M12 Class 2 Laser **Emitter**

Datasheet

IEC Class 2 Laser for Use with Banner Modulated Receivers



- Uses a self-contained Class 2 modulated laser emitters with visible red beam
- Beam is bore-sighted to within 2 milliradians and 0.25 mm of the housing centerline
- Useful for long-range sensing, or for sensing very small objects or profiles; excellent mechanical repeatability in position-sensing applications
- Features 12.7 mm diameter smooth aluminum barrel
- 10 V dc to 30 V dc supply voltage
- Compatible with a variety of photoelectric receivers
- Features collimated, apertured beam 2 mm in diameter, divergence of less than 1 milliradian
- Delivers excellent mechanical repeatability in position-sensing applications
- Available with unterminated, 2 m (6.5 ft) cable or 150 mm (6 in) quick-disconnect cable
- Modulated beam (33 kHz, 25% duty cycle)

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[1]	Supply Voltage	**Effective** Beam at Receiver at 25° C	
				Opposed Distance	Beam Width
M126E2LD	Range varies, depending on which receiver is used (see *Excess Gain* on page 4)	2 m (6.5 ft) unterminated	10 V dc to 30 V dc	1.5 m (5 ft)	5 mm (0.20 in)
				3 m (10 ft)	6.5 mm (0.26 ft)
				6 m (20 ft)	9.5 mm (0.37 ft)
M126E2LDQ		15 mm (6 in) PVC cable with 3-wire Pico-style quick disconnect		15 m (50 ft)	19 mm (0.75 ft)
				30 m (100 ft)	34 mm (1.34 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).

[1] To order the 9 m (30 ft) PVC cable model, replace the suffix "Q" with "W/30" in the model number. For example, M126E2LD W/30. Models with a quick disconnect require a mating cordset.

- 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:

- 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.

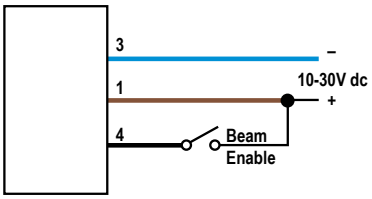


Figure 1. Three Possible M12 Orientations

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

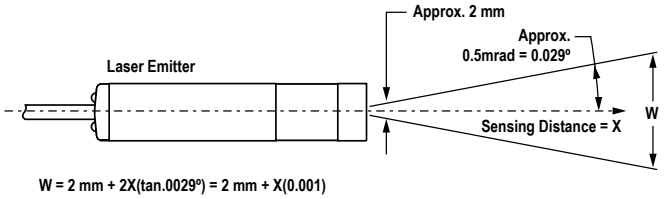
Quick disconnect (QD) wiring diagrams are functionally identical.



Key
1 = Brown
3 = Blue
4 = Black

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 3). This translates, for example, to a beam diameter of only 9.5 mm (0.37 in) at a distance of 6.1 m (20 ft). Consequently, there is very little forgiveness for angular misalignment.

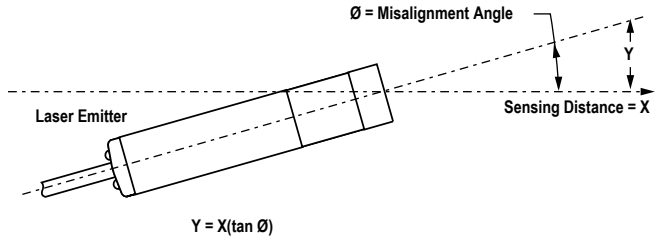


Opposed Distance (X)	Beam Width (W)
1.5 m (5 ft)	5.0 mm (0.20 in)
3 m (10 ft)	6.5 mm (0.26 in)
6 m (20 ft)	9.5 mm (0.37 in)
15 m (50 ft)	19 mm (0.75 in)
30 m (100 ft)	34 mm (1.34 in)

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

The beam size listed in *Figure 2* on page 3 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 3.5 mm (0.14 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.



Opposed Distance (X)	Beam Displacement (Y) for 1° of Misalignment
1.5 m (5 ft)	25 mm (1 in)
3 m (10 ft)	50 mm (2 in)
6 m (20 ft)	100 mm (4 in)
15 m (50 ft)	250 mm (10 in)
30 m (100 ft)	500 mm (20 in)

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.

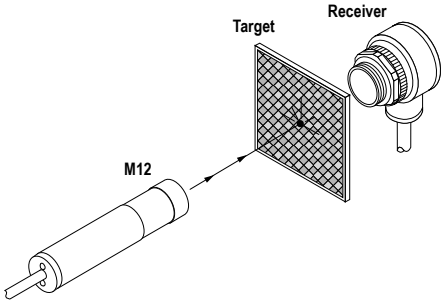


Figure 4. At long distances, use retroreflective tape to locate the beam at the receiver location.

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 2 laser, 650 nm (temperature coefficient 0.2 nm/°C)
Pulse Width: 7 µs
Rep Rate: 30 µs
Peak Output Power: 2.8 milliwatts

Beam Diameter at Aperture
Approximately 3.5 mm (0.14 in) diameter

Beam Placement
Within 0.25 mm (0.01 in) and ±2 milliradians of mechanical centerline axis of housing

Beam Divergence
± 0.5 milliradians typical at 25° C; ±1.0 milliradians at operating temperature extremes

Laser **Classification**
Class 2 laser product; complies to 21 CFR 1040.10, EN 60825-1:2001 except for deviations pursuant to laser notice 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)

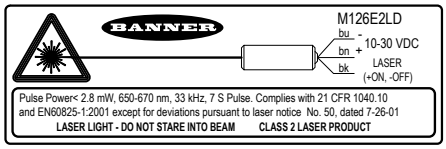
Construction
12.7 mm (0.50 in) dimeter smooth aluminum barrel; black hard-coat anodized finish
MIL-A-8625 Type 2, Class 2

Operating Temperature
0 °C to +40 °C (+32 °F to +104 °F)
90% at +50 °C maximum relative humidity (non-condensing)

Environmental **Rating**
NEMA 6; IEC IP67

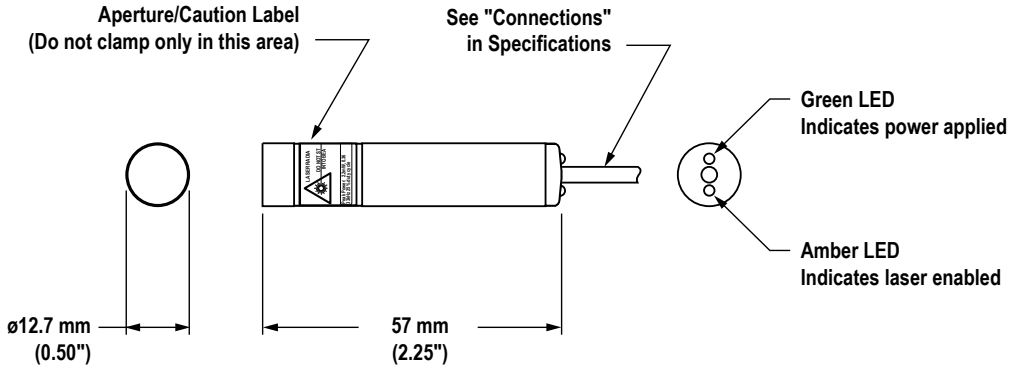
Certifications

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**)
MULTI-BEAM	
SBRX1	19,000
SBR1	19,000
SBRXD1	19,000
SBRD1	19,000
MAXI-BEAM	
RSBR	14,000
RSBRSR	1,500
VALUE-BEAM	
SMW95R	34,000
SMI91RQD	18,000
EZ-BEAM	
T18SN6R	7,500
T30SN6R	7,500
S12SN6R	7,500

Receiver	Excess Gain at 15 m (50 **ft**)
MINI-BEAM	
SM31R	2,500
SM31RL	17,000
SM31RMHS	1,800
SM31RLMHS	11,000
ECONO-BEAM	
SE61R	600
SE61RMHS	500
Others	
SM51RB	1,200
Q23SN6R	400
Q10AN6R	250
Q45BB6R	9,000

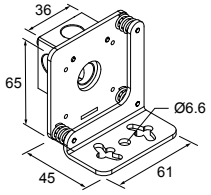
For information on compatibility of the M12 emitter with other Banner photoelectric receivers contact Banner Engineering.

Accessories

Mounting Brackets

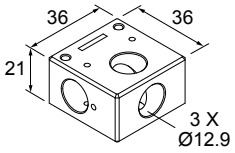
SMB46X3

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

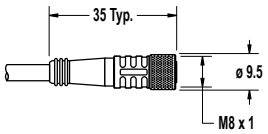
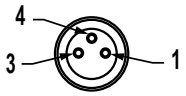


SMB127

- 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		
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)			

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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)

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