

Along with the traditional optoelectronic sensors, an increasingly large range of specialized sensors has arisen which was designed for special tasks.

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The Balluff **distance sensor BOD 26K** not only detects the presence of objects, but also indicates their precise position. The distance of the target object from the optical surface corresponds to the voltage (0 to 10 V) on the sensor output.

The BOD (Balluff optical distance sensor) is actually a diffuse sensor which employs triangulation (like the sensors with background suppression). This means the object color has virtually no effect on the distance measurement.

The use of brilliant red laser light makes object positioning and the detection of very small objects easier.

Balluff distance sensors are designed for industrial use: rugged, reliable and easy to work with. Their use requires no special knowledge or training. They are the ideal partner in sophisticated automation.

**Features**

- Non-contact and non-interfering
- High accuracy (in the  $\mu\text{m}$  range)
- Needle sharp light spot
- Optimum light spot size
- Distance measurement of virtually any object
- Detects rapid processes
- Compact size
- Laser protection class II (no special safety measures required)
- Connector and cable versions

**Applications**

- Dimension checking (length, width, height)
- Flexible positioning
- Contour sensing
- Level detection
- Control tasks (grinding machines)
- Tool condition checking on machine tools
- Surface checking
- Object detection



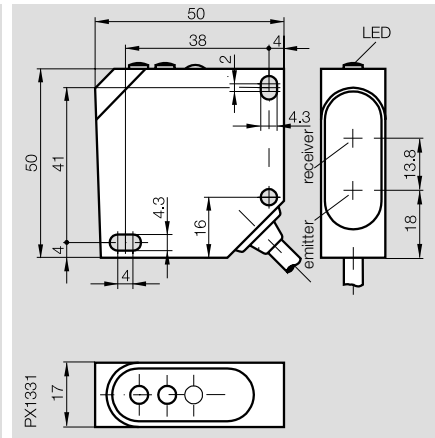
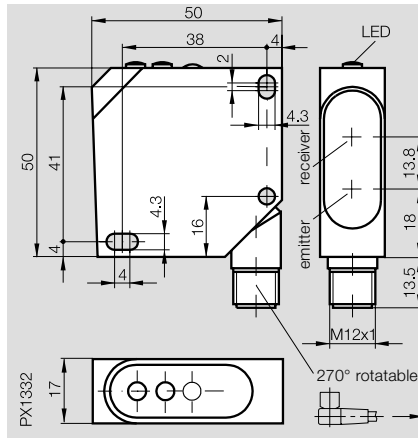
# Laser Analog Sensor



## Optoelectronic Sensors

BOD 26K  
Laser Distance Sensor

Series	BOD 26K	BOD 26K
Working range	<b>45...85 mm</b>	<b>45...85 mm</b>
Analog output	0...10 V	0...10 V



### Diffuse

Ordering code	<b>BOD 26K-LA01-S-4-C</b> <b>BOD 26K-LA02-S-4-C</b>	<b>BOD 26K-LA01-C-06</b> <b>BOD 26K-LA02-C-06</b>
Supply voltage $U_B$	18...28 V DC	18...28 V DC
Rated isolation voltage $U_i$	250 V AC	250 V AC
Rated operational current $I_o$	3 mA	3 mA
No-load supply current $I_o$ max.	≤ 35 mA	≤ 35 mA
Protected against polarity reversal	yes	yes
Short circuit protected	yes	yes
On/off delay	1 ms	1 ms
Frequency of operating cycles f	400 Hz   40 Hz	400 Hz   40 Hz
Output	0...10 V	0...10 V
Output function	analog	analog
Permissible ambient light	5000 lux	5000 lux
Status/contamination indication	LED green/red	LED green/red
Ambient temperature range $T_a$	0...+45 °C	0...+45 °C
Degree of protection per IEC 60529	IP 67	IP 67
Insulation class	□	□
Laser protection class	II	II
Housing material	ABS impact resistant	ABS impact resistant
Material of sensing face	PMMA	PMMA
Connection	connector	6 m cable, PVC
No. of wires × conductor cross section		4 × 0.25 mm <sup>2</sup>
Recommended connector	only with BKS-S 19-14-PU-05	
Weight	40 g	600 g (with 6 m cable)
Emitter type	laser light red 670 nm	laser light red 670 nm
Light spot diameter	≤ 0.9 mm at $s_n = 65$ mm	≤ 0.9 mm at $s_n = 65$ mm
Gray value shift (90 %/18 %)	3 %	3 %
Linerarity	≤ 1 %	≤ 1 %
Resolution	80 μm   20 μm	80 μm   20 μm
Temperature drift	18 μm/°C	18 μm/°C

Diffuse values referenced to Kodak gray card with 90 % reflection.

For wiring diagrams, characteristics and accessories see page 2.2.20.



Connector orientation

### Laser safety regulation (see page 2.0.18)

The emitter corresponds to laser safety class II per DIN EN 60825-1/94. Therefore, no additional safety measures are required.



The device must be mounted so that the laser warning label is easily visible.

2.2

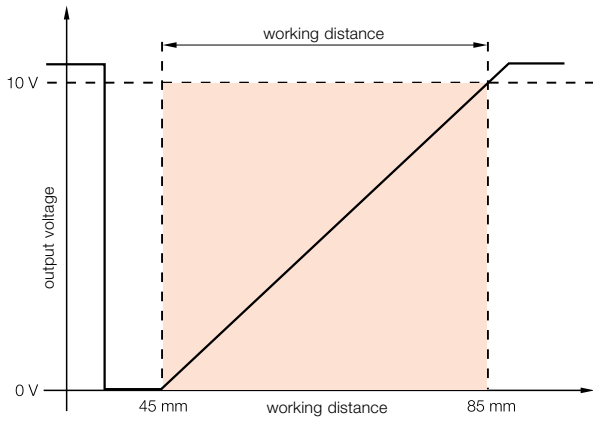
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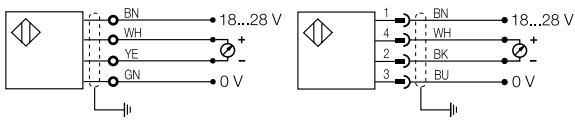
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**Analog output**



**Wiring diagrams**



**Recommended accessories**

please order separately



Mounting Bracket  
BOS 26-HW-1



Connector  
BKS-S 19-14-PU-05

The microprocessor controlled **contrast sensor BKT** represents another addition to the Balluff line of intelligent opto sensors.

In this device the microprocessor takes over the entire setup process. The user need only press two keys to setup the sensor for the mark and the background. The data are stored, so that recalibration is only required if the marking/background ratio changes. The LED's indicate which calibration step you are in. During the setup phase, the data record for the working mode, consisting of emitter color, light-on/dark-on selection, and switching threshold, is automatically created. 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 buttons.

The internal microprocessor monitors and synchronizes the emitter, receiver and output circuits, for optimum switching frequency, repeatability and insensitivity to interference and ambient light.

The sensor output is selectable between NPN and PNP. In both cases, the output is protected against over-voltage and short circuit. All models have an analog output whose signal is proportional to the light intensity reflected from the target.

A stable metal housing gives the sensor an IP 67 rating. The sensor lens can be placed in two positions, for setting the exit surface straight or rotated 90° from the sensor axis. For even greater installation flexibility, the connector or cable fitting can be rotated in three 90° increments.

#### Features

- Complete microprocessor control of the setup process
- Automatic selection of red or green emitter light
- Automatic setting of light-on/dark-on function
- Switching threshold automatically determined
- Remote key functions and 4 storable programs (cable version)
- Time delay and key lock selectable
- PNP/NPN selectable
- M12 connector or cable fitting rotatable by 90°
- Metal housing, IP 67 rating, with moveable lens (straight and 90° optics)

#### Applications

- Recognizing colored markings on packaging material
- Synchronizing cutting or separating processes
- Checking adhesive, ink and paint
- Checking art work orientation (IC's)
- Contrast-based object detection



2.2

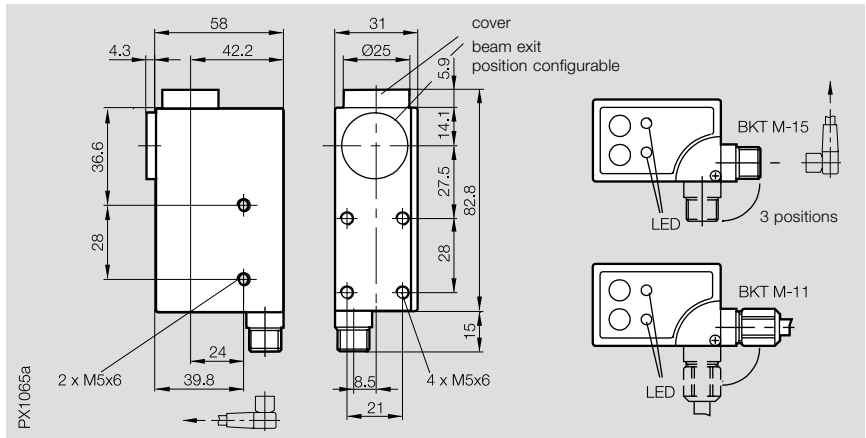
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Series	BKT
Contrast sensor working distance	9 mm
working distance with optional lens	18 mm



### Diffuse

	PNP/NPN ○/● vertical spot	BKT M-15-U-S 4	BKT M-11-U-03
	PNP/NPN ○/● horizontal spot	BKT M-15L-U-S 4	BKT M-11L-U-03

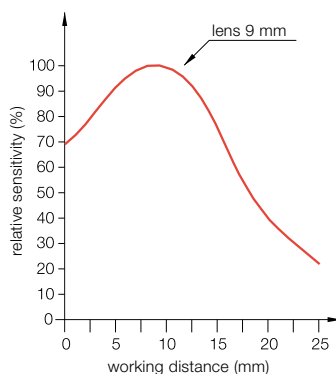
Supply voltage $U_B$	10...30 V DC
Voltage drop $U_d$ at $I_e$	1.5 V
Rated isolation voltage $U_i$	75 V DC
Rated operational current $I_e$	200 mA
No-load supply current $I_0$ max.	80 mA
Protected against polarity reversal	yes
Short circuit protected	yes
Permissible capacitance	1 $\mu$ F
On/off delay	50 $\mu$ s
Frequency of operating cycles $f$	10 kHz
Utilization category	DC 13
Output	PNP/NPN selectable
Output function	○/● selectable
Permissible ambient light	3000 lux artificial light/10000 lux sunlight
Sensitivity/range adjustment	teach-in
Output function indicator	LED red
Status indicator/error indicator	LED green
Ambient temperature range $T_a$	-15...+55 °C
Degree of protection per IEC 60529	IP 67

Housing material	GD-Zn
Material of sensing face	glass
Connection	connector 3 m cable, PVC
No. of wires $\times$ conductor cross section	6 $\times$ 0.34 mm <sup>2</sup> with shield
Recommended connector	BKS-B19-3/BKS-B20-3
Weight	500 g 600 g (with 3 m cable)
Emitter type	red/green visible 635 nm/565 nm
Spot size	1.5 $\times$ 5 (2 $\times$ 7 with 18 mm lens)
Analog output	0...5 V DC (2.5 V DC with Kodak gray card 90 % reflection)

○/● = Light-on/dark-on



### Sensitivity curve

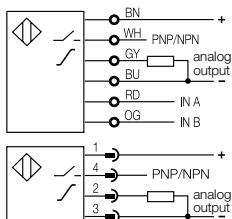


### Recommended accessories

please order separately



### Wiring diagrams



Optical 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 (short-wavelength, here 380 nm) into visible light (between blue 450 nm and dark red 780 nm). This effect is called photo-synthesis. The visible light can then be detected as usual by the receiver portion of the sensor.

**Luminescence sensor BLT** are especially designed for this purpose. The Balluff luminescence sensor (BLT) is equipped with a modern UV source (a UV-LED), so that no external UV lamp is required. Signal processing is microprocessor-controlled using teach-in. By pressing a button the BLT learns the difference between the fluorescent marking and the background. If the difference is too slight and not reliably detectable, a flashing LED indicates this condition. The sensing distance is typically 9 to 18 mm. Use of an additional lens (BKT M-PK-1) increases this distance to 15...30 mm.

Configuring two internal DIP switches allows you to set a turn-off delay of 20 ms or disable the buttons. The PNP/NPN output is also selectable. An analog signal proportional to the light reflected by the marking rounds out the functionality of the BLT.

#### Features

- UV source: LED, 100000 hour life
- Sensing distance 9...18 mm (15...30 mm with optional lens)
- Push-button setting
- Automatic setting of light-on/dark-on
- Time delay setting
- PNP or NPN selectable
- Analog output 0...7 V DC standard
- Configurable M12 connector (3 positions)
- Button disable
- Metal housing
- IP 67

#### 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)
- Foods industry



## 2.2

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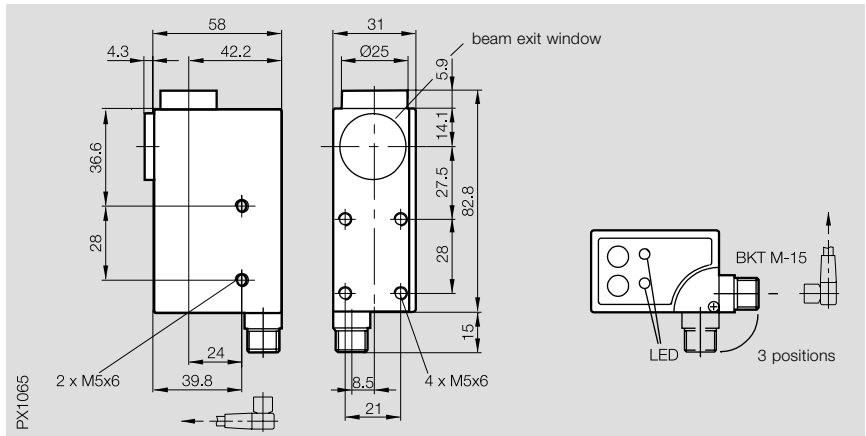
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# Optoelectronic Sensors

## BLT Luminescence Sensor with Teach-in

Series	BLT
Luminescence sensor	working distance 9...18 mm
	working distance with optional lens 15...30 mm



### Diffuse

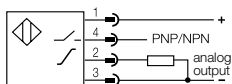


PNP/NPN	○/●	BLT M-15-U-S 4
Supply voltage $U_B$		10...30 V DC
Voltage drop $U_d$ at $I_e$		1.5 V
Rated isolation voltage $U_i$		75 V DC
Rated operational current $I_e$		200 mA
No-load supply current $I_0$ max.		80 mA
Protected against polarity reversal		yes
Short circuit protected		yes
Permissible capacitance		1 $\mu$ F
On/off delay		250 $\mu$ s
Frequency of operating cycles $f$		2 kHz
Utilization category		DC 13
Output		PNP/NPN selectable
Output function		○/● selectable
Permissible ambient light		3000 lux artificial light/10000 lux sunlight
Sensitivity/range adjustment		teach-in
Output function indicator		LED red
Status indicator/error indicator		LED green
Ambient temperature range $T_a$		-15...55 °C
Degree of protection per IEC 60529		IP 67
Housing material		GD-Zn
Material of sensing face		glass
Connection		connector
Recommended connector		BKS-B 19-3/BKS-B 20-3
Weight		500 g
Emitter type		UV-LED (380 nm), life expectancy 100000 hrs.
Spot size		Ø 5 (Ø 7 with 18 mm lens)
Analog output		0...7 V DC

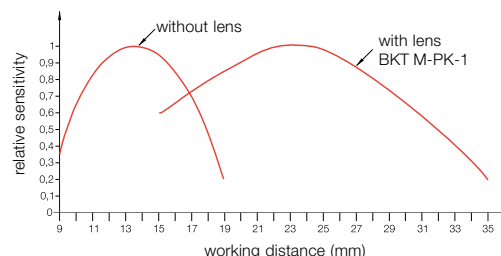
○/● = Light-on/dark-on



### Wiring diagrams



### Sensitivity curve



**Recommended accessories**  
please order separately



Lens  
BKT M-PK-1

Connector  
BKS-B 19-3/BKS-B 20-3

All colors are made up of various combinations of the primary colors red, blue and green. Likewise, every color can be broken down into its primary colors (such as a prism does). Normally the object whose color you wish to determine needs to be illuminated with white light. The reflected light is picked up by three different receivers (red, blue, green) and then processed. Another alternative is to illuminate the object with the three complementary colors and process the reflected light with a single receiver. This is the principle which the **BFS 28K** employs.

The **BFS 28K** is a base unit for plastic fiber optic cables. When using the **BFO D22-XA-AF...** it works as a color sensing system. The BFS 28K is designed for reliable and versatile sensing of objects, surfaces, markings or other references based on their color. The BFS 28K operates on the diffuse sensing principle. It emits red, green and blue light and receives their reflected components. It can detect a particular color or a color range, depending on how it is set up. With its built-in micro-processor the BFS 28K is easy to calibrate with the push of a button. The display LED's guide you systematically and reliably through the setup process. The BFS 28K is available with integrated cable or a connector. The cable version provides for remote setup over a control line.

#### Features

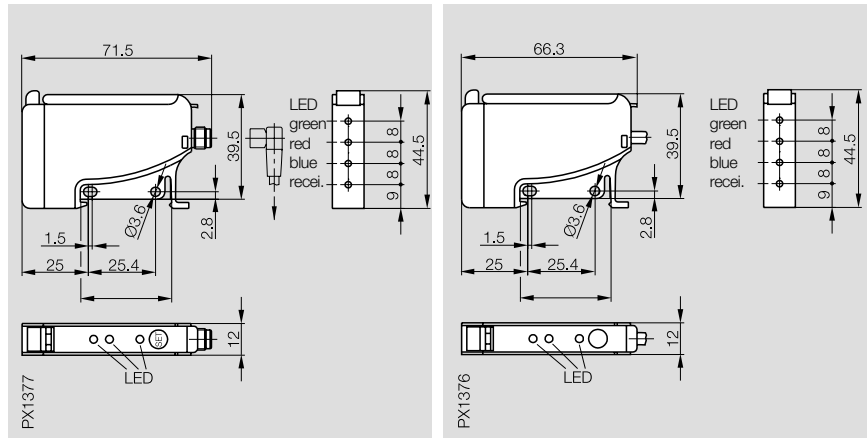
- Microcontroller built-in
- Compact color sensing system
- 3 emitter LED's
- Teach-in
- Connector or cable version
- Selectable for color or color range

#### Applications

- Selecting materials based on the color of the part
- Selecting by color
- Paint finish verification

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Series	BFS 28K	BFS 28K
Working distance	5...8 mm	5...8 mm



### Diffuse

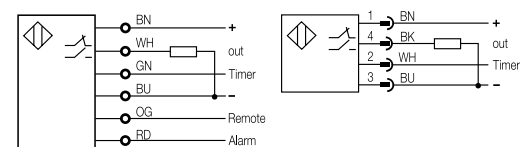
PNP	○	BFS 28K-PS-F01-S 75	BFS 28K-PS-F01-02
Supply voltage $U_B$		10...30 V DC	10...30 V DC
Rated isolation voltage $U_i$		75 V DC	75 V DC
Rated operational current $I_o$		100 mA	100 mA
No-load supply current $I_o$ max.		≤ 35 mA	≤ 35 mA
Protected against polarity reversal		yes	yes
Short circuit protected		yes	yes
On/off delay		900 μs	900 μs
Frequency of operating cycles f		550 Hz	550 Hz
Utilization category		DC 13	DC 13
Output		PNP	PNP
Output function		○	○
Sensitivity/range adjustment		teach-in	teach-in
Output function indicator		LED yellow	LED yellow
Ambient temperature range $T_a$		0...+60 °C	0...+60 °C
Degree of protection per IEC 60529		IP 65	IP 65
Housing material		PC	PC
Connection		connector	2 m cable, PVC
No. of wires x conductor cross section			6 x 0.32 mm <sup>2</sup>
Recommended connector		BKS-B 74/BKS-B 75	
Weight		50 g	100 g (with 2 m cable)
Time function		40 ms turn-off delay option	40 ms turn-off delay option

○/● = Light-on/dark-on

Diffuse values referenced to Kodak gray card with 90 % reflection.

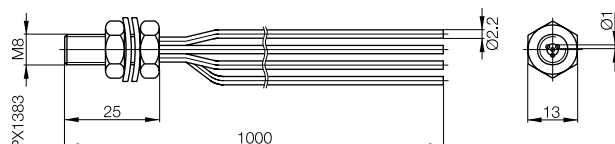


### Wiring diagrams



### Plastic fiber optic BFO D22-XA-AF-EAK-35-01

Supplied, but may also be ordered separately.



### Recommended accessories

please order separately

Connector  
BKS-B 74/BKS-B 75



The **BGL 21 slot sensor** is an optoelectronic sensor in which the setup procedure and function monitoring are handled by a microprocessor. These data are stored in an EEPROM, so that reprogramming is only required for new conditions. The autoset button is on the upper side of the sensor, next to the function displays: a yellow LED for displaying the output status, and a two-color LED (red/green) for displaying function or an error condition.

An setup aid is printed on the upper and lower side of the sensor housing for indicating the position in which the object must be located.

The internal microprocessor controls all settings for achieving optimum switching frequency, repeatability and insensitivity to optical interference and stray light. The BGL 21-AH has a red and green emitter diode, designed for recognizing colored markings. Selection of the most effective emitter light for the application is automatic during the setup procedure. The BGL 21 features a solid metal housing with polycarbonate keypad and glass lenses. The enclosure rating is IP 65. The block with the mounting holes and the M8 connector can be rotated by 90° for solving virtually any installation problem.

#### Features

- Fast, fully automatic setup
- Control pad consisting of just one button and two LED's
- A microprocessor controls all sensor functions
- Very short response time and high repeatability
- High resistance to optical interference and ambient light
- NPN/PNP output on separate pins with overload and short circuit protection
- M8 connector block rotatable by 90°
- Metal housing, IP 65 rating

#### Applications

- Recognizing colored markings on transparent substrate material
- Label detection
- Guide control on tracks
- Tape break control
- Thread tear/slack monitoring
- Hole checking in thin materials (< 2 mm)



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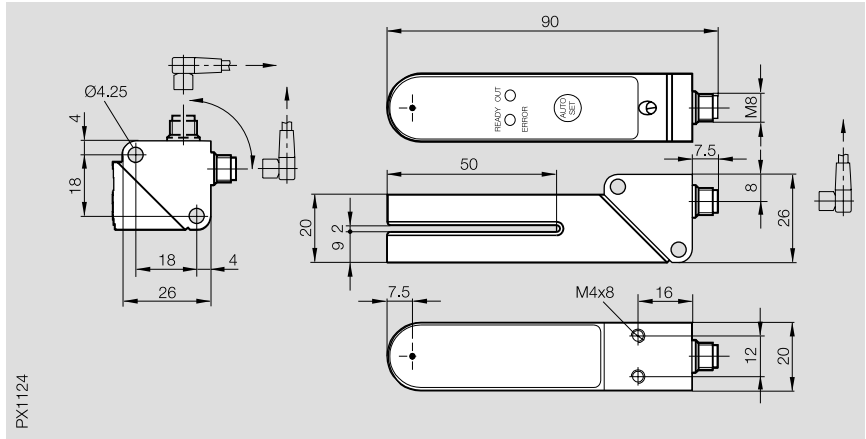
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# Optoelectronic Sensors

## BGL 21 Slot Sensor with Teach-in

Series	BGL
Slot sensor	slot spacing 2 mm

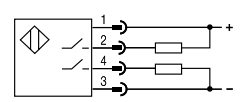


	PNP/NPN O/●	BGL 21-AH
Supply voltage $U_B$	10...30 V DC	
Voltage drop $U_d$ at $I_o$	1.2 V	
Rated isolation voltage $U_i$	75 V DC	
Rated operational current $I_o$	100 mA	
No-load supply current $I_o$ max.	55 mA	
Protected against polarity reversal	yes	
Short circuit protected	yes	
Permissible capacitance	1 $\mu$ F	
On/off delay	50 $\mu$ s	
Frequency of operating cycles f	10 kHz	
Utilization category	DC 13	
Output	PNP/NPN on separate pins	
Output function	O/● selectable	
Permissible ambient light	3000 lux artificial light/10000 lux sunlight	
Sensitivity/range adjustment	teach-in	
Output function indicator	LED yellow	
Status indicator/error indicator	LED red/green	
Ambient temperature range $T_a$	0...55 °C	
Degree of protection per IEC 60529	IP 65	
Housing material	Al anodized	
Material of sensing face	glass	
Connection	connector	
Recommended connector	BKS-B 74/BKS-B 75	
Weight	100 g	
Emitter type	red/green visible 635 nm/565 nm	
Min. object width	1 mm	

O/● = Light-on/dark-on



### Wiring diagram



### Recommended accessories

please order separately

Connector  
BKS-B 74/BKS-B 75



Thru-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. Slot sensors allow very precise thru-beam configurations to be integrated into very small housings containing both the emitter and receiver.

The advantages compared with a fiber optic cable approach are not only price related, but also in their ease of handling, setup and operating reliability. The rugged metal housing ensures that production is not interrupted by undesired mechanical misalignment.

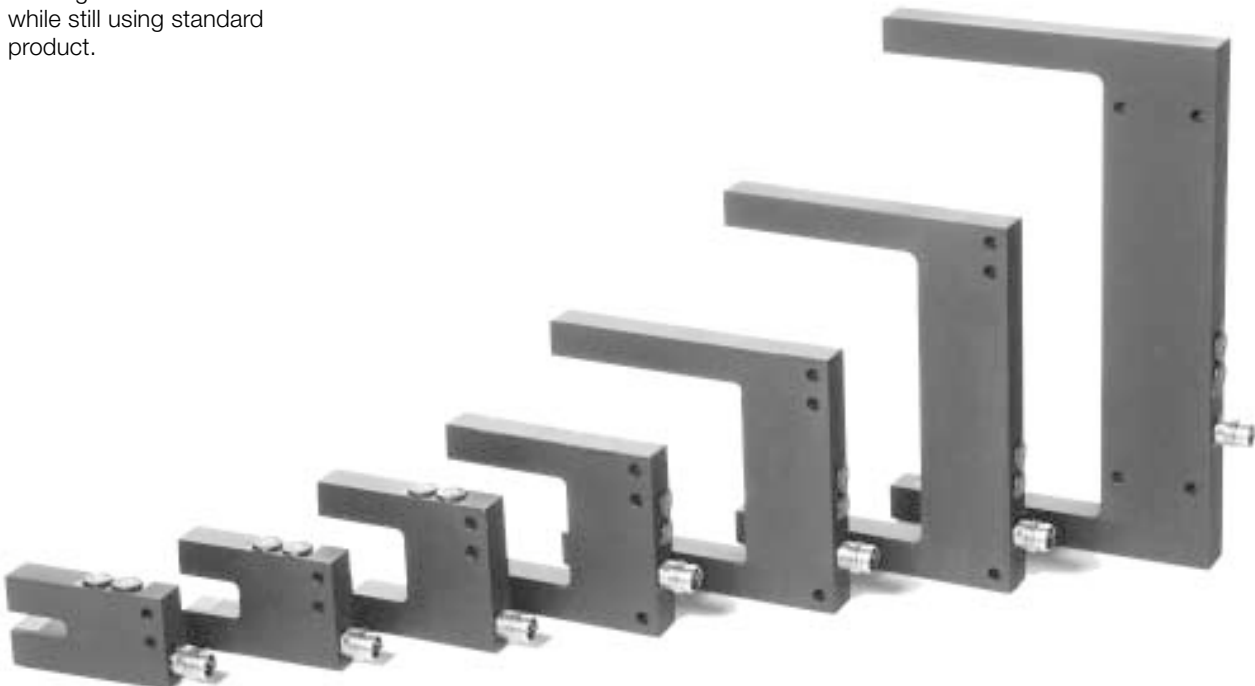
A full range of slot sensors with a variety of slot separations and dimensions ensures that virtually any sensing task can be handled while still using standard product.

### Features

- Integrated signal processing
- Easy handling and setup
- Only one cable connection required
- Rugged metal housing
- Active surface made of glass
- High switching frequency
- Adjustable sensitivity
- High resolution
- N.O./N.C. selectable
- 360 deg. LED indicator
- Red emitter light

### Applications

- Parts sensing on conveyor rails and conveying belts
- Label discrimination with transparent substrates
- Parts dimension verification
- Parts counting in assembly lines
- Tool break monitoring
- Position verification
- Feed verification on automatic assembly equipment
- Checking for complete count (e. g. connector pins)
- Level monitoring in tanks
- Handling and assembly technology



2.2

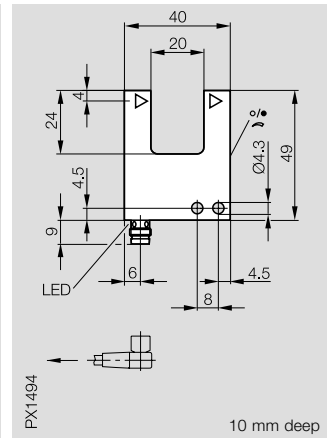
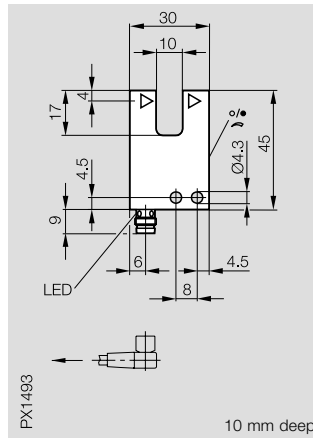
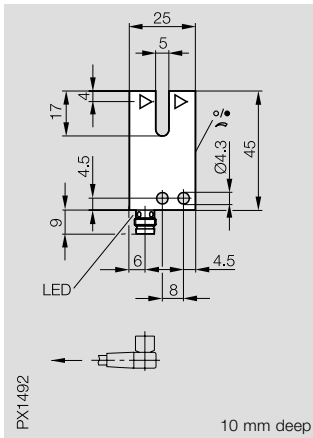
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Series	BGL	BGL	BGL
Slot sensor slot spacing	5 mm	10 mm	20 mm

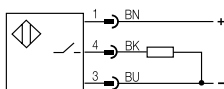


PNP O/●	BGL 5A-001-S 49	BGL 10A-001-S 49	BGL 20A-001-S 49
Supply voltage $U_B$	10...30 V DC	10...30 V DC	10...30 V DC
Voltage drop $U_d$ at $I_e$	< 3 V	< 3 V	< 3 V
Rated isolation voltage $U_i$	75 V DC	75 V DC	75 V DC
Rated operational current $I_e$	200 mA	200 mA	200 mA
No-load supply current $I_0$ max.	≤ 35 mA	≤ 35 mA	≤ 35 mA
Protected against polarity reversal	yes	yes	yes
Short circuit protected	yes	yes	yes
Permissible capacitance	0.2 μF	0.2 μF	0.2 μF
On/off delay	0.2 ms	0.2 ms	0.33 ms
Frequency of operating cycles f	3000 Hz	3000 Hz	1500 Hz
Utilization category	DC 13	DC 13	DC 13
Output	PNP*	PNP*	PNP*
Output function	O/● selectable	O/● selectable	O/● selectable
Permissible ambient light	10 kLux	10 kLux	10 kLux
Sensitivity/range adjustment	potentiometer 0...270°	potentiometer 0...270°	potentiometer 0...270°
Function indicator (receiver sees light)	LED red	LED red	LED red
Ambient temperature range $T_a$	-10...60 °C	-10...60 °C	-10...60 °C
Degree of protection per IEC 60529	IP 65	IP 65	IP 65
Housing material	Al anodized	Al anodized	Al anodized
Material of sensing face	glass	glass	glass
Connection	connector	connector	connector
Recommended connector	BKS-B 48/BKS-B 49	BKS-B 48/BKS-B 49	BKS-B 48/BKS-B 49
Weight	20 g	23 g	28 g
Emitter type	red 640 nm	red 640 nm	red 640 nm
Switching hysteresis	≤ 0.1 mm	≤ 0.1 mm	≤ 0.1 mm
Resolution	0.3 mm	0.3 mm	0.3 mm
Repeatability	0.02 mm	0.02 mm	0.02 mm

\*NPN version on request.



### Wiring diagram



# Slot Sensors

## Optoelectronic Sensors

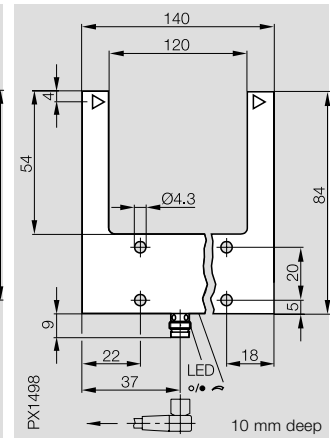
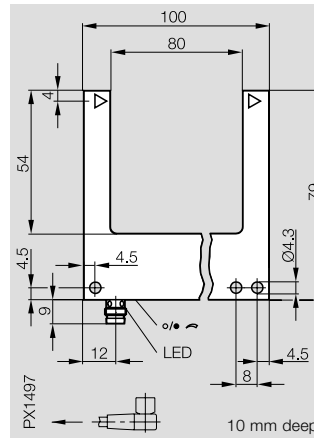
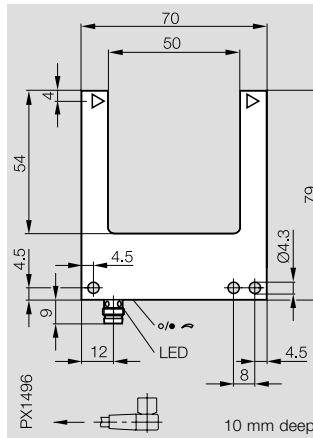
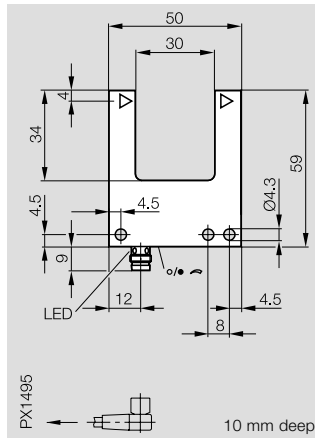
## BGL Slot Sensors

BGL  
30 mm

BGL  
50 mm

BGL  
80 mm

BGL  
120 mm



BGL 30A-001-S 49

BGL 50A-001-S 49

BGL 80A-001-S 49

BGL 120A-001-S 49

10...30 V DC

< 3 V

75 V DC

200 mA

≤ 35 mA

yes

yes

0.2 µF

0.33 ms

1500 Hz

DC 13

PNP\*

○/● selectable

10 kLux

potentiometer 0...270°

LED red

-10...60 °C

IP 65

Al anodized

glass

connector

BKS-B 48/BKS-B 49

36 g

red 640 nm

≤ 0.1 mm

0.3 mm

0.02 mm

10...30 V DC

< 3 V

75 V DC

200 mA

≤ 35 mA

yes

yes

0.2 µF

0.33 ms

1500 Hz

DC 13

PNP\*

○/● selectable

5 kLux

potentiometer 0...270°

LED red

-10...60 °C

IP 65

Al anodized

glass

connector

BKS-B 48/BKS-B 49

58 g

red 640 nm

≤ 0.15 mm

0.5 mm

0.04 mm

10...30 V DC

< 3 V

75 V DC

200 mA

≤ 35 mA

yes

yes

0.2 µF

0.33 ms

1500 Hz

DC 13

PNP\*

○/● selectable

5 kLux

potentiometer 0...270°

LED red

-10...60 °C

IP 65

Al anodized

glass

connector

BKS-B 48/BKS-B 49

76 g

red 640 nm

≤ 0.2 mm

0.5 mm

0.06 mm

10...30 V DC

< 3 V

75 V DC

200 mA

≤ 35 mA

yes

yes

0.2 µF

0.33 ms

1500 Hz

DC 13

PNP\*

○/● selectable

5 kLux

potentiometer 0...270°

LED red

-10...60 °C

IP 65

Al anodized

glass

connector

BKS-B 48/BKS-B 49

116 g

red 640 nm

≤ 0.2 mm

0.8 mm

0.08 mm



### Recommended accessories

please order separately

Connector  
BKS-B 48/BKS-B 49



2.2

2.3

Accessories  
Optosensors  
page 2.3.2 ...

6

Connectors ...  
page 6.2 ...

