MINI-BEAM® AC Voltage Series Sensor

Original Instructions
p/n: 69942 Rev. I
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ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

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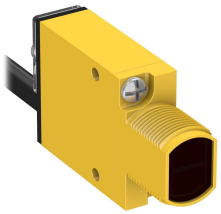
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Chapter Contents

Models 3
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Chapter 1 Features

Self-contained photoelectric sensors



- 24 to 240 V AC with solid-state outputs
- Signal strength or output indicator
- 2 m or 9 m integral cable, 1/2 in-20UNF (1/2-in Dual Key) quick-disconnect fitting
- 18 mm threaded lens mount on some models

WARNING:

- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models

Model	Sensing Mode	Range	LED
SMA31E	Opposed Emitter	3 m (10 ft)	Infrared, 880 nm
SM2A31R	Opposed Receiver		
SMA31EL	Opposed Emitter - Long Range	30 m (100 ft)	
SM2A31RL	Opposed Receiver - Long Range		
SMA31EPD	Opposed Emitter Clear Plastic Detection	0 to 300 mm (0 to 12 in) Actual range varies, depending upon the light transmission properties of the plastic material being sensed.	Visible red, 650 nm
SM2A31RPD	Opposed Receiver Clear Plastic Detection		
SM2A312LV	Non-Polarized Retroreflective	5 m (15 ft)	
SM2A312LVAG	Polarized Retroreflective	50 mm to 2 m (2 in to 7 ft)	
SM2A312LP	Extended-Range Polarized Retroreflective	10 mm to 3 m (0.4 in to 10 ft)	
SM2A312D	Diffuse	380 mm (15 in)	Infrared, 880 nm
SM2A312DBZ		300 mm (12 in)	
SM2A312W	Divergent Diffuse	130 mm (5 in)	
SM2A312C	Convergent	16 mm (0.65 in) Focus	Infrared, 880 nm
SM2A312C2		43 mm (1.7 in) Focus	
SM2A312CV		16 mm (0.65in) Focus	Visible red, 650 nm
SM2A312CV2		43 mm (1.7 in) Focus	
SM2A312CVG		16 mm (0.65 in) Focus	Visible green, 560 nm

Continued on page 4

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Continued from page 3

Model	Sensing Mode	Range	LED
SM2A312F	Glass Fiber Optic	Range varies, depending on sensing mode and fiber optics used.	Infrared, 880 nm
SM2A312FV			Visible red, 650 nm
SM2A312FP	Plastic Fiber Optic		

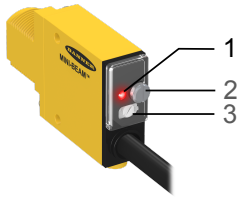
Standard 3-wire 2 m (6.5 ft) cable models are listed.

- To order the 9 m (30 ft) cable model, add the suffix “W/30” (for example, SMA31E W/30).
- To order the 3-pin Micro-style QD model, add the suffix “QD” (for example, SMA31EQD).

For a list of discontinued models, see Discontinued Models.

Overview

1. Adjustment Indicator Device (AID)
2. Gain (sensitivity) adjustment screw
3. Light/dark operate select switch



Adjust the light/dark operate switch clockwise for light operate and counterclockwise for dark operate. In dark operate (DO) mode, the output is ON when the target returns less light to the sensor than the configured target and OFF when the sensor detects more light than the configured/taught target. In light operate (LO) mode, the output is ON when the target returns the same or more light to the sensor and OFF when the sensor detects less light than the configured/taught target.

See Installation and Alignment for descriptions of each sensing mode and how light and dark operate work with each sensing mode.

Specifications

Supply Voltage and Current
24 to 240 V AC (50/60 Hz), 250 V AC maximum

Supply Protection Circuitry
Protected against transient voltages

Output Configuration
SPST SCR solid-state relay with either normally closed or normally open contact (light/dark operate selectable); 2-wire wiring

Output Rating
Minimum load current 5 mA; maximum steady-state load capability 300 mA to 50 °C ambient (122 °F) 100 mA to 70 °C ambient (158 °F)

Inrush capability: 3 amps for 1 second (non repetitive); 10 amps for 1 cycle (non repetitive)

OFF-state leakage current: less than 1.7 mA rms

ON-state voltage drop: ≤ 5 V at 300 mA load, ≤ 10 V at 15 mA load

Output Protection Circuitry
Protected against false pulse on power-up

Output Response Time
Opposed: 2 millisecond on and 1 millisecond off

Non-Polarized and Polarized Retro, Convergent, and Plastic Fiber Optic: 4 milliseconds on and off

Diffuse and Glass Fiber Optic: 8 milliseconds on and off

OFF response time specification does not include load response of up to 1/2 ac cycle (8.3 milliseconds). Response time specification of load should be considered when important.

NOTE: 300 millisecond delay on power-up.

Repeatability
Opposed: 0.3 milliseconds

Non-Polarized and Polarized Retro, Convergent, and Plastic Fiber Optic: 1.3 milliseconds

Diffuse and Glass Fiber Optic: 2.6 milliseconds

Response time and repeatability specifications are independent of signal strength.

Indicators
Red indicator LED on rear of sensor is ON when the load is energized

Construction
Reinforced thermoplastic polyester housing, totally encapsulated, o-ring sealing, acrylic lenses, stainless steel screws

Connections
PVC-jacketed 2-conductor 2 m (6.5 ft) or 9 m (30 ft) cables, or 3-pin Micro-style QD fitting; QD cables available separately

Application Notes
Overload conditions can destroy ac MINI-BEAM sensors. Directly wiring sensor without load series, across hot and neutral will damage sensor (except emitter models).

Low-voltage use requires careful analysis of the load to determine if the sensor’s leakage current or on-state voltage will interfere with proper operation of the load.

The false-pulse protection feature may cause momentary drop-out of the load when the sensor is wired in series or parallel with mechanical switch contacts.

Operating Conditions
–20 °C to +70 °C (–4 °F to +158 °F)

90% at +50 °C maximum relative humidity (non-condensing)

Environmental Rating
IP67

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Certifications

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Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN

Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.

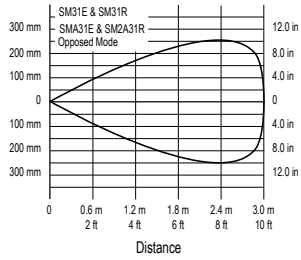
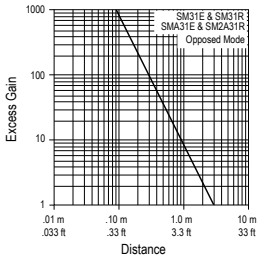
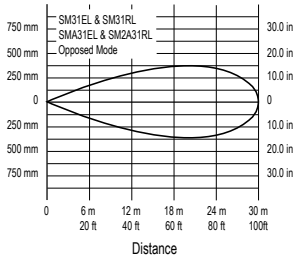
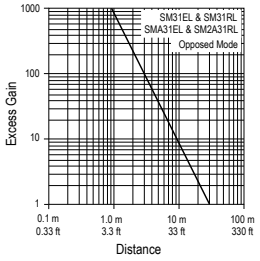
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.

Supply wiring leads < 24 AWG shall not be spliced.

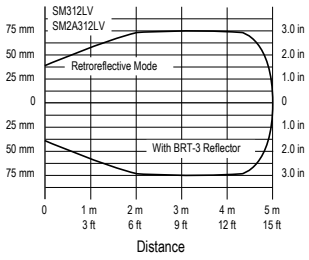
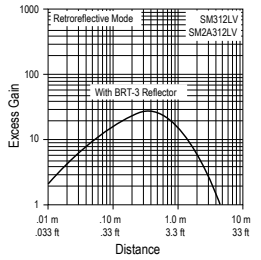
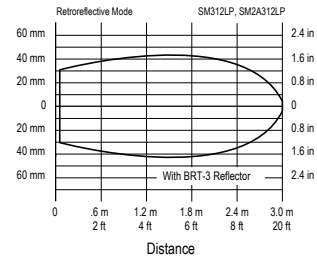
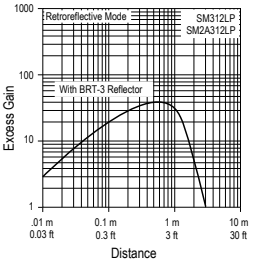
For additional product support, go to www.bannerengineering.com.

Supply Wiring (AWG)	Required Overcurrent Protection (A)	Supply Wiring (AWG)	Required Overcurrent Protection (A)
20	5.0	26	1.0
22	3.0	28	0.8
24	2.0	30	0.5

Performance Curves for SM31Ex Emitter and SM31Rx Receiver Models

Beam Pattern for SM31E/R	Excess Gain Curve for SM31E/R	Beam Pattern for SM31EL/RL	Excess Gain Curve for SM31EL/RL
			
Effective Beam: 3.5 mm		Effective Beam: 13 mm	

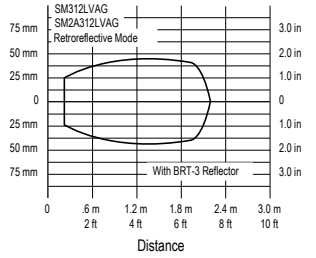
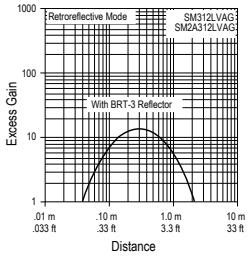
Performance Curves for the SM312Lx Retroreflective Models

Beam Pattern for SM312LVxx	Excess Gain Curve for SM312LVxx	Beam Pattern for SM312LP	Excess Gain Curve for SM312LP
			

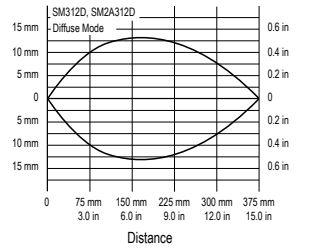
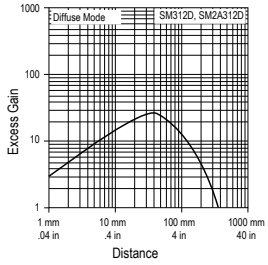
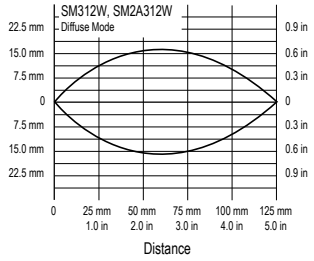
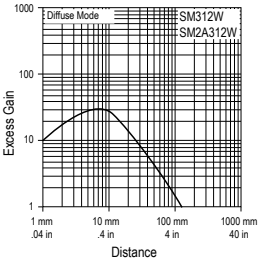
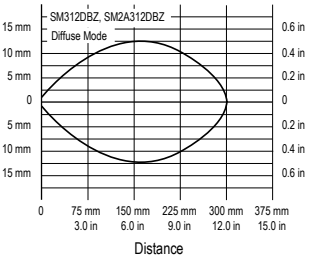
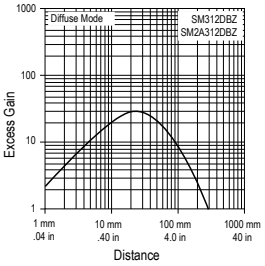
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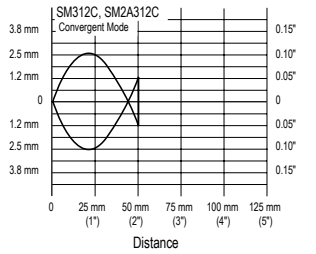
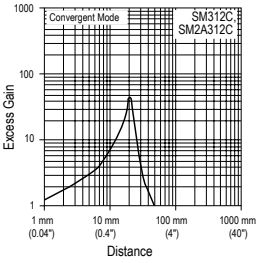
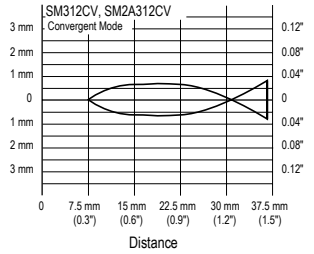
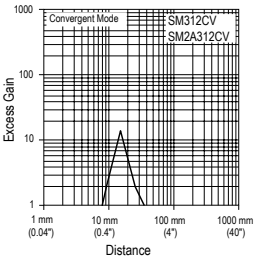
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Beam Pattern for SM312LVxx	Excess Gain Curve for SM312LVxx	Beam Pattern for SM312LP	Excess Gain Curve for SM312LP
			

Performance Curves for the SM312Dx and SM312W Diffuse Models

Beam Pattern for SM312Dx	Excess Gain Curve for SM312Dx	Beam Pattern for SM312W	Excess Gain Curve for SM312W
			
			

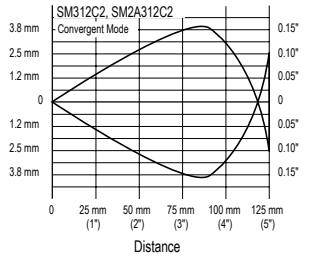
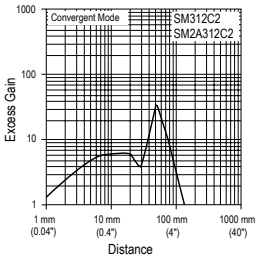
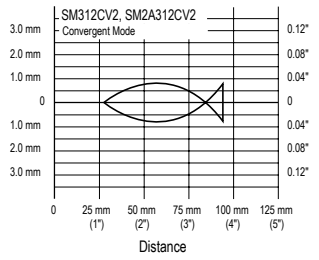
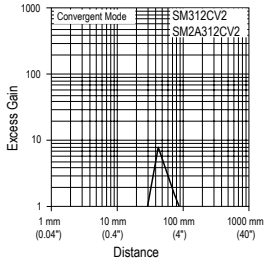
Performance Curves for the SM312Cx Convergent Models

Beam Pattern for SM312C	Excess Gain Curve for SM312C	Beam Pattern for SM312CV	Excess Gain Curve for SM312CV
			

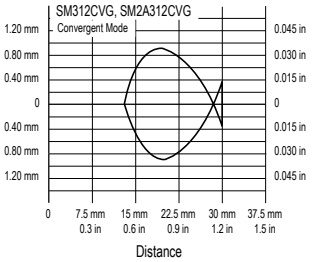
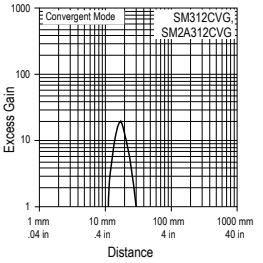
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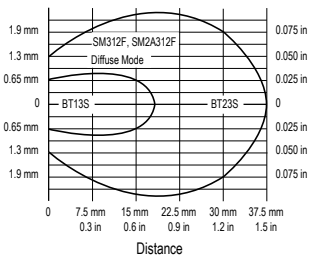
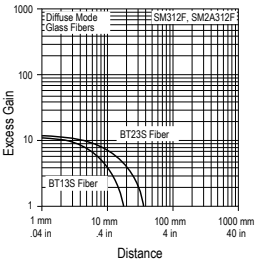
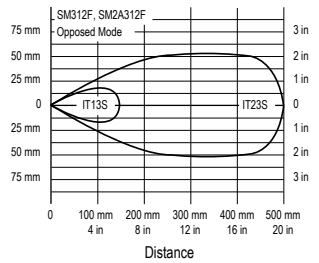
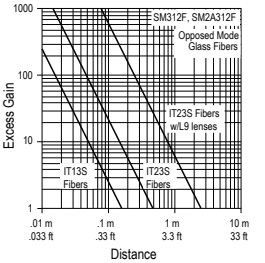
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Beam Pattern for SM312C	Excess Gain Curve for SM312C	Beam Pattern for SM312CV	Excess Gain Curve for SM312CV
			

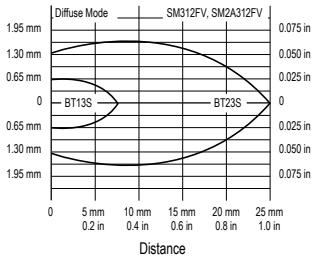
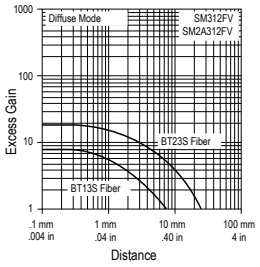
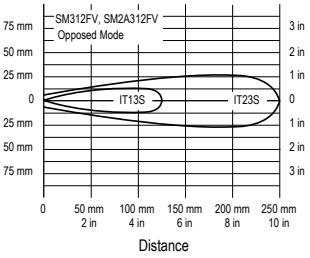
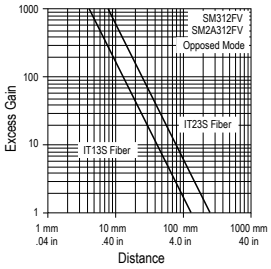
Performance is based on a 90% reflectance white test card.

Beam Pattern for SM312CVG	Excess Gain Curve for SM312CVG		
			

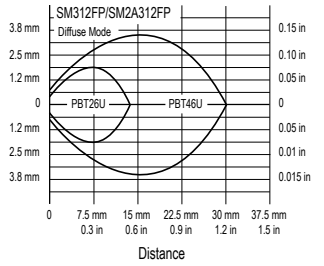
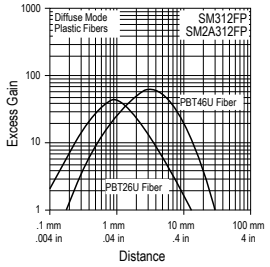
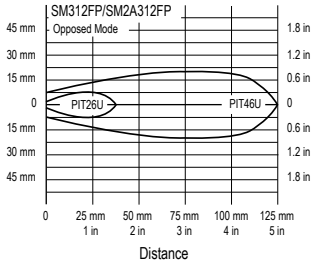
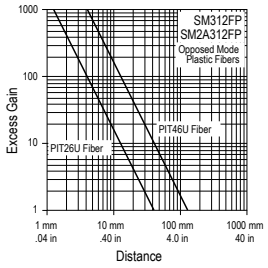
Performance Curves for the SM312F Glass Fiber Optic Models

Diffuse Mode		Opposed Mode	
Beam Pattern for SM312F	Excess Gain Curve for SM312F	Beam Pattern for SM312F	Excess Gain Curve for SM312F
			

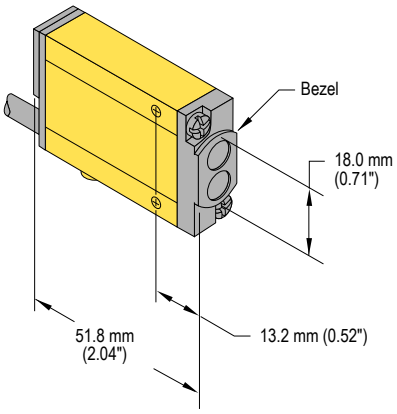
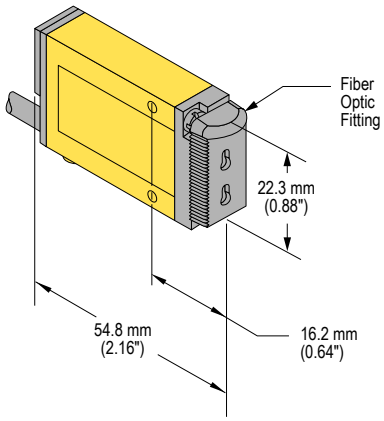
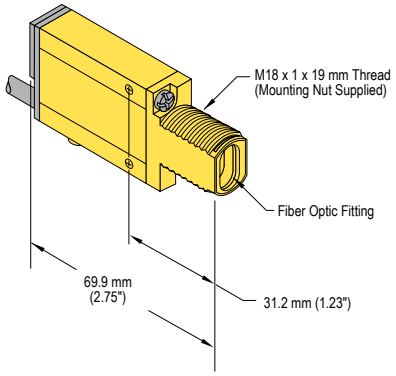
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Diffuse Mode		Opposed Mode	
Beam Pattern for SM312FV	**Excess Gain Curve for SM312FV**	**Beam Pattern for SM312FV**	**Excess Gain Curve for SM312FV**
			

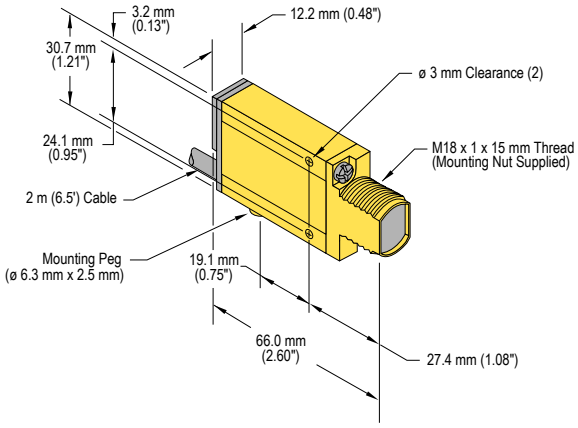
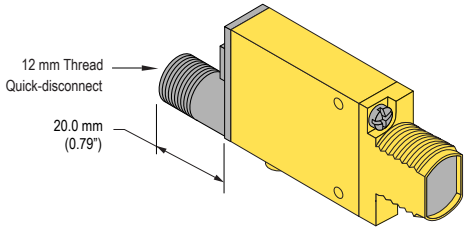
Performance Curves for the SM312FP Plastic Fiber Models

Diffuse Mode		Opposed Mode	
Beam Pattern for SM312FP	**Excess Gain Curve for SM312FP**	**Beam Pattern for SM312FP**	**Excess Gain Curve for SM312FP**
			

Dimensions

Divergent Diffuse Models (Suffix DBZ and W)	Plastic Fiber Models (Suffix FP)	Glass Fiber Models (Suffix F, FV)
		

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Cabled Models (Suffix E, EL, EPD, R, RL, RPD, LV, LVAG, LP, D, C, C2, CV, CV2, and CVG)	QD Models
	

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Chapter Contents

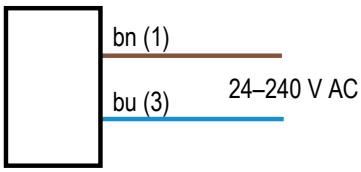
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Mount the Device 10
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Installing Plastic Fibers on a MINI-BEAM 13

Chapter 2 Installation Instructions

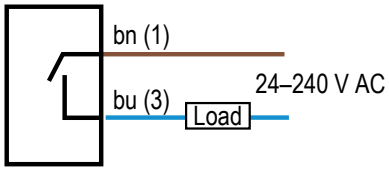
Wiring

The output type for all models is SPST solid-state 2-wire.

Emitters with an attached cable



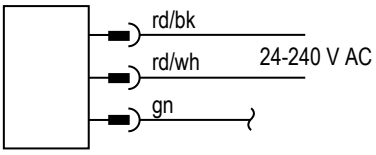
All other models with an attached cable



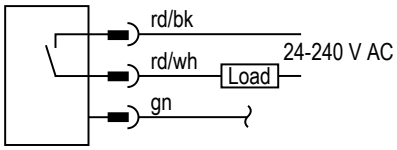
Key

1. Brown
3. Blue

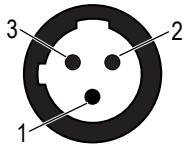
Emitters with quick disconnect (3-pin 1/2 in-20UNF (1/2-in Dual Key))



All other models with a QD (3-pin 1/2 in-20UNF (1/2-in Dual Key))



3-pin 1/2 in-20UNF (1/2-in Dual Key) male pinout



1. Green
2. Red/black
3. Red/white

Mount the Device

1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or the device and the bracket) in the aligned position.

Sensor Alignment

NOTE: Follow proper electronic shock discharge (ESD) precautions when adjusting the Gain potentiometer or the LO/DO switch.

NOTE: When turning the Light/Dark Operate Select switch, be careful not to damage the small tabs on the switch.

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1. Using line-of-sight, position the MINI-BEAM sensor to its emitter (opposed-mode sensing) or to its target (all other sensing modes).

   When using a retroreflective sensor, the target is the retroreflector (“retro target”). For diffuse or convergent sensing modes, the target is the object to be detected.
2. Apply power to the sensor (and to the emitter, if using the opposed mode).
3. Using a small, flat-blade screwdriver, turn the 15-turn Gain control to maximum (the clockwise end of rotation).

   The Gain control is clutched at both ends to avoid damage, and will “free-wheel” when either endpoint is reached.

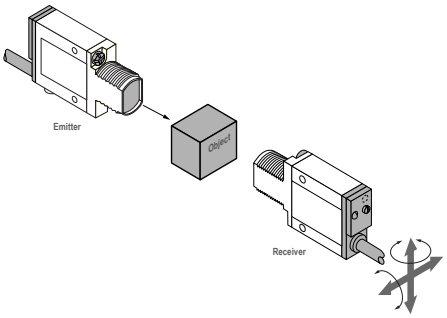
   If the MINI-BEAM sensor is receiving its light signal, the red LED Alignment indicator is ON and flashing at a rate proportional to the signal strength (a faster flash rate = more signal).
4. Move the sensor (or move the retro target, if applicable) up-down-right-left, including angular rotation, to find the center of the movement zone within which the LED indicator remains ON.

   Reducing the Gain setting reduces the size of the movement zone and enables more precise alignment.
5. Repeat the alignment motions after each Gain reduction.
6. When optimum alignment is achieved, mount the sensor, and the emitter or retro target, if applicable, securely in that position.
7. Increase the Gain to the maximum.
8. Test the sensor by placing the object to be detected in the sensing position, then removing it.

   The Alignment indicator LED turns ON when the sensing beam is established (Light condition), and turns OFF when the beam is broken (Dark condition). If the Alignment indicator LED stays ON for both sensing conditions, see the following tips for each sensing mode.

Opposed Mode Alignment

In opposed-mode sensing, the sensor's emitter and receiver are housed in two separate units. The emitter is placed opposite the receiver so that the light beam goes directly from the emitter to the receiver. An object is detected when it breaks the working part of the light beam, known as the effective beam.



In **opposed** sensing modes, light operate means the output is on when the beam is unblocked and dark operate means the output is on when the beam is blocked.

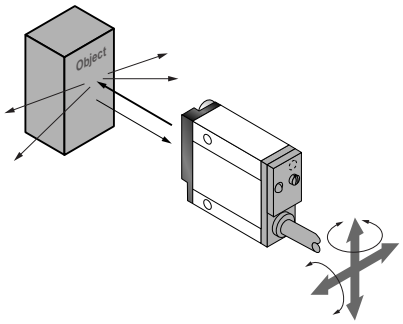
Flooding occurs when a portion of the sensing beam passes around the object to be sensed. *Burn-through* occurs when a portion of the emitter’s light energy passes through a thin or translucent object, and is sensed by the receiver.

To correct either problem, do one or more of the following to reduce the light energy:

- Reduce the Gain adjustment on the receiver
- Add an aperture to one or both lenses (MINI-BEAM apertures, available from Banner, fit neatly inside the lens assembly)
- Intentionally misalign the emitter and receiver

Diffuse Mode Alignment

In diffuse-mode sensing, light emitted from the sensor strikes the surface of the object to be detected and is reflected back to the receiver, which is housed with the emitter. With a diffuse-mode sensor, the object is detected when it "makes" the beam, that is, the object reflects the sensor's transmitted light energy back to the sensor.



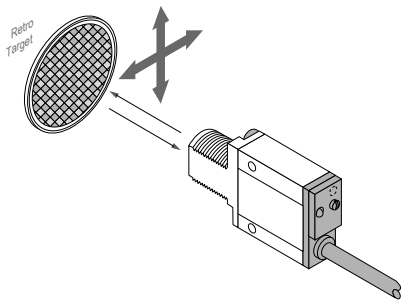
In **diffuse** sensing modes, light operate means the output is on when the target is present and within the sensing range. Dark operate means the output is on when no target is detected.

If the Alignment LED does not turn OFF when the object is removed from the beam, the sensor is probably detecting light reflected from some background object. To remedy this problem:

- Reduce the reflectivity of the background by painting the surface(s) flat-black, scuffing any shiny surface, or drilling a large hole, directly opposite the diffuse sensor
- Move the sensor closer to the object to be detected and reduce the Gain adjustment. Rule of thumb for diffuse sensing: The distance to the nearest background object should be at least three times the sensing distance

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Retroreflective Mode Alignment



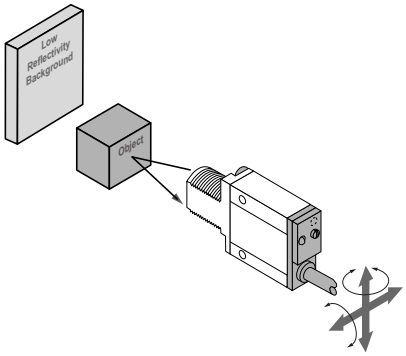
A retroreflective sensor contains both the emitter and receiver elements. The effective beam is established between the emitter, the retroreflector, and the receiver. As with an opposed-mode sensor, an object is sensed when it interrupts or "breaks" the effective beam.

In **retroreflective** sensing modes, light operate means the output is on when the beam is unblocked and dark operate means the output is on when the beam is blocked.

A highly reflective object may reflect enough light back to a retroreflective sensor to allow that object to slip through the beam, without being detected. This problem is called *proxing*, and the following methods may be used to correct it:

- Position the sensor and retro target so the beam will not strike a shiny surface perpendicular to the sensor lens
- Reduce the Gain adjustment
- Add a polarizing filter (for model SM2A312LV)

Convergent Mode Alignment



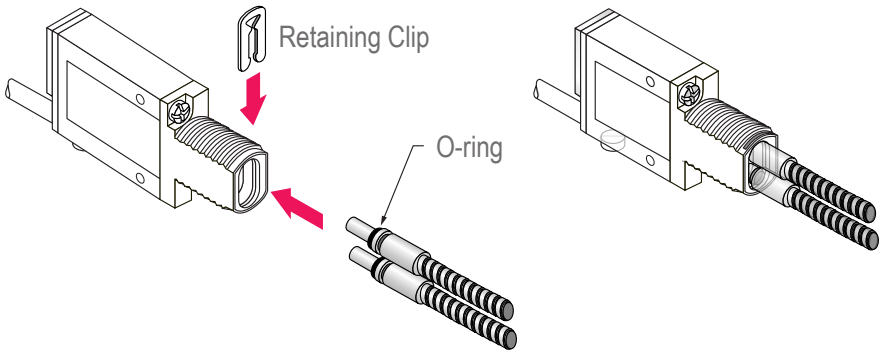
Convergent-mode sensors use a lens system to focus the emitter and receiver elements to an exact point in front of the sensor. Like diffuse-mode and divergent-mode sensors, convergent-mode sensors detect an object when that object completes or "makes" the light beam. This design produces a small, intense, and well-defined sensing area, at a fixed distance from the sensor lens. It is a very efficient use of reflective energy.

In **convergent** sensing modes, light operate means the output is on when the object is present and within the sensing range. Dark operate means the output is on when no target is detected.

The sensing energy of a convergent mode sensor is concentrated at the specified focus point. Convergent mode sensors are less sensitive to background reflections than diffuse mode sensors. However, if background reflections are a problem:

- Skew the sensor position at a 10° to 25° angle to eliminate direct reflections from shiny background surfaces
- Reduce the reflectivity of the background by painting the surface(s) flat-black, scuffing any shiny surface, or drilling a large hole, directly opposite the sensor
- Reduce the Gain adjustment

Installing the Glass Fibers in MINI-BEAMs



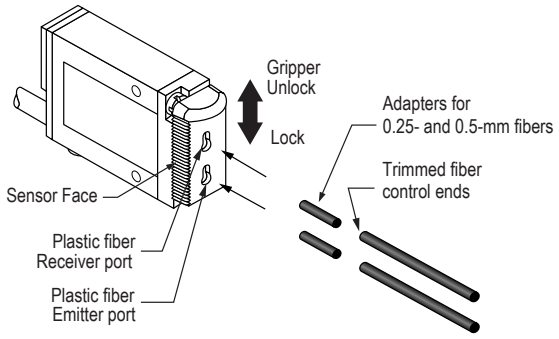
1. Install the O-ring (supplied with the fiber) on each fiber end, as shown in the drawing.
2. While pressing the fiber ends firmly into the ports on the sensor front, slide the U-shaped retaining clip (supplied with the sensor) into the slot in the sensor's barrel, until it snaps into place.

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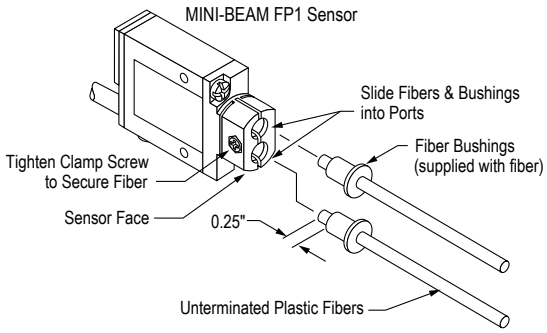
Installing Plastic Fibers on a MINI-BEAM

Follow these instructions to install plastic fibers into your sensor. MINI-BEAMS may have either a fiber gripper or a clamp screw. **MINI-BEAM** and **ECONO-BEAM** sensors for use with plastic fiber optic assemblies include sensors with the letters **FP** in their model number.

MINI-BEAM with fiber grippers



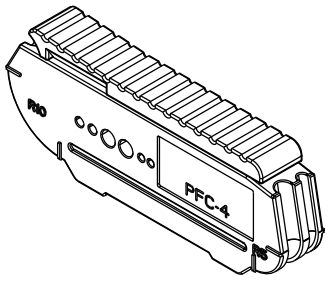
MINI-BEAM with clamp screws



1. Prepare the sensor ends of the fibers (see "Cut the Plastic Fiber" on page 13).
2. Prepare the sensor for the fibers.
   - For models with a fiber gripper: Unlock the fiber gripper as shown in the figure and apply the appropriate fiber adaptors to the fiber, if needed.
   - For models with a clamp screw: Loosen the clamp screw on the sensor face.
3. Insert the plastic fibers.
   - For models with a fiber gripper: Gently insert the prepared fiber ends into the ports as far as they will go.
   - For models with a clamp screw: Align the fiber ends flush with the ends of the bushings as shown. Hold the bushings to the fibers and slide both into the sensor ports. Push the fiber an additional 1 inch through the bushing.
4. Lock in the fibers.
   - For models with a fiber gripper: Slide the fiber gripper back to lock, as shown in the figure.
   - For models with a clamp screw: Tighten the clamp screw to secure the fibers.

Cut the Plastic Fiber

An unterminated plastic fiber is designed to be cut by the customer to the length required for the application. To facilitate cutting, a Banner model PFC-4 cutting device is supplied with this fiber.



1. Locate the non-terminated end, and determine the length of fiber required for the application.
2. Lift the top of the cutter to open the cutting ports.
3. Insert the non-terminated end through one of the four large cutting ports on the PFC-4 cutter so that the excess fiber protrudes from the back of the cutter.
4. Double-check the fiber length, and close the cutter until the fiber is cut.
5. Gently wipe the cut ends of the fiber with a clean, dry cloth to remove any contamination.

NOTE: Do not use solvents or abrasives on any exposed optical fiber. Do not use a cutting port more than once. The blade may tend to dull after one cut.

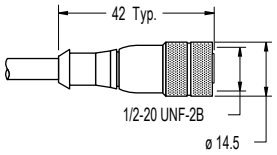
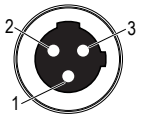
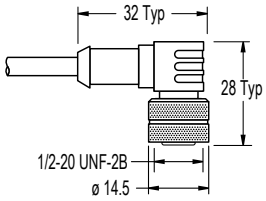
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Chapter 3 Accessories

Quick Disconnect Cordsets — AC Sensors

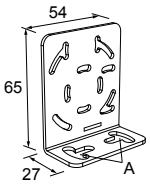
3-pin Single-Ended 1/2-in Dual Key Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDC-306	2 m (6.56 ft)	Straight		 1 = Green 2 = Red/Black 3 = Red/White
MQDC-315	5 m (16.40 ft)			
MQDC-330	9 m (29.53 ft)			
MQDC-306RA	1.83 m (6 ft)	Right-Angle		
MQDC-315RA	4.57 m (15 ft)			
MQDC-330RA	9.14 m (30 ft)			

Mounting Brackets

SMB46L

- Right-angle
- L bracket
- 14-ga. 316 stainless steel
- CAD Files: DXF, PDF, IGS, STP

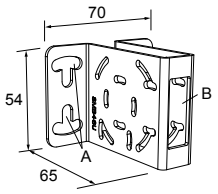
Hole center spacing: A = 16.0
Hole size: A = 16.5 × 18.7



SMB46U

- Right-angle
- U bracket for sensor protection
- 14-ga. 316 stainless steel
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A = 16.0
Hole size: A = 16.5 × 18.7, B = 34.0 × 13.0



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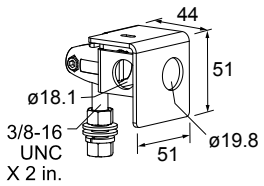
SMB18AFA..

- Protective, swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolts available
- Mounting hole for 18 mm sensors

Hole size: B = ø 18.1

Bolt Thread (A):

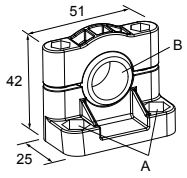
SMB18AFA = 3/8 - 16 × 2 in
CAD Files: DXF, PDF, IGS, STP
SMB18AFAM10 = M10 - 1.5 × 50
CAD Files: IGS, STP



SMB18SF

- 18 mm swivel bracket with M18 × 1 internal thread
- Black thermoplastic polyester
- Stainless steel swivel locking hardware included
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A = 36.0
Hole size: A = ø 5.3, B = ø 18.0

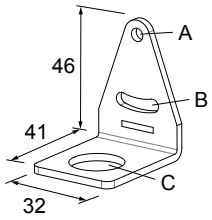


SMB312PD

- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A to B = 24.2
Hole size: A = ø 4.6, B = 17 × 4.6, C = ø 18.5

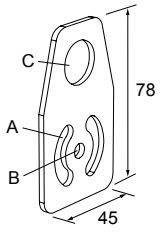
NOTE: Not for use with plastic fiber optic sensors



SMBAMS18P

- Flat SMBAMS series bracket with 18 mm hole
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel
- CAD Files: DXF, PDF, IGS, STP

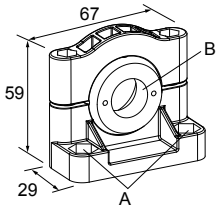
Hole center spacing: A = 26.0, A to B = 13.0
Hole size: A = 26.8 × 7.0, B = ø 6.5, C = ø 19.0



SMB3018SC

- 18 mm swivel side or barrel-mount bracket
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A = 50.8
Hole size: A = ø 7.0, B = ø 18.0

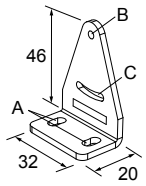


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SMB312S

- Stainless steel 2-axis, side-mount bracket
- CAD Files: DXF, PDF, IGS, STP

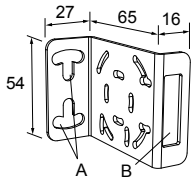
A = 4.3 × 7.5, B = diam. 3, C = 3 × 15.3



SMB46S

- Right-angle
- S bracket
- 14-ga. 316 stainless steel
- CAD Files: DXF, PDF, IGS, STP

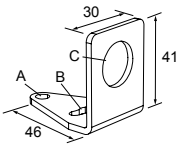
Hole center spacing: A = 16.0
Hole size: A = 16.5 × 18.7, B = 34.0 × 10.0



SMB18A

- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware
- CAD Files: DXF, PDF, IGS, STP

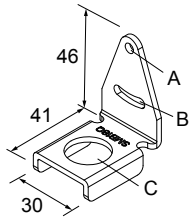
Hole center spacing: A to B = 24.2
Hole size: A = ø 4.6, B = 17.0 × 4.6, C = ø 18.5



SMB18Q

- Right-angle flanged bracket
- 18 mm sensor mounting hole
- 12-ga. stainless steel
- CAD Files: DXF, PDF, IGS, STP

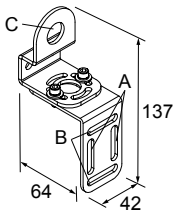
Hole center spacing: A to B = 24.2
Hole size: A = ø 4.6, B = 17.0 × 4.6, C = ø 19.0



SMB18UR

- 2-piece universal swivel bracket
- 300 series stainless steel
- Stainless steel swivel locking hardware included
- Mounting hole for 18 mm sensor
- CAD Files: DXF, PDF, IGS, STP

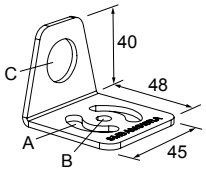
Hole center spacing: A = 25.4, B = 46.7
Hole size: B = 6.9 × 32.0, C = ø 18.3



SMBAMS18RA

- Right-angle SMBAMS series bracket with 18 mm hole
- Articulation slots for 90+° rotation
- 12-ga. (2.6 mm) cold-rolled steel
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A = 26.0, A to B = 13.0
Hole size: A = 26.8 × 7.0, B = ø 6.5, C = ø 19.0

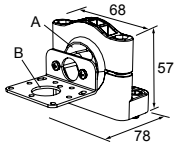


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SMB30SK

- Flat-mount swivel bracket with extended range of motion
- Black reinforced thermoplastic polyester and 316 stainless steel
- Stainless steel swivel locking hardware included
- CAD Files: DXF, PDF, IGS, STP

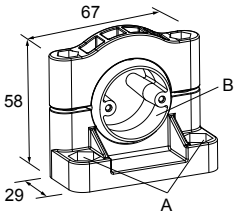
Hole center spacing: A=50.8
Hole size: A=ø 7, B=ø 18



SMB30SUS

- Side-mount swivel with extended range of motion
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included
- CAD Files: DXF, PDF, IGS, STP

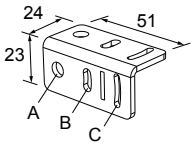
Hole center spacing: A=50.8, B=24.1
Hole size: A=ø 7, B=ø 7.6



SMB312B

- Stainless steel 2-axis, bottom-mount bracket
- Includes mounting foot
- CAD Files: DXF, PDF, IGS, STP

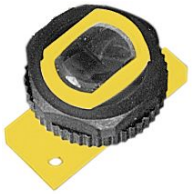
A = diam. 6.9, B = 4.3 × 10.5, C = 3.1 × 15.2



Miscellaneous Accessories and Replacement Parts

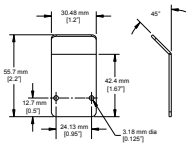
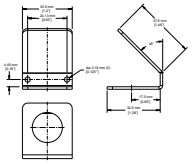
MINI-BEAM lens assemblies are field-replaceable.

Replacement Lens Model	Replacement Lens for MINI-BEAM Model	Possible Sensing Mode or Range Changes	
UC-300AG	LVAG	LV to LVAG	
UC-300BZ	W and DBZ	D to DBZ and F to DBZ	
UC-300C..7	C, CV, and CVG	CV2 to CV	
UC-300C2	C2 and CV2	CV to CV2	
UC-300E	E and R	-	
UC-300EL	EL and RL	Extends the range of the E/R models	
UC-300EPD	EPD	-	
UC-300F	F and FV	D to F and DBZ to F	
UC-300FP	FP (old style)	-	
UC-300FP2	FP	-	
UC-300L	LV and D	F to D, LVAG to LV, and DBZ to D	
UC-300LP	LP	-	
UC-300RPD	RPD	-	

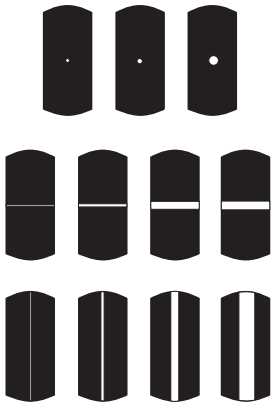


MINI-BEAM right-angle reflectors are useful for tight sensing locations. These reflectors significantly decrease excess gain.

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Right-Angle Reflectors	
RAR300SM • Side mount right-angle reflector • Profile dimension of 14 mm (0.56 inches) in the direction of the scan • Use with MINI-BEAM models 31E, EL, R, RL; and 312D, DBZ, LV, W	
RAR300FM • Front mount right-angle reflector that attaches directly to the threaded barrel of most MINI-BEAMs • Profile dimension of 34 mm (1.35 inches) in the direction of the scan • Use with MINI-BEAM models 31E, EL, R, RL; and 312D, LV	

Opposed-mode MINI-BEAM sensors may be fitted with apertures that narrow or shape the effective beam of the sensor to more closely match the size or profile of the object to be sensed, for example, the use of “line” (or “slit”) apertures for sensing wire or thread. Aperture material: black PBT

MINI-BEAM Opposed-Mode Aperture Kits			
Aperture Kit	**Description**	**Pieces**	
Circular			
AP31-020	0.5 mm dia.	20	
AP31-040	1 mm dia.	20	
AP31-100	2.5 mm dia.	20	
Horizontal Slot			
AP31-020H	0.5 x 6.4 mm	20	
AP31-040H	1 x 6.4 mm	20	
AP31-100H	2.5 x 6.4 mm	20	
AP31-200H	5.1 x 6.4 mm	20	
Vertical Slot			
AP31-020V	0.5 x 12.7 mm	20	
AP31-040V	1 x 12.7 mm	20	
AP31-100V	2.5 x 12.7 mm	20	
AP31-200V	5.1 x 12.7 mm	20	
Kit			
AP31-DVHX2	2 of each aperture	2	

Aperture Kit	Range (Standard Group I and II Sensor Pairs)				Range (Group I Sensor Pairs with UC-300EL Upper Covers Substituted)	
	Aperture on Both Emitter and Receiver		Aperture on Receiver Only			
	Group I Sensors	Group II Sensors	Group I Sensors	Group II Sensors	Aperture on Both Emitter and Receiver	Aperture on Receiver Only
AP31-020	89 mm	102 mm	457 mm	1.5 m	127 mm	914 mm
AP31-040	330 mm	457 mm	940 mm	3.2 m	183 mm	2 m
AP31-100	1.5 m	3 m	2.5 m	8.2 m	2.1 m	5.8 m
AP31-020H	406 mm	1.8 m	965 mm	9.1 m	864 mm	3.4 m
AP31-040H	914 mm	4 m	1.8 m	12.5 m	1.8 m	5.2 m
AP31-100H	2.3 m	10.4 m	2.9 m	20.7 m	5.2 m	8.5 m
AP31-200H	2.8 m	21.3 m	3 m	24.4 m	8.2 m	11 m
AP31-020V	457 mm	1.7 m	1 m	8.2 m	1 m	3.4 m
AP31-040V	1 m	5.5 m	1.8 m	15.8 m	2.1 m	5.5 m

Continued on page 19

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Continued from page 18

Aperture Kit	Range (Standard Group I and II Sensor Pairs)				Range (Group I Sensor Pairs with UC-300EL Upper Covers Substituted)	
	Aperture on Both Emitter and Receiver		Aperture on Receiver Only			
	Group I Sensors	Group II Sensors	Group I Sensors	Group II Sensors	Aperture on Both Emitter and Receiver	Aperture on Receiver Only
AP31-100V	2.3 m	10.7 m	2.9 m	22.9 m	6.1 m	8.5 m
AP31-200V	2.8 m	22.9 m	3 m	25.9 m	8.5 m	11 m

GROUP I Emitter/ Receiver Pairs (see Range): SMA31E/SM2A31R

GROUP II Emitter/ Receiver Pairs (see Range): SMA31EL/SM2A31RL

Example: A MINI-BEAM sensor pair is in Group I. With an AP31-040 circular aperture on the receiver only, range is 940 mm (37 in). With AP31-040 apertures on both emitter and receiver, range is 330 mm (13 in). Group I range with AP31-040 apertures and UC-300EL upper covers on both units is 183 mm; range with receiver aperture only is 2 m (80 in).

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Chapter 4 Product Support and Maintenance

Clean Sensor with Compressed Air Then Isopropyl Alcohol

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. create stray light that may degrade the peak performance of the sensor.

Blow dust from the sensor using filtered, compressed air. If the sensor is still dirty, gently wipe the sensor with a dry optical cloth. If the dry optical cloth does not remove all residue, use 70% isopropyl alcohol on a clean optical cloth, then dry with a clean dry optical cloth and blow with filtered, compressed air. Do not use any other chemicals for cleaning.

Repairs, Translations, and Replacement Parts

English

Do not attempt any repairs to this Banner device, other than replacing the component(s) listed in this document with original Banner replacement components.

See "Miscellaneous Accessories and Replacement Parts" on page 17 for a list of replaceable components.

Other than these components, this Banner device contains no field-replaceable components. For other problems, contact Banner Engineering for troubleshooting of this device. If the device is determined to be defective by a Banner Applications Engineer, they will advise you of Banner's RMA (Return Merchandise Authorization) procedure.

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IMPORTANT: If instructed to return the device, pack it with care. Damage that occurs in return
shipping is not covered by warranty.
```

Obtain assistance with product repairs by contacting your local Banner Engineering Corp distributor or by calling Banner directly at (763) 544-3164. Access literature translated into your native language on the Banner website at www.bannerengineering.com or contact Banner directly at (763) 544-3164.

Deutsch

Versuchen Sie nicht, dieses Banner-Gerät zu reparieren, es sei denn, Sie ersetzen die in diesem Dokument aufgeführten Komponenten durch Originalersatzkomponenten von Banner.

Siehe "Miscellaneous Accessories and Replacement Parts" on page 17 mit einer Liste der Ersatzkomponenten.

Abgesehen von diesen Komponenten enthält dieses Banner-Gerät keine vor Ort austauschbaren Komponenten. Wenden Sie sich bei anderen Störungen zur Fehlerbehebung dieses Geräts an Banner Engineering. Wenn ein Banner-Anwendungstechniker zu dem Schluss kommt, dass dieses Gerät defekt ist, erhalten Sie von dem Techniker Erläuterungen zum RMA-Verfahren (Return Merchandise Authorization) von Banner für die Warenrückgabe.

```
WICHTIG: Wenn Sie der Techniker anweist, das Gerät zurückzusenden, verpacken Sie es bitte
sorgfältig. Transportschäden bei der Rücksendung werden von der Garantie nicht abgedeckt.
```

Unterstützung bei Produktreparaturen erhalten Sie von Ihrem örtlichen Banner Engineering Corp Händler oder direkt von Banner unter Tel. (763) 544-3164. Die in Ihre Muttersprache übersetzte Literatur finden Sie auf der Banner-Website unter www.bannerengineering.com oder kontaktieren Sie Banner direkt unter Tel. (763) 544-3164.

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Français

Aucune réparation ne doit être effectuée sur ce dispositif, à l'exception du remplacement du/des composant(s) répertorié(s) dans ce document par des pièces de rechange Banner d'origine.

Voir "Miscellaneous Accessories and Replacement Parts" on page 17 pour obtenir la liste des composants remplaçables.

À l'exception de ces composants, ce dispositif Banner ne contient aucune pièce qui puisse être remplacée sur place. Si vous rencontrez un autre problème, contactez Banner Engineering pour le dépannage du dispositif. Si un ingénieur d'applications Banner détermine que le dispositif est défectueux, il vous indiquera la procédure à suivre pour le retour des produits (RMA).

Important : Si vous devez retourner le dispositif, emballez-le avec soin. Les dégâts occasionnés pendant le transport de retour ne sont pas couverts par la garantie.

Pour vous aider lors de la réparation de produits, contactez votre distributeur Banner local our appelez directement Banner au (763) 544-3164. La documentation traduite dans votre langue est disponible sur le site internet de Banner www.bannerengineering.com ou contactez directement Banner au (763) 544-3164.

Italiano

Non tentare di riparare questo dispositivo Banner autonomamente, se non sostituendo i componenti indicati nel presente documento con componenti di ricambio originali Banner.

Per un elenco dei componenti che è possibile sostituire, vedere "Miscellaneous Accessories and Replacement Parts" on page 17.

Ad eccezione di tali componenti, questo dispositivo Banner non contiene altri componenti sostituibili sul campo. Nel caso in cui si riscontrino problemi di altro tipo, si prega di contattare Banner Engineering per richiedere assistenza. Se il dispositivo viene riscontrato difettoso da un tecnico Banner, il nostro personale vi comunicherà la procedura da seguire per ottenere l'autorizzazione al reso (RMA).

Importante: Se si ricevono istruzioni di rispedire il dispositivo al produttore, imballarlo con cura. I danni dovuti al trasporto non sono coperti dalla garanzia.

Per assistenza nelle riparazioni dei prodotti, contattare il distributore locale Banner Engineering Corp o contattare direttamente Banner al numero (763) 544-3164. È possibile accedere alla documentazione tradotta nella propria lingua madre sul sito Web Banner all'indirizzo www.bannerengineering.com o contattare direttamente Banner al numero (763) 544-3164.

Español

No intente realizar ninguna reparación en este dispositivo Banner, salvo reemplazar los componentes mencionados en este documento por componentes de repuesto originales de Banner.

Consulte "Miscellaneous Accessories and Replacement Parts" on page 17 para obtener una lista de componentes que se pueden reemplazar.

Aparte de estos componentes, este dispositivo Banner no contiene componentes reemplazables en campo. Para otras situaciones, comuníquese con Banner Engineering para solucionar los problemas de este dispositivo. Si algún ingeniero de Aplicaciones de Banner determina que el dispositivo está defectuoso se le informará el procedimiento RMA (Autorización de Devolución de Mercancía) de Banner.

Importante: Si se le solicita devolver el dispositivo, empáquelo con cuidado. Puede haber daños durante el envío de devolución que no estén cubiertos por la garantía.

Para reparaciones de productos, por favor contacte a su distribuidor local de Banner Engineering o llame a Banner directamente al 00 1 (763) 544-3164. Vea la literatura traducida en su idioma en el sitio web Banner en www.bannerengineering.com o comuníquese con Banner directamente al 00 1 (763) 544-3164.

中国人

除使用邦纳原厂备件替换本文中列出的组件外，请勿对该邦纳装置进行任何维修操作。

有关可更换组件的列表，请参见 "Miscellaneous Accessories and Replacement Parts" on page 17。

除这些组件外，该邦纳装置不包含任何可现场更换的组件。对于其他问题，请联系邦纳以获取该装置的故障排查信息。如果装置经邦纳应用工程师认定为有缺陷，他们会告知您邦纳的 RMA（退货授权）程序。

重要注意事项： 如被要求退回装置，请妥善包装后寄回。退货运输过程中发生的损坏不在保修范围内。

请联系当地的 Banner Engineering Corp 经销商或直接致电 Banner +1 (763) 544-3164，以获得产品维修帮助。请访问邦纳网站 www.bannerengineering.com 或直接拨打 +1 (763) 544-3164 联系邦纳，获取翻译成您母语的资料。

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한국인

이 문서에 나열된 구성부품을 정품 Banner 교체용 구성부품으로 교체하는 것 외에는 이 Banner 장치를 수리하려고 시도하지 마십시오.

교체 가능한 구성부품 목록은 "Miscellaneous Accessories and Replacement Parts" on page 17를 참조하십시오.

이 Banner 장치에는 해당 구성부품 이외에 현장에서 교체할 수 있는 구성부품이 없습니다. 다른 문제는 Banner Engineering에 연락하여 해당 장치의 문제 해결을 문의하십시오. Banner 애플리케이션 엔지니어가 장치에 결함이 있는 것으로 판정하면, Banner의 RMA(제품 반품 승인)절차에 대해 안내해 드립니다.

중요: 제품을 반송하도록 안내 받으셨다면 잘 포장해주십시오. 반송 도중에 발생한 손상은 보증 서비스가 적용되지 않습니다.

제품 수리에 대한 지원은 지역 Banner Engineering Corp 대리점에 문의하거나 Banner에 직접 (763) 544-3164로 문의하실 수 있습니다. 사용자의 모국어로 번역된 자료는 Banner 웹사이트 www.bannerengineering.com에서 액세스하거나 Banner에 직접 (763) 544-3164로 문의하실 수 있습니다.

日本語

このバナー装置の修理は、本書に記載されているコンポーネントをバナー純正の交換用コンポーネントに交換する以外、行わないでください。

交換可能な部品のリストについては、"Miscellaneous Accessories and Replacement Parts" on page 17をご覧ください。

このバナー装置に対応する現場で交換可能な部品は、これらの部品以外にありません。その他の問題については、本装置のトラブルシューティングについてバナーエンジニアリングにお問い合わせください。バナーのアプリケーションエンジニアが装置に欠陥があると判断した場合、バナーのRMA（返品承認）手続きについてお知らせします。

重要 ： 返品を指示された場合は、装置を丁寧に梱包してください。返品時に発生した破損は保証の対象外となります。

製品の修理については、最寄りのBanner Engineering Corp代理店にお問い合わせいただくか、米国+1 (763) 544-3164まで直接お電話でお問い合わせください。バナーのウェブサイト（www.bannerengineering.com）でお客様の言語に翻訳された資料にアクセスするか、米国+1 (763) 544-3164まで直接お電話でお問い合わせください。

čeština

Nepokoušejte se provádět žádné opravy tohoto zařízení Banner, kromě výměny součástí uvedených v tomto dokumentu za originální náhradní součásti Banner.

Seznam vyměnitelných součástí naleznete v části "Miscellaneous Accessories and Replacement Parts" on page 17.

Kromě těchto součástí neobsahuje toto zařízení Banner žádné součásti vyměnitelné v provozních podmínkách. V případě potřeby řešení problémů se zařízením kontaktujte společnost Banner Engineering. Pokud je zařízení vyhodnoceno technikem společnosti Banner jako poškozené, bude vám doporučen postup reklamace RMA společnosti Banner.

Důležité: Pokud byl vydán požadavek na vrácení zařízení, pečlivě ho zabalte. Poškození vzniklé při dopravě není považováno za záruční opravu.

Pokud produkt potřebuje opravu, vyžádejte si pomoc od místního distributora společnosti Banner Engineering Corp nebo přímo na telefonním čísle (763) 544-3164. Dokumentaci přeloženou do vašeho jazyka si vyhledejte na webových stránkách společnosti Banner na adrese www.bannerengineering.com nebo se obraťte přímo na společnost Banner na telefonním čísle (763) 544-3164.

Polski

Nie należy podejmować żadnych prób naprawy urządzenia Banner poza wymianą elementów wymienionych w niniejszym dokumencie na oryginalne elementy zamienne Banner.

Zobacz "Miscellaneous Accessories and Replacement Parts" on page 17, aby zapoznać się z listą wymiennych elementów.

Poza tymi elementami urządzenie Banner nie zawiera żadnych elementów, które można wymieniać samodzielnie. W celu rozwiązania problemów z urządzeniem należy skontaktować się z działem technicznym firmy Banner Engineering. Jeśli urządzenie zostanie uznane za wadliwe przez inżyniera technicznego Banner, poinformuje on użytkownika o firmowej procedurze zwrotu towaru (RMA) w firmie Banner.

Ważne: Jeśli urządzenie ma zostać zwrócone, należy je starannie zapakować. Uszkodzenia powstałe podczas odsyłki nie są objęte gwarancją.

Aby uzyskać pomoc w zakresie naprawy produktu, należy skontaktować się z lokalnym dystrybutorem Banner Engineering Corp lub zadzwonić bezpośrednio do firmy Banner pod numer (763) 544-3164. Dostęp do literatury przetłumaczonej na swój język ojczysty można uzyskać na stronie internetowej firmy Banner pod adresem www.bannerengineering.com lub kontaktując się bezpośrednio z firmą Banner pod numerem (763) 544-3164.

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Português

Não tente fazer nenhum reparo neste dispositivo Banner, a não ser substituir o(s) componente(s) listado(s) neste documento por componentes de reposição originais da Banner.

Consulte "Miscellaneous Accessories and Replacement Parts" on page 17 para obter uma lista de componentes substituíveis.

Além desses componentes, este dispositivo Banner não contém componentes substituíveis em campo. Para outros problemas, entre em contato com a Banner Engineering para solucionar o problema deste dispositivo. Se um engenheiro de aplicações da Banner determinar que o dispositivo está com defeito, ele o informará sobre o procedimento de RMA (Return Merchandise Authorization) da Banner.

Importante: Se for instruído a devolver o dispositivo, embale-o com cuidado. Os danos ocorridos no transporte de devolução não são cobertos pela garantia.

Obtenha assistência para reparos do produto entrando em contato com o distribuidor local da Banner Engineering Corp ou ligando diretamente para a Banner no telefone (763) 544-3164. Acesse a literatura traduzida para seu idioma nativo no site da Banner em www.bannerengineering.com ou entre em contato diretamente com a Banner pelo telefone (763) 544-3164.

Türkçe

Bu belgede listelenen bileşen(ler)in orijinal Banner yedek bileşenleri ile değiştirilmesi dışında bu Banner cihazında onarım yapmaya çalışmayın.

Değiştirilebilir bileşenlerin listesi için "Miscellaneous Accessories and Replacement Parts" on page 17 bölümüne bakın.

Bu Banner cihazı listelenen bileşenler dışında sahada değiştirilebilecek hiçbir bileşen içermez. Diğer sorunlarda cihazda sorun giderme işlemleri için Banner Engineering ile iletişime geçin. Bir Banner Uygulama Mühendisi tarafından cihazın kusurlu olduğu tespit edilirse, Banner RMA (İade Mal Yetkilendirme) prosedürü hakkında bilgilendirilirsiniz.

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Discontinued Models

The following models are no longer available for order but are still covered by the information in this document.

- SMA31E W/30
- SMA31EL W/30
- SM2A31R W/30
- SM2A31RL W/30
- SMA31EPD W/30
- SM2A31RPD W/30
- SM2A312LVAG W/30
- SM2A312LP W/30
- SM2A312DBZ W/30
- SM2A312W W/30
- SM2A312C W/30
- SM2A312C2 W/30
- SM2A312CVG W/30
- SM2A312F W/30
- SM2A312FV W/30
- SM2A312FP W/30

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