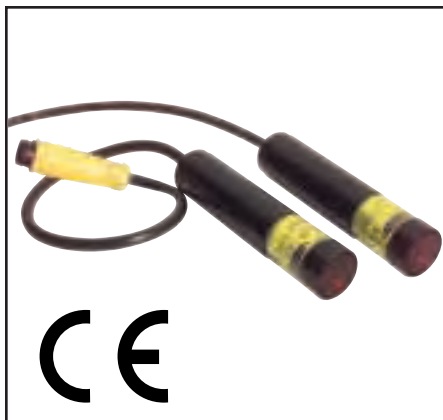




# M12 Class 1 Laser Emitter

IEC Class 1 Laser for use with Banner modulated receivers



## Features and Benefits

- 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 2mm diameter with divergence of less than 1 milliradian.
- Compatible with a variety of Banner modulated photoelectric receivers (see Excess Gain chart, page 3).
- 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') cable or 150 mm (6") pigtail, quick-disconnect cable
- Modulated beam (33kHz, 25% duty cycle)
- 57 mm (2.25") long overall
- 10 to 30V dc operation



### CAUTION . . .

**Never stare directly into the emitter lens.** Laser light can damage your eyes.

Avoid placing any mirror-like object in the beam. Never use a mirror as a target. (See Figure 5.)

## Models

Models	Range	Cable*	Supply Voltage	Excess Gain	Effective Beam at Receiver	
					Opposed Distance	Beam Width
M126E1LD	Range varies, depending on which receiver is used (see Excess Gain chart, page 3).	2m (6.5') Unterminated	10-30V dc	See chart on page 3.	<u>at 25°C</u>	
M126E1LDQ		150 mm (6") Pigtail with 3-wire Pico-style QD connector			1.5 m (5')	3.5 mm (0.14")
					3 m (10')	5.5 mm (0.2")
					6 m (20')	8.5 mm (0.3")
					15 m (50')	18 mm (0.7")
					30 m (100')	32 mm (1.3")

\*9 m (30') cables are available by adding suffix "W/30" to the model number to the cabled version (e.g., M126E1LD W/30).

A model with a QD connector requires an accessory mating cable. See page 6.




### WARNING . . . Not To Be Used for Personnel Protection

**Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.**

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

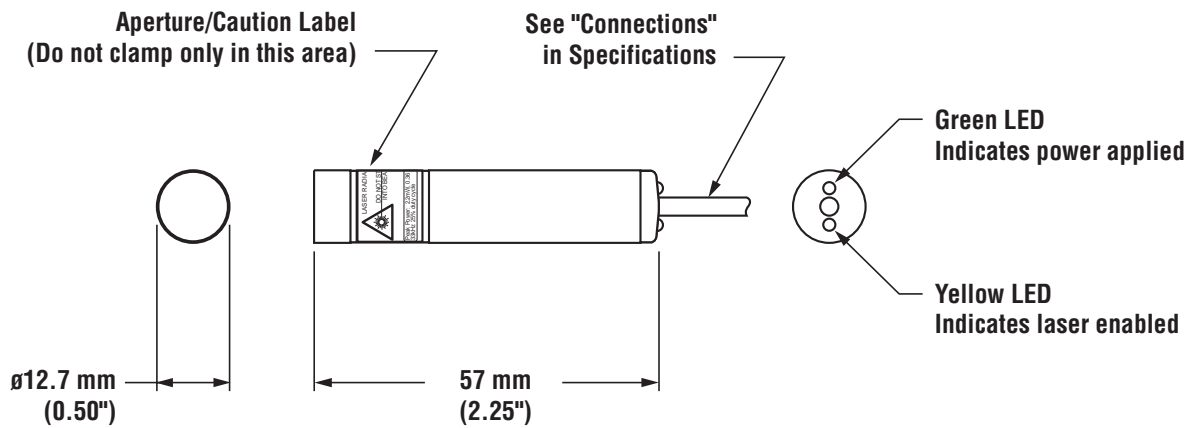
# M12 Class 1 Laser Emitter

## M12 Class 1 Laser Emitter Specifications

<b>Supply Voltage and Current</b>	10 to 30V dc (10% maximum ripple) at less than 30 mA
<b>Supply Protection Circuitry</b>	Protected against electrostatic discharge (ESD) and transient voltages; Protected against reverse polarity
<b>Delay at Power-up</b>	Less than 30 milliseconds
<b>Sensing Beam</b>	650 nm visible red laser (temperature coefficient 0.2 nm/°C); <b>Pulse Width:</b> 7µs <b>Rep Rate:</b> 30µs <b>Peak Output Power:</b> 0.36 milliwatts
<b>Beam Diameter at Aperture</b>	Approximately 2 mm (0.08") diameter
<b>Beam Divergence</b>	±0.5 milliradians typical at 25°C; ±1.0 milliradian at operating temperature extremes
<b>Beam Placement</b>	Within 0.25 mm (0.01") and ±2 milliradians of mechanical centerline axis of housing
<b>Laser Control</b>	Apply +10 to 30V dc to black wire to enable beam; Inhibit beam by applying 0V dc or by opening circuit; Enable delay less than 30 milliseconds; Inhibit delay less than 1 millisecond
<b>Indicators</b>	Indicators are visible through rear cover. <b>Green</b> indicates power applied <b>Yellow</b> indicates laser enabled
<b>Construction</b>	12.7 mm (0.50") diameter smooth aluminum barrel; Black hard-coat anodized finish, MIL-A-8625 Type III, Class II
<b>Environmental Rating</b>	NEMA 6; IEC IP67
<b>Connections</b>	PVC-jacketed 3-conductor 2 m (6.5') or 9 m (30') high-flex cable (unterminated); or 150 mm (6") pigtail with 3-wire Pico-style connector
<b>Operating Temperature</b>	Temperature: 0° to 40° C (32° to 104° F); Maximum relative humidity: 90% at 40° C (non-condensing)
<b>Laser Classification</b>	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
<b>Certifications</b>	

# M12 Class 1 Laser Emitter

## M12 Dimensions



## Excess Gain

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

Receiver	Excess Gain at 15 m (50')	Receiver	Excess Gain at 15 m (50')
<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>VALU-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 the factory Applications Group at the address or numbers listed on the back cover.

# M12 Class 1 Laser Emitter

## 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") diameter housing, max. dia. 12.83 mm (0.505").
- 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 (see Figure 1 and ordering information on page 7). It consists of:

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

The mounting block may be ordered separately, (model SMB127; see pages 6 and 7).

To mount the M12, insert the laser emitter into the black mounting block, through any of the three holes. Check to be sure that the label area of the emitter is not aligned with a set screw, then tighten the set screws (using the supplied 3/64" Allen wrench) so the emitter is held snugly in place. Then mount the block to the adjustable baseplate (or to your own bracket). Mount the bracket base using your own M5 or #10 screws or bolts, and then check for alignment (see page 5). Tighten or loosen one or two of the precision alignment screws (using the supplied 2 mm Allen wrench) until the laser is accurately aligned.



Figure 1. Model SMB127 mounting block

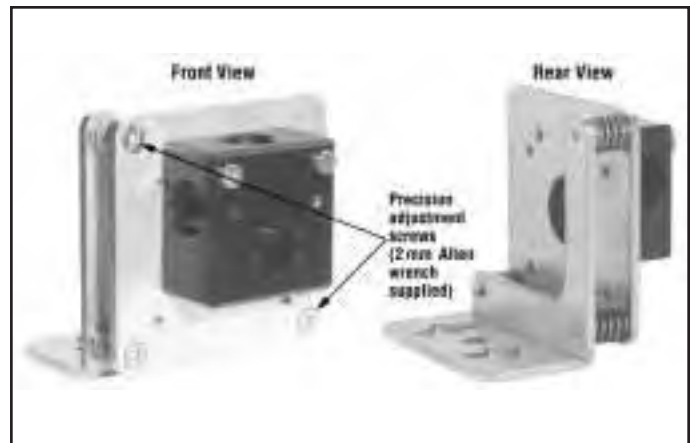
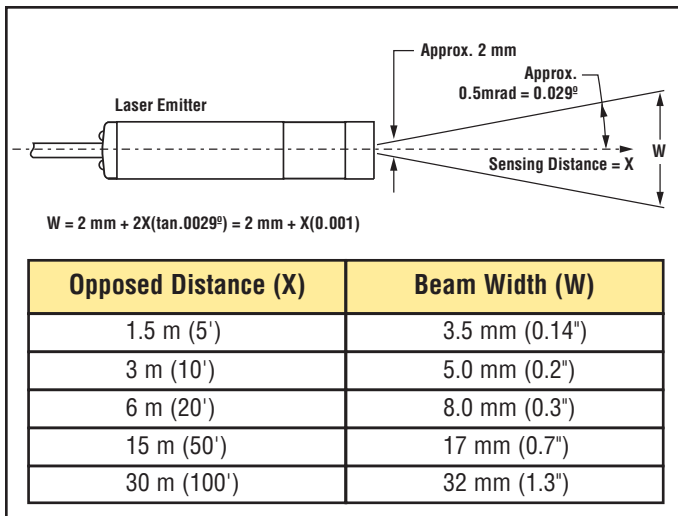


Figure 1a. Mounting bracket model SMB46X3, front and rear views

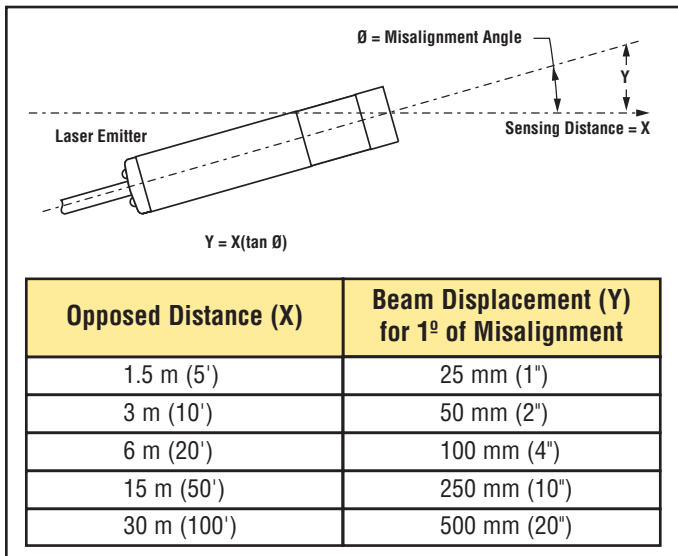


Figure 2. Three possible M12 orientations

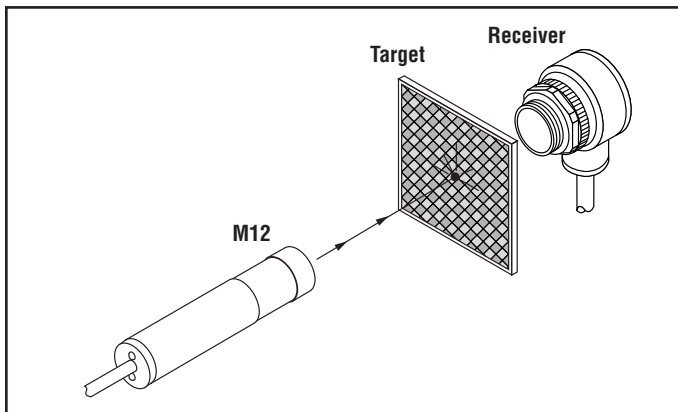
# M12 Class 1 Laser Emitter



**Figure 3. M12 laser emitter beam divergence at 25°C (beam size vs. distance)**



**Figure 4. Beam displacement per degree of misalignment**



**Figure 5. At long distances, use retroreflective tape to locate the beam at the receiver location. Never use a mirror as an alignment target.**

## Alignment

Conventional modulated infrared LED photoelectric emitters are designed with beam divergence angles of several degrees. As a result, most emitters are easily aligned to their receivers by simple line-of-sight methods.

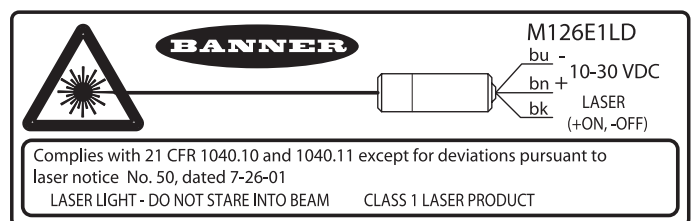
In sharp contrast to conventional photoelectric emitters, M12 laser emitters have a beam divergence of only 0.03° (0.5 milliradians) at 25° C (77°F) ambient temperature (see Figure 3). This translates, for example, to a beam diameter of only 0.3" at a distance of 20'. Consequently, there is very little forgiveness for angular misalignment.

The beam size listed in Figure 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 2 mm (.08") diameter.

The effect of angular misalignment is dramatic (see Figure 4). The wide beam angles offered by conventional photoelectric emitters allow several degrees of misalignment between the optical axes of the emitter and receiver. This is not true for laser emitters which require their beam center to directly strike the receiver lens. Figure 4 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' range, one degree of misalignment will cause the laser beam to miss the lens of most receivers.

**Alignment Tip:** The visible red beam of the laser emitter is easily seen in subdued lighting. At opposed distances of up to 10', attach a sheet of white paper directly in front of the receiver lens. Mark the location of the lens center on the paper. This mark is used as an aiming target. Sight along the beam from directly behind the laser emitter. Adjust the emitter mounting until the red image (the dot of red light) is centered exactly on the mark. Remove the paper and check the response of the receiver.

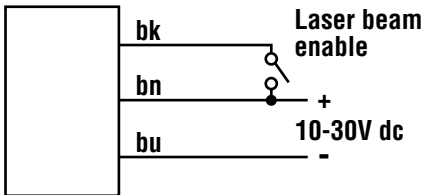
For longer distances (up to 25'), replace the white paper with a 4" x 4" square of high-grade retroreflective tape (Banner model BRT-THG-4X4-5 or equivalent; see Figure 5). For greater distances, use a larger sheet of retroreflective material (see page 7).



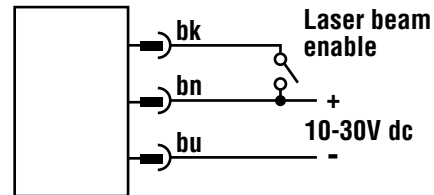
# M12 Class 1 Laser Emitter

## Hookups

**M126E1LD Laser Diode Emitter**  
**Unterminated Cable**

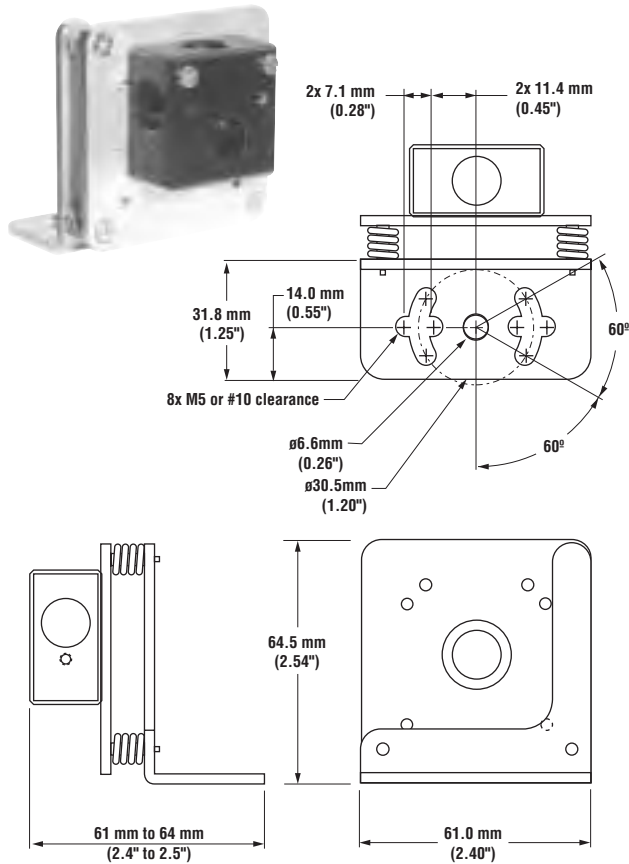


**M126E1LDQ Laser Diode Emitter**  
**3-pin Pico-style Connector**

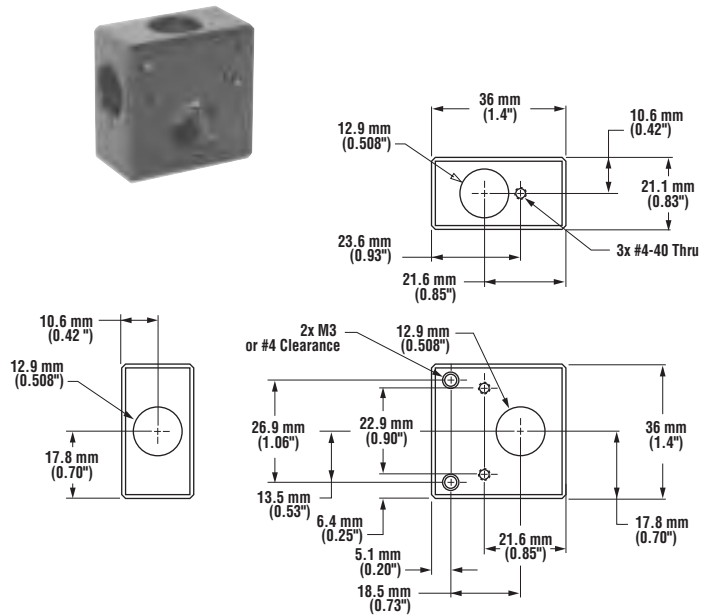


## Mounting Bracket Dimensions

**SMB46X3 Bracket Assembly**





**SMB127 Mounting Block**




# M12 Class 1 Laser Emitter

## Accessories

### Mounting Brackets

Model	Description	
SMB46X3	Assembly with mounting block and adjustable bracket Comes with: 2mm Shortarm hex key 3/64" Shortarm hex key 4 Set screws	
SMB127	Mounting block only Comes with: 3/64" Shortarm hex key 4 Set screws	

### Retroreflective Tape

Model	Reflectivity Factor	Maximum Temperature	Size	Unit	
BRT-THG-4X4-5	0.7	60°C (140°F)	100 x 100 mm (4" x 4")	Package of 5	
BRT-THG-8.5X11-2	0.7	60°C (140°F)	216 x 280 mm (8.5" x 11")	Package of 2	
BRT-THG-18X36	0.7	60°C (140°F)	457 x 914 mm (18" x 36")	Single Sheet	

### Pico-Style Quick-Disconnect Cables

**Cable:** PUR jacket, polyurethane connector body, POM snap-lock coupling

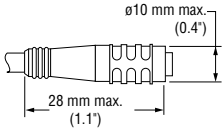
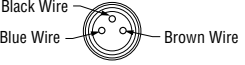
**Conductors:** 26 or 24 AWG high-flex stranded, gold-plated contacts

**Temperature:** -40° to +90°C (-40° to +194°F)

**Voltage Rating:** 30V ac/36V dc

**Environmental Rating:** None



Model	Style	Length	Dimensions	Pin-out
PKG3-2	3-Pin Straight	2 m (6.5')		



# M12 Class 2 Laser Emitter

IEC Class 2 Laser for use with Banner modulated receivers



## Features and Benefits

- Class 2 laser is a low-power device emitting 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 3.5 mm diameter with divergence of less than 1 milliradian.
- Compatible with a variety of Banner modulated photoelectric receivers (see Excess Gain chart, page 3).
- Useful for long-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') cable or 150 mm (6") pigtail, quick-disconnect cable
- Modulated beam (33kHz, 25% duty cycle)
- 57 mm (2.25") long overall
- 10 to 30V dc operation



### CAUTION . . .

**Never stare directly into the emitter lens.** Laser light can damage your eyes.

Avoid placing any mirror-like object in the beam. Never use a mirror as a target. (See Figure 5.)

## Models

Models	Range	Cable*	Supply Voltage	Excess Gain	Effective Beam at Receiver at 25°C	
					Opposed Distance	Beam Width
M126E2LD	Range varies, depending on which receiver is used (see Excess Gain chart, page 3).	2 m (6.5') Unterminated	10 to 30V dc	See chart on page 3.	1.5 m (5')	5 mm (0.20")
M126E2LDQ		15 mm (6") Pigtail with 3-wire Pico-style QD connector			3 m (10')	6.5 mm (0.26")
					6 m (20')	9.5 mm (0.37")
					15 m (50')	19 mm (0.75")
					30 m (100')	34 mm (1.34")

- \*NOTES:
- 9 m (30') cables are available by adding suffix "W/30" to the model number to the cabled version (e.g., **M126E2LD W/30**).
  - A model with a QD connector requires an accessory mating cable. See page 6.




### WARNING . . . Not To Be Used for Personnel Protection

**Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.**

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

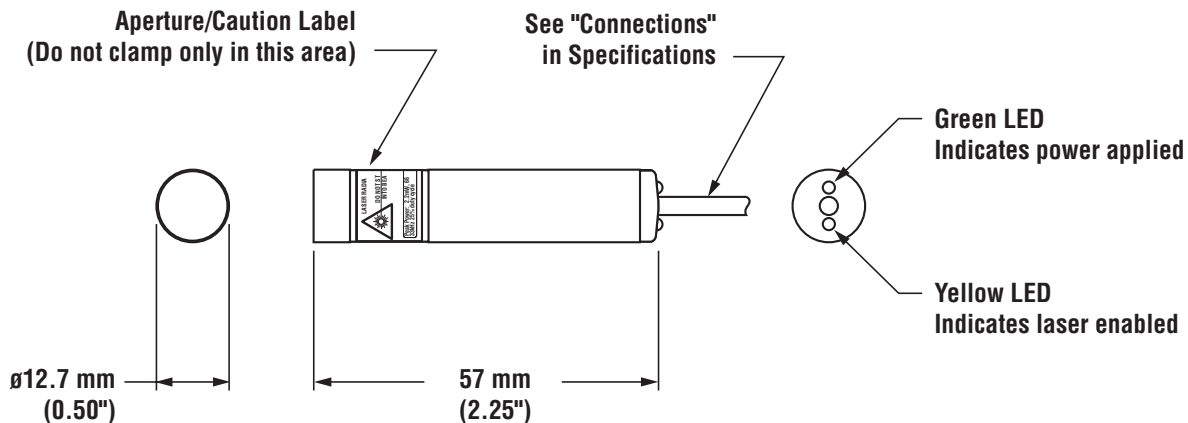
# M12 Class 2 Laser Emitter

## M12 Class 2 Laser Emitter Specifications

<b>Supply Voltage and Current</b>	10 to 30V dc (10% maximum ripple) at less than 30 mA
<b>Supply Protection Circuitry</b>	Protected against electrostatic discharge (ESD) and transient voltages; Protected against reverse polarity
<b>Delay at Power-up</b>	Less than 30 milliseconds
<b>Sensing Beam</b>	650 nm visible red Class 2 laser (temperature coefficient 0.2 nm/°C); <b>Pulse Width:</b> 7µs <b>Rep Rate:</b> 30µs <b>Peak Output Power:</b> 2.8 milliwatts
<b>Beam Diameter at Aperture</b>	Approximately 3.5 mm (0.14") diameter
<b>Beam Divergence</b>	±0.5 milliradians typical at 25°C; ±1.0 milliradian at operating temperature extremes
<b>Beam Placement</b>	Within 0.25 mm (0.01") and ±2 milliradians of mechanical centerline axis of housing
<b>Laser Control</b>	Apply +10 to 30V dc to black wire to enable beam; Inhibit beam by applying 0V dc or by opening circuit Enable delay less than 30 milliseconds; Inhibit delay less than 1 millisecond
<b>Indicators</b>	Indicators are visible through rear cover. <b>Green</b> indicates power applied <b>Yellow</b> indicates laser enabled
<b>Construction</b>	12.7 mm (0.50") diameter smooth aluminum barrel; Black hard-coat anodized finish, MIL-A-8625 Type III, Class II
<b>Environmental Rating</b>	NEMA 6; IEC IP67
<b>Connections</b>	PVC-jacketed 3-conductor 2 m (6.5') or 9 m (30') high-flex cable (unterminated); or 150 mm (6") pigtail with 3-wire Pico-style connector
<b>Operating Temperature</b>	Temperature: 0° to 40° C (32° to 104° F); Maximum relative humidity: 90% at 50° C (non-condensing)
<b>Laser Classification</b>	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
<b>Certifications</b>	

# M12 Class 2 Laser Emitter

## M12 Dimensions



## Excess Gain

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

Receiver	Excess Gain at 15 m (50')	Receiver	Excess Gain at 15 m (50')
<b>MULTI-BEAM</b>		<b>MINI-BEAM</b>	
SBRX1	19,000	SM31R	2,500
SBR1	19,000	SM31RL	17,000
SBRXD1	19,000	SM31RMHS	1,800
SBRD1	19,000	SM31RLMHS	11,000
<b>MAXI-BEAM</b>		<b>ECONO-BEAM</b>	
RSBR	14,000	SE61R	600
RSBRSR	1,500	SE61RMHS	500
<b>VALU-BEAM</b>		<b>Others</b>	
SMW95R	34,000	SM51RB	1,200
SMI91RQD	18,000	Q23SN6R	400
<b>EZ-BEAM</b>		Q10AN6R	250
T18SN6R	7,500	Q45BB6R	9,000
T30SN6R	7,500		
S12SN6R	7,500		

For information on compatibility of the M12 emitter with other Banner photoelectric receivers contact the factory Applications Group at the address or numbers listed on the back cover.

# M12 Class 2 Laser Emitter

## 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") diameter housing, max. dia. 12.83 mm (0.505").
- 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 SMB46X3, is available, and is recommended for use with the M12 (see Figure 1 and ordering information on page 7). It consists of:

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

The mounting block may be ordered separately, (model SMB127; see pages 6 and 7).

To mount the M12, insert the laser emitter into the black mounting block, through any of the three holes. Check to be sure that the label area of the emitter is not aligned with a set screw, then tighten the set screws (using the supplied 3/64" Allen wrench) so the emitter is held snugly in place. Then mount the block to the adjustable baseplate (or to your own bracket). Mount the bracket base using your own M5 or #10 screws or bolts, and then check for alignment (see page 5). Tighten or loosen one or two of the precision alignment screws (using the supplied 2 mm Allen wrench) until the laser is accurately aligned.



Figure 1. Model SMB127 mounting block

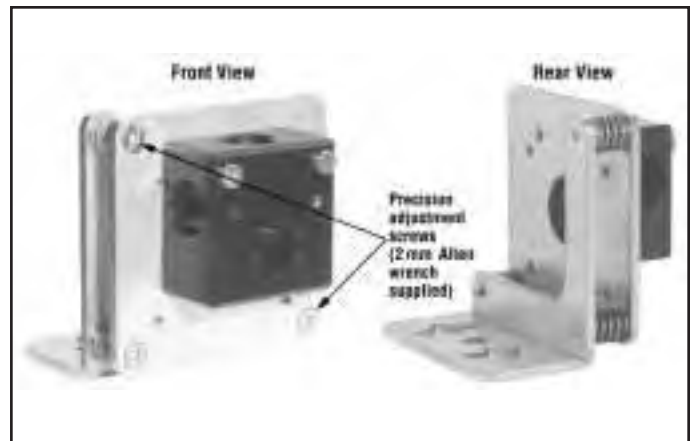


Figure 1a. Mounting bracket model SMB46X3, front and rear views



Figure 2. Three possible M12 orientations

# M12 Class 2 Laser Emitter

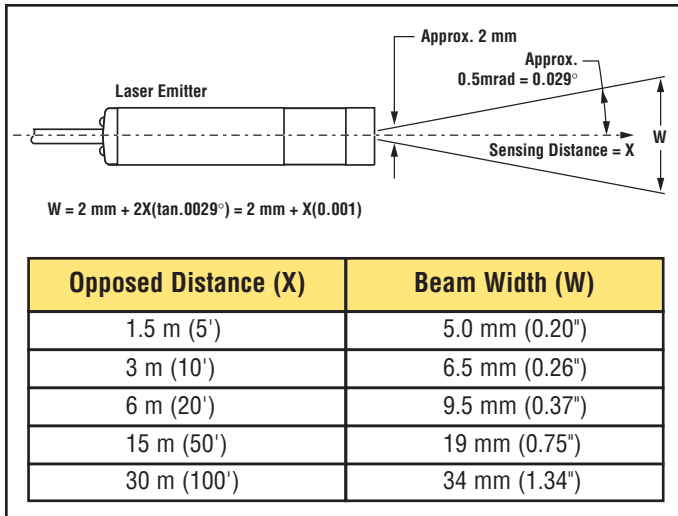


Figure 3. M12 laser emitter beam divergence at 25°C (beam size vs. distance)

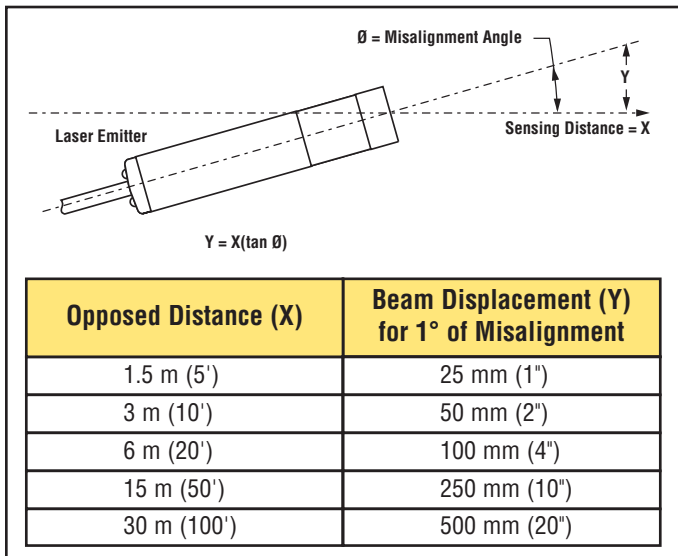


Figure 4. Beam displacement per degree of misalignment

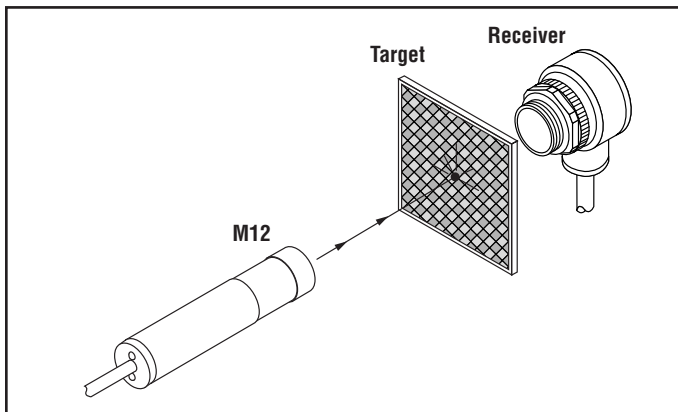


Figure 5. At long distances, use retroreflective tape to locate the beam at the receiver location. Never use a mirror as an alignment target.

## Alignment

Conventional modulated infrared LED photoelectric emitters are designed with beam divergence angles of several degrees. As a result, most emitters are easily aligned to their receivers by simple line-of-sight methods.

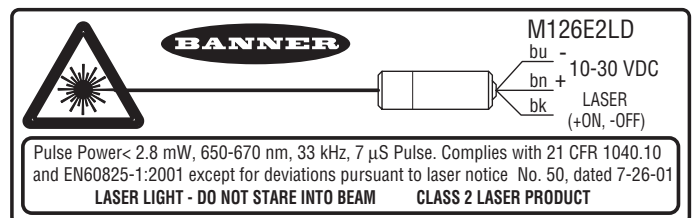
In sharp contrast to conventional photoelectric emitters, M12 laser emitters have a beam divergence of only 0.03° (0.5 milliradians) at 25° C (77°F) ambient temperature (see Figure 3). This translates, for example, to a beam diameter of only 0.37" at a distance of 20'. Consequently, there is very little forgiveness for angular misalignment.

The beam size listed in Figure 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") diameter.

The effect of angular misalignment is dramatic (see Figure 4). The wide beam angles offered by conventional photoelectric emitters allow several degrees of misalignment between the optical axes of the emitter and receiver. This is not true for laser emitters which require their beam center to directly strike the receiver lens. Figure 4 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' range, one degree of misalignment will cause the laser beam to miss the lens of most receivers.

**Alignment Tip:** The visible red beam of the laser emitter is easily seen in subdued lighting. At opposed distances of up to 10', attach a sheet of white paper directly in front of the receiver lens. Mark the location of the lens center on the paper. This mark is used as an aiming target. Sight along the beam from directly behind the laser emitter. Adjust the emitter mounting until the red image (the dot of red light) is centered exactly on the mark. Remove the paper and check the response of the receiver.

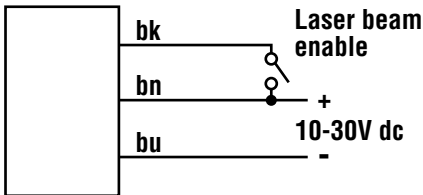
For longer distances (up to 25'), replace the white paper with a 4" x 4" square of high-grade retroreflective tape (Banner model BRT-THG-4X4-5 or equivalent; see Figure 5). For greater distances, use a larger sheet of retroreflective material (see page 7).



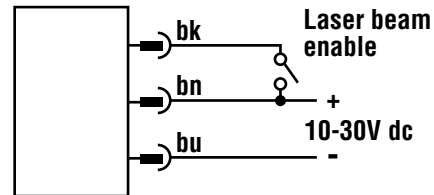
# M12 Class 2 Laser Emitter

## Hookups

**M126E2LD Laser Diode Emitter**  
**Unterminated Cable**



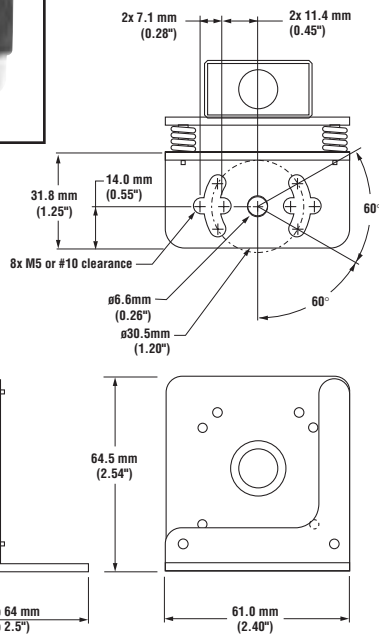
**M126E2LDQ Laser Diode Emitter**  
**3-pin Pico-style Connector**



## Mounting Brackets

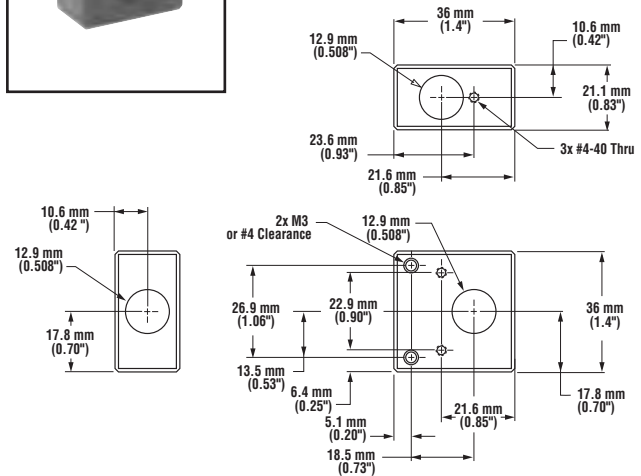
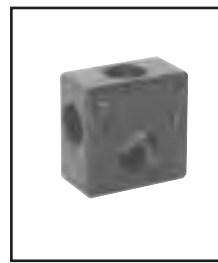
**SMB46X3**  
**Bracket**  
**Assembly**

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





**SMB127**  
**Mounting**  
**Block**

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



# M12 Class 2 Laser Emitter

Retroreflective Tape					
Model	Reflectivity Factor	Maximum Temperature	Size	Unit	
<b>BRT-THG-4X4-5</b>	0.7	60°C (140°F)	100 x 100 mm (4" x 4")	Package of 5	
<b>BRT-THG-8.5X11-2</b>	0.7	60°C (140°F)	216 x 280 mm (8.5" x 11")	Package of 2	
<b>BRT-THG-18X36</b>	0.7	60°C (140°F)	457 x 914 mm (18" x 36")	Single Sheet	

Pico-Style Quick-Disconnect Cables					
<p><b>Cable:</b> PUR jacket, polyurethane connector body, POM snap-lock coupling  <b>Conductors:</b> 26 or 24 AWG high-flex stranded, gold-plated contacts  <b>Temperature:</b> -40° to +90°C (-40° to +194°F)  <b>Voltage Rating:</b> 30V ac/36V dc  <b>Environmental Rating:</b> None</p>					
Model	Style	Length	Dimensions	Pin-out	
<b>PKG3-2</b>	3-Pin Straight	2 m (6.5')	