Photoelectric Sensors

Photoelectric sensors for object detection

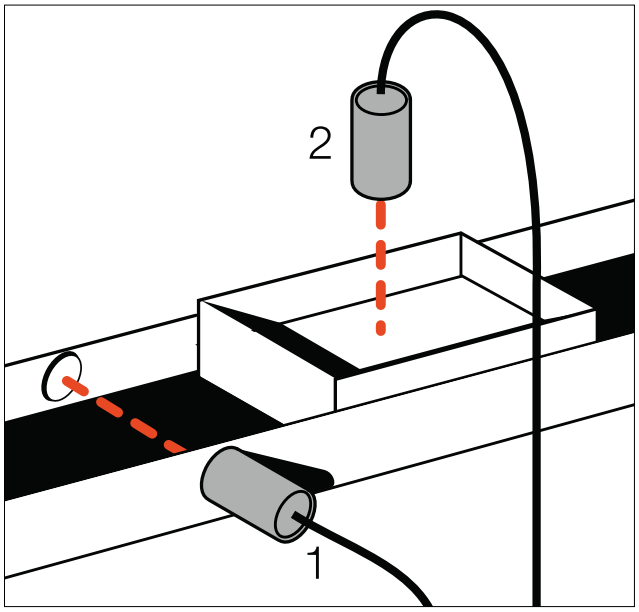
Photoelectric sensors check presence, size, color, distance and thickness.
They are excellent specialists with completely different focuses:

- Part recognition and counting
- Stack height monitoring
- Detection through glass
- Small parts detection
- Brand recognition
- Fill level detection and much more.

The wide Balluff spectrum offers every light type, whether red light, infrared or laser technology. In different ranges. With and without background suppression.
Various designs – also in mini version – ensure a wide variety of possible applications. Our photoelectric sensors are optimized for robotics, automation, installation and handling.

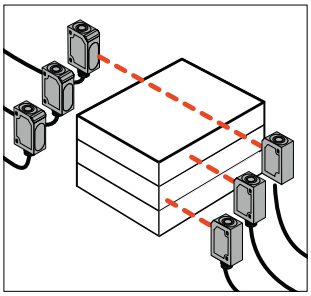
Contents

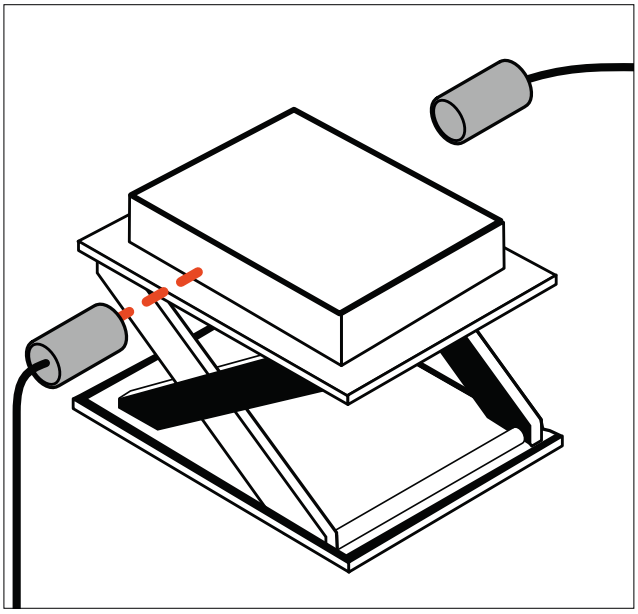
Basic information and definitions can be found on **page 934.**



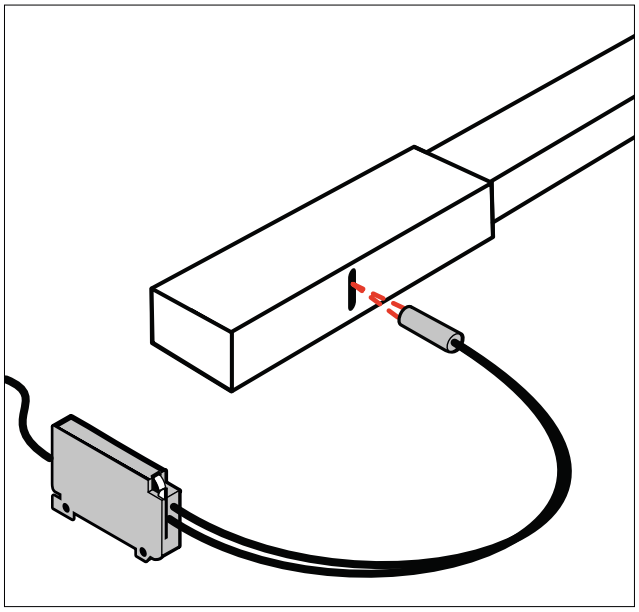
Querying the size and content of containers
The retroreflective sensor (1) indicates the presence of the box. The pulse duration can be used to count or measure box lengths.
The diffuse sensor (2) with background suppression checks the contents of the box. Its range is adjustable.

Checking stack height
Through-beam light sensors that consist of a emitter and receiver can be installed one on top of the other. Each through-beam sensor then scans a specific stack height. The accuracy of the scan is within a few millimeters, if apertures are used.

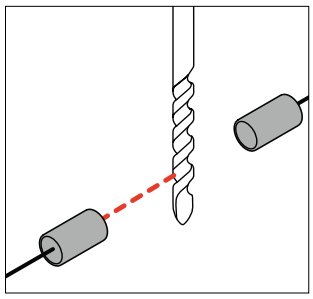




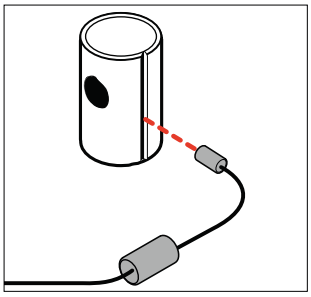
Tracking a hoist
The through-beams are assigned so that the uppermost metal plate interrupts the light beam. The beam path is open when the metal plate is removed for processing. The through-beams provide a switching signal, and the hoist is automatically reset to the height of a metal plate.



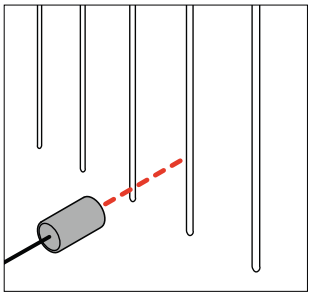
Scanning a read mark
In order to recognize a reading mark, a base unit and plastic fiber optics are used. This way a mark – such as a bright line – can be scanned on a dark background, as occur on belts, hoses or containers.



Checking drill breakage
Using a through-beam light sensor with double-slotted apertures, a drill breakage check can be carried out from 2 m away. Drills larger than approx. 2 mm diameter can be checked this way. If even smaller drills (down to 1 mm Ø) have to be checked, then a laser through-beam sensor can be used.

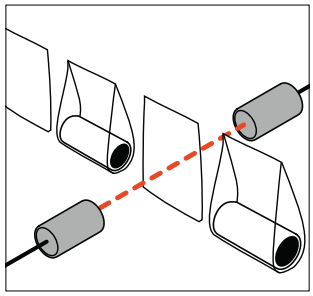


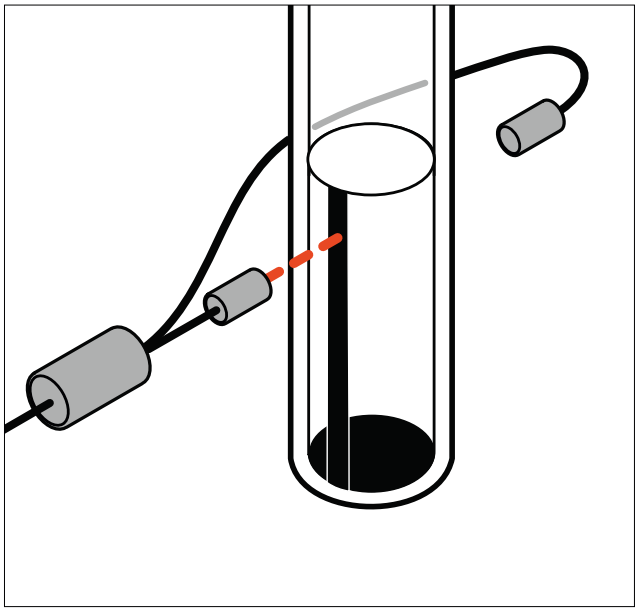
Detecting a groove
To sense a groove on a bearing pillow, a diffuse sensor is adjusted using a fiber optic cable so that the bearing pillow is reliably detected. The groove interrupts the beam (no reflection), and the switch changes its output condition.



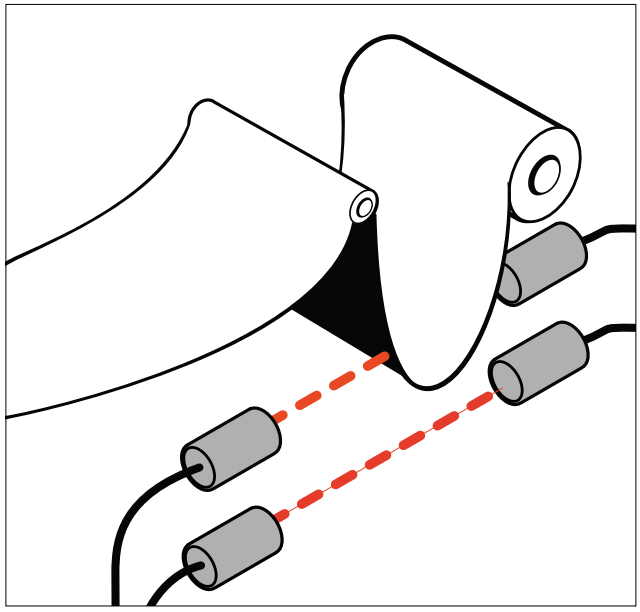
Detecting small parts
With an optical adapter such as the BOS 18-PK-1, small parts can be measured and the background simultaneously suppressed. In this way, with a sensing distance of up to 13 mm, for example, fibers with a diameter of 0.05 mm can be queried, where the color plays a subordinate role. Diffuse sensors with background suppression enable larger ranges.

Querying packaging contents
A through-beam sensor is used in order to query the content of a package (e.g., bandages). To do so, the emitter and receiver are arranged so that the light beam goes through the packaging. If the packaging is empty, the light is sufficient to light up the receiver. If it is filled, the packaging contents interrupt the emitter's light beam, and the sensor switches.



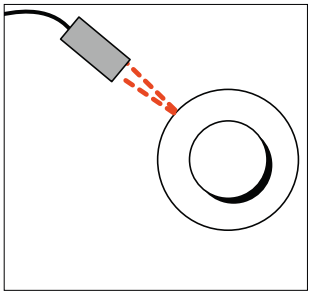


Querying fill level in transparent containers
During the fill level query in a transparent container (cylinder), a diffuse sensor with fiber optics is used as a through-beam sensor. If no liquid is at the sensor height, the light beam is not broken, so that it hits the receiver. If enough fluid is available, the light beam is deflected away from the receiver. The switch changes its output condition.

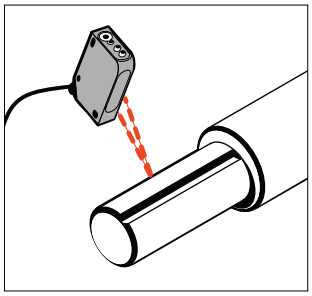


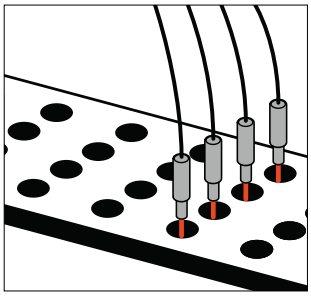
Checking sag
Two through-beam sensors can be used to control the positioning of a roller conveyor. In addition, the through-beams are arranged above each other so that at optimum slack, the lower light beam is clear and the upper beam interrupted. If both light beams are clear, more roll tension is needed.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

Recognizing different diameters
In order to be able to recognize different shaft diameters, a diffuse sensor with background suppression (HGA) is used in such a manner that it switches with large diameters. Small diameters, on the other hand, are suppressed as "background" so that the sensor does not switch.

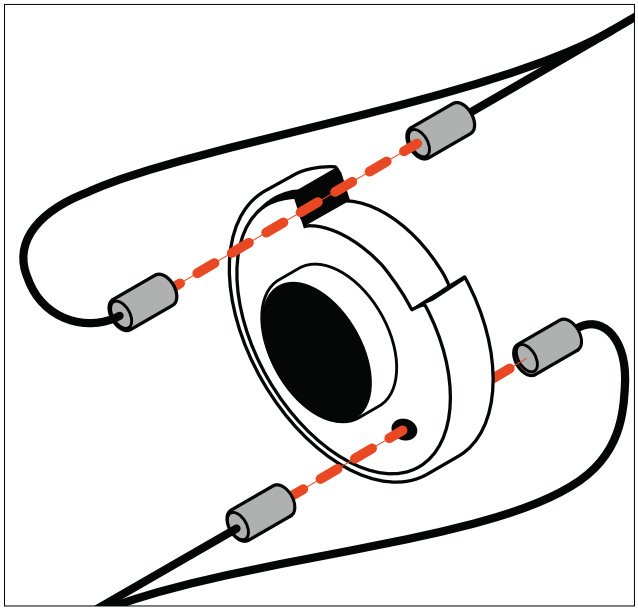


Positioning parts
In order to correctly position pivoted parts, its groove can be scanned. A laser sensor with background suppression is calibrated so that it recognizes the surface of the pivoted part. If the light beam strikes the slot, the light is reflected back to the sensor at a different angle. The switch recognizes this as a background signal and ignores it, i. e. changes its switching state.

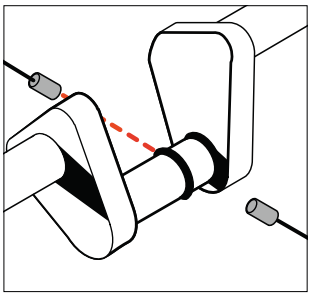




Checking the level: Granular material in small packages
Multiple sensors simultaneously check the content of a whole series of small packages on a conveyor belt.
In addition, the user can shorten the plastic fiber optics to the desired length. Its standard length is 2 m.

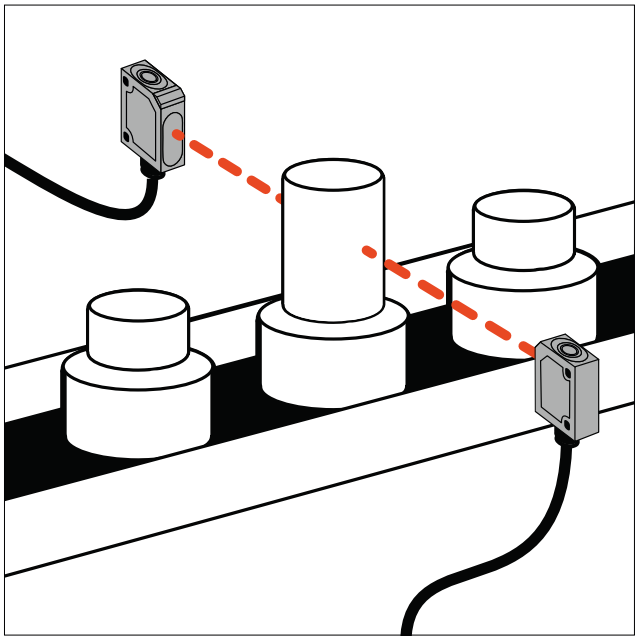


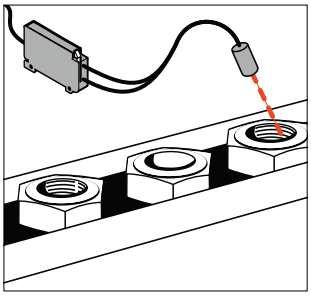
Checking the quality of workpieces
Multiple sensors with fiber optic attachments simultaneously check different features of a workpiece.
Only if all drill holes, screws, dimensional accuracies, surface qualities etc. are present may the workpiece be processed further. Later failures and downtime are thus avoided.



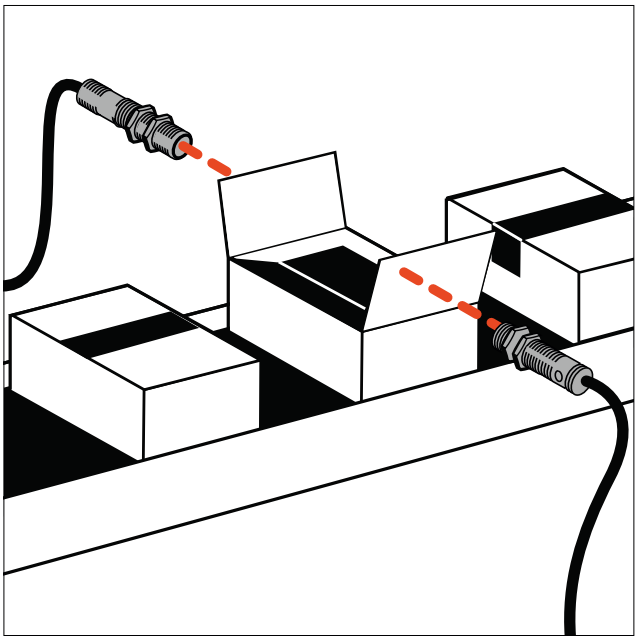
Detecting the bead of a camshaft
To detect whether a bead is present, a diffuse sensor with fiber optics is used. This fiber optic is arranged on a level parallel to the camshaft. If a bead is present on the camshaft, the light beam is interrupted. With no bead, the beam path is free.

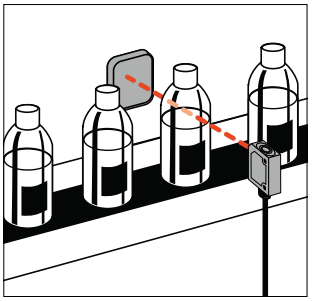
Sorting parts
In order to be able to sort parts of various heights, a through-beam sensor is used. To do so, a teach-in process is used so that taller parts interrupt the light beam and can be sorted out. The quick and secure teach-in enables quick adaptation to changed conditions.





Checking threads
Prior to assembling nuts, a check needs to be made to determine whether a thread is present or not. If the thread is present, they will reflect the light back to the fiber optics and the sensor will operate.
If the thread is missing, there will be a total reflection on the blank wall of the drill hole, and as a result, no light will be reflected to the fiber optics. The sensor does not switch.

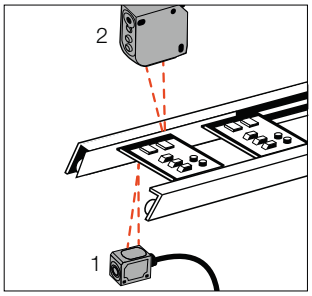


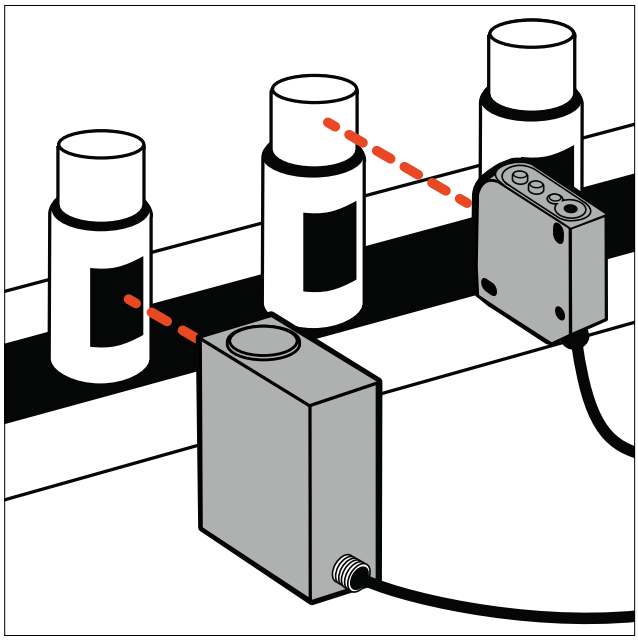


Counting transparent bottles
Transparent objects absorb only a little light. In order to measure them accurately, retroreflective light sensors with small hysteresis are best suited. Through their teach-in-buttons, the sensors can additionally be set very easily, and their configuration can be changed even when the process is running. Unnecessary downtimes are thus prevented easily.

Checking packaging
In order to check whether a packaging is correctly closed, a through-beam sensor is configured so that the light beam runs just above the packaging. If it is not correctly closed, the obstructing lid interrupts the light beam, and the through-beam sensor signals it.

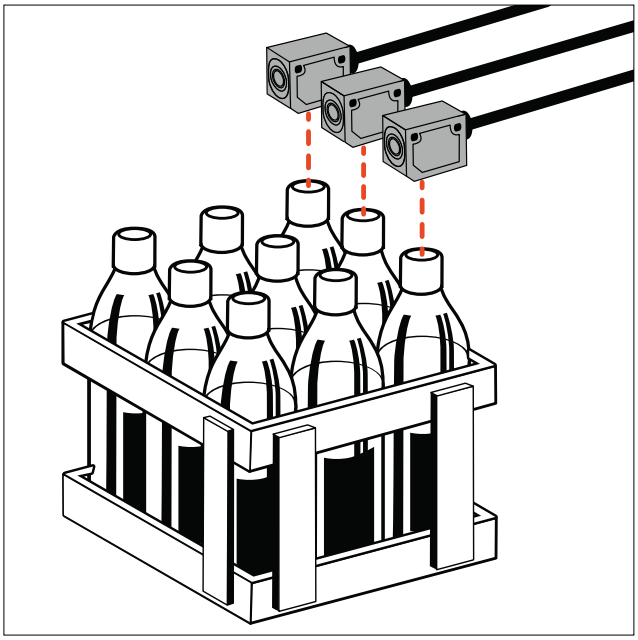
Positioning and checking equipment
To bring the circuit board to a particular inspection position, a focused diffuse sensor (1) is used. The board crosses the light beam of the sensor exactly in its focus. This enables maximum precision.
Through the small spot of light of the laser diffuse sensor (2) and its background suppression, it can be checked whether even small components are present on the board.

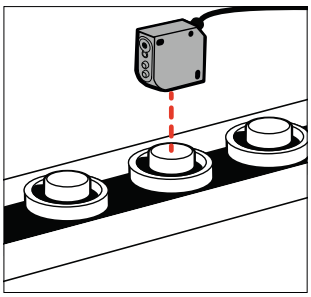




Final inspection of labels and caps
For the final inspection of dish detergent bottles, a check must be made to determine whether the label and cap are attached. A contrast sensor is used for the label inspection. This distinguishes between the relative reflectivity of the label and the bottle.
The cap is detected using a diffuse sensor with background suppression. The advantage of background suppression is that the screw closure can be faded out if the cap is missing.

Checking completeness
In order to be able to check an assembly process in detail, diffuse sensors with background suppression (HGA) are used. These sense small objects with high precision and are not misled by different colors. If details need to be measured even more accurately, we recommend laser sensors with background suppression.





Inspecting closing caps
Depending on installation circumstances and the required switching distance, a wide variety of diffuse sensors with background suppression can be employed. In this way, you can choose excellent specialists from the tightest installation conditions, the maximum resolution or high ranges.
Contact us

	mini.s	mini.s	Global		Global	
						
Type	**BOS 08M**	**BOS 08M**	**BOS 12M**	**BOS 12M laser**	**BOS 18M**	**BOS 18M red light**
Housing material	Metal	Stainless steel	Metal	Metal	Metal	Metal
Range/sensing distance						
Through-beam sensor emitter/receiver	0...1.1 m	0...1.5 m	0...5 m	0...3 m, 0...30 m	0...20 m, 0...25 m	0...20 m
Retroreflective sensor						
Retroreflective light sensor with polarizing filter	25...550 mm		0...1.5 m		4 m, 6 m	7 m
Retroreflective sensor for glass detection						
Diffuse sensor	0...55 mm		0...100 mm, 0...200 mm, 0...400 mm		1...400 mm, 1...600 mm	1...300 mm, 1...600 mm
Diffuse sensor with background suppression			0...24 mm, 10...60 mm			30...150 mm, 30...300 mm
Diffuse sensor with foreground suppression						
Technical data						
Supply voltage	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Output function	PNP NO/NC	PNP NO	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC
Connection	Connectors/ cables	Cable	Connectors/ cables	Connectors/ cables	Plug connec- tor	Plug connec- tor
Ambient temperature	–10...+60 °C	–10...+60 °C	–5...+55 °C, –15...+55 °C, –20...+60 °C	–10...+50 °C	–5...+55 °C	–5...+55 °C
Degree of protection as per IEC 60529	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67
Light	Red light	Infrared light	Infrared light/ red light	Laser	Infrared light/ red light	Red light
Special features						
Page	38	40	44	51	56	62

	Dynamic Sensor Control						Global	Global
								
	BOS 18M red light Teach-in	**BOS 18M red light angle head**	**BOS 18M infrared**	**BOS 18M Laser**	**BOS 18M laser with angle head**	**BOS 18E**	**BOS 18KF**	**BOS 18KF laser**
	Metal	Metal	Metal	Metal	Metal	Stainless steel	Plastic	Plastic
	0...20 m	0...16 m	0...50 m	0...50 m, 0...60 m	0...50 m	16 m	0...20 m	0...60 m
			10 m			4 m	0.1...4.5 m	
	5 m	2 m	7 m	0.1...16 m	0.1...9 m	2 m	0.1...5 m	0.1...16 m
							0.1...1.7 m	
	1...500 mm	0...400 mm	1...800 mm	0...350 mm	0...250 mm	0...100 mm, 0...200 mm, 0...400 mm	0...100 mm, 0...400 mm, 0...700 mm	0...350 mm
		10...120 mm, 40...120 mm		30...150 mm		0...40 mm	50...100 mm, 100 mm	
							40...100 mm	
	10...30 V DC	10...30 V DC, 10...36 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC
	Plug connector	Plug connector	Plug connector	Connectors/ cables	Connectors/ cables	Plug connector	Connectors/ cables	Connectors/ cables
	–5...+55 °C	–15...+55 °C, –25...+55 °C	–5...+55 °C	–5...+55 °C, –10...+55 °C, –15...+55 °C	–5...+55 °C	–5...+75 °C, –20...+75 °C	–25...+55 °C	–10...+50 °C
	IP 67	IP 67	IP 67	IP 65/IP 67	IP 67	IP 69K/IP 68	IP 67	IP 67
	Red light	Red light	Infrared light	Laser	Laser	Infrared light/ red light	Infrared light/ red light	Laser
	with DSC							
	70	72	76	82	86	96	104	112

						
Type	**BOS 18KW with angle head**	**BOS 18KW laser with angle head**	**BOS 30M**	**BOS Q08M**	**BOS Q08M Laser**	**BOS 2K**
Housing material	Plastic	Plastic	Metal	Metal	Metal	Plastic
Range/sensing distance						
Through-beam sensor emitter/receiver	0...15 m	0...50 m		0...2.2 m	0...3 m	0...1.2 m
Retroreflective light sensor with polarizing filter	0.1...3 m	0.1...9 m		25...550 mm		45...800 m
Retroreflective sensor for glass detection	0.1...1.7 m					
Retroreflective light sensor with autocollimation						
Diffuse sensor	0...80 mm, 0...400 mm	0...250 mm	0...2 m	0...55 mm		1...55 mm
Diffuse sensor with background suppression	50...100 mm			5...50 mm		1...15 mm, 1...30 mm
Diffuse sensor with foreground and background suppression						
Technical data						
Supply voltage	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC
Output function	PNP NO/NC	PNP NO/NC	PNP/NPN	PNP NO/NC	PNP NO/NC	PNP NO/NC
Connection	Connectors/ cables	Connectors/ cables	Plug connector	Connectors/ cables	Connectors/ cables	Connectors/ cables
Ambient temperature	–25...+55 °C	–10...+50 °C	–20...+60 °C	–10...+60 °C	0...+50 °C	–20...+50 °C
Degree of protection	IP 67	IP 67	IP 65	IP 67	IP 67	IP 67
Light	Infrared light/ red light	Laser	Infrared light	Red light	Laser	Red light
Page	122	128	137	140	144	150

Global







	BOS 5K	BOS 6K	BOS 6K Laser	BOS 21M	BOS 21M Laser	BOS 23K	BOS 23K Laser	
	Plastic	Plastic	Plastic	Metal	Metal	Plastic	Plastic	
	0...10 m	0...6.5 m		0...20 m	0...60 m	0...20 m	0...25 m	
	0.1...4 m		0.05...3 m	0.1...8 m	0.1...20 m	0.3...12 m	0.3...12 m	
		0...500 mm, 50...700 mm		0...2 m				
		0...500 mm	0...4 m	0...4 m				
	1...900 mm, 50...200 mm	20...300 mm		0.01...1 m, 0.05...2 m	0...600 mm	0...2 m	0...1.2 m	
		25...100 mm	20...60 mm, 30...110 mm	70...200 mm	50...100 mm	70...800 mm	120...600 mm, 150...800 mm	
				70...200 mm				
	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC, 12...30 V DC	
	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	
	Connectors/ cables	Connectors/ cables	Connectors/ cables	Plug connector	Plug connector	Plug connector	Plug connector	
	–25...+55 °C	–20...+60 °C	–20...+60 °C	–10...+50 °C, –25...+55 °C	–10...+50 °C	–20...+60 °C	–20...+60 °C	
	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67, IP 69K	IP 67, IP 69K	
	Infrared light/ red light	Red light	Laser/red light	Infrared light/ red light	Laser	Red light	Laser	
	160	170	176	184	190	198	200	

Type	**BOS 26K**	**BOS 26K Laser**	**BOS 50K**	**BOS 63M Laser**	**BOS 64K**
Housing material	Plastic	Plastic	Plastic	Metal	PBT
Range/sensing distance					
Through-beam sensor emitter/receiver			0...60 m		0...50 m
Retroreflective light sensor with polarizing filter			0.1...18 m		0.1...10 m
Retroreflective light sensor with autocollimation	0...5.5 m	0...6 m, 0...7 m, 0...20 m			
Diffuse sensor			1...2000 mm 1...3500 mm		0.05...2 m
Diffuse sensor with background suppression	30...300 mm, 150...600 mm	30...150 mm, 40...60 mm, 50...300 mm	200...2000 mm	0.2...6 m	0.2...2 mm
Technical data					
Supply voltage	10...30 V DC	10...30 V DC	10...30 V DC	15...30 V DC	24...60 V DC
Output function	PNP NO/NC	PNP NO/NC	PNP NO/NC	2× PNP	Relay
Connection	Plug connector	Plug connector	Plug connector	Plug connector	Screw terminal
Ambient temperature	–20...+60 °C	–15...+45 °C, –20...+45 °C	–5...+55 °C, –10...+60 °C,	–10...+60 °C	–25...+55 °C
Degree of protection as per IEC 60529	IP 67	IP 67	IP 67	IP 67	IP 67
Light	Infrared light/ red light	Laser	Red light	Laser	Infrared, Red light
Special features			partially with IO-Link		
Page	210	212	220	230	234

							
Type	**BFB 75K**	**BOS 73K**	**BOS 6K**	**BOS 18KF**	**BOS**	**BFO**	
Housing material	Plastic	Plastic	Plastic	Plastic	Metal	Plastic	
Range/sensing distance							
Optical fiber base units	Depending on fiber used	Depending on fiber used	Depending on fiber used	Depending on fiber used	Depending on fiber used		
Distance sensor							
Diffuse sensor with background suppression							
Contrast sensor							
Technical data							
Supply voltage	10...30 V DC	11...26 V DC	10...30 V DC	10...30 V DC	10...30 V DC		
Output function	PNP/NPN NO/NC	PNP NO/NC	PNP/NPN NO/NC	PNP/NPN NO/NC	PNP NO/NC		
Connection	Connectors/ cables	Connectors/ cables	Connectors/ cables	Connectors/ cables	Plug connector		
Ambient temperature	–20...+60 °C	–25...+55 °C	–20...+60 °C	–25...+55 °C	–20...+60 °C	–40...+105 °C	
Degree of protection as per IEC 60529	IP 64	IP 54	IP 67	IP 67	IP 67		
Light	Red light	Red light	Red light	Red light	Infrared light	for red light	
Special features	with display, analog output	with display					
Page	315	319	321	323	324	328	






BFO 18 glass fiber optics	**BOD 6K**	**BOD 21M laser**	**BOD 26K laser**	**BOD 63M laser**	**BOD 66M**	**BOD 66M laser**	**BKT 6K laser**
Metal, Silicon, polyurethane	Plastic	Metal	Plastic	Metal	Metal	Metal	Plastic
	20...80 mm	25...45 mm, 20...200 mm, 20...500 mm	45...85 mm, 30...100 mm, 80...300 mm	200...2000 mm, 200...6000 mm	100...600 mm	150...800 mm 150...2000 mm	
	20...80 mm		30...100 mm, 80...300 mm	200...2000 mm, 200...6000 mm	100...600 mm	150...800 mm 150...2000 mm	
							40...150 mm
	15...30 V DC	18...30 V DC	18...28 V DC, 18...30 V DC	15...30 V DC	18...30 V DC	18...30 V DC	10...30 V DC
	analog PNP NO/NC	analog PNP NO/NC	analog PNP NO/NC	analog PNP NO	analog PNP NO	analog PNP NO	PNP/NPN NO/NC
	Connectors/ cables	Plug connector	Connectors/ cables	Plug connector	Plug connector	Plug connector	Connectors/ cables
–20...+85 °C, –0...+170 °C	–20...+60 °C	–10...+50 °C	0...+45 °C, –10...+60 °C	–10...+60 °C	–20...+50 °C	–20...+50 °C	–20...+60 °C
	IP 67	IP 67	IP 67	IP 67	IP 65	IP 65	IP 67
for infrared light	Red light	Laser	Laser	Laser	Red light	Laser	Laser
Custom lengths pos-sible	Teach-in						Focused light beam
346	355	356	358	367	371	373	297






Type	BKT 18KF	BKT 21M	BKT 67M	BLT 18KF	BLT 21M	BFS 26K
Housing material	Plastic	Metal	Metal	Plastic	Metal	Plastic
Range/sensing distance						
Contrast sensor	10 mm±2 mm	19 mm±2 mm	9 mm ±3 mm (18 mm) ±4 mm			
Luminescence sensor				8...20 mm	0...40 mm	
Color sensor						12...32 mm, 15...30 mm, 18...22 mm,
Fork sensor						
Technical data						
Supply voltage	10...30 V DC	10...30 V DC,	10...30 V DC	10...30 V DC	10...30 V DC	12...28 V DC
Output function	PNP NO/NC	PNP/NPN NO/NC	PNP/NPN/ Analog NO/NC	PNP NO/NC	PNP NO/NC	3 × PNP NO
Connection	Connectors/ cables	Plug connector	Plug connector	Connectors/ cables	Plug connector	Plug connector
Ambient temperature	–25...+55 °C	–25...+55 °C	–10...+55 °C	–25...+55 °C	–10...+55 °C	–10...+55 °C
Degree of protection as per IEC 60529	IP 67	IP 67	IP 67	IP 67	IP 67	IP 67
Light	White light	White light	Red, green and blue light	UV	UV	White light
Special features			Interchange-able optics			various Light spot sizes
Page	299	301	303	309	311	293







	BFS 33M true color sensor	**BGL red light**	**BGL pin point**	**BGL infrared**	**BGL laser**	**BGL 21**	**BGL_C analog**	
	Metal	Metal	Metal	Metal	Metal	Metal	Metal	
						2 mm	30 mm, 50 mm	
	up to 400 mm							
		5, 10, 20, 30, 50, 80, 120, 180, 220 mm	5, 10, 20, 30, 50, 80, 120, 180, 220 mm	5, 10, 20, 30, 50, 80, 120, 180, 220 mm	30, 50, 80, 120 mm			
	24 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	18...30 V DC	
	3 × push-pull RS 232	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP/NPN NO/NC	PNP/analog NO/NC	
	Cable	Plug connector	Plug connector	Plug connector	Plug connector	Plug connector	Plug connector	
	+10...+55 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C	–20...+60 °C	–5...+55 °C	
	IP 54	IP 67	IP 67	IP 67	IP 67	IP 65	IP 65	
	White light	Red light	Red light, pin point	Infrared	Laser	Infrared/ red, green light	Red light	
	True color Sensor			Fluid detection	Transparent Detection	for label sens-ing	IO-Link, DSC	
	291	240	244	248	252	259	276	






Type	**BWL red light**	**BWL pin point**	**BWL infrared**	**BWL laser**	**BWL automotive**	**BOW**	
Housing material	Metal	Metal	Metal	Metal	Metal	Metal	
Range/sensing distance							
Fork sensor							
Angled light sensor	40, 54, 68, 90, 110 mm	40, 54, 68, 90, 110 mm	40, 54, 68, 90, 110 mm	40, 54, 68, 90, 110 mm	22×22 mm, 43×43 mm, 42×62 mm		
Optical window sensor						40×80 mm, 80×80 mm, 120×80 mm	
Light grids							
Technical data							
Supply voltage	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	10...30 V DC	
Output function	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO/NC	PNP NO	PNP NO	
Connection	Plug connector	Plug connector	Plug connector	Plug connector	Plug connector	Plug connector	
Ambient temperature	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+60 °C	–10...+55 °C	
Degree of protection as per IEC 60529	IP 67	IP 67	IP 67	IP 67	IP 67	IP 65	
Light	Red light	Red light, Pin point	Infrared light	Laser	Infrared light	Infrared light	
Special features	stackable	stackable	stackable	stackable		Dynamic measuring procedures	
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BLG

	Metal							
	0.15...2.1 m							
	24 V DC,							
	PNP/analog NO							
	Plug connector							
	0...+55 °C							
	IP 65							
	Infrared light							
	various measurement field heights							
	287							