

Analog Laser Sensor

Catalog Numbers 45BPD-8LTB1-D5, 45BPD-8LTB2-D5

IMPORTANT Save these instructions for future use.

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Summary of Changes

This manual contains an update to the sensing beam Laser Class. The Laser Class changed from Class 2 to Class 1.

Description

The 45BPD sensor analog output sensor is a Class 1 visible red laser sensor that provides sensing with both an analog and discrete output. It is installed using the Teach-in buttons and status indicators on the top of the sensor.

This sensor uses the triangulation principle for precise measurement and the visible red beam spot is useful for alignment in small part detection and measurement applications. The sensor is self-contained in an IP67 enclosure and does not require any external control devices, which add cost and, require additional mounting space.

The 45BPD sensor is easily installed by mounting the sensor so that the target is within the operating range of the sensor and teach setpoints that are required for the application. The sensor can be set with both a discrete PNP output and a 4...20 mA analog output. The discrete output can be set for normally open (N.O.) or normally closed (N.C.)

operation and the analog output is automatically scaled between the taught setpoints with either a positive or negative slope.

The 45BPD sensor is an excellent solution for several noncontact measurement applications including: distance measurement, part profiling, thickness measurement, error proofing, inspection, verifying material position, hole depth, warpage, and position.

Specifications

Attribute	45BPD-8LTB1-D5, 45BPD-8LTB2-D5
Sensing Beam	Visible red Class 1 laser, 650 nm
Sensing Range	45BPD-8LTB1-D5: 30...100 mm (1.18...3.94 in.) 45BPD-8LTB2-D5: 80...300 mm (3.15...11.81 in.)
Range	70 mm and 220 mm (2.75 in. and 8.66 in.)
Spot Size 30/100 mm model 80/300 mm model	1.5 x 3 mm/1.5 x 3.25 mm (0.06 x 0.12 in./ 0.06 x 0.13 in.) 1.5 x 3.5 mm/2.0 x 4.5 mm (0.06 x 0.14 in./ 0.08 x 0.18 in.)
Linearity	<0.25% of range
Resolution	<0.1% of range
Temperature Drift	<0.02%/°C
Supply Voltage	18...30V DC
Current Consumption	≤40 mA @ 24V DC
Circuitry Protection	Short circuit, overload Figure 3 on page 2 , false pulse, transient noise, reverse polarity protection
Output Type	Discrete: PNP (N.O./N.C.); Analog: Current 4...20 mA
Output Rating	100 mA max. for discrete output, 500 Ω max. impedance for analog
Response Time	Speed Mode: 0.4 ms (applicable with synchronously switched laser and target)
Control Input	Laser disable; Teach-in lock; free running
Housing Material	Plastic—ABS
Lens Material	PMMA
Status indicator Indicators	See Figure 3 on page 2
Connection Type	5-pin DC micro, 270° rotatable
Accessories	Cordsets, mounting brackets
Operating Environment	IP67
Vibration	10...55 Hz, 1.5 mm (0.06 in.) amplitude; 3 planes; meets or exceeds IEC 60947-5-2
Shock	30 g (1.06 oz); 11 ms; meets or exceeds 60947-5-2
Operating Temperature	-10...+60 °C (14...140 °F)
Approvals	UL, c-UL-us, and CE marked for all applicable directives ¹

¹ For use with any listed (CYLV) cable assembly.

Read and understand the Installation Instructions before operating the sensor. Only qualified personnel can install the 45BPD sensor.

The 45BPD sensor is not a safety component as described by EU machine directives.

Only mount the analog laser sensor so that it is not directed at people (head height). And so that the beam path is terminated at the end of its functional path.

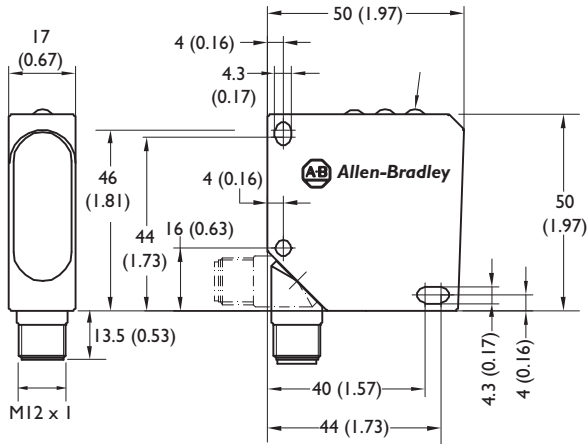
A label has been provided for the user to attach to the sensor during installation.

Features

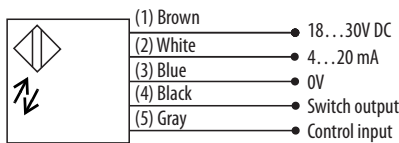
- Noncontact measurement
- Visible red Class 1 laser
- Analog and discrete outputs
- Scalable analog output (4...20 mA)
- Configurable discrete output (N.O./N.C.)
- IP67 enclosure
- 270° rotatable connector
- Setpoint adjustment via push buttons
- Self-contained sensor
- Laser-disable control
- Teach-in lockout
- Averaging and speed mode

Dimensions

Dimensions are shown in mm (in.)



Wiring Diagram



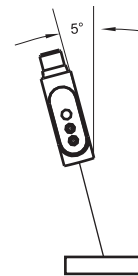
The control input (pin 5) can be used to disable the laser by connecting it to the +DC power supply (18...30V DC). The laser is shut down and both the discrete and analog outputs retain their state. The control input (pin 5) can also be used to help prevent setting changes to the sensor (lockout the Teach-in buttons) by connecting it to 0V DC. The sensor can be operated in the free-run mode by not connecting the control input (pin 5).

Sensor Alignment

Position the 45BPD sensor so that the distance from the object to the sensor is within the sensing range of the sensor.

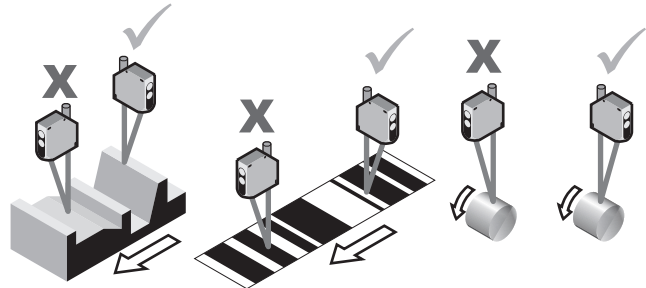
The sensor can be mounted at an angle of approximately 5° for reflective targets as shown in [Figure 1](#).

Figure 1 - Sensor Alignment



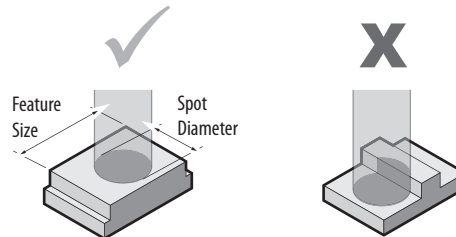
Mount the sensor perpendicular to the direction of travel for targets, which have steps, border lines, and round targets (see [Figure 2](#)).

Figure 2 - Mounting Recommendations



The sensor provides more precision when the spot size is not larger than the feature that is being measured (see [Figure 3](#)).

Figure 3 - Special Considerations



Mounting

Securely mount the sensor on a firm, stable surface, or support for better operation. A mounting, which is subjected to excessive vibration or shift, can cause intermittent operation. The following mounting brackets are available for installation convenience and sensor protection. Once securely mounted, the sensor can be wired per the attached wiring diagrams.

Mounting Bracket Dimensions

Dimensions are shown in mm (in.)

Figure 4 - 45BPD-BKT2

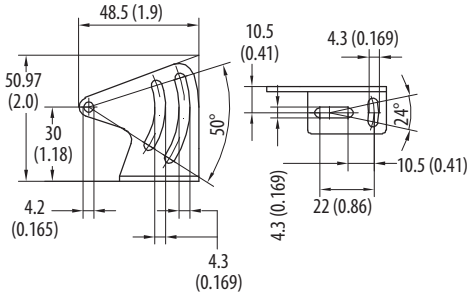
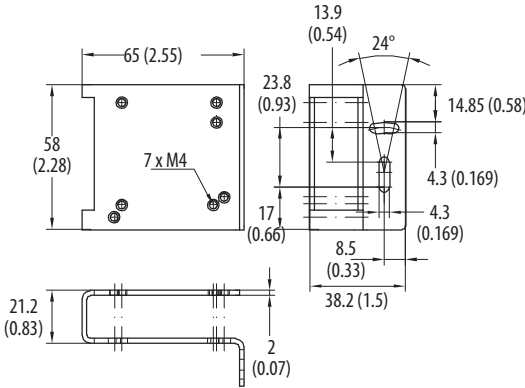


Figure 5 - 45BPD-BKT2



Wiring

The 45BPD sensor is available with a micro quick-disconnect for ease of installation and maintenance. The connector can be rotated up to 270° to accommodate the installation of the sensor and its associated wiring. We recommend the use of the 889 Series of cordsets and patchcords for quick disconnect model sensors. All external wiring conforms to the National Electric Code and all applicable local codes.

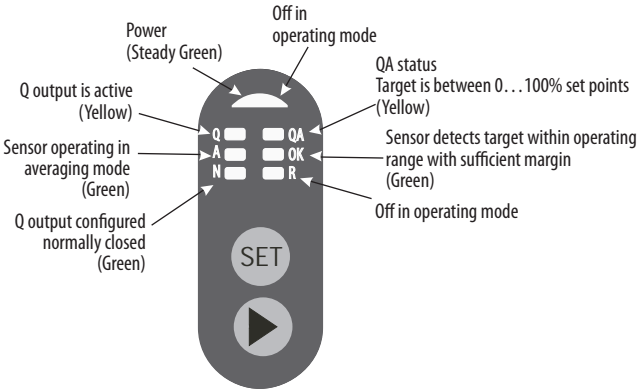
The 45BPD sensor is ready to operate with factory settings after power is applied.

Possible Settings and Operating Modes

- Set a switching point
- Set a switching window
- Scale the analog output between two setpoints (positive or negative slope)
- Set the operating mode to either Speed mode or Averaging mode
- Set the switch type (N.O. or N.C.)
- Reset the sensor to the factory settings
- Laser disable control (requires electrical connection)
- Hold the measured value (requires electrical connection)
- Teach-in button lockout (requires electrical connection)

Status Indicators

Figure 6 - Sensor in Operation

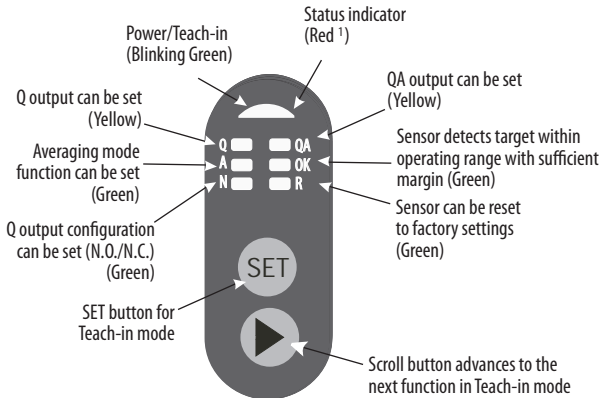


Factory Settings

- Switching Output Q: The switching output is active when the target is in the operating range.
- Switching Output Q is configured for normally open operation.
- Analog Output (4...20 mA) Q_A: 4 mA at the end of operating range; 20 mA at the beginning of operating range
- Operating mode is set to the Speed mode

Status Indicators

Figure 7 - Teach-in Mode



¹ The status indicator can be steady or blinking depending on the Teach-in setting.

Setting the Sensor

The 45BPD sensor is installed using the push buttons (SET and ►) and the status indicator on the top of the sensor.

To begin the Teach-in process, press the SET and ► and buttons simultaneously for three seconds. The Power/Teach-in status indicator begins to blink when the sensor is in the Teach-in mode.

Scroll through the Teach-in functions is done using the ► button and is indicated as shown in [Figure 7](#). There are five possible settings (Q, Q_A, Av, Nc, R). To skip over a function and not change a setting, press the ► button to advance to the next desired function. After the last function is reached, the menu is started again from the first function.

Press the SET button to teach the selected function that is indicated by the Teach-in status indicators.

Step 1—Setting the Discrete Output Q

The discrete output can be set with either a switchpoint or switching window as described.

Switchpoint

Press the ► button until the “Q” status indicator turns on which shows that this function can be set.

Position the target at the desired switchpoint.

Press the SET button and the status indicator begins to blink, which sets the switchpoint.

Press the ► button to advance to the next setting or press the SET and ► and buttons simultaneously for 1 second to exit the Teach-in process.

Switching Window

Press the ► button until the “Q” status indicator turns on which specifies that this function can be set.

Position the target at the first limit for the switching window.

Press the SET button and the status indicator begins to blink, which sets the first limit.

Position the target at the second limit for the switching window.

Press the SET button and the status indicator turns on as long as SET is pressed to confirm, which sets the second limit.

Press the ► button to advance to the next setting or press the SET and ► and buttons simultaneously for 1 second to exit the Teach-in process.

IMPORTANT If the target is in the same position when setting both limits of the switching window, a minimum switching window of 1% of the operating range is set around the teach point.

Step 2—Scaling the Analog Output Q_A

Press the ► button until the “Q_A” status indicator turns ON, which shows that this function, can be set.

Position the target at the desired 0% point (4 mA).

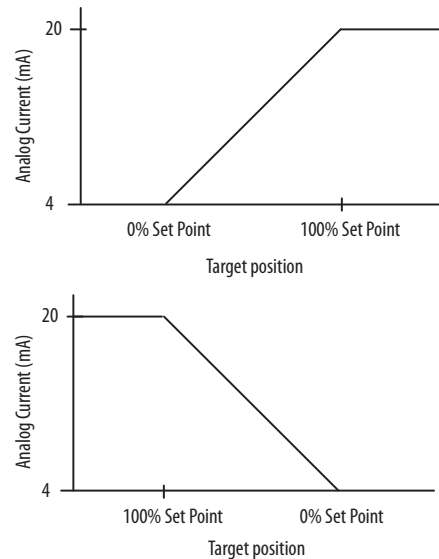
Press the SET button and the status indicator begins to blink, which sets the 0% setpoint.

Position the target at the desired 100% point (20 mA).

Press the SET button and the status indicator turns on as long as SET is pressed to confirm, which sets the 100% setpoint.

Press the ► button to advance to the next setting or press the SET and ► and buttons simultaneously for 1 second to exit the Teach-in process.

Figure 8 - Analog Output



IMPORTANT If the distance between the 0% and 100% setpoints is less than 5% of the overall operating range, then the analog output is automatically scaled to 5% of the operating range. The middle is placed between the 0% and 100% setpoints.

Step 3—Setting the Averaging Mode/ Speed Mode

Press the ► button until the “Av” status indicator turns on which shows that this function can be set.

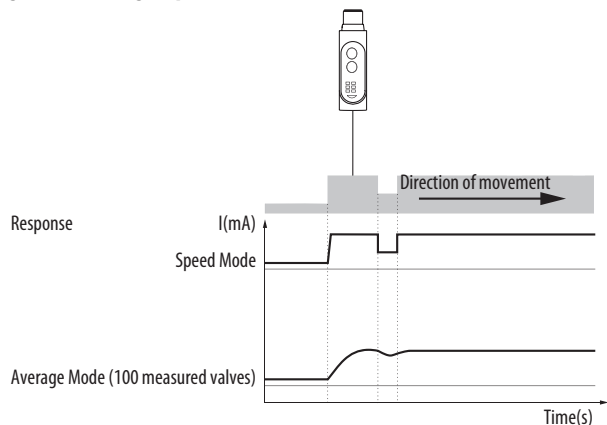
This function can be set to either Averaging mode or Speed mode by pressing the SET button.

The status indicator turns on when the Averaging mode is active, the status indicator turns off when operating in the Speed mode.

Press the ► button to advance to the next setting or press the SET and ► and buttons simultaneously for 1 second to exit the Teach-in process.

IMPORTANT The averaging mode can be used when detecting rough surfaces. The speed mode can be used when the shortest response time and maximum switching frequency is required.

Figure 9 - Average/Speed Mode



Step 4—Discrete Output Configuration (N.O. / N.C.)

Press the ► button until the “Nc” status indicator turns on which shows that this function can be set.

This function can be set to either Normally Open mode or Normally Closed mode by pressing the SET button.

The status indicator turns on when the output is in the normally closed mode, the status indicator turns off when the output is in the normally open mode.

Press the ► button to advance to the next setting or press the SET and ► and buttons simultaneously for 1 second to exit the Teach-in process.

Step 5—Factory Reset

Press the ► button until the “R” status indicator turns ON, which shows that this function, can be set.

The sensor can be reset to the factory settings by pressing the SET button.

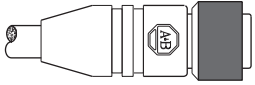
The status indicator turns on as long as the SET button is depressed to confirm that the sensor has been reset.

Press the ► button to advance to the next setting or press the SET and ► and buttons simultaneously for 1 second to exit the Teach-in process.

Exit the Teach-in Menu

After the desired functions are set, press SET and ► simultaneously for approximately 1 second to save the settings and exit the Teach-in mode. The sensor begins normal operation mode, which is based on these Teach-in settings.

Accessories

Description	Cat. No.	
2 m (6.5 ft) Micro QD Cordset	889D-F5AC-2	
Mounting Bracket	45BPD-BKT1	—
Protective Mounting Bracket	45BPD-BKT2	—

Micron Conversions

1 μm	=	0.001 mm
1 μm	=	0.000039 in.
25.4 μm	=	0.001 in. (one thousandth)
20 μm	=	0.00079 in. (0.79 thousandths)

Application Notes

1. The sensor can be powered for approximately 5 minutes for maximum precision.
2. The sensor is ready to operate after a delay (≤ 300 ms).
3. The precision of the sensor is dependent on the combined errors of linearity, resolution, and temperature drift.

Notes:

Notes:

Rockwell Automation Support

Use the following resources to access support information.

Technical Support Center	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	https://rockwellautomation.custhelp.com/
Local Technical Support Phone Numbers	Locate the phone number for your country.	http://www.rockwellautomation.com/global/support/get-support-now.page
Direct Dial Codes	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	http://www.rockwellautomation.com/global/support/direct-dial.page
Literature Library	Installation Instructions, Manuals, Brochures, and Technical Data.	http://www.rockwellautomation.com/global/literature-library/overview.page
Product Compatibility and Download Center (PCDC)	Get help determining how products interact, check features and capabilities, and find associated firmware.	http://www.rockwellautomation.com/global/support/pcdc.page

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