Photoelectric Sensors
Contrast Sensor BKT 67M-003/004-U-S92
No. 856 493 E · Edition 1006

| Order Code	Contrast Sensor	Light spot
BKT0003	BKT 67M-003-U-S92	vertical
BKT0004	BKT 67M-004-U-S92	horizontal

Safety Notes

⚠️ These photoelectric sensors may not be used in applications where personal safety depends on proper function of the devices (not safety designed per EU machine guideline). Read these operating instructions carefully before putting the device into service.

CE The CE Marking confirms that our products conform to the EC Directives 2004/108/EEC (EMC) and the EMC Law.
In our EMC Laboratory, which is accredited by the DATech for Testing of Electromagnetic Compatibility, proof has been documented that these Balluff products meet the EMC requirements of the harmonized standard EN 60947-5-2.

Installation

The sensor can be mounted using the through-holes (φ 3.5 mm) or the M5 tapped holes (max. depth 6 mm).
Caution: Excessively long screws may damage the sensor.
To change the reading direction (lateral or frontal), exchange the lens with the cover cap.
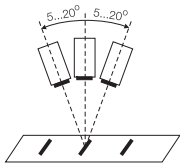
If the material is very shiny (i.e. plastic or metal plate) it is advisable to tilt the reading head 5° to 20° in relation to the material that has to be read and to the direction of its movement.
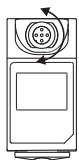
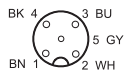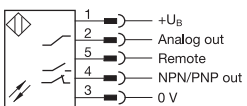The connector block can be locked in 5 various positions.

Connections

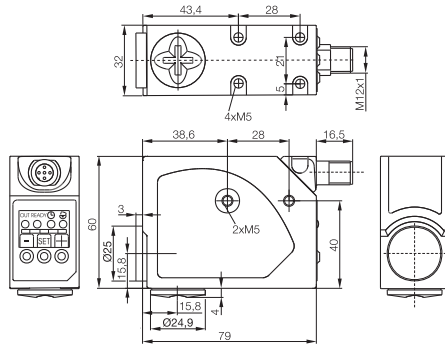Fig. 1: Wiring diagram, pin configuration

1	+U_B
2	Analog out
5	Remote
4	NPN/PNP out
3	0 V

BK 4   3 BU
5 GY
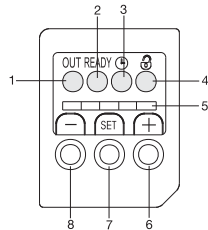BN 1   2 WH

Dimensions

Fig. 2: Dimensions

Indicators and keys

1 Yellow LED OUT
  Output function indicator
  LED on: Output active
2 Green LED READY
  Power indicator
  LED on: Sensor ready
  LED blinks: Output overload
3 Orange LED DELAY ⏱
  Time delay indicator
  LED on: Time delay is enabled
  LED off: Time delay is disabled.
4 Orange LED KEYLOCK 🔒
  Indicates key status
  LED on: Keys enabled and operable
  LED off: Keys locked
  PNP or NPN setting result indication
  LED blinks 1x: PNP output is set.
  LED blinks 2x: NPN output is set.
5 Segment display (Bargraph)
  Displays switching threshold level
6 + key
  Raises switching threshold incrementally.
7 SET key
  Used for acquiring the mark and background.
8 – key
  Reduces switching threshold incrementally.

Operational and Error indication

Green LED	Function/Error
Off	Data are being read
On	Settings correct, sensor is ready
Fast blinking	Output short circuit or output current exceeded
Slow blinking	The settings or the acquisition of data are incorrect, the sensor is not operative. Causes: - The contrast between the mark and the background is insufficient - The acquisition of the new mark or of the new background is incorrect or not stored.

Enabling the keys

The keys are disabled after the sensor is turned on. This protects the settings. To enable the keys:

1. Hold down the SET key for 5 s until the orange KEYLOCK LED turns on.

Note:
The keys are automatically disabled after 2 minutes of inactivity (no keys pressed during that time).

Setting reading mode (Teach in)

During the setup procedure the sensor adjusts automaticaly the optimum combination of red, green or blue emission, dark/light function and switching threshold:
- The light emission is set to red, green or blue to maximize the contrast between the mark and the background reading.
- The dark or light function is selected on the basis of the reading of a darker or lighter mark with respect to the background.
- The switching threshold is set halfway between the acquired mark and background values.

1. Place the mark under the light spot and don't move the mark for a few seconds while reading is taking place.
2. Press the SET key until the green LED turns off. The sensor acquires the mark alternating the red, green and blue emission until the most effective emission combination is achieved.
3. Place the background under the light spot and don't move the mark for a few seconds until the emission color is stable.
4. Press the SET key. The green LED blinks on briefly. The sensor acquires the background alternating the red, green and blue emission.
5. The green LED continuously on indicates the mark and background acquisition was correct and the sensor is ready.
   If the green LED blinks slowly, the contrast difference is insufficient. To restore the previous setting, press the SET key again.

Turning time delay (DELAY) on/off

Standard configuration (factory setting): Output delay off.
To enable slower sensor interfaces to detect shorter pulses as well, turn on the output delay. This increases the minimum length of the output signal to 20 ms.
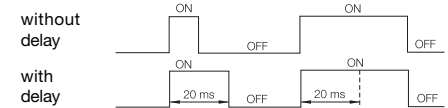

Fig. 3: Output without and with delay

Turning on the output delay
1. Press + and − contemporaneously for 2 sec. until the Delay LED turns on.

Turning off the output delay
1. Press + and − contemporaneously for 2 sec. until the Delay LED turns off.

Selecting light-on or dark-on

The sensor automatically selects light-on or dark-on switching during setup.

Light-on:
For dark background and light marking.

Dark-on:
For light background and dark marking.

Setting the switching threshold manually

The switching threshold can be adjusted to the application. The blinking pattern on the segment display indicates by how much the switching threshold deviates from the threshold output value.

1. Press the + or – key:
   The first 3 LEDs from the left turn on.
2. To increase the switching threshold, press the + key multiple times. The segment display moves to the right.
   To reduce the threshold value, press the – key multiple times. The segment display moves to the left.
3. To store the current threshold value, press the SET key or wait 30 s.

Setting PNP or NPN output

Standard configuration (factory setting): PNP

1. To change, hold down the + and – keys together for 10 s:
   If the time delay is enabled, the DELAY LED will go out after 2 s and come on again after 10 s.
   This completes the change.
   If the time delay is disabled, the DELAY LED will come on after 2 s and go off again after 10 s.
   This completes the change.
2. Do not release the keys until the DELAY LED has responded as described under step 1.
   The KEYLOCK LED indicates the setting:
   1x flashing: PNP output active
   2x flashing: NPN output active

Setting Remote control (REMOTE SET)

With remote control enabled, the SET key is disabled. The SET function is triggered by a signal applied to Pin 5 (Fig. 3).

SET functions using the Remote cable:
- "Press SET key" function: Connect cable to 10...30 V DC.
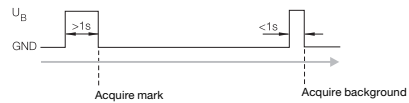- "Do not press SET key" function: Connect cable to 0 V DC or leave unconnected.

Fig. 4: Acquiring mark and background via REMOTE

Accessory lenses

Order code	Lenses	Focal length	Light spot
BAM0120	BKT M-PK-1	18 mm	2 x 7 mm
BAM0121	BKT M-PK-2	9 mm (high resolution)	1,5 x 4 mm
BAM0122	BKT M-PK-3	28 mm	2 x 9 mm
BAM00P2	BKT M-PK-4	9 mm (Standard lens included in delivery)	1,5 x 5 mm
BAM00P3	BKT M-PK-5	40 mm	2,5 x 11 mm

Detection diagrams
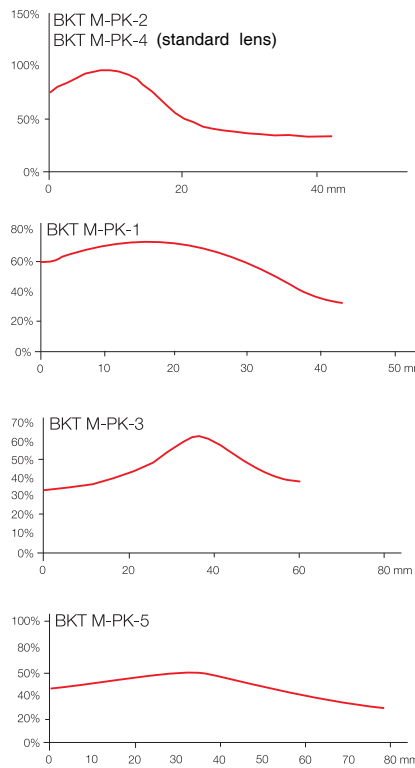
Fig. 5: Relative sensitivity as a function of object distance

Technical Data

Optical

Range with standard lens	9 mm
Depth of field with standard lens with standard lens	±3 mm
Recommended range with standard lens	9 ±3 mm
Light spot dimension	≤ 1.5 x 5 mm
Light type (autom. selected)	blue (465 nm) green (520 nm) red (630 nm)

Electrical

Operating voltage V_S	10...30 V DC
Ripple	≤ 2 V
No-load current I_O	≤ 85 mA
Effective operating current I_e	100 mA
Effective operating voltage V_e	24 V DC
Voltage drop V_d at I_e	≤ 2 V
Output selectable	PNP/NPN, N.O./N.C.
Short circuit protected	yes
Reverse polarity protected	yes
Light-on/dark-on switching	automatic
Data retention	EEPROM

Analog Output

Voltage proportional to the signal received	1...3 V ±10% max. 5.5 V
on white 90% reflective	3 V
Output resistance R_a	2.2 kΩ
Impedance	2.2 kΩ

Mechanical

Connector	M12, 5-pin
Housing material	Al
Active surface material	Glass
Degree of contamination	3
Weight	170 g

Indicators

Output function indicator	yellow LED OUT
Power indicator	green LED READY
Delay indicator ⏱	orange LED
Keylock indicator	orange LED
Switching threshold display	Bargraph

Time Data

Switching frequency f at V_e	20 kHz
Turn-on delay t_{on}	≤ 25 μs
Turn-off delay t_{off}	≤ 25 μs
Output delay selectable	20 ms
Power-on delay t_v	≤ 300 ms

Ambient

Ambient temperature T_a	-10 to +55 °C
Storage temperature	-20 to +70 °C
Enclosure rating per IEC 60529	IP 67
Protection class	II
Ambient light rejection	per EN 60947-5-2