

Installation Instructions

Original Instructions



Allen-Bradley

by ROCKWELL AUTOMATION

45LMS Laser Measurement Sensor

Catalog Numbers 45LMS-D8LGC1-D4, 45LMS-D8LGC2-D4, 45LMS-U8LGC3-D4



ATTENTION:

- This installation instruction must be read and understood before operating the sensor.
- Only qualified personnel must install the 45LMS sensor.
- The 45LMS sensor is not a safety component as described by the EU Machinery Directives.

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

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Updated Description	1
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Description

The 45LMS family of long-distance laser sensors is available in various measuring ranges. The 8 m (26 ft) and 15 m (49 ft) diffuse and 50 m (164 ft) retroreflective models use a Class 1 visible red laser. The discrete and analog outputs can be easily set using the 5-step rotary switch and the push button. Potential applications include object position (analog output) and object detection (background suppression with discrete output).

This sensor uses the Time of Flight (ToF) principle and has a relatively small beam spot even at 15 m (49.2 ft) away. The sensor is completely self-contained and does not require any external control devices that add cost and require additional mounting space.

The 45LMS sensor is easily installed by mounting the sensor with the target within the operating range of the sensor and teaching in the appropriate setpoints that are required for the application. All sensors in this family have one discrete output with one analog output. The discrete output can be wired for either Light Operate (L.O.) or Dark Operate (D.O.) and the analog output is automatically scaled between the selected setpoints with either a positive or negative slope.

The 45LMS sensor is an excellent solution for long range detection and measurement applications including: distance measurement, verifying material position, stack level, thickness measurement, roll diameter, positioning fixtures, error proofing inspection, long standoff distance, level monitoring, crane crash protection, and other difficult applications that exceed the capabilities of standard diffuse or background suppression photoelectric sensors.

Features

- Eye-safe Class 1 laser
- 8 m (26 ft), 15 m (49 ft), or 50 m (164 ft) sensing range (dependent on model)
- One discrete output (1 x NPN/PNP) and one analog output (1 x 4...20 mA)
- Easy configuration of switch points or analog scaling using programming buttons
- IP65 enclosure
- Self-contained sensor

Specifications

Attribute	Value
Certifications	UL Listed, cULus Listed, CE Marked for all applicable directives, and UKCA Marked for all regulations
Operation	
Sensing beam	Class 1 laser, visible red 660 nm
Spot size	<ul style="list-style-type: none">• < 10 mm (0.39 in.) at a distance of 8 m (26 ft) at 20 °C (68 °F)• < 15 mm (0.59 in.) at a distance of 15 m (49 ft) at 20 °C (68 °F)• < 50 mm (2 in.) at a distance of 50 m (164 ft) at 20 °C (68 °F)
Sensing distance	<ul style="list-style-type: none">• 0.2...8 m (0.66...26.25 ft) diffuse• 0.2...15 m (0.66...49.21 ft) diffuse• 0.2...50 m (0.66...164.04 ft) retroreflective
Absolute accuracy	± 25 mm (± 0.98 in.)
Repeatability	< 5 mm (0.20 in.)
Angle deviation, max	± 2°
Reference target	Kodak white (90%)
Temperature influence	≤ 0.25 mm/K typical
Electrical	
Operating voltage	10...30V DC (18...30V DC when operating in IO-Link mode)
Current consumption	≤ 70 mA @ 24V DC
Discrete output type	1 NPN/PNP output, short-circuit protected, reverse polarity protected
Discrete output rating, max	30V DC /100 mA
Analog output type	One analog output 4...20 mA, short-circuit/overload protected
Switching frequency	50 Hz
Response time	10 ms
Mechanical	
Material	<ul style="list-style-type: none">• Housing: Plastic ABS• Optical face: Plastic pane
Control inputs	5-step rotary switch for operating modes selection Push button for setpoint teach
Status indicators	<ul style="list-style-type: none">• Green: Power• Yellow: Output switching states• Green/yellow flashing 2.5 Hz: Teach indication• Green/yellow flashing 8.0 Hz: Teach error
Connection type	4-pin DC Micro (M12)
Supplied accessories	None
Environmental	
Ingress protection	IP65
Vibration	10...55 Hz, 0.5 mm amplitude 3 planes Meets or exceeds IEC 60068-2-6
Shock	30 g, 11 ms 3 planes Meets or exceeds IEC 60068-2-27
Temperature	<ul style="list-style-type: none">• Operating: -30...+50 °C (-22...+122 °F)• Storage: -30...+70 °C (-22...+158 °F)
Interface	
Interface type	IO-Link
Protocol	IO-Link V1.0
Cycle time, min	2.3 ms
Mode	COM 2 (38.4 kBaud)
Process data width	16 bit
SIO mode support	Yes

All models of the 45LMS sensor are Class 1 laser products. A Class 1 laser is safe under all conditions of normal use, which means that the maximum permissible exposure (MPE) is impossible to exceed.

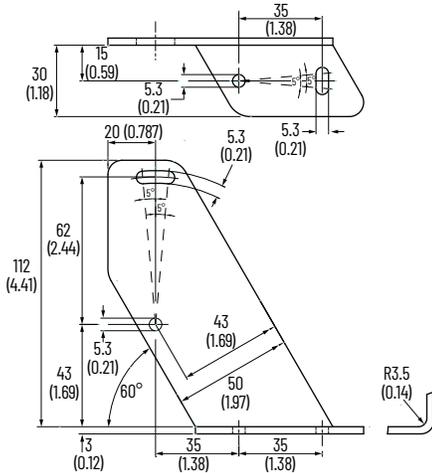


8, 15, and 50 m Models
Laser Class 1

Mount

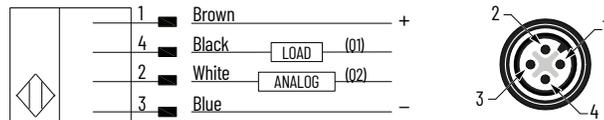
Securely mount the sensor on a firm, stable surface or support for reliable operation. A mounting subject to excessive vibration or shifting can cause intermittent operation. The 45LMS-BKT1 mounting bracket is available for installation convenience. Once securely mounted, the sensor can be wired per the wiring instructions (see [Wiring](#)).

Figure 1 - 45LMS-BKT1 Mounting Bracket [mm (in.)]



Wiring

Figure 2 - NPN or PNP (Push-Pull)

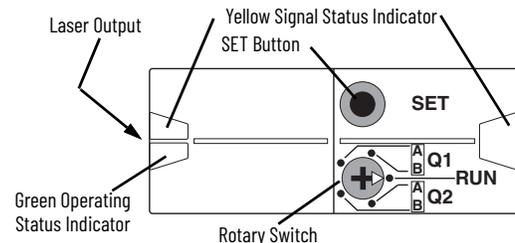


The 45LMS sensor is available with a micro quick-disconnect for ease of installation and maintenance.

We recommend the use of the 889 Series of cordsets and patchcords for quick-disconnect model sensors. All external wiring must conform to the National Electric Code and all applicable local codes.

The 45LMS sensor features a push-pull discrete output, which means the outputs always drive either 24V or 0V and can therefore be wired like either an NPN or a PNP sensor.

Controls and Status Indicators



Set the Sensor

The 45LMS sensor is configured with the rotary switch and the SET button, and it displays feedback via the yellow and green status indicators on the top of the sensor.

Upon completion of any setpoint Teach, both status indicators flash simultaneously, followed by alternating flashing of the status indicators.

- Successful Teach: A slower alternating flashing (2.5 Hz).
- Unsuccessful Teach: A faster alternating flashing (8 Hz). After an unsuccessful Teach, the sensor continues to operate with the previous valid setting.

Setpoints can be independently taught. For example, setpoint Q1-B can be set/re-taught without changing setpoint Q1-A.

When the SET button is pressed for >5 s when Q1-A, Q1-B, or Q2-A is selected with the rotary switch, the taught value for that setpoint is deleted, which leaves the sensor with no value for the setpoint that was selected. When you delete Q2-A, the analog output changes to Zero Point mode (see [Zero Point \(Positive Slope\) on page 4](#) for details). The value for Q2-B cannot be deleted, it can only be overwritten.

When you switch between discrete sensing modes, it is necessary to delete or teach the setpoints for both Q1-A and Q1-B.

IMPORTANT The remainder of these instructions refers to the 24V state as ON and the 0V state as OFF (PNP). If wired as NPN, the logic is inverted.

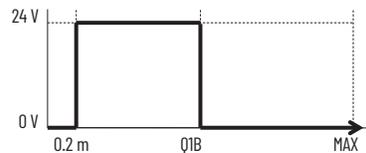
Set the Discrete Output (Q1)

The discrete NPN/PNP output can be set as a switchpoint or switching window.

These instructions were made with the assumption that the sensor is being used for Light Operate and that a PNP output is desired. If the required output is NPN, then refer to the rotary positions listed in the parentheses () throughout the Discrete Output instructions.

IMPORTANT When you use the sensor for an NPN output, the yellow status indicator behaves opposite to the sensor output. For example, when the NPN output is ON, the yellow status indicator is OFF.

Switch-point and Closer



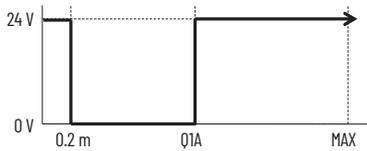
This mode is most commonly used for object detection with background suppression. If you use the sensor for this type of application set the Teach-point at the farthest distance from the sensor that the target passes.

In this mode, the sensor output turns on if it detects an object between 200 mm (7.9 in.) from the sensor face and up to the Teach-point. For example, if the Teach-point is set at 2 m (6.6 ft), the output turns on if the sensor detects an object anywhere between 200 mm (7.9 in.) and 2 m (6.6 ft).

1. Place a target at the desired Teach-point, move the rotary switch to position Q1-B (Q1-A for NPN).
2. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
3. If the Teach is successful, move the rotary switch to RUN.

(a) After the status indicators flash simultaneously, they flash alternately to indicate the Teach results:
Successful: slower alternating flashing (2.5 Hz)
Unsuccessful: faster alternating flashing (8 Hz)

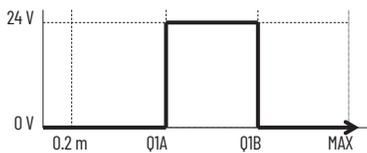
Switch-point and Farther



In this mode, the sensor output turns on if it detects an object at the Teach-point or at any distance farther than the Teach-point up to the maximum range of the sensor. For example, if the Teach-point is at 2 m (6.6 ft), the output turns on if the sensor detects an object anywhere from 2 m (6.6 ft) to the maximum range.

1. Place a target at the desired Teach-point, move the rotary switch to position Q1-A (Q1-B for NPN).
2. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
3. If the Teach is successful, move the rotary switch to RUN.

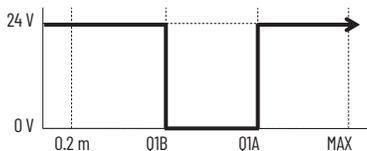
Switching Window



When you set the sensor this way, the output turns on when it detects an object within a window that is created between two Teach-points. For example, if the Teach-point for Q1-A is set at 2 m (6.6 ft), and the Teach-point for Q1-B is set at 3 m (9.8 ft), the sensor turns on the output if it detects an object between 2 m (6.6 ft) and 3 m (9.8 ft).

1. Place a target at the closer (relative to the sensor) desired Teach-point, move the rotary switch to position Q1-A (Q1-B for NPN).
2. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
3. Place a target at the farther (relative to the sensor) desired Teach-point, move the rotary switch to position Q1-B (Q1-A for NPN).
4. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
5. If the Teach is successful, move the rotary switch to RUN.

Switching Window (Inverted)



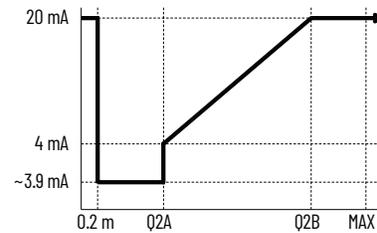
When you set the sensor this way, the output turns on when no object is detected within the defined window that is created between two Teach-points. For example, if the Teach-point for Q1-B is set at 2 m (6.6 ft), and the Teach-point for Q1-A is set at 3 m (9.8 ft), the sensor remains on as long as there is no object detected between 2 m (6.6 ft) and 3 m (9.8 ft).

1. Place a target at the closer (relative to the sensor) desired Teach-point, and move the rotary switch to position Q1-B (Q1-A for NPN).
2. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
3. Place a target at the farther (relative to the sensor) desired Teach-point, move the rotary switch to position Q1-A (Q1-B for NPN).
4. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
5. If the Teach is successful, move the rotary switch to RUN.

Set the Analog Output (Q2)

The 4...20 mA output can be defined as any range within 200 mm (7.9 in.) to the maximum range of the sensor, as either a rising or falling slope. The default analog output setting for Q2 is A = 200 mm (7.9 in.) and B = 5000 mm (16 ft) for all sensor models. Minimum window for setting the analog span is 21 mm (0.8 in.)

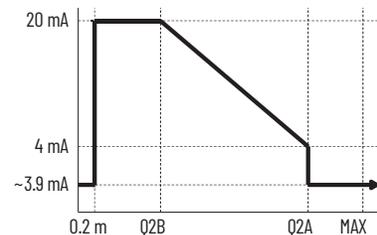
Positive Slope



In the Positive Slope mode (also called Rising Slope), a target positioned at the closer setpoint results in an analog output of 4 mA while a target at the farther setpoint results in an output of 20 mA, with the analog output scaled linearly in between. In this mode, the sensor outputs 20 mA when the target is outside of the operating range, which is 0...200 mm (0...7.9 in.) and anything greater than the maximum sensing range.

1. Place a target at the minimum Teach-point.
2. Move the rotary switch to position Q2-A.
3. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
4. Place a target at the maximum Teach-point.
5. Move the rotary switch to position Q2-B.
6. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
7. If the Teach is successful, move the rotary switch to RUN.

Negative Slope

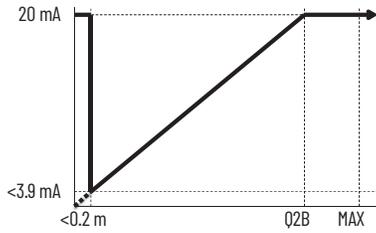


In the Negative Slope mode (also called Falling Slope), a target positioned at the farther setpoint results in an analog output of 4 mA while a target at the closer setpoint results in an output of 20 mA, with the analog output scaled linearly in between. In this mode, the sensor outputs 3.9 mA when the target is outside of the operating range, which is 0...200 mm (0...8 in.) and anything greater than the maximum sensing range.

1. Place a target at the maximum Teach-point, and move the rotary switch to position Q2-A.
2. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
3. Place a target at the minimum Teach-point, move the rotary switch to position Q2-B.
4. Press and hold the SET button until the green and yellow status indicators flash simultaneously ^(a).
5. If the Teach is successful, move the rotary switch to RUN.

(a) After the status indicators flash simultaneously, they flash alternately to indicate the Teach results:
 Successful: slower alternating flashing (2.5 Hz)
 Unsuccessful: faster alternating flashing (8 Hz).

Zero Point (Positive Slope)



In the Zero Point (Positive Slope) mode, a target that is positioned at the farther setpoint (Q2-B) results in an analog output of 20 mA. The analog signal is scaled linearly between 0.0 mm and (Q2-B), which helps simplify the scaling within the PLC or control device. For example, the following equation can be used:

$$D = (D_{\text{Max}} / I_{\text{Max}}) * I_i$$

where

D = Current distance of target

D_{Max} = Setpoint distance

I_{Max} = Analog range (which is always 20 for the 45LMS sensor)

I_i = Current analog output from sensor

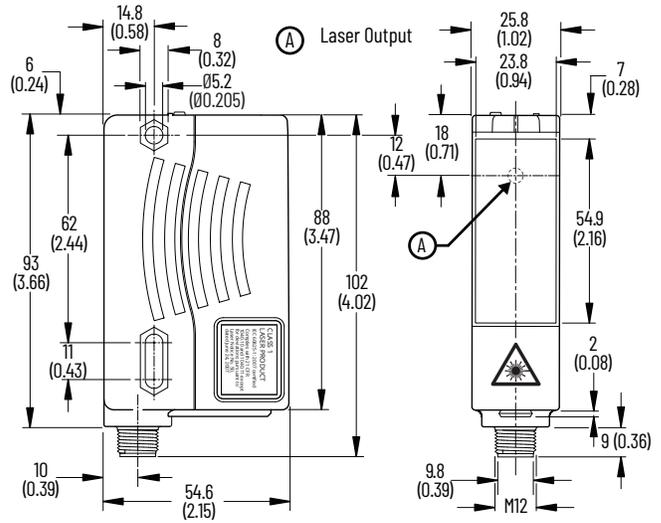
However, even though the analog signal is scaled linearly from 0.0 mm to (Q2-B) it still provides an analog output of 20 mA when the target is outside of the operating range, which is 0...200 mm (0...8 in.) and anything greater than the maximum sensing range. The 45LMS sensor cannot detect objects between 0...200 mm (0...8 in.).

1. Place a target at the maximum Teach-point.
2. Move the rotary switch to position Q2-B.
3. Press and hold the SET button until the green and yellow status indicators flash simultaneously^(a).
4. Move the rotary switch to position Q2-A, and delete the setpoint [factory default is 200 mm (8 in.)] by pressing and holding the SET button for >5 s. Both status indicators turning off indicate a successful completion.
5. If the Teach is successful, move the rotary switch to RUN.

(a) After the status indicators flash simultaneously, they flash alternately to indicate the Teach results:
 Successful: slower alternating flashing (2.5 Hz)
 Unsuccessful: faster alternating flashing (8 Hz).

Approximate Dimensions

Figure 3 - 45LMS Sensor [mm (in.)]



Waste Electrical and Electronic Equipment (WEEE)



At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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