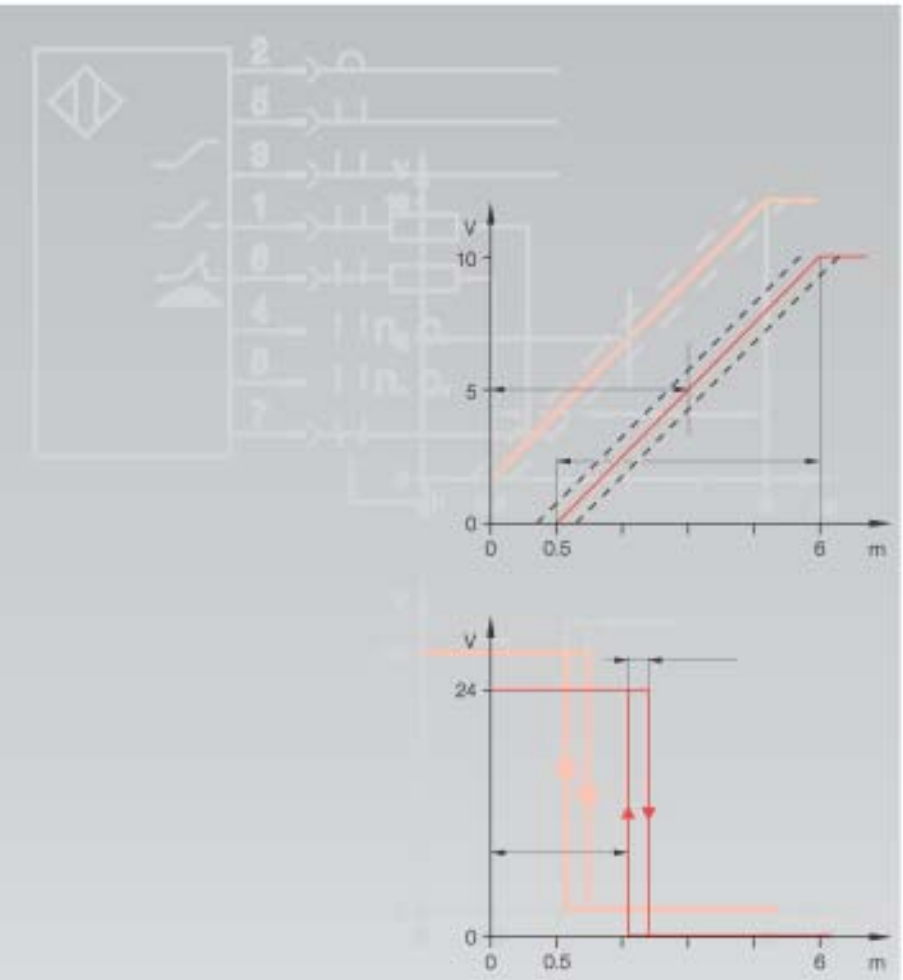
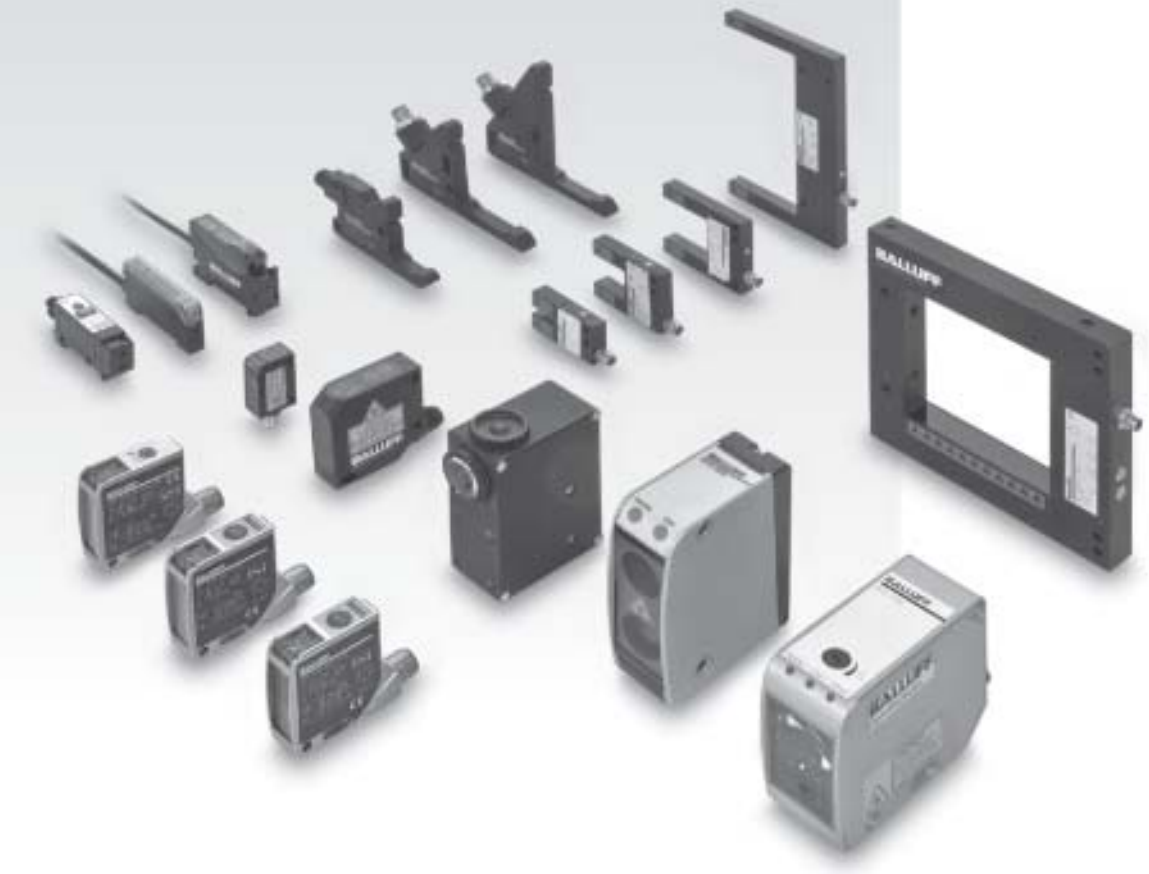
Photoelectric Sensors for Special Applications





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

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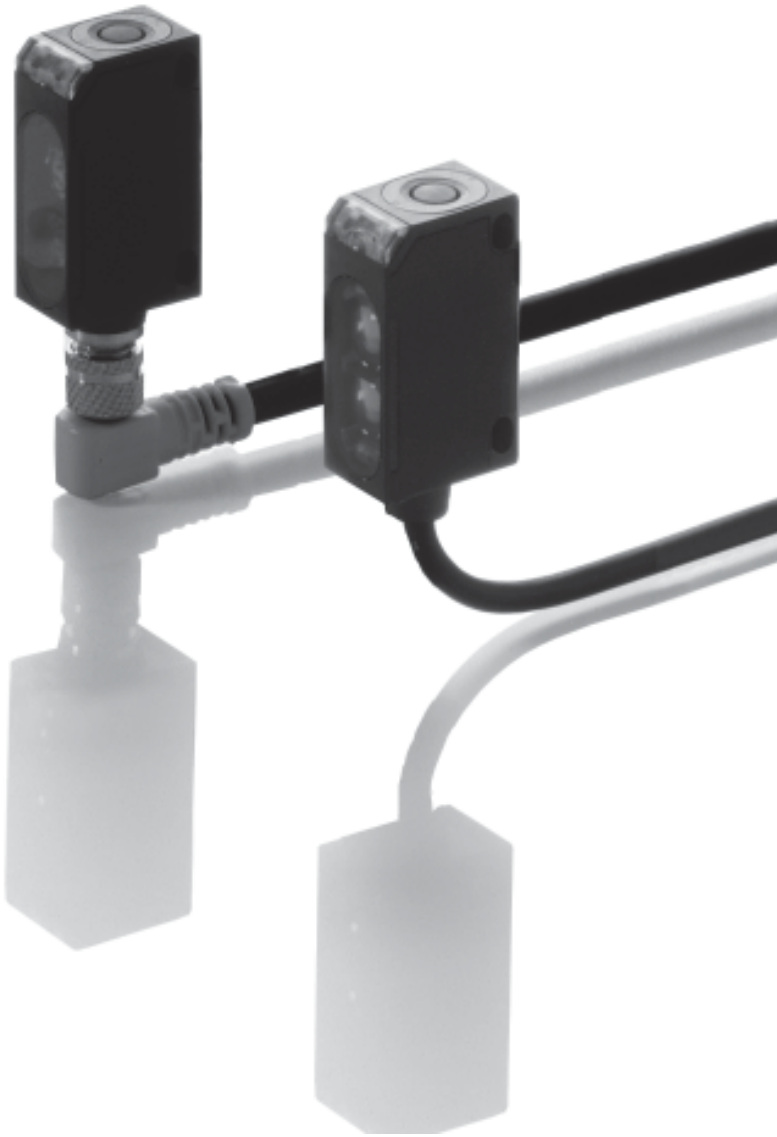
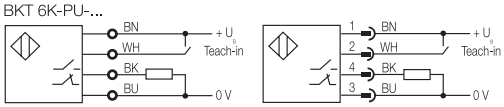
The **BKT 6K** laser contrast sensor is designed for reliable detection of small-area contrast differences. Even the narrowest lines can be definitively sensed over the optimum working range of 70...100 mm. Larger areas are capable of being detected outside this range.

Programming the sensor is easy using a teach-in button or control line.

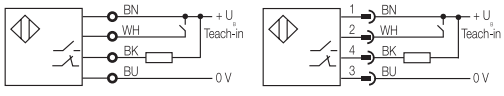


Wiring diagrams

BKT 6K-PU-...



BKT 6K-NU-...



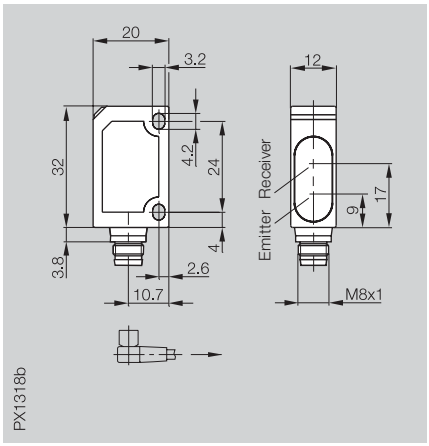
Recommended accessories

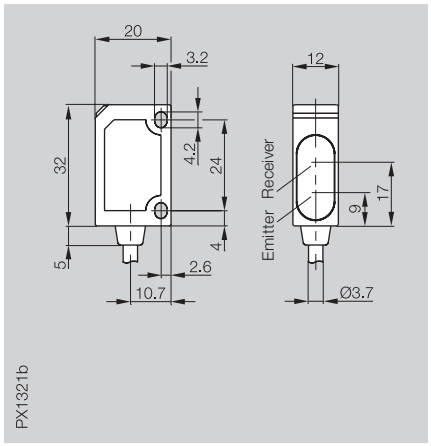
please order separately

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_e	≤ 2.4 V	≤ 2.4 V
Settings	teach-in	teach-in
Optical data		
Emitter, light type	Laser, red light	Laser, red light
Wavelength	650 nm	650 nm
Laser class	2	2
Light spot diameter	0.7 mm at focus (85 mm ±15 mm)	0.7 mm at focus (85 mm ±15 mm)
Time data		
Response time	0.5 ms	0.5 ms
Switching frequency f	1 kHz	1 kHz
Indicators		
Output function indicator	LED yellow	LED yellow
Stability indicator	LED green	LED green
Mechanical data		
Connection	M8 connector, 4-pin	2 m cable, PVC
No. of wires × cross-section		4×0.14 mm²
Housing material	impact-resistant ABS	impact-resistant ABS
Optical surface	PMMA	PMMA
Weight	40 g	120 g
Ambient data		
Degree of protection per IEC 60529	IP 67	IP 67
Polarity reversal protected	yes	yes
Short circuit protected	yes	yes
Ambient light rejection	EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a	–20...+60 °C	–20...+60 °C

*optimum working range for small markings: 70...100 mm

Connector orientation

Contrast sensor values referenced to Kodak gray card 90% reflective, 100×100 mm.

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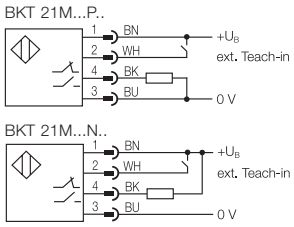
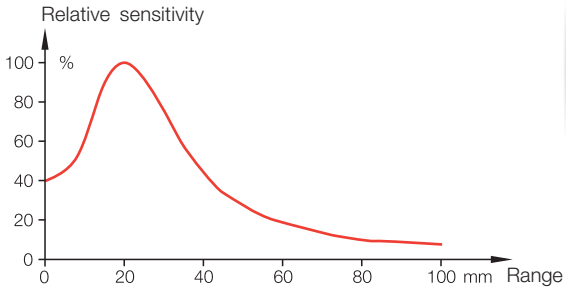
The **BKT 21M** contrast sensor uses white light and is programmed with the push of a button. It discriminates colored markings as well as gray levels on various surfaces. In its standard setting the sensor is dark-switching (markings with less light intensity are detected as the background).
A fine setting is available for slight contrast differences. The output function can also be selected in this setting.

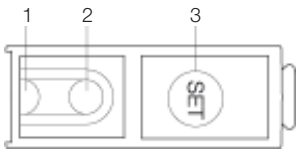
Wiring diagrams



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

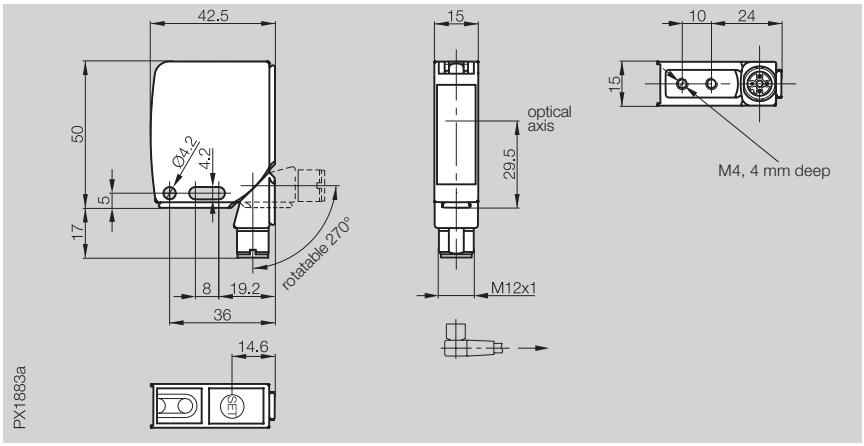

Mounting clamp
BOS 21-KH-2


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_e	≤ 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

Connector orientation

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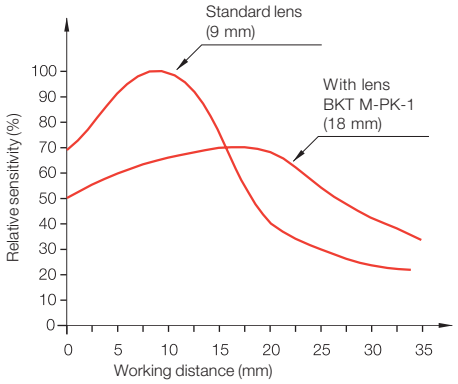
In this device the microprocessor takes over the entire setup process. The latter monitors and synchronizes the emitter, receiver and output circuits, for optimum switching frequency, repeatability and insensitivity to intereference and ambient light.
The user needs only to press two buttons for setting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

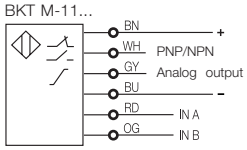
- Selectable vertical or horizontal light spot
- Automatic selection of red or green emitter light
- Automatic setting of light-on/dark-on function
- Remote key functions and 4 storable programs (cable version)
- Time delay and key lock selectable
- Interchangeable optics (straight and 90°)
- Analog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

Function diagram

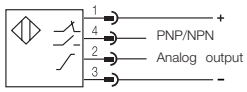


Wiring diagrams

BKT M-11...



BKT M-15...



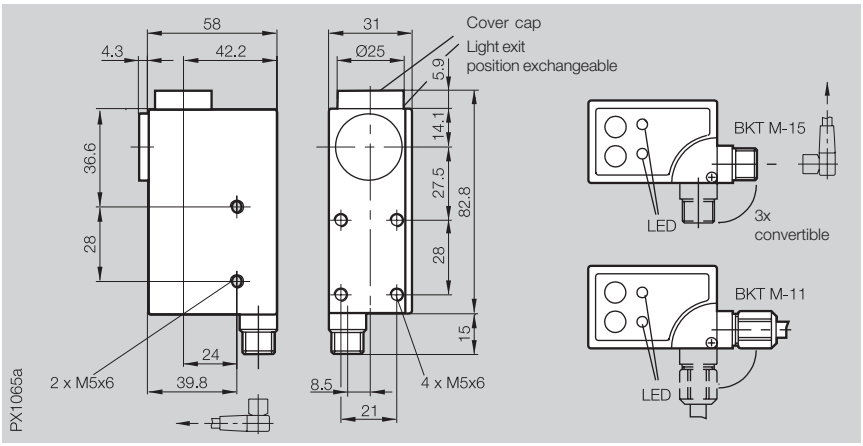
Recommended accessories
please order separately

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_e			≤ 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			1.5×5 mm**	1.5×5 mm**
Time data				
Response time			50 µs	50 µs
Switching frequency f			10 kHz	10 kHz
Time function			20 ms off-delay selectable	20 ms off-delay selectable
Indicators				
Ready indicator			LED green	LED green
Output function indicator			LED red	LED red
Mechanical data				
Connection			M12 connector, 4-pin	3 m cable, PVC
No. of wires × cross-section				6×0.34 mm² with shield
Housing material			GD-Zn	GD-Zn
Optical surface			Glass	Glass
Weight			310 g	600 g
Ambient data				
Degree of protection per IEC 60529			IP 67	IP 67
Polarity reversal protected			yes	yes
Short circuit protected			yes	yes
Ambient light rejection			EN 60947-5-2	EN 60947-5-2
Ambient temperature range T_a			–10...+55 °C	–10...+55 °C

*2.5 V DC with Kodak gray card 90% reflective
**2×7 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 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.

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