

BALLUFF



BOL 27K-PS/NS-01

Line sensor

INSTRUCTION MANUAL

CONTROLS

OUTPUT LED

The yellow LED ON indicates that the NO output is closed.

DISPLAY (green-coloured display)

The display indicates the value of the measurement detected [operating mode function].

Please refer to the following paragraphs for the correct indications to follow during the acquisition or setting phase.

M1, M2 LEDs

The LED couple visualises the operating mode according to the table given below:

OPERATING MODE	M1 LED	M2 LED
Object beg. – Object end	OFF	OFF
Object centre position	OFF	ON
Width measurement	ON	OFF
Area	ON	ON

ALARM LED

The blinking of the alarm LED indicates that the received signal is insufficient for the correct sensor functioning. In this case the "digital alarm" output is activated.

SET PUSH-BUTTON

Pressing the push-button for at least 2 seconds activates the self-setting procedure (2 thresholds => 2 phases).

A long pressure on the button (at least 6 seconds) allows the user to access into the sensor parameter setting menu.

Please refer to the following paragraphs for the correct indications to follow during the parameter setting phase.

+/- PUSH-BUTTONS

Pressing the + or – push-buttons for at least 2 seconds allows the user to access into the manual adjustment mode of the 2 switching thresholds.

The contemporary pressure on the + and – push-buttons (at least 2 seconds) activates the acquisition procedure of the working area map.

The contemporary pressure on the + and – push-buttons (at least 6 seconds) activates the setting procedure of the reflecting tape characteristics.

Please refer to the following paragraphs for the correct indications to follow during functioning.

INSTALLATION

The sensor can be mounted by means of the three housing's holes using two screws (M4x35 or longer) with washers.

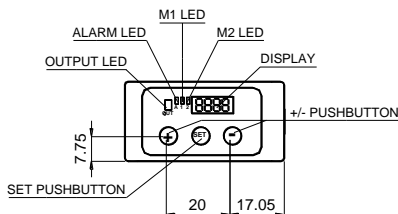
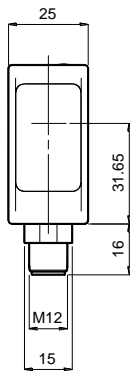
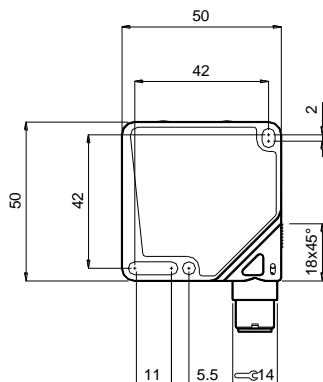
Various orientable fixing brackets to ease the sensor positioning are available (please refer to the accessories listed in the catalogue).

The operating distance is measured from the front surface of the sensor optics.

The M12 connector can be oriented at three different positions using the specific fastening spring and rotating the block of 180°.



DIMENSIONS



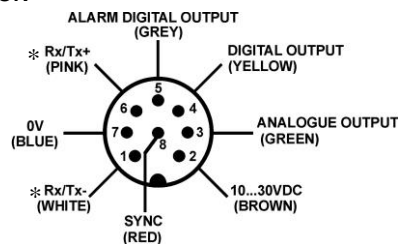
mm

TECHNICAL DATA

Power supply:	10 ... 30 Vdc limit values
Ripple:	2 Vpp max.
Consumption (output current excluded):	70 mA max.
Outputs:	1 PNP or NPN output 30 Vdc max. (short circuit protection) 1 PNP or NPN alarm output 30 Vdc max. (short circuit protection) 4-20mA analogue output
SYNC input:	PNP (+V)
Output current:	100 mA max.
Output saturation voltage:	≤ 2 V
Switching frequency:	> 130 Hz
Indicators:	4 digit display (GREEN), OUTPUT LED (YELLOW) 1 ALARM LED (GREEN) 2 LEDs (M1, M2) operating mode (GREEN)
Setting:	+, -, SET push-buttons
Data retention:	non volatile EEPROM memory
Operating temperature:	-10 ... 55 °C
Storage temperature:	-20 ... 70 °C
Electrical protection:	Class 2
Operating distance (typical values):	200 mm
Measurement range:	150 mm
Minimum object detectable:	0.9 mm
Resolution:	0.15 mm
Linearity:	1% max.
Emission type:	infrared (875nm)
Ambient light rejection:	according to EN 60947-5-2
Vibrations:	0.5 mm amplitude, 10 ... 55 Hz frequency, for each axis (EN60068-2-6)
Shock resistance:	11 ms (30 G) 6 shock for each axis (EN60068-2-27)
Housing material:	ABS
Lens material:	Glass window and lenses
Mechanical protection:	IP67
Connections:	8-pole M12 connector
Weight:	100 g. max.

CONNECTION

M12 CONNECTOR



* Available only for the versions with RS485 serial interface (consult factory).

NOTE: The wire colours are referred to the cables manufactured according to the European standard.

FUNCTIONING

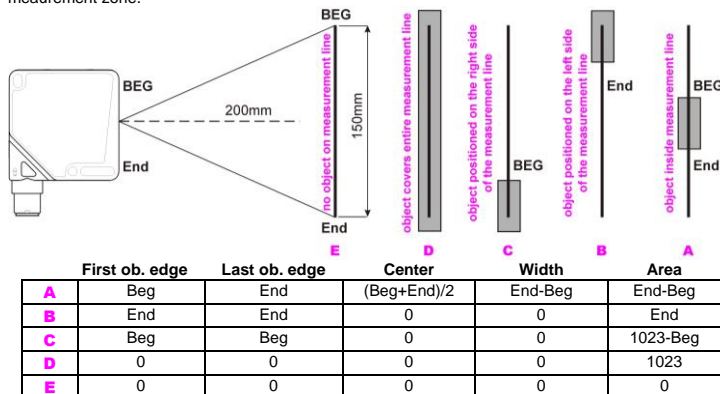
The BOL 27K-PS/NS-01 sensor is a line sensor.

The typical functioning diagram is shown in the drawing given below. The object to detect is placed in front of the sensor and the reflecting tape (inside the package) behind the sensor. The sensor illuminated with IR lights the tape and receives the reflected light on a photodiode array. Each object placed between the reflecting tape and the sensor is naturally detected as a dark spot on a luminous background.

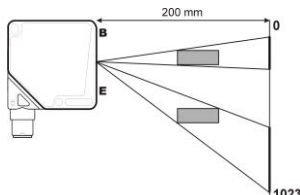
The sensor has 5 operating modes:

- **Object beg.:** the position of the first object edge is detected
- **Object end:** the position of the second object edge is detected
- **Object centre:** the centre of the object is measured
- **Width:** the distance between the first and last object edge is measured
- **Area:** the sum of all the object obscured zones is measured

The following diagram shows the sensor output according to the possible object position inside the measurement zone.



APPLICATION NOTES



The drawing shows how the same object can generate different obscured zones if placed in different positions inside the sensor working zone. The same happens if the object is placed at different distances.

The "Area" operating mode is particularly sensitive to the reflecting tape's characteristics and for this reason the sensor can detect the main specifications of the tape used (please refer to "Advanced functions" paragraph).

SETTING OF THE 2 THRESHOLDS

The sensor setting is effected placing the object to detect directly in front of the sensor following the procedure given below:

- push-button pressed ○ push-button not pressed
- LED on □ LED off

- Object detection at OFF/ON output switching

- Position the object inside the measurement area to define the measurement value (depending on the operating mode used) corresponding to the OFF/ON switching of the digital output.

OUT	A	M1	M2	Display				Keyboard		
				Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	4	5	0		●	○	○

- Press the SET push-button for at least 2s.
- The detected value for the first switching threshold appears (4Hz blinking until the SET push-button is released).
- The value acquired can be changed using the +/- push-buttons.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	4	5	0		●	○	○

- The units change if these push-buttons are pressed repeatedly, the tens if kept pressed.
- Press the SET push-button again for at least 0.5 s. to end the detection phase of the first switching threshold.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	4	5	0		○	●	○

- Object detection at ON/OFF output switching

- Position the object inside the measurement area to define the measurement value (depending on the operating mode used) corresponding to the ON/OFF switching of the digital output.
- The detected value for the second switching threshold appears.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	6	0	0		○	●	○

- The present value appears (4Hz blinking).
- Press the SET push-button again for at least 0.5 s. to detect the second switching threshold.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	6	0	0		○	●	○

- The detected value for the second switching threshold appears.
- The value acquired can be changed using the +/- push-buttons.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	6	0	0		●	○	○

- The units change if these push-buttons are pressed repeatedly, the tens if kept pressed.
- Press the SET push-button again for at least 0.5 s. to end the detection phase.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	6	0	0		○	●	○

SWITCHING THRESHOLD ADJUSTMENT

OUT	A	M1	M2	Display				Keyboard		
				Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	0	4	5	0	○	○	○

- Press one of the +/- push-buttons for at least 2 s.
- The "tH-1" message appears.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	t	H	-	1	○	○	○

- Switching threshold selection

- Use the +/- push-buttons to select the switching threshold.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	t	H	-	1	●	○	○
■	□	■	□	t	H	-	2	●	○	○

- Adjustment phase of the switching threshold

- Press the SET push-button for at least 0.5 s.
- The previously detected value appears.
- The value can be changed using the +/- push-buttons.
- The units change if these push-buttons are pressed repeatedly, the tens if kept pressed.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	0	6	0	0	●	○	○

- Press the SET push-button again for at least 0.5 s. to end the adjustment phase.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	0	4	5	0	○	●	○

SETTING OF THE PARAMETERS

OUT	A	M1	M2	Display				Keyboard		
				Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	4	5	0		○	●	○

Press the SET push-button for at least 6s to enter into the parameter setting mode. The "MEnu" message appears.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	M	E	n	u	○	○	○

- Pressing the + and - push-buttons the user can run up and down the menu, reading the following messages.

- Functioning mode selection

- At each pressure on the SET push-button the user can run through the options of the selected level.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	E	n	d		●	○	○
				b	E	G		○	●	○
				c	E	n	t	○	●	○
				W	l	d	t	○	●	○
				A	r	E	A	○	●	○

- Delay setting

- At each pressure on the SET push-button the user can run through the options of the selected level.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	d	-	0	0	●	○	○
				d	-	0	5	○	●	○
				d	-	1	0	○	●	○
				d	-	2	0	○	●	○
				d	-	3	0	○	●	○
				d	-	4	0	○	●	○

- The setting of the delay value is in common to both outputs.
- When the delay value set is different from zero, the outputs will remain active for a minimum time equal to the number of milliseconds visualised on the display.

- Visualisation of the threshold 1 data

- Pressing the SET push-button the value of the threshold 1 appears.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	t	H	-	1	●	○	○
				THRESHOLD	0	4	5	○	●	○

- Visualisation of the threshold 2 data

- Pressing the SET push-button the value of the threshold 2 appears.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	t	H	-	2	●	○	○
				THRESHOLD	6	0	0	○	●	○

- Visualisation of the operating area status

- Pressing the SET push-button the operating area status. More precisely; if "FULL" the operating area is complete, if "REDU" the acquired area is not complete, but presents some zones that do not have to be detected.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	F	U	L	L	●	○	○
								○	○	○
				r	E	d	U	○	○	○

- Reset of the sensor default configuration

- Pressing the SET push-button (the "RESE" message blinks for 2s, 4Hz) the default configuration is re-set and the user exits from the menu, returning to the normal mode. The default configuration is: "beg object" operating mode, delay 0, Th1 switching threshold = 100, Th2 = 200.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	r	E	S	E	●	○	○
				r	E	S	E	○	●	○

- Memorisation of the parameters set

- Pressing the SET push-button (the "SAVE" message blinks for 2s, 4Hz) all the modified values are memorised and the user exits from the menu, returning to the normal mode.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
□	□	□	□	S	A	V	E	●	○	○
				S	A	V	E	○	●	○

- Press one of the +/- push-buttons the user can return to the setting menu.

- Exit from the parameter setting menu

- After 10s inactivity of the sensor push-buttons, the sensor returns to the normal operating mode visualising the distance.

ADVANCED FUNCTIONS

OUT	A	M1	M2	Display				Keyboard		
				Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	0	4	5	0	●	○	○

- Operating area selection

- Press contemporarily the + and - push-buttons for at least 2s.
- The "W_Ar" message appears.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	W	-	A	r	○	○	○
				W	-	A	r	○	○	○

- The operating area configuration is memorised when the push-buttons are released (the "W_Ar" blinks for 2s, 4Hz) and the sensor returns to the normal mode.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	0	4	5	0	○	○	○

- This operation is necessary when objects, inside the operating area, must not be detected.

Detection of the reflecting tape characteristics

- Press contemporarily the + and – push-buttons for at least 6s.
- The “TAPE” message appears.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	t	A	p	E	○	●	○



- The reflecting tape characteristics are memorised when the push-buttons are released (the “TAPE” message blinks for 2s, 4Hz) and the sensor returns to the normal mode.

OUT	A	M1	M2	Dig1	Dig2	Dig3	Dig4	+	SET	-
■	□	■	□	0	4	5	0	○	○	○

This operation is particularly suggested in the “AREA” operating mode as this mode is very sensitive to the reflecting tape characteristics.

REMOTE FUNCTIONS

KEYLOCK

The keyboard block function is activated at powering on, connecting the SYNC terminal to the positive power supply (+Vdc) for at least 1 s, and the push-buttons are NO LONGER active. After the first second, the SYNC input is ready for the normal functioning and if the SYNC is passive the outputs are deactivated.

To deactivate the keyboard block, the sensor has to be turned off and re-powered maintaining the SYNC wire not connected or ground connected (GND).

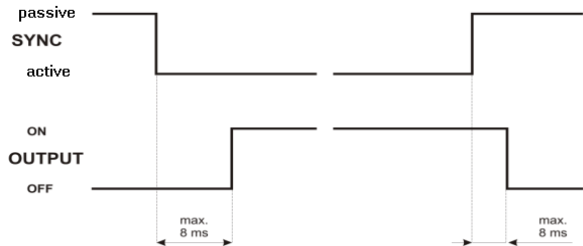
SYNC input

The SYNC signal allows to determine precisely the beginning and end of the identification.

The identification cycle begins after the transition of the SYNC signal from passive to active and the sensor outputs are updated after max. 8 ms.

All the outputs are deactivated after max. 8 ms from the active – passive transition.

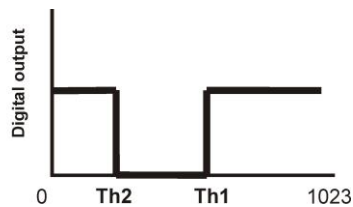
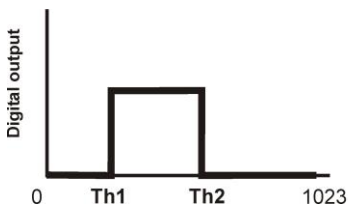
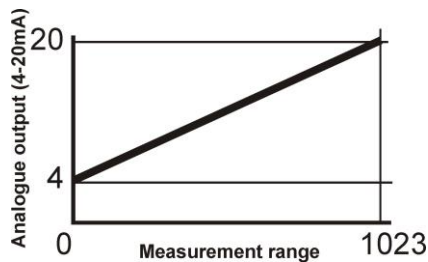
The connection of the SYNC wire to +Vdc corresponds to the passive logic status while SYNC not connected or connected to 0 V corresponds to the active.



If the SYNC input is active, at the receipt of the @ <CR> <LF> command, the sensor responds with: ?? <CR> <LF>. At the receipt of the q <CR> <LF> or e <CR> <LF> commands, the sensor transmits ok <CR> <LF>.

NOTE: the single characters have to be distanced amongst themselves at least 1 ms, during the command transmission.

DETECTION DIAGRAMS



DECLARATION OF CONFORMITY

We BALLUFF declare under our sole responsibility that these products are conform to the 89/336 CEE, 73/23 CEE Directives and successive amendments.

BALLUFF warrants its products to be free from defects.

BALLUFF will repair or replace, free of charge, any product found to be defective during the warranty period of 24 months from the manufacturing date.

This warranty does not cover damage or liability deriving from the improper application of BALLUFF products.

BALLUFF GmbH

Schurwaldstrasse 9
73765 Neuhausen a.d.F.
Germany
Telefon +49 (0) 71 58/1 73-0
Telefax +49 (0) 71 58/50 10
E-Mail: balluff@balluff.com
■ www.balluff.com

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