

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 time-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	Resolution	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	15...30 V DC	18...28 V DC	18...30 V DC	M8 connector, 4-pin	M12 connector	Cable	
 Distance sensor																	
BOD 6K-RA01-S75-C	20...80 mm		■		■				■		■			■			2.2.29
BOD 6K-RA01-C-02	20...80 mm		■		■				■		■					■	2.2.29
BOD 26K-LA01-S4-C	45...85 mm	80 µm		■	■							■			■		2.2.31
BOD 26K-LA01-C-06	45...85 mm	80 µm		■	■							■				■	2.2.31
BOD 26K-LA02-S4-C	45...85 mm	20 µm		■	■							■			■		2.2.31
BOD 26K-LA02-C-06	45...85 mm	20 µm		■	■							■				■	2.2.31
BOD 26K-LB04-S115-C	30...100 mm	70 µm		■			■		■				■		■		2.2.33
BOD 26K-LBR04-S115-C	30...100 mm	70 µm		■			■	■	■				■		■		2.2.33
BOD 26K-LB05-S115-C	80...300 mm	220 µm		■			■		■				■		■		2.2.35
BOD 26K-LBR05-S115-C	80...300 mm	220 µm		■			■	■	■				■		■		2.2.35
BOD 63M-LA01-S115	500...6000 mm	2 mm		■	■				■	■	■				■		2.2.37
BOD 63M-LB01-S115	500...6000 mm	2 mm		■			■		■	■	■				■		2.2.37
BOD 66M-RA01-S92-C	100...600 mm	0.5 mm	■			■			■				■		■		2.2.41
BOD 66M-RB01-S92-C	100...600 mm	0.5 mm	■				■		■				■		■		2.2.41
BOD 66M-LA04-S92-C	200...2000 mm	5 mm		■		■			■				■		■		2.2.43
BOD 66M-LB04-S92-C	200...2000 mm	5 mm		■			■		■				■		■		2.2.43

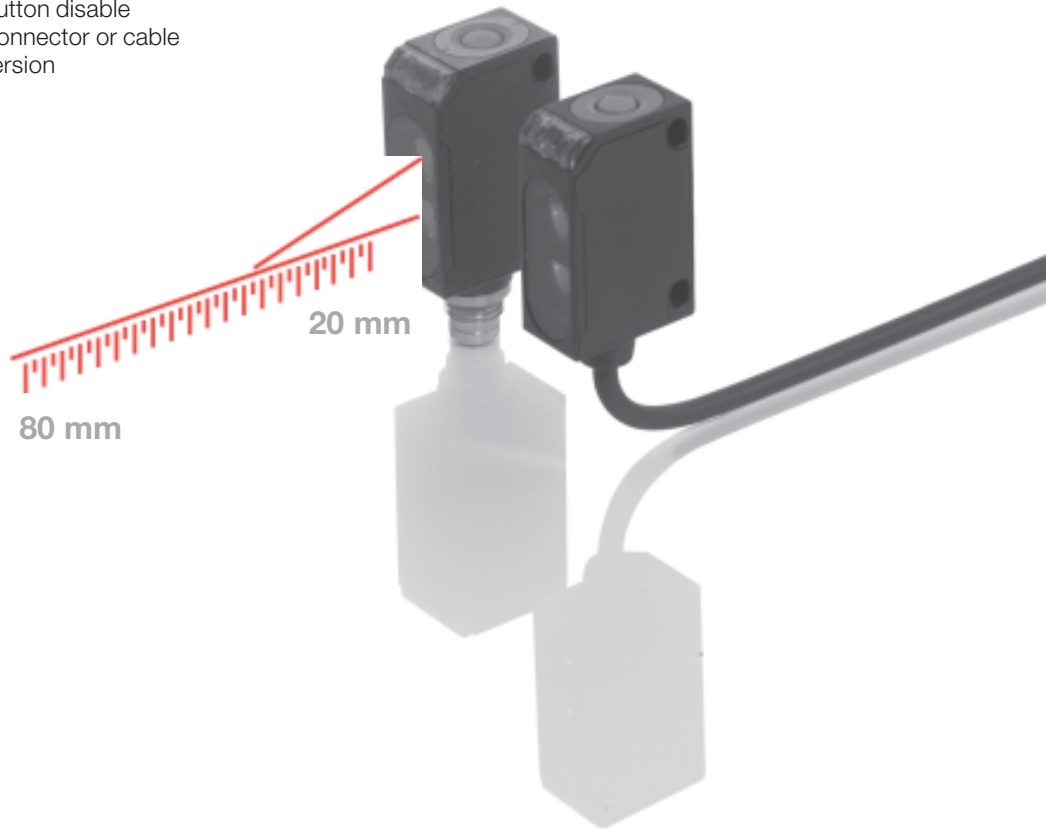
2.2**2.3**Photoelectric
sensors
accessories
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page 6.2 ...

The **BOD 6K** provides a distance-proportional analog output signal with falling voltage over a fixed measuring range of 20 to 80 mm.

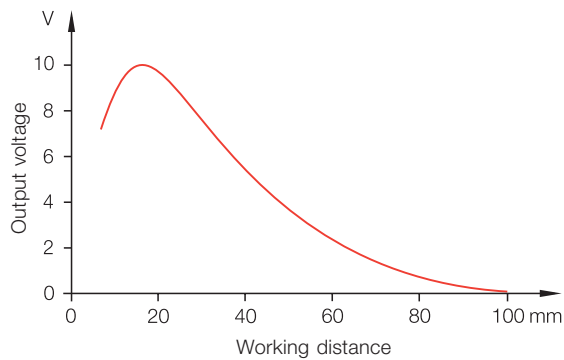
With an output adjustable using teach-in the sensor can also be used as a diffuse type with background suppression.

Features

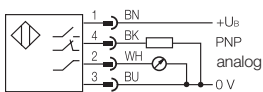
- Fixed measuring range between 20...80 mm
- Analog output 0...10 V
- Adjustable background suppression
- Output PNP, NO/NC
- Teach-in
- Button disable
- Connector or cable version



Analog output BOD 6K-RA01



Wiring diagram



Recommended accessories

please order separately

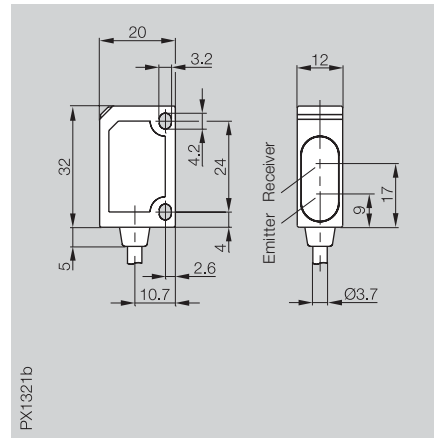
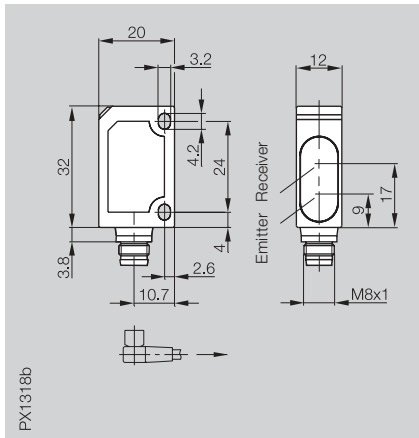


Mounting bracket
BOS 6-HW-1



Connector
BKS-S 74/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	$\leq 15\%$ of U_B	$\leq 15\%$ 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_0	≤ 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	5x5 mm at 60 mm	5x5 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	20x32x12 mm	20x32x12 mm
Connection	M8 connector, 4-pin	2 m cable, PVC
No. of wires x cross-section		4x0.14 mm ²
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

Diffuse values referenced to Kodak gray card 90 % reflective, 100x100 mm.



Connector orientation

2.2

2.3

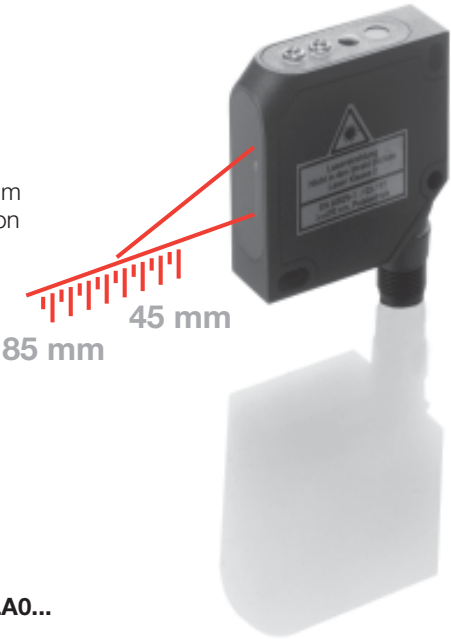
Photoelectric sensors accessories page 2.3.2 ...

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Connectors page 6.2 ...

Features

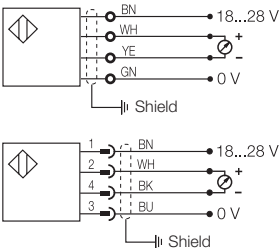
- Fixed measuring range between 45...85 mm
- Analog output 0...10 V
- Resolution 20 µm or 80 µm
- Connector or cable version



Analog output BOD 26K-LA0...



Wiring diagrams



Recommended accessories
please order separately



Mounting bracket
BOS 26K-HW-1



Connector
BKS-S 19-14-PU-05

Series	
Working range	
Measuring range	



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 x 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	

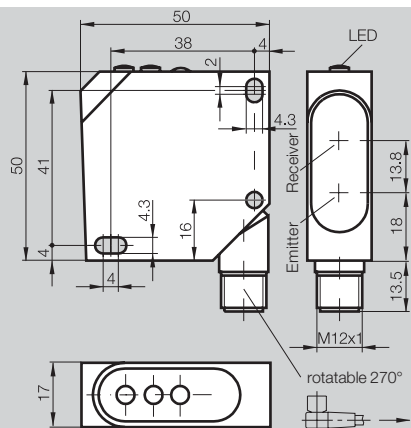
Diffuse values referenced to Kodak gray card 90 % reflective.



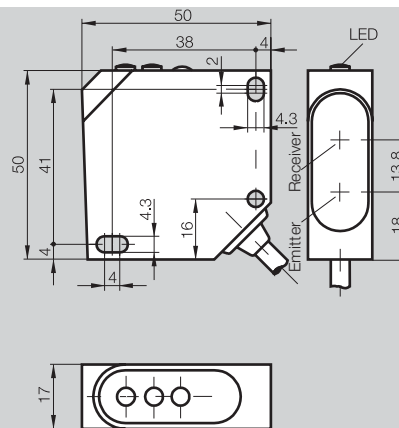
Connector orientation



BOD 26K
45...85 mm
40 mm



BOD 26K
45...85 mm
40 mm



BOD 26K-LA01-S4-C

18...28 V DC
10 %
≤ 35 mA
0...10 V (max. 3 mA)
fix

Laser, red light
670 nm

2
≤ 0.8 mm at 65 mm
18 µm/°C
80 µm
≤ 1 %

400 Hz
3 ms
2 ms

LED green
LED red

50×50×17 mm
M12 connector, 4-pin

impact-resistant ABS
PMMA
40 g

IP 67
yes
yes

EN 60947-5-2
0...+45 °C

BOD 26K-LA02-S4-C

18...28 V DC
10 %
≤ 35 mA
0...10 V (max. 3 mA)
fix

Laser, red light
670 nm

2
≤ 0.8 mm at 65 mm
18 µm/°C
20 µm
≤ 1 %

40 Hz
30 ms
20 ms

LED green
LED red

50×50×17 mm
M12 connector, 4-pin

impact-resistant ABS
PMMA
40 g

IP 67
yes
yes

EN 60947-5-2
0...+45 °C

BOD 26K-LA01-C-06

18...28 V DC
10 %
≤ 35 mA
0...10 V (max. 3 mA)
fix

Laser, red light
670 nm

2
≤ 0.8 mm at 65 mm
18 µm/°C
80 µm
≤ 1 %

400 Hz
3 ms
2 ms

LED green
LED red

50×50×17 mm
6 m cable, PVC
4×0.25 mm²

impact-resistant ABS
PMMA
600 g

IP 67
yes
yes

EN 60947-5-2
0...+45 °C

BOD 26K-LA02-C-06

18...28 V DC
10 %
≤ 35 mA
0...10 V (max. 3 mA)
fix

Laser, red light
670 nm

2
≤ 0.8 mm at 65 mm
18 µm/°C
20 µm
≤ 1 %

40 Hz
30 ms
20 ms

LED green
LED red

50×50×17 mm
6 m cable, PVC
4×0.25 mm²

impact-resistant ABS
PMMA
600 g

IP 67
yes
yes

EN 60947-5-2
0...+45 °C

2.2

2.3

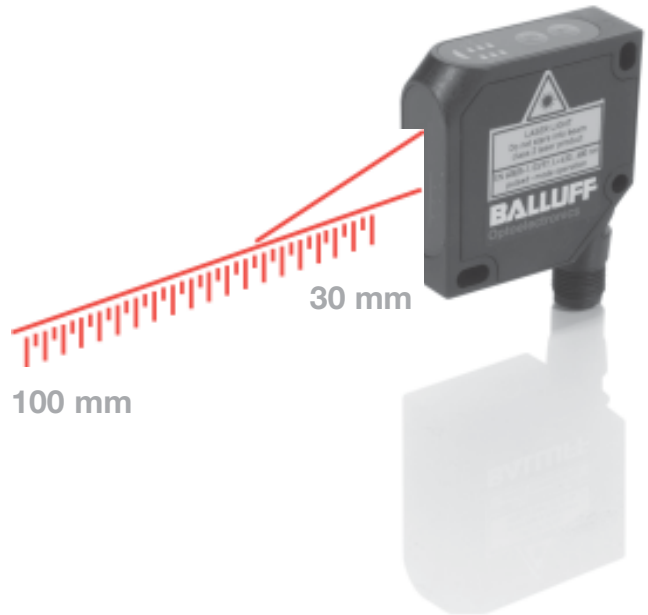
Photoelectric sensors
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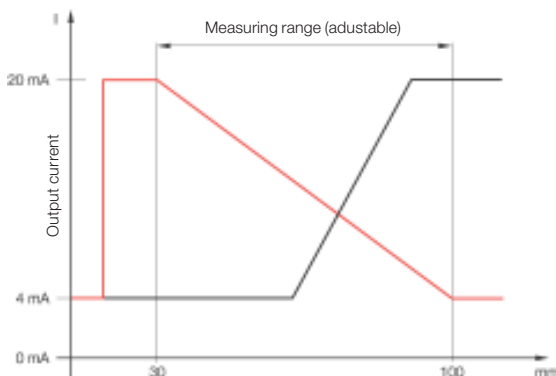
Connectors
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Features

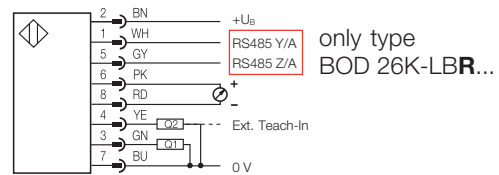
- Adjustable measuring range between 30...100 mm
- Analog output 4...20 mA adjustable: rising or falling
- Optional with RS485-Interface (for Master-slave mode) and for visualization on PC (additional software required)
- 2 switching outputs with adjustable switch points
- Teach-in
- Adjustable averaging
- Numerous additional functions



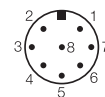
Analog output BOD 26K-LB(R)04...



Wiring diagram



Connector diagram



Recommended accessories please order separately



Mounting bracket
BOS 26K-HW-1



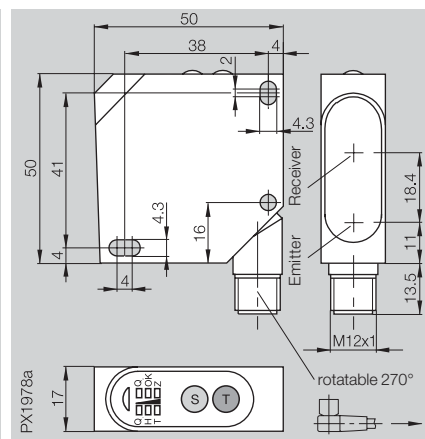
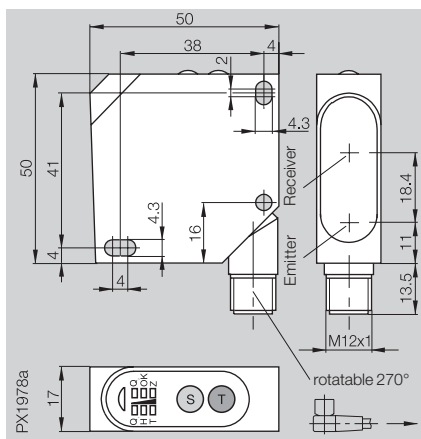
Connector
BKS-S139-PU-05



Series
Working range
Measuring range

BOD 26K
30...100 mm
adjustable max. 70 mm

BOD 26K
30...100 mm
adjustable max. 70 mm



Distance sensor

	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	2x PNP-Transistor	2x 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 μ m	≤ 70 μ m
Linearity	≤ 175 μ m	≤ 175 μ m
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	50x50x17 mm	50x50x17 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 % reflective.



Connector orientation

2.2

2.3

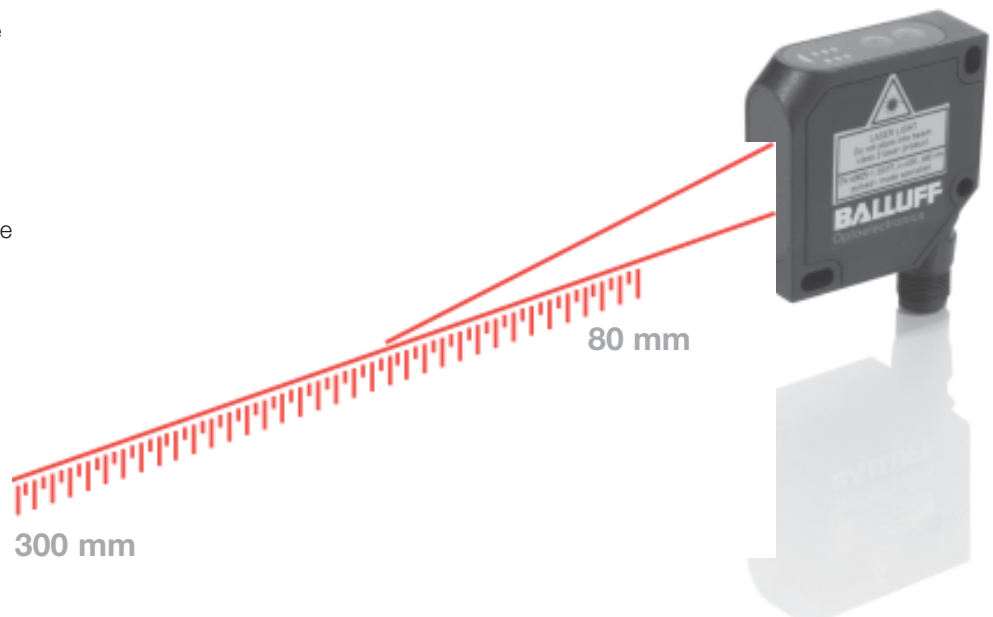
Photoelectric sensors
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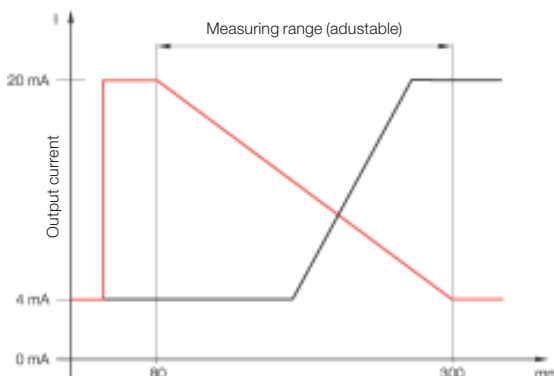
Connectors
page 6.2 ...

Features

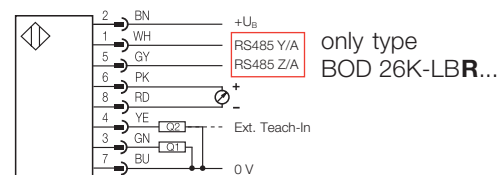
- Measuring range adjustable between 80...300 mm
- Analog output 4...20 mA adjustable: rising or falling
- Option with RS485-Interface (for Master-slave mode) and for visualization on a PC (additional software required)
- 2 switching outputs with adjustable switch points
- Teach-in
- Adjustable averaging
- Numerous additional functions



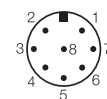
Analog output BOD 26K-LB(R)05...



Wiring diagram



Connector diagram



Recommended accessories

please order separately



Mounting bracket
BOD 26K-HW-1



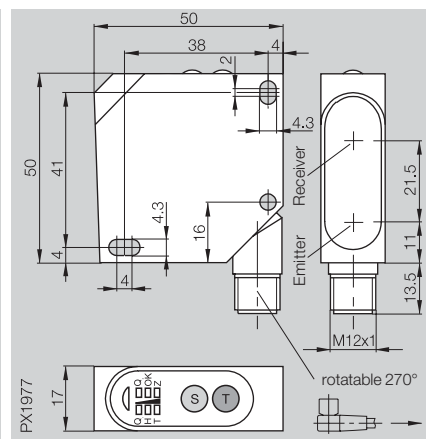
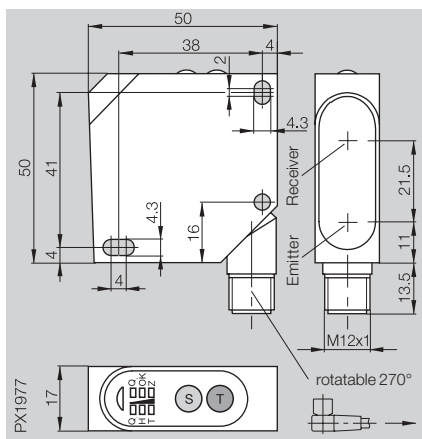
Connector
BKS-S139-PU-05



Series
Working range
Measuring range

BOD 26K
80...300 mm
adjustable max. 220 mm

BOD 26K
80...300 mm
adjustable max. 220 mm



Distance sensor

Electrical data

Supply voltage U_B
Ripple
No-load supply current I_0 max.
Analog output
Interface
Switching output
Output current
Switching type
Settings
Additional functions

BOD 26K-LB05-S115-C
18...30 V DC
10 %
≤ 40 mA
4...20 mA
2× PNP-Transistor
100 mA
Light- or dark-on
teach-in

BOD 26K-LBR05-S115-C
18...30 V DC
10 %
≤ 40 mA
4...20 mA
RS485
2× PNP-Transistor
100 mA
Light- or dark-on
teach-in
Master-slave mode

Optical data

Emitter, light type
Wavelength
Laser class
Light spot diameter
Resolution
Linearity

Laser, red light
650 nm
2
4.5 mm at 300 mm
≤ 220 μ m
≤ 550 μ m

Laser, red light
650 nm
2
4.5 mm at 300 mm
≤ 220 μ m
≤ 550 μ m

Time data

Switching frequency f
Time functions

1 kHz
50 ms pulse extension

1 kHz
50 ms pulse extension

Indicators

Power-on indicator
Output function indicator

LED green
LED yellow

LED green
LED yellow

Mechanical data

Dimensions
Connection
Housing material
Optical surface
Weight

50×50×17 mm
M12 connector, 8-pin
impact-resistant ABS
PMMA
43 g

50×50×17 mm
M12 connector, 8-pin
impact-resistant ABS
PMMA
43 g

Ambient data

Degree of protection per IEC 60529
Polarity reversal protected
Short circuit protected
Ambient light rejection
Ambient temperature range T_a

IP 67
yes
yes
EN 60947-5-2
-10...+60 °C

IP 67
yes
yes
EN 60947-5-2
-10...+60 °C

Measured values referenced to Kodak gray card 90 % reflective.



→ Connector orientation

2.2

2.3

Photoelectric sensors
accessories
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Connectors
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This innovative sensor technology with its large variety of output types is used in applications where traditional methods meet either technological or economical limits. Such applications include detecting small objects at great distances, or under challenging conditions where for example under high temperatures or in robot cells where sensing needs to be performed from the "outside".

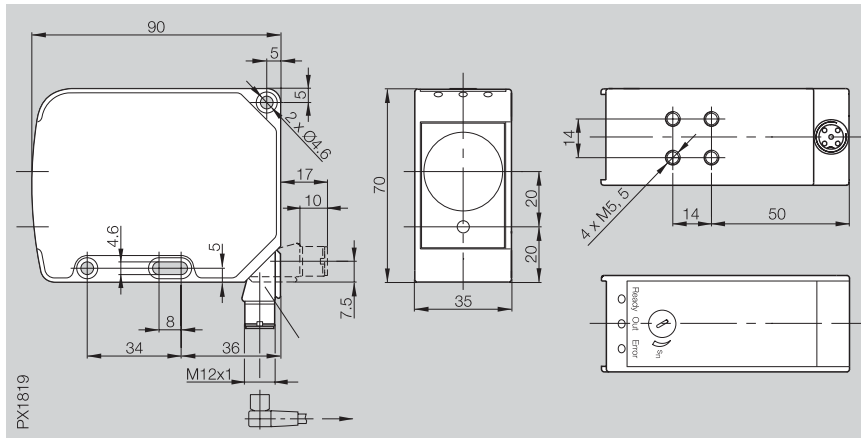
- Small laser spot for detecting small objects over large distances
- Virtually independent of the reflective properties of the target object within a particular sensing range
- Background suppression (HGA) over the entire working range
- Analog, binary and alarm output

- Exact detection over long distances
(e.g. physical inaccessibility of excessive heat)
- 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





Series	BOD 63M	BOD 63M
Working range	500...6000 mm	500...6000 mm
Measuring range	5500 mm	5500 mm



Distance sensor

PNP		BOD 63M-LA01-S115	BOD 63M-LB01-S115
Electrical data			
Supply voltage U_B		15...30 V DC	15...30 V DC
No-load supply current I_0 max.		≤ 100 mA	≤ 100 mA
Analog output		0...10 V	4...20 mA
Switching output		PNP-Transistor	PNP-Transistor
Switching type		Light-on	Light-on
Alarm output		PNP-Transistor (dark-on)	PNP-Transistor (dark-on)
Output current	Output	200 mA	200 mA
	Alarm output	200 mA	200 mA
Voltage drop U_d at I_0		≤ 2.5 V	≤ 2.5 V
Settings		4-turn potentiometer	4-turn potentiometer
Optical data			
Emitter, light type		Laser, red light	Laser, red light
Wavelength		650 nm	650 nm
Laser class		2	2
Light spot diameter		5 mm at 3 m 10 mm at 6 m	5 mm at 3 m 10 mm at 6 m
Resolution		≤ 2 mm	≤ 2 mm
Gray value shift		≤ 1.5 %	≤ 1.5 %
Repeat accuracy		≤ 10 mm	≤ 10 mm
Temperature drift		≤ 2 mm/°C	≤ 2 mm/°C
Linearity		1%	1%
Switching hysteresis		≤ 20 mm	≤ 20 mm
Time data			
On-/off-delay		≤ 70 ms	≤ 70 ms
Response time		5 ms	5 ms
Switching frequency f		≥ 100 Hz	≥ 100 Hz
Indicators			
Power-on indicator		LED green	LED green
Output function indicator		LED yellow	LED yellow
Stability indicator		LED red	LED red
Mechanical data			
Dimensions		90x70x35 mm	90x70x35 mm
Connection		M12 connector, 8-pin	M12 connector, 8-pin
Housing material		anodized Al	anodized Al
Optical surface		Glass	Glass
Weight		270 g	270 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		-10...+55 °C	-10...+55 °C
Ambient light rejection		≤ 10 kLux	≤ 10 kLux



2.2

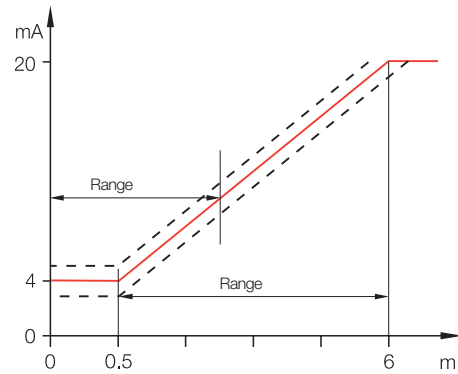
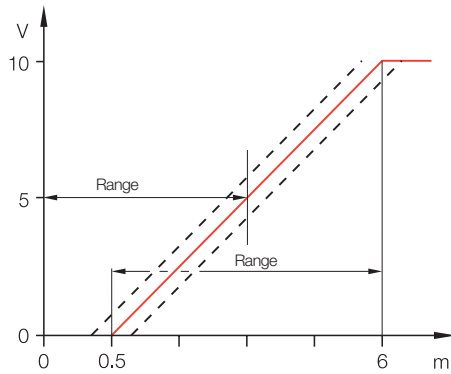
2.3

Photoelectric sensors accessories page 2.3.2 ...

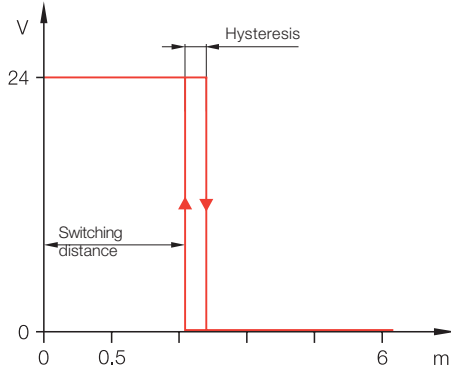
6

Connectors page 6.2 ...

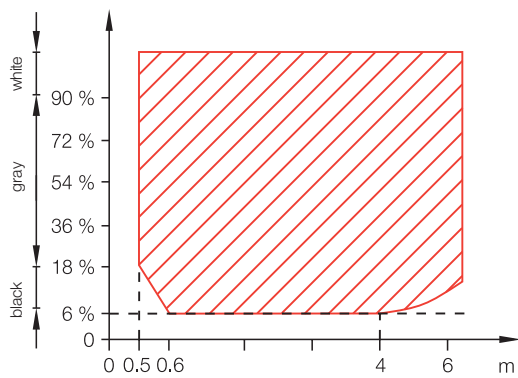
Analog output



Output



Measuring range as a function of object reflectivity





Laser class

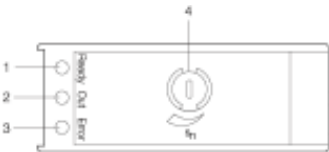
(see page 2.0.16)

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.

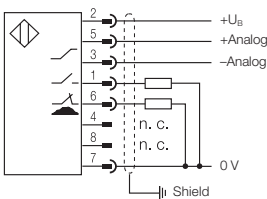


Indicators and operating elements

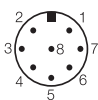


- 1 Power-on indicator (green)
- 2 Output function indicator (yellow)
- 3 Stability indicator (red)
- 4 4-turn potentiometer

Wiring diagram



Connector diagram



Pin outs	Cable color	
1	white	Output
2	brown	+U _B
3	green	-Analog output
4	yellow	NC
5	gray	+Analog output
6	pink	Error output
7	blau	0 V
8	red	NC
Knurled ring	Braided shield	Shield

Recommended accessories

please order separately



Mounting bracket
BOD 63-HW-1



Connector
BKS-S138-PU-05
BKS-S139-PU-05

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Photoelectric sensors accessories page 2.3.2 ...

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Connectors page 6.2 ...

Distance measurements with high resolution are achieved using triangulation and modern CCD technology.

The **BOD 66M-R_01** with analog voltage or current output plus a 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

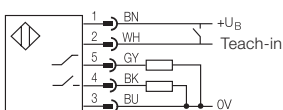
- Extremely color- and ambient light insensitive
- Working range 100...600 mm
- Resolution 0.5 mm
- Analog output with voltage (1...10 V) or current (4...20 mA)
- PNP output teachable
- Rugged metal housing
- Scratch-resistant glass optics

Applications

- Level monitoring
- Positioning
- Winding diameter measurement
- Profile measurement
- Sag control



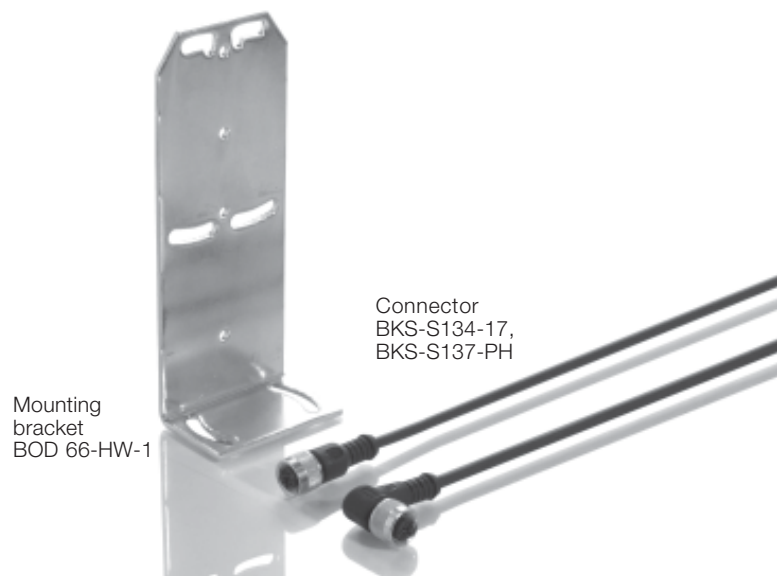
Wiring diagram



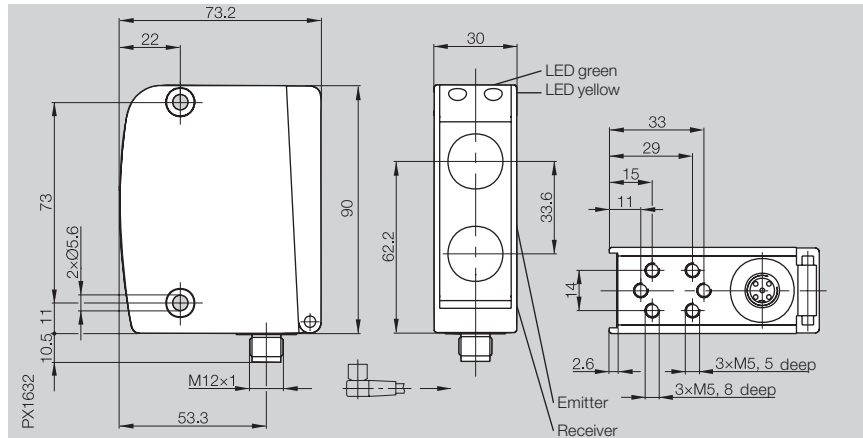
Connector diagram



Recommended accessories please order separately



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	$\leq 15\%$ of U_B	$\leq 15\%$ 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_0	≤ 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 %)	$\leq 1\%$	$\leq 1\%$
Repeat accuracy	$\pm 0.5\%$	$\pm 0.5\%$
Temperature drift	0.2 mm/°C	0.2 mm/°C
Absolute measuring accuracy**	$\pm 2\%$ (of the measured distance)	$\pm 2\%$ (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	73x90x30 mm	73x90x30 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 $\geq 50 \times 50$ mm²



Connector orientation

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Photoelectric accessories
page 2.3.2 ...

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Connectors
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The **BOD 66M-L_04** features an analog as well as an additional switching output. It measures object position over a range of from 200...2000 mm. The switching output (with background suppression) can also be set in the same range using a teach-in procedure. Forward-looking laser and CCD technology assure 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
- Rugged metal housing
- Scratch-resistant glass optics

Applications

- Background suppression up to 2 m
- Analog measuring at up to 2 m target distance
- Positioning tasks

Laser class

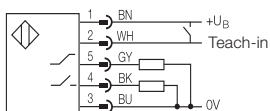
(see page 2.0.16)

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.



Wiring diagram

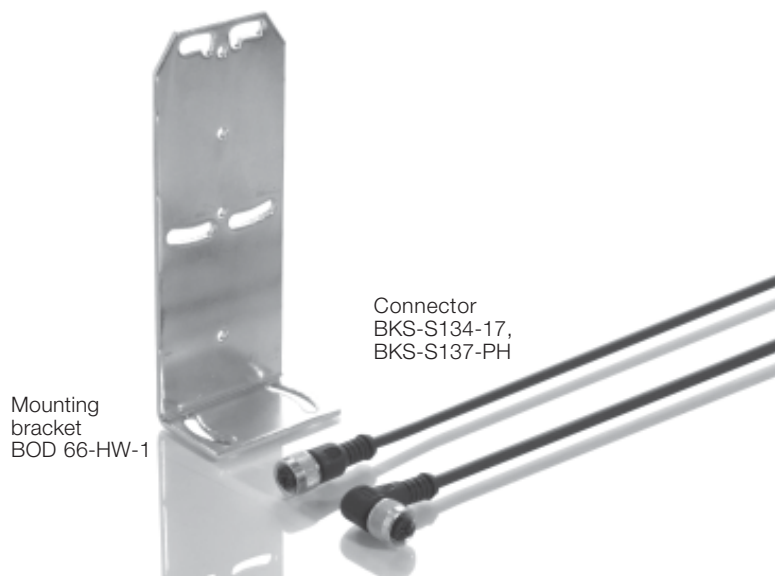


Connector diagram



Recommended accessories

please order separately

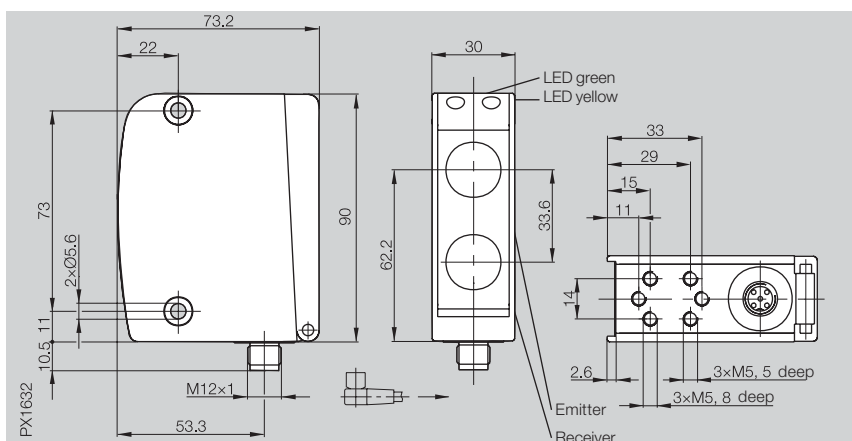




Series
Working range
Measuring range

BOD 66M
200...2000 mm
1800 mm

BOD 66M
200...2000 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	$\leq 15\%$ of U_B	$\leq 15\%$ 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_0	≤ 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	$3 \times 12 \text{ mm}^2$ at 2 m	$3 \times 12 \text{ mm}^2$ at 2 m
Resolution	≤ 5 mm	≤ 5 mm
Gray value shift (90 %/6 %)	$\leq 1\%$	$\leq 1\%$
Repeat accuracy	$\pm 0.5\%$	$\pm 0.5\%$
Temperature drift	$0.6 \text{ mm}/^\circ\text{C}$	$0.6 \text{ mm}/^\circ\text{C}$
Absolute measuring accuracy**	$\pm 2\%$ (of the measured distance)	$\pm 2\%$ (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	73x90x30 mm	73x90x30 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 $^\circ\text{C}$	-20...+50 $^\circ\text{C}$
Ambient light rejection	≤ 5 kLux	≤ 5 kLux

*depending on object reflectivity

**Target $\geq 50 \times 50 \text{ mm}^2$



Connector orientation

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Photoelectric sensors
accessories
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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

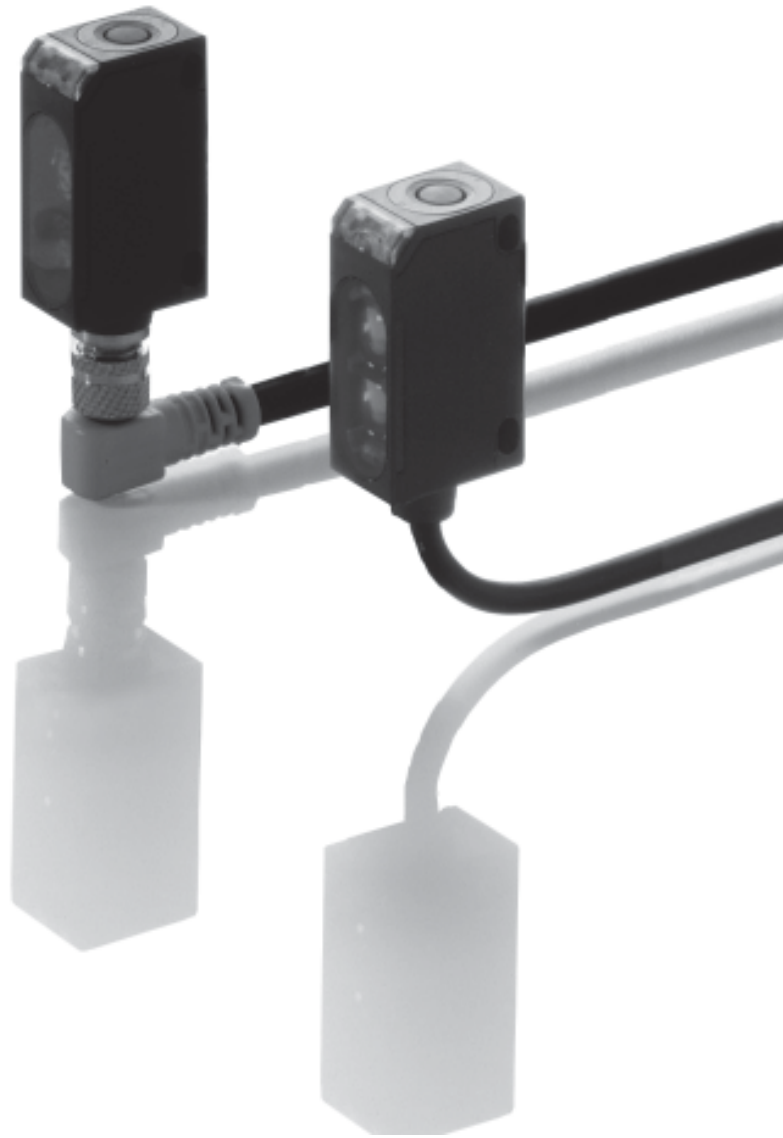
- Sensing markings on packaging material
- Synchronizing cutting or separating processes
- Checking for adhesive, ink and color
- Position checking of printing templates
- Sensing objects based on contrast



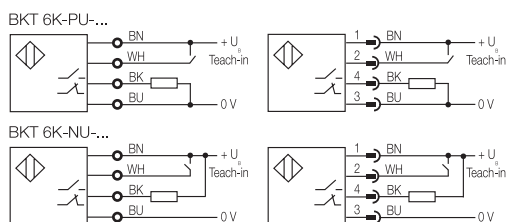
Type	Range	Light type			Output			Output function		Switching frequency	U _B	Connection			Page
		White light	Red and green light	Laser light	PNP-Transistor	NPN-Transistor	Analog output	Light-on	Dark-on		10...30 V DC	M8 connector, 4-pin	M12 connector, 4-pin	Cable	
 Contrast sensor															
BKT 6K-001-P-S75	40...150 mm			■	■			■	■	1 kHz	■	■			2.2.47
BKT 6K-001-N-S75	40...150 mm			■		■		■	■	1 kHz	■	■			2.2.47
BKT 6K-001-P-02	40...150 mm			■	■			■	■	1 kHz	■			■	2.2.47
BKT 6K-001-N-02	40...150 mm			■		■		■	■	1 kHz	■			■	2.2.47
BKT 21M-002-P-S4	19 mm	■			■			■	■	5 kHz	■		■		2.2.49
BKT 21M-002-N-S4	19 mm	■				■		■	■	5 kHz	■		■		2.2.49
BKT M-15-U-S4	9 mm (18 mm)		■		■	■	■	■	■	10 kHz	■		■		2.2.51
BKT M-15L-U-S4	9 mm (18 mm)		■		■	■	■	■	■	10 kHz	■		■		2.2.51
BKT M-11-U-03	9 mm (18 mm)		■		■	■	■	■	■	10 kHz	■			■	2.2.51
BKT M-11L-U-03	9 mm (18 mm)		■		■	■	■	■	■	10 kHz	■			■	2.2.51

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



Recommended accessories please order separately



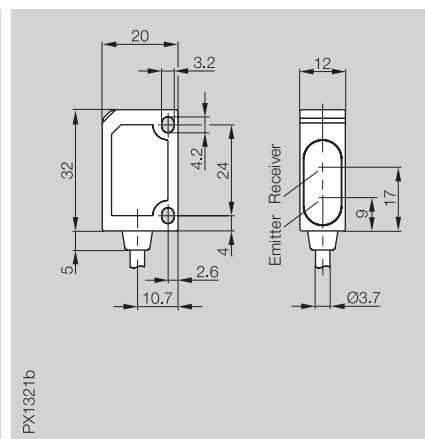
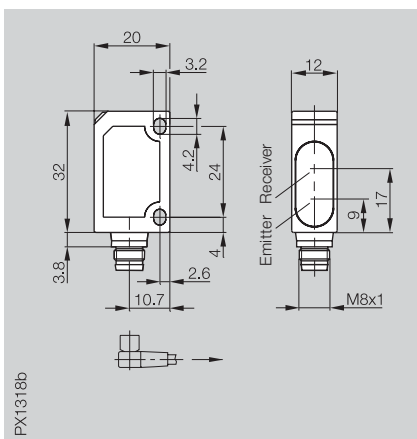
Mounting bracket
BOS 6-HW-1



Connector
BKS-S 74/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_0	≤ 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 mm ²
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% reflective, 100×100 mm.

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Photoelectric sensors
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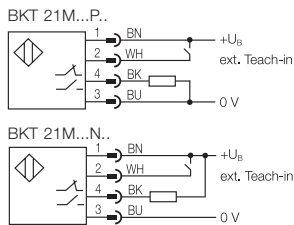
Connectors
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The **BKT 21M** contrast sensor uses white light and is programmed with the push of a button. It discriminates colored markings as well as gray levels on various surfaces. In its standard setting the sensor is dark-switching (markings with less

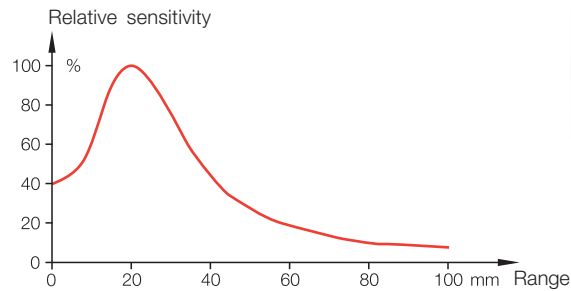
light intensity are detected as the background). A fine setting is available for slight contrast differences. The output function can also be selected in this setting.



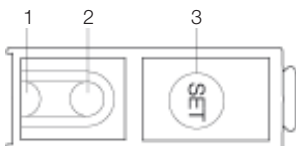
Wiring diagrams



Function diagram



Indicators and operating elements



- 1 Output function indicator (yellow)
- 2 Operating/error indicator (green/red)
- 3 SET button

Recommended accessories

please order separately



Mounting clamp
BOS 21-KH-1



Mounting clamp
BOS 21-KH-2



Mounting bracket
BOS 21-HW-1

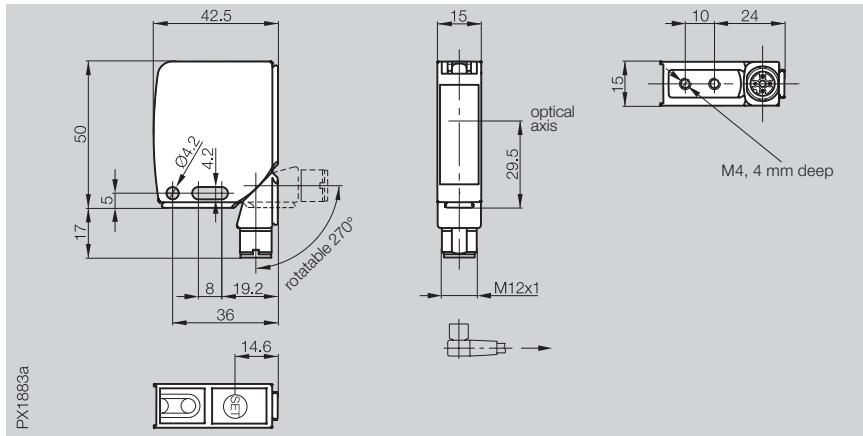


Mounting bracket
BOS 21-HW-2



Connector
BKS-_ 19/BKS-_ 20

Series	BKT
Working distance	19 mm ±2 mm



Contrast sensor

PNP	BKT 21M-002-P-S 4
NPN	BKT 21M-002-N-S 4
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 fine mode)
Voltage drop U_d at I_0	≤ 2 V
Settings	teach-in
Additional functions	Button disable
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



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Photoelectric sensors
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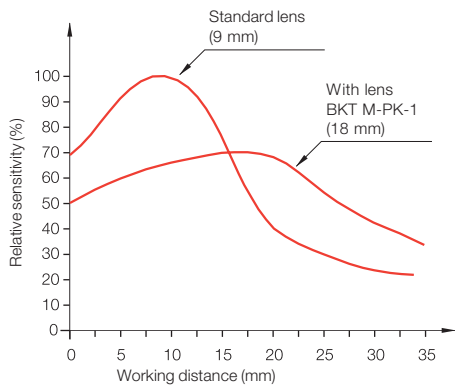
In this device the micro-processor takes over the entire setup process. The latter monitors and synchronizes the emitter, receiver and output circuits, for optimum switching frequency, repeatability and insensitivity to interference and ambient light. The user needs only to press two buttons for setting 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 buttons.

The sensor output is selectable 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. For even greater installation.

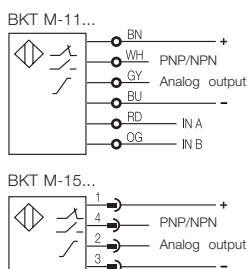
Features

- Selectable vertical or horizontal light spot
- Automatic selection of red or green emitter light
- Automatic setting of light-on/dark-on function
- Remote key functions and 4 storable programs (cable version)
- Time delay and key lock selectable
- Interchangeable optics (straight and 90°)
- Analog output

Function diagram



Wiring diagrams



Recommended accessories please order separately



Lens
BKT M-PK-1

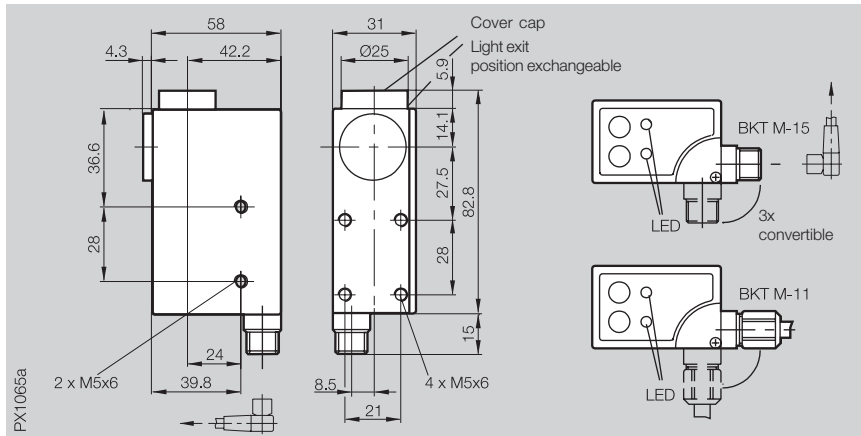


Lens
BKT M-PK-3



Connector
BKS-S 19-3/BKS-S 20-3

Series	BKT	BKT
Working distance	9 mm ±2 mm	9 mm ±2 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-S 4	BKT M-11-U-03
PNP/NPN	horizontal spot	⊙	BKT M-15L-U-S 4	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_0			≤ 2 V	≤ 2 V
Analog output			0...5.5 V DC*	0...5.5 V DC*
Settings			teach-in	teach-in
Additional functions			Button disable	Button disable
Optical data				
Emitter, light type			LED red/green	LED red/green
Wavelength			630 nm/526 nm	630 nm/526 nm
Light spot diameter			1.5x5 mm**	1.5x5 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 x cross-section				6x0.34 mm ² 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% reflective

**2x7 mm with BKT M-PK1



Connector orientation

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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 chinks, 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.

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



Type	Range	Light type		Output			Output		Switching frequency	U _B	Conne- ction	Page
		UV light		PNP-Transistor	NPN-Transistor	Analog output	Light-on	Dark-on		10...30 V DC	M12 connector, 4-pin	
 Luminescence sensor												
BLT 21M-001-P-S4	0...40 mm	■		■			■	■	2 kHz	■	■	2.2.55
BLT 21M-001-N-S4	0...40 mm	■			■		■	■	2 kHz	■	■	2.2.55
BLT M-15-U-S4	9...18 mm	■		■	■	■	■	■	2 kHz	■	■	2.2.57

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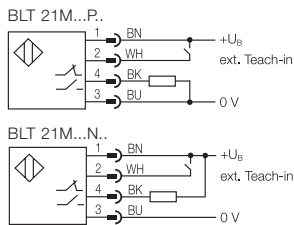
6

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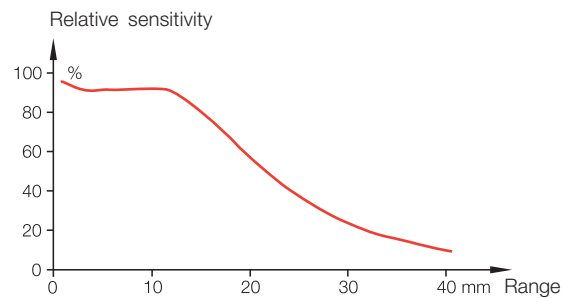
BLT 21M luminescence sensors detect all kinds of luminescent markings on any background. The sensor is calibrated with the simple push of a button. In the standard setting the sensor is light-switching (marking with greater luminescence are recognized as the background).

A fine setting is available for weakly luminescent markings. In this setting the output function can also be selected.

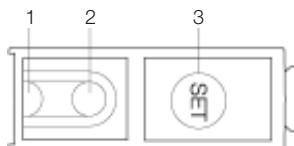
Wiring diagrams



Function diagram



Indicators and operating elements



- 1 Output function indicator (yellow)
- 2 Operating/error indicator (green/red)
- 3 SET button

Recommended accessories

please order separately



Mounting clamp
BOS 21-KH-1



Mounting clamp
BOS 21-KH-2



Mounting bracket
BOS 21-HW-1

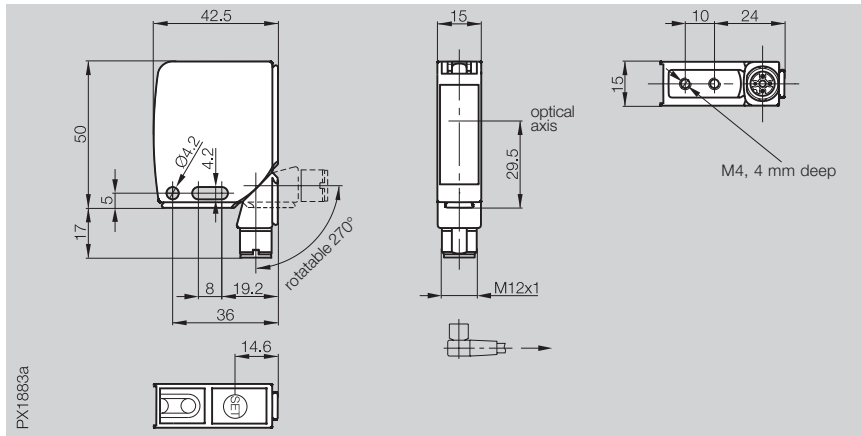


Mounting bracket
BOS 21-HW-2



Connector
BKS-_ 19/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 fine mode)
Voltage drop U_d at I_0	≤ 2 V
Settings	teach-in
Additional functions	Button disable
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 μ s
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	42.5x50x15 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 nach	EN 60947-5-2
Ambient temperature range T_a	-10...+55 °C



Connector orientation

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Connectors
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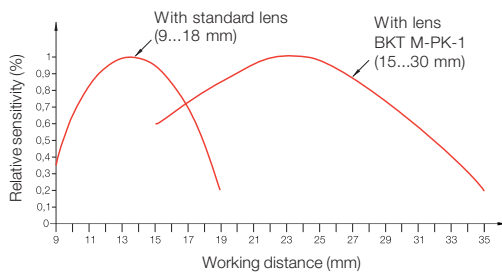
The Balluff luminescence sensor is equipped with a modern UV source so that no external UV lamp is needed. A microcontroller handles the evaluation using a teach-in procedure. By simply pressing a button the BLT learns the difference between the fluorescent marking and the background. If the difference is too slight and can not be reliably discriminated, this is indicated by an error message (flashing LED). The range is typically from 9 to 18 mm, but can be increased by using other lenses.

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.

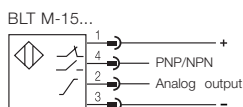
Features

- UV source: LED, 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)
- Button disable

Function diagram

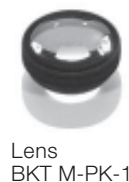


Wiring diagram

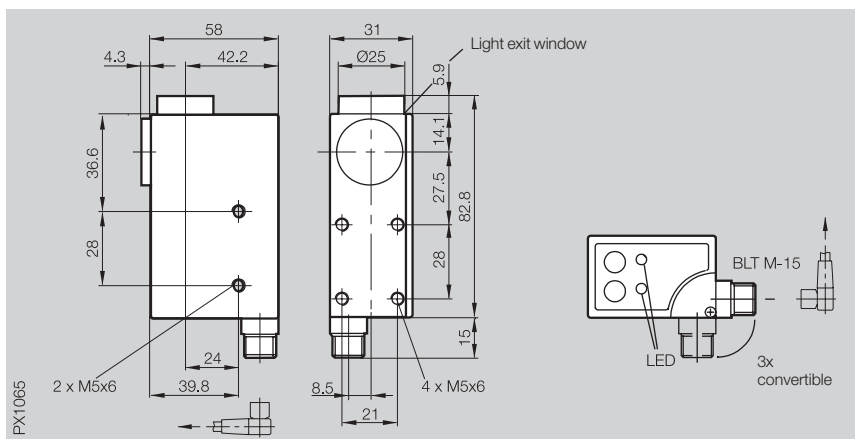


Recommended accessories

please order separately



Series	BLT
Working range	9...18 mm
Working range with lens PK-1	15...30 mm



Luminescence sensor

PNP/NPN	BLT M-15-U-S 4
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	Button disable
Optical data	
Emitter, light type	LED, UV
Wavelength	380 nm
Light spot diameter	5 mm
Time data	
Response time	250 μ s
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



Please note! Lenses not interchangeable for BLT M-15.

2.2

2.3

Photoelectric sensors
accessories
page 2.3.2 ...

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Connectors
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The **BFS 26K** uses pulsed white light, making it insensitive to ambient light. The light reflected back from the object is received and processed by three different receivers (red, green, blue). The various light spot geometry configurations of the respective sensors (round, rectangular or square) allow even the smallest color markings to be reliably discriminated.

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 buttons via teach-in.

The color tolerance can be set in 5 levels for each of the 3 switching outputs (channels).

Numerous special functions such as color scanning, pulse expansion and blanking input provide additional application flexibility.

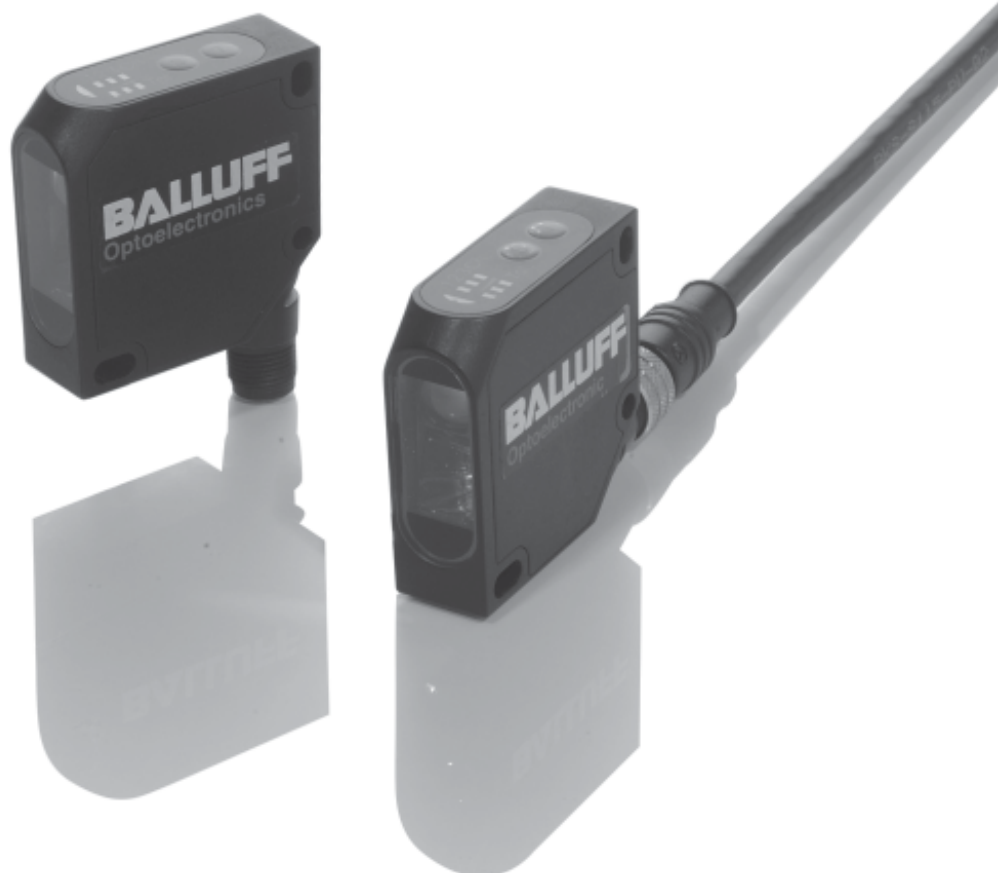
Features

- Microcontroller-based
- Pulsed white light
- Various light spot geometries
- Teach-in and external teach-in
- M12 connector 270° rotatable
- 3 different colors can be identified at the same time
- 5-stage adjustable color tolerance
- 3 yellow LED's for switching state indication
- 3 red LED's for tolerance level indication

Applications

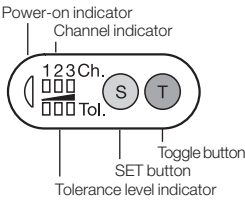
Color sensors are used throughout the field of robotics, automation, quality assurance and production processes.

- Quality assurance
- Selecting parts and components by color
- Discriminating cable conductor colors



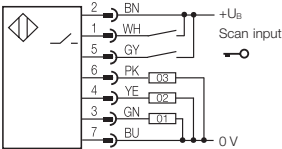
Type	Range	Light type		Output		Output		Switching frequency	U _B	Connection	Features		Page
		White light		PNP-Transistor		Light-on			12...28 V DC	M12 connector, 8-pin	Reflector mode Color scan		
 Color sensors													
BFS 26K-PS-L01-S115	12...32 mm	■		■		■		500 Hz	■	■		■	2.2.61
BFS 26K-PS-L02-S115-C	15...30 mm	■		■		■		500 Hz	■	■		■	2.2.61
BFS 26K-PS-L03-S115-C	18...22 mm	■		■		■		500 Hz	■	■		■	2.2.61

Indicators
and operating elements

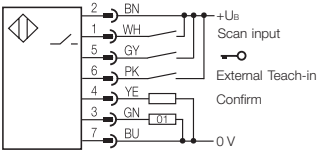


Wiring diagrams

Two modes are available.
1. Normal mode "factory setting"

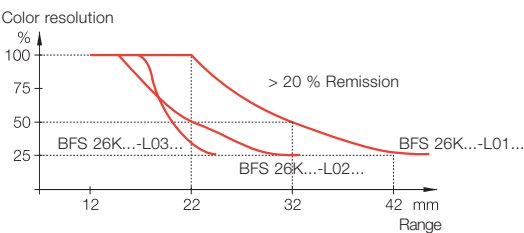


2. External Teach-in
setting using "special functions"



Disabling input:
> 12 V = buttons disabled
< 3 V = buttons not disabled

Color resolution/range diagram



Recommended accessories
please order separately



Mounting bracket
BOS 26K-HW-1



Connector
BKS-S139-PU-05

Series	
Working range	Diffuse mode
Working range	Reflector mode



Color sensor

PNP

Electrical data

Supply voltage U_B
Ripple
No-load supply current I₀ 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
Range 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

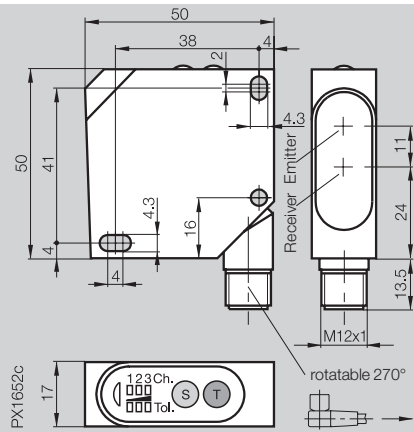
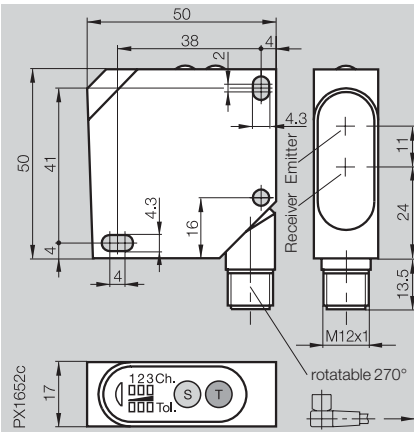
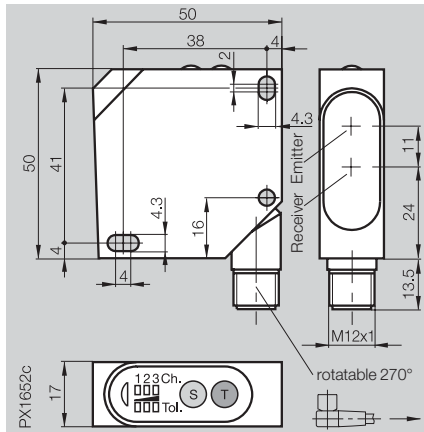
Mechanical data

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



BFS 26K
12...32 mm
50...200 mmBFS 26K
15...30 mmBFS 26K
18...22 mm

BFS 26K-PS-L01-S115

12...28 V DC
10 %
≤ 40 mA
3 × PNP-Transistor
100 mA
Light-on
≤ 2.4 V
teach-in

pulsed white light
round
Ø 4 mm at 22 mm range
±6 mm for Tol. 3
settable in 5 levels

LED green
3 × LED yellow
3 × LED red

300 ms
1 ms
500 Hz
50 ms turn-off delay selectable

50×50×17 mm
M12 connector, 8-pin
impact-resistant ABS
PMMA
40 g

IP 67
yes
yes
-10...+55 °C
EN 60947-5-2

BFS 26K-PS-L02-S115-C

12...28 V DC
10 %
≤ 40 mA
3 × PNP-Transistor
100 mA
Light-on
≤ 2.4 V
teach-in

pulsed white light
square
2×2 mm at 22 mm range
±5 mm for Tol. 3
settable in 5 levels

LED green
3 × LED yellow
3 × LED red

300 ms
1 ms
500 Hz
50 ms turn-off delay selectable

50×50×17 mm
M12 connector, 8-pin
impact-resistant ABS
PMMA
40 g

IP 67
yes
yes
-10...+55 °C
EN 60947-5-2

BFS 26K-PS-L03-S115-C

12...28 V DC
10 %
≤ 40 mA
3 × PNP-Transistor
100 mA
Light-on
≤ 2.4 V
teach-in

pulsed white light
rectangular
5×1 mm at 22 mm range
±2 mm for Tol. 3
settable in 5 levels

LED green
3 × LED yellow
3 × LED red

300 ms
1 ms
500 Hz
50 ms turn-off delay selectable

50×50×17 mm
M12 connector, 8-pin
impact-resistant ABS
PMMA
40 g

IP 67
yes
yes
-10...+55 °C
EN 60947-5-2

2.2

2.3

Photoelectric
sensors
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Connectors
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