	0.6 m	BKS-S 48-1/GS4-PU-00,6
			PUR	1 m	BKS-S 48-1/GS4-PU-01
			PUR	2 m	BKS-S 48-1/GS4-PU-02
			PUR	3 m	BKS-S 48-1/GS4-PU-03
E	Straight coupling M8, 3-pole solder contacts	threaded ring M8			BKS-S 81-00
F	straight connector M8, 3-pole solder contacts*	threaded ring M8			BKS-S 82-00
G	straight connector M12, 4-pole screw contacts*	threaded ring M12			RSC 4/7

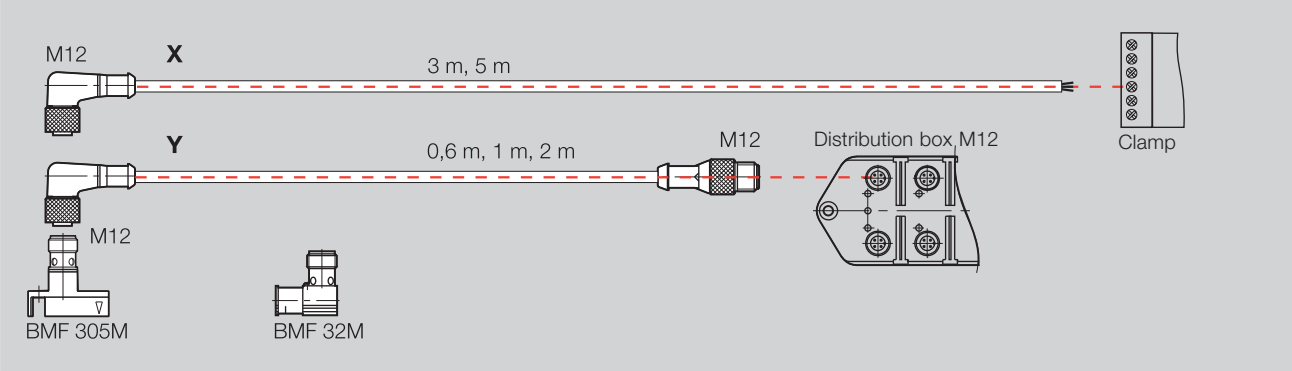
*Insulation displacement and screw contact

Wiring versions for M12 (BMF-...-S4)
Select the appropriate cables from the BMF sensor for your controller.



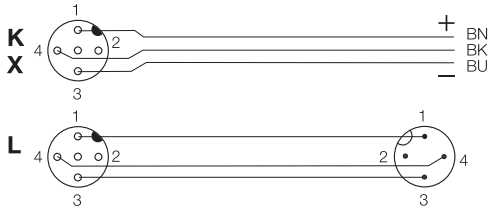
	Type/version	Fastening	Material	Length	Ordering code
K	straight coupling M12 with molded-in cable	threaded ring M12 self-securing	PVC	3 m	BKS-_ 19-1-03
			PVC	5 m	BKS-_ 19-1-05
			PUR	3 m	BKS-_ 19-1-PU-03
			PUR	5 m	BKS-_ 19-1-PU-05
L	straight coupling M12 with cable and straight connector M12	threaded ring M12, threaded ring M12 self-securing	PUR	0.6 m	BKS-S 19-1/GS4-PU-00,6
			PUR	1 m	BKS-S 19-1/GS4-PU-01
			PUR	2 m	BKS-S 19-1/GS4-PU-02
M	Straight coupling M12, 4-pole screw contacts*	threaded ring M12			BKS-S 10-3
N	straight connector M12, 4-pole screw contacts	threaded ring M12			RSC 4/7

*Insulation displacement and screw contact

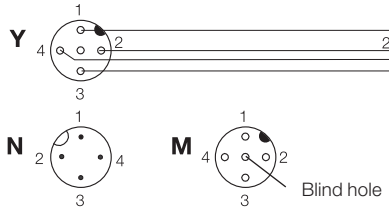


	Type/version	Fastening	Material	Length	Ordering code
X	right angle coupling M12 with molded-in cable	threaded ring M12 self-securing	PVC	3 m	BKS-_ 20-1-03
			PVC	5 m	BKS-_ 20-1-05
			PUR	3 m	BKS-_ 20-1-PU-03
			PUR	5 m	BKS-_ 20-1-PU-05
Y	right angle coupling M12 with cable and straight connector M12	threaded ring M12, threaded ring M12 self-securing	PUR	0.6 m	BKS-S 20-3/GS4-PU-00,6
			PUR	1 m	BKS-S 20-3/GS4-PU-01
			PUR	2 m	BKS-S 20-3/GS4-PU-02

Pin configurations



Top view of socket/pins



Wire colors
Coding per DIN IEC 60757

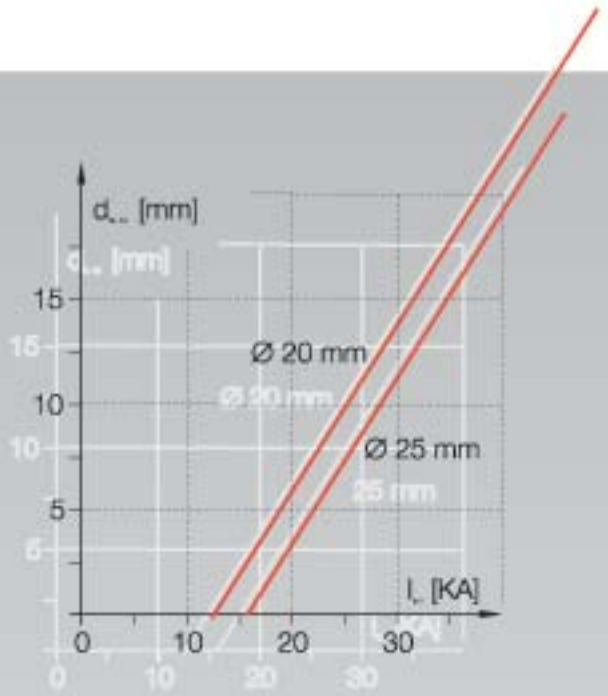
BN	brown
BK	black
BU	blue

Hose clamp matrix



Piston Ø	**BMF 303-HW-59** with **hose clamp** **BMF size _**	**BMF 305-HW-24** with **hose clamp** **BMF size _**	**BMF 21-HW-11** with **hose clamp** **BMF size _**	**BMF 32** with **hose clamp** **BMF size _**	**BMF 10E-HW-19** with **hose clamp** **BMF size _**
≤ 8		0			
8...10	1	1	1	1	2
12	2	1	1	1	2
16	2	1	2	2	3
20	2	2	2	2	3
25	2	2	2	2	3
32	3	3	3	3	4
40	4	4	4	4	5
50	5	5	5	5	6
63	6	6	6	6	8
80	7	7	7	7	

Please append size to part number!



Sensors for Pneumatic Cylinders

Magnetic field sensors respond to an external magnetic field. Their main area of application is sensing piston positions in pneumatic cylinders.

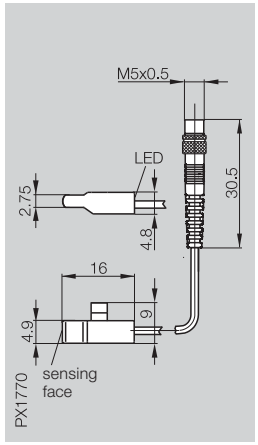
3.1.2 BMF 103
3.1.3 Mounting brackets, selection guide and installation for BMF 103
3.1.4 BMF 273
3.1.6 BMF 303
3.1.7 Mounting brackets, selection guide and installation for BMF 303
3.1.8 BMF 305
3.1.10 Mounting brackets, selection guide and installation for BMF 305
3.1.14 BMF 305 Reed switches
3.1.15 BMF 307
3.1.16 BMF 307 Reed switches
3.1.17 BMF 315K
3.1.18 BMF 315M
3.1.20 BMF 21
3.1.21 Mounting brackets for BMF 21
3.1.22 BMF 32
3.1.23 Mounting brackets for BMF 32
3.1.24 BMF 10E (Ø 10 mm)

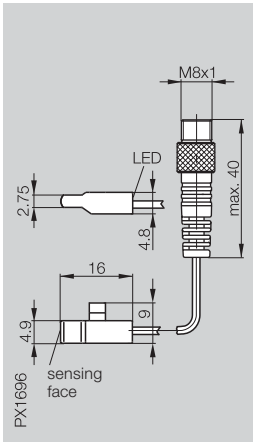


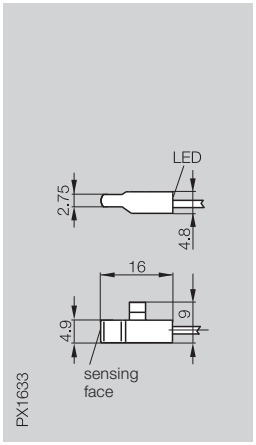
Series	BMF 103	BMF 103	BMF 103
Type	Connector M5×0.5 with rotatable union nut	Connector M8×1 with rotatable union nut	

The sensor for positioning monitoring on miniature grippers and miniature cylinders with C- or T-slot. Highly precise switching response for monitoring even the smallest piston movements.









PNP	NO	BMF 103K-PS-C-2A-S26-00,3	BMF 103K-PS-C-2A-SA2-S49-00,3	BMF 103K-PS-C-2A-PU-02
	NC		BMF 103K-PO-C-2A-SA2-S49-00,3	BMF 103K-PO-C-2A-PU-02
NPN	NO		BMF 103K-NS-C-2A-SA2-S49-00,3	BMF 103K-NS-C-2A-PU-02
Rated operating field strength I H_n I		1.2 kA/m	1.2 kA/m	1.2 kA/m
Assured operating field strength I H_a I		≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m
Hysteresis of I H_n I		≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I		≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Turn-off delay		≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d		≤ 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		100 mA	100 mA	100 mA
No-load supply current I_0 max.		≤ 5 mA	≤ 5 mA	≤ 5 mA
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C	–25...+70 °C
Utilization category		DC 13	DC 13	DC 13
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Housing material		LCP	LCP	LCP
Connection		0.3 m cable (PUR) with connector	0.3 m cable (PUR) with connector	2 m Cable PUR
No. of wires × cross-section				3×0.10 mm²
Approval		cULus	cULus	cULus
Recommended connector		BKS-_ 25	BKS-_ 48	

Other cable lengths on request.

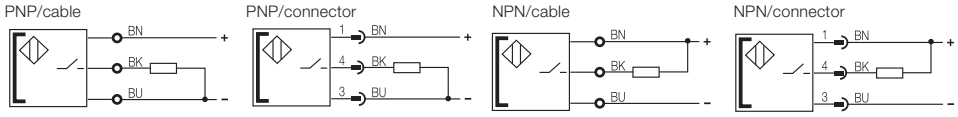




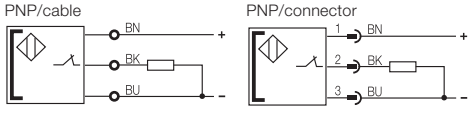


Wiring diagrams

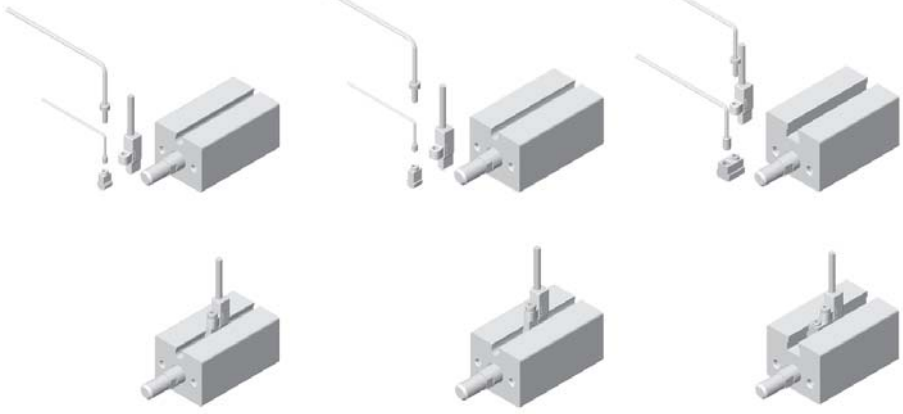
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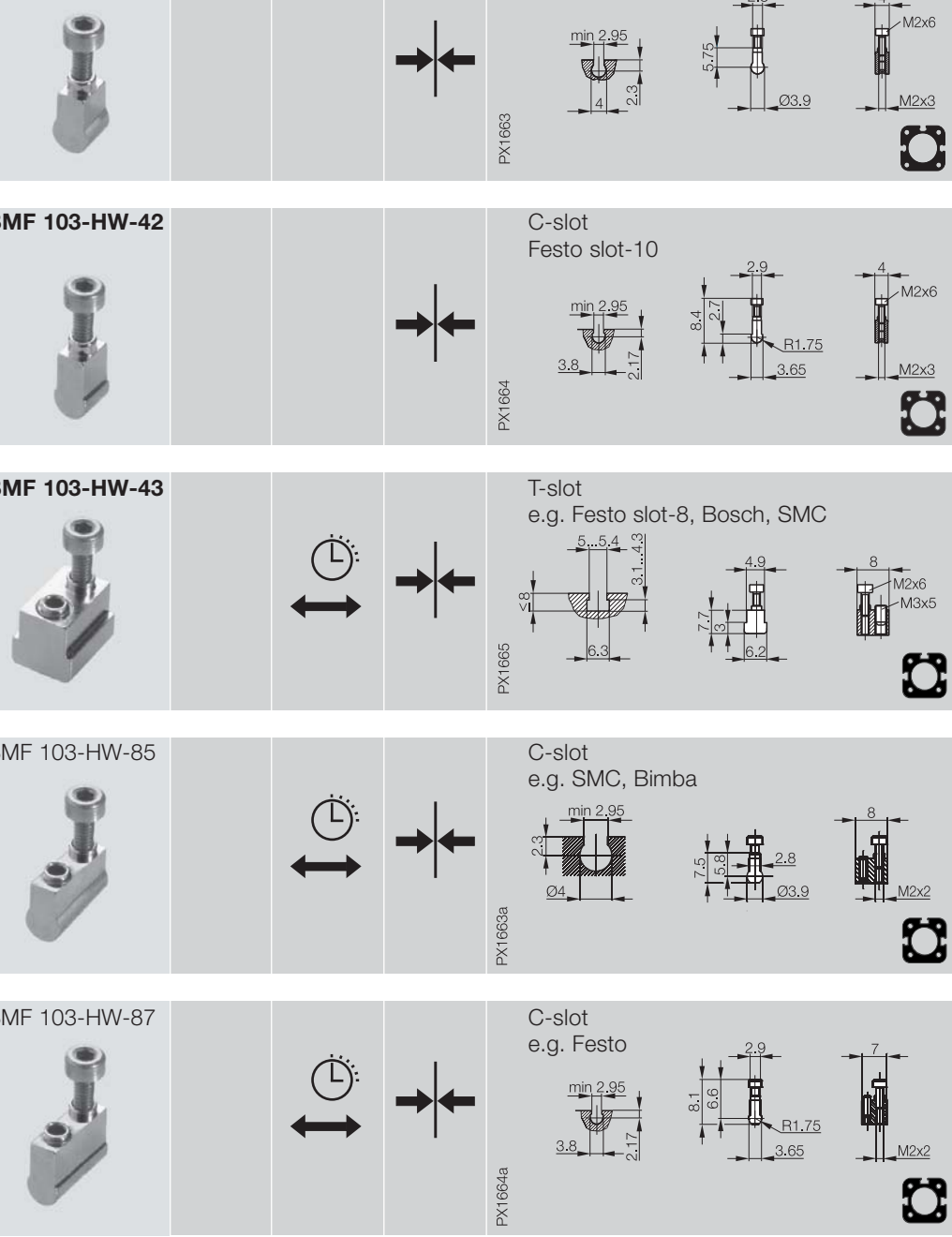
NC



BMF 103-HW-41 BMF 103-HW-42 BMF 103-HW-43



Advantages	Ordering code	Advantages			Cylinder type	Mounting brackets
Switchpoint can be adjusted in seconds! Turn screw one revolution, adjust position, tighten.	**BMF 103-HW-41**				C-slot e.g. SMC	
Switchpoint cannot be lost. Even if you replace the sensor, the adjusted switchpoint is determined by the mounting bracket, not the sensor.	**BMF 103-HW-42**				C-slot Festo slot-10	
	BMF 103-HW-43				T-slot e.g. Festo slot-8, Bosch, SMC	
	BMF 103-HW-85				C-slot e.g. SMC, Bimba	
	BMF 103-HW-87				C-slot e.g. Festo	





Cable clip for routing on request



Hex Key Set



BMF Hex Key

Please order accessories separately see page **5.**74

3.1
Connectors selection guide page 3.0.7 ...

5
Connectors ... page 5.2 ...

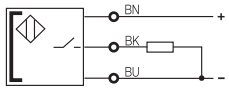
Advantages

- Can be inserted in C-slot from above,
- Proven circuitry from the BMF line: Low hysteresis, precise switching point, can be used for cylinders and grippers with strong or weak magnets
- Rugged, compact, low-profile housing
- Can be installed without mounting bracket in cylinders with C-slot e.g. Festo, SMC.

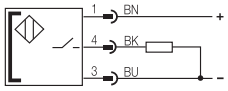
Wiring diagrams

NO

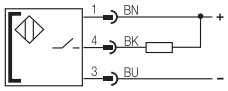
PNP/cable



PNP/connector

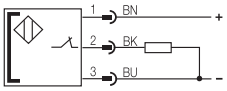


NPN/connector

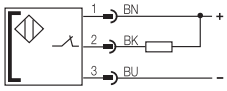


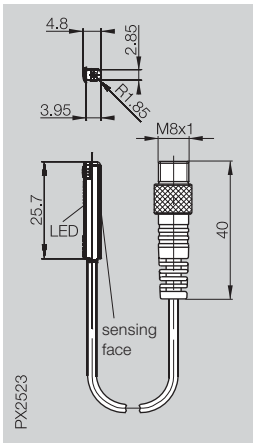
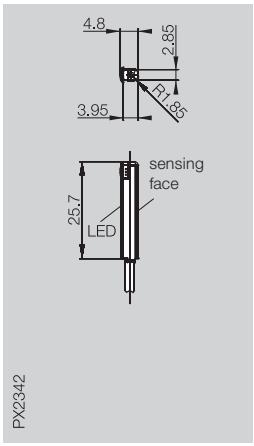
NC

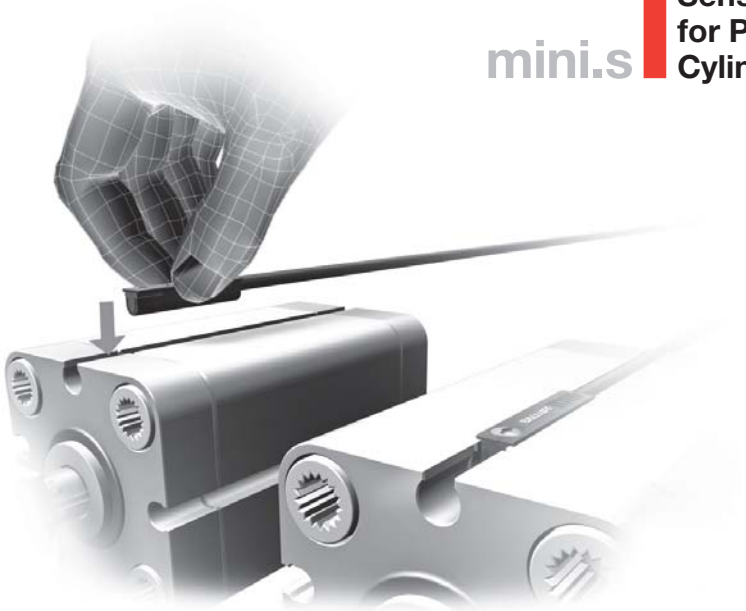
PNP/connector

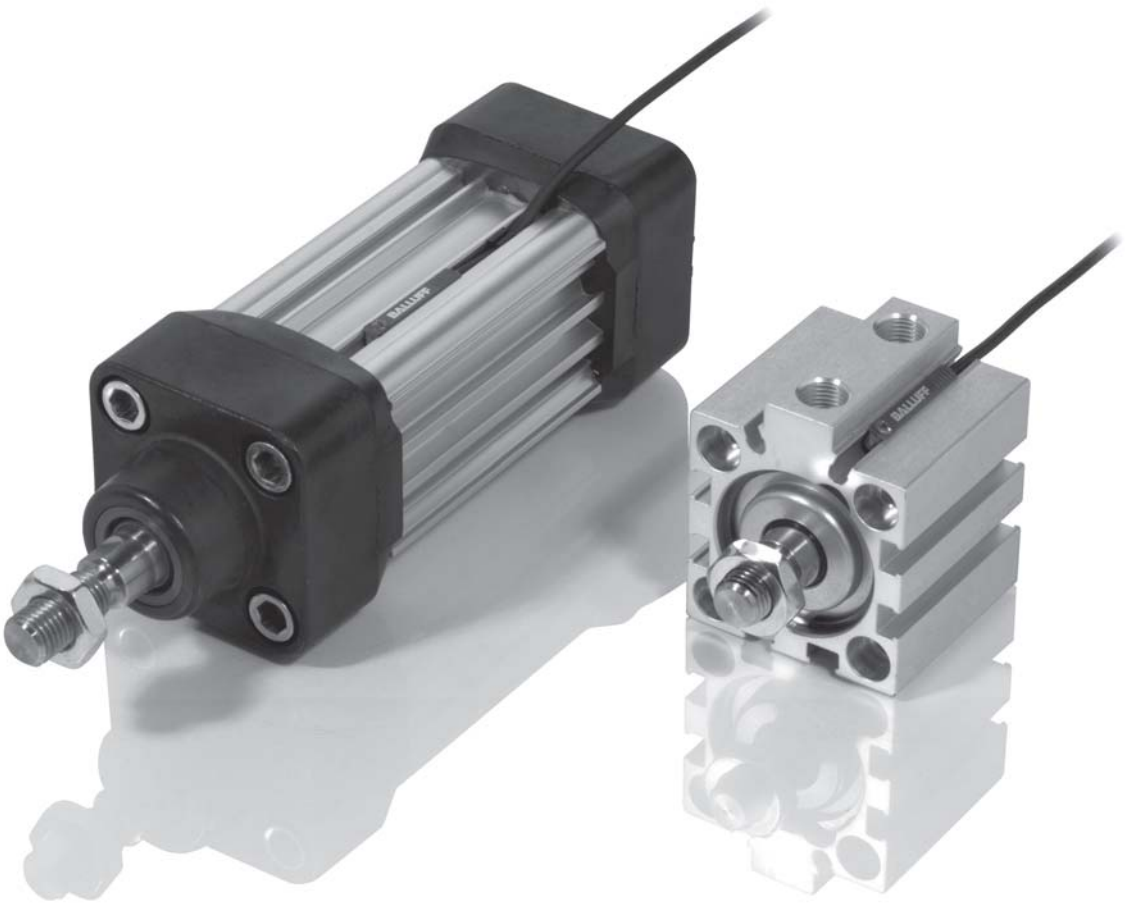


NPN/connector



Series		BMF 273	BMF 273
Type		Connector for direct connection to distribution box	
			
			
PNP	NO	BMF 273K-PS-C-2A-SA2-S49-00,3	BMF 273K-PS-C-2A-PU-02
	NC	BMF 273K-PO-C-2A-SA2-S49-00,3	
NPN	NO	BMF 273K-NS-C-2A-SA2-S49-00,3	BMF 273K-NS-C-2A-PU-02
	NC	BMF 273K-NO-C-2A-SA2-S49-00,3	
Rated operating field strength I H_n I		1.2 kA/m	1.2 kA/m
Assured operating field strength I H_a I		≥ 2 kA/m	≥ 2 kA/m
Hysteresis of I H_n I		≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I		≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.07 ms	≤ 0.07 ms
Turn-off delay		≤ 0.07 ms	≤ 0.07 ms
Supply voltage U_B		10...30 V DC	10...30 V DC
Voltage drop U_d		≤ 2.5 V	≤ 2.5 V
Rated insulation voltage U_i		75 V DC	75 V DC
Rated operational current I_e		100 mA	100 mA
No-load supply current I_0 max.		≤ 8 mA	≤ 8 mA
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–25...+70 °C	–25...+70 °C
Utilization category		DC 13	DC 13
Degree of protection per IEC 60529		IP 67	IP 67
Housing material		PBT	PBT
Connection		0.3 m PUR cable with connector	2 m PUR cable
No. of wires × cross-section			3×0.14 mm²
Approval		cULus	cULus
Recommended connector		BKS-B/S 48	
Other cable lengths on request.			







Cable clip for routing on request



Hex Key Set



BMF Hex Key

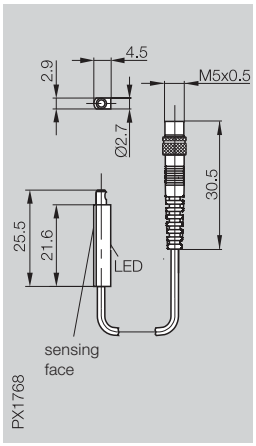
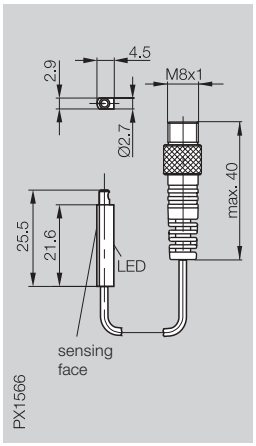
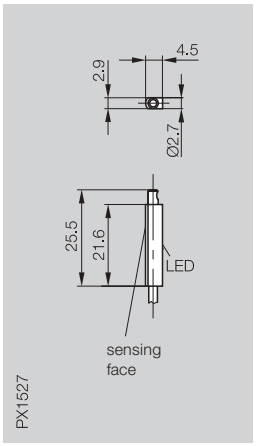
Please order accessories separately see page **5.**74

3.1
Connectors selection guide page 3.0.7 ...

5
Connectors ... page 5.2 ...

The universal sensor for position monitoring on small grippers and cylinders.
A variety of mounting brackets enables adapting to virtually every miniaturized pneumatic actuator on the market.



Series	BMF 303	BMF 303	BMF 303
Type	Connector M5×0.5 with rotatable union nut	Connector M8×1 with rotatable union nut	
			
PNP NO	BMF 303K-PS-C-2A-S26-00,3	BMF 303K-PS-C-2A-SA2-S49-00,3	BMF 303K-PS-C-2A-PU-02
PNP NC		BMF 303K-PO-C-2A-SA2-S49-00,3	BMF 303K-PO-C-2A-PU-02
NPN NO	BMF 303K-NS-C-2A-S26-00,3	BMF 303K-NS-C-2A-SA2-S49-00,3	BMF 303K-NS-C-2A-PU-02
NPN NC		BMF 303K-NO-C-2A-SA2-S49-00,3	BMF 303K-NO-C-2A-PU-02
Rated operating field strength I H_n I	1.2 kA/m	1.2 kA/m	1.2 kA/m
Assured operating field strength I H_a I	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m
Hysteresis of I H_n I	≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay	≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Turn-off delay	≤ 0.07 ms	≤ 0.07 ms	≤ 0.07 ms
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d	≤ 2 V	≤ 2 V	≤ 2 V
Rated insulation voltage U_i	75 V DC	75 V DC	75 V DC
Rated operational current I_e	100 mA	100 mA	100 mA
No-load supply current I_0 max.	≤ 5 mA	≤ 5 mA	≤ 5 mA
Polarity reversal protected	yes	yes	yes
Short circuit protected	yes	yes	yes
Ambient temperature range T_a	–25...+70 °C	–25...+70 °C	–25...+70 °C
Utilization category	DC 13	DC 13	DC 13
Degree of protection per IEC 60529	IP 67	IP 67	IP 67
Housing material	LCP	LCP	LCP
Connection	0.3 m cable (PUR) with connector	0.3 m cable (PUR) with connector	2 m Cable PUR
No. of wires × cross-section			3×0.10 mm²
Approval	cULus	cULus	cULus
Recommended connector	BKS-_ 25	BKS-_ 48	

Other cable lengths on request.

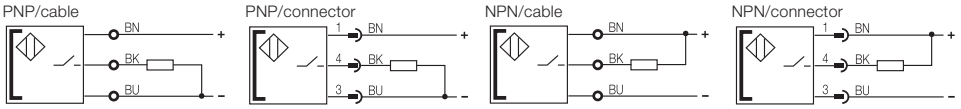




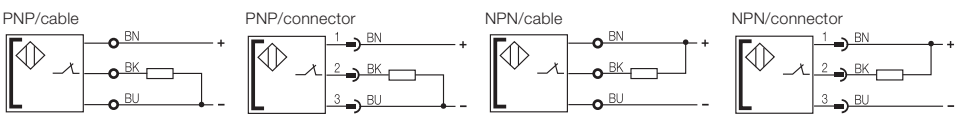


Wiring diagrams

NO



NC





Please order accessories separately see page **5.**74

Advantages

Sensor disappears in the slot!

Switchpoint can be adjusted in seconds! Turn screw one revolution, adjust position, tighten.

Switchpoint cannot be lost. Even if you replace the sensor, the adjusted switchpoint is determined by the mounting bracket, not the sensor.

BMF 303-HW-28/30

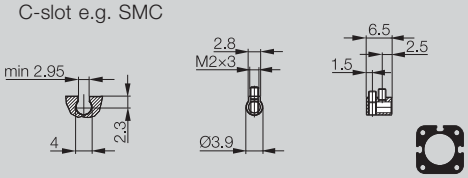
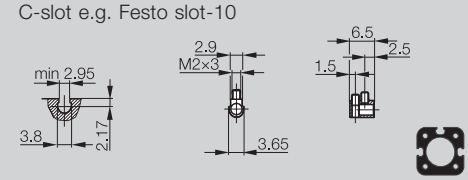
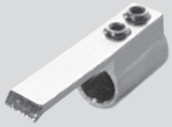
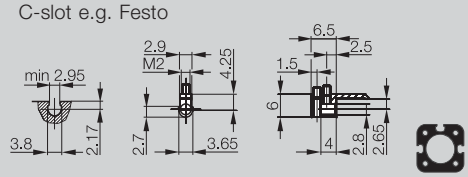
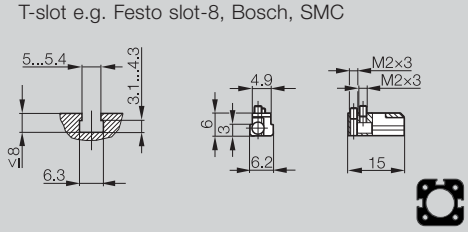
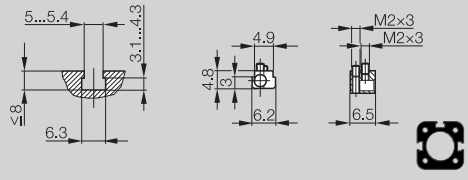
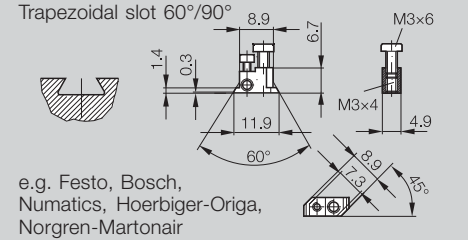
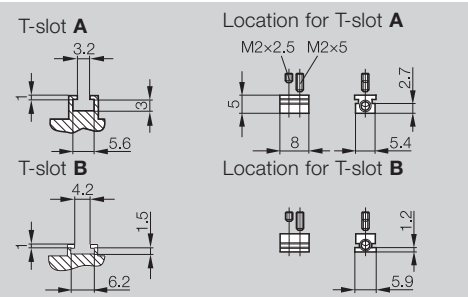
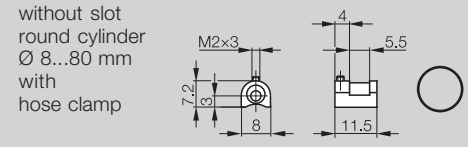
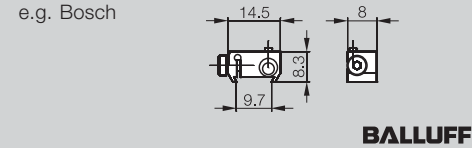


BMF 303-HW-33





For hose clamp matrix see page **3.0.**10.

Ordering code	Advantages	Cylinder type	Mounting brackets
BMF 303-HW-28 		C-slot e.g. SMC 	
BMF 303-HW-30 		C-slot e.g. Festo slot-10 	
BMF 303-HW-31 		C-slot e.g. Festo 	
BMF 303-HW-33 		T-slot e.g. Festo slot-8, Bosch, SMC 	
BMF 303-HW-40 		T-slot e.g. Festo slot-8, Bosch, SMC 	
BMF 303-HW-44 		Trapezoidal slot 60°/90° 	
BMF 303-HW-51 		T-slot **A** Location for T-slot **A** T-slot **B** Location for T-slot **B** 	
BMF 303-HW-59 		without slot round cylinder Ø 8...80 mm with hose clamp 	
BMF 303-HW-80 		e.g. Bosch 	

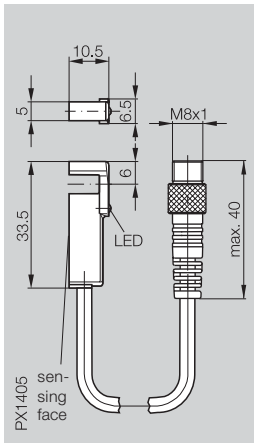
3.1 Connectors selection guide page 3.0.7 ...

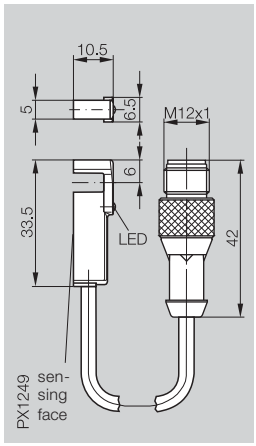
5 Connectors ... page 5.2 ...

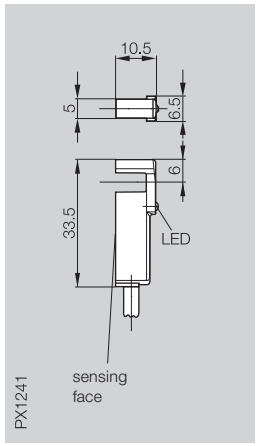
Series	**BMF 305**	**BMF 305**	**BMF 305**
Type	Connector M8×1 with rotatable union nut	Connector M12×1 with rotatable union nut	

The all-rounder for position monitoring on cylinders.





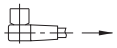




PNP	NO	BMF 305K-PS-C-2-SA2-S49-00,3	BMF 305K-PS-C-2-S4-00,2	BMF 305K-PS-C-2-PU-02
	NC	BMF 305K-PO-C-2-SA2-S49-00,3		BMF 305K-PO-C-2-PU-02
NPN	NO	BMF 305K-NS-C-2-SA2-S49-00,3		BMF 305K-NS-C-2-PU-02
	NC	BMF 305K-NO-C-2-SA2-S49-00,3		BMF 305K-NO-C-2-PU-02
Rated operating field strength I H_n I		1.2 kA/m	1.2 kA/m	1.2 kA/m
Assured operating field strength I H_a I		≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m
Hysteresis of I H_n I		≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I		≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
Turn-off delay		≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d		≤ 3.1 V	≤ 3.1 V	≤ 3.1 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.		≤ 30 mA	≤ 30 mA	≤ 30 mA
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Ambient temperature range T_a		–25...+85 °C	–25...+85 °C	–25...+85 °C
Utilization category		DC 13	DC 13	DC 13
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Housing material		LCP	LCP	LCP
Connection		0.3 m cable (PUR) with connector	0.2 m cable (PUR) with connector	2 m Cable PUR
No. of wires × cross-section				3×0.14 mm²
Approval		cULus	cULus	cULus
Recommended connector		BKS-_ 48	BKS-_ 19	

*Temperature load curve see page **3.0.**6

Other cable lengths on request.

 Connector orientation

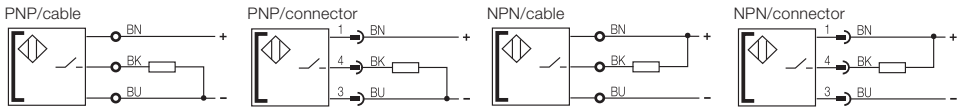




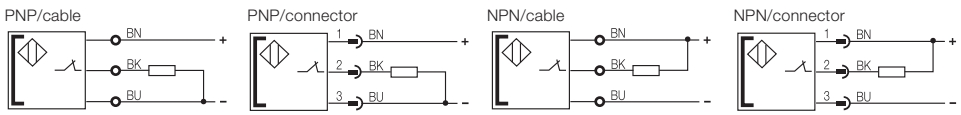


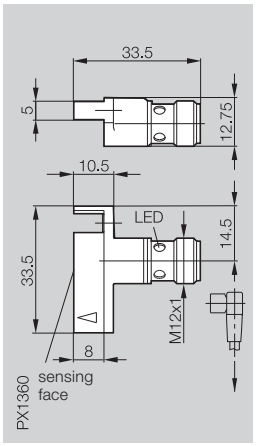
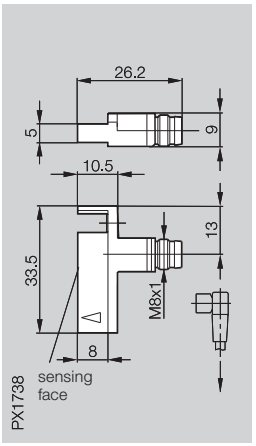
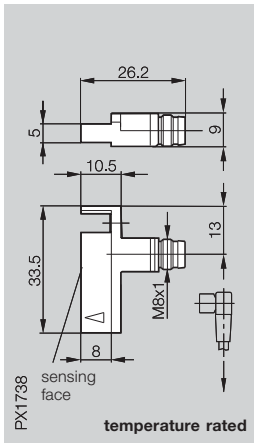
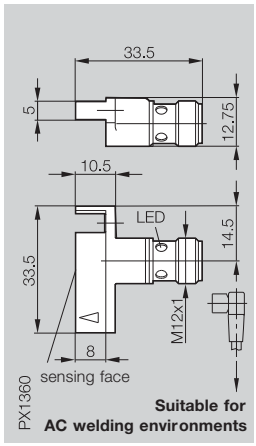
Wiring diagrams

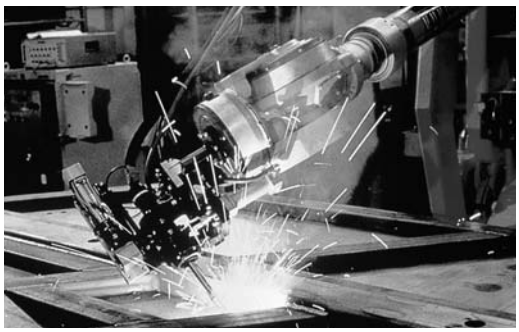
NO



NC



	BMF 305	BMF 305	BMF 305	BMF 305
				
	BMF 305M-PS-C-2-S4	BMF 305M-PS-C-2-S49	BMF 305M-PS-C-2-SA4-S49	BMF 305M-PS-**W**-2-S4
	1.2 kA/m	1.2 kA/m	1.2 kA/m	1.2 kA/m
	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m
	≤ 45 %	≤ 45 %	≤ 45 %	≤ 45 %
	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 3 %/°C	≤ 0.3 %/°C
	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 3.1 V	≤ 3.1 V	≤ 3.1 V	≤ 4 V
	75 V DC	75 V DC	75 V DC	75 V DC
	200 mA*	200 mA*	200 mA*	200 mA*
	≤ 30 mA	≤ 30 mA	≤ 30 mA	≤ 30 mA
	yes	yes	yes	yes
	yes	yes	yes	yes
	–25...+85 °C	–25...+85 °C	**–25...+105 °C**	–25...+85 °C
	DC 13	DC 13	DC 13	DC 13
	IP 67	IP 67	IP 65	IP 67
	Al	Al	Al	Al
	Connector	Connector	Connector	Connector
	cULus	cULus	cULus	cULus
	BKS-_ 19/BKS-_ 20	BKS-_ 48/BKS-_ 49	BKS-S146-00	BKS-_ 19/BKS-_ 20
				

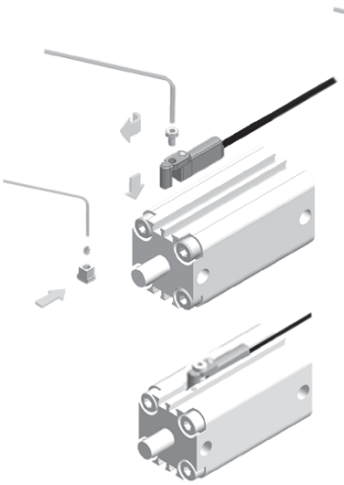


The series BMF 305M/315M/32M-..-**W**-.. is suitable for extreme conditions of use. The housings are metal, making them resistant to weld splatter. Conditions including weld currents of over 25 kA do not affect the function ability of the sensor. The output state of the sensor is stored during AC welding.

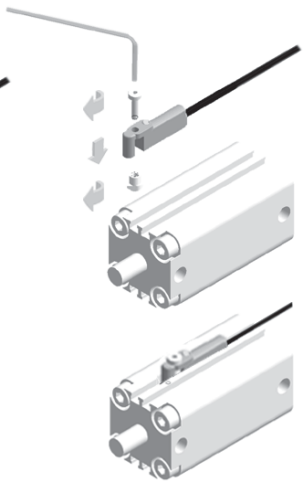
3.1 Connectors selection guide page 3.0.7 ...

5 Connectors ... page 5.2 ...

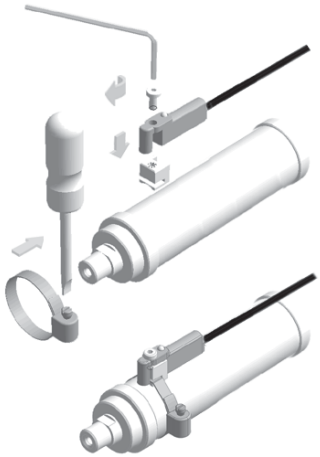
BMF 305-HW-20



BMF 305-HW-23



BMF 305-HW-24



Advantages



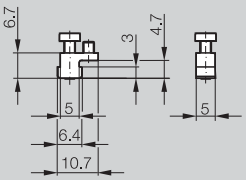
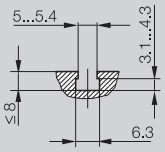
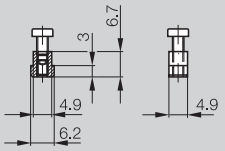
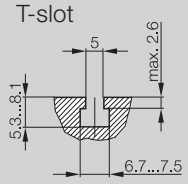
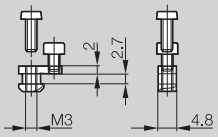
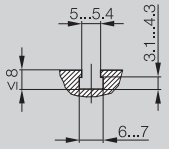
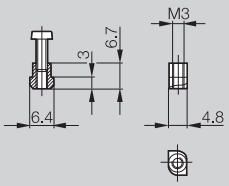
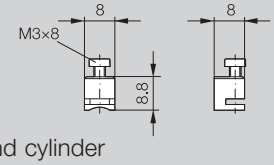
Can be inserted in slot from above. Anytime! Also afterwards! Fast! Saves time!



Switchpoint can be adjusted in seconds! Turn screw one revolution, adjust position, tighten.



Switchpoint cannot be lost. Even if you replace the sensor, the adjusted switchpoint is determined by the mounting bracket, not the sensor.

Ordering code	Advantages	Cylinder type	Mounting brackets
BMF 305-HW-17 	 	T-slot  PX1207a e.g. Festo, SMC	
BMF 305-HW-20 	 	T-slot  PX1287b e.g. Festo, SMC	
BMF 305-HW-22 	  	T-slot  PX1305 e.g. Festo, Bosch	
BMF 305-HW-23 	 	T-slot  PX1306 e.g. Festo, SMC	
BMF 305-HW-24 	 	without slot  PX1341 round cylinder with piston Ø < 8...80 mm	

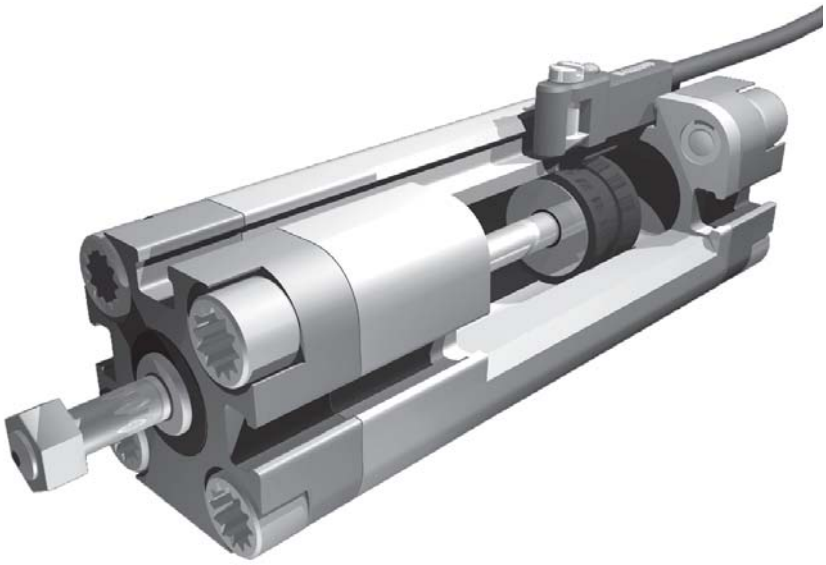


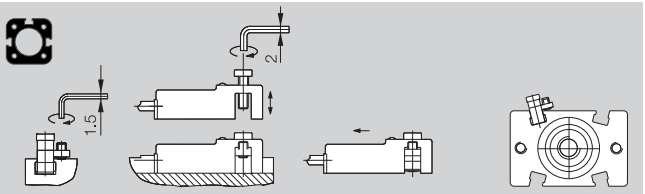
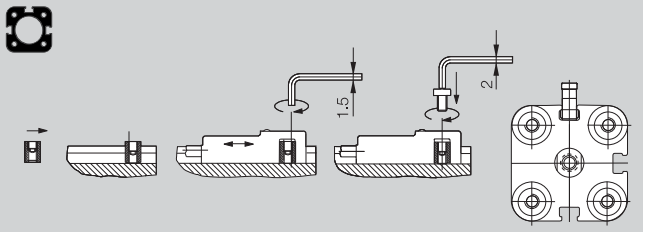
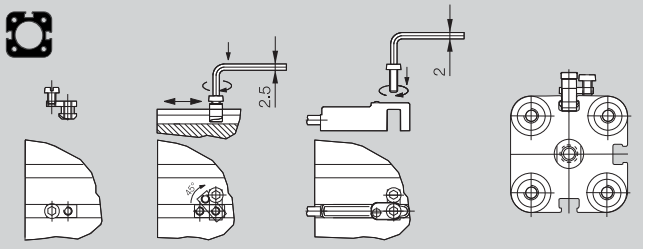
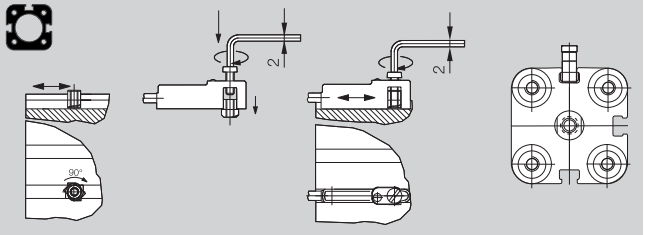
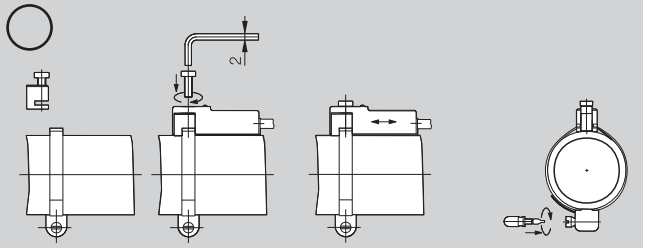
Hex Key Set



BMF Hex Key

Please order accessories separately see page **5.**74



	Installation notes	Included
	1. Insert mounting bracket in slot from front side 2. Insert sensor from above and tighten 3. Position sensor, bolt together mounting bracket	Set screw DIN 916 M3×5-A2 Screw DIN 7984 M3×10-A2 Mounting bracket
	1. Insert mounting bracket into slot from head end 2. Insert sensor from above, position and tighten mounting bracket 3. Bolt together sensor with mounting bracket	Set screw DIN 916 M3×4-A2 Screw ISO 1207 M3×6-A2 Mounting bracket also: Screw DIN 7984 M3×6-A2
	1. Insert mounting bracket from above into slot Rotate 90° 2. Insert sensor from above and tighten 3. Position sensor, bolt together mounting bracket	Screw DIN 912 M3×4-A2 Screw DIN 7984 M3×8-A2 Mounting bracket also: Screw ISO 1207 M3×4-A2 Screw ISO 1207 M3×8-A2
	1. Attach mounting bracket to sensor with 1 to 2 turns 2. Insert sensor and mounting bracket from above and tighten (mounting bracket turns also 90°)	Screw DIN 7984-KL M3×10-A2 Mounting bracket also: Screw ISO 1207-KL M3×10-A2
	1. Place tube cuff on loosely 2. Attach sensor with mounting bracket to tube cuff 3. Position and tighten	Screw DIN 7984 M3×8-A2 Mounting bracket For hose clamp matrix see page **3.0.**10 (please order separately)

3.1

5

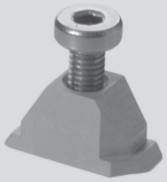
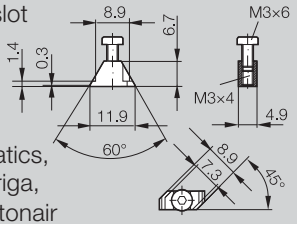
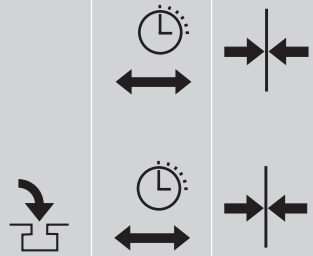
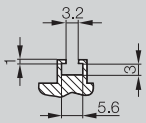
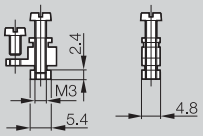
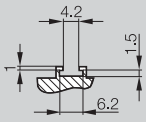
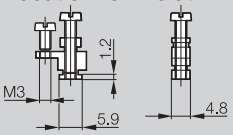
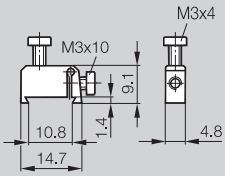
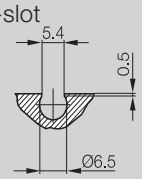
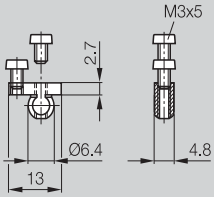
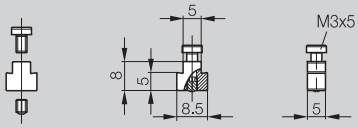
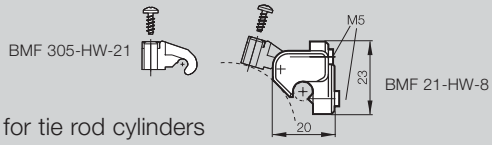
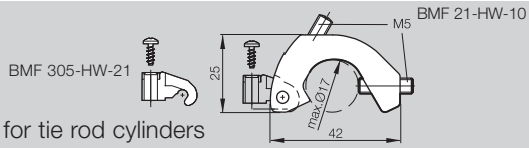
Connectors ... page 5.2 ...

Advantages

Can be installed in the slot from above.
Anytime!
Also afterwards!
Fast!
Saves time!

Switchpoint can be adjusted in seconds! Turn screw one revolution, adjust position, tighten.

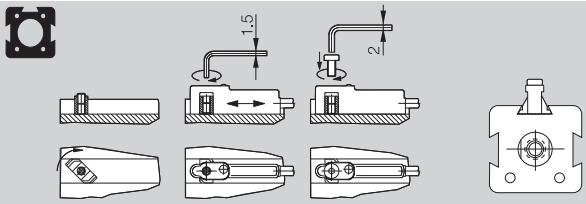
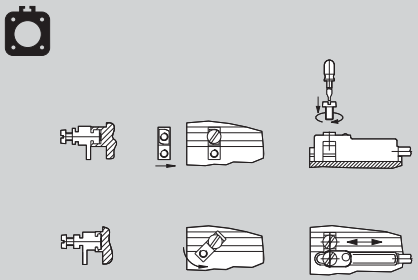
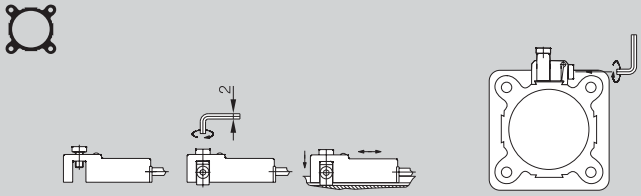
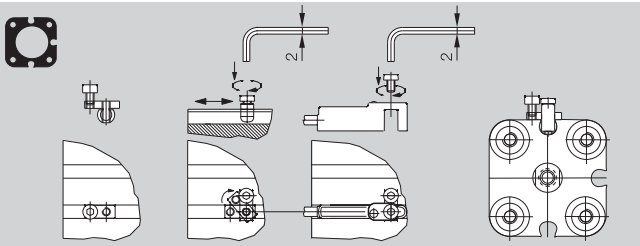
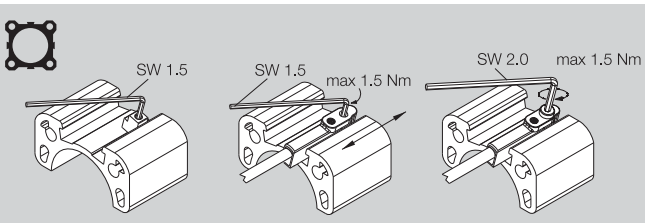
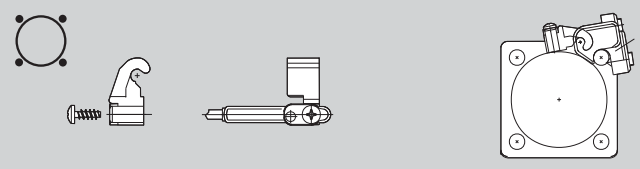
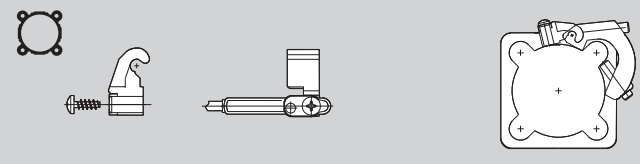
Switchpoint cannot be lost. Even if you replace the sensor, the adjusted switchpoint is determined by the mounting bracket, not the sensor.

Ordering code	Advantages	Cylinder type	Mounting brackets
BMF 305-HW-25 		Trapezoidal slot 60°/90°  e.g. Festo, Bosch, Numatics, Hoerbiger-Origa, Norgren-Martonair  PX1343	
BMF 305-HW-26 		T-slot **A**  Location for T-slot **A**  T-slot **B**  Location for T-slot **B**  e.g. SMC PX1419	
BMF 305-HW-27 		Trapezoidal guide   e.g. Bosch PX1501	
BMF 305-HW-32 		C-slot   e.g. Norgren PX1537	
BMF 305-HW-64 		 e.g. Bosch PX1900	
BMF 305-HW-21 and BMF 21-HW-8 		 for tie rod cylinders PX1302d	
BMF 305-HW-21 and BMF 21-HW-10 		 for tie rod cylinders (profile shape) PX1302c	

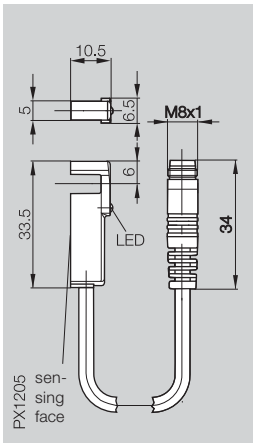
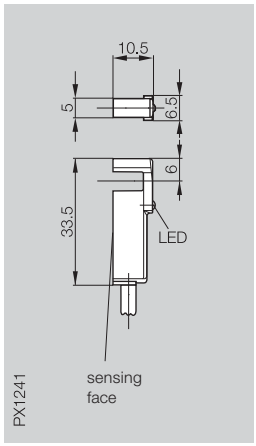
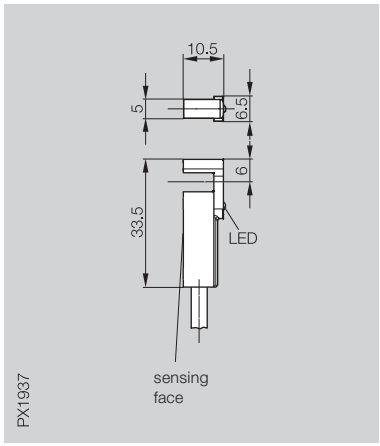

Hex Key Set


BMF Hex Key

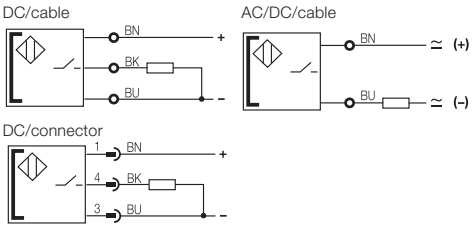
Please order accessories separately see page **5.**74

	Installation notes	Included
	1. Insert mounting bracket from above and rotate 90° 2. Insert sensor, position, tighten mounting bracket 3. Screw sensor to mounting bracket	Set screw DIN 916 M3×4-A2 Screw DIN 7984 M3×6-A2 Mounting bracket
 The mounting bracket can be used for two slot dimensions.	T-slot **A**: insert mounting bracket, insert sensor from above, position and tighten both screws. T-slot **B**: insert mounting bracket from above and rotate 90°. Insert sensor from above, position and tighten both screws.	Cheese head screw ISO 1207 M3×5 A2 Cheese head screw ISO 1207 M3×14 A2 Mounting bracket
	1. Insert mounting bracket from above 2. Insert sensor from above and tighten 3. Position sensor, tighten mounting bracket	Screw DIN 912 M3×4-A2 Screw DIN 7984 M3×10-A2 Mounting bracket
	1. Insert mounting bracket from above and rotate 90° 2. Insert sensor, position, tighten mounting bracket 3. Screw sensor to mounting bracket	Screws DIN 7984 M3×5-A2 Mounting bracket
	1. Mounting bracket in slot from above 2. Insert sensor from above, position and tighten mounting bracket 3. Bolt together sensor with mounting bracket	Cheese head screw DIN 7984 M3×5-A2, Threaded stud DIN 914 M3×4-A2 Angled screwdriver 1.5 mm blade Angled screwdriver 2.0 mm blade
	BMF 305-HW-21 used with BMF 21-HW-8 for attaching to a tie rod cylinder	PT-Screw KBL 30x8-A2 Mounting bracket BMF 305-HW-21 (Mounting bracket BMF 21-HW-8 please order separately)
	BMF 305-HW-21 used with BMF 21-HW-10 for attaching to a profile cylinder	PT-Screw KBL 30x8-A2 Mounting bracket BMF 305-HW-21 (Mounting bracket BMF 21-HW-10 please order separately)

All-rounder Reed BMF 305

Series	BMF 305	BMF 305	BMF 305
				
				
DC NO, PNP		BMF 305K-R-PS-F-3-S49-00,2	BMF 305K-R-PS-F-3-03	
AC NO / DC NO polarized				BMF 305K-R-US-L-3-03
Sensed medium		Magnetic field	Magnetic field	Magnetic field
Turn-on delay		≤ 0.7 ms	≤ 0.7 ms	≤ 0.7 ms
Turn-off delay		≤ 0.2 ms	≤ 0.2 ms	≤ 0.2 ms
Supply voltage U_B		10...30 V DC	10...30 V DC	6...240 V AC/DC
Switching capacity max. reed contact		10 W	10 W	10 W
Rated operational current I_e		500 mA	500 mA	128 mA at 24 V AC/DC 86 mA at 115 V AC/DC 43 mA at 230 V AC/DC
Minimum operating current I_m				3 mA
Polarity reversal protected		no	no	no
Short circuit protected		no	no	no
Ambient temperature range T_a		–20...+70 °C	–20...+70 °C	–20...+70 °C
Utilization category		DC 13	DC 13	AC 12/DC 12
Degree of protection per IEC 60529		IP 65	IP 65	IP 65
Housing material		LCP	LCP	LCP
Connection		0.2 m cable (PUR) with connector	3 m cable, PVC	3 m cable, PVC
No. of wires × cross-section			3×0.14 mm²	2×0.18 mm²
Approval				cULus
Recommended connector		BKS-_ 48		
				

Wiring diagrams



The **reed switches BMF 305K-R-...** have an LED for function indication and as a setup aid. The recovery diode for switching an inductive load is already integrated.
For sensing the piston position in pneumatic cylinders you can choose between electronic and mechanical cylinder switches.
Select whichever one fits your application.

We'll be glad to help you.

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

When using reed switches you should verify functionality on the pneumatic cylinder by means of pre-testing.

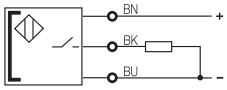
Advantages

- Non-contact, wear-free sensing of the piston position
- Desensitized to contamination
- Senses piston position through the cylinder wall
- Can be installed in T-slot cylinder without mounting bracket
  e.g. Festo: ADVU, ADN, DRQ, DGP; SMC; Bosch.

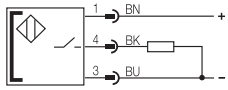
Wiring diagrams

NO

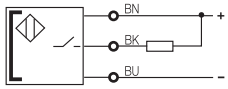
PNP/cable



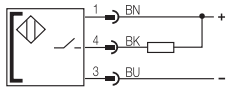
PNP/connector



NPN/cable

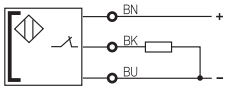


NPN/connector

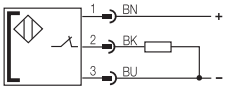


NC

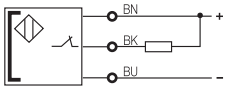
PNP/cable



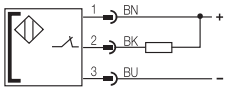
PNP/connector



NPN/cable

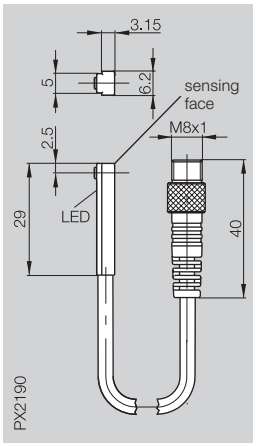


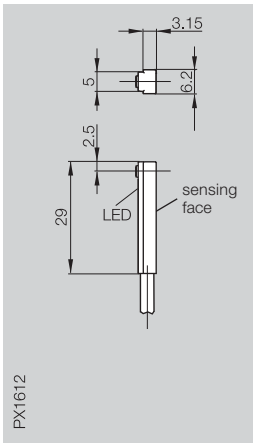
NPN/connector



Series	BMF 307	BMF 307
Type	Connector M8×1 with rotatable union nut	







PNP	NO	BMF 307K-PS-C-2-SA2-S49-00,3	BMF 307K-PS-C-2-PU-02
	NC	BMF 307K-PO-C-2-SA2-S49-00,3	BMF 307K-PO-C-2-PU-02
NPN	NO	BMF 307K-NS-C-2-SA2-S49-00,3	BMF 307K-NS-C-2-PU-02
	NC	BMF 307K-NO-C-2-SA2-S49-00,3	BMF 307K-NO-C-2-PU-02

Rated operating field strength | H_n |	1.2 kA/m	1.2 kA/m
Assured operating field strength | H_a |	≥ 2 kA/m	≥ 2 kA/m
Hysteresis of | H_n |	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of | H_n |	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay	≤ 0.05 ms	≤ 0.05 ms
Turn-off delay	≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B	10...30 V DC	10...30 V DC
Voltage drop U_d	≤ 3.1 V	≤ 3.1 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.	≤ 30 mA	≤ 30 mA
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient temperature range T_a	–25...+85 °C	–25...+85 °C
Utilization category	DC 13	DC 13
Degree of protection per IEC 60529	IP 67	IP 67
Housing material	LCP	LCP
Connection	0.3 m cable (PUR) with connector	2 m Cable PUR
No. of wires × cross-section		3×0.14 mm²
Approval	cULus	cULus
Recommended connector	BKS-_ 48	

*Temperature load curve see page **3.0.**6

Other cable lengths on request.

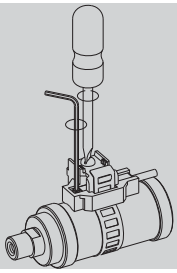




3.1
Connectors selection guide
page 3.0.7 ...

5
Connectors ...
page 5.2 ...

Mounting brackets
BMF 307-HW-73-115/
BMF 307-HW-73 -255
page **3.1.**16





Cable clip for routing on request

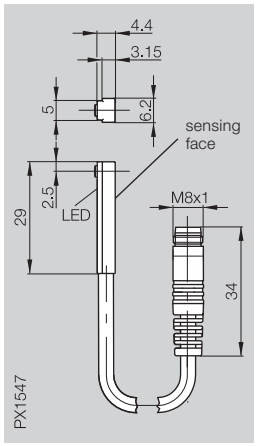
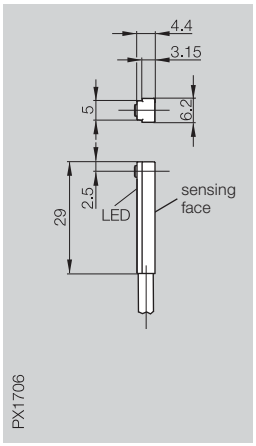
Please order accessories separately
see page **5.**74

Compact Reed BMF 307



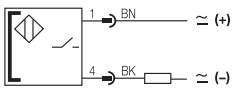
The **reed switches BMF 307K-R-...** have an LED for function indication and as a setup aid. The recovery diode for switching an inductive load is already integrated.
For sensing the piston position in pneumatic cylinders you can choose between electronic and mechanical cylinder switches.
Select whichever one fits your application.
We'll be glad to help you.

Can be installed in T-slot cylinder without mounting bracket e.g. Festo: ADVU, ADN, DRQ, DGP; SMC; Bosch.
When using reed switches you should verify functionality on the pneumatic cylinder by means of pre-testing.

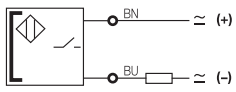
Series	BMF 307	BMF 307
		
AC NO / DC NO polarized	BMF 307K-R-AS-L-3-S49-00,2	BMF 307K-R-AS-L-3-03
Sensed medium	Magnetic field	Magnetic field
Turn-on delay	≤ 0.7 ms	≤ 0.7 ms
Turn-off delay	≤ 0.2 ms	≤ 0.2 ms
Supply voltage U_B	4...30 V AC/DC	4...30 V AC/DC
Switching capacity max. reed contact	10 W	10 W
Rated operational current I_e	128 mA at 24 V AC/DC	128 mA at 24 V AC/DC
Minimum operating current I_m	3 mA	3 mA
Polarity reversal protected	no	no
Short circuit protected	no	no
Ambient temperature range T_a	–20...+70 °C	–20...+70 °C
Utilization category	AC 12/DC 12	AC 12/DC 12
Degree of protection per IEC 60529	IP 65	IP 65
Housing material	LCP	LCP
Connection	0.2 m cable (PUR) with connector	3 m cable, PVC
No. of wires × cross-section		2×0.14 mm²
Recommended connector	BKS-_ 48	
		

Wiring diagrams

Connector example BKS-_48-1-_ _



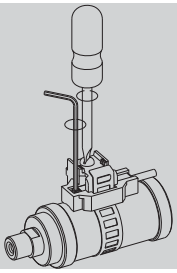
Cable

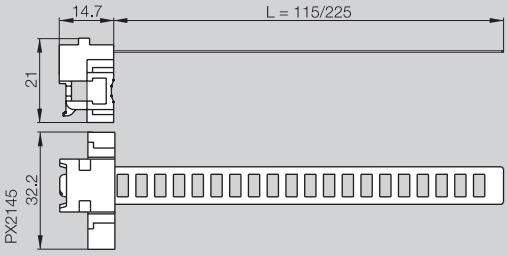


Connect to ground on controller side!

BMF 307-HW-73 -115
BMF 307-HW-73 -255
"Well saddled!
BMT T-slot sensors on round cylinders!"
Mounting brackets suitable for BMF 307 and BMF 315

Piston Ø	Mounting bracket
8...25	BMF 307-HW-73-115
25...63	BMF 307-HW-73-255





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

The T-slot has established itself over the past years as the standard for pneumatic cylinders.

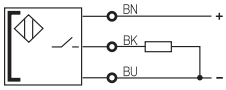
Advantages

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

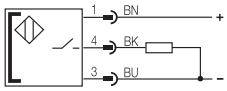
Wiring diagrams

NO

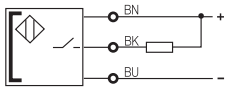
PNP/cable



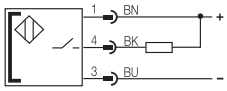
PNP/connector



NPN/cable

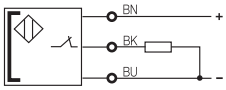


NPN/connector

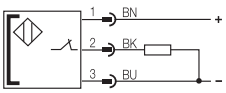


NC

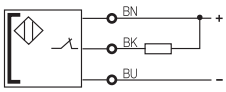
PNP/cable



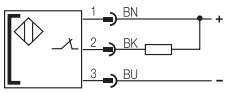
PNP/connector



NPN/cable

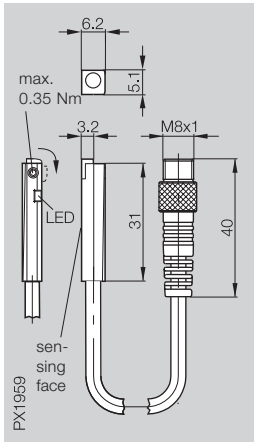


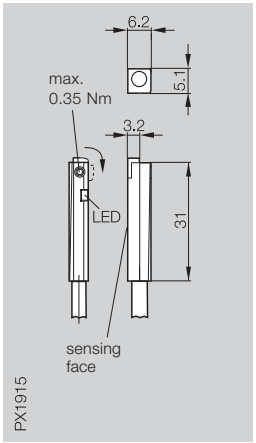
NPN/connector



Series	BMF 315K	BMF 315K
Type	Connector M8×1 with rotatable union nut	







PNP	NO	BMF 315K-PS-C-2-SA2-S49-00,2	BMF 315K-PS-C-2-PU-02
	NC	BMF 315K-PO-C-2-SA2-S49-00,2	BMF 315K-PO-C-2-PU-02
NPN	NO	BMF 315K-NS-C-2-SA2-S49-00,2	BMF 315K-NS-C-2-PU-02
	NC	BMF 315K-NO-C-2-SA2-S49-00,2	BMF 315K-NO-C-2-PU-02
Rated operating field strength I H_n I		1.2 kA/m	1.2 kA/m
Assured operating field strength I H_a I		≥ 2 kA/m	≥ 2 kA/m
Hysteresis of I H_n I		≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I		≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.05 ms	≤ 0.05 ms
Turn-off delay		≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B		10...30 V DC	10...30 V DC
Voltage drop U_d		≤ 3.1 V	≤ 3.1 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.		≤ 15 mA	≤ 15 mA
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–25...+85 °C	–25...+85 °C
Utilization category		DC 13	DC 13
Degree of protection per IEC 60529		IP 67	IP 67
Housing material		PA 66	PA 66
Connection		0.2 m cable (PUR) with connector	2 m Cable PUR
No. of wires × cross-section			3×0.14 mm²
Approval		cULus	cULus
Recommended connector		BKS-_ 48	

*Temperature load curve see page **3.0.**6

Other cable lengths on request.







Cable clip for routing on request



Hex Key Set



BMF Hex Key

Please order accessories separately see page **5.**74

3.1
Connectors selection guide page 3.0.7 ...

5
Connectors ... page 5.2 ...

BMF 307-HW-73 -115
BMF 307-HW-73 -255
Mounting brackets suitable for BMF 307 and BMF 315

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

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

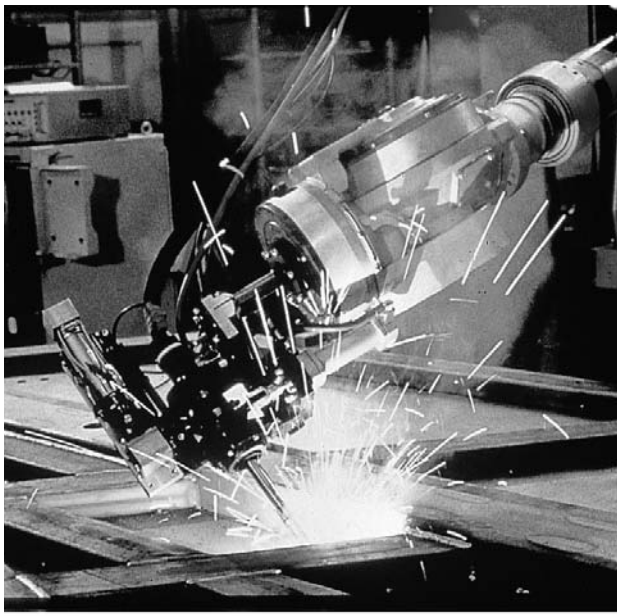
To shorten assembly time, the ability to install from above is increasingly demanded.

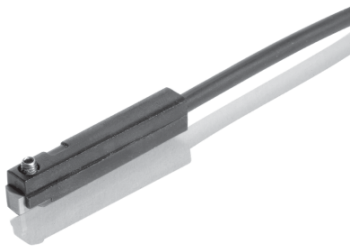
The BMF 315M meets every requirement and stands out with its reliable switching characteristics and functional reserve.

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

Advantages

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





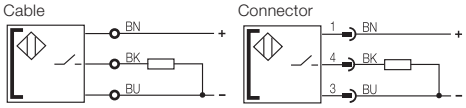
Series	
Type	
PNP	NO
Rated operating field strength I H_n I	
Assured operating field strength I H_a I	
Noise field strength max.	
Noise field frequency	
Hysteresis of I H_n I	
Temperature drift of turn-on point of I H_n I	
Turn-on delay	
Turn-off delay	
Supply voltage U_B	
Voltage drop U_d	
Rated insulation voltage U_i	
Rated operational current I_e	
No-load supply current I_0 max.	
Polarity reversal protected	
Short circuit protected	
Ambient temperature range T_a	
Utilization category	
Degree of protection per IEC 60529	
Housing material	
Connection	
No. of wires × cross-section	
Approval	
Recommended connector	

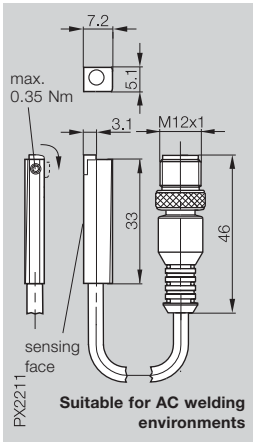
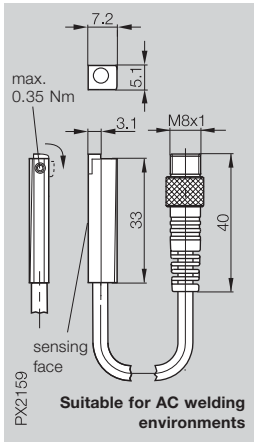
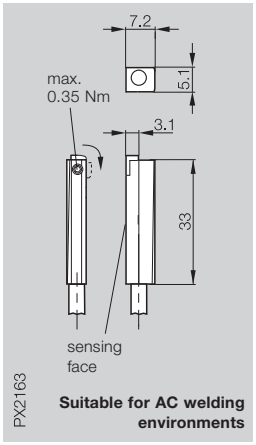
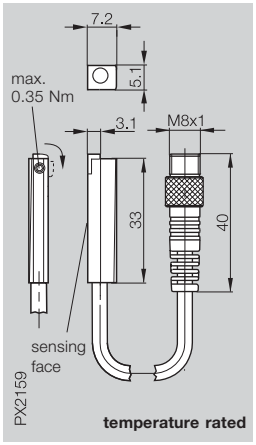
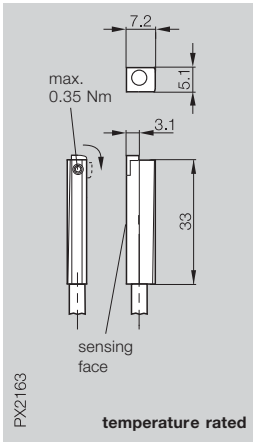
*Temperature load curve see page **3.0.**6

Other cable lengths on request.

Wiring diagrams

NO



	BMF 315M Connector M12×1 with rotatable union nut	BMF 315M Connector M8×1 with rotatable union nut	BMF 315M	BMF 315M Connector M8×1 with rotatable union nut	BMF 315M
					
	BMF 315M-PS-**W**-2-S04-00,3	BMF 315M-PS-**W**-2-S49-00,3	BMF 315M-PS-**W**-2-PU-02	BMF 315M-PS-D-2-SA3-S49-00,3	BMF 315M-PS-D-2-SA3-PU-02
	1.2 kA/m	1.2 kA/m	1.2 kA/m	1.2 kA/m	1.2 kA/m
	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m
	200 kA/m	200 kA/m	200 kA/m		
	50...60 Hz	50...60 Hz	50...60 Hz		
	≤ 45 %	≤ 45 %	≤ 45 %	≤ 45 %	≤ 45 %
	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
	≤ 50 ms	≤ 50 ms	≤ 50 ms	≤ 0.05 ms	≤ 0.05 ms
	≤ 50 ms	≤ 50 ms	≤ 50 ms	≤ 0.05 ms	≤ 0.05 ms
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 4 V	≤ 4 V	≤ 4 V	≤ 3.1 V	≤ 3.1 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*
	≤ 20 mA	≤ 20 mA	≤ 20 mA	≤ 15 mA	≤ 15 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–25...+85 °C	–25...+85 °C	–25...+85 °C	**–25...+105 °C**	**–25...+105 °C**
	DC 13	DC 13	DC 13	DC 13	DC 13
	IP 67	IP 67	IP 67	IP 67	IP 67
	Al	Al	Al	Al	Al
	0.3 m cable (PUR) with connector	0.3 m cable (PUR) with connector	2 m Cable PUR	0.3 m cable (PUR) with connector	2 m Cable PUR
			3×0.1 mm²		3×0.1 mm²
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 19	BKS-_ 48		BKS-_ 48	
					



Cable clip for routing on request



Hex Key Set

BMF Hex Key

Please order accessories separately see page **5.**74

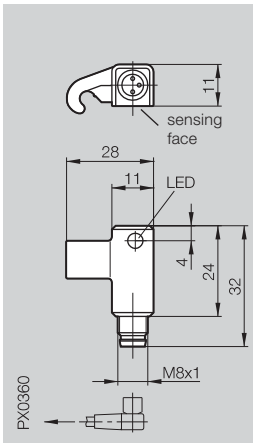
3.1
Connectors selection guide page 3.0.7 ...

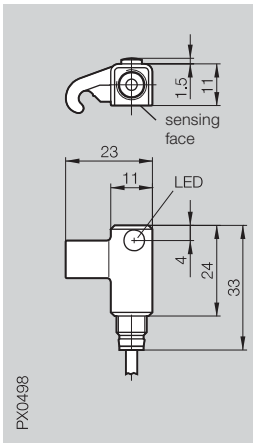
5
Connectors ... page 5.2 ...

BMF 21 are the classics for cylinders with tie rod, DUO rail, round cylinders and profile cylinders.

Reliable,
tough,
universal..

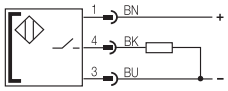




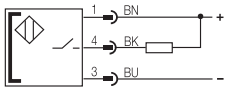


Wiring diagrams

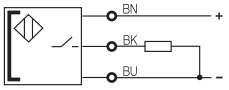
PNP/connector



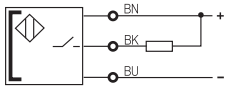
NPN/connector



PNP/cable



NPN/cable

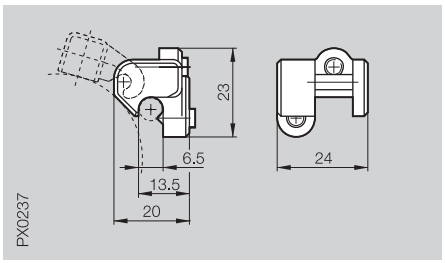


Series		BMF 21	BMF 21
PNP	NO	BMF 21K-PS-C-2-S49	BMF 21K-PS-C-2-PU-02
NPN	NO	BMF 21K-NS-C-2-S49	BMF 21K-NS-C-2-PU-02
Rated operating field strength I H_n I		1.2 kA/m	1.2 kA/m
Assured operating field strength I H_a I		≥ 2 kA/m	≥ 2 kA/m
Hysteresis of I H_n I		≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I		≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.05 ms	≤ 0.05 ms
Turn-off delay		≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B		10...30 V DC	10...30 V DC
Voltage drop U_d		≤ 3.1 V	≤ 3.1 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.		≤ 30 mA	≤ 30 mA
Polarity reversal protected		yes	yes
Short circuit protected		yes	yes
Ambient temperature range T_a		–25...+85 °C	–25...+85 °C
Utilization category		DC 13	DC 13
Degree of protection per IEC 60529		IP 67	IP 67
Housing material		PBT (fiberglass reinforced)	PBT (fiberglass reinforced)
Connection		Connector	2 m Cable PUR
No. of wires × cross-section			3×0.14 mm²
Approval		cULus	
Recommended connector		BKS-_ 48/BKS-_ 49	

*Temperature load curve see page **3.0.**6

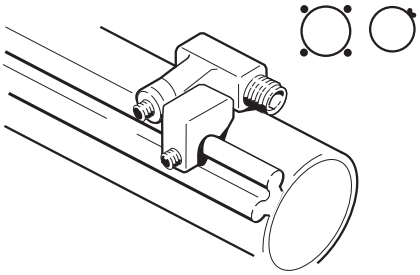
Other cable lengths on request.

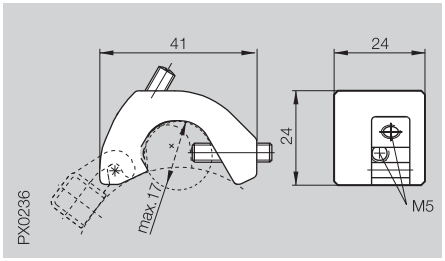
Connector orientation



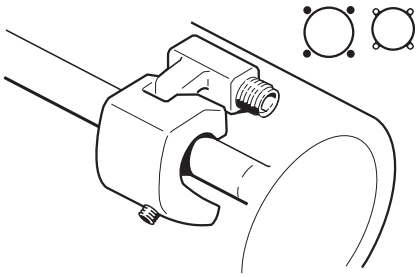
BMF 21-HW-8
for pneumatic cylinders with tie rod;
piston diameter any
tie rod diameter up to 6.5 mm

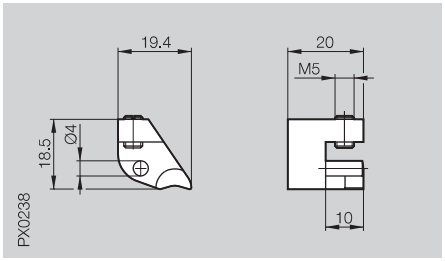
Pneumatic cylinders with DUO rail (Festo), piston diameter any



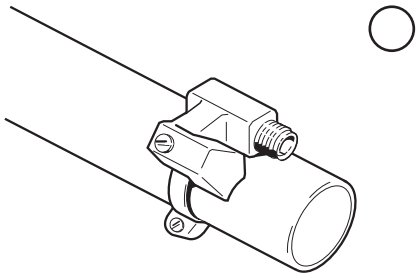


BMF 21-HW-10/BMF 21-HW-10-E
for pneumatic cylinders with tie rod;
piston diameter any Tie rod diameter to 17 mm for pneumatic cylinders with integrated tie rod (Profile)
Any piston diameter
Profile width up to 17 mm
BMF 21-HW-10-E:
Stainless steel 1.4305





BMF 21-HW-11
for pneumatic cylinders without tie rod/rail
Piston diameter 8...80 mm
Mounting bracket only usable with tube cuffs.





For hose clamp matrix
see page **3.0.**10.



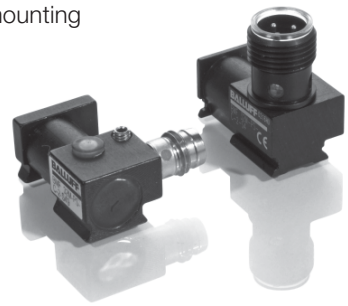
Hex Key Set

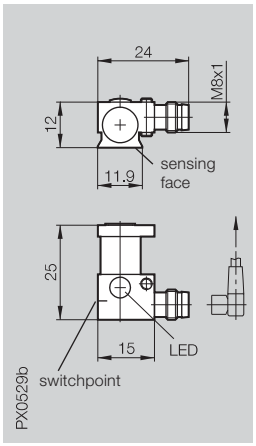
BMF Hex Key

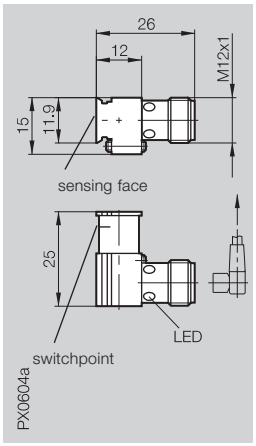
Please order accessories separately see page **5.**74

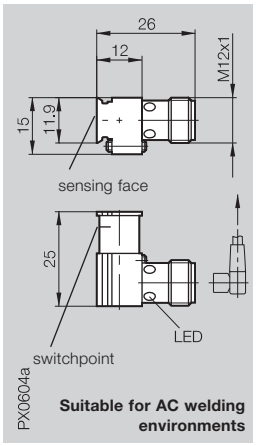
Series	BMF 32	BMF 32	BMF 32

BMF 32 – the specialist for round cylinders as well as cylinders with trapezoidal slot. Also for universal use with many cylinder types using suitable mounting brackets.









PNP	NO	BMF 32M-PS-C-2-S49	BMF 32M-PS-C-2-S4	BMF 32M-PS-**W**-2-S4
NPN	NO	BMF 32M-NS-C-2-S49	BMF 32M-NS-C-2-S4	
Rated operating field strength I H_n I		1.2 kA/m	1.2 kA/m	1.2 kA/m
Assured operating field strength I H_a I		≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m
Hysteresis of I H_n I		≤ 45 %	≤ 45 %	≤ 45 %
Temperature drift of turn-on point of I H_n I		≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
Turn-on delay		≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
Turn-off delay		≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
Supply voltage U_B		10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop U_d		≤ 3.1 V	≤ 3.1 V	≤ 4 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.		≤ 30 mA	≤ 30 mA	≤ 30 mA
Polarity reversal protected		yes	yes	yes
Short circuit protected		yes	yes	yes
Ambient temperature range T_a		–25...+85 °C	–25...+85 °C	–25...+85 °C
Utilization category		DC 13	DC 13	DC 13
Degree of protection per IEC 60529		IP 67	IP 67	IP 67
Housing material		Al	Al	Al
Connection		Connector	Connector	Connector
Approval		cULus	cULus	cULus
Recommended connector		BKS-_ 48/BKS-_ 49	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20

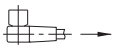
*Temperature load curve see page **3.0.**6

without mounting bracket

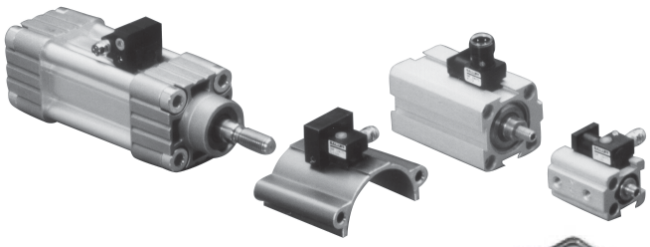


Cylinder with T-slot/ Trapezoidal slot

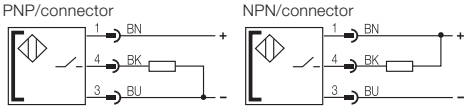
without mounting bracket for installation in cylinders with 60°- or 90°-trapezoidal slot e.g. Festo, Bosch, Martonair



Connector orientation



Wiring diagrams





The series BMF 305M/315M/32M-..-**W**-.. is suitable for extreme conditions of use. The housings are metal, making them resistant to weld splatter. Conditions including weld currents of over 25 kA do not affect the function ability of the sensor. The output state of the sensor is stored during AC welding.

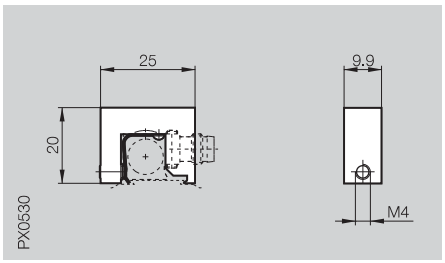


Hex Key Set

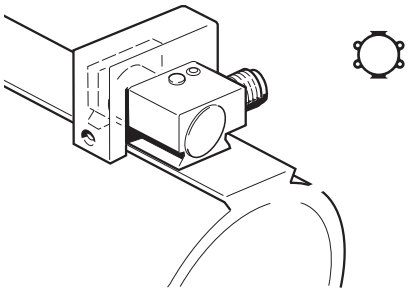


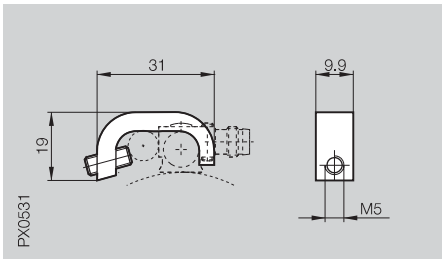
BMF Hex Key

Please order accessories separately see page **5.**74

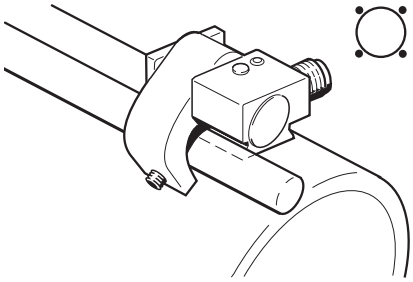


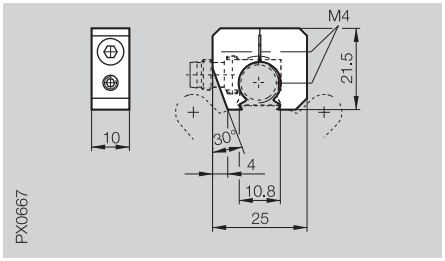
BMF 32-HW-12
for pneumatic cylinders with trapezoidal rail (Bosch Rexroth) any piston diameter



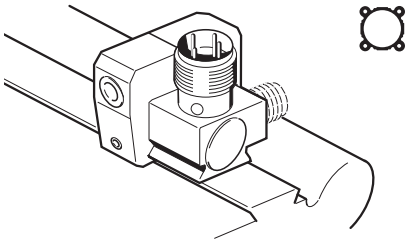


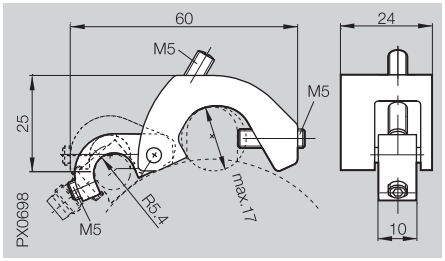
BMF 32-HW-13
for pneumatic cylinders with tie rod, any piston diameter
tie rod diameter max. 11 mm



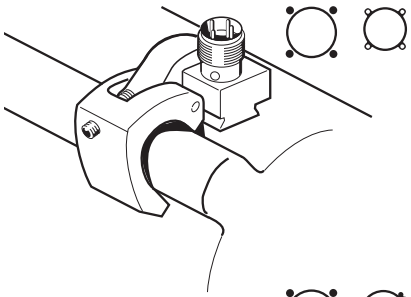


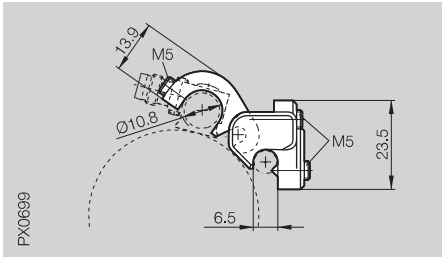
BMF 32-HW-14
for pneumatic cylinders with trapezoidal rail (Bosch) Typ:
0 822 350/351/352/353/354/355
any piston diameter





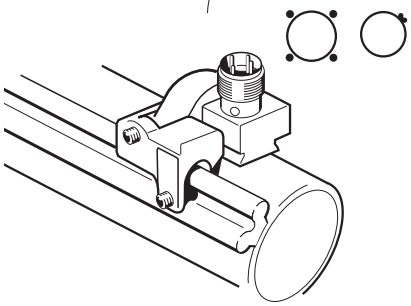
BMF 32-HW-15
for pneumatic cylinders with tie rod, any piston diameter
tie rod diameter up to 17 mm
for pneumatic cylinders with tie rod integrated in housing
any piston diameter
profile width up to 17 mm

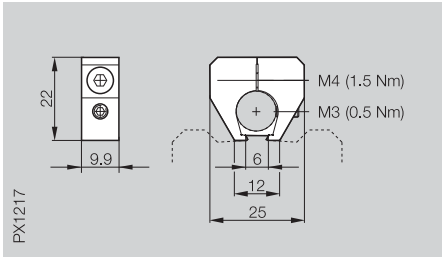




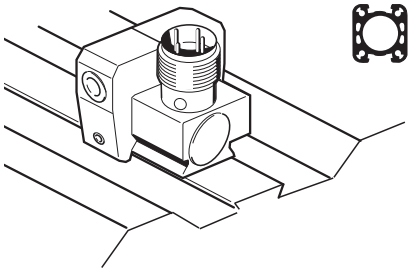
BMF 32-HW-16
for pneumatic cylinders with tie rod, any piston diameter
tie rod diameter up to 6.5 mm

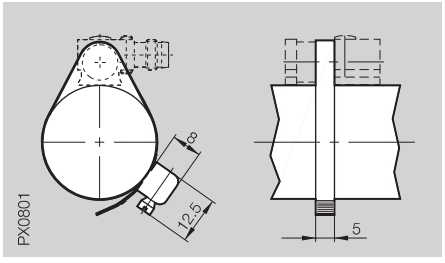
Pneumatic cylinders with DUO rail (Festo), piston diameter any





BMF 32-HW-18
for pneumatic cylinders with trapezoidal rail Bosch Rexroth Series 2700

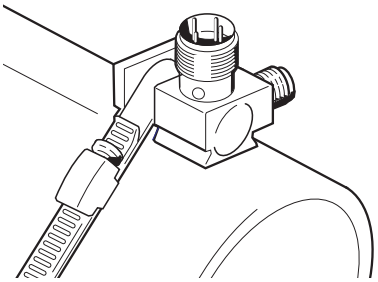




BMF hose clamp size 0...8
stainless steel for pneumatic cylinders without tie rod/rail piston diameter up to 80 mm



For hose clamp matrix see page **3.0.**10.



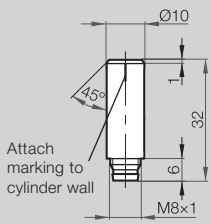
3.1
Connectors selection guide
page 3.0.7 ...

5
Connectors ...
page 5.2 ...

BMF 10E – developed for the stricter demands of the foods industry.
Extremely tough thanks to single-part stainless steel housing.

Series	**BMF 10E**
Housing size	Ø 10 mm



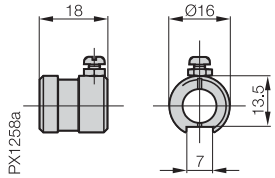


stainless steel

PNP NO	BMF 10E-PS-D-2-SA1-S49
Rated operating field strength I H_n I	1.2 kA/m
Assured operating field strength I H_a I	≥ 2 kA/m
Hysteresis of I H_n I	≤ 45 %
Temperature drift of turn-on point of I H_n I	≤ 0.3 %/°C
Turn-on delay	≤ 0.05 ms
Turn-off delay	≤ 0.05 ms
Supply voltage U_B	10...30 V DC
Voltage drop U_d	≤ 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.	≤ 12 mA
Polarity reversal protected	yes
Short circuit protected	yes
Ambient temperature range T_a	–40...+85 °C
Utilization category	DC 13
Degree of protection per IEC 60529	IP 67
Housing material	**Stainless steel 1.4571**
Connection	Connector
Recommended connector	BKS-_ 48/BKS-_ 49

*Temperature load curve see page **3.0.**6

Mounting bracket
BMF 10E-HW-19
Stainless steel 1.4571
(please order separately)



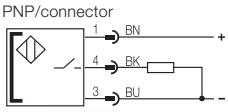
Usable only with hose clamp
(please order separately)



For hose clamp matrix see page **3.0.**10.

Wiring diagram

PNP/connector



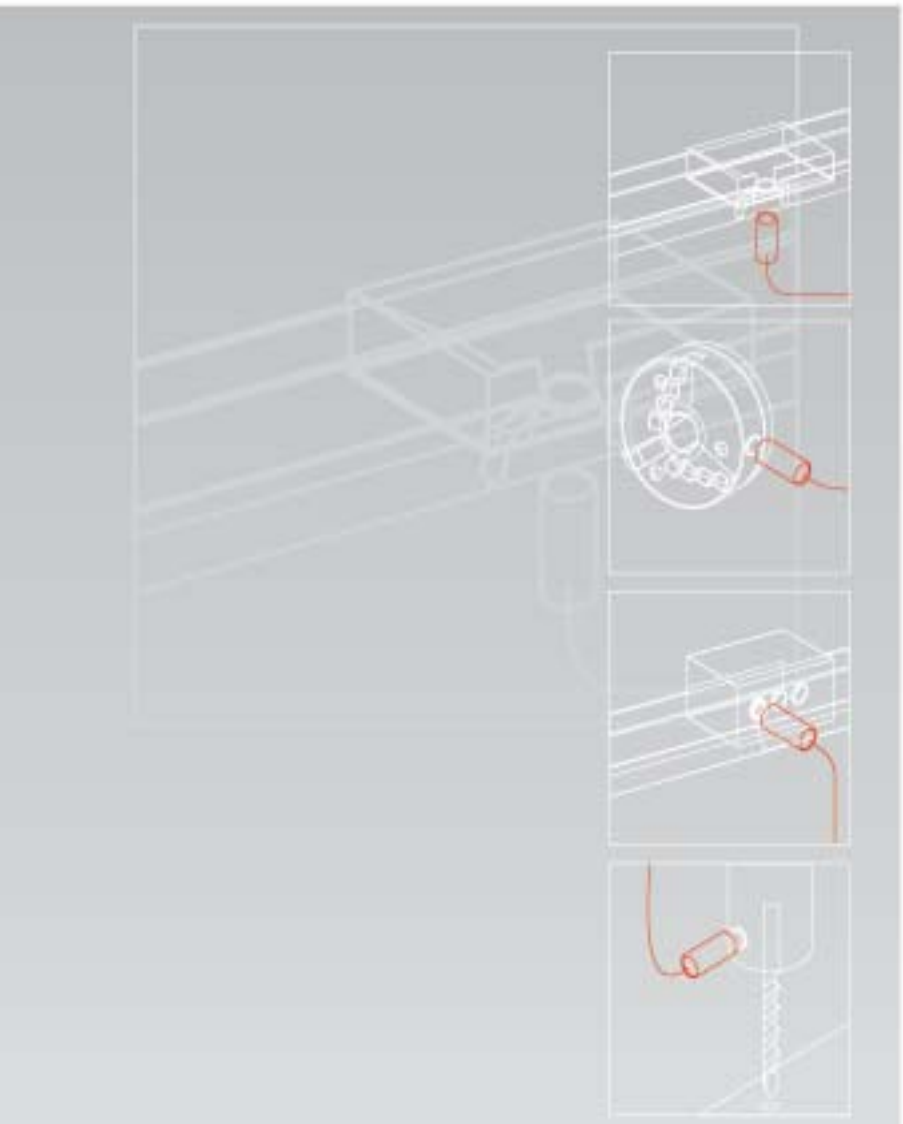




Hex Key Set

BMF Hex Key

Please order accessories separately see page **5.**74



Magnetic Field Sensors

Magnetic field sensors are used mainly for position sensing, even through walls of non-magnetizable materials (aluminum, brass and non-magnetic stainless steels). Very long switching distances in a small package can be achieved through proper selection of the magnets.

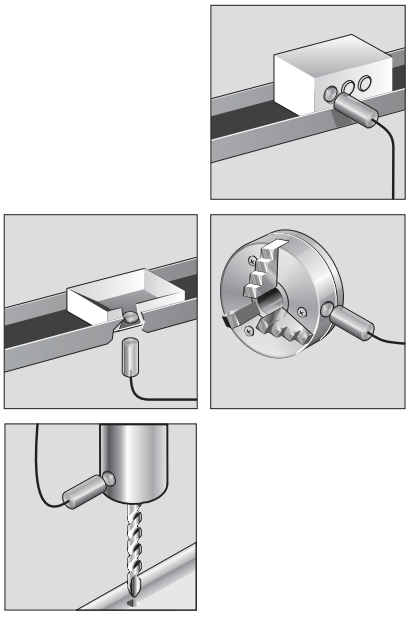
3.2.2 BMF 07M (∅ 6.5 mm), BMF 08M (M8), BMF 12M (M12)





Magnetic field sensors in the classic tubular housings of an inductive sensor offer several application advantages.

- Significantly longer switching distances compared with inductive sensors of the same size
- Senses through alloy or aluminum walls with no switching distance reduction
- Front or side actuation possible
- Magnet can be flush mounted in steel
- Responds to north or south pole
- Solid state, wear-free
- Insensitive to vibration
- Output protected against inductive spikes

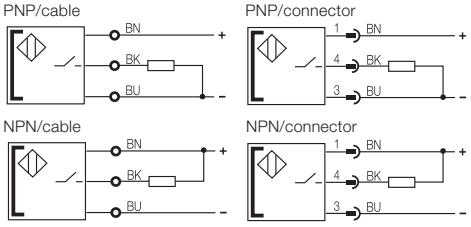


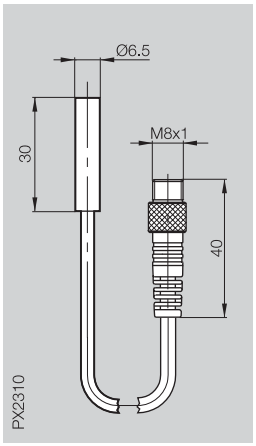
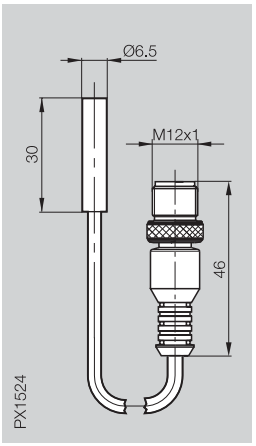
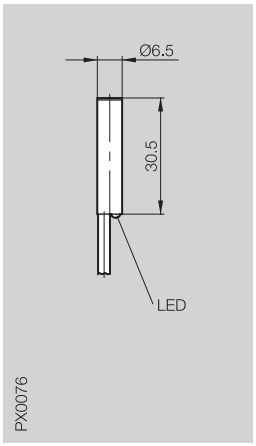
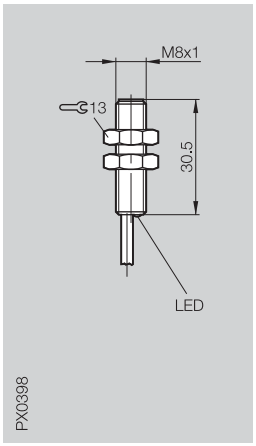
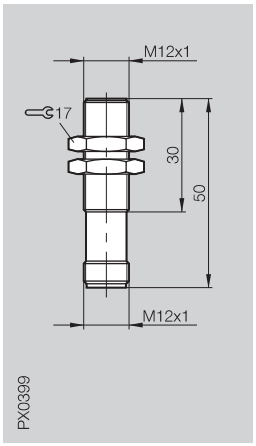
Series		
Type		
PNP	NO	
NPN	NO	
Rated operating field strength I H_n I		
Assured operating field strength I H_a I		
Hysteresis of I H_n I		
Temperature drift of turn-on point of I H_n I		
Turn-on delay		
Turn-off delay		
Supply voltage U_B		
Voltage drop U_d		
Rated insulation voltage U_i		
Rated operational current I_e		
No-load supply current I_0 max.		
Polarity reversal protected		
Short circuit protected		
Ambient temperature range T_a		
Utilization category		
Degree of protection per IEC 60529		
Housing material		
Connection		
No. of wires × cross-section		
Approval		
Recommended connector		

*Temperature load curve see page **3.0.**6

Other cable lengths on request.

Wiring diagrams



	BMF 07M Connector M8×1 with rotatable union nut	BMF 07M Connector M12×1 with rotatable union nut	BMF 07M	BMF 08M	BMF 12M
					
	BMF 07M-PS-D-2-SA2-S49-00,3	BMF 07M-PS-D-2-S4-00,6	BMF 07M-PS-C-2-KPU -02	BMF 08M-PS-C-2-KPU -02	BMF 12M-PS-D-2-S4
	BMF 07M-NS-D-2-SA2-S49-00,3		BMF 07M-NS-C-2-KPU -02	BMF 08M-NS-C-2-KPU -02	BMF 12M-NS-D-2-S4
	1.2 kA/m	1.2 kA/m	1.2 kA/m	1.2 kA/m	1.2 kA/m
	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m	≥ 2 kA/m
	≤ 45 %	≤ 45 %	≤ 45 %	≤ 45 %	≤ 45 %
	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C	≤ 0.3 %/°C
	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms	≤ 0.05 ms
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	≤ 3.1 V	≤ 3.1 V	≤ 3.1 V	≤ 3.1 V	≤ 3.1 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*
	≤ 30 mA	≤ 30 mA	≤ 30 mA	≤ 30 mA	≤ 30 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	–25...+85 °C	–25...+85 °C	–25...+85 °C	–25...+85 °C	–25...+85 °C
	DC 13	DC 13	DC 13	DC 13	DC 13
	IP 67	IP 67	IP 67	IP 67	IP 67
	CuZn coated	CuZn coated	CuZn coated	CuZn coated	CuZn coated
	0.3 m cable (PUR) with connector	0.6 m cable (PUR) with connector	2 m Cable PUR	2 m Cable PUR	Connector
			3×0.14 mm²	3×0.14 mm²	
	cULus	cULus	cULus	cULus	cULus
	BKS-_ 48	BKS-_ 19			BKS-_ 19/BKS-_ 20

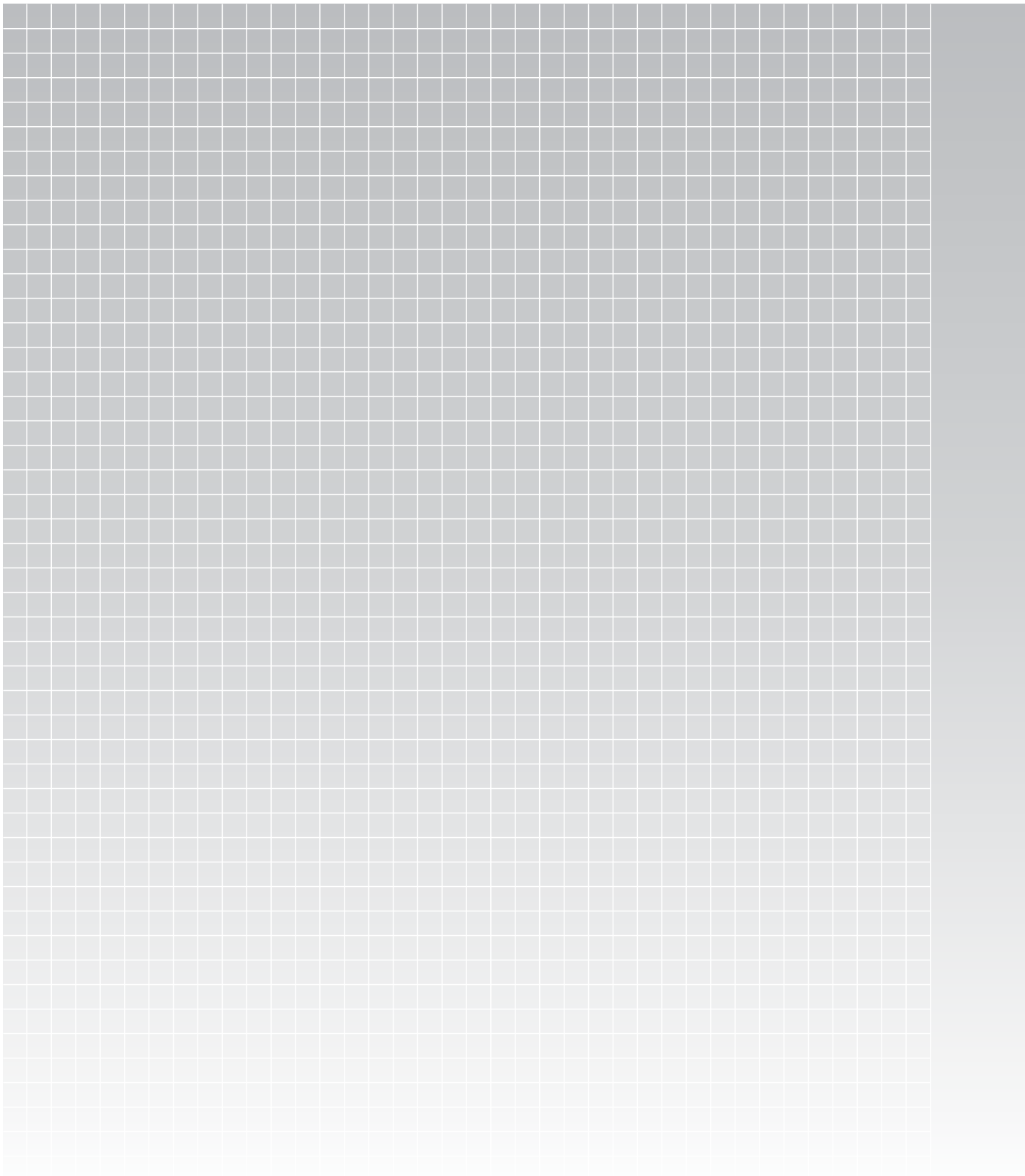
Operating distance magnet sensor

Magnet type	Samarium cobalt	Hard ferrite	Strontium ferrite
			
Ordering code	620260	620961	709084
Housing size	16×12 mm	Ø 10 mm	Ø 4 mm
Height	3 mm	10 mm	5 mm
Assured operating distance s_a	28 mm	15 mm	5 mm
Hysteresis	8 mm	2 mm	2 mm

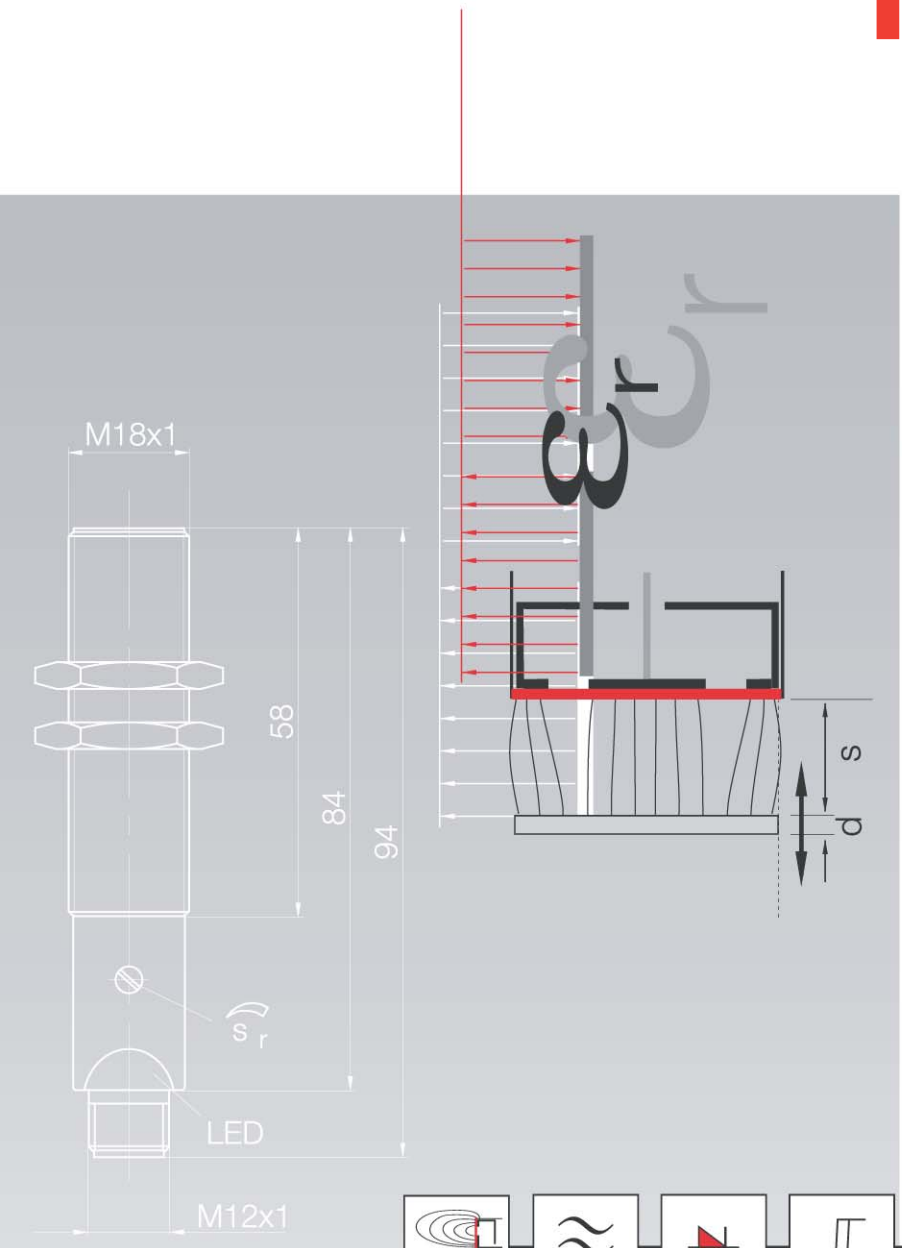
Assured switching is given from 0 mm to the operating distance indicated in the table. The given switching distances are determined from series measurements and should be considered a starting point for selecting a suitable magnet.

3.2

5
Connectors, holders ...
page 5.2 ...

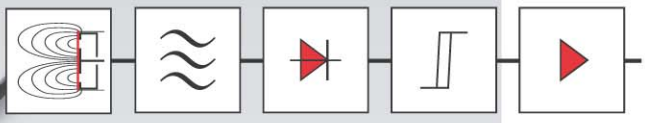


Capacitive Sensors

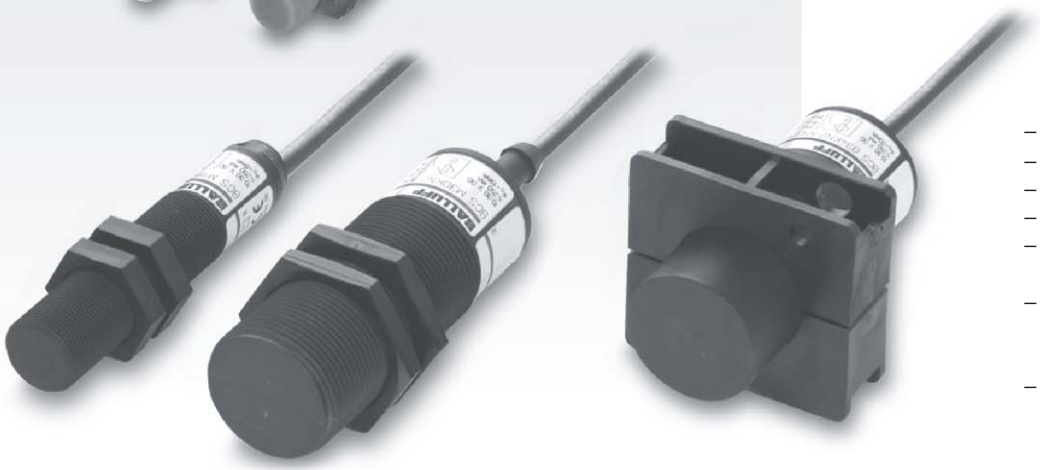


Capacitive sensors detect the change in capacitance caused by the approach of an object. Their advantage lies in the ability to detect virtually any material, from metals to oils.

4.2 Principles, Definitions
4.4 Installation
4.5 Conductance values, function areas
4.6 Applications
4.8 DC M8, ∅ 10 mm, M12
4.9 DC M12, M18
4.10 DC M30
4.11 DC M34
4.12 AC/DC M18, M30, ∅ 34 mm
4.13 DC Block style housings
4.14 Dynamic function diagnostics
4.15 DC ∅ 20 mm
4.16 DC M12 with sensor amplifier







- Non-contacting
- Wear-free
- Non-interfering
- LED function indicator
- Detects virtually any material
- Detects objects through many other non-metallic materials
- Detects aqueous media

4

A capacitor

... in its traditional form consists of two electrode plates and a dielectric, with a non- or poorly conducting medium in between. **Capacitance C** = ε **(A/d)** is determined by **surface A**, **distance d**, and the **dielectric constant ε = (ε₀ × εᵣ).**

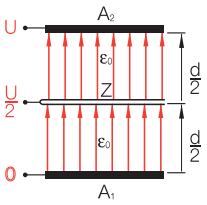
ε describes the dielectric constant of this medium.

ε₀ is the absolute dielectric constant of the empty space (vacuum).

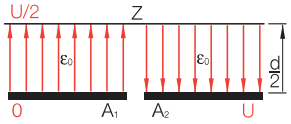
εᵣ is the dielectric number, a (density dependent) material constant.

The sensor electrode

... and its effect can be explained using a step-by-step derivation of its geometric shape. The stray fields at the edges of the plates can be ignored for these purposes.
In the middle, between the two circular capacitor plates A_1 and A_2 at distance d/2,

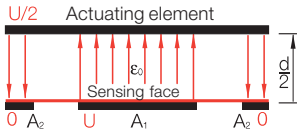


is an additional, highly conducting, folded "intermediary electrode" Z having thickness D → 0.
A voltage applied generates an electrical field between A_1 and A_2. This impresses voltage U/2 in electrode Z. The "intermediate electrode" thereby assumes the function of an additional capacitor plate. This has the effect of changing the capacitor into two geometrically and electrically series-connected capacitors. If these partial capacitors are unfolded, plates A_1 and A_2 lie next to each other in a plane and the "intermediate" electrode in a second plane at distance d/2.
This results in an "open" capacitor. The fields in the capacitor halves run in opposite directions.



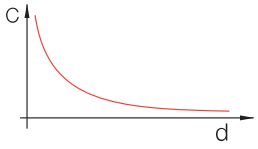
In capacitive sensors

... this „open" capacitor is used as a sensor element. The plate A_2, however, is configured as a ring electrode (housing) concentric to A_1 in order to make the electrical field symmetrical, and the „intermediate electrode" is the „actuation element". The „sensing face" of this sensor element corresponds to ring electrode A_2.



The formula for capacitance remains – with the above defined premises – valid even for this capacitor geometry.

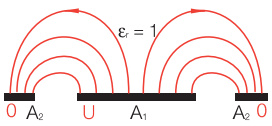
Capacitance C as a function of the distance still decreases hyperbolically (as 1/d).



Non-conducting materials

... (Plastics, glass as well as liquids) can be detected by capacitive sensors, if ε_ρ is significantly greater than ε_0;
The preceding is based on the fact that for the lines of field, the path of least resistance leads across the actuation element. If the actuation element (d → ∞; ε_r = 1, C → 0) is absent, they run in an arc from the middle to the ring electrode.The path of least resistance is determined by the repelling effect of field lines oriented in the same direction.

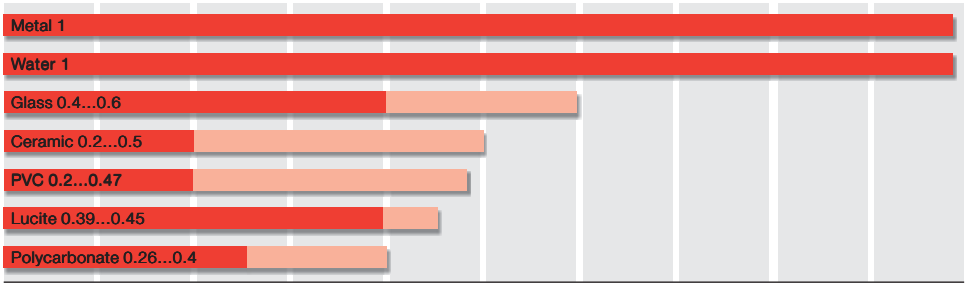
The arcs and their distances thus become larger towards the outside.



Conditions and correction factors

If an electrically non-conducting actuation element (target) enters the sensor field, the capacitance changes proportionally to ε_r and to the immersion depth or to the distance to the „sensing face“. Since the rated switching distance s_n is based on a grounded standard target made of Fe 360, the switching distances must be corrected when using other materials.

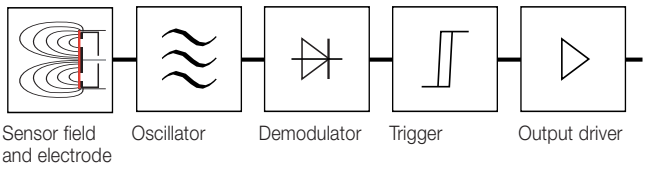
Correction factors for typical materials



Correction factors should be determined using the target material directly.

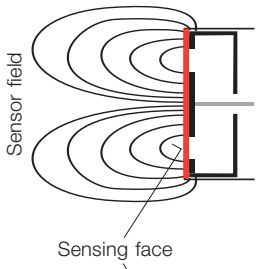
Function groups

... of a capacitive proximity sensor are:



Sensing face

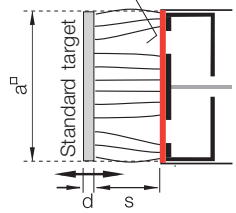
... is the area through which the high-frequency sensor field enters the air space. It is determined mainly by the area of the cover and corresponds roughly to the area of the outer sensor electrode.



Standard target

... is a grounded, square plate made of Fe 360 (ISO 630), with the switching distance determined 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”
- 3 s_r, if the value is greater than the respective diameter.



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

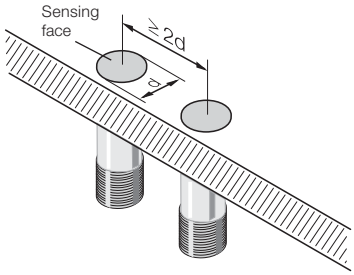
... is the switching distance of a single proximity switch measured under specified conditions such as flush mounting, rated operating voltage U_e, temperature T_a = +23 °C ±5 °C.

For capacitive sensors, the effective operating distance s_r can be set using a potentiometer.

Installation in metal

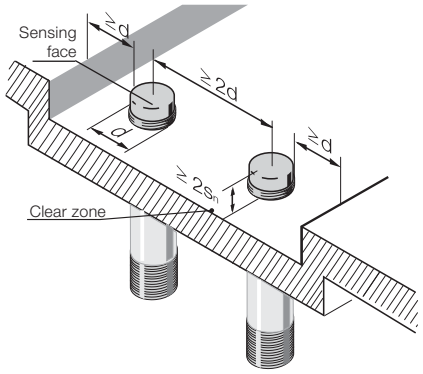
Flush mountable proximity switches

... can be installed with their sensing faces flush to the metal.
The distance between two proximity switches (in row mounting) must be ≥ 2d.



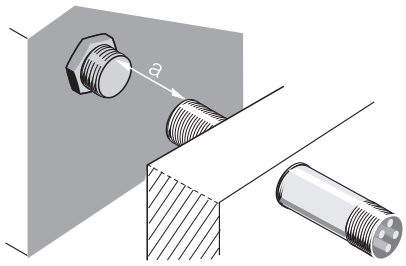
Non-flush mountable proximity switches

The sensing face must extend ≥ $2s_n$ from the metallic installation medium.
The distance between two proximity switches must be ≥ 2d.

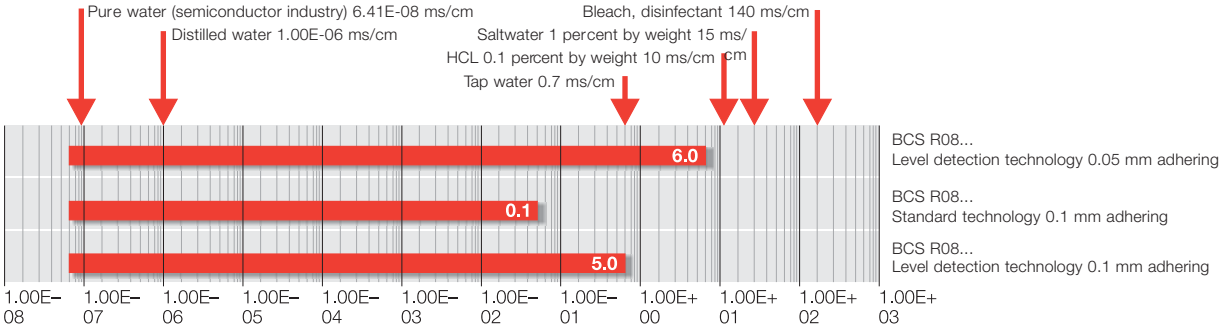


Opposing installation of 2 sensors

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



Conductance values, adhering liquids



Function areas for capacitive sensors

Standard

- Metals
- Plastic granulates
- Hydraulic oils
- Ceramics
- Glass
- PVC

- Switching distance adjustable
- Container walls up to 4 mm

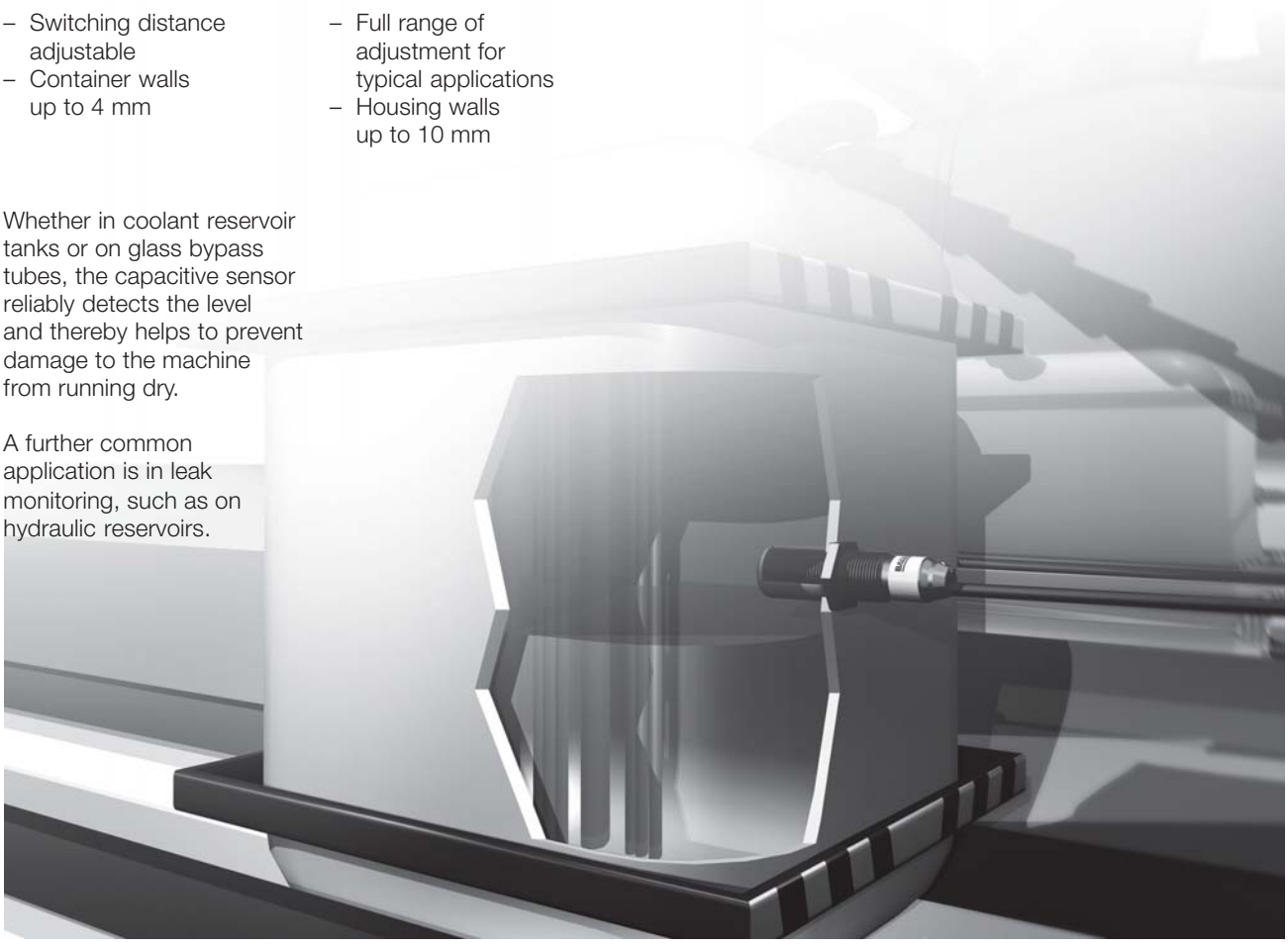
Level Detection (Series R08)

- Aqueous media
- Carbon
- Graphite
- Acids
- Blood

- Full range of adjustment for typical applications
- Housing walls up to 10 mm

Whether in coolant reservoir tanks or on glass bypass tubes, the capacitive sensor reliably detects the level and thereby helps to prevent damage to the machine from running dry.

A further common application is in leak monitoring, such as on hydraulic reservoirs.



4

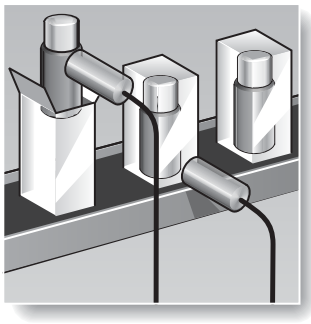
Capacitive Sensors

Capacitive sensors detect the change in capacitance of an object when it enters the sensor's electrical field.

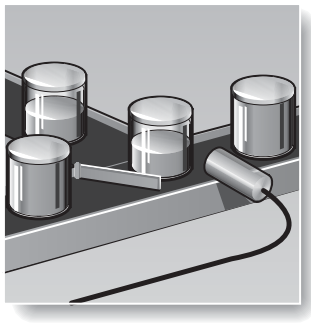
This means a capacitive sensor can detect not only metal, but even non-conductors whose dielectric constants are sufficiently large.

Properly selected, a capacitive sensor is also able to "see through" certain non-metallic materials. This makes it the classical level detector, sensing the presence or absence of liquids or granular material through the container wall.

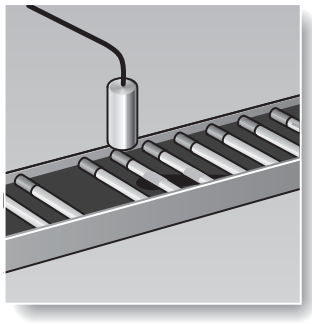
Balluff also offers the appropriate cover nuts which, once installed in the container, allow the capacitive sensor to be mounted and later replaced if necessary without unsealing the vessel.



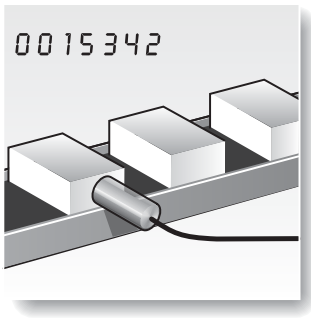
Inspection on packaging lines.
Packaging, contents.



Level control in filling applications, controlling the reject station.



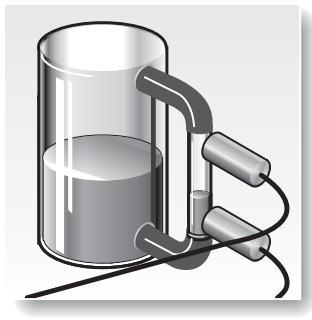
Quality and presence sensing in cigarette factory.
Filter/tobacco ok?*



Detecting, counting objects.

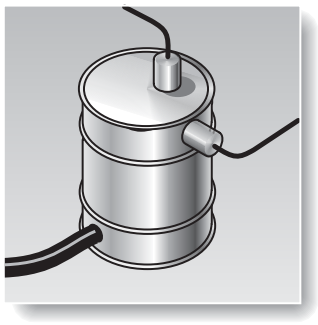


Inspecting paper, cloth or plastic strips.
From above or below.*

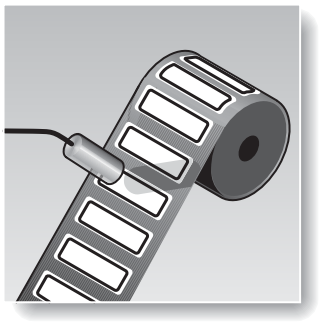


Inflow or pumping control in water storage containers.

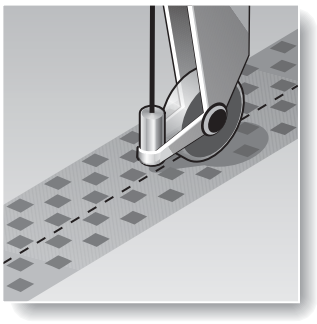
*No metal permitted underneath the desired object within the sensor field.



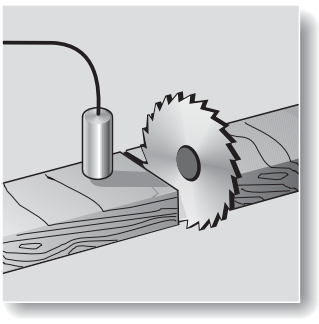
Level control in plastic or glass containers.



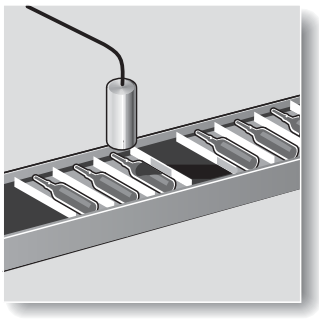
Checking for missing labels on thin backing.*



Guiding a knife through metal thread, e.g. for separating cloth.



Sensing and thickness detection of wood in secondary processing.



Packaging.
Are all the ampules there?*

Most capacitive sensors are not designed for flush mounting in metal.

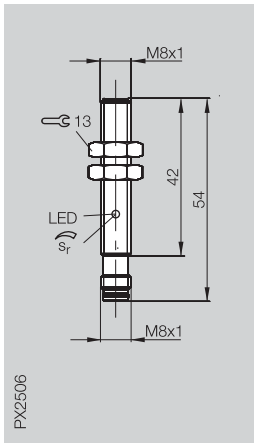
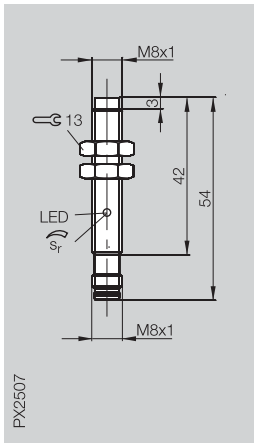
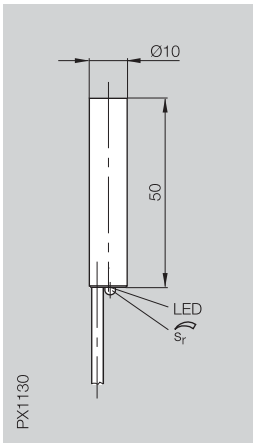
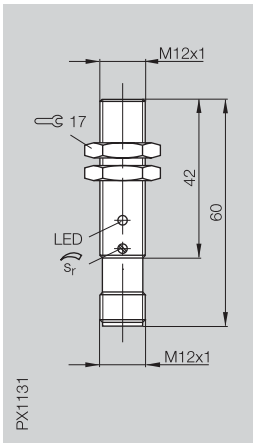
However, the potentiometers on Balluff sensors allow the switching distance to be adjusted so that even flush mounting is possible.

Typical applications

Level monitoring of
– liquids
– powdered and granular materials.

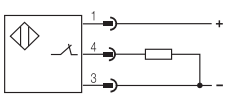
Detecting and counting parts made of
– metals
– plastics
– glass.

4

Housing size		**M8×1**	**M8×1**	**∅ 10 mm**	**M12×1**	
Mounting		flush	non-flush	flush	flush	
Rated operating distance s_n		**1.5 mm**	**3 mm**	**4 mm**	**4 mm**	
						
PNP	NO ①	BCS M08EG1-PSC15C-S49G	BCS M08EG-PSC30G-S49G	BCS 010-PSB-1-L-PU-02	BCS 012-PSB-1-L-S4	
	NC ②			BCS 010-POB-1-L-PU-02		
NPN	NO ④					
	NC ⑤					
Supply voltage U_B		11...30 V DC	11...30 V DC	12...35 V DC	12...35 V DC	
Voltage drop U_d at I_e		≤ 2 V	≤ 2 V	≤ 0.8 V	≤ 0.8 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.		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		≤ 2 %	≤ 2 %	≤ 2 %	≤ 2 %	
Ambient temperature range T_a		–10...+70 °C	–10...+70 °C	–30...+70 °C	–30...+70 °C	
Switching frequency f		100 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 65	IP 65	IP 65	IP 65	
Housing material		Stainless steel	Stainless steel	Stainless steel	Stainless steel	
Material of sensing face		PTFE	PTFE	PTFE	PTFE	
Connection		Connector	Connector	2 m Cable PUR	Connector	
No. of wires × cross-section				3×0.14 mm²		
Recommended connector		BKS-_ 48/BKS-_ 49	BKS-_ 48/BKS-_ 49		BKS-_ 19/BKS-_ 20	

① Wiring diagrams see page **1.0.**6
Exception: BCS M18KM3-POC80G-S04G-001
For this sensor the pinout does not conform to the standard.

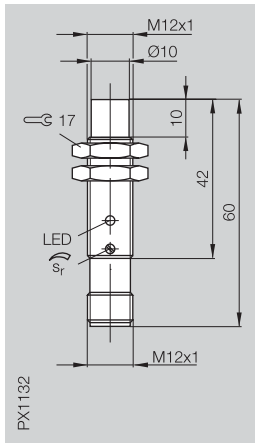
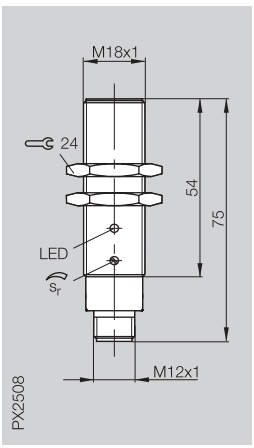
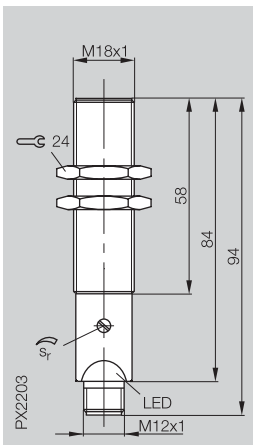
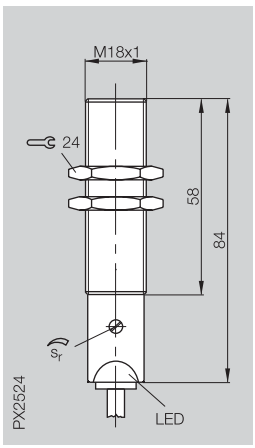
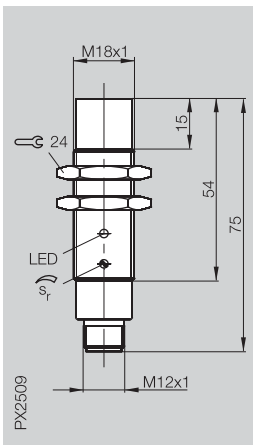
BCS M18KM3-POC80G-S04G-001







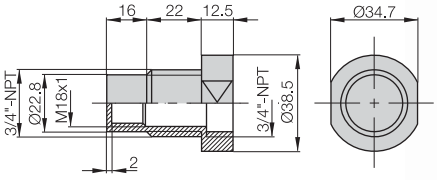
Reducing sleeve BMS AD-P-001-12/10
for sensors with ∅ 10 mm
for installing in clamps and holders with ∅ 12 mm,
see page **5.**65.

	M12×1	**M18×1**	**M18×1**	**M18×1**	**M18×1**
	non-flush	flush	non-flush	non-flush	non-flush
	8 mm	**8 mm**	**8 mm**	**8 mm**	**15 mm**
					
	BCS 012-PS-1-L-S4	BCS M18EM1-PSC80C-S04G BCS M18EM1-POC80C-S04G	BCS M18KM3-PSC80G-S04G BCS M18KM3-POC80G-S04G-001	BCS M18KM3-PSC80G-BV02 BCS M18KM3-POC80G-BV02	BCS M18EM-PSC15G-S04G BCS M18EM-POC15G-S04G
				BCS M18KM3-NSC80G-BV02 BCS M18KM3-NOC80G-BV02	
	12...35 V DC	10...35 V DC	10...36 V DC	10...36 V DC	10...35 V DC
	≤ 0.8 V	≤ 1.5 V	≤ 2.5 V	≤ 2.5 V	≤ 1.5 V
	75 V DC	75 V DC	250 V AC	250 V AC	75 V DC
	200 mA	300 mA	250 mA	250 mA	300 mA
	10 mA	10 mA	15 mA	15 mA	10 mA
	yes	yes	yes	yes	yes
	yes	yes	yes	yes	yes
	≤ 2 %	≤ 2 %	≤ 10 %	≤ 10 %	≤ 2 %
	–30...+70 °C	–30...+70 °C	–25...+80 °C	–25...+80 °C	–30...+70 °C
	100 Hz	100 Hz	50 Hz	50 Hz	100 Hz
	DC 13	DC 13	DC 13	DC 13	DC 13
	yes	yes	yes	yes	yes
	IP 65	IP 67	IP 67	IP 67	IP 67
			⧈	⧈	
	Stainless steel	Stainless steel	PBT	PBT	Stainless steel
	PTFE	PBT	PBT	PBT	PTFE
	Connector	Connector	Connector	2 m cable, PVC 3×0.34 mm²	Connector
	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20		BKS-_ 19/BKS-_ 20

Protective cap nuts for installing in containers for level detection

Material: PTFE
Pressure rated up to 13 bar when correctly installed.

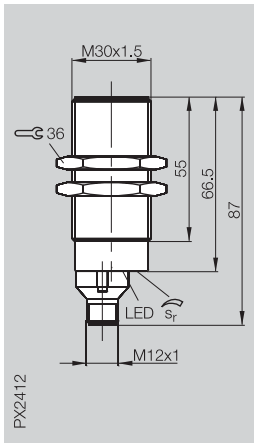
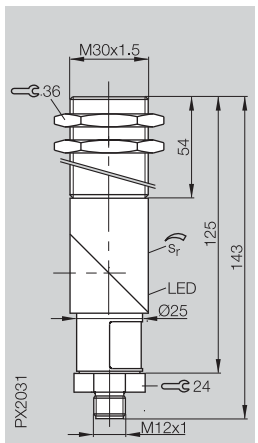
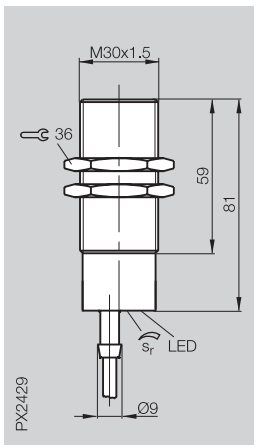
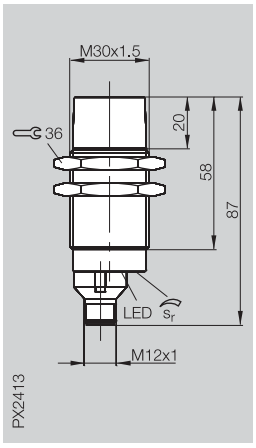
BES 18-SM-3



PX1047a

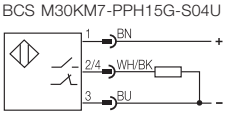


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5
Connectors, holders ... page 5.2 ...

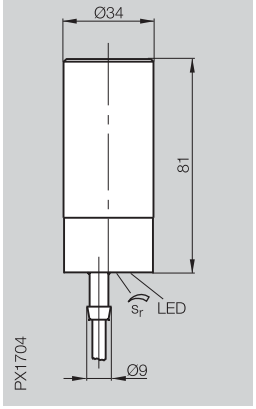
Housing size			**M30×1.5**	**M30×1.5**	**M30×1.5**	**M30×1.5**
Mounting			flush	non-flush	non-flush	non-flush
Rated operating distance s_n			**20 mm**	**15 mm**	**15 mm**	**30 mm**
						
PNP	NO	①	BCS M30EM2-PSC20C-S04K		BCS M30KN2-PSC18G-AV02	BCS M30EG2-PSC30G-S04K
	NC	②			BCS M30KN2-POC15G-AV02	
	NO/NC			BCS M30KM7-PPH15G-S04U		
NPN	NO	④			BCS M30KN2-NSC18G-AV02	
	NC	⑤			BCS M30KN2-NOC15G-AV02	
Supply voltage U_B			10...35 V DC	10...36 V DC	10...36 V DC	10...35 V DC
Voltage drop U_d at I_e			≤ 1.8 V	≤ 2.5 V	≤ 2.5 V	≤ 1.8 V
Rated insulation voltage U_i			75 V DC	250 V AC	250 V AC	75 V DC
Rated operational current I_e			300 mA	250 mA	250 mA	300 mA
No-load supply current I_0 max.			15 mA	16 mA	15 mA	15 mA
Polarity reversal protected			yes	yes	yes	yes
Short circuit protected			yes	yes	yes	yes
Repeat accuracy R			≤ 5 %	≤ 10 %	≤ 10 %	≤ 5 %
Ambient temperature range T_a			–30...+70 °C	–25...+70 °C	–25...+70 °C	–30...+70 °C
Switching frequency f			100 Hz	40 Hz	40 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 67	IP 65	IP 65	IP 67
Insulation class				⧈	⧈	
Housing material			Stainless steel	PBT/PC	PBT	Stainless steel
Material of sensing face			PBT	PBT	PBT	PTFE
Connection			Connector	Connector	2 m cable, PVC	Connector
No. of wires × cross-section					3×0.5 mm²	
Recommended connector			BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20 Connector orientation rotatable by 90°		BKS-_ 19/BKS-_ 20

① Wiring diagrams see page **1.0.**6
Exception: BCS M30KM7-PPH15G-S04U
Factory setting: Normally open. The sensor can be converted to normally closed. Once done, however, this cannot be reversed.

BCS M30KM7-PPH15G-S04U



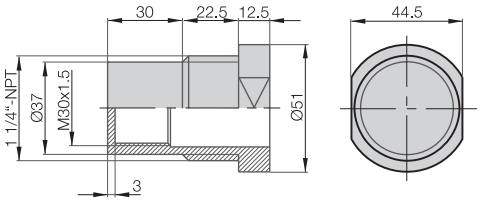


	∅ 34 mm non-flush **20 mm**				
					
	BCS G34KN2-PSC24G-AV02 BCS G34KN2-POC20G-AV02				
	BCS G34KN2-NSC24G-AV02 BCS G34KN2-NOC20G-AV02				
	10...36 V DC ≤ 2.5 V 250 V AC 250 mA 13 mA yes yes				
	≤ 10 % –25...+70 °C 40 Hz DC 13 yes				
	IP 65 ⧈ PBT PBT 2 m cable, PVC 3×0.5 mm²				
	Mounting cuff included in scope of delivery!				

Protective cap nuts for installing in containers for level detection

Material: PTFE
Pressure rated up to 13 bar when correctly installed.

BES 30-SM-3

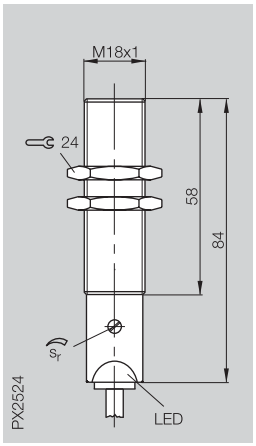


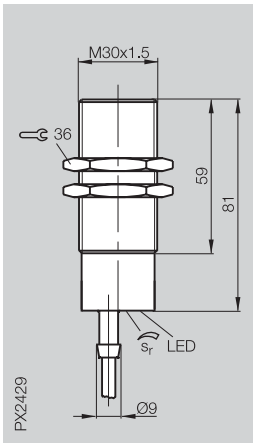
PX1046a

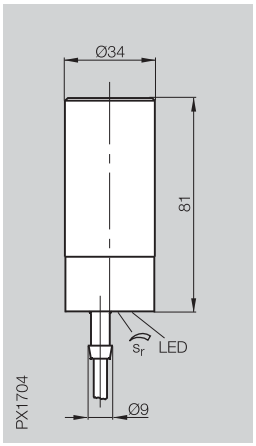


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5
Connectors, holders ... page 5.2 ...

Housing size	**M18×1**	**M30×1.5**	**∅ 34 mm**
Mounting	non-flush	non-flush	non-flush
Rated operating distance s_n	**8 mm**	**15 mm**	**20 mm**





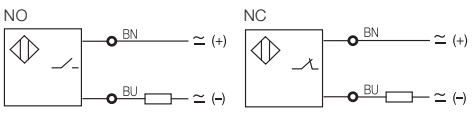


NO	BCS M18KM3-UST80G-BV02	BCS M30KN2-UST15G-AV02	BCS G34KN2-UST20G-AV02
NC	BCS M18KM3-UOT80G-BV02	BCS M30KN2-UOT15G-AV02	BCS G34KN2-UOT20G-AV02
Rated operational voltage U_e	110 V AC	110 V AC	110 V AC
Supply voltage U_B	20...250 V AC/DC	20...250 V AC/DC	20...250 V AC/DC
Voltage drop U_d at I_e	≤ 6 V	≤ 6 V	≤ 6 V
Rated insulation voltage U_i	250 V AC	250 V AC	250 V AC
Rated operational current I_e	350 mA (AC)/100 mA (DC)	250 mA (AC)	250 mA (AC)
Minimum operating current I_m	4 mA	5 mA	5 mA
Off-state current I_r	≤ 2.5 mA at 250 V AC	≤ 2.5 mA at 250 V AC	≤ 2.5 mA at 250 V AC
Inrush current I_k t ≤ 20 ms	≤ 2.1 A/≤ 0.5 Hz	≤ 1.5 A/≤ 0.5 Hz	≤ 1.5 A/≤ 0.5 Hz
Polarity reversal protected	no	no	no
Short circuit/overload protected	no/no	no/no	no/no
Repeat accuracy R	≤ 10 %	≤ 10 %	≤ 10 %
Ambient temperature range T_a	–25...+80 °C	–25...+70 °C	–25...+70 °C
Switching frequency f	25 Hz (AC)/50 Hz (DC)	25 Hz (AC)/50 Hz (DC)	25 Hz (AC)/50 Hz (DC)
Utilization category	AC 140/DC 13	AC 140/DC 13	AC 140/DC 13
Function indicator	yes	yes	yes
Degree of protection per IEC 60529	IP 67	IP 65	IP 65
Insulation class	⧈	⧈	⧈
Housing material	PBT	PBT	PBT
Material of sensing face	PBT	PBT	PBT
Connection	2 m cable, PVC	2 m cable, PVC	2 m cable, PVC
No. of wires × cross-section	2×0.34 mm²	2×0.34 mm²	2×0.5 mm²

Other cable lengths on request.



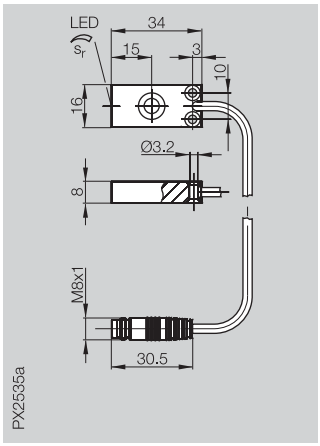
Wiring diagrams

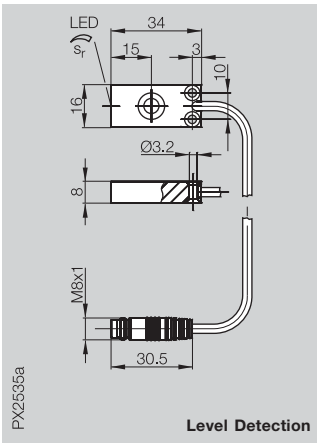


Note

With these AC/DC sensors use a miniature fuse as per the technical data sheet. Recommendation: After a short circuit, check the device for proper function.

Housing size	**16×34×8 mm** R08	**16×34×8 mm** R08
Mounting	flush	flush
Rated operating distance s_n	**8 mm**	**Self-adjusting**





PNP	NO	①	BCS R08KE-PSC80C-EP00,2-GS49	BCS R08KE-PSCFAC-EP00,2-GS49
	NC	②	BCS R08KE-POC80C-EP00,2-GS49	BCS R08KE-POCFAC-EP00,2-GS49

Supply voltage U_B	12...30 V DC	12...30 V DC
Voltage drop U_d at I_e	≤ 1.5 V	≤ 1.5 V
Rated insulation voltage U_i	75 V DC	75 V DC
Rated operational current I_e	50 mA	50 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	–30...+70 °C	–30...+70 °C
Switching frequency f	100 Hz	2 Hz
Utilization category	DC 13	DC 13
Function indicator	yes	yes
Degree of protection per IEC 60529	IP 67	IP 67
Housing material	PP	PP
Material of sensing face	PP	PP
Connection	0.2 m cable (PUR) with connector	0.2 m cable (PUR) with connector
Recommended connector	BKS-_ 48	BKS-_ 48

① Wiring diagrams see page **1.0.**6

Other cable lengths on request.



Level Detection

- For aqueous media with foam compensation
- Standard application with no adjustment
- Self-compensating
- Through glass or plastic with wall thicknesses of approx. 2...10 mm
- Level detection – the new solution for critical or challenging applications with aqueous media

4
5
Connectors, holders ... page 5.2 ...

Function principle

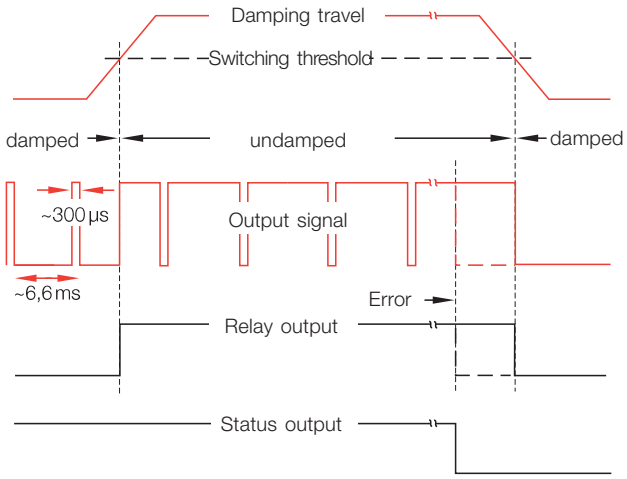
Proximity switches with dynamic diagnostics allow monitoring of the sensor functions including the cable.

The oscillator state is changed by means of a pulse generator while the switch is operating. As soon as there is any damage to the sensor head or the oscillator fails electrically, the pulse generator can no longer change the oscillator state and there are no longer pulses on the output.

The pulse frequency is f ~ 160 Hz and the pulse duration t ~ 300 µs. The pulse-pause ratio of t ~ 5 % is selected 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 following may be connected:

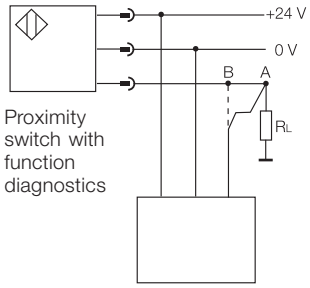
Inductive sensors
see page **1.5.**18
– BES 113-356-SA6-S4
Normally open
– BES 113-356-SA31-S4
Normally open
– BES 113-3019-SA1-S4
Normally closed

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

Single faults are detected when monitoring for the entire system.

Installation notes

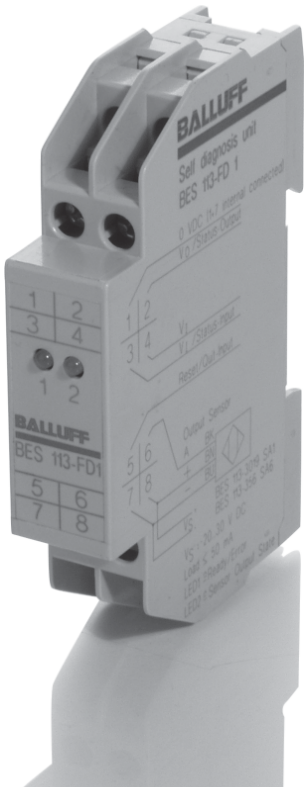
The signal line for the function diagnostics unit should be connected as close as possible to the load R_L (Point A). When Point B is connected the cable segment between B and load R_L is not monitored.



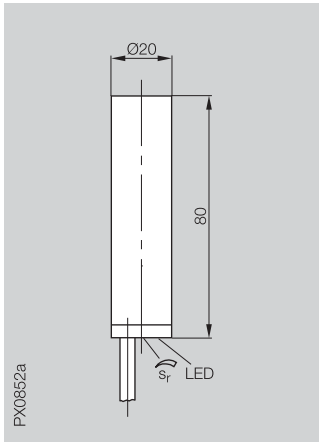
Note!

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

For additional information please request a device description.



Housing size	**Ø 20 mm**
Mounting	flush
Rated operating distance s_n	**10 mm**



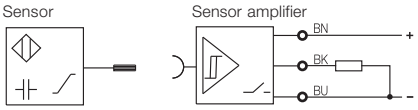
PNP complementary ③	BCS 20MG10-XPA1Y-8B-03
Supply voltage U_B	10...30 V DC
Voltage drop U_d at I_e	≤ 3.5 V
Rated insulation voltage U_i	75 V DC
Rated operational current I_e	130 mA
Minimum operating current I_m	1 mA
No-load supply current I_0 max.	10 mA
Output resistance R_a	Open collector
Polarity reversal protected	yes
Short circuit protected	yes
Repeat accuracy R	≤ 15 %
Ambient temperature range T_a	+10...+50 °C
Switching frequency f	100 Hz
Utilization category	DC 13
Function/Supply voltage indicator	yes/yes
Degree of protection per IEC 60529	IP 63
Housing material	Stainless steel
Material of sensing face	EP
Connection	3 m Cable PUR
No. of wires × cross-section	4×0.25 mm²

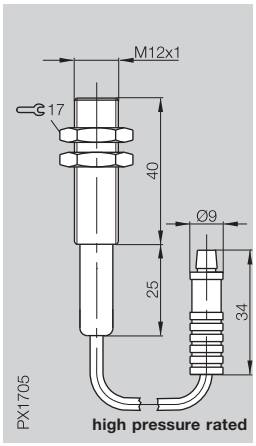
③ Wiring diagram see page **1.0.**6

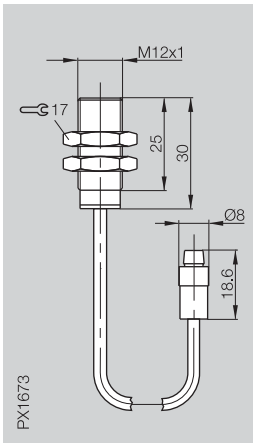


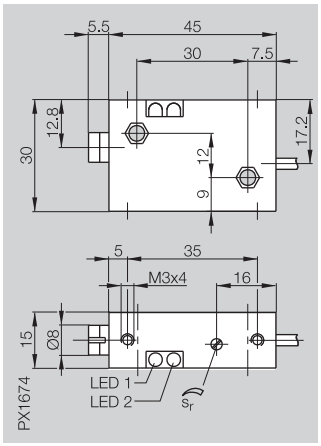
DC 3-wire
M12 with sensor amplifier 30×45×15 mm
s_r 0...1 mm, 0.1...4 mm

Housing size	**M12×1**	**M12×1**	**30×45×15 mm** sensor amplifier
Mounting	flush	flush	
Rated operating distance s_n	**1 mm**	**4 mm**	





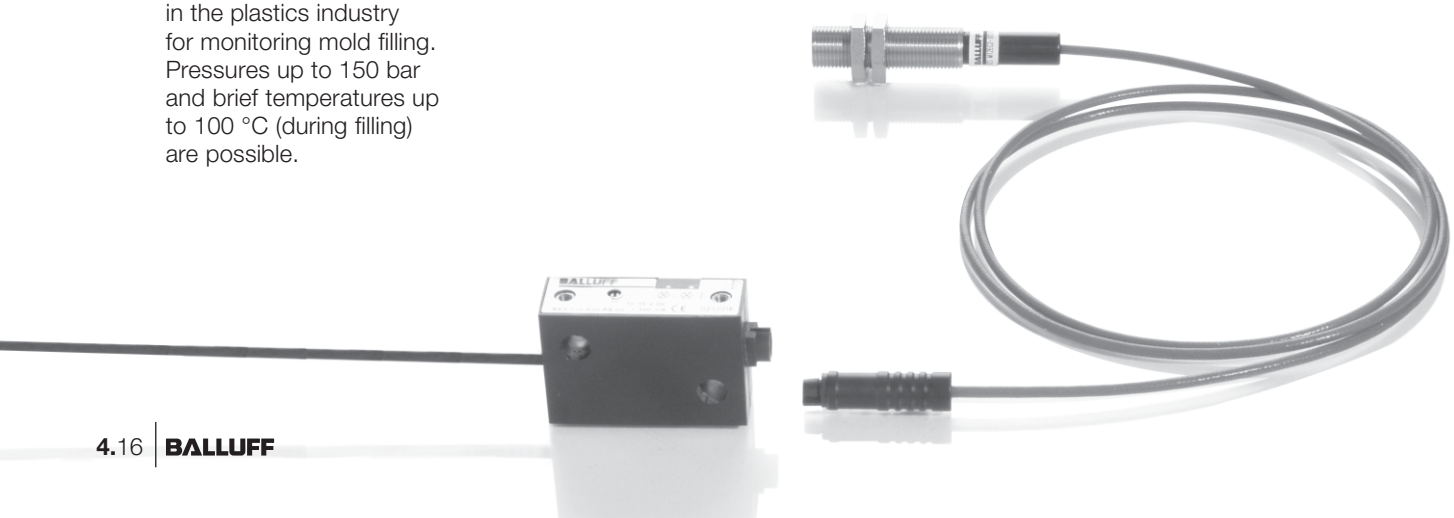




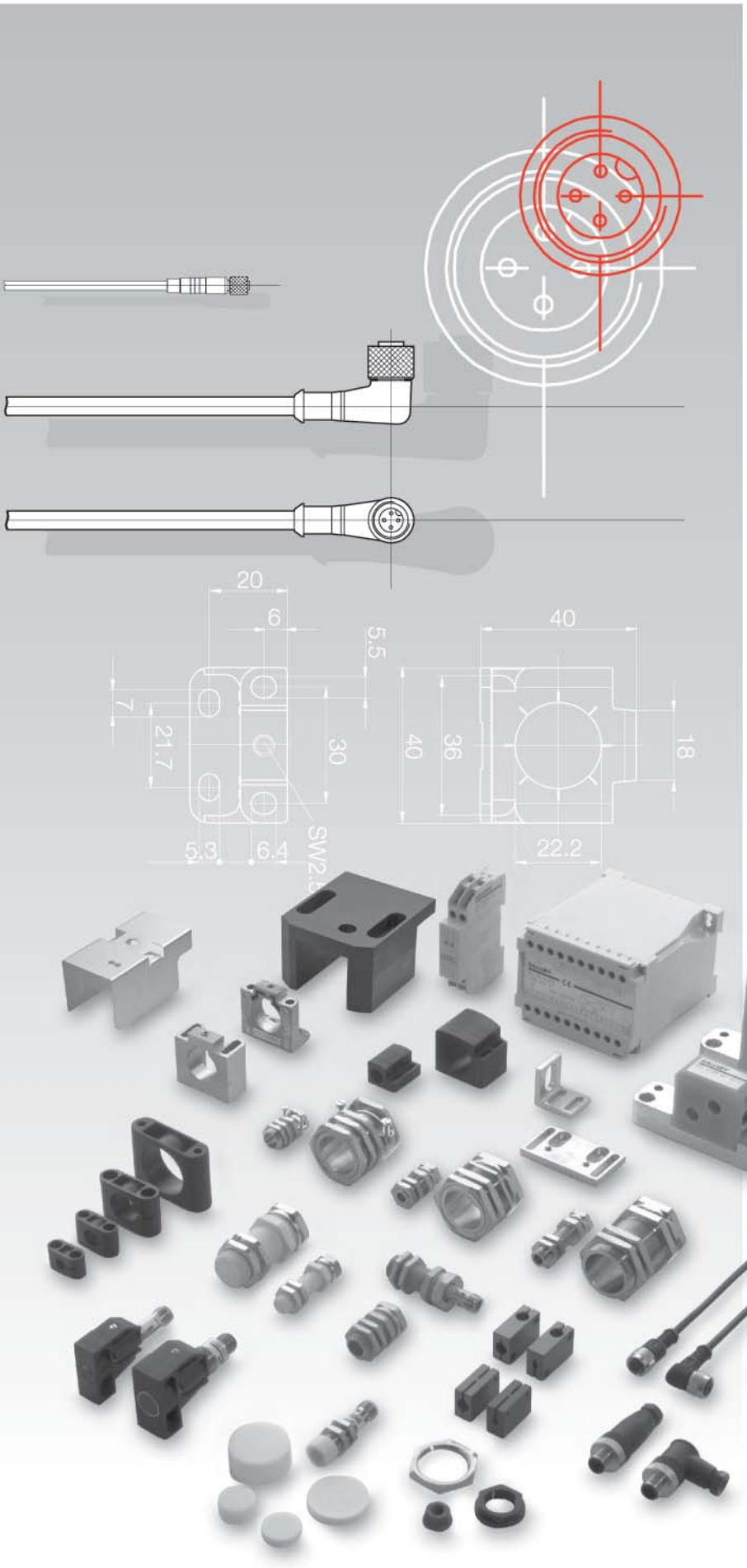
PNP NO	BCS M12EG2-XXS10B-BT01-GZ01-501	BCS M12ED-XXS40B-BP02-GZ01	BES 516-620-PS-02
Supply voltage U_B	4...8 V DC using amplifier	4...8 V DC using amplifier	10...35 V DC
Voltage drop U_d at I_e			≤ 1.5 V
Rated insulation voltage U_i	75 V DC	75 V DC	75 V DC
Rated operational current I_e			300 mA
Inrush current I_k t ≤ 20 ms			700 mA
Polarity reversal protected			yes
Short circuit protected	yes	yes	yes
Repeat accuracy R	≤ 10 %	≤ 2 %	
Ambient temperature range T_a	0...+70 °C	–30...+80 °C	–30...+70 °C
Ambient temperature range short-time 1 h	**+100 °C**		
Switching frequency f	100 Hz	100 Hz	100 Hz
Utilization category			DC 13
Function/Supply voltage indicator	no/no	no/no	yes/yes
Degree of protection per IEC 60529	IP 67	IP 67	IP 67
Housing material	Stainless steel	Stainless steel	PC
Material of sensing face	PTFE	PTFE	
Connection	1 m FEP cable with connection for switching amplifier Triax	2 m PUR cable with connection for switching amplifier	2 m Cable PUR
No. of wires × cross-section		3×0.14 mm²	3×0.14 mm²
High-pressure rated for slow-flowing media up to	**150 bar**		

High pressure and temperature: The **BCS M12EG2...** capacitive sensor is ideal for both. It can be used for example in the plastics industry for monitoring mold filling. Pressures up to 150 bar and brief temperatures up to 100 °C (during filling) are possible.

Due to its small housing size, the **BCS M12ED...** capacitive sensor is ideal for tight mounting conditions.



Accessories



Connectors

5.2 DC connectors
M5 connection (S26)

5.3 M8 connection
(S49, S75)
DC connection cable
with M8 connector
(S49, S75)

5.10 DC connection cables
DC connectors MQ12
connection (S4)
M12 connection (S4)

5.18 DC connectors
for user assembly

5.22 AC/DC connectors
M12 connection (S27)

5.23 DC-2-wire
M12 connection (S220)

Splitter boxes and accessories

5.24 BSB splitter boxes
M12, metal

5.26 BSB splitter boxes
M12, plastic

5.29 BSB splitter boxes
M8, plastic

5.30 Connectors

5.32 Screw plugs, Tee,
adapters

5.34 BSB splitter boxes

Electrical devices

5.35 Pulse extender

5.36 Analog switching
amplifiers

5.38 Power supplies

5.40 Testers

5.42 Signal adapter

5.45 Digital display

Fasteners

5.46 BMS Mounting System

5.58 Clamps, holders,
mounting cuffs

5.65 Mounting brackets,
reducing sleeve

5.66 Positive stops

5.67 Mounting clamps
for row mounting
of sensors

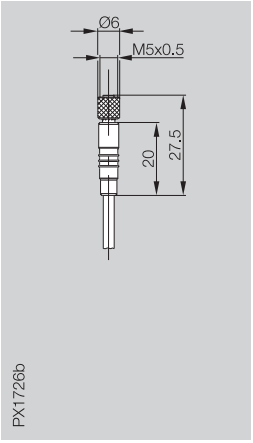
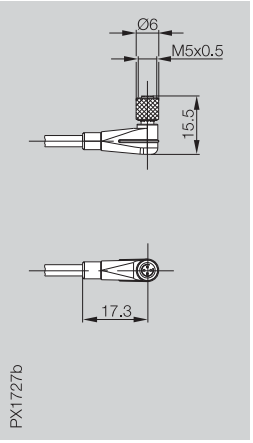
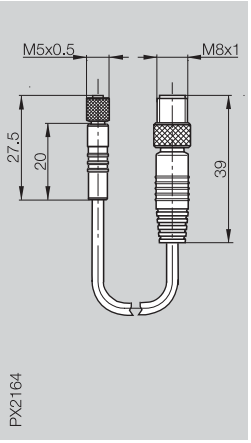
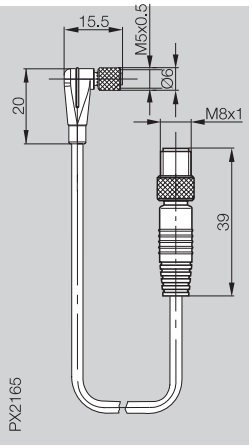
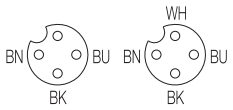
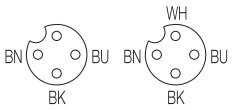
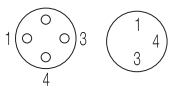
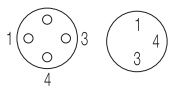
5.68 Mounting bracket,
mounting socket
and holding system
for Unicompact

5.69 Weld protection and
protective cover for
Unicompact, mounting
plate for Unisensor

5.70 Cover nuts, nuts,
seal nut

Tools

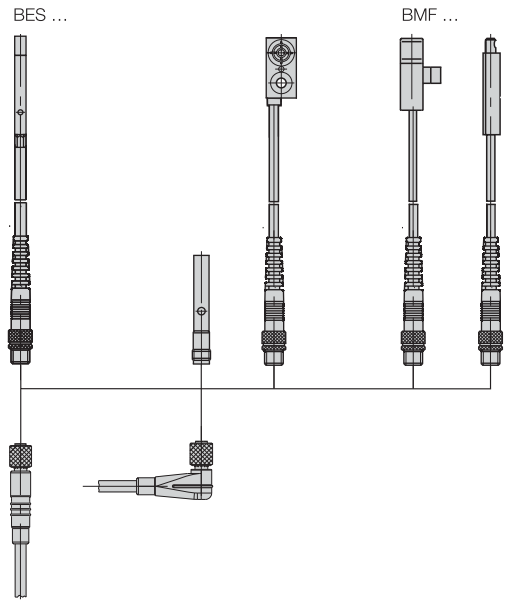
5.74 BMF Hex Key,
Important notes

Connector	BKS-B 25	BKS-B 26	BKS-B 25-_/GS49	BKS-B 26-_/GS49	
Version	straight female	angle female	straight female/ straight male	angle female/ straight male	
Application	Plug sensors S26	Plug sensors S26	Plug sensors S26	Plug sensors S26	
					
no LED, NO	BKS-B 25-1-PU-03	BKS-B 26-1-PU-03	BKS-B 25-1/GS49-PU-01	BKS-B 26-1/GS49-PU-01	
no LED, NC or NO					
no LED, complementary	BKS-B 25-3-PU-03	BKS-B 26-3-PU-03			
with LED, NC or NO PNP					
with LED, NC or NO NPN					
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Cable	3 m molded-on PUR	3 m molded-on PUR	1 m molded-on PUR	1 m molded-on PUR	
No. of wires × cross-section	3×0.14 mm²/4×0.14 mm²	3×0.14 mm²/4×0.14 mm²	3×0.14 mm²	3×0.14 mm²	
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67	
Ambient temperature range T_a	–25...+85 °C	–25...+85 °C	–25...+85 °C	–40...+85 °C	
View of female side					

Other cable lengths and cable qualities on request.

Ordering examples
PUR, Length 1 m = BKS-B 25-1/GS49-PU-01
PVC, Length 3 m = BKS-B 48-1-03
PUR, Length 3 m = BKS-B 48-1-PU-03

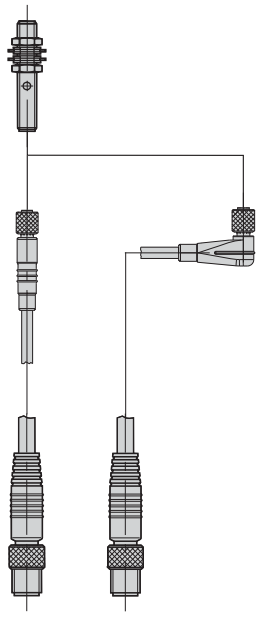
Sensors with connector Ordering code endings S26



Connector with mounting thread M5×0.5

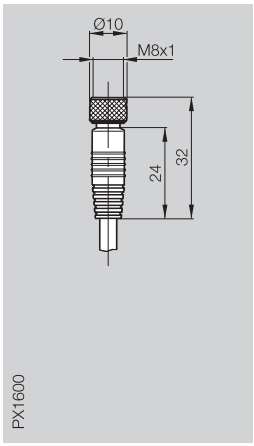
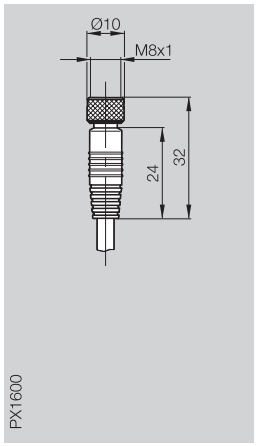
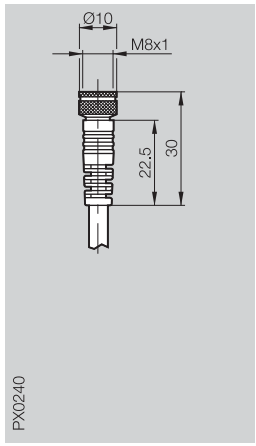
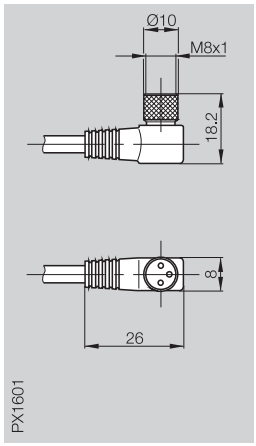
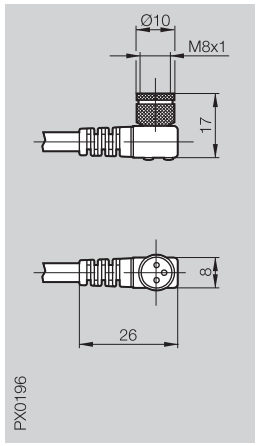
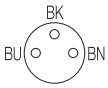
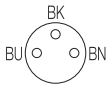
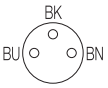
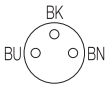
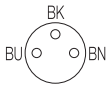
BKS-B 25 BKS-B 26

Sensors with connector Ordering code endings S25



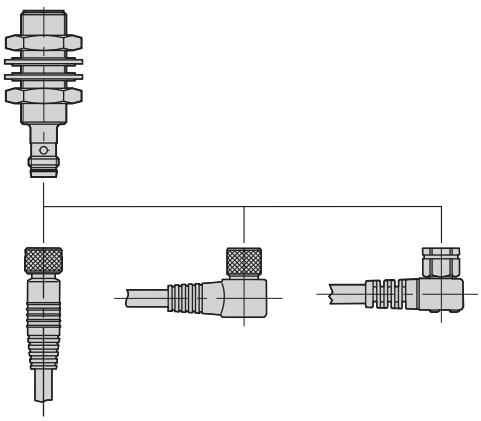
Connection cable with mounting thread M5×0.1/M8×1

BKS-B 25-1/GS49 BKS-B 26-1/GS49

	BKS-B 48 straight female	BKS-B 48 straight female	BKS-S 48 straight female	BKS-B 49 angle female	BKS-S 49 angle female
	Plug sensors S49	Plug sensors S49	Plug sensors S49	Plug sensors S49	Plug sensors S49
					
	BKS-B 48-1-03	BKS-B 48-1-PU2-05	BKS-S 48-03	BKS-B 49-1-03 BKS-B 49-4-03	BKS-S 49-1-PU-03 BKS-S 49-4-PU-03 BKS-S 49-6-PU-05
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	3 m molded-on PVC	5 m molded-on PUR	3 m molded-on PVC	3 m molded-on PVC	3 m/5 m molded-on PUR
	3×0.25 mm²	3×0.34 mm²	3×0.34 mm²	3×0.25 mm²	3×0.34 mm²
	IP 67	IP 67	IP 67	IP 67	IP 67
	–20...+85 °C	**–25...+120 °C**	–25...+90 °C	–20...+85 °C	–25...+90 °C
					

Sensors with connector Ordering code endings S49

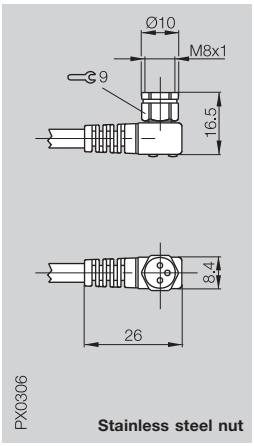
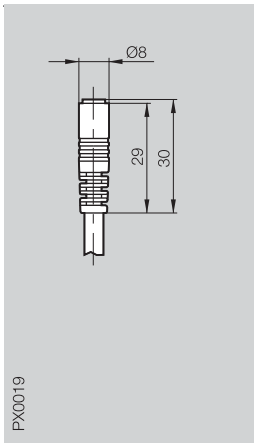
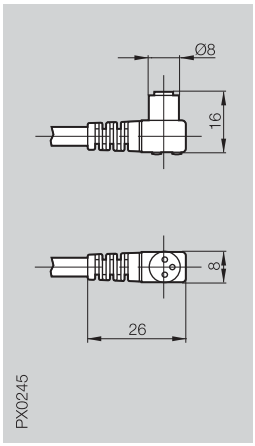
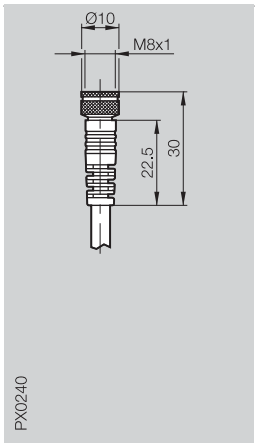
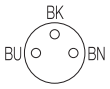
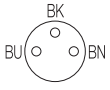
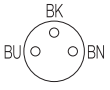
Connector with mounting thread M8×1



BKS-B 48/ BKS-S 48 | BKS-B 49/ BKS-S 49 | BKS-S 49E

Function and color of the LED's
2 LED's: green = Power, yellow = Switching output status

5
Connectors
Splitter boxes with accessories
Electrical devices
Fasteners
Tools

Connector	BKS-S 49E	BKS-S 41	BKS-S 40	BKS-S 74	
Version	angle female	straight female	angle female	straight female	
Application	Plug sensors S49	Plug sensors S49	Plug sensors S49	Plug sensors S75	
					
no LED, NC or NO		BKS-S 41-1-05	BKS-S 40-1-PU-03		
no LED, complementary				BKS-S 74-3-03	
no LED, complementary shielded					
with LED, NC or NO PNP	BKS-S 49E-4-PU-03		BKS-S 40-4-PU-03		
with LED, NC or NO NPN			BKS-S 40-6-PU-03		
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Cable	3 m molded-on PUR	5 m molded-on PVC	3 m molded-on PUR	3 m molded-on PVC	
No. of wires × cross-section	3×0.34 mm²	3×0.34 mm²	3×0.34 mm²	4×0.34 mm²	
Cable diameter min.					
Connection					
Degree of protection per IEC 60529	IP 67	IP 65	IP 65	IP 67	
Ambient temperature range T_a	–25...+90 °C	–25...+90 °C	–25...+90 °C	–25...+90 °C	
View of female/male side					

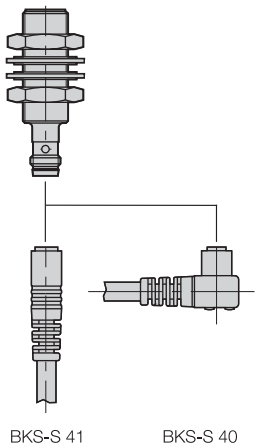
Other cable lengths and cable qualities on request.

Ordering examples
PVC, Length 3 m = BKS-S 41-1-03
PUR, Length 3 m = BKS-S 49E-4-PU-03

Function and color of the LED's
2 LED's: green = Power, yellow = Switching output status

Sensors with connector Ordering code endings S49

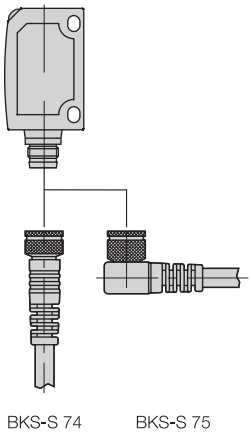
Connector with mounting thread M8×1



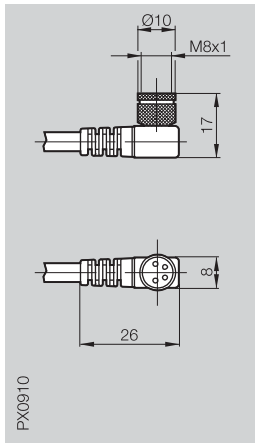
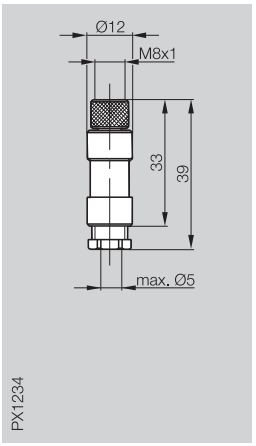
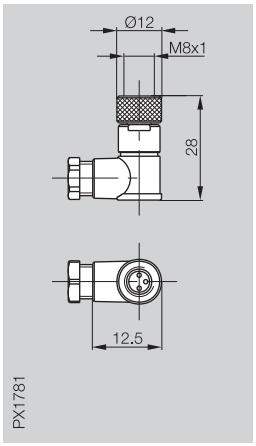
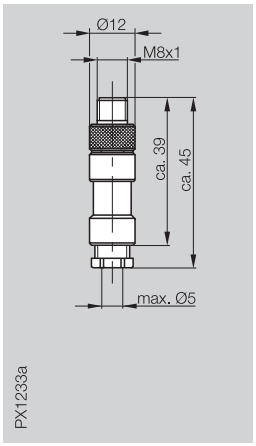
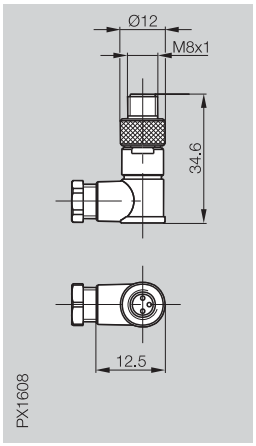
BKS-S 41 BKS-S 40

Sensors with connector Ordering code endings S75

Connector with mounting thread M8×1



BKS-S 74 BKS-S 75

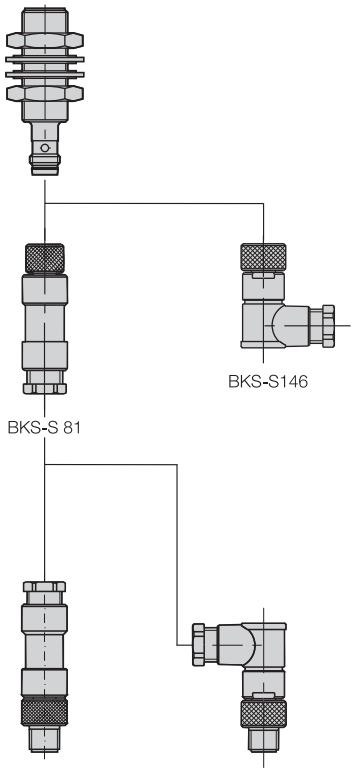
	BKS-S 75 angle female	BKS-S 81-00 straight female	BKS-S146-00 angle female	BKS-S 82-00 straight male	BKS-S 91-00 angle male
	Plug sensors S75	Plug sensors S49	Plug sensors S49	Female S49	Female S49
					
	BKS-S 75-3-03 BKS-S 75-14-03*	BKS-S 81-00	BKS-S146-00	BKS-S 82-00	BKS-S 91-00
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	3 m molded-on PVC	for user assembly	for user assembly	for user assembly	for user assembly
	4×0.34 mm²	3× max. 0.25 mm²	3× max. 0.25 mm²	3× max. 0.25 mm²	3× max. 0.25 mm²
		max. Ø 5 mm	max. Ø 5 mm	max. Ø 5 mm	max. Ø 5 mm
		Solder	Solder	Solder	Solder
	IP 67	IP 67	IP 67	IP 67	IP 67
	–25...+90 °C	–40...+85 °C	**–25...+100 °C****	–40...+85 °C	–40...+85 °C
					

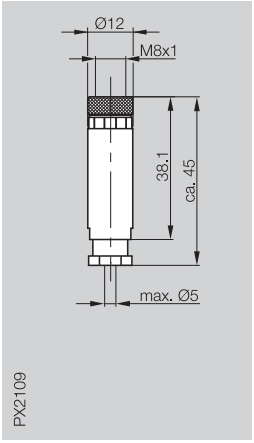
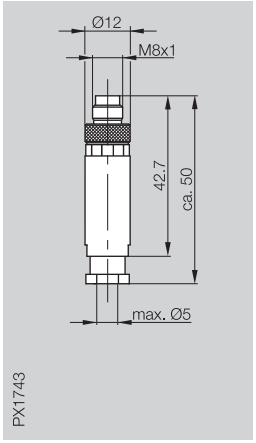
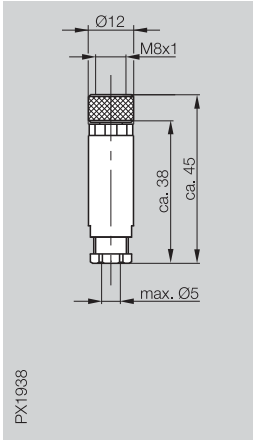
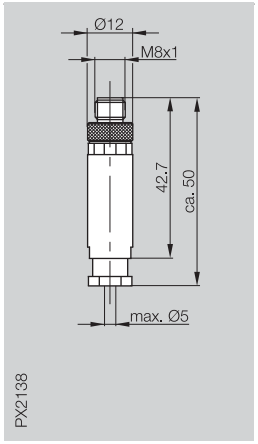
*Shield up to the cable-connector body transition!

**120 °C (max. 100 h)

Sensors with connector Ordering code endings S49

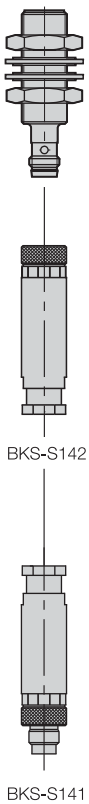
Connector for user assembly with thread M8×1



Connector	**BKS-S142-00**	**BKS-S141-00**	**BKS-S149-00**	**BKS-S150-00**	
Version	straight female	straight male	straight female	straight male	
Application	Plug sensors S49	Female S49	Plug sensors S75	Female S75	
					
no LED, NC or NO	BKS-S142-00	BKS-S141-00	BKS-S149-00	BKS-S150-00	
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Cable	for user assembly	for user assembly	for user assembly	for user assembly	
No. of wires × cross-section	3×0.14...0.5 mm²	3×0.14...0.5 mm²	4×0.14...0.5 mm²	4×0.14...0.5 mm²	
Cable diameter min.	max. Ø 5 mm	max. Ø 5 mm	max. Ø 5 mm	max. Ø 5 mm	
Connection	Screw terminal	Screw terminal	Screw terminal	Screw terminal	
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67	
Ambient temperature range T_a	–40...+85 °C	–40...+85 °C	–40...+85 °C	–40...+85 °C	
View of female/male side					

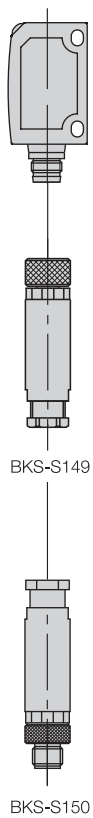
Sensors with connector Ordering code endings S49

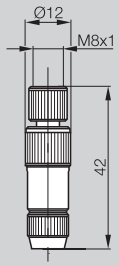
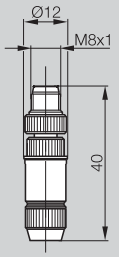
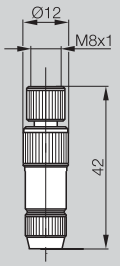
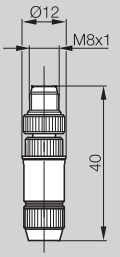
Connector for user assembly with thread M8×1



Sensors with connector Ordering code endings S75

Connector for user assembly with thread M8×1

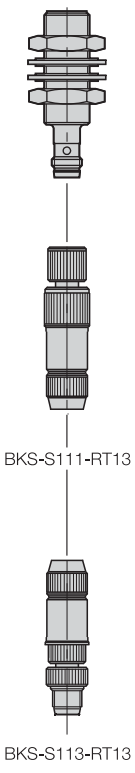


	BKS-S111-RT13	BKS-S113-RT13	BKS-S216-RT14	BKS-S218-RT14	
	straight female	straight male	straight female	straight male	
	Plug sensors S49	Female S49	Plug sensor S75	Female S75	
	 PX2093 Quick-connect system	 PX2094 Quick-connect system	 PX2093 Quick-connect system	 PX2094 Quick-connect system	
	BKS-S111-RT13	BKS-S113-RT13	BKS-S216-RT14	BKS-S218-RT14	
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
	for user assembly	for user assembly	for user assembly	for user assembly	
	3×0.14...0.34 mm²	3×0.14...0.34 mm²	4×0.14...0.34 mm²	4×0.14...0.34 mm²	
	Ø 3.2...5.4 mm	Ø 3.2...5.4 mm	Ø 3.2...5.4 mm	Ø 3.2...5.4 mm	
	Insulation displacement	Insulation displacement	Insulation displacement	Insulation displacement	
	IDC	IDC	IDC	IDC	
	IP 67	IP 67	IP 67	IP 67	
	–25...+85 °C*	–25...+85 °C*	–25...+85 °C*	–25...+85 °C*	
					

*Assembling the cable to the connector over temperature range –5...+50 °C

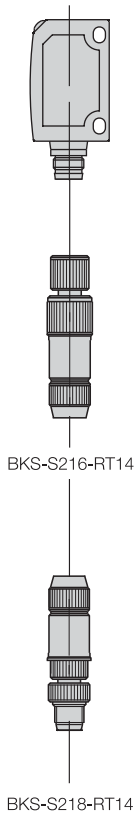
Sensors with connector Ordering code endings S49

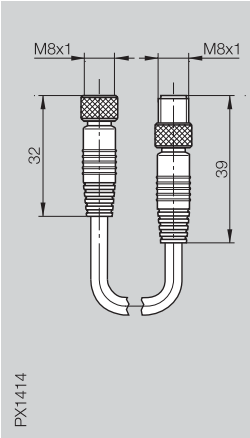
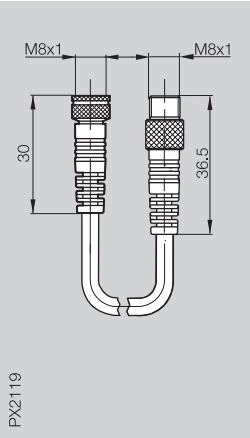
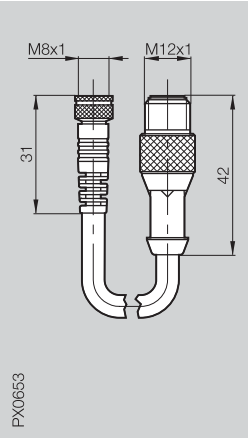
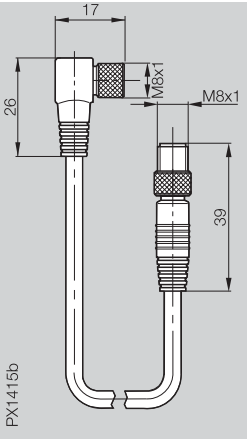
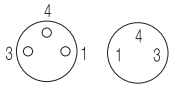
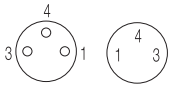
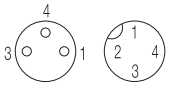
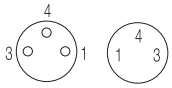
Connector for user assembly with thread M8×1



Sensors with connector Ordering code endings S75

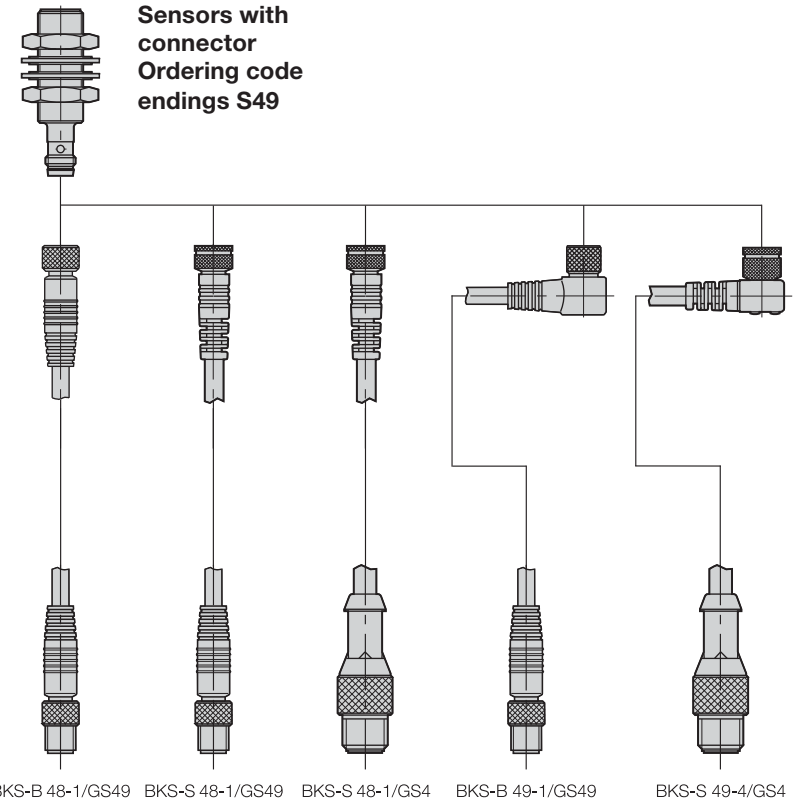
Connector for user assembly with thread M8×1

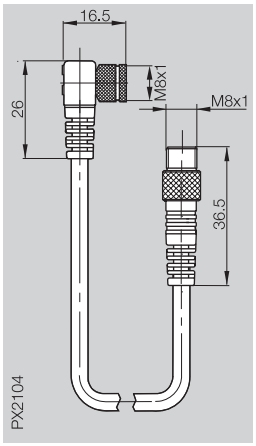
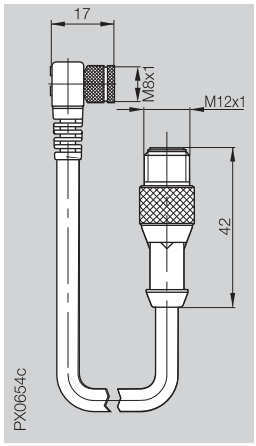
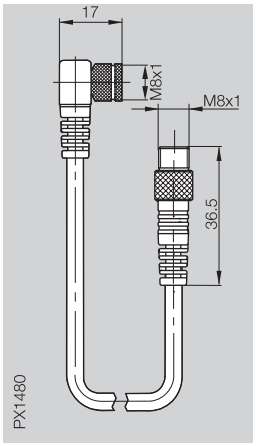
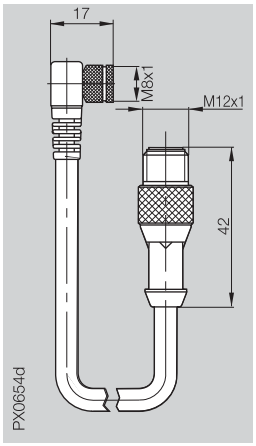
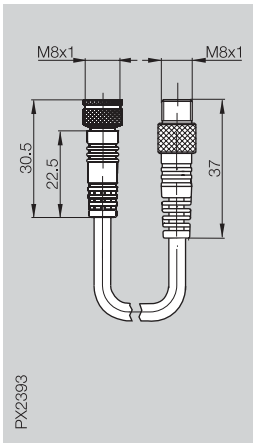
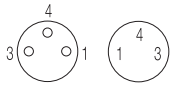
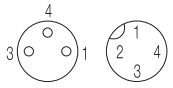
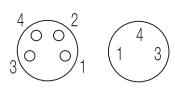
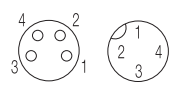
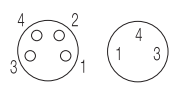


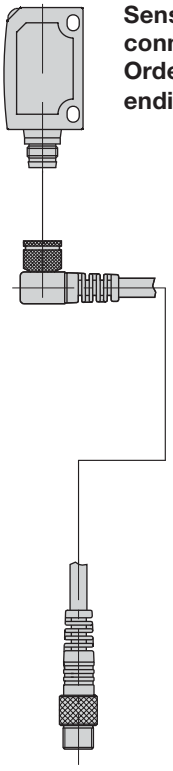
Connection cable	BKS-B 48-1/GS49	BKS-S 48-1/GS49	BKS-S 48-1/GS4	BKS-B 49-1/GS49	
Version	straight female/ straight male	straight female/ straight male	straight female/ straight male	angle female/ straight male	
Application	Plug sensors S49	Plug sensors S49	Plug sensors S49	Plug sensors S49	
					
no LED, NO			BKS-S 48-1/GS4-PU-01		
no LED, NC or NO	BKS-B 48-1/GS49-PU-01	BKS-S 48-1/GS49-PU-01		BKS-B 49-1/GS49-PU-01	
with LED, NO PNP					
no LED, 3 pins					
no LED, 4 pins					
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Cable	1 m molded-on PUR	1 m molded-on PUR	1 m molded-on PUR	1 m molded-on PUR	
No. of wires × cross-section	3×0.25 mm²	3×0.34 mm²	3×0.34 mm²	3×0.25 mm²	
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67	
Ambient temperature range T_a	–25...+85 °C	–25...+80 °C	–25...+90 °C	–40...+85 °C	
View of female/male side					

Other cable lengths and cable qualities on request.

Ordering example
PUR, length 1 m = BKS-S 48-1/GS49-PU-01



	BKS-S 49-4/GS49	BKS-S 49-4/GS4	BKS-S 75-1/GS49	BKS-S 75-3/GS4	BKS-S 74-1/GS49
	angle female/ straight male	angle female/ straight male	angle female/ straight male	angle female/ straight male	straight female/ straight male
	Plug sensors S49	Plug sensors S49	Plug sensors S75	Plug sensors S75	Plug sensors S75
					
	BKS-S 49-4/GS49-PU-01	BKS-S 49-4/GS4-PU-01	BKS-S 75-1/GS49-PU-00,1	BKS-S 75-3/GS4-PU-00,5	BKS-S 74-1/GS49-PU-01
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	1 m molded-on PUR	1 m molded-on PUR	0.1 m molded-on PUR	0.5m molded-on PUR	1 m molded-on PUR
	3×0.34 mm²	3×0.34 mm²	3×0.34 mm²	4×0.34 mm²	4×0.34 mm²
	IP 67	IP 67	IP 67	IP 67	IP 67
	–25...+80 °C	–25...+90 °C	–25...+80 °C	–25...+80 °C	–25...+80 °C
					



BKS-S 75-1/GS49

Sensors with connector Ordering code endings S75

Function and color of the LED's
2 LED's: green = Power, yellow = Switching output status

The first quick-connect system requiring no changes on the sensor side!

There is a whole range of quick-connect systems for M12 connectors on the market, but they all have the same problem. To truly make use of the benefits of the system, you have to make changes to the mating piece. Different systems mean different mating pieces, since the systems are of course not compatible with each other. This makes things difficult for the customer and his applications.

The new MQ12 eliminates this problem completely. MQ12 can be used for any commonly available M12 sensor, no ifs, buts or maybes!

Simply plug it in and fix with a quarter turn – that's it! This means the system can be directly inserted in existing applications and is a 1:1 replacement for today's standard cables. The MQ12 is advantageous especially in applications for warehousing, assembly and conveying, where large numbers of sensors are used.

By reducing the connection time by up to 80%, the time expenditure for the overall installation is drastically reduced.

Technical benefits

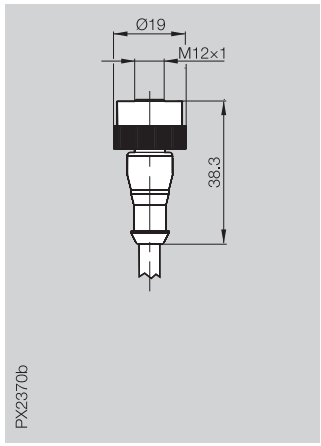
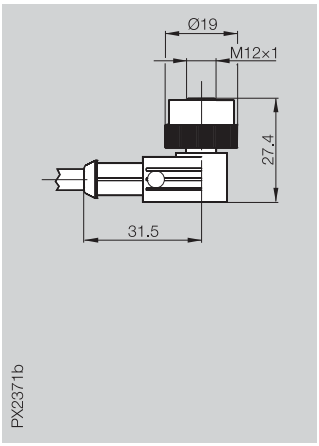
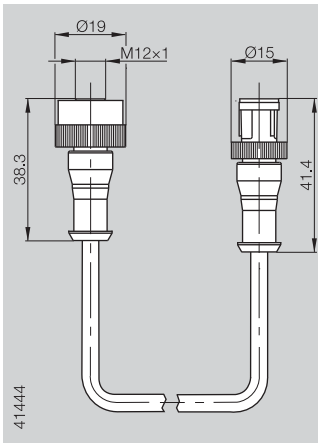
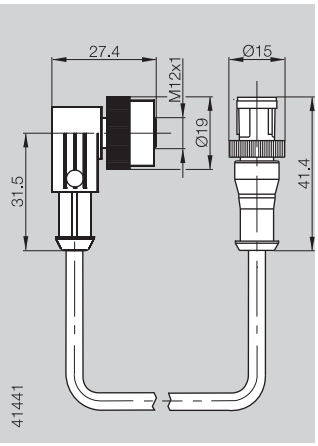
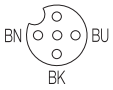
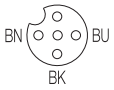
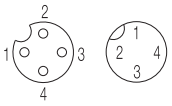
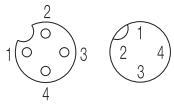
- High shock and vibration resistance
- Degree of protection IP 67
- Available for various cable materials (PUR, PVC)

Connector		
Version		
Application		
no LED,	NO	
no LED,	complementary	
with LED,	NO	
with LED,	complementary	
Supply voltage U_B		
Cable		
No. of wires × cross-section		
Degree of protection per IEC 60529		
Ambient temperature range T_a		
View of female side		

Other cable lengths and cable qualities on request.

Ordering example
PUR, length 1 m = BKS-S212-1/S214-PU-01
PUR, length 2 m = BKS-S213-3-PU-02

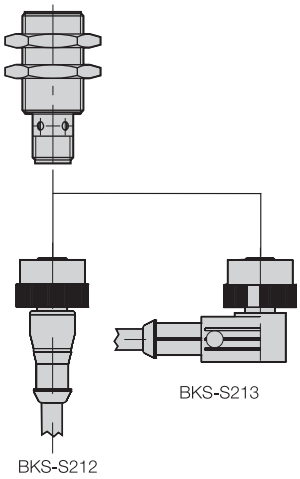


	BKS-S212 straight female	BKS-S213 angle female	BKS-S212-_/S214 straight female/ straight male	BKS-S213-_/S214 angle female/ straight male
	Plug sensors S4	Plug sensors S4	Plug sensors S4	Plug sensors S4
				
	BKS-S212-1-PU-02 BKS-S212-3-PU-02	BKS-S213-1-PU-02 BKS-S213-3-PU-02	BKS-S212-1/S214-PU-01 BKS-S212-3/S214-PU-01	BKS-S213-3/S214-PU-01 BKS-S213-4/S214-PU-01 BKS-S213-8/S214-PU-01
	max. 250 V AC/DC	max. 250 V AC/DC	10...30 V DC	10...30 V DC
	2 m molded-on PUR	2 m molded-on PUR	1 m molded-on PUR	1 m molded-on PUR
	3×0.34 mm²/4×0.25 mm²	3×0.34 mm²/4×0.25 mm²	3×0.34 mm²	3×0.34 mm²/4×0.25 mm²
	IP 65/IP 67*	IP 65/IP 67*	IP 65/IP 67*	IP 65/IP 67*
	–20...+80 °C	–20...+80 °C	–20...+80 °C	–20...+80 °C
				

*when plugged together/locked

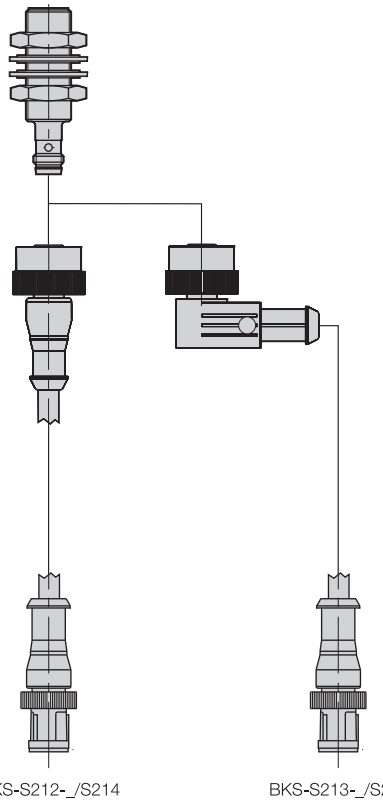
Sensors with connector Ordering code endings S4

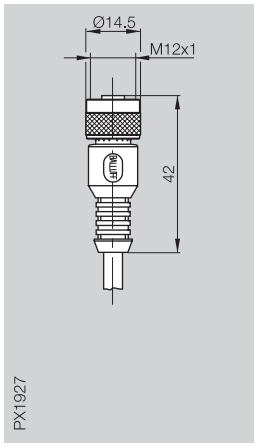
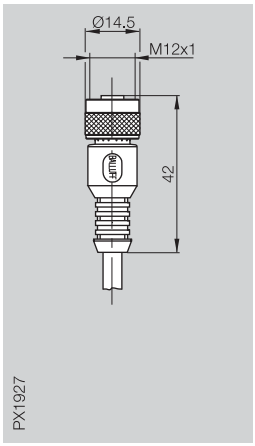
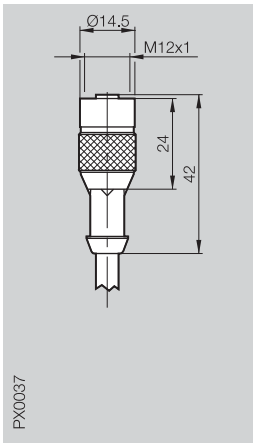
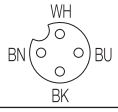
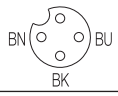
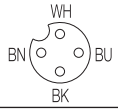
Connector with mounting thread M12×1



Sensors with connector Ordering code endings S4

Connection cable with mounting thread M12×1/M12×1



Connector			BKS-B 19	BKS-B 19	BKS-S 19	
Version			straight female	straight female	straight female	
Application			Plug sensors S4	Plug sensors S4	Plug sensors S4	
						
no LED,	NO		BKS-B 19-1-03	BKS-B 19-1-PU2-03	BKS-S 19-1-PU-03	
no LED,	NC					
no LED,	complementary		BKS-B 19-3-05		BKS-S 19-3-PU-03	
with 2 LED's,	NO,	PNP	BKS-B 19-4-05		BKS-S 19-4-PU-03	
with 2 LED's,	NC,	PNP				
with 2 LED's,	NO	NPN				
with 2 LED's,	NC,	NPN				
with 2 LED's,	complementary	PNP			BKS-S 19-8-PU-03	
with 2 LED's,	complementary	NPN			BKS-S 19-9-PU-03	
with 3 LED's,	complementary	PNP				
no LED,	NO,	2-pin, non-polarized			BKS-S 19-11-PU-03	
no LED,	NC,	2-pin, polarized/non-polarized			BKS-S 19-12-PU-05	
no LED,	NO,	2 pins, polarized			BKS-S 19-13-PU-05	
no LED,	complementary	shielded			BKS-S 19-14-PU-05*	
Supply voltage U_B			10...30 V DC	10...55 V DC	10...30 V DC	
Cable			3 m/5 m molded-on PVC	3 m molded-on PUR	3 m/5 m molded-on PUR	
No. of wires × cross-section			3×0.34 mm²/4×0.25 mm²	3×0.34 mm²	3×0.34 mm²/4×0.34 mm²	
Degree of protection per IEC 60529			IP 67	IP 67	IP 68 per BWN Pr. 20	
Ambient temperature range T_a			–25...+85 °C	**–25...+120 °C**	–25...+70 °C	
View of female side						

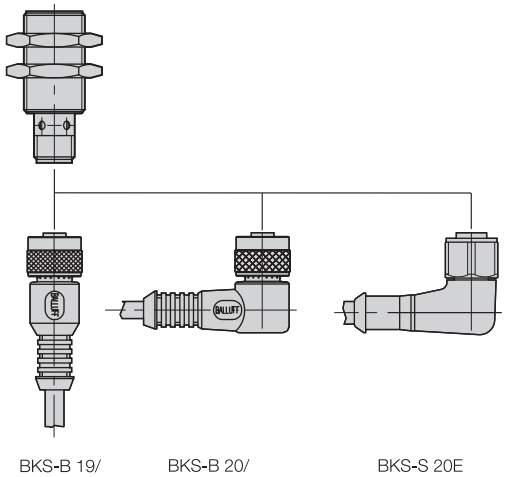
*Shield through knurled ring!

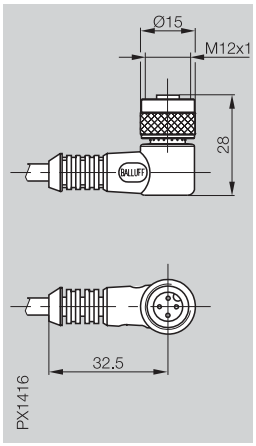
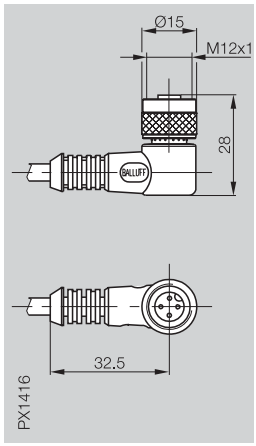
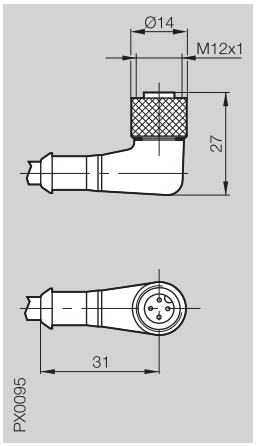
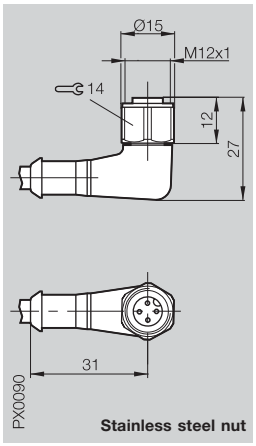
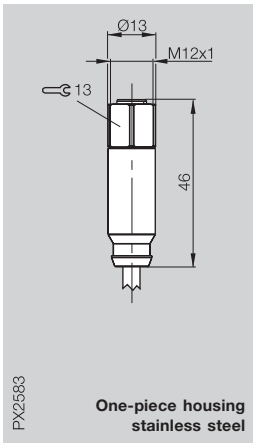
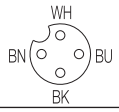
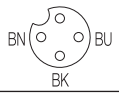
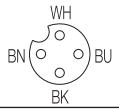
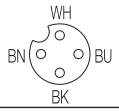
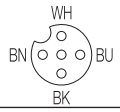
Other cable lengths and cable qualities on request.

Ordering examples
PVC, length 3 m = BKS-B 19-1-03
PUR, length 3 m = BKS-S 20-1-PU-03

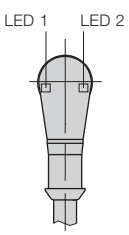
Sensors with connector Ordering code endings S4

Connector with mounting thread M12×1



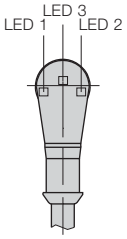
	BKS-B 20 angle female	BKS-B 20 angle female	BKS-S 20 angle female	BKS-S 20E angle female	BKS-S260-3-02 straight female
	Plug sensors S4	Plug sensors S4	Plug sensors S4	Plug sensors S4	Plug sensors S4
					
	BKS-B 20-1-03	BKS-B 20-1-PU2-03	BKS-S 20-1-PU-03		
			BKS-S 20-2-PU-05		
			BKS-S 20-3-PU-03		BKS-S260-3-02
	BKS-B 20-4-03		BKS-S 20-4-PU-03	BKS-S 20E-4-PU-03	
			BKS-S 20-5-PU-03		
			BKS-S 20-6-PU-03		
			BKS-S 20-7-PU-05		
	BKS-B 20-8-PU-03		BKS-S 20-8-PU-03	BKS-S 20E-8-PU-03	
			BKS-S 20-9-PU-05		
			BKS-S 20-10-PU-05		
			BKS-S 20-11-PU-03		
			BKS-S 20-12-PU-05		
			BKS-S 20-13-PU-05		
	10...30 V DC	10...55 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	3 m molded-on PVC/PUR	3 m molded-on PUR	3 m/5 m molded-on PUR	3 m molded-on PUR	2 m molded-on PVC
	3×0.34 mm²/4×0.25 mm²	3×0.34 mm²	3×0.34 mm²/4×0.34 mm²	3×0.34 mm²/4×0.34 mm²	4×0.34 mm²
	IP 67	IP 67	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68/IP 69K*
	–25...+85 °C	**–25...+120 °C**	–25...+70 °C	–25...+90 °C	–40...+85 °C**
					
					*when plugged together/locked

Connectors with 2 LED's



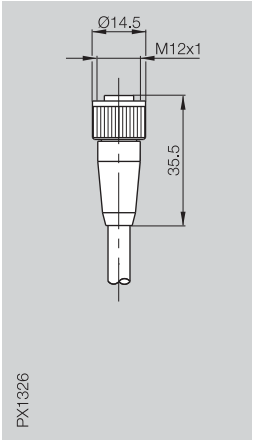
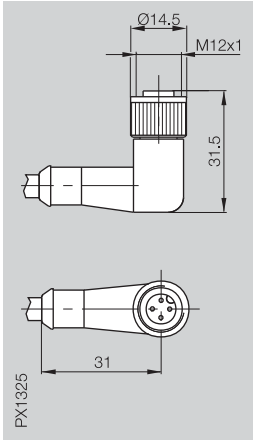
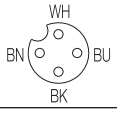
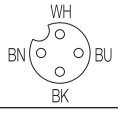
Color and function:
LED 1: yellow (NO)
LED 2: green (Power)

with 3 LED's



Color and function:
LED 1: yellow (NO)
LED 2: green (Power)
LED 3: white (NC)

**short-time 105 °C

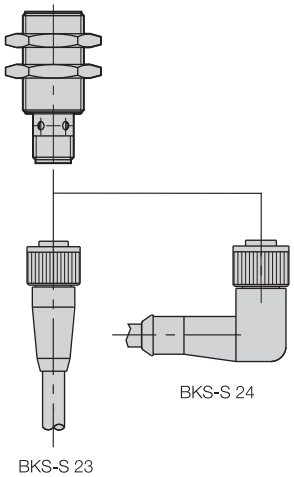
Connector	BKS-S 23	BKS-S 24			
Version	straight female	angle female			
Application	Plug sensors S4	Plug sensors S4			
					
no LED, NO	BKS-S 23-1-05				
no LED, complementary	BKS-S 23-3-05	BKS-S 24-3-03			
no LED, 5 pins					
no LED, 8-pin shielded					
Supply voltage U_B	10...30 V DC	10...30 V DC			
Cable	5 m molded-on PVC	3 m molded-on PVC			
No. of wires × cross-section	3×0.34 mm²/4×0.25 mm²	3×0.34 mm²/4×0.25 mm²			
Degree of protection per IEC 60529	IP 67	IP 67			
Ambient temperature range T_a	**–40...+105 °C**	**–40...+105 °C**			
View of female side					

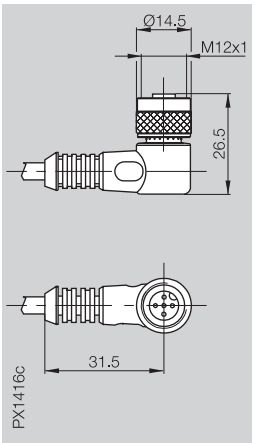
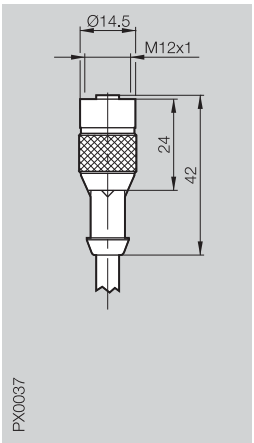
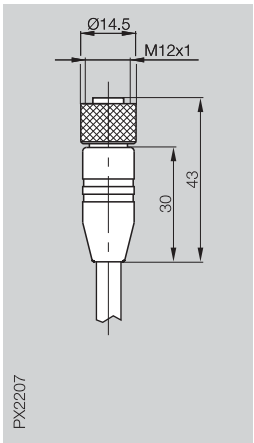
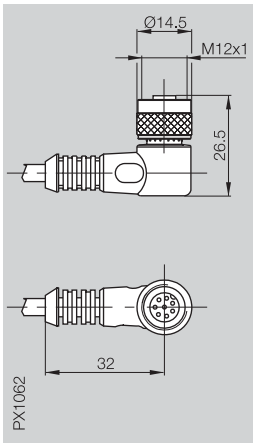
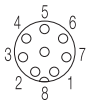
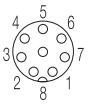
Other cable lengths and cable qualities on request.

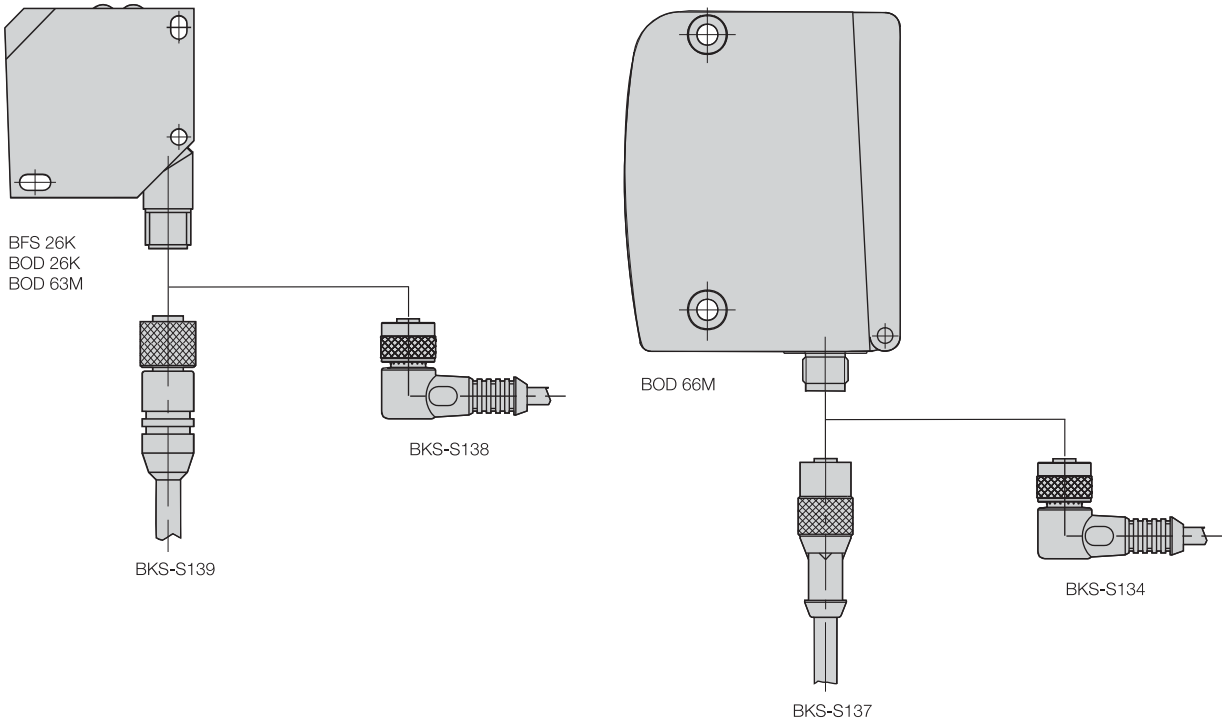
Ordering examples
PVC, length 3 m = BKS-S 23-1-03
PUR, length 3 m = BKS-S139-PU-03

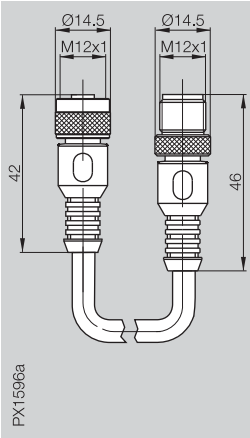
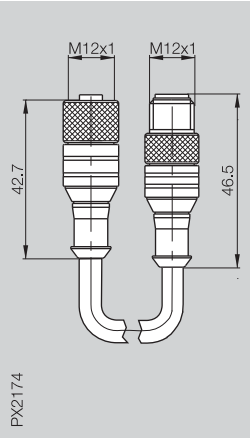
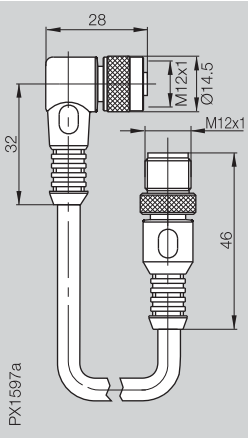
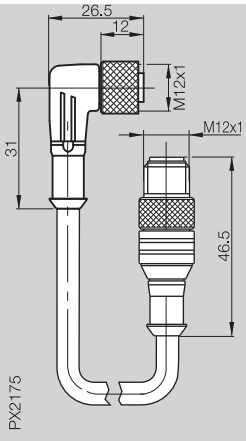
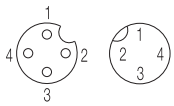
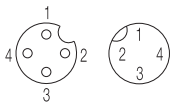
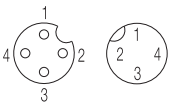
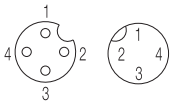
Sensors with connector Ordering code endings S4

Connector with mounting thread M12×1



	BKS-S134	**BKS-S137**	**BKS-S139**	**BKS-S138**	
	angle female	straight female	straight female	angle female	
	Plug sensors S92	Plug sensors S92	Plug sensors S115	Plug sensors S115	
					
	BKS-S134-17-05	BKS-S137-17-PU-05	BKS-S139-PU-05*	BKS-S138-PU-05**	
	10...30 V DC	10...30 V DC	10...30 V DC	30 V AC/36 V DC	
	5 m molded-on PVC	5 m molded-on PUR	5 m molded-on PUR	5 m molded-on PUR	
	5×0.25 mm²	5×0.25 mm²	8×0.25 mm²	8×0.25 mm²	
	IP 67	IP 67	IP 67	IP 67	
	–25...+85 °C	–25...+85 °C	–25...+90 °C	–25...+80 °C	
					
			*Shield through knurled ring!	**Shield up to the cable-connector body transition!	



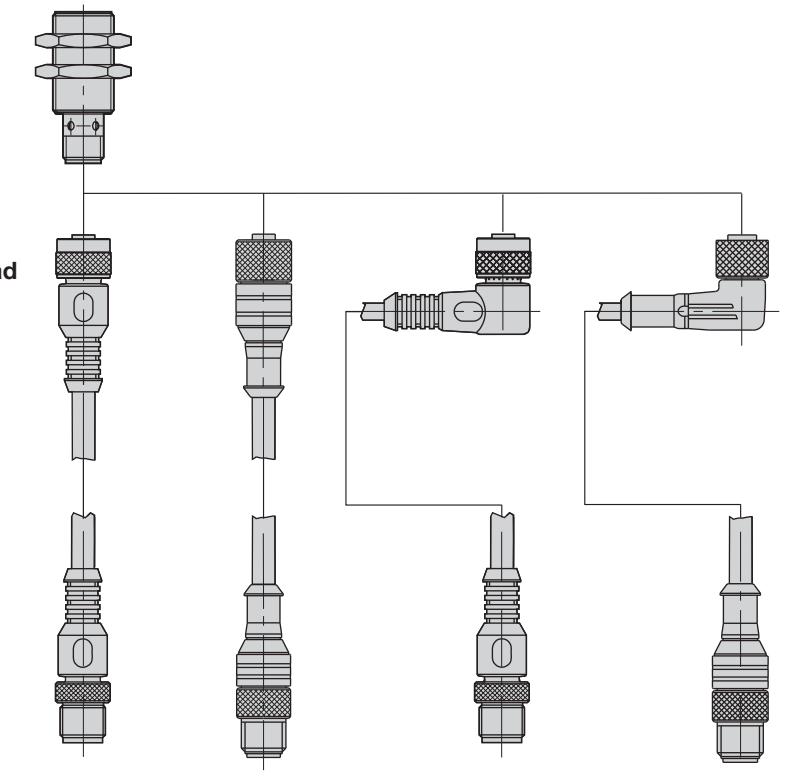
Connection cable	**BKS-B 19-_/GS4**	**BKS-S 19-_/GS4**	**BKS-B 20-_/GS4**	**BKS-S 20-_/GS4**	
Version	straight female/ straight male	straight female/ straight male	right-angle female/ straight male	right-angle female/ straight male	
Application	Plug sensors S4	Plug sensors S4	Plug sensors S4	Plug sensors S4	
					
no LED, NO	BKS-B 19-1/GS4-PU-01	BKS-S 19-1/GS4-PU-01			
no LED, complementary	BKS-B 19-3/GS4-PU-01	BKS-S 19-3/GS4-PU-01	BKS-B 20-3/GS4-PU-01	BKS-S 20-3/GS4-PU-01	
with LED, NO, PNP			BKS-B 20-4/GS4-PU-01	BKS-S 20-4/GS4-PU-01	
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Cable	1 m molded-on PUR	1 m molded-on PUR	1 m molded-on PUR	1 m molded-on PUR	
No. of wires × cross-section	3×0.34 mm²/4×0.25 mm²	3×0.34 mm²/4×0.25 mm²	3×0.34 mm²/4×0.25 mm²	3×0.34 mm²/4×0.25 mm²	
Degree of protection per IEC 60529	IP 67	IP 68 per BWN Pr. 20	IP 67	IP 68 per BWN Pr. 20	
Ambient temperature range T_a	–25...+85 °C	–25...+90 °C	–25...+85 °C	–25...+80 °C	
View of female/male side					

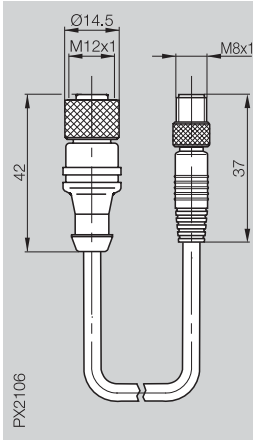
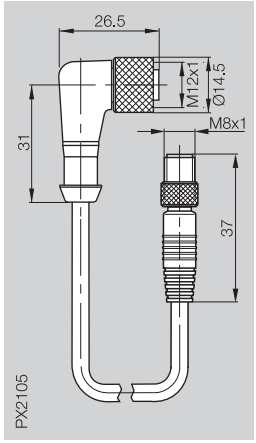
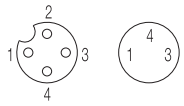
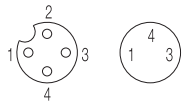
Other cable lengths and cable qualities on request.

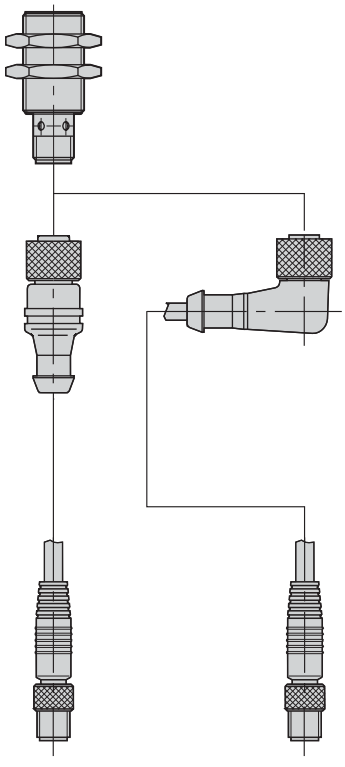
Ordering example
PUR, length 1 m = BKS-S 20-3/GS4-PU-01

Sensors with connector Ordering code endings S4

Connection cable with mounting thread M12×1

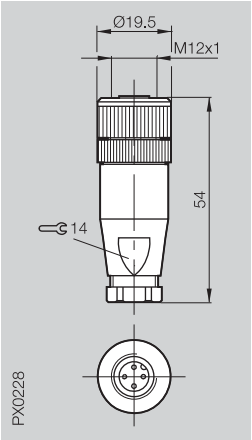
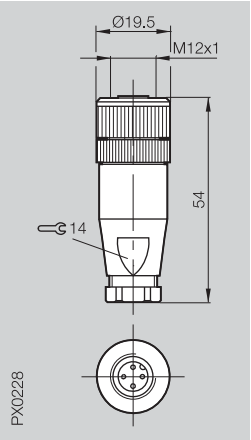
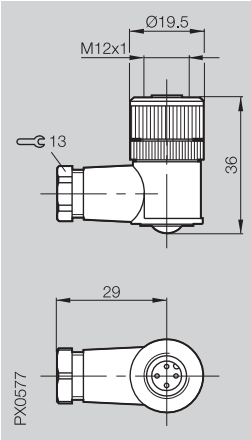
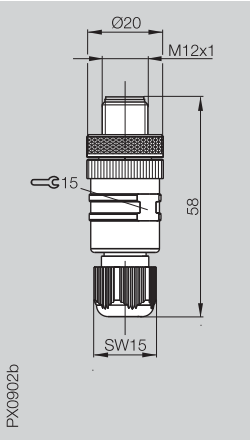
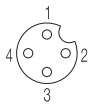
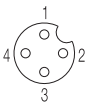
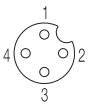


	BKS-S 19-_/GS49	BKS-S 20-_/GS49
	straight female/ straight male	right-angle female/ straight male
	Plug sensors S4	Plug sensors S4
		
	BKS-S 19-4/GS49-PU-01	BKS-S 20-4/GS49-PU-01
	10...30 V DC	10...30 V DC
	1 m molded-on PUR	1 m molded-on PUR
	3×0.34 mm²	3×0.34 mm²
	IP 67	IP 67
	–25...+80 °C	–25...+80 °C
		



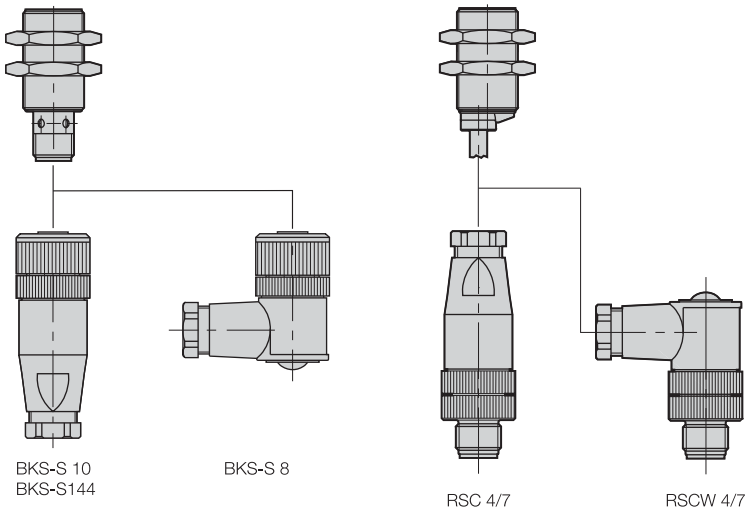
BKS-B 19-_/GS49 BKS-S 20-_/GS49

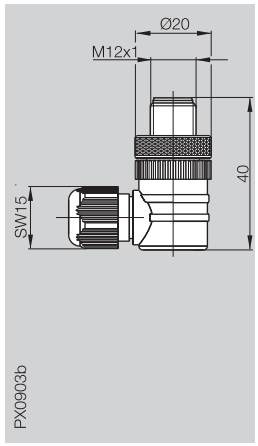
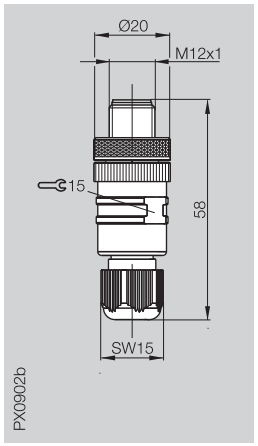
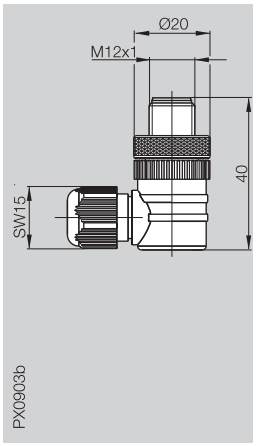
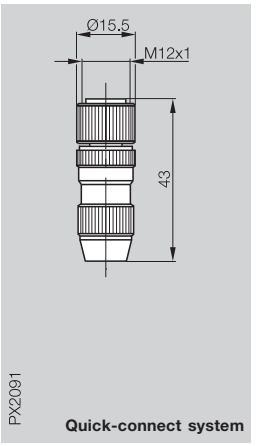
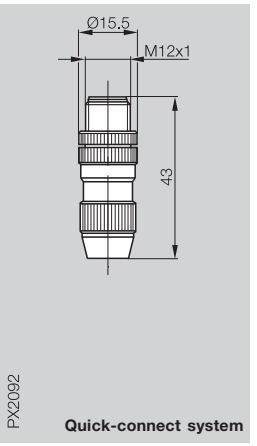
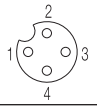
Function and color of the LED's
2 LED's: green = Power, yellow = Switching output status

Connector	**BKS-S 10**	**BKS-S144-00**	**BKS-S 8**	**RSC 4/7**	
Version	straight female	straight female	angle female	straight male	
Application	Plug sensors S4	Plug sensors S4	Plug sensors S4	female S4	
					
no LED, complementary	BKS-S 10-3	BKS-S144-00	BKS-S 8-3	RSC 4/7	
with LED, NO, PNP	BKS-S 10-4		BKS-S 8-4		
with LED, NO, NPN	BKS-S 10-6		BKS-S 8-6		
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Cable	for user assembly	for user assembly	for user assembly	for user assembly	
No. of wires × cross-section	3/4× max. 0.75 mm²	3/4× max. 0.75 mm²	3/4× max. 0.75 mm²	3/4× max. 0.75 mm²	
Cable diameter min.	Ø 4...6 mm	Ø 4...6 mm	Ø 4...6 mm	Ø 4...6 mm	
Connection	Screw terminals	Screw terminals	Screw terminals	Screw terminals	
Degree of protection per IEC 60529	IP 67	IP 68, 1 m, 30 days	IP 67	IP 67	
Ambient temperature range T_a	–40...+85 °C	**–25...+100 °C**	–40...+85 °C	–25...+90 °C	
View of female/male side					

Sensors with connector Ordering code endings S4 or sensors with cable

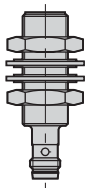
Connector for user assembly with connecting thread M12×1



	RSCW 4/7	RSC 5/7	RSCW 5/7	BKS-S107-RT14	BKS-S109-RT14
	angle male	straight male	angle male	straight female	straight male
	female S4	female S4	female S4	Plug sensors S4	female S4
					
	RSCW 4/7	RSC 5/7	RSCW 5/7	BKS-S107-RT14	BKS-S109-RT14
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	for user assembly	for user assembly	for user assembly	for user assembly	for user assembly
	3/4× max. 0.75 mm²	5× max. 0.75 mm²	5× max. 0.75 mm²	3/4× 0.14...0.34 mm²	3/4× 0.14...0.34 mm²
	Ø 4...6 mm	Ø 3...6.5 mm	Ø 3...6.5 mm	Ø 4...5.1 mm	Ø 4...5.1 mm
	Screw terminals	Screw terminals	Screw terminals	Insulation displacement	Insulation displacement
	IP 67	IP 67	IP 67	IDC	IDC
	–25...+90 °C	–25...+90 °C	–25...+90 °C	IP 67	IP 67
				–25...+85 °C*	–25...+85 °C*
					

*Assembling the cable to the connector over temperature range –5...+50 °C

Sensors with connector Ordering code endings S4



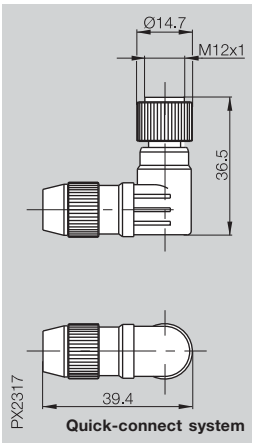
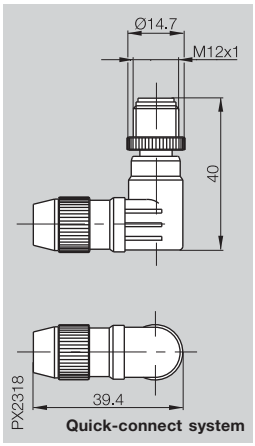
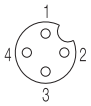
Connectors for user assembly with connecting thread M12×1



BKS-S107-RT14

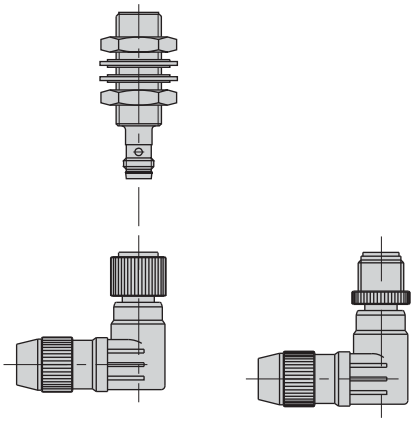


BKS-S109-RT14

Connector	**BKS-S 76-RT04**	**BKS-S 77-RT04**			
Version	angle female	angle male			
Application	Plug sensors S4	female S4			
					
no LED, complementary	BKS-S 76-RT04	BKS-S 77-RT04			
Supply voltage U_B	10...30 V DC	10...30 V DC			
Cable	for user assembly	for user assembly			
No. of wires × cross-section	3/4× 0.25...0.5 mm²	3/4× 0.25...0.5 mm²			
Cable diameter min.	Ø 4...5.1 mm	Ø 4...5.1 mm			
Connection	Insulation displacement	Insulation displacement			
Degree of protection per IEC 60529	IDC	IDC			
Ambient temperature range T_a	IP 67	IP 67			
	–25...+85 °C	–25...+85 °C			
View of female/male side					

Sensors with connector Ordering code endings S4

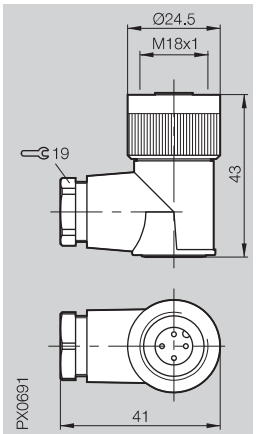
Connector for user assembly with connecting thread M12×1



BKS-S 76-RT04 BKS-S 77-RT04

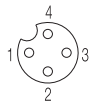
BKS-S 7-1
angle female

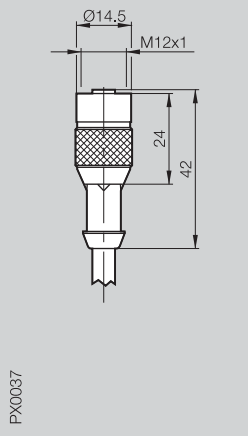
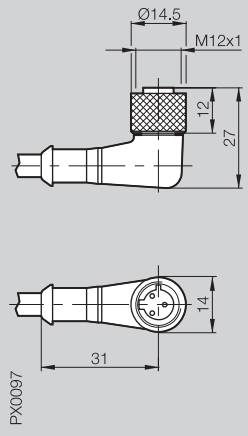
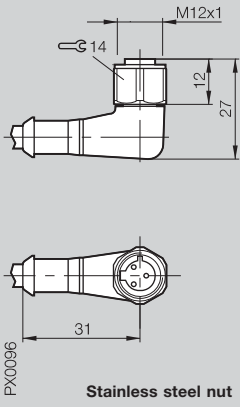
BES 516-300-S203



BKS-S 7-1

10...30 V DC
for user assembly
3/4× 0.5...0.75 mm²
Ø 6.5...8 mm
Screw terminals
IP 65
–40...+85 °C

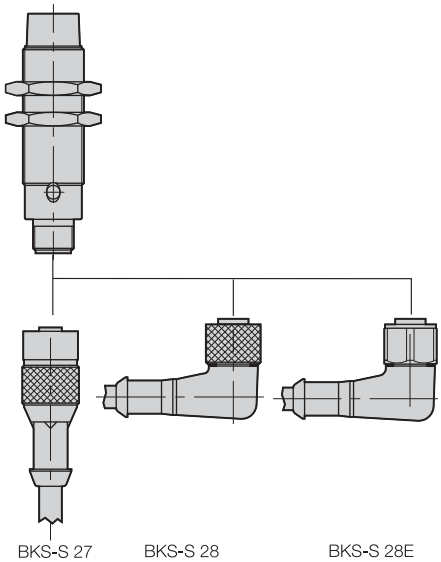


Connector	BKS-S 27	BKS-S 28	BKS-S 28E		
Version	straight female	angle female	angle female		
Application	Plug sensors S27	Plug sensors S27	Plug sensors S27		
					
no LED, NC or NO	BKS-S 27-03	BKS-S 28-03	BKS-S 28E-03		
Supply voltage U_B	20...250 V AC/DC	300 V AC	300 V AC		
Cable	3 m molded-on PVC	3 m molded-on PVC	3 m molded-on PVC		
No. of wires × cross-section	3×0.5 mm²	3×0.5 mm²	3×0.5 mm²		
Cable diameter					
Degree of protection per IEC 60529	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20	IP 68 per BWN Pr. 20		
Ambient temperature range T_a	–25...+90 °C	–25...+90 °C	–25...+90 °C		
View of female side					

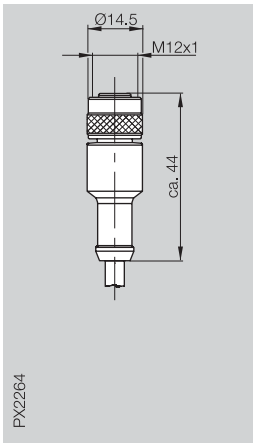
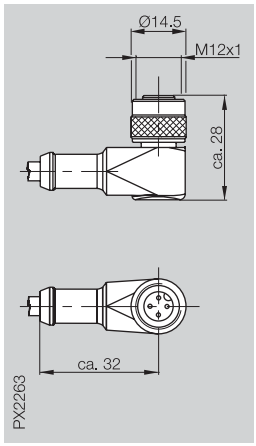
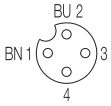
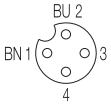
Other cable lengths and cable qualities on request.

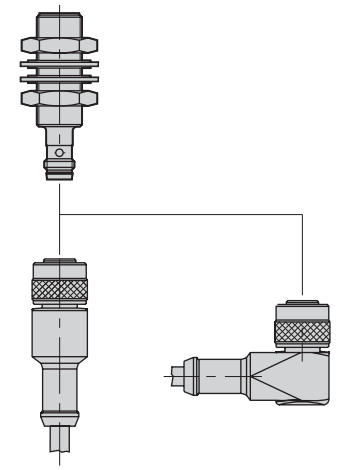
Ordering example
PVC, length 3 m = BKS-S 27-03

Sensors with connector
Ordering code endings S27



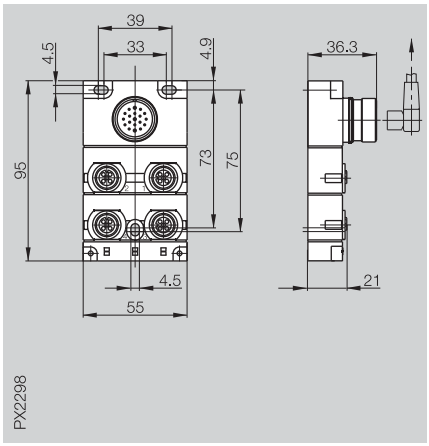
Connectors with
M12×1 thread

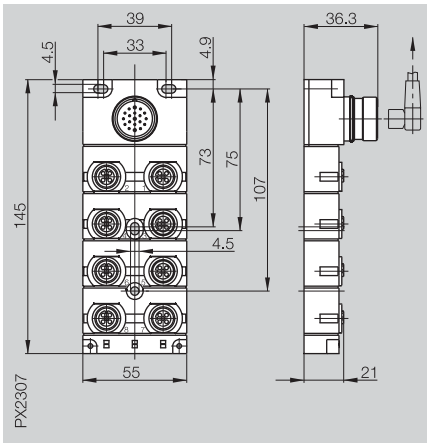
	BKS-S220-12	BKS-S221-12
	straight female	angle female
	Namur sensors	Namur sensors
	Pinout EN 60947-5-6	Pinout EN 60947-5-6
		
	BKS-S220-12-PB-02	BKS-S221-12-PB-02
	10...30 V DC	10...30 V DC
	2 m molded-on PUR	2 m molded-on PUR
	2×0.34 mm²	2×0.34 mm²
	Ø 4.5...±0.2 mm	Ø 4.5...±0.2 mm
	IP 68	IP 68
	–25...+80 °C	–25...+80 °C
		
	Cable color blue	Cable color blue

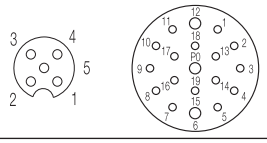
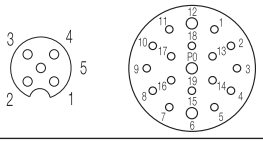


BKS-S220-12 BKS-S221-12

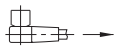
Splitter Boxes	**BSB-04-F01P/4-...**	**BSB-04-F01P/8-...**
Version	4× connectors	8× connectors





Ordering code	BSB-04-F01P/4-M01M-2319	BSB-04-F01P/8-M01M-2319
Rated operational voltage U_e	24 V DC	24 V DC
Supply voltage U_B	18...30 V DC	18...30 V DC
Function indicator	LED yellow	LED yellow
Power-on indicator	LED green	LED green
Sensor connection	5-pole female, M12×1	5-pole female, M12×1
Control side connection	M23 connector, 19-pin	M23 connector, 19-pin
Number of connections	4	8
Current load capacity	max. 4 A per contact	max. 4 A per contact
Total current	max. 12 A at +60 °C	max. 12 A at +60 °C
Housing material	GD-Zn	GD-Zn
Degree of protection per IEC 60529	IP 67 (when connected)	IP 67 (when connected)
Ambient temperature range T_a	–25...+90 °C	–25...+90 °C
View of female/male side		

Other cable lengths and cable qualities on request.

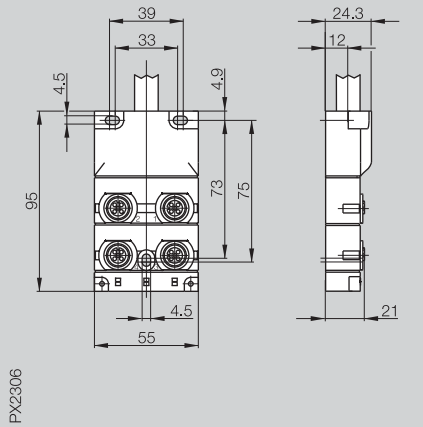
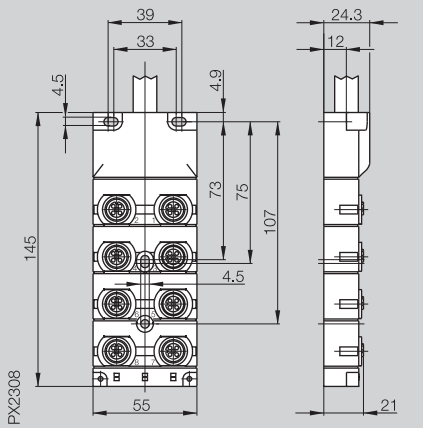
 Connector orientation

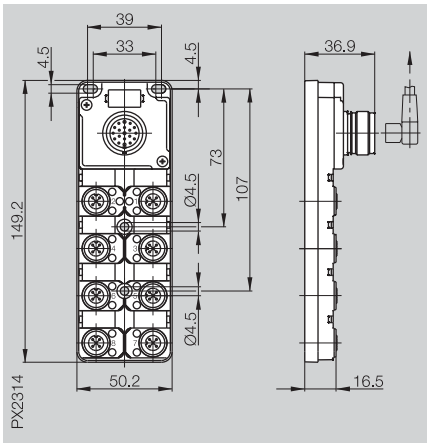
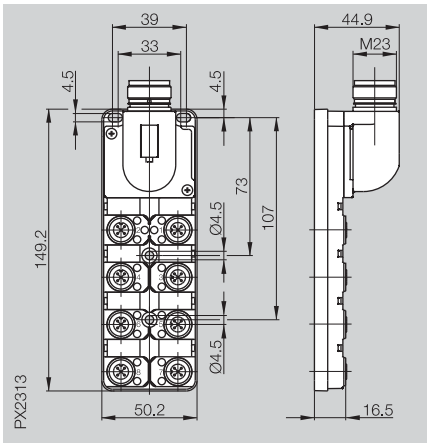
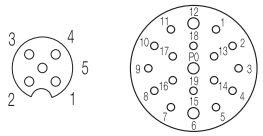
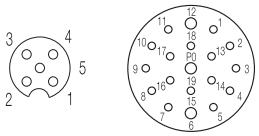




We offer a wide variety of passive actuator/sensor boxes. These allow the user to collect signals in the field and pass them centrally to a controller or to pass signals from the controller to the actuators.

This enables organized and decentralized wiring of the peripherals. With their light, compact design, the M8 and M12 distribution boxes with up to 8 connections take up little room and are used in machines and systems where space is at a premium.

	BSB-04-F01P/4-...	BSB-04-F01P/8-...
	4× cable	8× cable
		
	BSB-04-F01P/4-M02M-KP-05	BSB-04-F01P/8-M02M-KP-05
	24 V DC	24 V DC
	18...30 V DC	18...30 V DC
	LED yellow	LED yellow
	LED green	LED green
	5-pole female, M12×1	5-pole female, M12×1
	5 m molded-on PUR cable	5 m molded-on PUR cable
	8×0.5 mm² and 3×1 mm²	16×0.5 mm² and 3×1 mm²
	4	8
	max. 4 A per contact	max. 4 A per contact
	max. 12 A at +60 °C	max. 12 A at +60 °C
	GD-Zn	GD-Zn
	IP 67 (when connected)	IP 67 (when connected)
	–25...+90 °C	–25...+90 °C
		
		

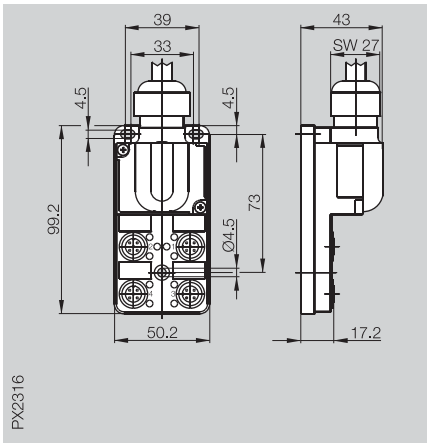
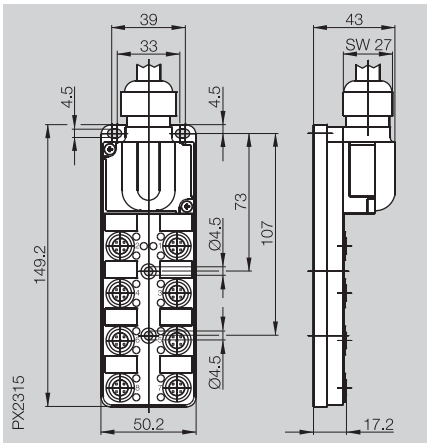
Splitter Boxes	**BSB-04-F02P/8-...**	**BSB-04-F02P/8-...**
Version	8× connectors	8× connectors
		
Ordering code	BSB-04-F02P/8-M01K-2319	BSB-04-F02P/8-M02K-2319
Rated operational voltage U_e	24 V DC	24 V DC
Supply voltage U_B	18...30 V DC	18...30 V DC
Function indicator	LED yellow	LED yellow
Power-on indicator	LED green	LED green
Sensor connection	5-pole female, M12×1	5-pole female, M12×1
Control side connection	M23 connector, 19-pin	M23 connector, 19-pin
Number of connections	8	8
Current load capacity	max. 4 A per contact	max. 4 A per contact
Total current	max. 16 A at +60 °C	max. 16 A at +60 °C
Potential isolation		
Housing material	PA 66	PA 66
Degree of protection per IEC 60529	IP 67 (when connected)	IP 67 (when connected)
Ambient temperature range T_a	–20...+80 °C	–20...+80 °C
View of female/male side		

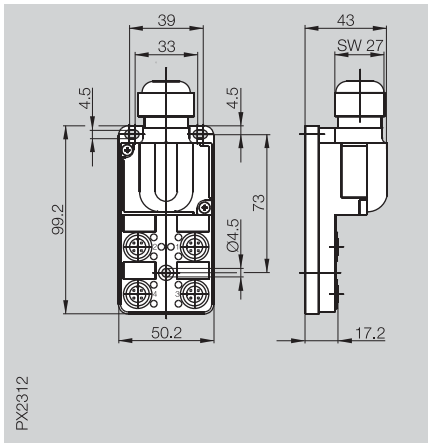
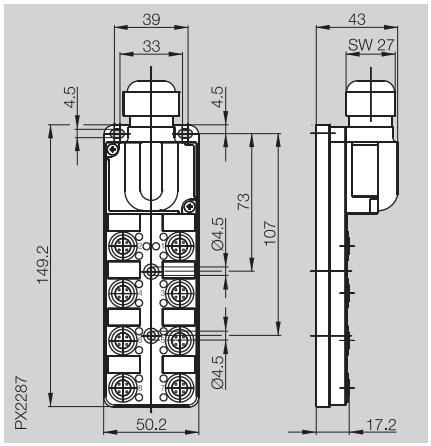
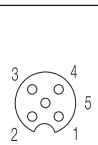
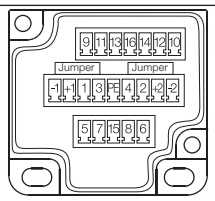
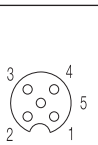
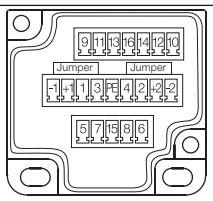
Other cable lengths and cable qualities on request.

Connector orientation





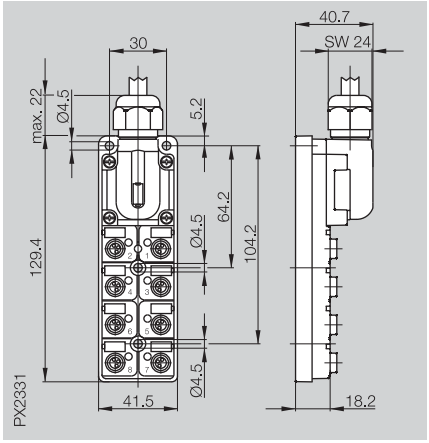
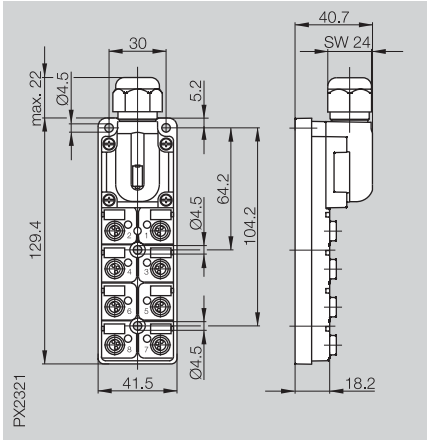
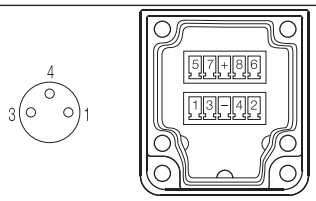
	BSB-04-P01P/4-...	BSB-04-P01P/8-...
	4× cable	8× cable
		
	BSB-04-P01P/4-M02K-HKP-05	BSB-04-P01P/8-M02K-HKP-05
	24 V DC	24 V DC
	18...30 V DC	18...30 V DC
	LED yellow	LED yellow
	LED green	LED green
	5-pole female, M12×1	5-pole female, M12×1
	5 m molded-on PUR cable 8×0.34 mm² and 5×0.75 mm²	5 m molded-on PUR cable 16×0.34 mm² and 5×0.75 mm²
	4	8
	max. 4 A per contact	max. 4 A per contact
	max. 8 A with single power feed max. 16 A with double power feed	max. 8 A with single power feed max. 16 A with double power feed
	Possible with removable jumper	Possible with removable jumper
	PBT	PBT
	IP 67 (when connected)	IP 67 (when connected)
	–20...+80 °C	–20...+80 °C
		
		

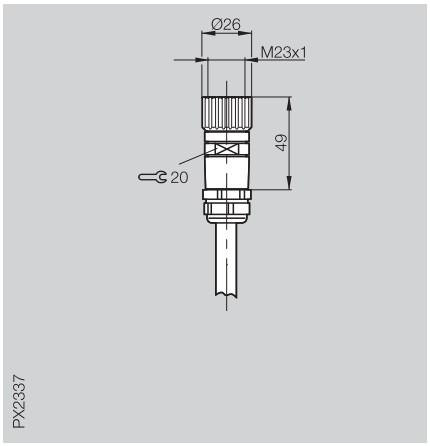
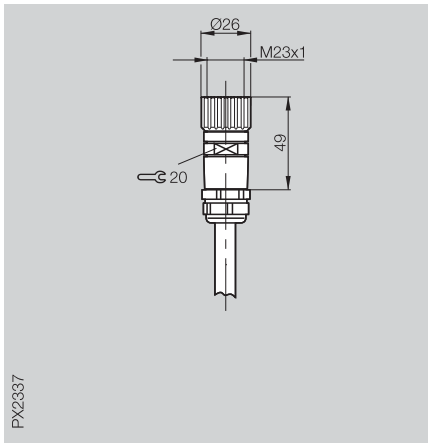
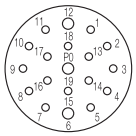
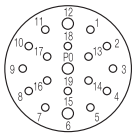
Splitter Boxes	**BSB-04-P01P/4-...**	**BSB-04-P01P/8-...**
Version	4× with cover (no connection)	3× with cover (no connection)
		
Ordering code	BSB-04-P01P/4-M02K-HTS	BSB-04-P01P/8-M02K-HTS
Rated operational voltage U_e	24 V DC	24 V DC
Supply voltage U_B	18...30 V DC	18...30 V DC
Function indicator	LED yellow	LED yellow
Power-on indicator	LED green	LED green
Sensor connection	5-pole female, M12×1	5-pole female, M12×1
Control side connection	Plug-in terminals	Plug-in terminals
Number of connections	4	8
Current load capacity	max. 4 A per contact	max. 4 A per contact
Total current	max. 8 A with single power feed max. 16 A with double power feed	max. 8 A with single power feed max. 16 A with double power feed
Potential isolation	Possible with removable jumper	Possible with removable jumper
Housing material	PBT	PBT
Degree of protection per IEC 60529	IP 67 (when connected)	IP 67 (when connected)
Ambient temperature range T_a	–20...+80 °C	–20...+80 °C
View of female/male side	 	 

Other cable lengths and cable qualities on request.





	BSB-49-F01P/8-...	BSB-49-F01P/8-...
	8× cable	8× with cover (no connection)
		
	BSB-49-F01P/8-M02K-KP-05	BSB-49-F01P/8-M02K-HTS
	24 V DC	24 V DC
	18...30 V DC	18...30 V DC
	LED yellow	LED yellow
	LED green	LED green
	3-pole female, M8×1	3-pole female, M8×1
	5 m molded-on PUR cable 8×0.34 mm² and 2×0.75 mm²	Plug-in terminals
	8	8
	max. 2 A per contact	max. 2 A per contact
	max. 6 A	max. 6 A
	PBT	PBT
	IP 67 (when connected)	IP 67 (when connected)
	–25...+85 °C	–25...+85 °C
		
		

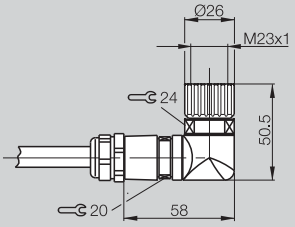
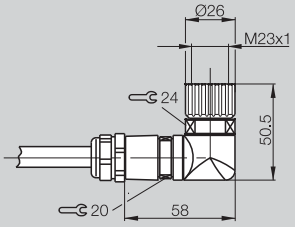
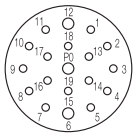
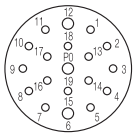
Connector	**BKS-S196**	**BKS-S196**	
Version	straight female	straight female	
Application	4× splitter box connection	8× splitter box connection	
			
Ordering code M23, 19-pin	BKS-S196-21-PU-05	BKS-S196-22-PU-05	
Supply voltage U_B	18...30 V DC	18...30 V DC	
Cable	5 m molded-on PUR	5 m molded-on PUR	
No. of wires × cross-section	8×0.34 mm² and 3×0.75 mm²	16×0.34 mm² and 3×0.75 mm²	
Degree of protection per IEC 60529	IP 67	IP 67	
Ambient temperature range T_a	–20...+80 °C	–20...+80 °C	
Housing material	CuZn	CuZn	
View of female side			

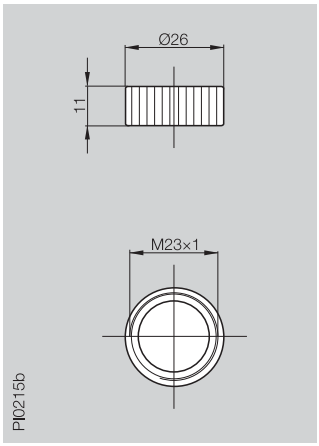
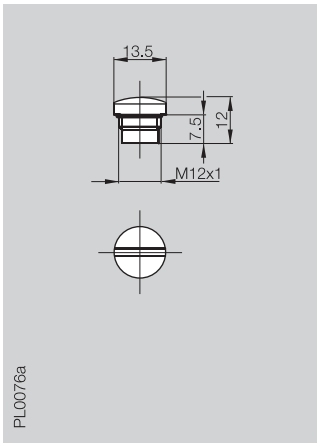
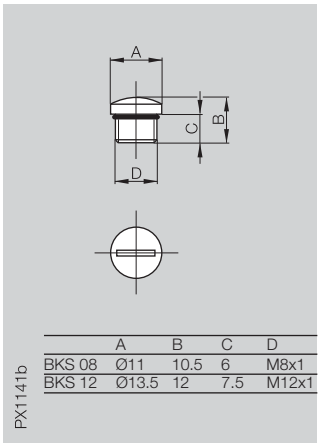
Other cable lengths and cable qualities on request.

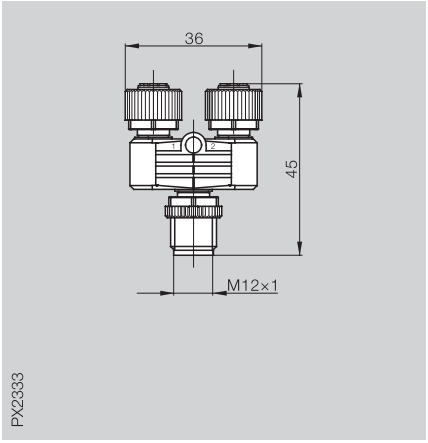
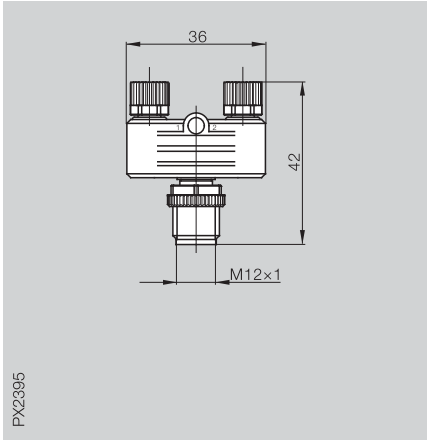
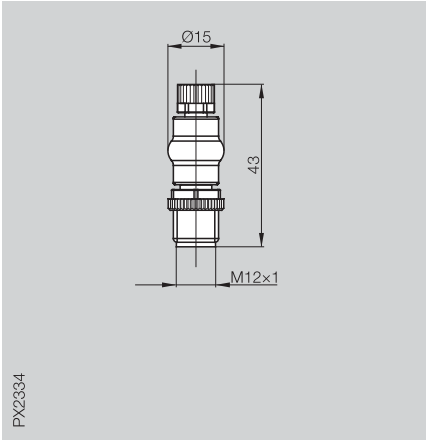
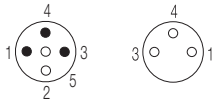
Ordering example
BKS-S196-21-PU-05 = PUR length 5 m





	BKS-S197	**BKS-S197**	
	right-angle female	right-angle female	
	4× splitter box connection	8× splitter box connection	
	 PX2336	 PX2336	
	BKS-S197-21-PU-05	BKS-S197-22-PU-05	
	18...30 V DC	18...30 V DC	
	5 m molded-on PUR	5 m molded-on PUR	
	8×0.34 mm2 and 3×0.75 mm²	16×0.34 mm² and 3×0.75 mm²	
	IP 67	IP 67	
	–20...+80 °C	–20...+80 °C	
	CuZn	CuZn	
			
			

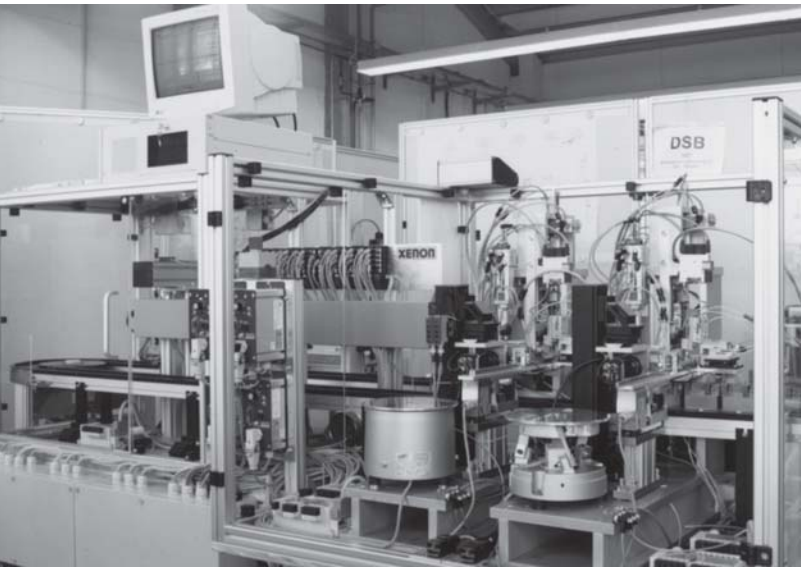
Description	**Screw plug M23**	**Screw plug M12**	**Screw plug M8, M12**
Application	IP 65 screw plug for unused connectors in BSB Splitter Boxes	IP 65 screw plug for unused connectors in BSB Splitter Boxes	IP 65 screw plug for unused connectors in BSB Splitter Boxes
			
			A B C D BKS 08 Ø11 10.5 6 M8x1 BKS 12 Ø13.5 12 7.5 M12x1
Ordering code	BKS 23-CS-00	BKS 12-CS-01	BKS 08-CS-00 BKS 12-CS-00
Supply voltage U_B			
Rated operational current I_e			
Degree of protection per IEC 60529			
Ambient temperature range T_a	–20...+80 °C	–20...+80 °C	–20...+80 °C
Housing material	CuZn coated	CuZn coated	PA/PBT
View of female side			
			

	Tee	Tee	Adapter
	M12 male to M12 female 2× 2 signals to one port	M12 male to M8 female 2× 2 signals to one port	M12 male 3-pin to M8 female 3-pin
			
	BKS-S4-TM1-01	BKS-S49-TM1-02	BKS-S4-GM1-01/S49
	max. 24 V DC	max. 24 V DC	max. 24 V DC
	max. 4 A per contact	max. 4 A per contact	max. 4 A per contact
	IP 67	IP 67	IP 67
	–25...+90 °C	–25...+90 °C	–25...+85 °C
	GD-Zn coated	GD-Zn coated	GD-Zn coated
			









BSB Plastic Splitter Boxes

Light and compact M8- and M12 plastic splitter boxes are used wherever space is at a premium or moving machine members are present. The plastic splitter boxes come either complete or in modular form.

Features

- Customized, versatile and light, usable as M8 or M12 splitter boxes
- Quick assembly and disassembly for transport
- Potential isolation using jumpers

Typical applications for the plastic version

- Assembly and handling machinery
- Packaging
- Specialty machine building



BSB Metal Splitter Boxes

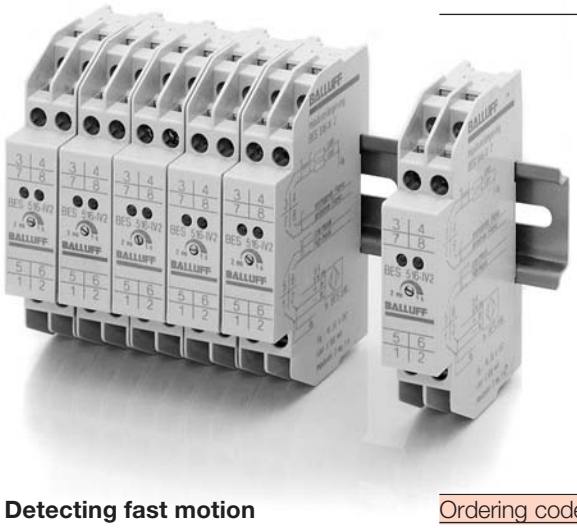
Fully potted metal splitter boxes offer maximum protection and security in harsh environments. These splitter boxes are especially tough, making them ideal for use in harsh conditions in machines and systems. Imperviousness, toughness and tight sealing are the requirements in such environments.

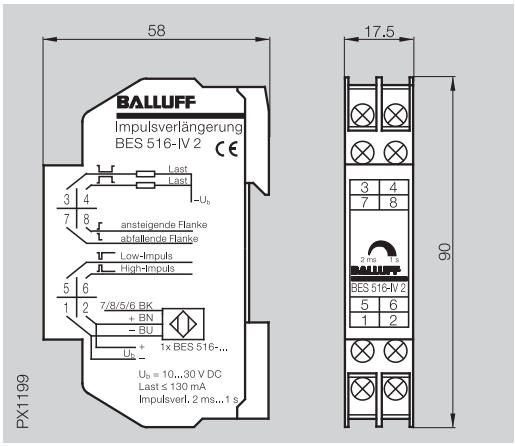
Features

- Tough and tightly sealed for extreme conditions
- Resistant to common coolants and lubricants
- High shock rating up to 50 g, vibration-proof
- Temperature resistant from –25...+90 °C

Typical applications for the metal version

- Machine tools and machining centers
- Automobile industry
- Metal forming
- Foundries





Detecting fast motion

Sound like your problem?

Rapid motions on machines mean that the proximity switches are only actuated for a short time.
The length of the sensor output signal – whether inductive, capacitive or photoelectric – is then not on long enough to ensure reliable processing. The controller does not recognize the output signal due to the former's cycle time.

The result:

Important information in the controller sequence is lost. This can pose a risk to your machine!

The solution:

Balluff Pulse Extender BES 516-IV 2.
Only the rising or falling edge of the output signal from a sensor is enough to drive this device. The extender creates a proper pulse that can be detected by your controller. The length is adjustable from 2 ms to 1 sec.
Small and space-saving, the device can be installed on a rail in accordance with EN 50022-35.

Description	**Pulse extender**
Ordering code	BES 516-IV 2
Output (LED indicators)	Sourcing (PNP), complementary
Adjustable pulse extender	2 ms...1 s
Set value	200 ms (+50 ms)
Input 7/8	referenced to the respective edge of the input signal
Input 5/6	referenced to the pulse end of the input signal
Repeatability	< 10 %
Input	1 PNP- or 1 NPN-NO or NC
min. input pulse length	1.5 ms
Supply voltage U_B	10...30 V DC (Input voltage = output voltage)
Ripple	≤ 15 %
No-load current	approx. 20 mA
Output current	≤ 130 mA
Permissible load capacitance	≤ 0.5 µF/24 V
Ambient temperature range T_a	0...60 °C
Housing attachment	DIN rail EN 50022-35
max. wire cross-section	2×2.5 mm²
Degree of protection per IEC 60529	Housing IP 40/terminals IP 20
Output 3	Low-pulse, extended
4	High-pulse, extended
Input 7	falling edge
8	rising edge
5	Low-pulse
6	High-pulse
1	$-U_B$
2	$+U_B$
falling edge	Output signal is triggered by falling edge
rising edge	Output signal is triggered by rising edge
Low-pulse	PNP-NC/NPN-NO short damped PNP-NO/NPN-NC short undamped
High-pulse	PNP-NO/NPN-NC short damped PNP-NC/NPN-NO short undamped

Remarks

Protected against overload (by PTC), against reversal of plus and minus.
All sensors (DC, 3-/4-wire) can be connected, either NO or NC. Either both or one of the outputs may be connected.

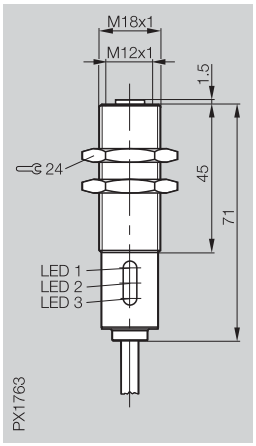
Analog switching amplifier for direct installation

This switching amplifier allows you to easily program sensors having an analog output signal, such as the BOD family, with three switchpoints for direct programming.

The sensor connected to the switching amplifier is simply brought to the desired switching distance from the target. Then connecting the control line to the (+) side of the supply voltage enables a "Teach-in" mode, whereby the set distance is assigned to the signal level present and this value is stored in the device. This procedure is assisted using LED's. During operation these LED's are available as switching state indicators.

For sensors with a temperature output the analog temperature signal is made available in unchanged form on the device output.

Housing size	**M18×1**
Application	Analog sensors BOD



PNP analog and PNP NO	BES 516-615-PS-1-PU-05
PNP analog and NPN NO	BES 516-615-NS-1-PU-05
Rated operational voltage U_e	24 V DC
Supply voltage U_B	15...30 V DC
Ripple	≤ 15 % of U_e
Rated insulation voltage U_i	75 V DC
Rated operational current I_e per output	100 mA
No-load supply current I_0 max.	≤ 20 mA
Off-state current I_r	≤ 10 µA
Polarity reversal protected	only against ±-reversal
Short circuit protected	yes
Ambient temperature range T_a	–10...+70 °C
Switching frequency f	2 kHz
Utilization category	DC 13
Function indicator for each output	yes
Analog input	
Input voltage U_{in}	0...10 V (brought out to output A)
Input impedance	4.2 kΩ
Switching outputs	
Freely programmable switching outputs	3
Hysteresis H	500 mV
Temperature drift	≤ 2 % of U_{in} max.
Degree of protection per IEC 60529	IP 67
Housing material	CuZn coated
Connection input/output	Connector/ 5 m Cable PUR
No. of wires × cross-section	7×0.25 mm²

Wiring example

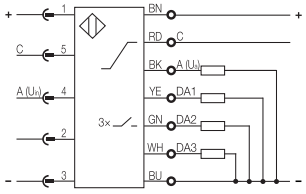
Inductive distance sensors **Analog switching amplifier**



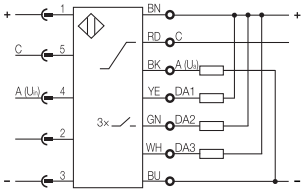
BOD... BES 516-615-PS-1-PU-05

Wiring diagrams

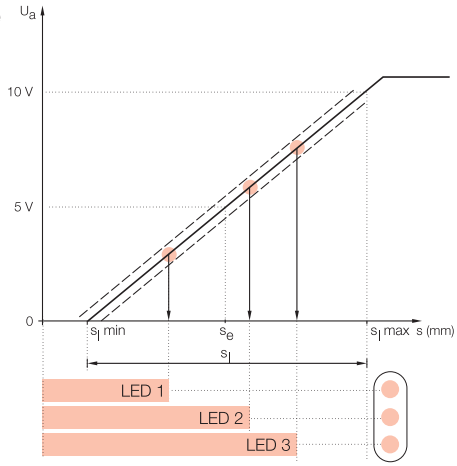
PNP analog and PNP NO



PNP analog and NPN NO



Approach curve





Analog switching amplifier for control cabinet installation

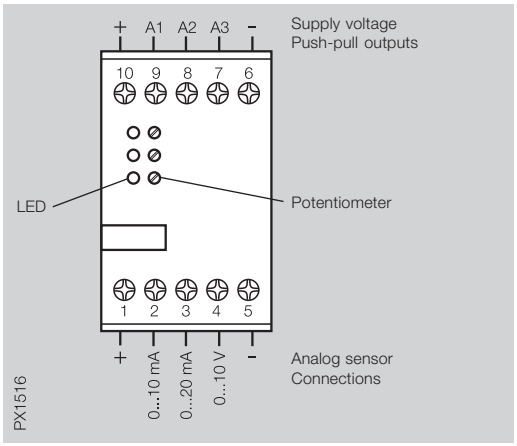
The analog switching amplifier is powered with 24 V and provides the supply voltage for analog sensors like the Balluff BOD. The device is driven directly by the current signals (2) or voltage signals (4).

From this signal, separate push-pull final stages (PNP/NPN) are used to create three switch points (A1...A3) which can be set independently using the potentiometer on the front side. The respective switching state is indicated by an associated LED. The operating direction (rising/falling) can be set using DIP switches inside the unit. This circuit allows width-adjustable “ranges” to be defined (cascading).

The voltage signal (4) proportional to the current can be used to drive additional switching amplifiers (expansion for additional switch points).

The signal inputs on the analog switching amplifier are protected against polarity reversal and the push-pull output stages against short circuit (internal fuses).

Description	**Analog switching amplifier** for analog current and voltage signals
Application	Analog sensors BOD



Ordering code	BES 516-611-A-1
Supply voltage U_B	24 V DC ±10 %
Ripple	≤ 10 %
Input circuit	
Current input terminal 2/terminal 3	0...10 mA/0...20 mA
Input impedance	308 Ω/154 Ω
Voltage input terminal 4	0...10 V
Input impedance	13 kΩ
Adjustment range	3...100 %
Hysteresis (referenced to set value)	3 %
Output current circuit	
Voltage drop PNP-Transistor	≤ 3.5 V
Voltage drop NPN-Transistor	≤ 2.5 V
Operating current per push-pull stage	≤ 200 mA
Housing material	PC (glass fiber reinforced)
Housing dimensions	74×45×120 mm
Connection	Screw terminals
max. wire cross-section	up to 2.5 mm²
Housing attachment	Snap mount on rail
Ambient temperature range T_a	0...+50 °C
Degree of protection per IEC 60529	Terminals IP 20, housing IP 40

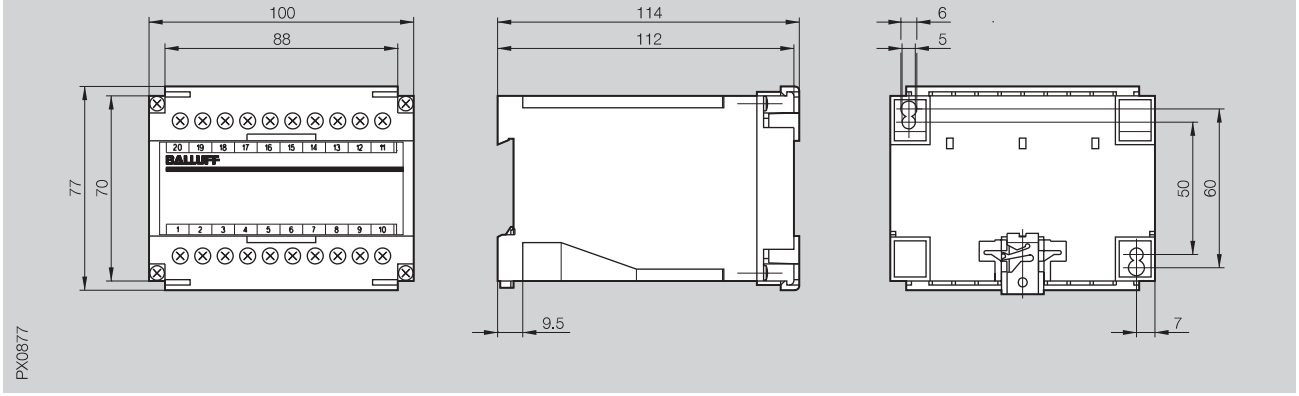


The relay output types are suitable for operating with NPN or PNP proximity switches.
For operating with PNP switches connect the terminals 5, 9 and 10 and with NPN switches the terminals 4, 9 and 10.

The power supplies are normally adjusted for an input voltage range of 220 V AC (terminals 1 and 3).

The switch to 110 V AC is made in the unit:
Remove the two connections from Terminal 2. Connect the free black connection to Terminal 1 and the white one to Terminal 3.

Description	
Version	
Ordering code	
Input voltage	
Output voltage	
Ripple	
Current consumption	
Output current	
Housing	
Ambient temperature range T_a	
Storage temperature	
Connections	
Housing attachment	
Relay functions	switching voltage
	coil voltage
	switching current
	switching power

	Power supply B-3 with 2 integrated output relays 723 Ω each	Power supply Z-3 with 2 integrated output relays each 723 Ω and positive opening contacts	Power supply A-3 no output relay
			
	BES 516-706-B-3	BES 516-706-Z-3	BES 516-706-A-3
	110/220 V AC ±10 %, 50 Hz		
	24 V DC ±20 %		
	≤ 10 % per DIN 41755 1.2.2		
	max. 20 VA		
	max. 0.5 A		
	Gray thermoplastic, temperature resistant to +100 °C		
	–20...+60 °C		
	–20...+60 °C		
	20 connection terminals for 2×2.5 mm²		
	Screw or snap-rail mounting for attaching to 35 mm standard rail per DIN 46277		
	max. 250 V DC/max. 380 V AC	max. 250 V DC	max. 250 V DC/max. 380 V AC
	17.5...28.2 V DC	17.5...28.2 V DC	17.5...28.2 V DC
	max. 5 A	max. 8 A	max. 5 A
	max. 250 VA DC/max. 1100 VA AC	max. 250 VA DC/max. 1700 VA AC	max. 250 VA DC/max. 1100 VA AC



Description
Application

CE

Ordering code

Output voltage
LED indicators
Battery type

Sensor connection
Degree of protection per IEC 60529
Housing material

Tester
BES 516-3

is an easy-to-use manual tester for PNP/NPN normally open and normally closed sensors.

- No current limitation
- Audible signal
- Automatic PNP/NPN detection
- LED and buzzer
- Power provided by 2×9 V batteries

Tester/Programmer
BES 516-4

This programming device provides an easy way to perform the following tests and calibration on sensors:

- Program the switching distance of analog sensors
- Sensors with teach-in switching points can also be programmed
- Testing a 3-wire BES switch
- Testing a 2-wire BES switch

New sensor tester
BES 516-7

Sensor tester with Balluff design and improved features

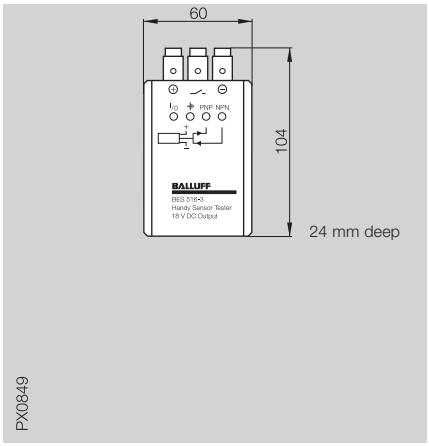
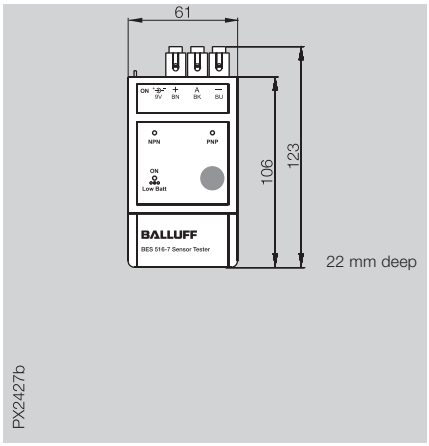
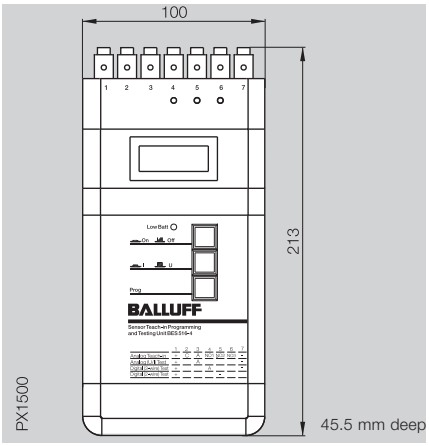
With the new BES 516-7 sensor tester you get a tester compatible with current Balluff design. Flatter, easier to use and visually attractive.
The tester is a simple manual testing unit for PNP/NPN, normally open and normally closed sensors with significantly improved features.

Advantages

- Built-in steel target for checking sensors
- Automatic shut-off after approx. 30 sec. of non-use
- Power provided by a single 9V battery
- Visual and acoustic signal

Note

Sensor tester is not suitable for 2-wire and Desina sensors.

	Tester for 3-wire sensors DC PNP/NPN	Tester for 3-wire sensors DC PNP/NPN	Tester/Programmer for 2-/3-wire sensors DC PNP/NPN and analog
			
	BES 516-3	BES 516-7	BES 516-4
	18 V DC	18 V DC	18 V DC
	1 power indicator	1 power indicator	3 function indicators, 1 battery indicator
	2× 9 V batteries	1× 9 V battery	2× 9 V batteries
	3 spring-loaded terminals	3 spring-loaded terminals	7 spring-loaded terminals
	IP 21	IP 40	IP 40
	Plastic	Plastic	Plastic
		Acoustic/visual signal, built-in steel target	







Series **BOS S** signal adapters can be used to implement various additional functions for sensors. Output signals or counting and timing functions can be changed without additional installations. The signal adapter is simply plugged in between the standard M12 connections on the sensor and cable. Setting is simple using teach-in and a control line.
Signal adapters can also be used as switching amplifiers and can be combined with each other.

The **BOS S-C** counts output pulses or pauses from a sensor and sends an output pulse when a pre-defined number is reached. The count range is from 1...65535 and can be freely set.
It also includes an output inverter function (normally open/normally closed).

With the **BOS S-T** you can set a turn-on or turn-off delay from 1 ms to 65 sec. The factory default setting is for a turn-off delay of 100 ms.

The **BOS S-F** converts a connected PNP signal into an NPN signal. In addition, you can toggle the output function between NO and NC.

The **BOS S-M** is a freely configurable module for frequency monitoring. It is "active" when the set frequency is exceeded by 5 %.

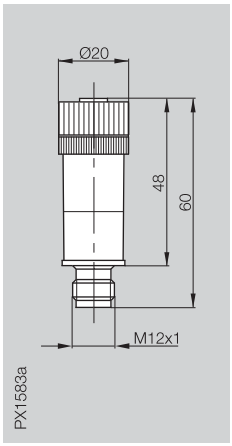
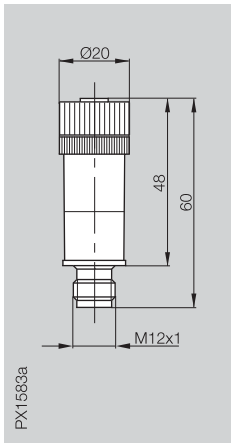
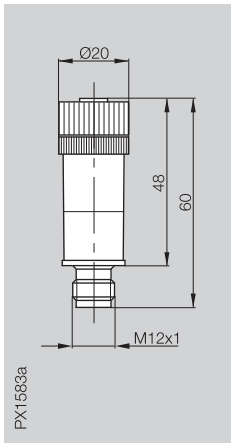
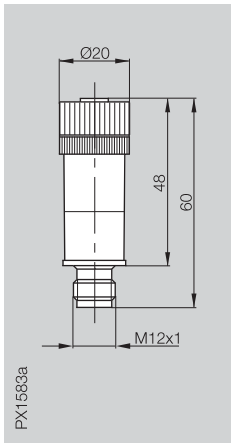
Application

For **all sensors** having a corresponding plug connection and output signal.

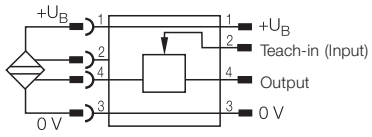


Signal adapter selection guide

Function	Device	Setting
NC/NO inverter	BOS S-**C**01	Pause counter 1
Flip-Flop (touch on, off)	BOS S-**C**01	Pause counter 2
Divider (1 pulse per revolution)	BOS S-**C**01	Pulse counter n
Parts counter (count down)	BOS S-**C**01	Pulse counter n
Switching amplifier to 400 mA	BOS S-**C**01	Pulse counter 1
Off-delay	BOS S-**T**01	Off-delay n
Off-delay	BOS S-**T**01	Off-delay n
PNP-/NPN converter	BOS S-**F**01	Factory setting
PNP-/NPN converter and NC/NO switcher	BOS S-**F**01	NC/NO teach
Speed monitor	BOS S-**M**01	
Speed monitor	BOS S-**M**01	
Pile-up detector	BOS S-**M**01	

Series	BOS S	BOS S	BOS S	BOS S
Function	programmable pulse or interval counter, switching inverter	programmable timer for on- and off-delay	PNP-/NPN converter, adjustable NC/NO switchover	programmable frequency monitoring
				
Ordering code PNP	BOS S-C01	BOS S-T01	BOS S-F01	BOS S-M01
Ordering code NPN	BOS S-C02	BOS S-T02	BOS S-F02	BOS S-M02
Supply voltage U_B	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Rated operational current I_e	< 400 mA	< 400 mA	< 400 mA	< 400 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
Input impedance	> 10 kΩ	> 10 kΩ	> 10 kΩ	> 10 kΩ
On-/off-delay	0.1 ms	0.1 ms	0.1 ms	0.1 ms
max. input frequency	10 kHz	10 kHz	10 kHz	10 kHz
Input	PNP NPN	PNP NPN	PNP NPN	PNP NPN
Output	PNP NPN	PNP NPN	NPN PNP	PNP NPN
Smallest preset number	1			
Largest preset number	65535			
Shortest settable time		1 ms		
Longest settable time		65535 ms		
Monitoring frequency range				0.015 Hz...1 kHz
Function indicator	LED red	LED red	LED red	LED red
Ambient temperature range T_a	0...+60 °C	0...+60 °C	0...+60 °C	0...+60 °C
Degree of protection per IEC 60529	IP 67	IP 67	IP 67	IP 67
Insulation class	⧈	⧈	⧈	⧈
Housing material	PBT/PA 6.6	PBT/PA 6.6	PBT/PA 6.6	PBT/PA 6.6
Connection type input	M12 female 4-pin	M12 female 4-pin	M12 female 4-pin	M12 female 4-pin
Connection type output	M12 male 4-pin	M12 male 4-pin	M12 male 4-pin	M12 male 4-pin
Recommended connector	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20	BKS-_ 19/BKS-_ 20
Weight	15 g	15 g	15 g	15 g

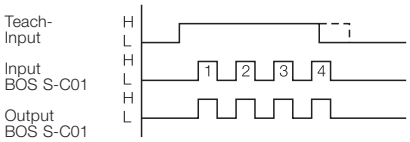
Wiring diagram



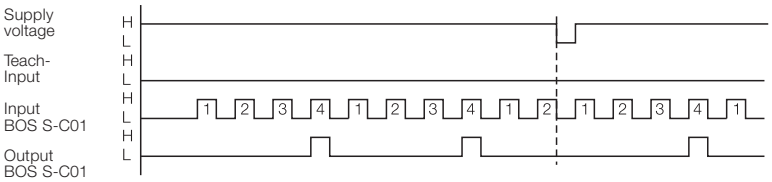


Signal Adapter BOS S-C
Programmable pulse or interval counter

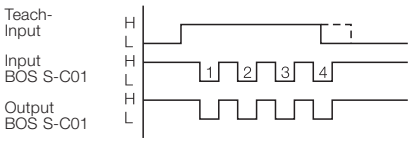
Pulse counter teaching



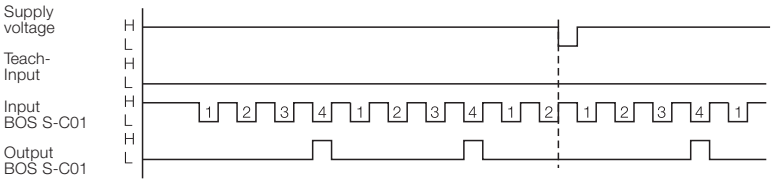
Use as a pulse counter



Interval counter teaching

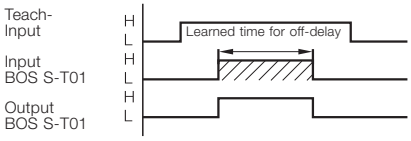


Use as an interval counter

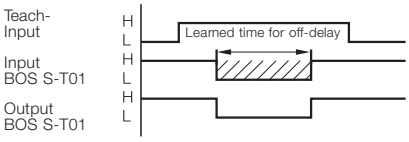


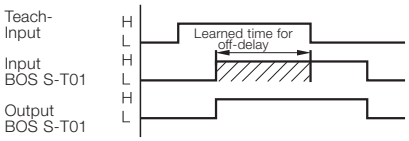
Signal Adapter BOS S-T
Programmable timer for turn-on or turn-off delay

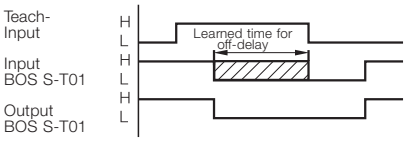
On-delay teaching



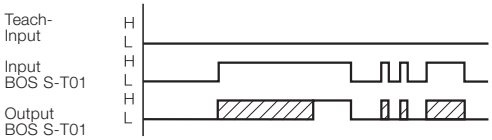
Teaching an off-delay



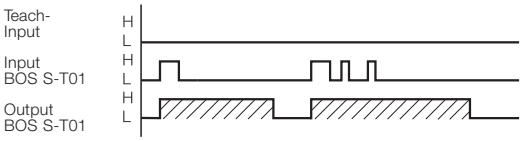




Operation with on-delay

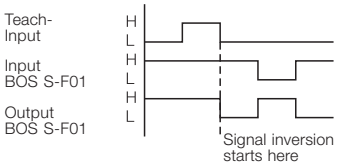


Use with off-delay

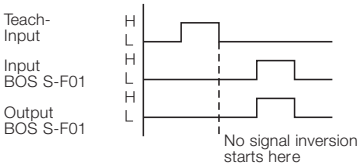


Signal Adapter BOS S-F
NPN-/PNP converter, configurable NO/NC toggle

Signal inversion teaching



Teaching without signal inversion



H = Input or Output active; L = Input or Output inactive

Digital Display for analog input signals

The model BDD-UM 3023 digital display is a universal device for acquiring the following analog measurement values.

– Voltage 0...10 V
– Current 0...20 mA/4...20 mA

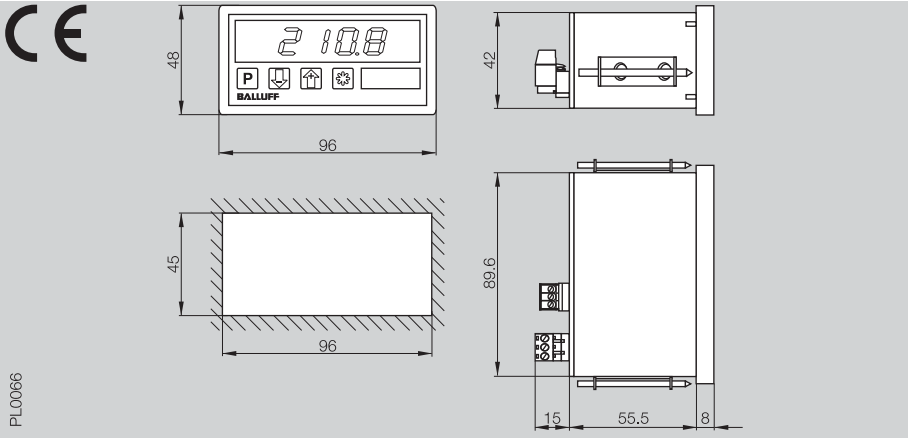
Standard hardware

– 4 function keys on the front panel

Standard software functions

– Scaling
– Tare
– Decimal point
– Display test

Description		**Digital display**
Application		for analog input signals e.g. BOD



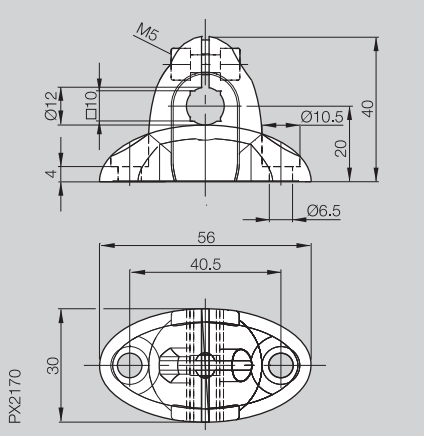
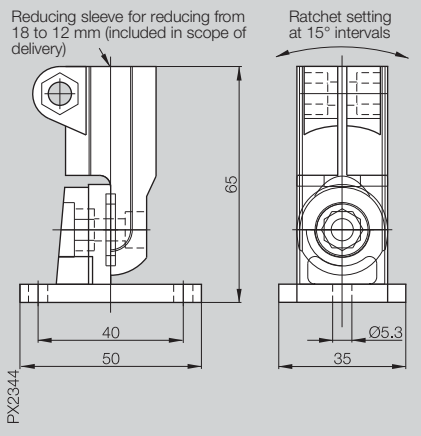
Ordering code		BDD-UM 3023
A/D converter		
	Resolution	12 bits
Measuring ranges	Voltage	0...10 V, ±0.05 %, ±1 digit
	Input impedance	≥ 50 kΩ
	Current	0/4...20 mA, ±0.05 %, ±1 digit
	Input impedance	10 Ω
Sampling rate		5 measurements/s
Display		4-digit, 14 mm, red Programmable decimal point Leading zero suppression Minus sign for negative values
Operation, keypad		Front keypad with short-stroke keys
Rated operating voltage		24 V, ±20 % DC (isolated
Current draw		max. 65 mA
Housing	Dimensions	96×48×60 mm
	Installation depth	≤ 72 mm (incl. screw terminal)
	Housing front enclosure rating	IP 54
	Terminals enclosure rating	IP 20
Ambient temperature range		0...+60 °C
Storage temperature		–20...+70 °C
Relative humidity		≤ 80 %, non-condensing
Contamination class		2
Insulation class		⧈
Weight		approx. 200 g



BMS
Mounting System

Whether sensors are used in machine tools, in assembly and handling machinery, packaging machines or specialty machines, one thing they all have in common, is that to work properly, they must be precisely positioned.

In demand are holding systems that can be used for a variety of widely disparate sensor applications. Balluff see themselves as a systems provider, and has not only sensors but also a correspondingly high-quality range of mounting accessories in their lineup for optimally positioning sensors in equipment and machines. The Balluff Mounting System can be attached on base plates and on all commonly used rails. The variable accessories kit enables virtually every required spatial angle to be covered. Compatible with tubular and block style sensors, additional accessories such as reflector holders or adapter plates round out the accessories kit.

Description	**Base holder**	**Articulated base holder**
Version	for 1 rod Ø 12 mm or 10×10 mm	for 1 rod Ø 12 mm
Application	for mounting on base plates or extrusions	for mounting on base plates or extrusions
		
Ordering code	BMS CU-P-D12-A040-00	BMS CUJ-P-D12-R040-00
Material	Plastic POM	Plastic POM

Screws (stainless steel) are included.



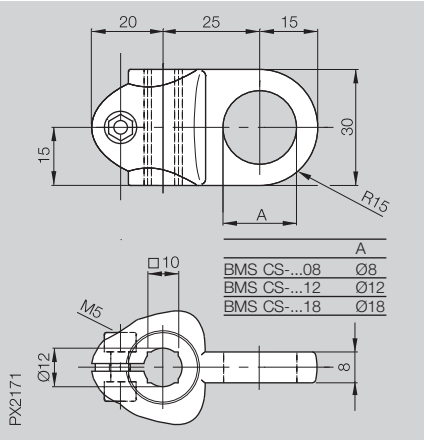
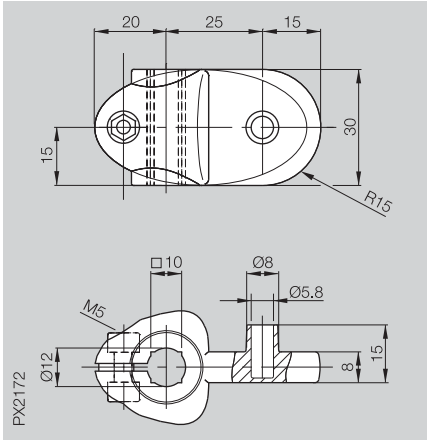
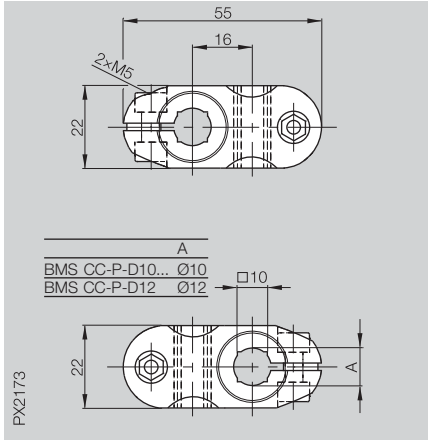




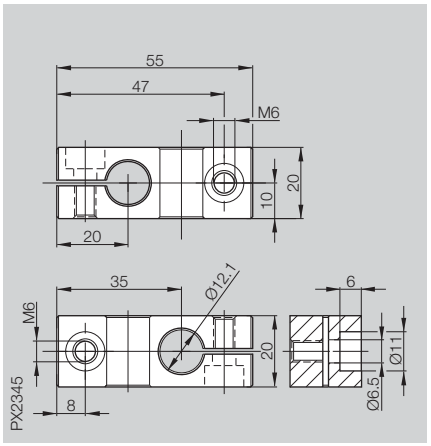
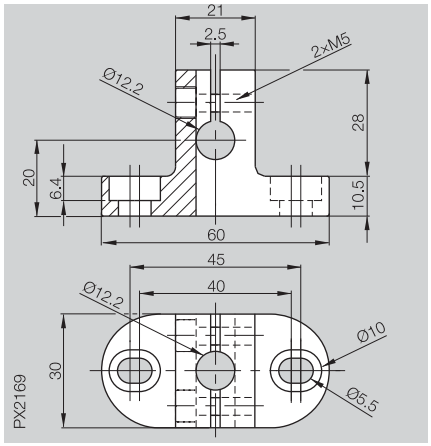
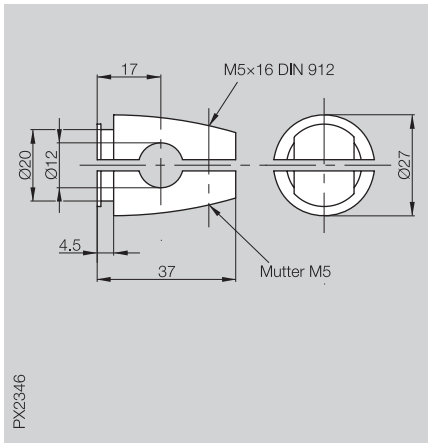
Mounting rods Ø 12 mm, anodized aluminum,
see page **5.56**





	Sensor holder	Reflector holder	Cross-connector
	for 1 rod Ø 12 mm or 10×10 mm for tubular sensors M8, M12, M18	for 1 rod Ø 12 mm or 10×10 mm for all reflectors with Ø 20 mm (glue attachment) and BOS R-14 Ø 51 mm (plug-in)	for 2 rods Ø 10/12 mm or 10×10 mm Connecting element for 2 rods Ø 10/12 mm or 10×10 mm
			
	BMS CS-P-D12-AD08-00 BMS CS-P-D12-AD12-00 BMS CS-P-D12-AD18-00	BMS CR-P-D12-AU-00	BMS CC-P-D10-A-00 BMS CC-P-D12-A-00
	Plastic POM	Plastic POM	Plastic POM



Description	Cross-connector	Base holder	Clamping cylinder	
Version	for 2 rods Ø 12 mm	for 1 rod Ø 12 mm (vertical or horizontal)		
Application	Connecting element for 2 rods Ø 12 mm	for mounting on base plates or extrusions	Accommodates all holders, sensors and reflectors	
				
Ordering code	BMS CC-M-D12-B-00*	BMS CU-M-D12-A040-00	BMS CS-M-D12-IZ	
Material	Anodized aluminum	Anodized aluminum	GD-Zn	

*Screws are included.





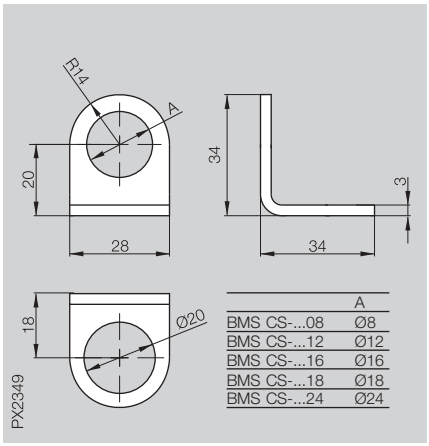
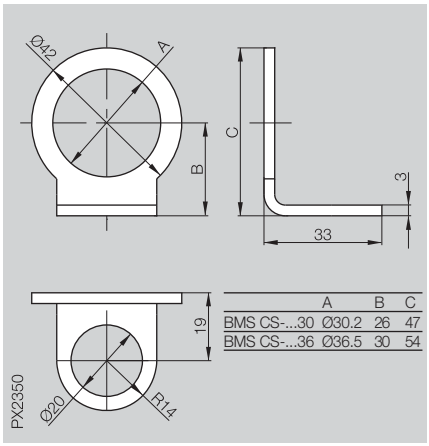
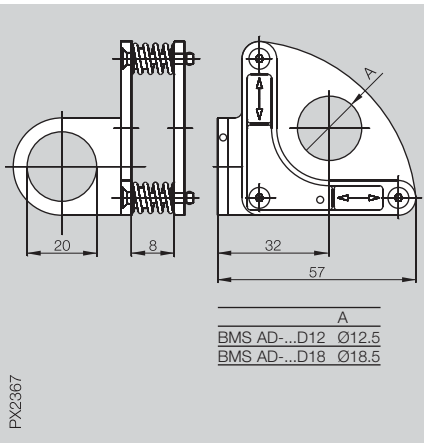




Mounting rods Ø 12 mm, anodized aluminum, see page **5.**56





	Sensor holder for clamping cylinder for M8, M12, M18 tubular sensors as well as all M8...M18 clamps	Sensor holder for clamping cylinders for M30, M36 tubular sensors as well as all M36 clamps	Adjusting unit for clamping cylinders for adjusting M12 and M18 laser sensors
	 A BMS CS-...08 Ø8 BMS CS-...12 Ø12 BMS CS-...16 Ø16 BMS CS-...18 Ø18 BMS CS-...24 Ø24	 A B C BMS CS-...30 Ø30.2 26 47 BMS CS-...36 Ø36.5 30 54	 A BMS AD-...D12 Ø12.5 BMS AD-...D18 Ø18.5
	BMS CS-M-D12-ID08-01 BMS CS-M-D12-ID12-01 BMS CS-M-D12-ID16-01 BMS CS-M-D12-ID18-01 BMS CS-M-D12-ID24-01	BMS CS-M-D12-ID30-01 BMS CS-M-D12-ID36-01	BMS AD-M-002-D12/D12 BMS AD-M-002-D12/D18
	Stainless steel	Stainless steel	Stainless steel





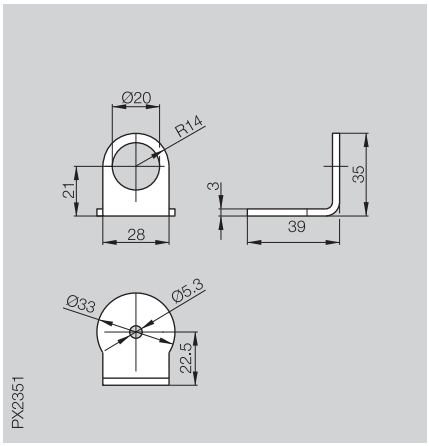
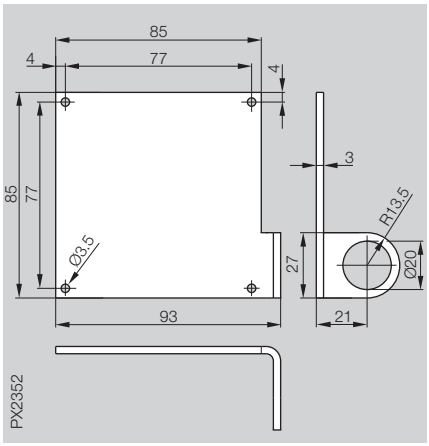
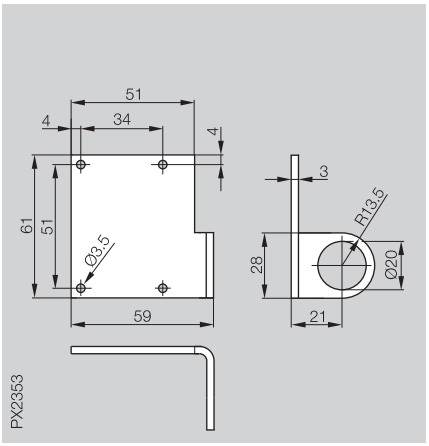








5
Connectors
Splitter boxes with accessories
Electrical devices
Fasteners
Tools

Description	**Reflector holder**	**Reflector holder**	**Reflector holder**	
Version	for BOS R1 + R2 + R3	for BOS R11	for BOS R9	
Application	for clamping cylinder	for clamping cylinder	for clamping cylinder	
				
Ordering code	BMS CR-M-D12-IU-02	BMS CR-M-D12-IS-03	BMS CR-M-D12-IS-04	
Material	Stainless steel	Stainless steel	Stainless steel	



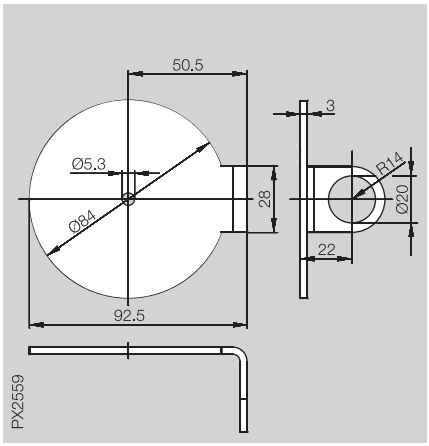
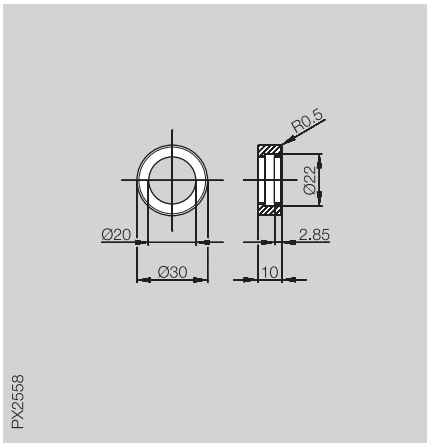










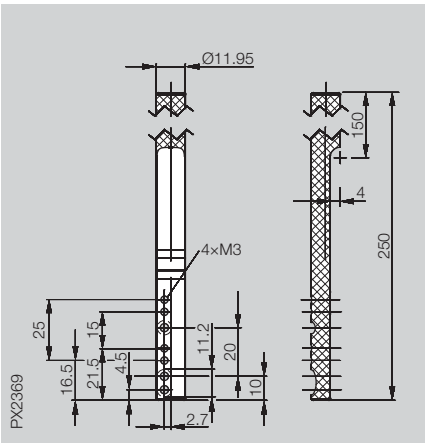
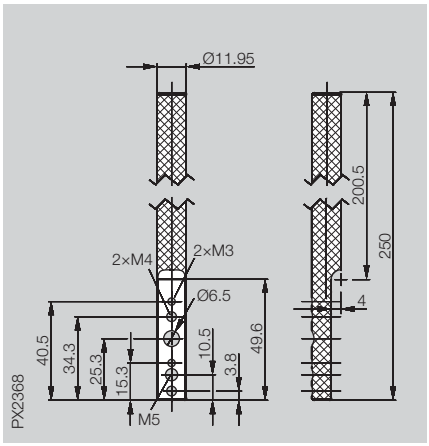
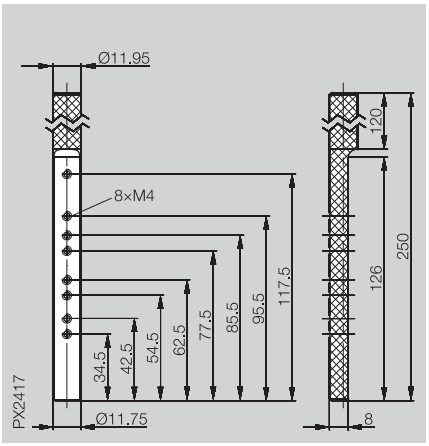
	Reflector holder for BOS R1 for clamping cylinder	Adapter ring for 2× BMS CS-M-D12-IZ for clamping cylinder	
			
	BMS CR-M-D12-IU-05	BMS AD-M-003-D12/IZ	
	Stainless steel	Anodized Al	







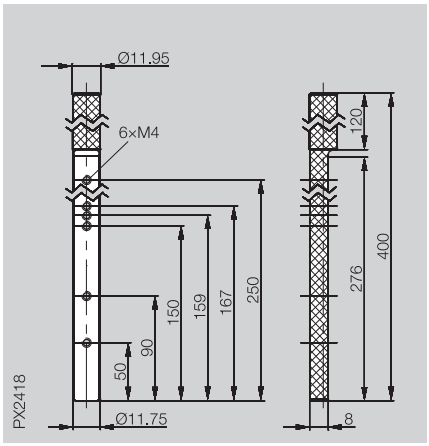
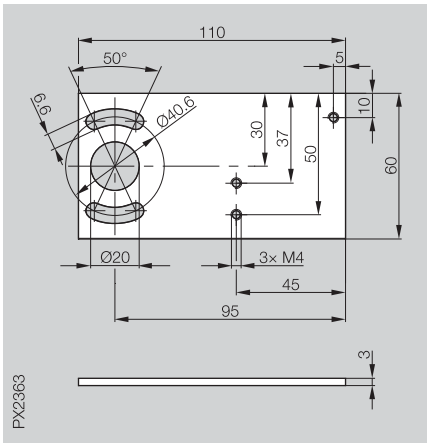
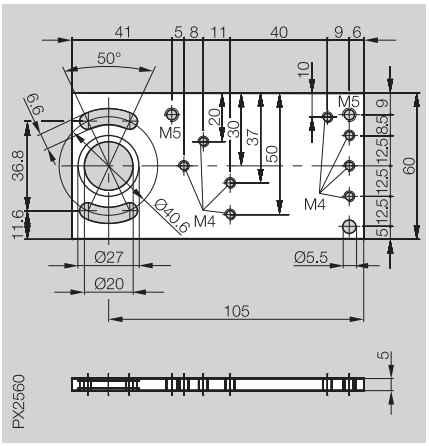


Description	Sensor holder	Reflector holder	Sensor holder	
Version	for BOS 2K, BOS 5K, BOS 6K, BES/BOS Q08	for reflectors R1, R9, R14, R22, R26	for slot sensors BGL 5A, 10A, 20A, 30A, 50A, 80A	
Application	for base holder Ø 12 mm	for base holder Ø 12 mm	for base holder with/without cross-connector	
				
Ordering code	BMS BS-M-D12-0250-02	BMS BS-M-D12-0250-01	BMS BS-M-D12-0250-03	
Material	Anodized aluminum	Anodized aluminum	Anodized Al	







	Sensor holder	Sensor adapter plate	Sensor adapter plate
	for slot sensors BGL 80A, 120A, 180A, 220A	for BOS 21/25/26	for BOS 21/25/26, BOD 63/66
	for base holder with/without cross-connector	for base holder with hold spacing 40 mm and clamping cylinders	for base holder with hole spacing 40 mm and clamping cylinders
			
	BMS BS-M-D12-0400-04	BMS CS-M-D12-BX01-01	BMS CS-M-D12-BX05-02
	Anodized Al	Anodized aluminum	Anodized Al





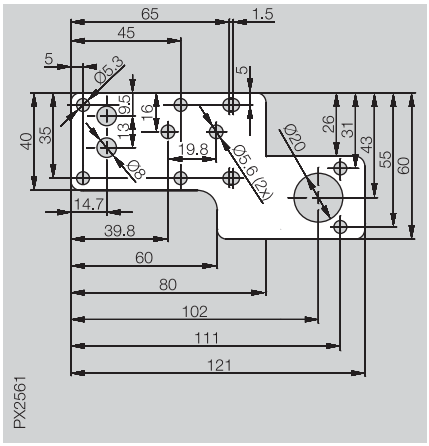
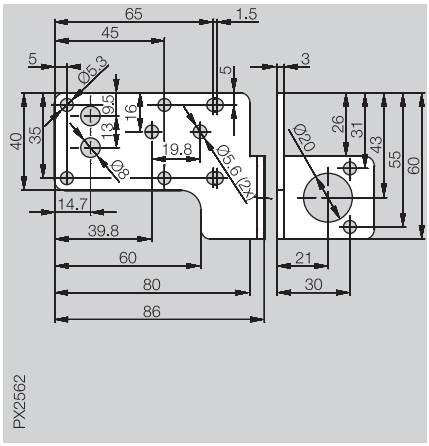










Description	**Sensor holder**	**Sensor holder**	
Version	straight	angled	
Application	Sensor holder for Unicompact, Unisensor, BES IKU	Sensor holder for Unicompact, Unisensor, BES IKU	
			
Ordering code	BMS CS-M-D12-IQ40-03	BMS CS-M-D12-IQ40-02	
Material	Stainless steel	Stainless steel	







When installing sensors on machines and systems, quick solutions are often required for positioning the sensors. Installers need finished, compatible solutions for service work.

For such work, Balluff offers the BMS Kit-V1 an. From the base holder to rods and cross-connectors to the most commonly needed sensor holders, everything you need for establishing a secure sensor position is included in the Mounting Kit. Once parts have been used, an order form is included for simple reordering.

The tough aluminum case with additional, variable compartments is designed for tough industrial use.

Ordering code:
BMS Kit-V1

Item	Case contents Quantity	Description	Ordering code
1. 	20	Base holder	BMS CU-M-D12-A040-00
2. 	10	Cross-connector	BMS CC-M-D12-B-00
3. 	20	Clamping cylinder	BMS CS-M-D12-IZ
4. 	5	Sensor holder for M8	BMS CS-M-D12-ID08-01
5. 	10	Sensor holder for M12	BMS CS-M-D12-ID12-01
6. 	10	Sensor holder for M16	BMS CS-M-D12-ID16-01
7. 	10	Sensor holder for M18	BMS CS-M-D12-ID18-01
8. 	10	Sensor holder for M24	BMS CS-M-D12-ID24-01
9. 	5	Sensor holder for M30	BMS CS-M-D12-ID30-01
10. 	5	Sensor holder for Q40 straight	BMS CS-M-D12-IQ40-03
11. 	5	Sensor adapter plate for BOS 21/25/26	BMS CS-M-D12-BX01-01
12. 	5	Reflector holder for BOS R-9	BMS CR-M-D12-IS-04
13. 	5	Reflector holder for R1, R9, R14, R22, R26	BMS BS-M-D12-0250-01
14. 	5	Reflector BOS R-9	BOS R-9
15. 	10	Mounting rod 150 mm	BMS RS-M-D12-0150-00
16. 	10	Mounting rod 250 mm	BMS RS-M-D12-0250-00

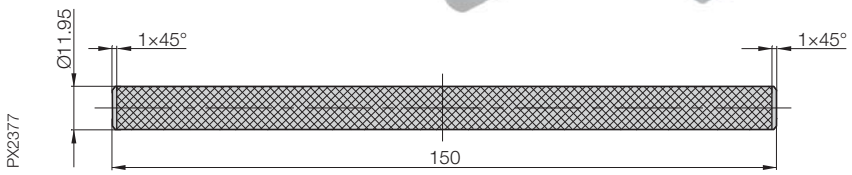






Mounting rods Ø 12 mm, anodized aluminum,

BMS RS-M-D12-**0150**-00 = 150 mm
BMS RS-M-D12-**0250**-00 = 250 mm
BMS RS-M-D12-**1000**-00 = 1000 mm
(for user assembly)



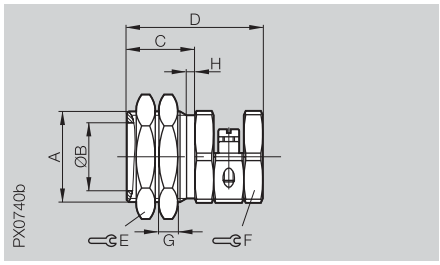
The mounting rods are knurled full-length. This prevents any position change.

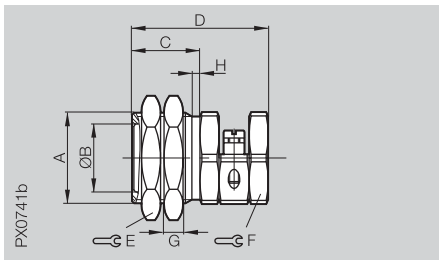


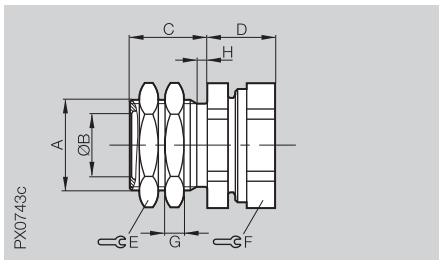


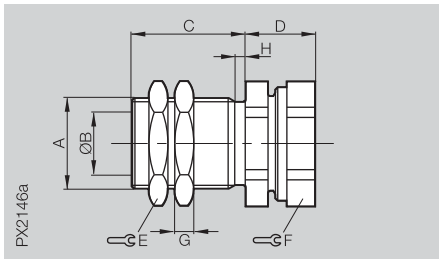


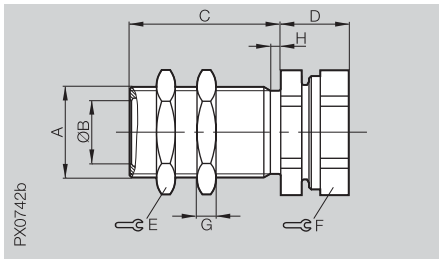












An old problem in installing proximity switches has now been solved. Balluff **clamps with positive stop** ensure the exact and correct position of the proximity switch.

Proximity switches can be quickly and easily changed even in difficult to access locations, and retain their sensing position without readjustment thanks to the positive stop.

Note for clamps with positive stop made of metal

The switching distance of the proximity switch may be reduced by use of these brackets.
Note this when using this clamping system.

Advantages

- Short downtimes
- Quickly replaced
- Once set, always in the right position
- No readjustment
- Easy to mount and replace proximity switches thanks to a positive stop
- Easy to attach the sensors using a pressure screw

Application

For all sensors with corresponding diameter.



Clamps without positive stop for sensors (material: CuZn coated)

	A	Ø B	C	D	E	F	G	H
BES 12,0-KH-4	M16×1	12	16	30.5	SW22	SW17	3.9	2.1
BES 18,0-KH-4	M24×1.5	18	18	36	SW30	SW24	5.0	3.2
BES 30,0-KH-4	M36×1.5	30	18	40	SW41	SW41	5.9	3.2

Clamp with positive stop for sensors (material: CuZn coated)

	A	Ø B	C	D	E	F	G	H
BES 08,0-KH-4-F	M12×1	8	15.4	30	SW17	SW17	3.8	2.1
BES 12,0-KH-4-F	M16×1	12	16	30.5	SW20	SW17	3.9	2.1
BES 18,0-KH-4-F	M24×1.5	18	18	36	SW30	SW24	5.0	3.2
BES 30,0-KH-4-F	M36×1.5	30	18	40	SW41	SW41	5.9	3.2

Clamp with positive stop for sensors with thread length ≥ 30 mm (material: CuZn coated)

	A	Ø B	C	D max.	E	F	G	H
BES 05,0-KH-2S	M8×1	5	13	11	SW13	SW13	4	2.1
BES 08,0-KH-2S*	M12×1	8	17.5	14.5	SW17	SW17	4	2.1
BES 12,0-KH-2S*	M16×1	12	19.5	14.5	SW22	SW22	4	2.1
BES 18,0-KH-2S*	M24×1.5	18	20.5	15.5	SW30	SW30	5	3.2
BES 30,0-KH-2S*	M36×1.5	30	20.5	15.5	SW41	SW41	6	3.2

Clamp with positive stop for sensors with thread length ≥ 45 mm (material: CuZn coated)

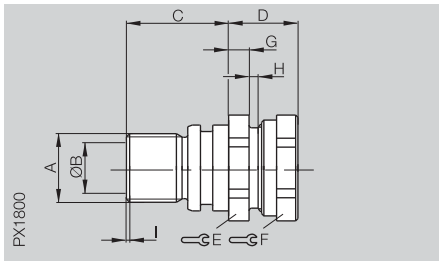
	A	Ø B	C	D max.	E	F	G	H
BES 18,0-KH-2M	M24×1.5	18	30	18.5	SW30	SW30	5	3.2

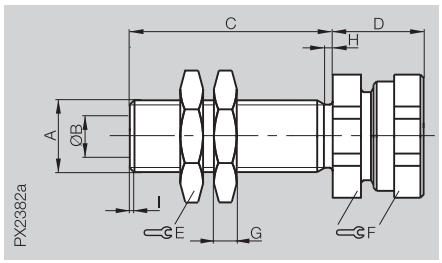
Clamp with positive stop for sensors with thread length ≥ L (material: CuZn coated)

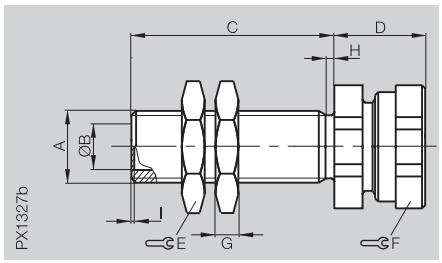
	A	Ø B	C	D max.	E	F	G	H
BES 08,0-KH-2L*	M12×1	8	34	14.5	SW17	SW17	4	2.1
BES 12,0-KH-2L*	M16×1	12	30	14.5	SW22	SW22	4	2.1
BES 18,0-KH-2L*	M24×1.5	18	40	18	SW30	SW30	5	3.2
BES 30,0-KH-2L*	M36×1.5	30	40	18	SW41	SW41	6	3.2

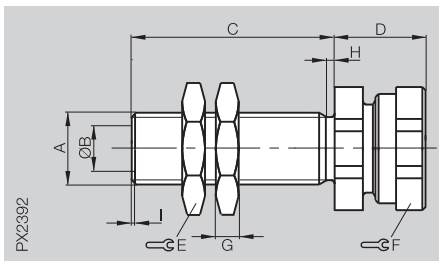
*Also available for welding machines (Teflon-coated).

Ordering example (weld-immune):
BES 12,0-KH-2L**/W**

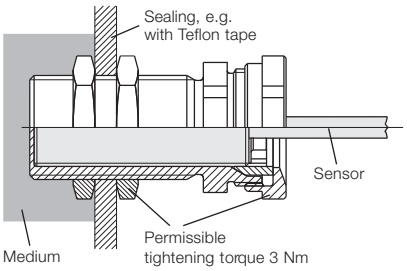


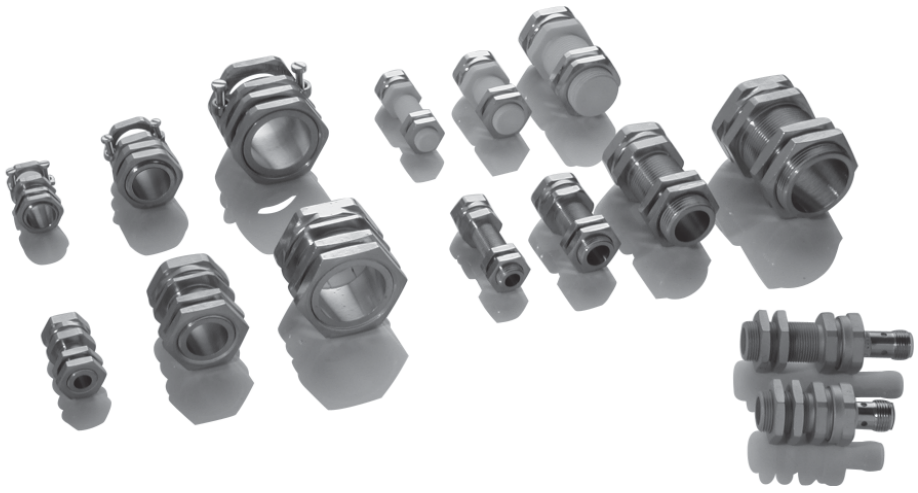






Installation example
clamp BES ...-KH-3L
particularly suitable
for sensing in liquid media





Clamps with positive stop for sensors in sealed installation (material: PBT fiberglass reinforced)

	A	Ø B	C	D	E	F	G	H	I
BES 12,0-KH-5F	M16×1	12	22,5	15.5	SW22	SW22	4	2.1	0.8

Clamps with positive stop for sensors in sealed installation (material: PBT fiberglass reinforced)

	A	Ø B	C	D	E	F	G	H	I
BES 12,0-KH-3X	M16×1	12	15.4	30	SW22	SW22	3.8	2.1	1

Clamps with positive stop for sensors in sealed installation (material: PBT fiberglass reinforced)

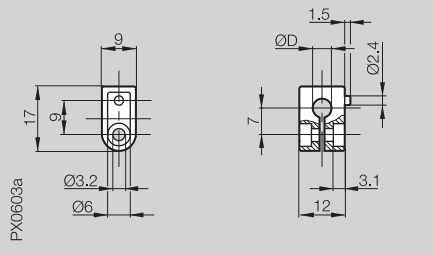
	A	Ø B	C	D max.	E	F	G	H	I
BES 08,0-KH-3L	M12×1	8	34	14.5	SW17	SW17	4	2.1	0.5
BES 12,0-KH-3L	M16×1	12	30	14.5	SW22	SW22	4	2.1	1
BES 18,0-KH-3L	M24×1.5	18	40	19.5	SW30	SW30	5	3.2	1

Clamp with positive stop for sensors with thread length ≥ 30 mm (material: stainless steel)

	A	Ø B	C	D max.	E	F	G	H
BES 08,0-KH-6L*	M12×1	8	34	14.5	SW17	SW17	4	2.1

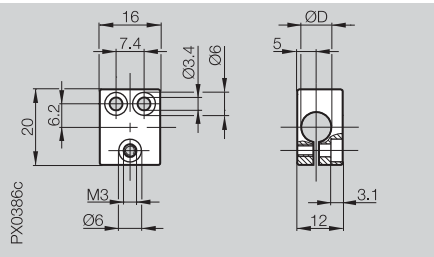
*Also available for welding machines (Teflon-coated).

Ordering example (weld-immune):
BES 08,0-KH-6L**/W**



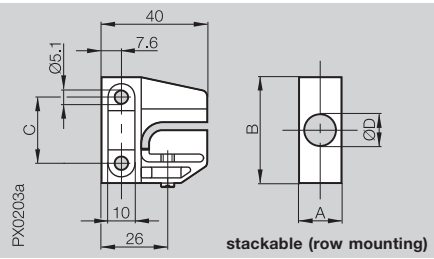
Mounting clamp for sensors Ø 4 mm, M5 or Ø 6.5 mm (material: PA 6)

	Ø D
BES 04,0-KB-1	4
BES 05,0-KB-1	5
BES 06,5-KB-1	6.5



Mounting clamp for sensors ∅ 6.5 mm, ∅ 8 mm or M8 (material: Al)

	Ø D
BES 06,5-KB-7	6.5
BES 08,0-KB-7	8

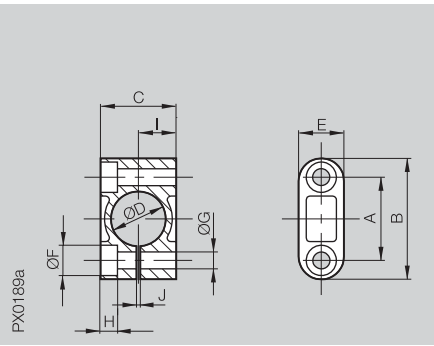


Mounting clamp for sensors M12 or M18 (material: PA 6)

	Ø D	A	B	C
BES 12,0-KB-2	12	16	40	25
BES 18,0-KB-2	18	22	45	30

Mounting clamp with positive stop for sensors M12 (material: PA 6)

	Ø D	A	B	C
BES 12,0-KB-2-F	12	16	40	25



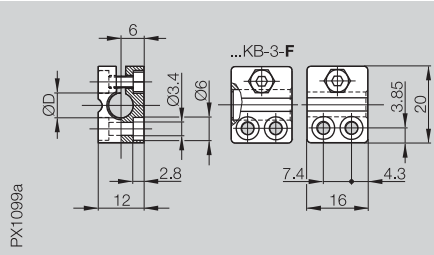
Mounting cuffs (material: PA 6)

	Ø D	A	B	C	E	Ø F	Ø G	H	I	J
BES 06,5-BS-1	6.4	17	27	16	12	8	4.5	4.5	8	1
BES 08,0-BS-1	7.9	17	27	16	12	8	4.5	4.5	8	1
BES 12,0-BS-1	11.9	22	32	20	12	8	4.5	4.5	10	1
BES 14.5-BS-1	14.5	22	32	20	12	8	4.5	4.5	10	1
BES 16,0-BS-1	16	26	36	26	12	8	4.5	4.5	13	1
BES 18,0-BS-1	17.9	26	36	26	12	8	4.5	4.5	13	1
BES 20,0-BS-1	20	32	45	30	15	10	5.5	5.5	15	2
BES 22,0-BS-1	21.9	32	45	30	15	10	5.5	5.5	15	2
BES 30,0-BS-1	30	42	55	38	18	10	5.5	5.5	19	1.5
BES 36,0-BS-1	35.9	48	61	44	18	10	5.5	5.5	22	1.5

Application

For all sensors with corresponding diameter.



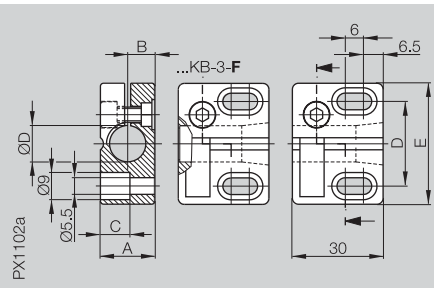


Mounting clamp without positive stop for sensors ∅ 3 mm to M8

	∅ D
BES 03,0-KB-3	3
BES 04,0-KB-3	4
BES 05,0-KB-3	5
BES 06,5-KB-3	6.5
BES 08,0-KB-3	8

Mounting clamp with positive stop for sensors ∅ 8 mm or M8

	∅ D
BES 08,0-KB-3-F	8

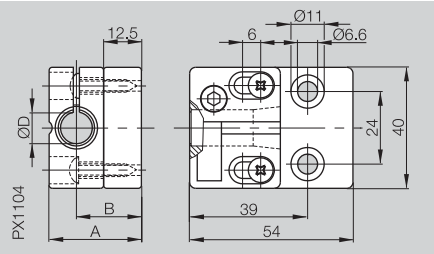


Mounting clamp without positive stop for sensors M12 or M18 non-flush

	∅ D	A	B	C	D	E
BES 12,0-KB-3	12	18	9	9.7	28	40
BES 18,0-KB-3	18	24	12	13.5	28	40

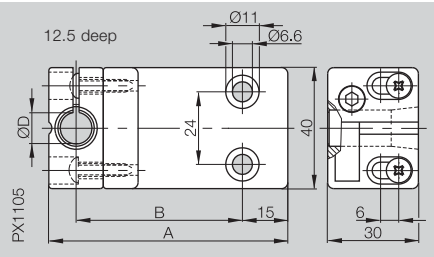
Mounting clamp with positive stop for sensors M12, M18 or M30 flush

	∅ D	A	B	C	D	E
BES 12,0-KB-3-F	12	18	9	9.7	28	40
BES 18,0-KB-3-F	18	24	12	13.5	28	40
BES 30,0-KB-3-F	30	36	18	19.5	42	54



Mounting clamp with positive stop for vertical insertion of sensors for M12 or M18 flush, with mounting plate

	∅ D	A	B
BES 12,0-KB-3-F-SA1	12	30.5	21.5
BES 18,0-KB-3-F-SA1	18	36.5	24.5



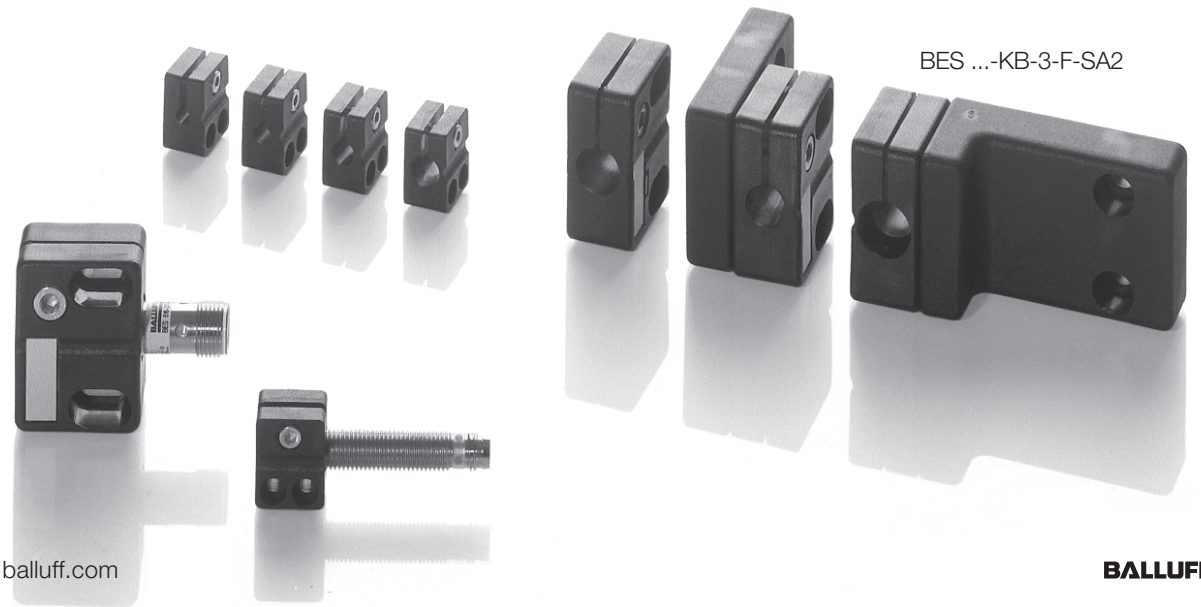
Mounting clamp with positive stop for horizontal insertion of sensors for M12 or M18 flush, with mounting plate

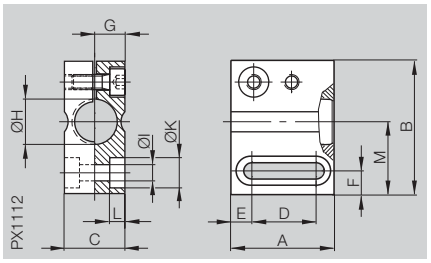
	∅ D	A	B
BES 12,0-KB-3-F-SA2	12	79	55
BES 18,0-KB-3-F-SA2	18	85	58

These mounting clamps made of PA 6 are ideal for on-location installation of sensors in the handling industry.

BES ...-KB-3-F-SA1

BES ...-KB-3-F-SA2



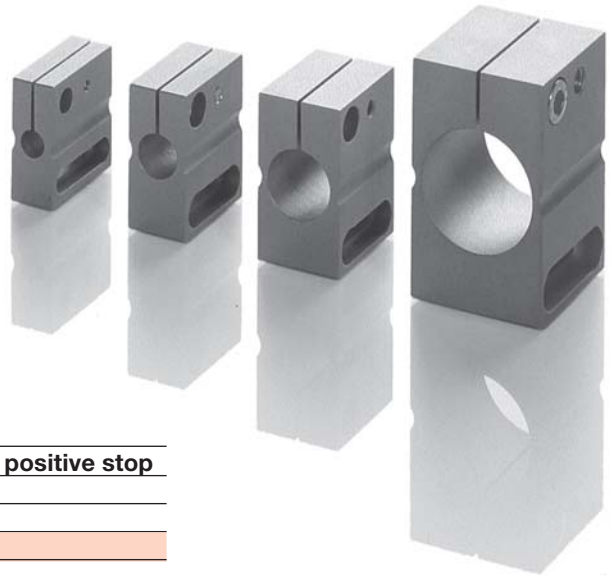


Mounting clamp with positive stop (material: Al)

	A	B	C	D	E	F	G	Ø H	Ø I	Ø K	L	M
BES 08,0-KB-4-F	28	30	12	20	4	5	6	8	3.4	6	3.4	15
BES 12,0-KB-4-F	28	35	16	17	5.5	6	8	12	4.3	8	4	19
BES 18,0-KB-4-F	28	40	22	17	5.5	6	11	18	4.3	8	4	20
BES 30,0-KB-4-F	34	56	34	22	6	7	17	30	6.4	10	6	28

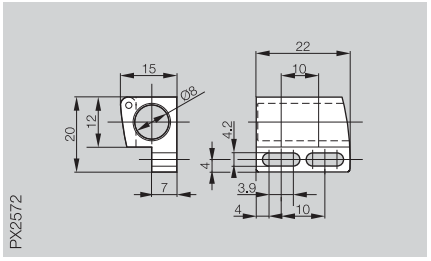
Note for aluminum mounting clamps with positive stop

The switching distance of the proximity switch may be reduced by using these clamps. Take note when using this clamping system.



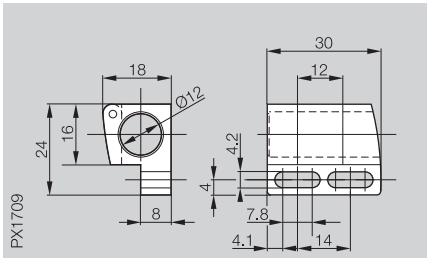
Application

For all sensors of corresponding diameter.



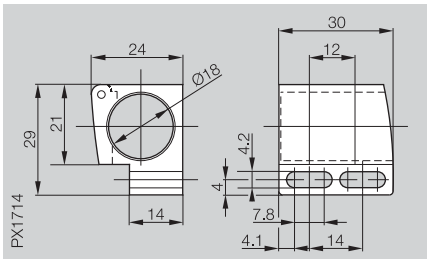
Mounting clamp with positive stop (material: PC plastic)

BES 08,0-KB-5-F



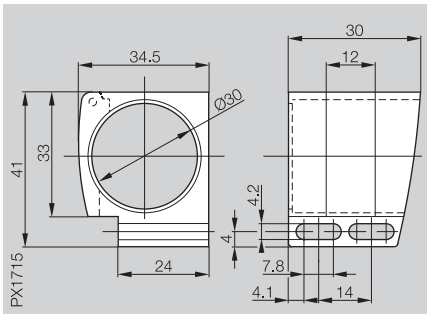
Mounting clamp with positive stop (material: PC plastic)

BES 12,0-KB-5-F



Mounting clamp with positive stop (material: PC plastic)

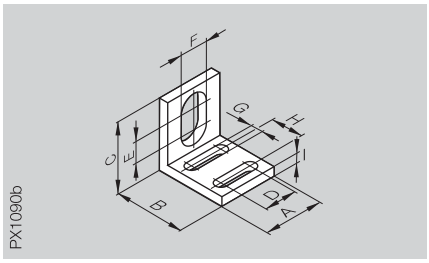
BES 18,0-KB-5-F



Mounting clamp with positive stop (material: PC plastic)

BES 30,0-KB-5-F



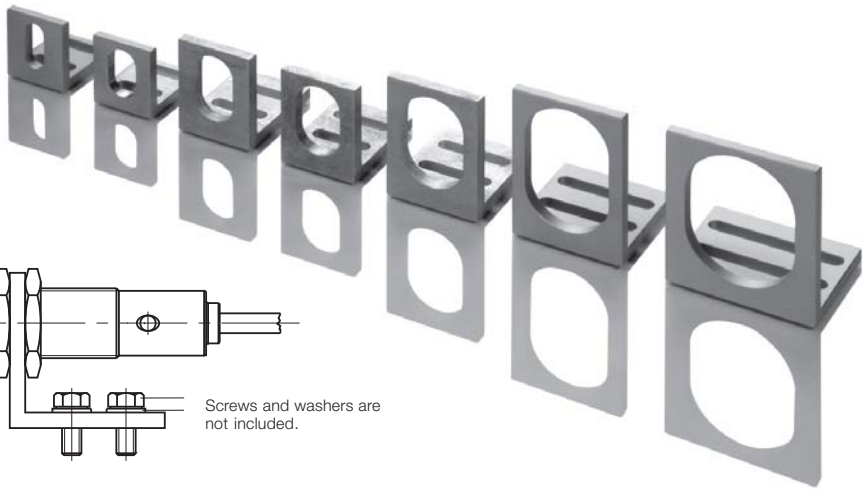


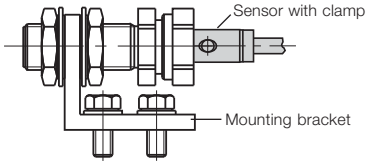
Mounting bracket (material: Al)

	A	B	C	D	E	F	G	H	I			
BES 08-HW-1	25	30	30	14	12	8.1	5.2	14	4			
BES 12-HW-1	25	30	30	14	9	12.1	5.2	14	4			
BES 16-HW-1	30	40	40	18	12	16.1	5.2	14	5			
BES 18-HW-1	30	40	40	18	11	18.1	5.2	14	5			
BES 24-HW-1	35	40	50	23	13	24.1	5.2	14	5			
BES 30-HW-1	40	40	60	30	19	30.1	5.2	14	5			
BES 36-HW-1	50	40	60	40	13	36.1	5.2	14	5			

These aluminum mounting brackets provide a way of easily and quickly attaching sensors to the machine.

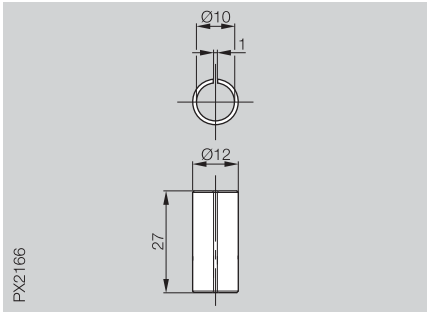
For tubular sensors, we recommend the additional use of clamps (see pages **5.**58 and **5.**61).





Application

For all sensors of corresponding diameter.



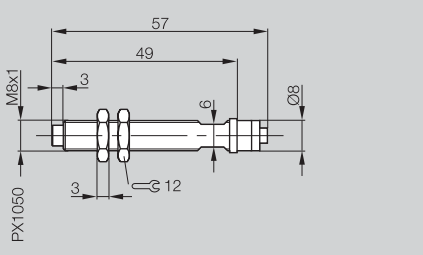
Reducing sleeve for reducing from 12 to 10 mm (material: PC)

BMS AD-P-001-12/10

Application

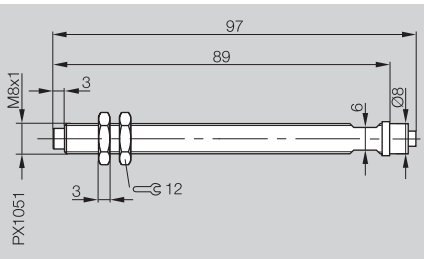
Reducing sleeve for sensors with Ø 10 mm for installing in clamps and holders with Ø 12 mm.





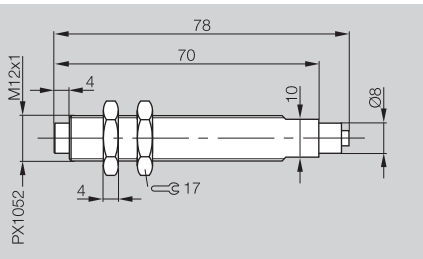
Positive stop

BES 08-FA-49
Material: stainless steel
Temperature range: –25...+100 °C
Spring force: 3 N
max. impact force Fmax.: 100×F
Spring travel: 2 mm
Permissible tightening torque: 15 Nm



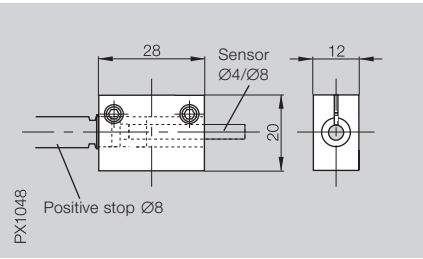
Positive stop

BES 08-FA-89
Material: stainless steel
Temperature range: –25...+100 °C
Spring force: 3 N
max. impact force Fmax.: 100×F
Spring travel: 2 mm
Permissible tightening torque: 15 Nm



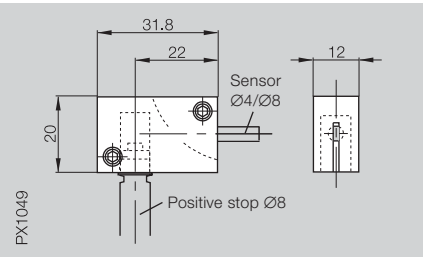
Positive stop

BES 12-FA-70
Material: stainless steel
Temperature range: –25...+100 °C
Spring force: 4 N
max. impact force Fmax.: 100×F
Spring travel: 3 mm
Permissible tightening torque: 25 Nm



Positive stop
mounting cuff straight
for sensors with ∅ 4 mm or ∅ 8 mm

BES 08-FA-BS-**4,0**-G
BES 08-FA-BS-**8,0**-G
Material: Al
Temperature range: –25...+100 °C
Permissible tightening torque: 15 Nm

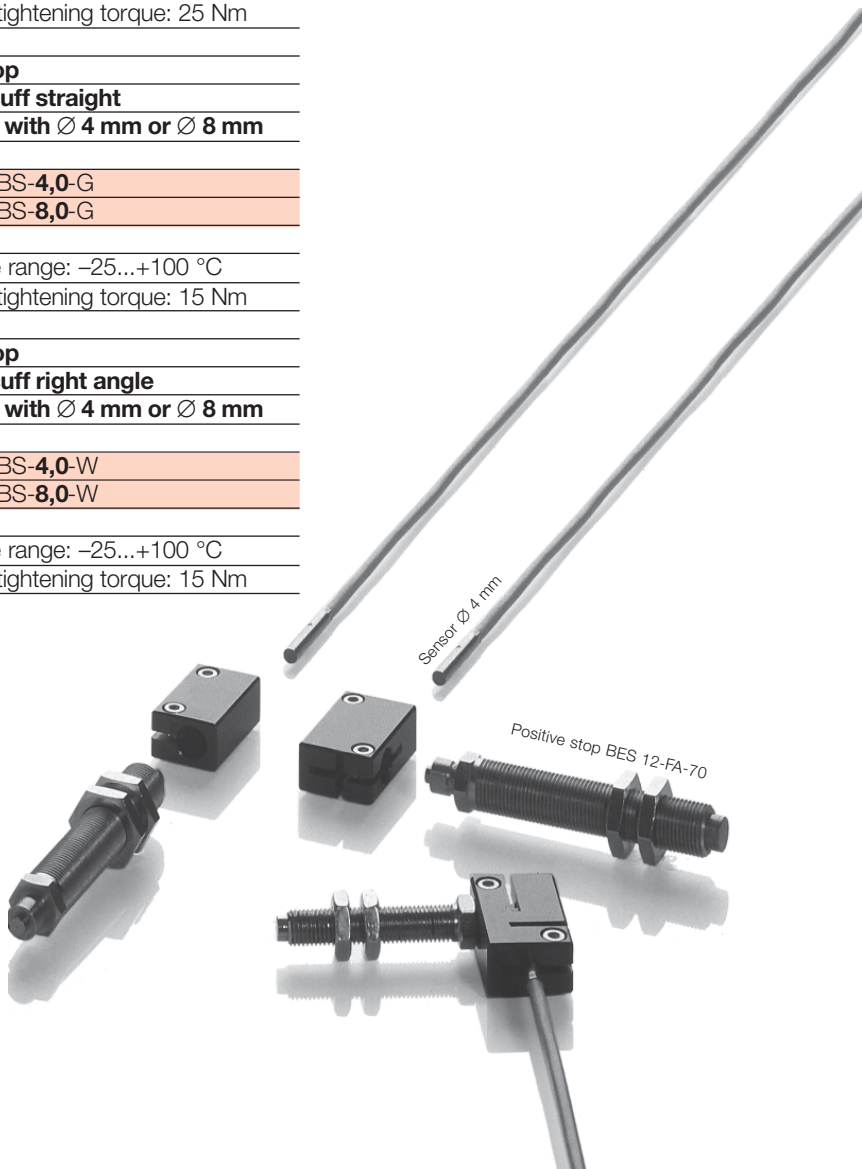


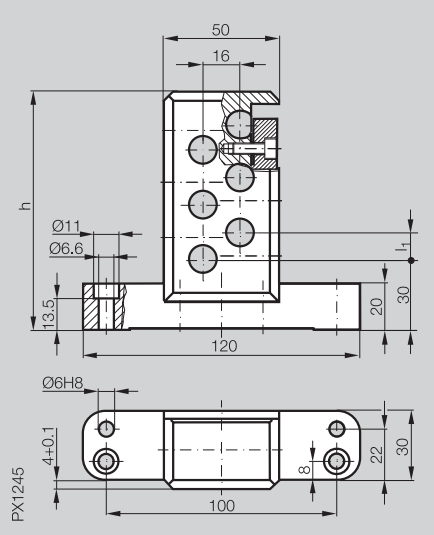
Positive stop
mounting cuff right angle
for sensors with ∅ 4 mm or ∅ 8 mm

BES 08-FA-BS-**4,0**-W
BES 08-FA-BS-**8,0**-W
Material: Al
Temperature range: –25...+100 °C
Permissible tightening torque: 15 Nm

Positive stops
for sensors with ∅ 4 mm or ∅ 8 mm housing

A positive stop combined with the corresponding mounting cuff is used to hold inductive proximity switching with housing diameters of ∅ 4 mm or ∅ 8 mm.
The desired switching point between the proximity switch and the trigger pin can be set wherever needed.





Mounting clamp for insertion of sensors M12
flush mountable with 12 or 16 mm spacing
for cam trays with 12 or 16 mm spacing

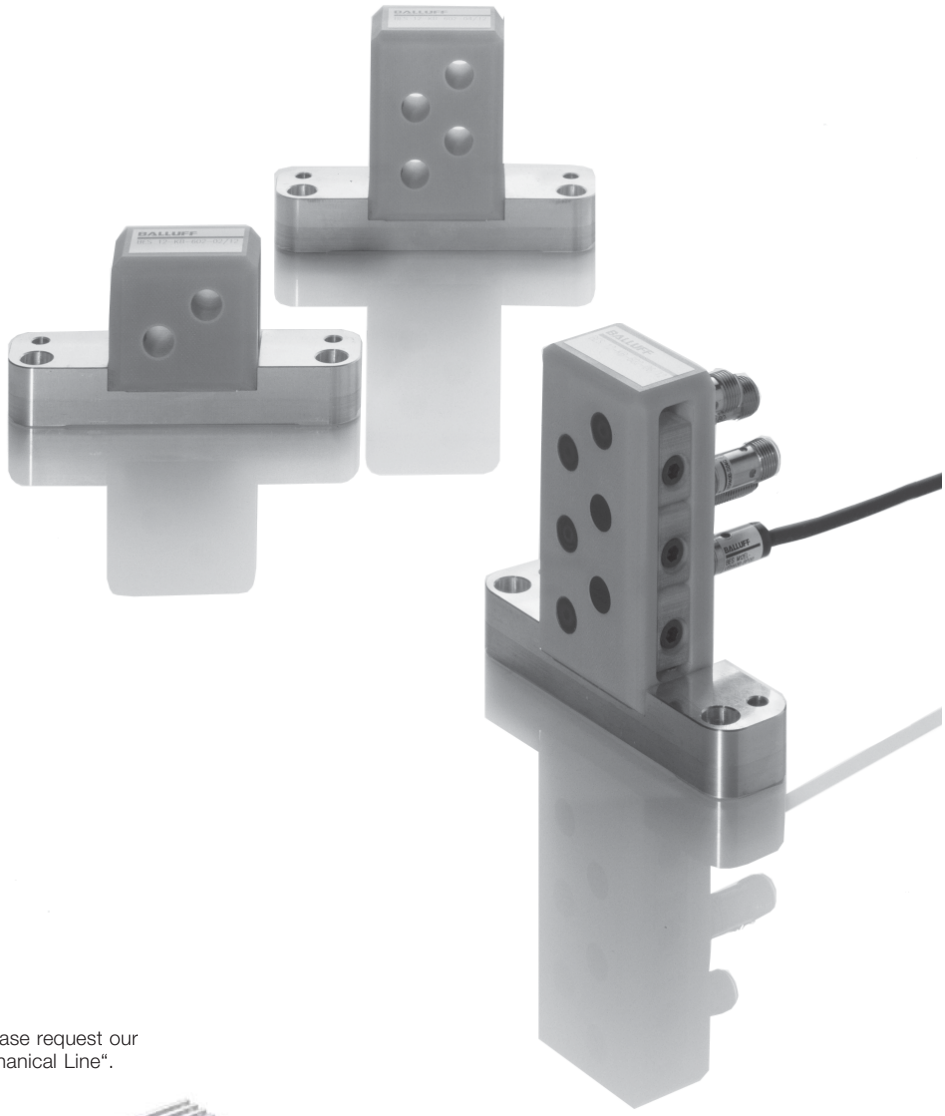
	spacing l_1	switch positions	height h
BES 12,0-KB-602-02/12	12 mm	2	57 mm
BES 12,0-KB-602-04/12	12 mm	4	81 mm
BES 12,0-KB-602-06/12	12 mm	6	105 mm
BES 12,0-KB-602-06/16	16 mm	6	125 mm

Material	Mounting plate	Al
	Mounting clamp and fastening bracket	EP (Reinforced fiberglass)
Clamping		M5 screw, galvanized, DIN 912
Ambient temperature range		–25...+70 °C

These mounting clamps allow you to arrange switch inserts in a pattern to be used in conjunction with Balluff cam trays as switching indicators for controlling applications.

The configuration corresponds to the switch positions of our multiple position switches. The flange is constructed so that the entire mounting clamp is interchangeable with our multiple position switches in housing series 602 as per DIN 43697.

- Mounting clamp with positive stop for inductive proximity switches
- Accepts standard M12 proximity switches
- Use of connector-type proximity switches is recommended for ease of installation
- Mounting clamp made of fiberglass reinforced epoxy, making it resistant to most coolants and lubricants



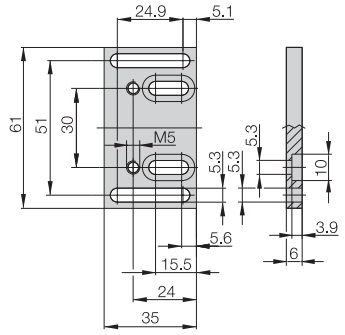
For cam trays, please request our catalog „The Mechanical Line“.



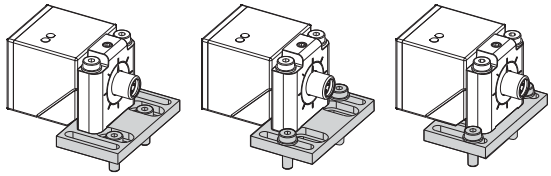
Mounting bracket, mounting socket and holding system for Unicompact

Description	**Mounting bracket for Unicompact**
Ordering code	BES Q40-HW-1

Material: Al



PX1678

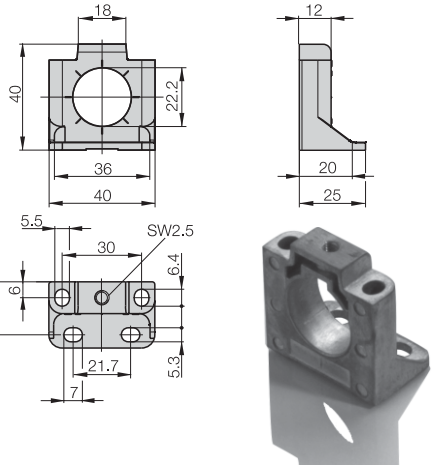


3 different attachment options

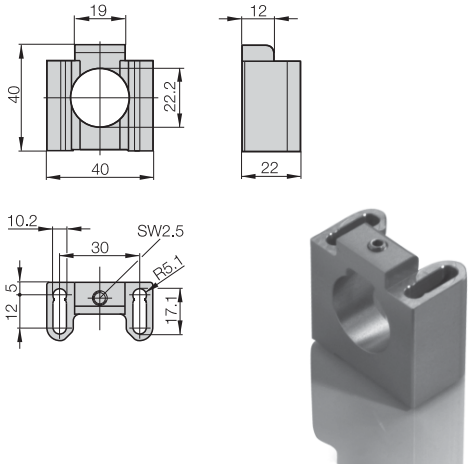


Description	**Mounting socket for Unicompact (3-/4-wire)**	**Mounting socket for Unicompact (3-/4-wire)**
Ordering code	BES Q40-HW-2	BES Q40-HW-3

Material: Al



PX2110



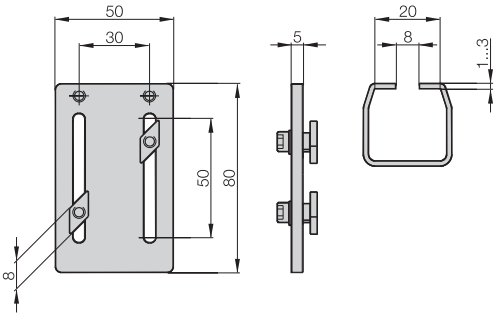
PX2125

Please note permissible installation variants in section **1.1** and **1.5**!

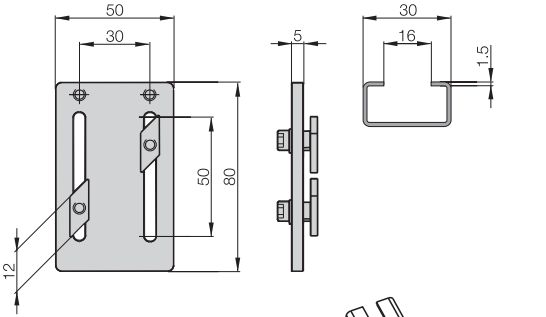
Description	**Holding system for Unicompact**	**Holding system for Unicompact**
Ordering code	BES HS-01-P1-C8/Q40	BES HS-01-P1-C16/Q40

This holding system is used to attach Unicompact sensors to extruded rails.
Material: Al/CuZn.

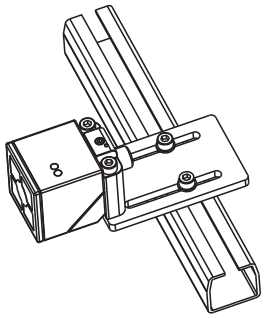
The mounting set consists of:
1 mounting plate
2 tenon blocks
2 cheese head screws M5×10 DIN 912 Zinc plated
2 washers Ø 5.3 DIN 533
2 cheese head screws M5x40 ISO 4762



PX1636c



PX1536

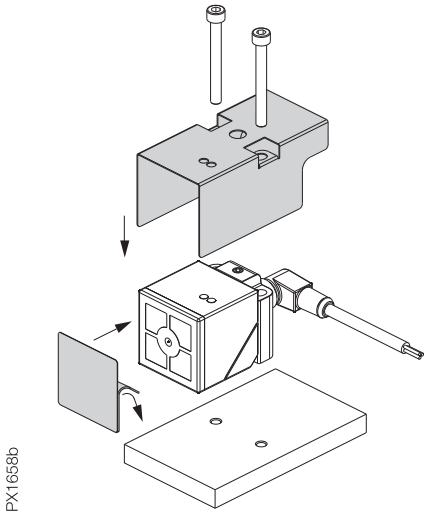


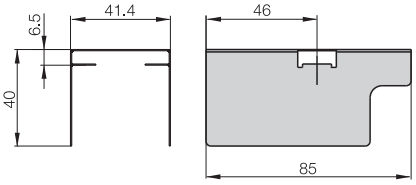
Description	Weld protection for Unicompact (3-/4-wire)
Ordering code	BES Q40-SH-1

Weld protection for magnetic field immune Unicompact sensors BES Q40KFU-...

Consists of a protective cover and a self-adhering PTFE film for protecting the active surface. When replacing the sensor head it is not necessary to remove the weld protection.

Material: Al

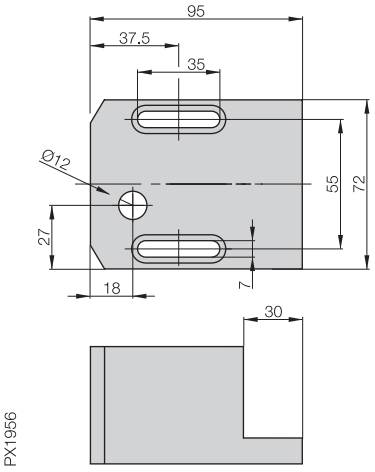


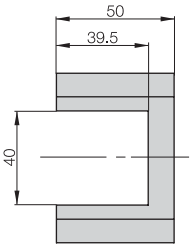




Description	Protective cover for Unicompact (3-/4-wire)
Ordering code	BES Q40-SH-2

Material: PA 6 black

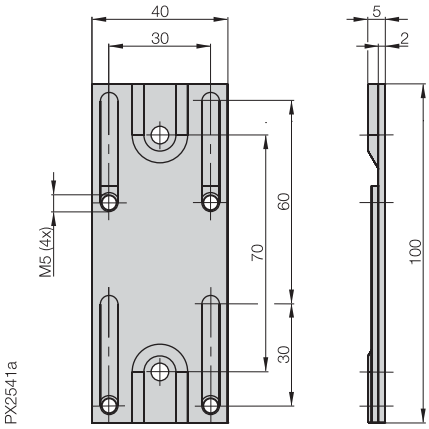




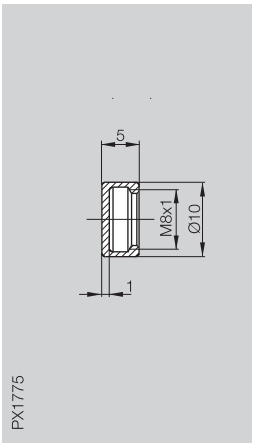
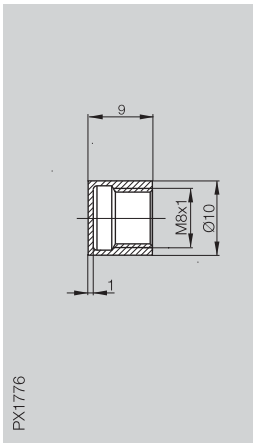
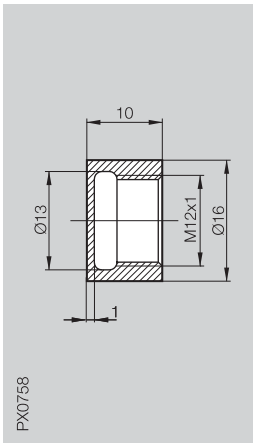
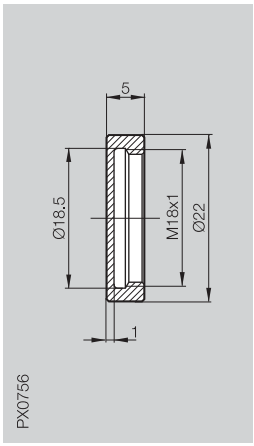


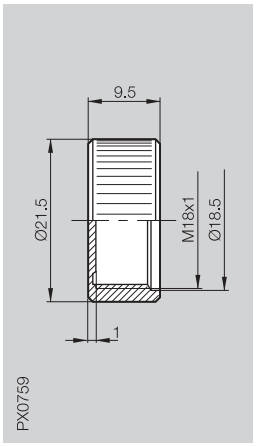
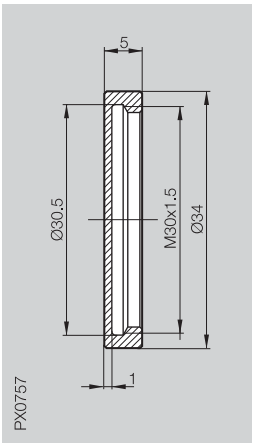
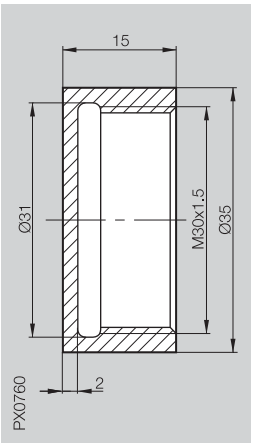
Description	Mounting plate for Unisensor
Ordering code	Montageplatte B 4 - 2057

Unisensors can be adjusted up to 30 mm on this mounting plate while wired. Loosening the sensor mounting screws (M5×25; included in set) allows the Unisensor to be easily repositioned to the desired location. Tighten screws! The mounting plate is made of corrosion-resistant aluminum.



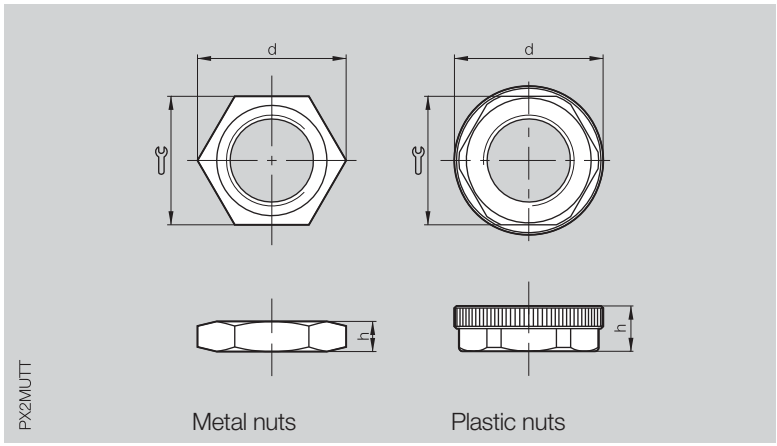


Description	Cover nut	Cover nut	Cover nut	Cover nut	
					
Ordering code	BES 08-SM-1	BES 08-SM-1F	BES 12-SM-2	BES 18-SM-1	
	This cover nut is threaded on to a M8×1 housing. It is made of PTFE and protects the active surface from weld splatter.	This cover nut is threaded on to a M8×1 housing. It is made of PTFE and protects the active surface from weld splatter.	This cover nut is threaded on to a M12×1 housing. It is made of POM and can be used for high mechanical stress applications.	This cover nut is threaded on to a M18×1 housing. It is made of PTFE and protects the active surface from weld splatter. It is also applicable for high temperatures and especially resistant to chemical influences.	
	Please note! The nominal switching distance of proximity switches is reduced by 1 mm when the cover nut is installed.	Please note! The nominal switching distance of proximity switches is reduced by 1 mm when the cover nut is installed.	Please note! The nominal switching distance of proximity switches is reduced by 1 mm when the cover nut is installed.	Please note! The nominal switching distance of proximity switches is reduced by 1 mm when the cover nut is installed.	

Cover nut	Cover nut	Cover nut
		
BES 18-SM-2	BES 30-SM-1	BES 30-SM-2
This cover nut is threaded on to a M18×1 housing. It is made of POM and can be used for high mechanical stress applications.	This cover nut is threaded on to a M30×1.5 housing. It is made of PTFE and protects the active surface from weld splatter. It is also applicable in high temperatures and especially resistant to chemical influences.	This cover nut is threaded on to a M30×1.5 housing. It is made of POM and can be used for high mechanical stress applications.
Please note! The nominal switching distance of proximity switches is reduced by 1 mm when the cover nut is installed.	Please note! The nominal switching distance of proximity switches is reduced by 1 mm when the cover nut is installed.	Please note! The nominal switching distance of proximity switches is reduced by 2 mm when the cover nut is installed.



Description	**Nuts**



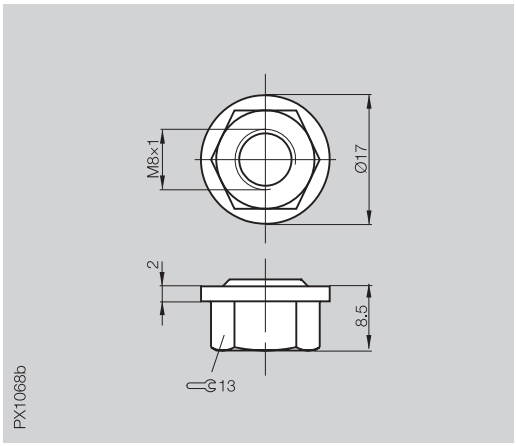
Ordering code	Ordering code = Part No.

Metal nuts	Part no.	Material	d	Wrench	h
M8×1	500557	Steel galvanized	15	13	4
M12×1	500462	CuZn coated	20	17	4
M16×1	142060	CuZn coated	22	19	3
M16×1	500030	CuZn coated	25	22	4
M18×1	500152	CuZn coated	28	24	4
M30×1.5	500252	CuZn coated	42	36	5
Stainless steel nuts					
M5×0.5	605313	1.4305	8.9	7	2.7
M12×1	636981	1.4305	20	17	4
M18×1	636982	1.4301	28	24	4
M30×1.5	636983	1.4401	42	36	5
Plastic nuts					
M18×1	606841	PA 6.6	28	24	8
M30×1.5	610292	PA 6.6	40	36	8

Zinc-plated lockwasher for M5 sensors: Part No. 710256
Zinc plated lockwasher for M18 sensors: Part No. 500558
Zinc plated lockwasher for M12 sensors: Part No. 500552
Zinc plated lockwasher for M18 sensors: Part No. 117684



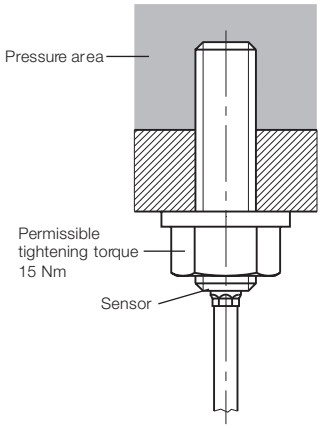
Seal nut



BES 08-DM-1

This is used to seal pressure rated proximity switches.
It seals against both liquids and gases. Suitable for pressure rated M8 sensors up to max. **100 bar** .

Please note!
Can be removed and tightened again up to five times.



Ordering code

BMF Hex Key Part No. 139870

Folding Allen key set, with additional blades, 8-piece

Tool set for all BMF sensors and BMF angle brackets as well as for sensors having a potentiometer, e.g. BOS, BCS ...



Material

Blade: Chrome vanadium steel, fully hardened, galvanically treated. Grip: Ergonomic, fiberglass reinforced housing, 55 mm long.

Application

Practical folding holder for Allen keys to prevent them from getting lost. Especially good for turning very small screws, .e.g. tightening down or precise setting of sensors.

Tough housing with release button for easily selecting the right blade. Eyelet with matching carabiner hook. Self-service packaging for Euro hole display.

⬢	⊕	◐ mm
0.7		
0.9		
1.3		
1.5		
2.0		
2.5		
		3.0
	PH00	

Lanyard included.

Ordering code

6-Kt. Winkelsatz 0,7-2,0 Part No. 123264

Tool set for BMF sensors and BMF angle brackets



⬢
0.71
0.89
1.27
1.5
2.0

Personal safety

Unless otherwise noted, the products described in this catalog are not intended for applications in which the safety of persons depends on the function of the device (not considered a safety component according to EU directives).

AC/DC sensors are not permitted to be operated directly on a German EVU grid.

Test conditions
IP 67
IP 68 per BWN Pr. 20/27
IP 69K

As per the standard, normal tap water without additives is used as a medium for testing the enclosure rating. Tap water is similar in its conductivity and viscosity to many coolants and lubricants.

The chemical resistance properties, when used with other media, must be determined on a case-by-case basis due to the possible variations.

The specifications in this catalog are based on our current knowledge and experience. Because of the variety of possible influences when using our products, these specifications do not absolve the user of responsibility for performing his own tests and checks. This applies in particular to the use of aggressive media such as cleaning agents, coolants and lubricants as well as hydraulic fluids. No legally binding assurance of particular properties or suitability for a concrete application is implied by our specifications. Any protection rights and regulations are the responsibility of the recipient of our products.

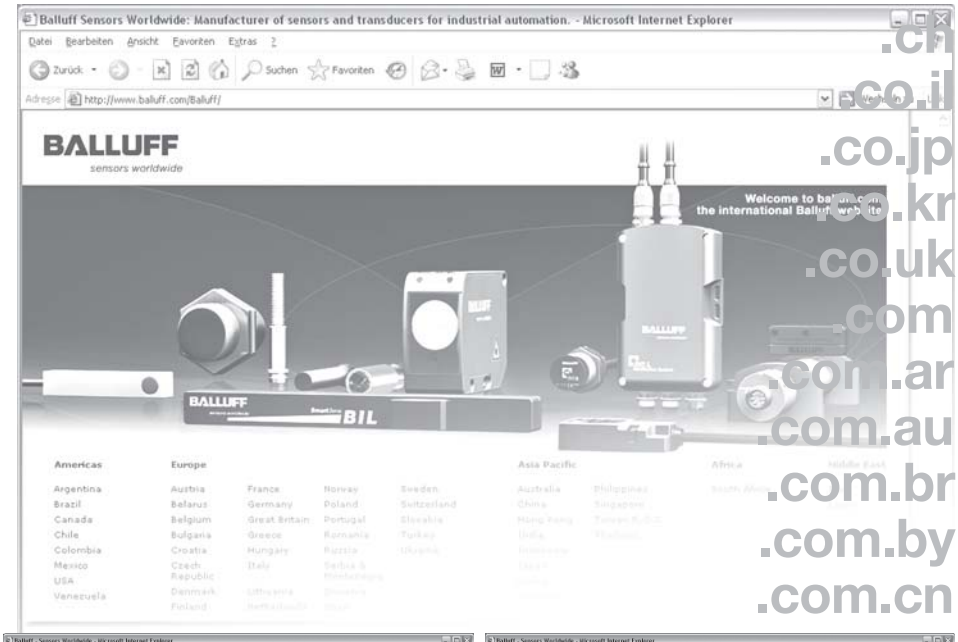
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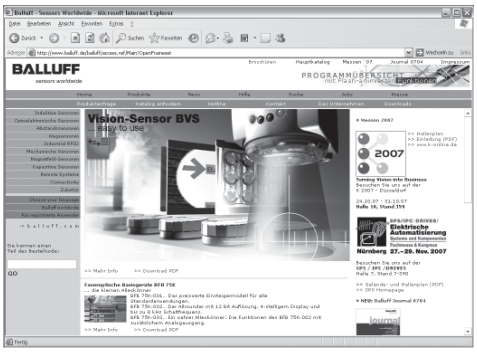
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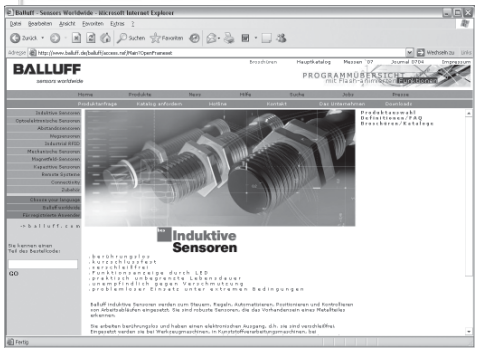
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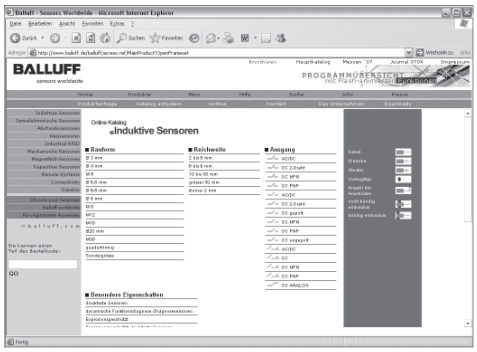
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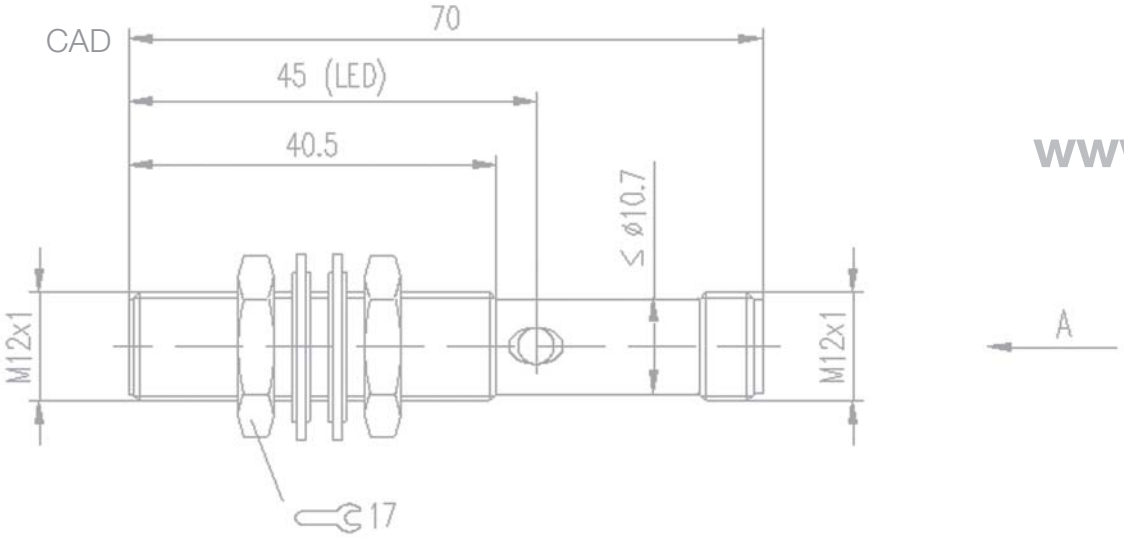






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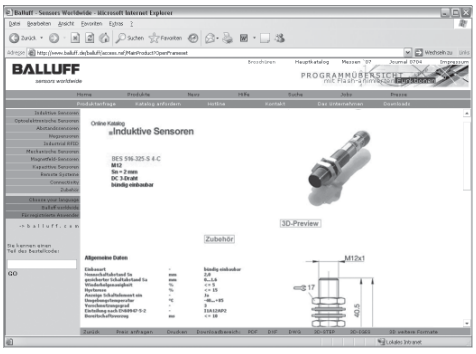


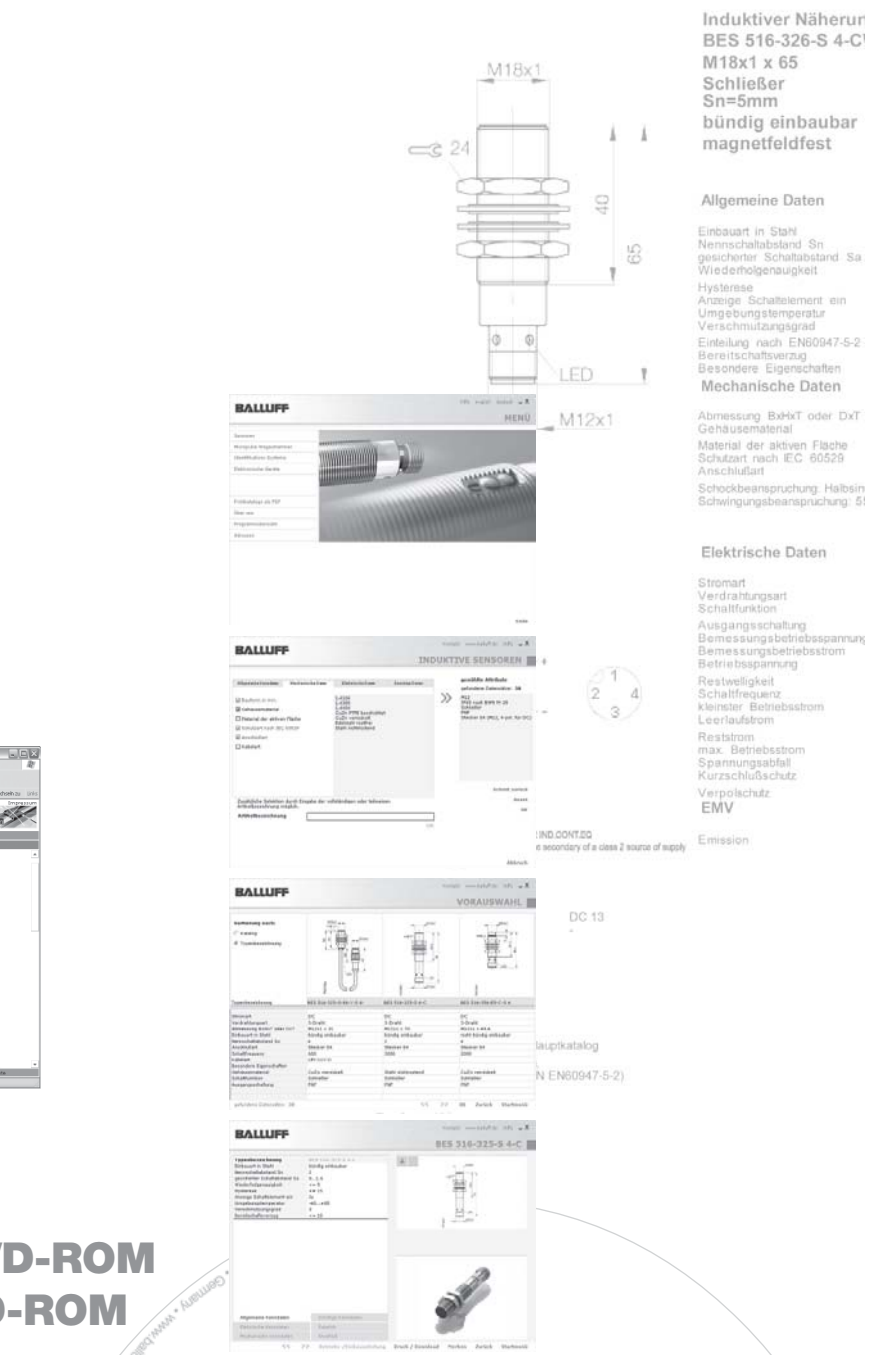
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The electronic catalog

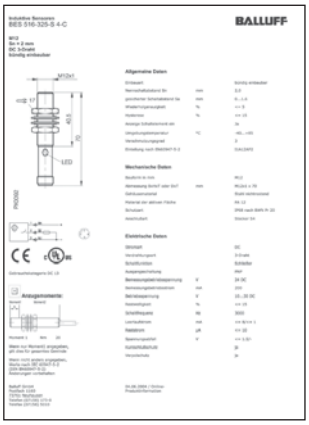
- Download drawings and manuals
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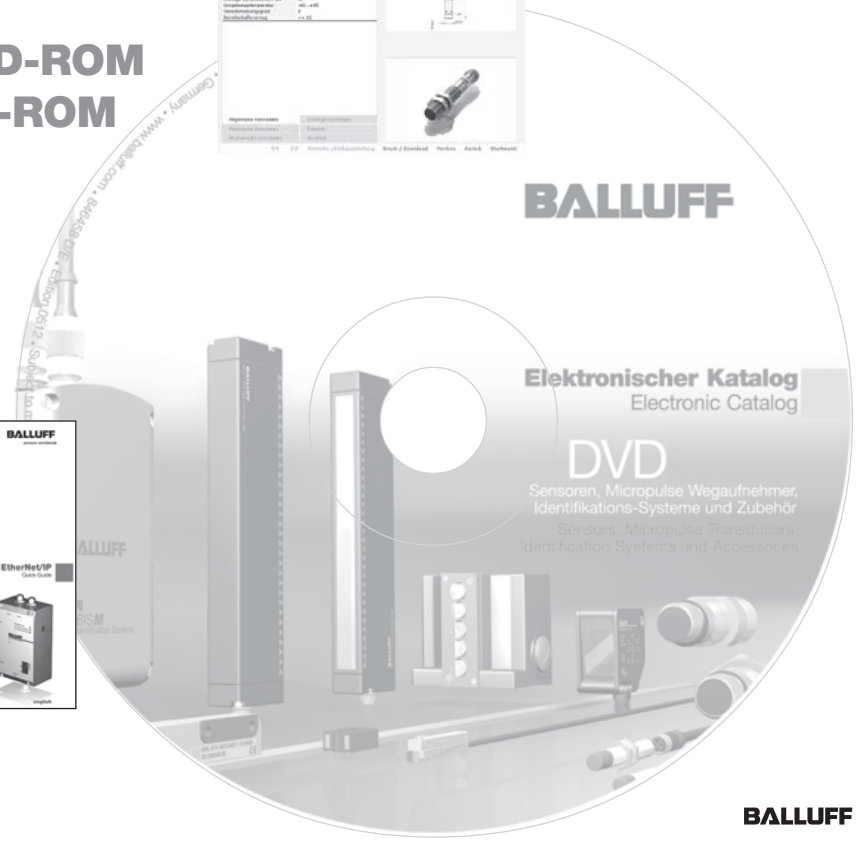
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CD-ROM

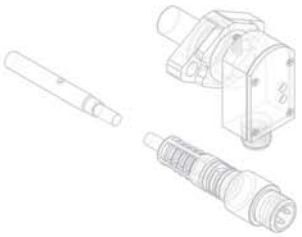
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Manual

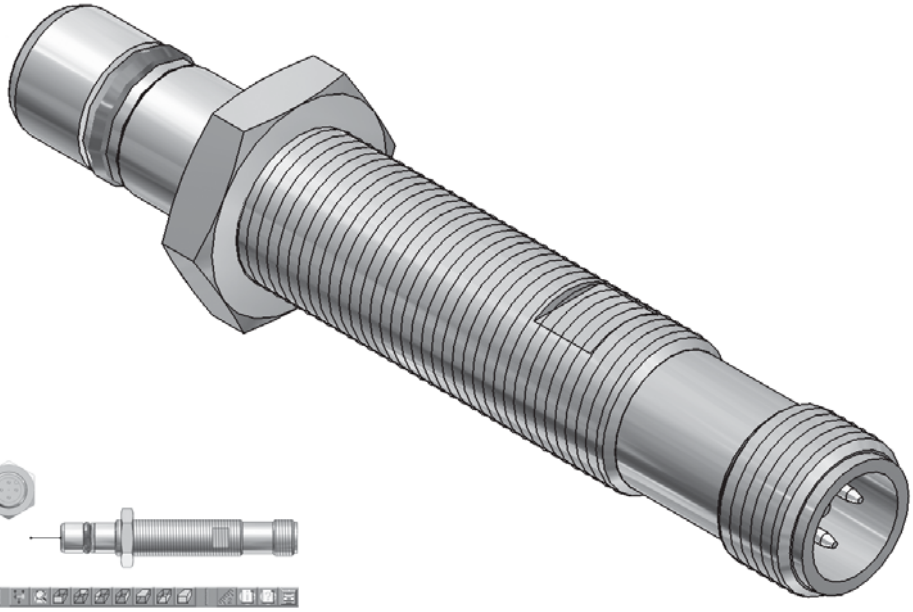


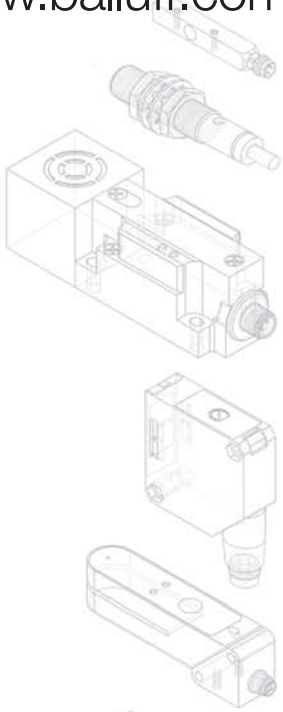


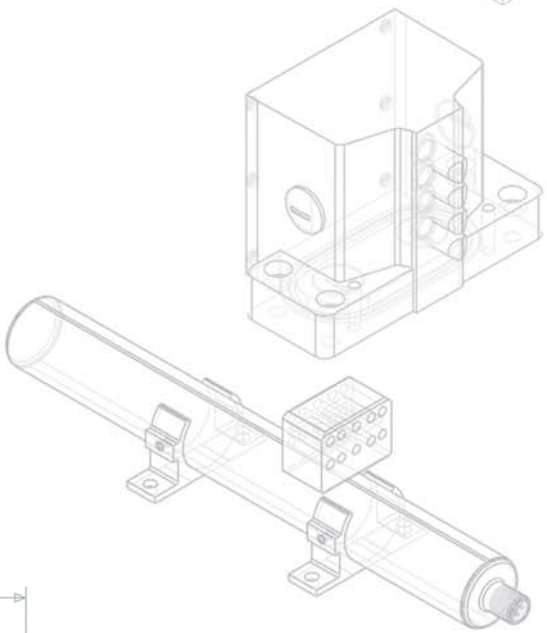


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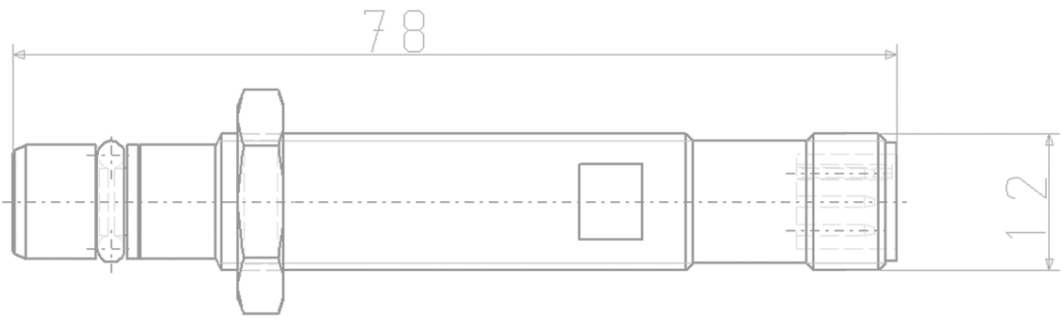
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- All catalog products available: Inductive sensors, photoelectric sensors, sensors for pneumatic cylinders, Micropulse transducers, identification systems, electromechanical multiple and single position switches ...



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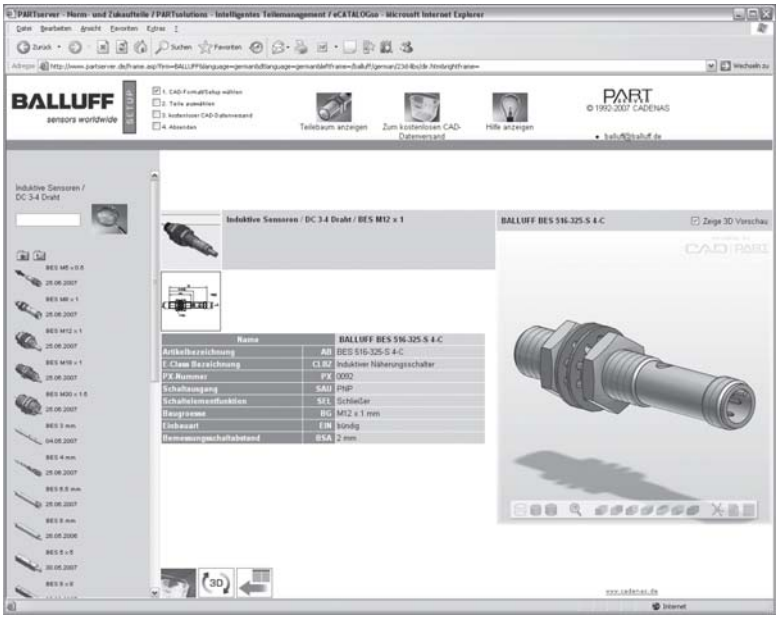
2D			3D		
BMP			CIP		
DWF	0	ASCII	DWG	?	>=V14
DWF	0	Binary	DXF	?	V12
DWF	0	Compressed	IGES		
DWG	0?	>=V14			
DXF	0?	V12			
DXF	0?	V9			
HPGL	0	V2			
IGES		>=V5.0			
JPEG					
Metafile 2D		V1			
Metafile 2D (PS2)		V2			
MI		>=V8			
Postscript EPS					
SVG					
TIFF					

Nativ

2D			3D		
AutoCAD	0?	>=V14	AutoCAD	?	>=V14
Cadkey CDL	?M	>=V19	Caddy++		SAT-V4.2
Catia IUA	?M	V4	Catia	?M	>=V5 R8
HP ME 10	0	>=V9	Catia IUA	?M	V4
IDF		3.0	EAI		
IDF		4.0	I-IDEAS	?M	V7
I-IDEAS	?M	>=V7	I-IDEAS	?M	V9
Medusa	?M	>=2000i	Inventor	?M	>=R5.3
MegaCAD		>=V5	Mechanical Desktop	?M	>=V5
SolidEdge		>=V15	MegaCAD		SAT-V2.0
Unigraphics		>=NX V1.0	PRO-Desktop	M	
VisiCAD			Pro e Wildfire		
VX (Varimetrix)	?	>=V5.0	SolidDesigner (LSP)	?M	>=V7.5
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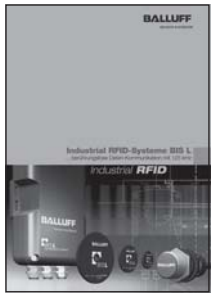


And here's how it works

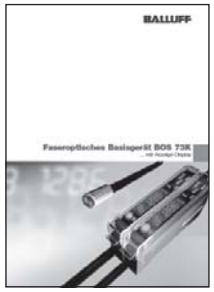
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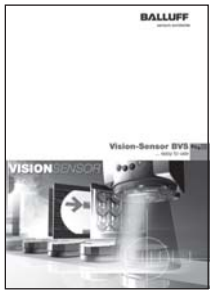

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Linear Position Sensing



Linear Position Sensing
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Incremental and Absolute Encoders BDG/BRG
Inductive Linear Position Sensor BIW
Inductive Distance Sensors BAW
Magneto-inductive Position Sensors BIL
Photoelectric Distance Sensors BOD

Industrial Identification



Industrial Identification
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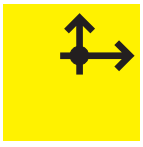
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Linear Position Sensing



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