

## Datasheet

IEC Class 1 Laser for Use with Banner Modulated Receivers



- A low-power device emitting a visible red beam, 650 nm wavelength
- Beam is bore-sighted to within 2 milliradians and 0.25 mm of the housing centerline
- Collimated, apertured beam is 2 mm diameter with divergence of less than 1 milliradian
- Compatible with a variety of Banner modulated photoelectric receivers
- Useful for medium-range sensing, or for sensing very small objects or profiles; excellent mechanical repeatability in position-sensing applications
- Smooth-barrel aluminum housing is suitable for a precision mount
- Available with unterminated, 2 m (6.5 ft) cable or 150 mm (6 in) quick-disconnect cable
- Modulated beam (33 kHz, 25% duty cycle)
- 57 mm (2.25 in) long overall
- 10 V dc to 30 V dc operation



**WARNING: Not To Be Used for Personnel Protection**

Never use this device as a sensing device for personnel **protection**. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.



**CAUTION:** Never stare directly into the sensor lens. Laser light can damage your eyes. Avoid placing any mirror-like object in the beam. Never use a mirror as a retroreflective target.



**CAUTION:** Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure. Do not attempt to disassemble this sensor for repair. A defective unit must be returned to the manufacturer.

## Models

Model	Range	Connector <sup>1</sup>	Supply Voltage	Effective Beam at Receiver at 25° C	
				Opposed Distance	Beam Width
M126E1LD	Range varies, depending on which receiver is used (see <a href="#">Excess Gain</a> on page 4)	2 m (6.5 ft) unterminated	10 V dc to 30 V dc	1.5 m (5 ft)	3.5 mm (0.14 in)
M126E1LDQ				3 m (10 ft)	5 mm (0.2 in)
		6 m (20 ft)		8 mm (0.3 in)	
		15 m (50 ft)		17 mm (0.7 in)	
		30 m (100 ft)		32 mm (1.3 in)	

## Installation

### Mounting

Mounting suggestions:

- To take advantage of the bore-sight beam placement offered by the M12 laser emitter, use a two-part clamp mount or a mounting block with a precision-drilled hole. Allow minimum clearance for the 12.7 mm (0.50 in) diameter housing, maximum diameter 12.83 mm (0.505 in).
- Clamp on both sides of the label. Do not clamp only on the labeled area. Use only plastic-tipped screws or set screws – not metal – to avoid compression of the housing.

Mounting bracket assembly model SMB46X3 is recommended for use with the M12. The assembly includes:

<sup>1</sup> To order the 9 m (30 ft) PVC cable model, replace the suffix "Q" with "W/30" in the model number. For example, M126E1LDQ W/30. Models with a quick disconnect require a mating cordset.



- A black-anodized aluminum block with holes drilled for mounting in any of 3 directions with plastic set screws
- An adjustable stainless steel bracket with 3 spring-loaded screws (2 of the screws are used for precise alignment)

The mounting block, model SMB127, can be ordered separately.

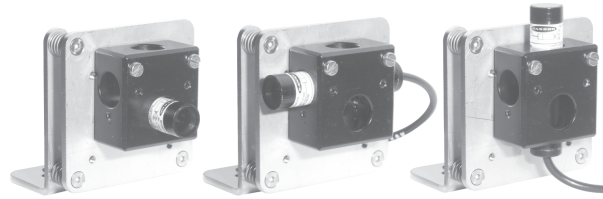
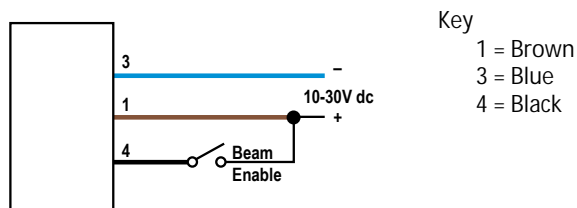


Figure 1. Three Possible M12 Orientations

1. Insert the laser emitter into the SMB127 mounting block, through any of the three holes.
2. Make sure that the label area of the emitter is not aligned with a set screw.
3. Tighten the set screws, using the supplied 3/64-in Allen wrench, so that the emitter is held snugly in place.
4. Mount the block to the adjustable baseplate (or to your own bracket).
5. Mount the bracket base using your own M5 or #10 screws or bolts.
6. Check for alignment (see Alignment).
7. Tighten or loosen one or two of the precision alignment screws, using the supplied 2 mm Allen wrench, until the laser is accurately aligned.

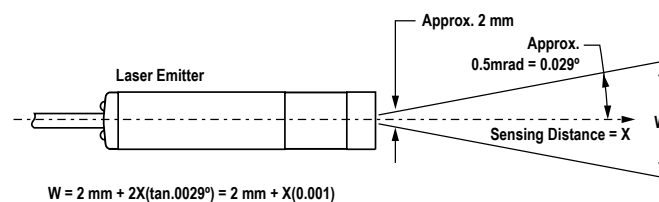
## Wiring

Quick disconnect (QD) wiring diagrams are functionally identical.



## Alignment

M12 laser emitters have a beam divergence of only 0.03° (0.5 milliradians) at 25 °C (77 °F) ambient temperature (see [Figure 2](#) on page 2). This translates, for example, to a beam diameter of only 8 mm (0.3 in) at a distance of 6.1 m ( 20 ft). Consequently, there is very little forgiveness for angular misalignment.

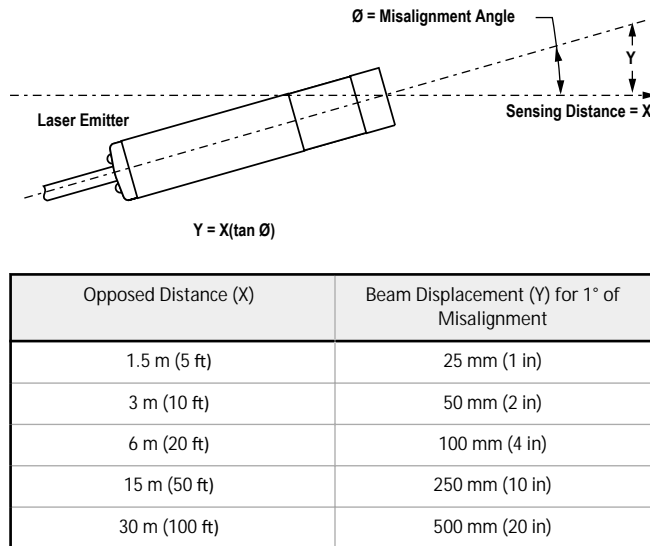


Opposed Distance (X)	Beam Width (W)
1.5 m (5 ft)	3.5 mm (0.14 in)
3 m (10 ft)	5 mm (0.2 in)
6 m (20 ft)	8 mm (0.3 in)
15 m (50 ft)	17 mm (0.7 in)
30 m (100 ft)	32 mm (1.3 in)

Figure 2. M12 laser emitter beam divergence at 25 °C (beam size vs. distance)

The beam size listed in *Figure 2* on page 2 is also the effective beam size at the receiver. The effective beam is equal to the minimum opaque object profile required to block the light beam. The beam size at the emitter is 2 mm (.08 in) diameter.

The effect of angular misalignment is dramatic. Laser emitters require their beam center to directly strike the receiver lens. *Figure 3* on page 3 shows how far the laser beam will miss the center of the receiver lens for each degree of angular misalignment (in any plane). Note that even at only a 5 ft range, one degree of misalignment causes the laser beam to miss the lens of most receivers.



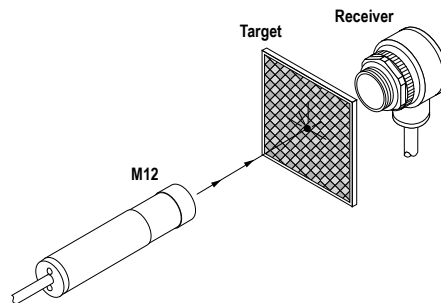
*Figure 3. Beam displacement per degree of misalignment*

**Alignment Tip:** The visible red beam of the laser emitter is easily seen in subdued lighting.

**Alignment:**

1. At opposed distances of up to 3 m (10 ft), attach a sheet of white paper directly in front of the receiver lens.
2. Mark the location of the lens center on the paper. Use this mark as an aiming target.
3. Sight along the beam from directly behind the laser emitter.
4. Adjust the emitter mounting until the red image (the dot of red light) is centered exactly on the mark.
5. Remove the paper and check the response of the receiver.

For longer distances (up to 7.6 m or 25 ft), replace the white paper with a 102 mm × 102 mm (4 in × 4 in) square of high-grade retroreflective tape (Banner model BRT-THG-4X4-5 or equivalent). For greater distances, use a larger sheet of retroreflective material. Never use a mirror as an alignment target.



*Figure 4. At long distances, use retroreflective tape to locate the beam at the receiver location.*

## Specifications

### Supply Voltage and Current

10 V dc to 30 V dc (10% max. ripple) at less than 30 mA

### Supply Protection Circuitry

Protected against reverse polarity, transient voltages, and electrostatic discharge

### Delay at Power-Up

Less than 30 milliseconds

### Sensing Beam

Visible red Class 1 laser, 650 nm (temperature coefficient 0.2 nm/°C)

Pulse Width: 7  $\mu$ s

Rep Rate: 30  $\mu$ s

Peak Output Power: 0.36 milliwatts

### Beam Diameter at Aperture

Approximately 2 mm (0.08 in) diameter

### Beam Placement

Within 0.25 mm (0.01 in) and  $\pm 2$  milliradians of mechanical centerline axis of housing

### Beam Divergence

$\pm 0.5$  milliradians typical at 25° C;  $\pm 1.0$  milliradians at operating temperature extremes

### Laser Classification

Class 1 laser product; complies with 21 CFR 1040.10, EN 60825-1:2001 except for deviations pursuant to laser notice No. 50, dated 7-26-01

### Laser Control

Beam enable: Apply + 10 V dc to 30 V dc to black wire

Beam inhibit: Apply 0 V or by opening circuit

Enable delay: Less than 30 milliseconds

Inhibit delay: Less than 1 milliseconds

### Indicators

Indicators are visible through the rear cover

Green indicates power applied

Amber indicates laser enabled

### Connections

2 m (6.5 ft) unterminated 3-wire PVC-jacketed high-flex cable, 9 m (30 ft) unterminated 3-wire PVC-jacketed high-flex cable, or 150 mm (6 in) PVC cable with a 3-pin M8/Pico-style male quick disconnect (QD)

### Construction

12.7 mm (0.50 in) diameter smooth aluminum barrel; black hard-coat anodized finish

MIL-A-8625 Type III, Class II

### Operating Temperature

0 °C to +40 °C (+32 °F to +104 °F)

90% at +40 °C maximum relative humidity (non-condensing)

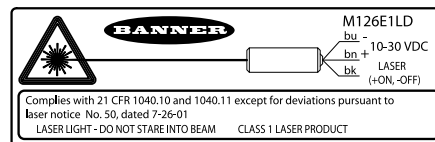
### Environmental Rating

NEMA 6; IEC IP67

### Certifications

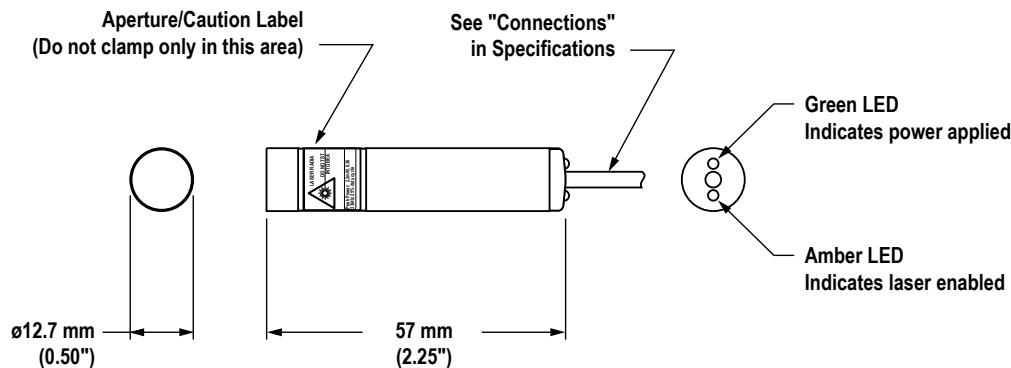


### Product Label



## Dimensions

All measurements are listed in millimeters [inches], unless noted otherwise.



## Excess Gain

The Excess Gain of the M12 emitter is dependent on the particular receiver used. The following is a comparison of the excess gain for various recommended receivers at 15 m (50 ft).

Receiver	Excess Gain at 15 m (50 ft)	Receiver	Excess Gain at 15 m (50 ft)
<b>MULTI-BEAM</b>		<b>MINI-BEAM</b>	
SBRX1	1,900	SM31R	250
SBR1	1,900	SM31RL	1,700
SBRXD1	1,900	SM31RMHS	180
SBRD1	1,900	SM31RLMHS	1,100
<b>MAXI-BEAM</b>		<b>ECONO-BEAM</b>	
RSBR	1,400	SE61R	60
RSBRSR	150	SE61RMHS	50
<b>VALUE-BEAM</b>		<b>Others</b>	
SMW95R	3,400	SM51RB	120
SMI91RQD	1,800	Q23SN6R	40
<b>EZ-BEAM</b>		Q10AN6R	25
T18SN6R	750	Q45BB6R	900
T30SN6R	750		
S12SN6R	750		

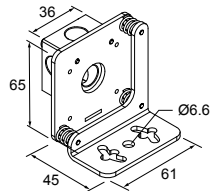
For information on compatibility of the M12 emitter with other Banner photoelectric receivers contact Banner Engineering.

## Accessories

### Mounting Brackets

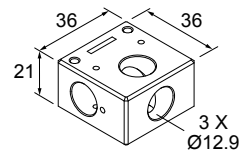
#### SMB46X3

- Assembly with mounting block and adjustable bracket
- Includes:
  - 2 mm Shortarm hex key
  - 3/64-in Shortarm hex key
  - 4 Set screws



#### SMB127

- Mounting block only
- Includes:
  - 3/64-in Shortarm hex key
  - 4 Set screws



### Quick-Disconnect Cables

3-Pin Threaded M8/Pico-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
PKG3M-2	2 m (6.56 ft)	Straight		<p>1 = Brown 3 = Blue 4 = Black</p>
PKG3M-5	5 m (16.40 ft)			
PKG3M-7	7 m (22.97 ft)			
PKG3M-9	9 m (29.53 ft)			
PKG3M-10	10 m (32.81 ft)			

## Retroreflective Tape

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-THG-4X4-5	0.7	+60 °C (+140 °F)	100 × 100 mm (package of 5)

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-THG-8.5X11-2	0.7	+60 °C (+140 °F)	216 × 280 mm (package of 2)

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-THG-18X36	0.7	+60 °C (+140 °F)	457 × 914 mm (single sheet)

## Banner Engineering Corp. Limited Warranty

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