

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 <sub>B</sub>	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		
 <b>Contrast Sensor</b>																
BKT 6K-001-P-S75	40...150 mm			■	■			■	■	1 kHz	■	■				<b>2.2.57</b>
BKT 6K-001-N-S75	40...150 mm			■		■		■	■	1 kHz	■	■				<b>2.2.57</b>
BKT 6K-001-P-02	40...150 mm			■	■			■	■	1 kHz	■		■			<b>2.2.57</b>
BKT 6K-001-N-02	40...150 mm			■		■		■	■	1 kHz	■		■			<b>2.2.57</b>
BKT 18KF-001-P-S4	10 mm	■			■			■	■	5 kHz	■		■			<b>2.2.59</b>
BKT 18KF-001-N-S4	10 mm	■				■		■	■	5 kHz	■		■			<b>2.2.59</b>
BKT 18KF-001-P-02	10 mm	■			■			■	■	5 kHz	■			■		<b>2.2.59</b>
BKT 18KF-001-N-02	10 mm	■				■		■	■	5 kHz	■			■		<b>2.2.59</b>
BKT 21M-002-P-S4	19 mm	■			■			■	■	5 kHz	■		■			<b>2.2.61</b>
BKT 21M-002-N-S4	19 mm	■				■		■	■	5 kHz	■		■			<b>2.2.61</b>
BKT M-15-U-S4	6...12 mm*		■		■	■	■	■	■	10 kHz	■		■			<b>2.2.63</b>
BKT M-15L-U-S4	6...12 mm*		■		■	■	■	■	■	10 kHz	■		■			<b>2.2.63</b>
BKT M-11-U-03	6...12 mm*		■		■	■	■	■	■	10 kHz	■			■		<b>2.2.63</b>
BKT M-11L-U-03	6...12 mm*		■		■	■	■	■	■	10 kHz	■			■		<b>2.2.63</b>
BKT M-15C-U-S4	6...12 mm*	■			■	■	■	■	■	20 kHz	■		■			<b>2.2.65</b>
BKT M-45-U-S4	0...3 mm	■			■	■	■	■	■	20 kHz	■		■		■	<b>2.2.65</b>

\*Longer ranges using interchangeable optics

## 2.2

## 2.3

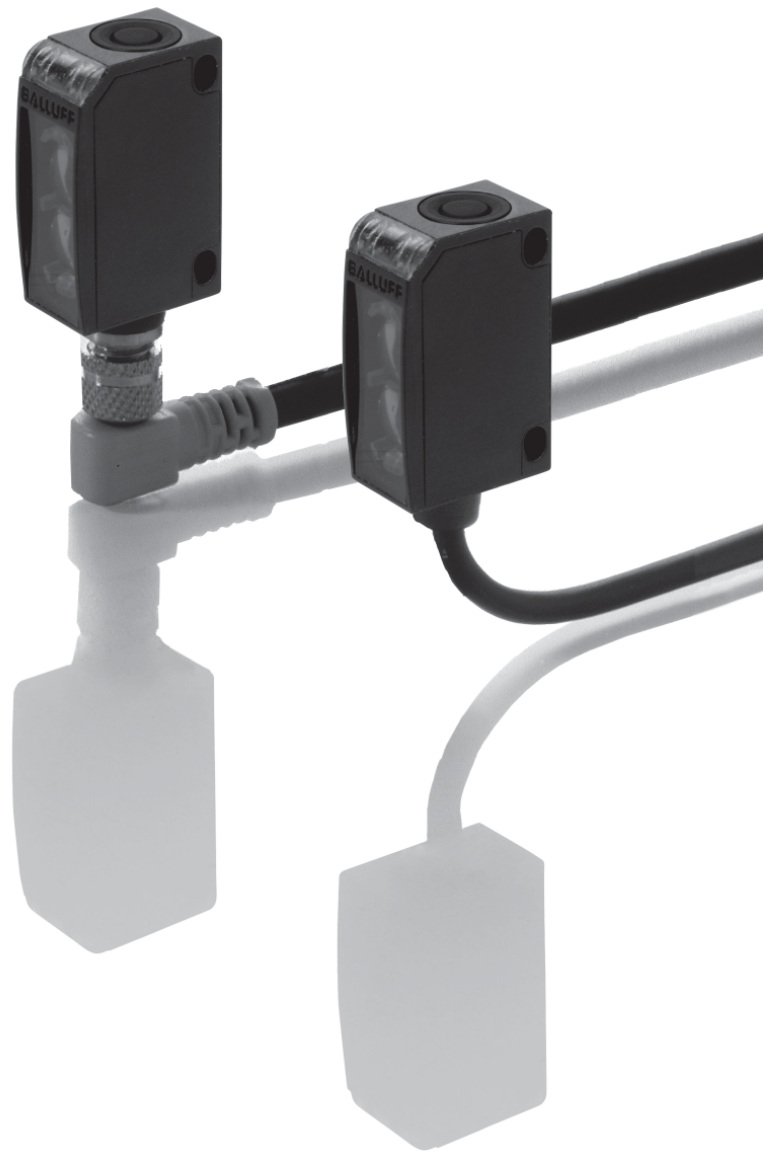
Photoelectric sensors accessories page 2.3.2 ...

## 5

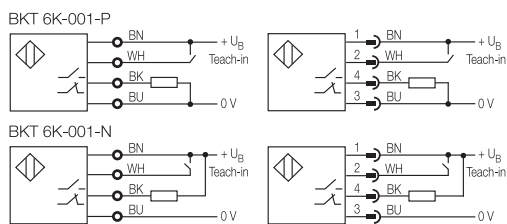
Connectors ... page 5.2 ...

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**



**Recommended accessories**

please order separately



Mounting bracket  
BOS 6-HW-1



Connector  
Straight BKS-S 74  
Right-angle BKS-S 75

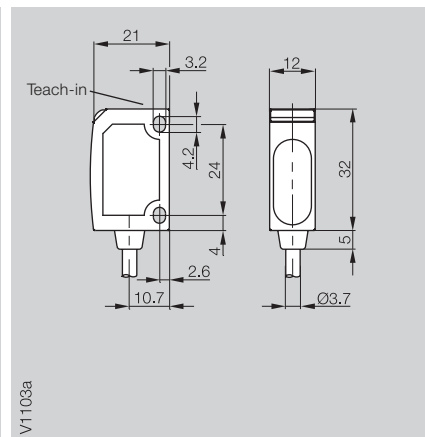
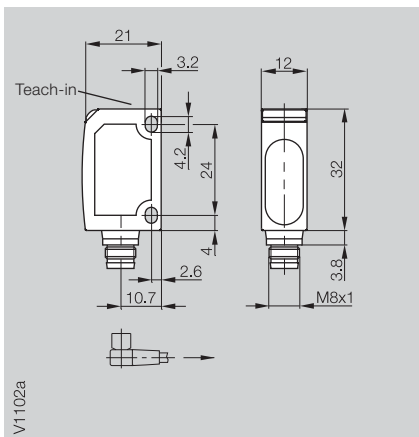
# Laser Contrast Sensor



**Photoelectric  
Sensors**

**BKT 6K  
Laser Contrast Sensor**

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
<b>Electrical data</b>		
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
<b>Optical data</b>		
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)
<b>Time data</b>		
Response time	0.5 ms	0.5 ms
Switching frequency $f$	1 kHz	1 kHz
<b>Indicators</b>		
Output function indicator	LED yellow	LED yellow
Stability indicator	LED green	LED green
<b>Mechanical data</b>		
Connection	M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm <sup>2</sup>
Housing material	impact-resistant ABS	impact-resistant ABS
Optical surface	PMMA	PMMA
Weight	40 g	120 g
<b>Ambient data</b>		
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.



**2.2**

**2.3**

Photoelectric sensors accessories page 2.3.2 ...

**5**

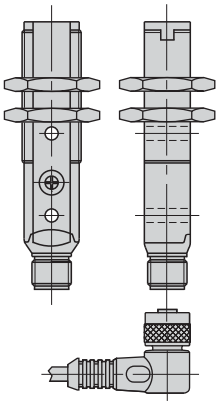
Connectors ... page 5.2 ...

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.

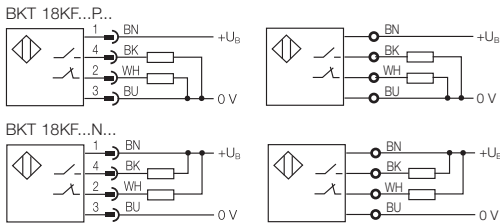
A precise setting is available for slight contrast differences. The output function can also be selected in this setting.



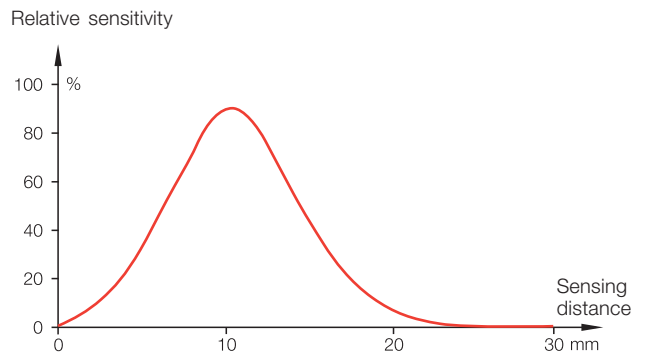
**Connector orientation**



**Wiring diagrams**



**Function diagram**



**Recommended accessories**  
please order separately



Mounting clamp  
BOS 18,0-KB-1

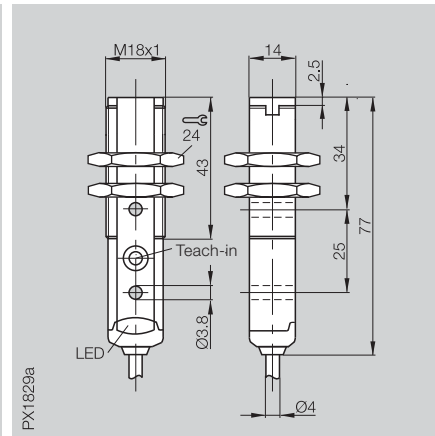
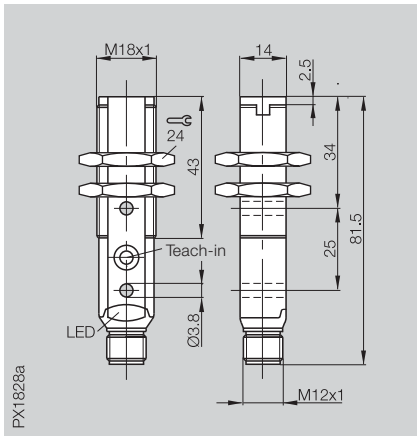


Mounting bracket  
BES 18-HW-1



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
<b>Electrical data</b>		
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 $I_0$	≤ 2 V	≤ 2 V
Settings	Teach-in	Teach-in
<b>Optical data</b>		
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
<b>Time data</b>		
Response time	100 μs	100 μs
Switching frequency $f$	5 kHz	5 kHz
<b>Indicators</b>		
Output function indicator	LED yellow	LED yellow
Operating/error indicator	LED green/red	LED green/red
<b>Mechanical data</b>		
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 mm <sup>2</sup>
Housing material	PBT	PBT
Lens material	PMMA	PMMA
Weight	25 g	75 g
<b>Ambient data</b>		
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

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Photoelectric sensors accessories page 2.3.2 ...

5

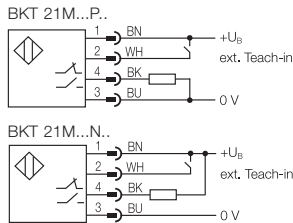
Connectors ... page 5.2 ...

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).

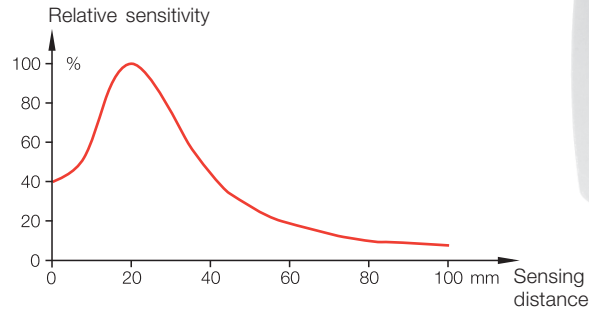
A precise setting is available for slight contrast differences. The output function can also be selected in this setting.



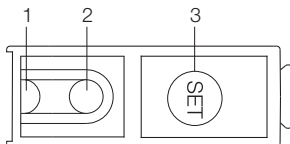
**Wiring diagrams**



**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

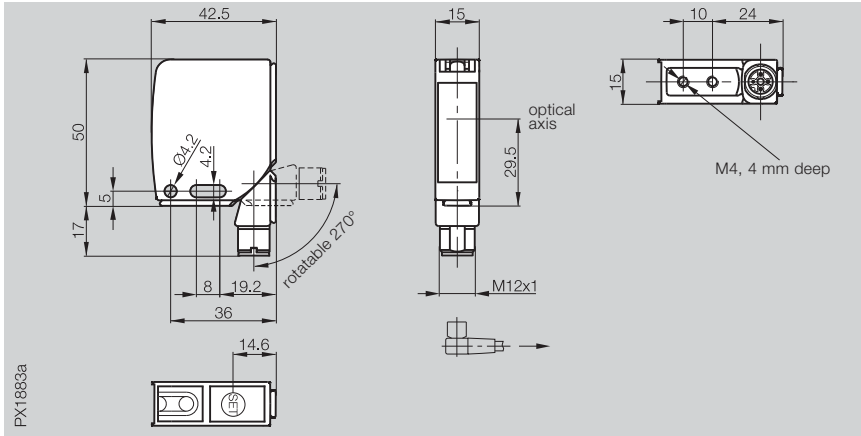


Mounting bracket  
BOS 21-HW-2



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



2.2

2.3

Photoelectric sensors accessories page 2.3.2 ...

5

Connectors ... page 5.2 ...



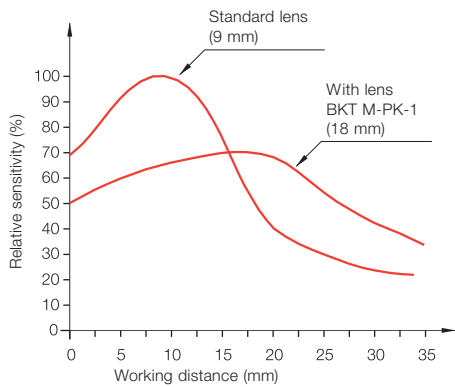
In this device the microprocessor takes over the entire setup process. The latter monitors and synchronizes the emitter, receiver and output circuits, for optimum switching frequency, repeatability and insensitivity to interference and ambient light. The user needs only to press two keys for setting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

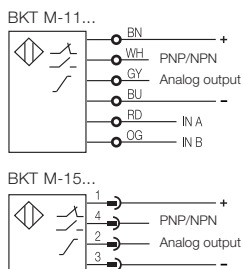
**Features**

- 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**



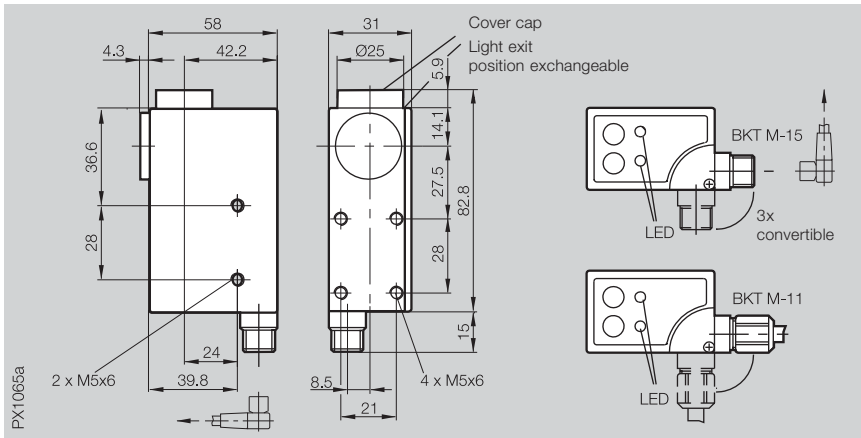
**Wiring diagrams**



**Recommended accessories**  
please order separately



Series	BKT	BKT
Working distance	<b>9 mm ±3 mm</b>	<b>9 mm ±3 mm</b>
Working distance with lens PK-1	<b>18 mm ±4 mm</b>	<b>18 mm ±4 mm</b>



## 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
<b>Electrical data</b>				
Supply voltage U <sub>B</sub>			10...30 V DC	10...30 V DC
Ripple			2 V DC	2 V DC
No-load supply current I <sub>0</sub> 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 <sub>d</sub> at I <sub>o</sub>			≤ 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
<b>Optical data</b>				
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**
<b>Time data</b>				
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
<b>Indicators</b>				
Ready indicator			LED green	LED green
Output function indicator			LED red	LED red
<b>Mechanical data</b>				
Connection			M12 connector, 4-pin	3 m cable, PVC
No. of wires x cross-section				6x0.34 mm <sup>2</sup> with shield
Housing material			GD-Zn	GD-Zn
Optical surface			Glass	Glass
Weight			310 g	600 g
<b>Ambient data</b>				
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 <sub>a</sub>			-10...+55 °C	-10...+55 °C

\*2.5 V DC with Kodak gray card 90% Reflexion

\*\*2x7 mm with BKT M-PK1



Connector orientation

2.2

2.3

Photoelectric sensors accessories page 2.3.2 ...

5

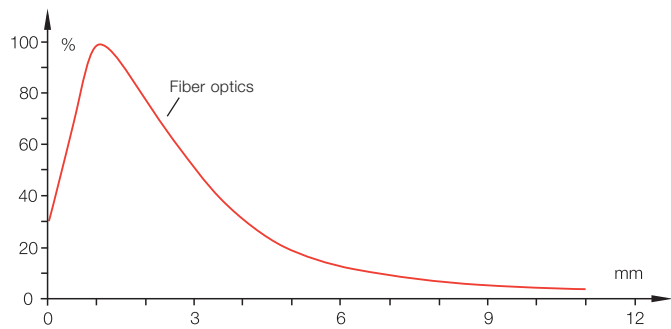
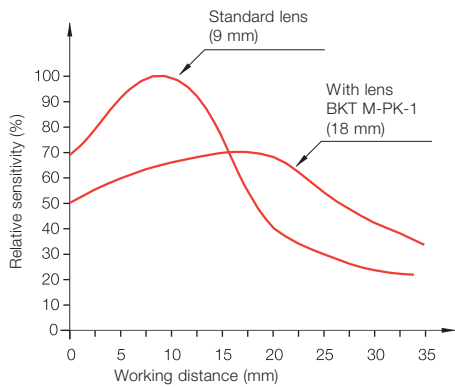
Connectors ... page 5.2 ...

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.

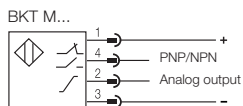
**Features**

- 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

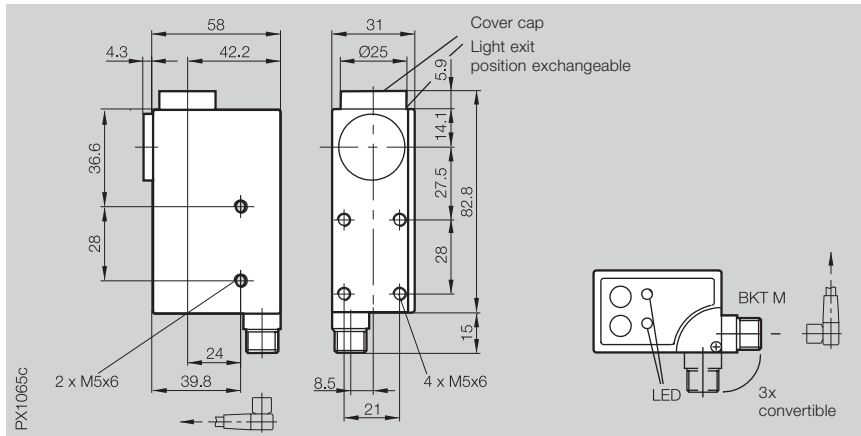
Connector  
Straight BKS-S 19-3  
Right-angle BKS-S 20-3

# Contrast Sensor with white light

## Photoelectric Sensors

BKT M  
Contrast Sensor  
with white light

Series	BKT	BKT
Working distance		<b>9 mm ±3 mm</b>
Working distance with lens PK-1		<b>18 mm ±4 mm</b>
Working distance with fiber optics (diffuse)	<b>0...3 mm</b>	



### Contrast Sensor

PNP/NPN for fiber optics	BKT M-45-U-S4	
PNP/NPN round spot		BKT M-15C-U-S4
<b>Electrical data</b>		
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 $I_o$	≤ 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
<b>Optical data</b>		
Emitter, light type	LED white	LED white
Wavelength	400...700 nm	400...700 nm
<b>Time data</b>		
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
<b>Indicators</b>		
Ready indicator	LED green	LED green
Output function indicator	LED red	LED red
<b>Mechanical data</b>		
Connection	M12 connector, 4-pin	M12 connector, 4-pin
Housing material	GD-Zn	GD-Zn
Optical surface	Glass	Glass
Weight	310 g	310 g
<b>Ambient data</b>		
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



2.2

2.3

Photoelectric sensors accessories page 2.3.2 ...

5

Connectors ... page 5.2 ...