EZ-BEAM® M18 Series Sensors

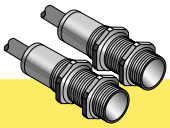
Stainless Steel 18 mm Barrel-style DC Photoelectric Sensors

EZ-BEAM M18 Series Features

- 18 mm threaded-barrel sensor
- 10 to 30V dc; choose SPDT (complementary) NPN or PNP outputs (150 mA max. ea.)
- Easy to use; no adjustments are necessary
- Advanced self-diagnostics with separate alarm output†; dual LED system indicates sensor performance
- Choice of integral cable or Euro-style quick disconnect connector
- Epoxy-encapsulated circuitry; IEC IP67 (NEMA 6P) construction for harsh sensing environments
- Brackets available for a wide array of mounting options

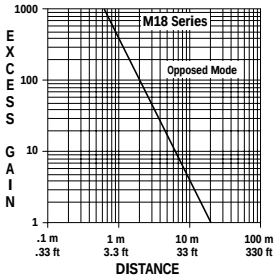
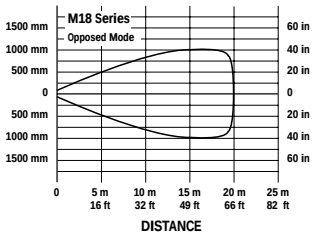
† U.S. patent 5087838 (see Specifications, page 5)

EZ-BEAM M18 Series Sensing Mode Options



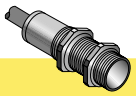
Infrared, 950 nm

M18 Series Opposed-Mode Emitter (E) and Receiver (R)

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Width
M186E **M186EQ**	20 m (66')	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	—		Effective Beam: 13 mm 
M18SN6R **M18SN6RQ**		2 m (6.5') 4-Pin Euro-style QD		NPN		
M18SP6R **M18SP6RQ**		2 m (6.5') 4-Pin Euro-style QD		PNP		

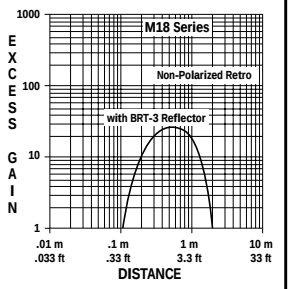
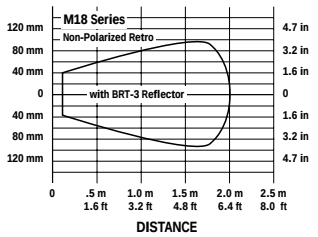
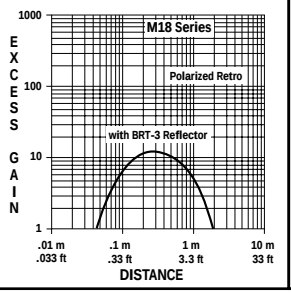
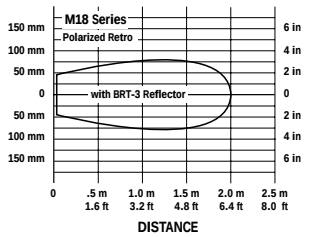
* 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **M18SN6R W/30**). A model with a QD connector requires an optional mating cable. See page 6 for more information.

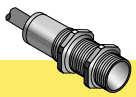
EZ-BEAM M18 Series Sensors



Non-Polarized, Polarized

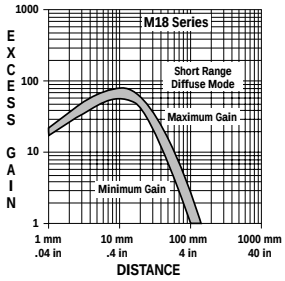
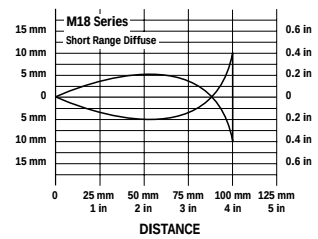
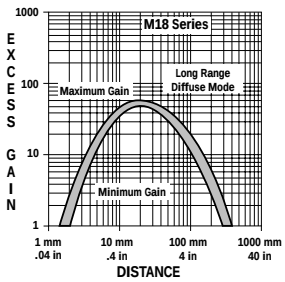
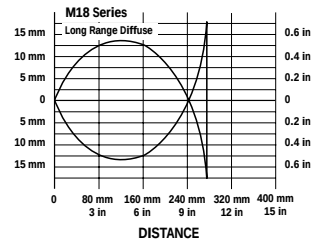
M18 Series Retroreflective Mode

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Non-Polarized (Infrared, 950 nm)						
M18SN6L **M18SN6LQ**	2 m (79")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	NPN		
M18SP6L **M18SP6LQ**		2 m (6.5') 4-Pin Euro-style QD		PNP		
Polarized (Visible red, 680 nm)						
M18SN6LP **M18SN6LPQ**	2 m (79")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	NPN		
M18SP6LP **M18SP6LPQ**		2 m (6.5') 4-Pin Euro-style QD		PNP		

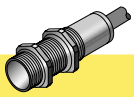


Infrared, 880 nm

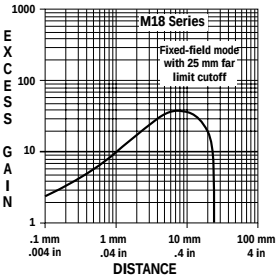
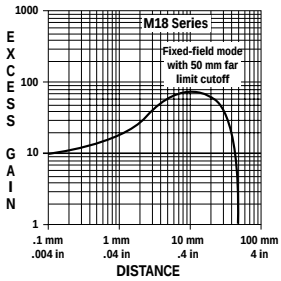
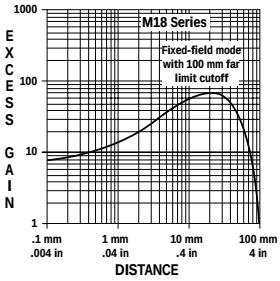
M18 Series Diffuse Mode

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
100 mm Range						
M18SN6D **M18SN6DQ**	100 mm (4")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	NPN		
M18SP6D **M18SP6DQ**		2 m (6.5') 4-Pin Euro-style QD		PNP		
300 mm Range						
M18SN6DL **M18SN6DLQ**	300 mm (12")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	NPN		
M18SP6DL **M18SP6DLQ**		2 m (6.5') 4-Pin Euro-style QD		PNP		

Infrared, 880 nm



M18 Series Fixed-Field Mode

Models	Cutoff Point	Cable	Supply Voltage	Output Type	Excess Gain
					Performance based on 90% reflectance white test card
With 25 mm Far Limit Cutoff					
M18SN6FF25 **M18SN6FF25Q**	25 mm (1")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	NPN	
M18SP6FF25 **M18SP6FF25Q**		2 m (6.5') 4-Pin Euro-style QD		PNP	
With 50 mm Far Limit Cutoff					
M18SN6FF50 **M18SN6FF50Q**	50 mm (2")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	NPN	
M18SP6FF50 **M18SP6FF50Q**		2 m (6.5') 4-Pin Euro-style QD		PNP	
With 100 mm Far Limit Cutoff					
M18SN6FF100 **M18SN6FF100Q**	100 mm (4")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	NPN	
M18SP6FF100 **M18SP6FF100Q**		2 m (6.5') 4-Pin Euro-style QD		PNP	

* 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **M18SN6FF25 W/30**). A model with a QD connector requires an optional mating cable. See page 6 for more information.

The excess gain curves above show excess gain vs. sensing distance for M18 Series fixed-field sensors with 25-, 50- and 100-millimeter cutoffs. Maximum excess gain for the 25-mm models occurs at a lens-to-object distance of about 7 mm; for the 50-mm models, at about 10 mm; and for the 100-mm models, at about 20 mm. Sensing at or near these distances will make maximum use of each sensor's available sensing power.

Backgrounds and background objects must *always* be placed beyond the cutoff distance.

These excess gain curves were generated using a white test card of 90% reflectance.

Objects with reflectivity of less than 90% reflect less light back to the sensor, and thus require proportionately more excess gain in order to be sensed with the same reliability as more reflective objects. When sensing an object of very low reflectivity, it may be especially important to sense it at or near the distance of maximum excess gain.

The effects of object reflectivity on cutoff distance, though small, may be important for some applications. Sensing of objects of less than 90% reflectivity causes the cutoff distances to be "pulled" slightly closer to the sensor. For example, an excess gain of 1 for an object that reflects 1/10 as much light as the 90% white card is represented by the heavy horizontal graph line at excess gain = 10. An object of this reflectivity results in far limit cutoffs of approximately 20, 40 and 70 mm (for 25-, 50- and 100-mm cutoff models, respectively).

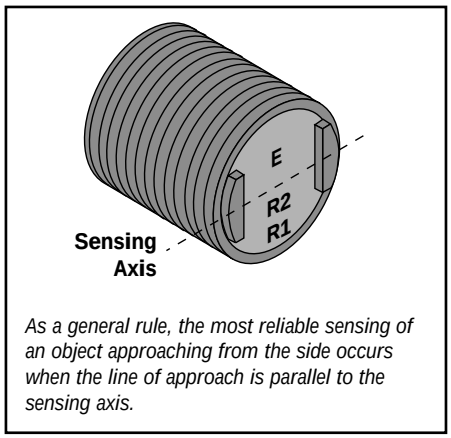
Objects with reflectivity greater than 90% return more light to the sensor. For this reason, highly reflective backgrounds or background objects such as mirrors, polished metal, and other sources of specular reflections require special consideration. If it is necessary to use a highly reflective background, it should be placed as far beyond the cutoff distance as possible and angled to direct reflected light away from the sensor (see page 4).

EZ-BEAM M18 Series Fixed-Field Sensor Setup Tips

General

For highest sensitivity, the sensor-to-object distance should be such that the object will be sensed at or near the point of maximum excess gain (see page 3). The background must be placed beyond the cutoff distance. Following these two guidelines makes it possible to detect objects of low reflectivity, even against close-in reflective backgrounds.

In the drawings and discussion on this page, the letters E, R1, and R2 identify how the sensor's three optical elements (Emitter "E", Near Detector "R1", and Far Detector "R2") line up across the face of the sensor. In Figures 2, 3, and 4, these elements align vertically; in Figure 5, they align horizontally. Note how the position of the tabs on the front of the sensor helps to define the sensing axis of the sensor (Figure 1, right). The sensing axis becomes important in situations like those illustrated in Figures 4 and 5 below.



As a general rule, the most reliable sensing of an object approaching from the side occurs when the line of approach is parallel to the sensing axis.

Figure 1. Sensing axis

Background reflectivity and placement

Avoid mirror-like backgrounds that produce specular reflections. False sensor response will occur if a background surface reflects the sensor's light more strongly to the near detector (R1) than to the far detector (R2). The result is a false ON condition (Figure 2). Use of a diffusely-reflective (matte) background will cure this problem. Other possible solutions are to either angle the sensor or angle the background (in any plane) so that the background does not reflect back to the sensor (see Figure 3).

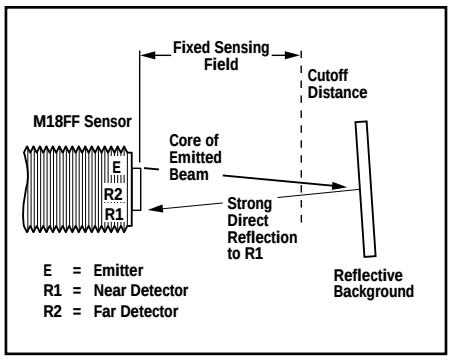


Figure 2. Reflective background – problem

An object beyond the cutoff distance, either moving or stationary (and when positioned as shown in Figure 4), can cause unwanted triggering of the sensor because it reflects more light to the near detector than to the far detector. Remedy the problem easily by rotating the sensor 90° (Figure 5) to align the sensing axis horizontally. The object then reflects the R1 and R2 fields equally, resulting in no false triggering. A better solution, if possible, may be to reposition the object or the sensor.

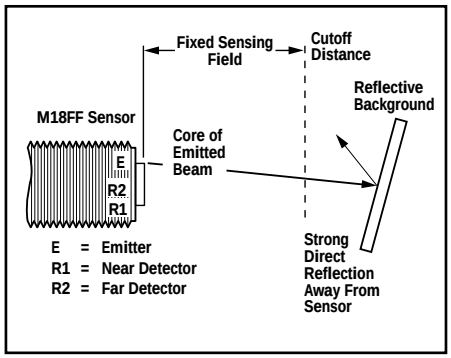


Figure 3. Reflective background – solution

Unwanted triggering of the sensor from an object beyond the cutoff can also be caused by attempting to sense a small object moving perpendicular to the sensor face, or by an object moving through the off-center position shown in Figure 4. Making the object larger, centering the sensor relative to the object, or rotating the sensor to place the sensing axis perpendicular to the longer dimension of the object (Figure 5) will solve the problem.

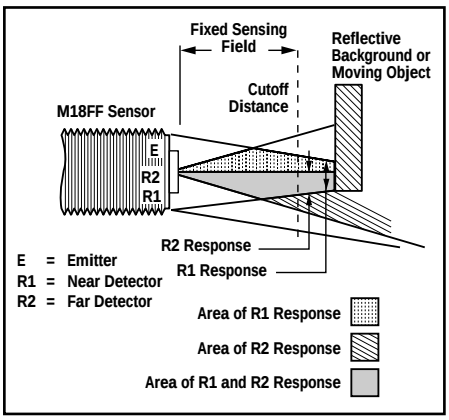


Figure 4. Object beyond cutoff – problem

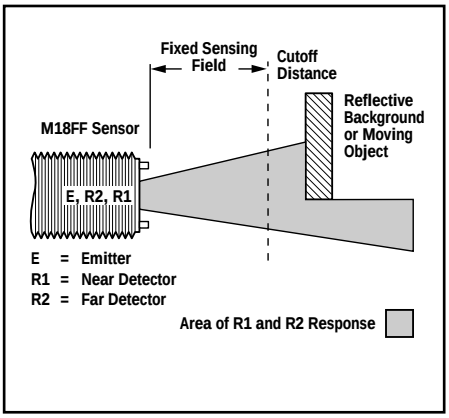


Figure 5. Object beyond cutoff – solution

Banner Engineering Corp. • Minneapolis, U.S.A.
Website: http://www.baneng.com • Tel: 888.373.6767

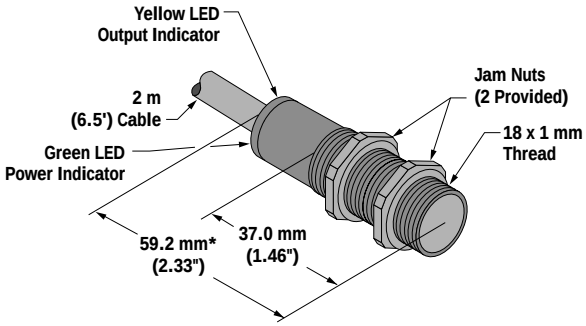
EZ-BEAM M18 Series Specifications

Supply Voltage and Current Opposed Mode Emitters: Opposed Mode Receivers: Polarized Retro: Non-polarized Retro: Fixed-field: Diffuse:	10 to 30V dc (10% maximum ripple); Supply current (exclusive of load current): 25 mA 20 mA 30 mA 25 mA 35 mA 25 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	SPDT (complementary) solid-state dc switch; choose NPN (current sinking) or PNP (current sourcing) models. **Light operate:** N.O. output conducts when the sensor sees its own (or the emitter's) modulated light **Dark operate:** N.C. output conducts when the sensor sees dark; the N.C. (normally closed) output may be wired as a normally open alarm output, depending upon hookup to the power supply (U.S. patent 5087838)
Output Rating	150 mA maximum (each) in standard hookup; When wired for alarm output, the total load may not exceed 150 mA; **Off-state leakage current** < 1 microamp at 30V dc; **On-state saturation voltage** < 1V at 10 mA dc; < 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed:** 3 milliseconds ON, 1.5 milliseconds OFF; **Polarized Retro, Non-Polarized Retro, Fixed-field and Diffuse:** 3 milliseconds ON and OFF NOTE: 100 millisecond delay on power-up; outputs do not conduct during this time
Repeatability	**Opposed mode:** 375 microseconds; **Polarized Retro, Non-Polarized Retro, Fixed-field and Diffuse modes**: 750 microseconds; Repeatability and response are independent of signal strength
Indicators	Two LEDs: Green and Yellow **Green glowing steadily** power to sensor is ON **Green flashing** output is overloaded **Yellow glowing steadily** normally open output is conducting **Yellow flashing** excess gain marginal (1-1.5x) in light condition
Construction	Housings are Stainless Steel; Lenses are Lexan® (opposed models) or acrylic
Environmental Rating	Rated NEMA 6P (IEC IP67)
Connections	2 m (6.5') or 9 m (30') attached cable, or 4-pin Euro-style quick disconnect fitting
Operating Conditions	**Temperature:** -40° to +70°C (-40° to 158°F) **Maximum relative humidity:** 90% at 50°C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06" acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)

EZ-BEAM M18 Series Sensors

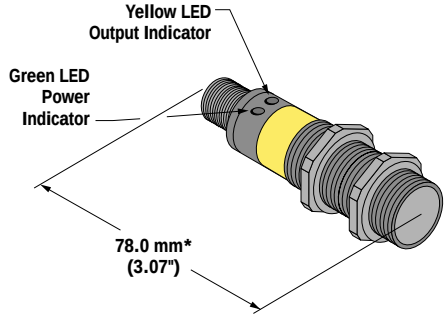
EZ-BEAM M18 Series Dimensions

Models with Attached Cable



* Polarized retroreflective and fixed-field cabled models = 65.0 mm (2.56")

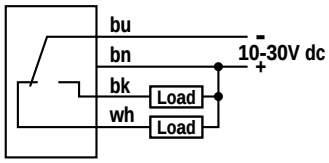
Models with Quick-Disconnect



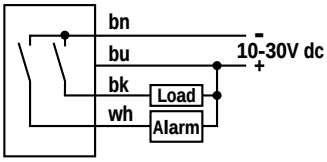
* Polarized retroreflective and fixed-field QD models = 83.8 mm (3.30")

EZ-BEAM M18 Series Hookups

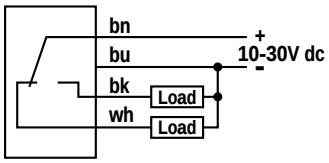
Sensors with NPN (Sinking) Outputs
Standard Hookup



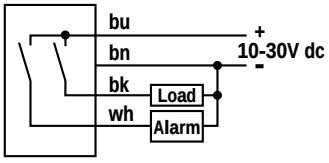
Alarm Hookup



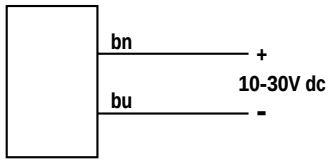
Sensors with PNP (Sourcing) Outputs
Standard Hookup



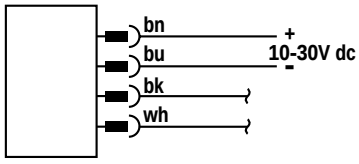
Alarm Hookup



Emitters with Attached Cable

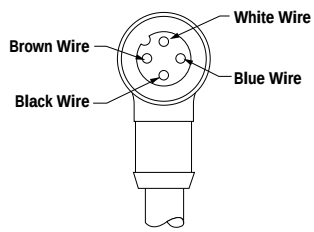


DC Emitters with Quick Disconnect
(No connection to bk and wh wires of QD cable.)



NOTE: hookups are the same for either an integral or QD cable.

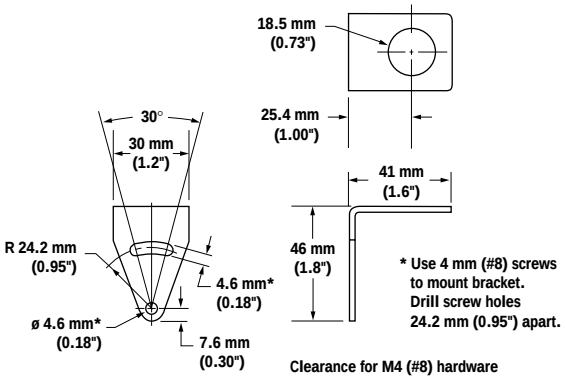
Quick-disconnect (QD) Cables

Style	Model	Length	Connector	Pin Out
4-Pin Euro-style	**MQDC-406** **MQDC-415** **MQDC-430** **MQDC-406RA** **MQDC-415RA** **MQDC-430RA**	2 m (6.5') 5 m (15') 9 m (30') 2 m (6.5') 5 m (15') 9 m (30')	Straight Straight Straight Right-Angle Right-Angle Right-Angle	

Mounting Brackets

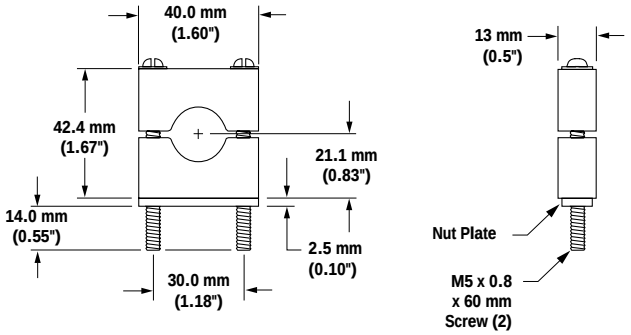
SMB18A

- 11-gauge stainless steel
- Right-angle bracket with a curved mounting slot for versatility and orientation



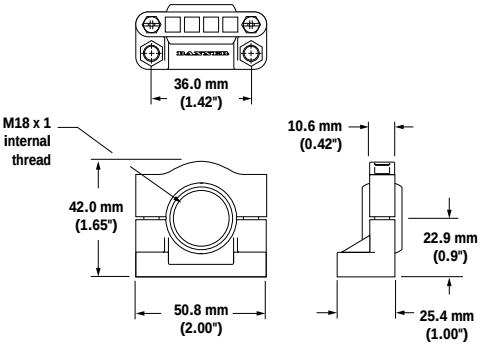
SMB18C

- 18 mm split clamp, black thermoplastic polyester
- Stainless steel mounting hardware included



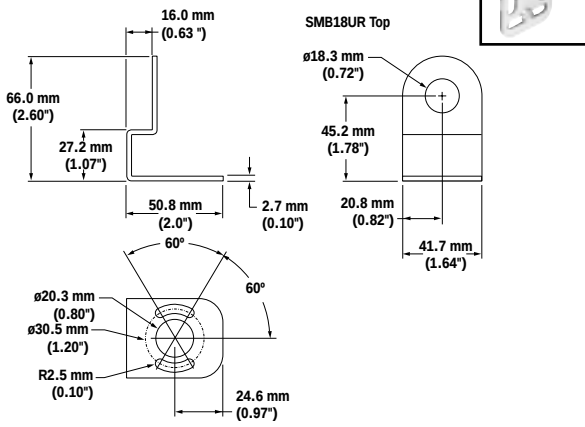
SMB18SF

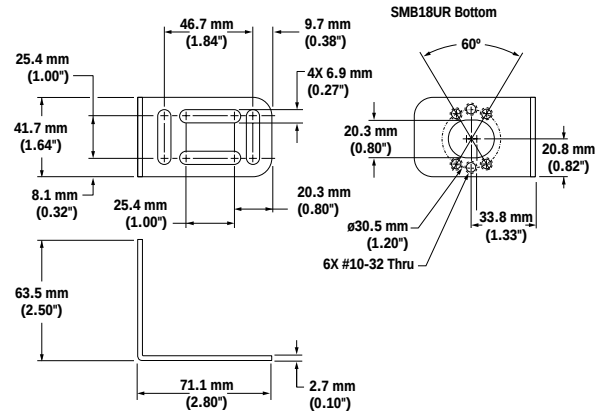
- 18 mm swivel bracket
- Black thermoplastic polyester



SMB18UR

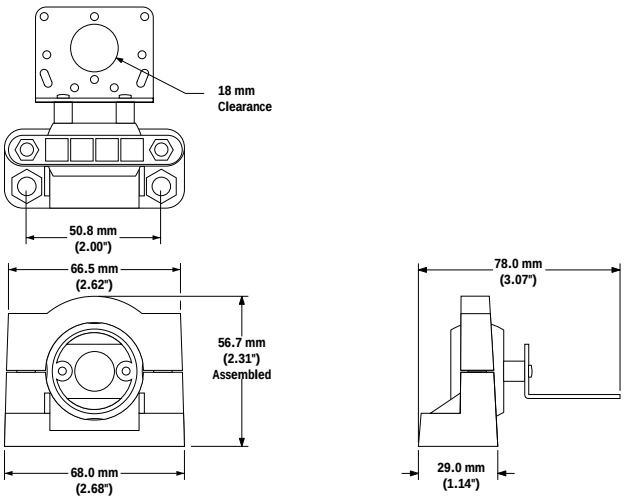
- 2-piece universal swivel bracket for 18 mm sensors
- 300 series stainless steel





SMB30SK

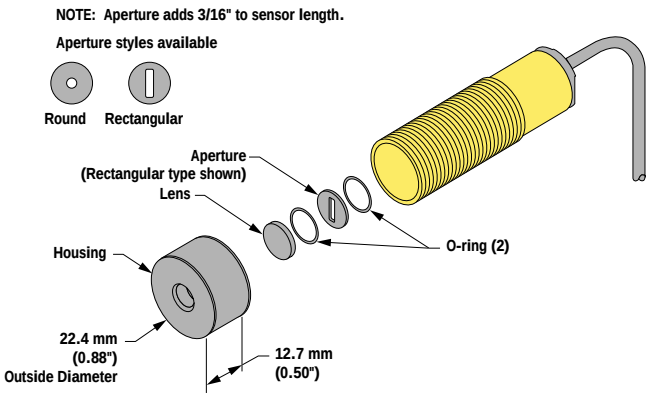
- Flat-mount swivel bracket with extended range of motion
- Black reinforced thermoplastic polyester and 316 stainless steel



EZ-BEAM M18 Series Sensors

Aperture Kits for M18 Series Opposed-Mode Sensors

Aperture kits are available for M18 Series opposed-mode sensors. Apertures are used to narrow and/or shape the sensor's effective beam for use in specialized applications.

Model	Description	
AP18SC	Kit includes round apertures of: 0.5 mm (0.02"), 1.0 mm (0.04") & 2.5 mm (0.10") in diameter	
AP18SR	Kit includes rectangular apertures of: 0.5 mm (0.02"), 1.0 mm (0.04") & 2.5 mm (0.10") wide Each kit also includes a thread-on aperture housing, a Teflon FEP® lens and two 0-rings	

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the photoelectric specialist

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.

WARRANTY: Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

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