



# SM30 Series 30 mm Barrel Sensor

*Opposed-Mode Infrared Photoelectric Sensors for Especially Demanding Applications*



## Features

- Stainless steel or plastic barrel models
- Very high excess gain; 200 m (700') sensing range; 880 nm Infrared LED
- Positive sealing eliminates even capillary leakage; lens is quad-ring sealed; exceeds NEMA 6P (IP67) ratings – ideal for equipment wash-down environments
- EZ-BEAM<sup>®</sup> technology provides reliable sensing without the need for adjustment
- Modulation frequency “A” is standard; frequencies “B” and “C” also available for preventing crosstalk in multiple-sensor applications (emitter and opposed receiver frequencies must match)
- AC- and DC-operated receiver models available; emitters feature Universal voltage
- Range for all models: 200 m (700'). See page 3 for performance curves.

## Models

Modulation Frequency*			Housing	Cable**	Supply Power	Output Type
A	B	C				
<b>Emitter Models</b>						
SMA30PEL	SMA30PELB	SMA30PELC	Plastic	2 m (6.5') 2-wire Cable	Universal: 12 to 240V ac, 10 to 30V dc	-
SMA30PELQD	SMA30PELQDB	SMA30PELQDC		3-pin Mini-style QD†		
SMA30SEL	SMA30SELB	SMA30SELC	Stainless Steel	2 m (6.5') 3-wire Cable		
SMA30SELQD	SMA30SELQDB	SMA30SELQDC		3-pin Mini-style QD†		
<b>DC Receivers</b>						
SM30PRL	SM30PRLB	SM30PRLC	Plastic	2 m (6.5') 4-wire Cable	10 to 30V dc	Bi-Modal™ NPN or PNP
SM30PRLQD	SM30PRLQDB	SM30PRLQDC		4-pin Mini-style QD		
SM30SRL	SM30SRLB	SM30SRLC	Stainless Steel	2 m (6.5') 4-wire Cable		
SM30SRLQD	SM30SRLQDB	SM30SRLQDC		4-pin Mini-style QD		
<b>AC Receivers</b>						
SM2A30PRL	SM2A30PRLB	SM2A30PRLC	Plastic	2 m (6.5') 2-wire Cable	24 to 240V ac	SPST Solid-state, L.O.
SM2A30PRLQD	SM2A30PRLQDB	SM2A30PRLQDC		3-pin Mini-style QD†		
SM2A30SRL	SM2A30SRLB	SM2A30SRLC	Stainless Steel	2 m (6.5') 3-wire Cable		
SM2A30SRLQD	SM2A30SRLQDB	SM2A30SRLQDC		3-pin Mini-style QD†		
SM2A30PRLNC	SM2A30PRLNCB	SM2A30PRLNCC	Plastic	2 m (6.5') 2-wire Cable		SPST Solid-state, D.O.
SM2A30PRLNCQD	SM2A30PRLNCQDB	SM2A30PRLNCQDC		3-pin Mini-style QD†		
SM2A30SRLNC	SM2A30SRLNCB	SM2A30SRLNCC	Stainless Steel	2 m (6.5') 3-wire Cable		
SM2A30SRLNCQD	SM2A30SRLNCQDB	SM2A30SRLNCQDC		3-pin Mini-style QD†		

\* Any emitter and receiver shown here can be used together, if they have the same modulation frequency.

\*\* Standard 2 m (6.5') cable and integral QD models are listed. A model with a QD connector requires a mating cable; see page 4.

**9 m (30') cable:** add suffix “W/30” following the Frequency suffix of any cable model (e.g., **SM30PRLBW/30**).

† AC models with QD require SM30CC model cables; see page 4.

**Important: See Safety Warning on Back Page**



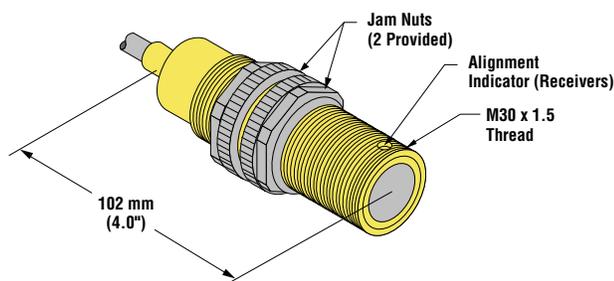
# SM30 Series 30 mm Sensors – for Especially Demanding Applications

## Specifications

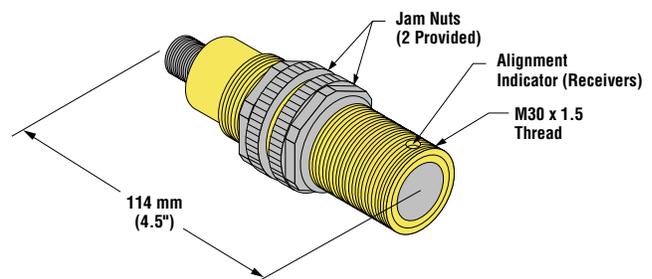
<b>Supply Voltage and Current</b>	<b>Emitters:</b> 12 to 240V ac (50/60 Hz) or 10-30V dc at 20 mA, 10% maximum ripple <b>DC Receivers:</b> 10 to 30V dc at 10 mA maximum (exclusive of load); 10% maximum ripple <b>AC Receivers:</b> 24 to 240V ac (50/60 Hz)
<b>Supply Protection Circuitry</b>	Protected against reverse polarity and transient voltages
<b>Output Configuration</b>	<b>DC Receivers:</b> Bi-Modal™ output (PNP sourcing or NPN sinking). Selection of light/dark operate and sourcing or sinking configuration dependent on hookup. <b>AC Receivers:</b> SPST solid-state switch; light operate (LO) or dark operate (DO) dependent on model.
<b>Output Rating</b>	<b>DC Receivers:</b> 250 mA continuous Output saturation voltage (PNP & NPN configuration) < 1 volt at 10 mA and < 2 volts at 250 mA Off-state leakage current < 10 microamps <b>AC Receivers:</b> Maximum steady-state load capability is 500 mA <b>Inrush capability:</b> 10 amps for 1 second (non-repeating) <b>Off-state leakage:</b> current < 1.7 mA rms <b>On-state voltage drop:</b> < 3.5 volts rms across a 500 mA load; < 5 volts rms across a 15 mA load
<b>Output Protection Circuitry</b>	Outputs of dc receivers are short circuit protected
<b>Output Response Time</b>	10 milliseconds on/off
<b>Repeatability</b>	<b>“A” frequency models:</b> 1 ms <b>“B” frequency models:</b> 1.5 ms <b>“C” frequency models:</b> 2.3 ms
<b>Indicators</b>	Internal red LED, visible through the lens or from side of the sensor. <b>Emitters:</b> Red “Power ON” indicator LED <b>DC Receivers:</b> Lights whenever receiver sees its modulated light source <b>AC Receivers:</b> Lights whenever receiver’s output is conducting
<b>Construction</b>	Fully epoxy-encapsulated tubular threaded housing, positive sealed at both ends, quad-ring sealed acrylic lens. <b>Plastic models:</b> 30 mm diameter thermoplastic polyester housing and jam nuts. <b>Stainless Steel models:</b> 30 mm diameter 303 stainless steel housing and jam nuts.
<b>Environmental Rating</b>	Exceeds NEMA 6P and IEC IP67 standards
<b>Connections</b>	PVC-jacketed 2 m or 9 m cables or Mini-style quick-disconnect (QD) fitting are available. QD cables are ordered separately. See page 4.
<b>Operating Conditions</b>	<b>Temperature:</b> -40° to +70° C (-40° to +158° F) <b>Relative humidity:</b> 90% at 50° C (non-condensing)
<b>Certifications</b>	

## Dimensions

### Cabled Models



### QD Models

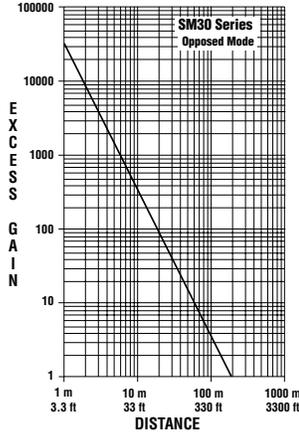


# SM30 Series 30 mm Sensors – for Especially Demanding Applications

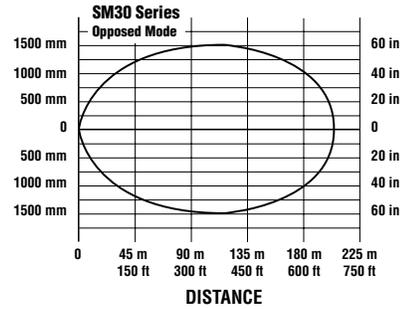


## Performance Curves

Excess Gain Curve

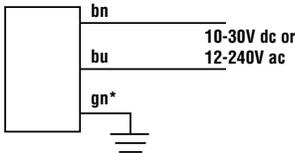


Beam Pattern

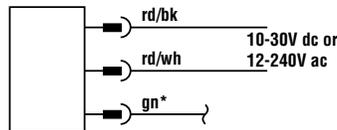


## Hookups

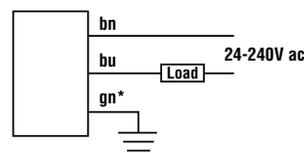
Emitters – Cabled



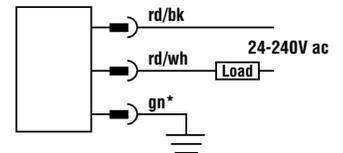
Emitters – QD



AC Receivers – Cabled



AC Receivers – QD

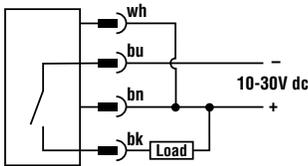


**NOTE:** AC emitters are not polarity-sensitive when powered by dc voltage.  
For QD emitters, use SM30CC model cables listed on page 4 in order to match cable colors.

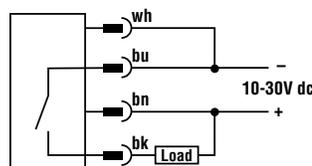
\*Connect green wire to earth ground whenever a stainless steel model is powered by ac voltage. (Cabled plastic models have no green wire.)

DC Receivers – NPN

Light Operate

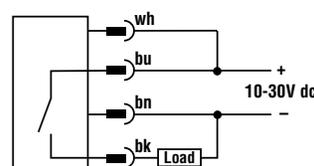


Dark Operate

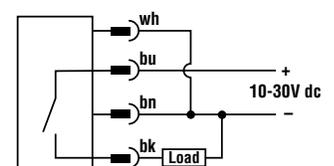


DC Receivers – PNP

Light Operate



Dark Operate



**NOTE:** Where QD hookups only are shown, cabled model hookups are functionally identical.



# SM30 Series 30 mm Sensors – for Especially Demanding Applications

## Quick-Disconnect (QD) Cables

Style	Model	Length	Connector	Use with	Pinout
3-pin Mini-Style	<b>SM30CC-306</b> <b>SM30CC-312</b>	2 m (6.5') 4 m (12')	Straight	Emitters and AC receivers	
4-pin Mini-Style	<b>MBCC-406</b> <b>MBCC-412</b> <b>MBCC-430</b>	2 m (6.5') 4 m (12') 9 m (30')		DC receivers	

## Apertures

Model	Description		
<b>APG30S</b>	Kit includes: a thread-on stainless steel housing, a flat glass lens, two quad-ring seals, plus 3 round and 3 slotted aperture disks		

## Mounting Brackets

	<b>SMB30A</b>	<ul style="list-style-type: none"> <li>• 30 mm, 12-gauge, stainless steel, right-angle bracket with a curved mounting slot for versatile orientation</li> <li>• Clearance for M6 (1/4") hardware</li> </ul>
	<b>SMB30C</b>	<ul style="list-style-type: none"> <li>• 30 mm split clamp bracket</li> <li>• Black reinforced thermoplastic polyester</li> <li>• Includes stainless steel mounting hardware</li> </ul>
	<b>SMB30MM</b>	<ul style="list-style-type: none"> <li>• 30 mm, 12-gauge, stainless steel, right-angle bracket with curved mounting slots for versatile orientation</li> <li>• Clearance for M6 (1/4") hardware</li> </ul>
	<b>SMB30SC</b>	<ul style="list-style-type: none"> <li>• 30 mm swivel bracket</li> <li>• Black reinforced thermoplastic polyester</li> <li>• Includes stainless steel mounting and swivel locking hardware</li> </ul>



### 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.

# SM30 Series EZ-BEAM Opposed Mode Sensor Pairs

Leakproof 30-mm dc barrel sensors for demanding industrial applications



- Economical opposed mode sensor pairs in leakproof 30-mm threaded VALOX® barrels; quad-ring sealed acrylic lenses
- Ideal for high-humidity and high-pressure washdown applications such as laundries, car washes, and food processing
- Sensing range of 60 meters (200 feet)
- Totally self-contained; 10 to 30 volt dc operation
- Complementary outputs: one normally open, one normally closed; choice of NPN (sinking) or PNP (sourcing) configuration, 150 mA max. (continuous, each output)
- One output may be used as a marginal signal alarm



These are economical opposed mode sensor pairs in leakproof (NEMA 6P, IEC IP67 rated) 30-mm threaded barrel VALOX® housings. Their size, shape, leakproof construction, mounting options, and price make them ideally suited for use in applications which undergo high-pressure washdown, such as car washes and food processing. Emitters and receivers must each be ordered separately (see below).

These sensors operate from 10-30V dc. Emitters draw 25 milliamps; receivers draw 20 milliamps maximum continuous, exclusive of load current. Receiver outputs are complementary: one normally open (N.O.) and one normally closed (N.C.), each capable of switching up to 150 milliamps (continuous). Receivers are available with either NPN sinking or PNP sourcing outputs. Models with NPN (current sinking) outputs are directly compatible as input devices to Banner logic modules, including all of the non-amplified MAXI-AMP™ and MICRO-AMP® modules.

The normally closed (N.C.) receiver output may be configured as a normally open (N.O.) alarm output (US patent no. 5087838) by reversing the receiver's hookup to the power supply. The alarm output conducts when the receiver's excess gain in the light condition drops below 1.5x. An easily-visible, internally-mounted red

indicator LED lights when the receiver "sees" the emitter's modulated light source, and flashes to indicate marginal excess gain (1-1.5x) in the light condition. The flashing LED corresponds to the "on" state of the alarm output.

SM30 Series EZ-BEAM opposed mode sensors are available with a 6-1/2 foot long attached PVC-covered cable or a 4-pin euro-type QD fitting. Mating QD cable must be purchased separately (see Specifications section).

Electronics are fully epoxy-encapsulated for maximum resistance to mechanical shock and vibration. Positive sealing at both ends of the sensor with no exposed epoxy interfaces eliminates all leakage paths (including capillary leakage). The acrylic lens is quad-ring sealed.

## Specifications and model listings:

**Sensing range:** 60 meters (200 feet).

**Sensing beam:** infrared, 880 nanometers.

**Supply voltage:** 10 to 30V dc at 25 mA for emitters (reverse polarity protected); 20 mA max. for receivers, exclusive of load. 10% max. ripple.

### Emitter model listing:

Use emitter SM306E (attached cable) or SM306EQ (euro-type QD fitting).

### Receiver model listing and output configurations:

Solid-state dc complementary outputs:

SM30SN6R = NPN sinking, N.O. & N.C. (attached cable)

SM30SN6RQ = NPN sinking, N.O. & N.C. (euro-type QD fitting)

SM30SP6R = PNP sourcing, N.O. & N.C. (attached cable)

SM30SP6RQ = PNP sourcing, N.O. & N.C. (euro-type QD fitting)

**Light operate:** N.O. output conducts when the receiver sees the emitter's modulated light source.

**Dark operate:** N.C. output conducts when the receiver does *not* see the emitter's modulated light source. The N.C. (normally closed) output may be used as an alarm output, depending upon hookup to the power supply.

**Receiver output rating:** 150 mA maximum (each) in standard hookup. Short-circuit protected.

**Off-state leakage current** <1 microamp at 30V dc.

**On-state saturation voltage** <1V at 10 mA dc; <1.5V at 150 mA dc.

**When wired for alarm output, the total load may not exceed 150 mA.**

**Response time:** 3 milliseconds "on"; 1.5 milliseconds "off". No false pulse on power-up (false pulse protection circuit causes a 100 millisecond delay on power-up). **Repeatability** 375 microseconds. Response time and repeatability are independent of signal strength.

**Indicators:** Receivers have red LED which lights whenever the receiver "sees" the emitter's modulated light source, and flashes to indicate marginal excess gain (1-1.5x) in the light condition. Emitters have red LED which lights to indicate DC POWER ON. Indicators are internally-mounted and are visible both through the sensor's lens from the front and through a sealed side viewing port near the lens.

**Construction:** M30x1.5 threaded VALOX® tubular housing with positive sealing at both ends. Completely sealed; epoxy-encapsulated circuitry. Quad-ring sealed acrylic lens. Exceeds NEMA 6P and IEC IP67 ratings. Two VALOX® jam nuts provided.

**Cabling:** 6-1/2 foot long (2 meter) attached PVC-covered 2-wire cable (emitters) and 4-wire cable (receivers), or 4-pin QD cable as follows:

**MQDC-415** cable for models with Q model suffix; 12 feet long, straight euro-type QD connector

**MQDC-415RA** cable for models with Q model suffix; 12 feet long, right-angled euro-type QD connector

**Vibration and mechanical shock:** meets Mil. Std. 202F requirements. Method 201A (Vibration: frequency 10 to 60 Hz, max., double amplitude 0.06-inch, maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation).

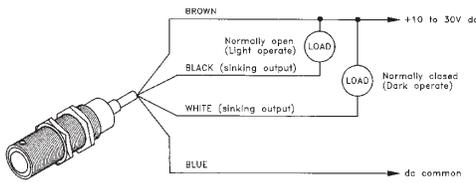
**Operating temperature range:** -40° to +70°C (-40° to 158°F).

**Maximum relative humidity** 90% at 50°C (non-condensing).

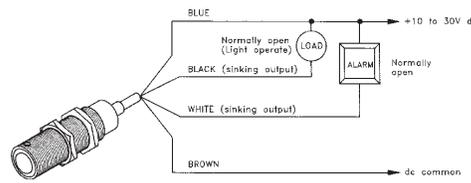
Lexan® and VALOX® are registered trademarks of General Electric Co.

**Hookup, SM30 Series dc opposed mode receivers**  
**NPN (sinking) models SM30SN6R and SM30SN6RQ\***  
*Standard hookup*

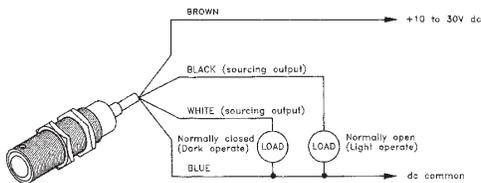
\* QD model, requires MQDC-415 or MQDC-415RA mating cable



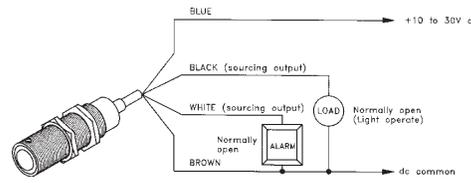
*Hookup for alarm output*



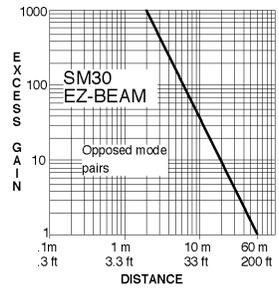
**PNP (sourcing) models SM30SP6R and SM30SP6RQ\***  
*Standard hookup*



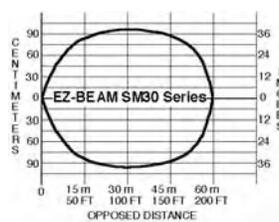
*Hookup for alarm output*



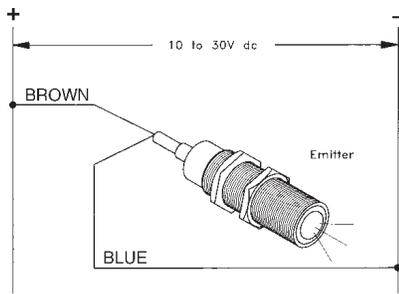
**Excess Gain Curve**



**Beam Pattern**



**Hookup, SM306E & SM306EQ\* dc emitters**



\* QD model requires MQDC-415 or MQDC-415RA mating cable

**Mounting Options for EZ-BEAM SM30 Series**

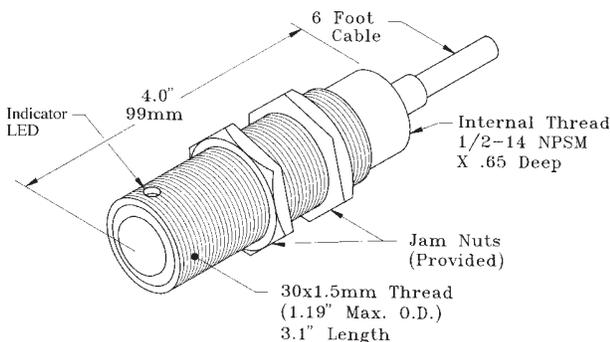
The **model SMB30A two axis mounting bracket** has a curved mounting slot for versatility and orientation. The SM30 Series sensor mounts to the bracket using a jam nut (supplied with the sensor). The curved mounting slot has clearance for 1/4-inch screws. Bracket material is 11-gauge stainless steel.

The **model SMB30S swivel-mount bracket** offers the ultimate in flexibility and convenience. This bracket mounts by its base. The SM30 threads into the "ball" of the bracket, which locks snugly in position when two clamping bolts are tightened. Bracket material is black VALOX®. Hardware is stainless steel, and mounting bolts are included.

The **model SMB30C split clamp** mounts to a flat surface and grips the SM30 sensor by its threaded barrel. This bracket is similar to the SMB30S, but without the adjustable ball.

**SM30 Series sensors may also be mounted in a 30-mm clearance hole**, using the supplied jam nuts.

**Dimensions, EZ-BEAM SM30 Series sensors**



Quick Disconnect fitting adds .35" (9 mm) in overall length to QD models.  
 QD models require model MQDC-415 or MQDC-415RA cable (cable must be ordered separately from sensor).



**WARNING** These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in either an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death.

Only MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

**WARRANTY:** Banner Engineering Corporation warrants its products to be free from defects for one year. Banner Engineering Corporation 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.

# SM30 Series EZ-BEAM Opposed Mode Sensor Pairs

Leakproof 30-mm ac barrel sensors for demanding industrial applications



- Economical opposed mode sensor pairs in leakproof 30-mm threaded VALOX® barrels; quad-ring sealed acrylic lenses
- Ideal for high-humidity and high-pressure washdown applications such as laundries, car washes, and food processing
- 20 to 250 volt ac operation; 3-wire receiver hookup
- Receiver output is solid-state AC switch; 300 milliamps maximum, continuous; choice of light- or dark-operate models



These are economical opposed mode sensor pairs in leakproof (NEMA 6P rated) 30-mm threaded barrel VALOX® housings. Their size, shape, leakproof construction, mounting options, and price make them ideally suited for use in applications which undergo high-pressure washdown, such as car washes and food processing.

SM30 Series EZ-BEAM ac opposed mode pairs operate from 20 to 250V ac. The receiver's solid-state output is capable of switching up to a 300-milliamp continuous load. Receivers are available with either light-operate or dark-operate output configuration. See **Specifications section, below, for model listing.** Any receiver may be paired with any emitter. Emitters and receivers must be ordered separately.

Receivers have a red LED indicator that glows steadily whenever the receiver "sees" the modulated light from the emitter and flashes to indicate marginal excess gain (1-1.5x) in the light condition. The LED is internally mounted to maintain the integrity of the leakproof design, and is visible both through the front of the lens and through a sealed window on the side of the barrel near the lens.

SM30 Series EZ-BEAM ac opposed mode sensor pairs are available with either a 6-

1/2 foot attached PVC-covered cable or a 4-pin micro-type quick disconnect (QD) connector. Mating QD cable must be ordered separately (see *Specifications*, below).

Electronics are fully epoxy-encapsulated for maximum resistance to mechanical shock and vibration. Positive sealing at both ends of the sensor with no exposed epoxy interfaces eliminates all leakage paths (including capillary leakage). The acrylic lens is quad-ring sealed.

The 30-mm threaded barrel housings of SM30 Series EZ-BEAM sensors enable them to be mounted in 30-mm clearance holes. A wide selection of mounting brackets is available.

## Specifications and Model Listings

**Sensing range:** 60 meters (200 feet).

**Sensing beam:** Infrared, 880 nanometers.

**Supply voltage:** 20 to 250V ac (50/60 Hz).

**Supply current:** Average current 20 mA.

Peak current 200 mA at 20V ac, 500 mA at 120V ac, 750 mA at 250V ac.

### Model listing and output configurations:

Use either emitter: **SM303E** (6-1/2 foot attached cable) or **SM303EQ1** (micro-type QD fitting).

Receivers; solid-state ac output:

Model **SM30AW3R** = light-operate (6-1/2 foot attached cable)

Model **SM30AW3RQ1** = light-operate (micro-type QD fitting)

Model **SM30RW3R** = dark-operate (6-1/2 foot attached cable)

Model **SM30RW3RQ1** = dark-operate (micro-type QD fitting)

**Light operate models:** Output conducts when the receiver sees the emitter's modulated light source.

**Dark operate models:** Output conducts when sensing beam is blocked.

**Output rating:** 300 mA maximum (continuous).

**Inrush capability** 1 amp for 20 milliseconds, non-repetitive.

**Off-state leakage current** <50 microamps.

**On-state voltage drop** 3V at 300 mA ac; 2V at 15 mA ac.

**Response time:** 16 milliseconds "on"; 8 milliseconds "off"; independent of signal strength. No false pulse on power-up (false pulse protection circuit causes a 100 millisecond delay on power-up).

**Repeatability** 2 milliseconds; independent of signal strength.

### Indicators:

**Receivers** have internally-mounted red LED that lights steadily whenever the receiver "sees" the emitter's modulated light source, and flashes to indicate marginal excess gain (1-1.5x) in the light condition. LED is visible both through the receiver's lens from the front and through a sealed window on the side of the barrel near the lens.

**Emitters** have internally-mounted red LED that lights steadily to indicate AC POWER ON. LED is visible both through the emitter's lens from the front and through a sealed window on the side of the barrel near the lens.

### Construction:

M30x1.5 threaded VALOX® tubular housing with positive sealing at both ends. Completely sealed; epoxy-encapsulated circuitry. Quad-ring sealed acrylic lens. Exceeds NEMA 6P and IEC IP67 ratings. Two VALOX® jamnuts provided.

**Cabling:** 6-1/2 foot long (2 meter) attached PVC-covered 2-wire cable (emitters) and 3-wire cable (receivers), or 4-pin QD cable as follows:

**MQAC-415** cable for models w/**Q1** suffix; 12 feet long, straight micro-type QD connector

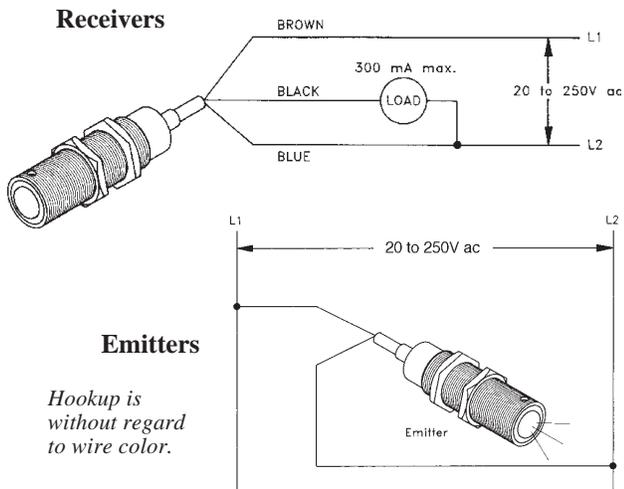
**MQAC-415RA** cable for models with **Q1** suffix; 12 feet long, right-angled micro-type QD connector

**Vibration and mechanical shock:** meets Mil. Std. 202F requirements. Method 201A (Vibration: frequency 10 to 60 Hz, max., double amplitude 0.06-inch, maximum acceleration 10G). Method 213B conditions H & I (Shock: 75G with unit operating; 100G for non-operation).

**Operating temperature range:** -40° to +70°C (-40° to 158°F).

**Maximum relative humidity** 90% at 50°C (non-condensing).

## Hookup, SM30 Series EZ-BEAM ac opposed mode sensors (cabled models)



Sensors with **Q1** model suffix require **QD** (Quick Disconnect) cable. See Specifications section for information.

### NOTE:

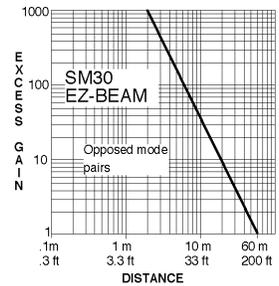
**Receivers SM30AW3R and SM30AW3RQ1** are light-operate. Output conducts when the receiver sees the emitter's modulated beam.

**Receivers SM30RW3R and SM30RW3RQ1** are dark-operate. Output conducts when the receiver does not see the emitter's modulated beam.

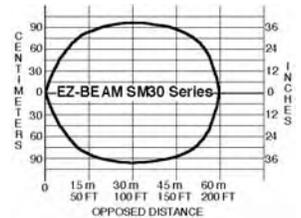
Any receiver may be paired with any emitter (**SM303E** or **SM303EQ1**).

Hookup information for **QD** sensors is provided with the sensor.

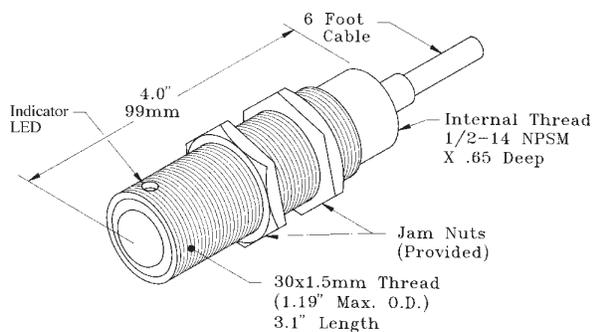
### Excess Gain Curve



### Beam Pattern



## Dimensions, EZ-BEAM SM30 Series sensors



Quick Disconnect fitting adds .35" (9 mm) in overall length to QD models. QD models require Quick Disconnect cable (order separately; see Specifications section for information).

## Mounting Options for EZ-BEAM S30 Series Sensors

The **model SMB30A right-angled mounting bracket** (not shown) has a curved mounting slot for versatility and orientation. The SM30 Series sensor mounts to the bracket using a jam nut (supplied with the sensor). The curved mounting slot has clearance for 1/4-inch screws. Bracket material is 11-gauge stainless steel.

The **model SMB30S swivel-mount bracket** (below, left) offers the ultimate in flexibility and convenience. This bracket mounts by its base. The SM30 threads into the adjustable captive "ball" of the bracket, which locks snugly in position when two clamping bolts are tightened. Bracket material is black VALOX®. Hardware is stainless steel, and mounting bolts are included.

The **model SMB30C split clamp** (not shown) mounts to a flat surface and grips the SM30 sensor by its threaded barrel. This bracket is similar to the SMB30S, but without the adjustable ball.

**SM30 Series sensors may also be mounted in a 30-mm clearance hole**, using the supplied jam nuts.

### SMB30S Swivel Mounting Bracket



**WARNING** These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in *either* an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death.

Only MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

**WARRANTY:** Banner Engineering Corporation warrants its products to be free from defects for one year. Banner Engineering Corporation 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.

# SMI30 Series Intrinsically Safe Sensors

Rugged, NEMA 6P-plus sensors in 30 mm threaded PBT barrel housings



more sensors, more solutions

- Designed for use with approved amplifiers and intrinsically safe barriers in explosive environments
- Very high excess gain; 460 ft. range (standard 10 ms models)
- Fast 1 ms response models (200 ft. range) available by special order
- Totally sealed, self-contained, intrinsically safe threaded-barrel opposed mode sensor pairs in rugged 30 mm PBT housings
- Highly immune to noise: the best noise immunity of any self-contained emitter/receiver pair
- Internal alignment indicator LED may be viewed either from the side or from the front of the receiver through the lens
- Integral mini-type 3-pin "QD" (quick-disconnect) connector

Banner SMI30 Series intrinsically safe barrel sensors are extremely rugged and powerful opposed mode infrared sensor pairs designed for the most demanding industrial applications. Their high excess gain (460 foot range) provides enough sensing power to penetrate the heaviest contamination (excess gain curve, page 5). Electronics are fully epoxy-encapsulated for maximum resistance to mechanical shock and vibration. Positive sealing at both ends, with no exposed epoxy interfaces, eliminates all leak paths (including capillary leakage). Construction exceeds NEMA 6P (IEC IP 67) standards. Sensors are approximately 1.2" in diameter by 4" long.

SMI30 series dc receivers operate from 10 to 30V dc. These sensors carry entity approval from **Factory Mutual Research** and **CSA** for intrinsically safe operation in hazardous atmospheres. SMI30 Series sensors are certified as being intrinsically safe when used with approved intrinsic safety barriers. SMI30 Series sensors are suitable for intrinsically safe use in hazardous locations as defined by Article 500 of the National Electrical Code (see classifications, above right). SMI30 Series sensors are also certified by Factory Mutual and CSA as non-incendive devices when used in Division 2 locations (except Groups E and F) without intrinsic safety barriers.

SMI30 Series sensors may be wired for either two- or three-wire current-sinking operation. In the three-wire hookup, which requires two intrinsic-safety barriers (or one dual barrier), the sink current is 15mA. The two-wire hookup, which requires one barrier, sinks  $\leq 10\text{mA}$  (OFF state) and  $\geq 20\text{mA}$  (ON state).

Intrinsic safety barriers are available from Banner (see page 5). Current trip point amplifier CI3RC2 is also offered (page 4). Several mounting brackets are available (see page 6).

(continued on page 2)

**Banner SMI30 Series Intrinsically Safe Sensors are designed to meet the following standards:**

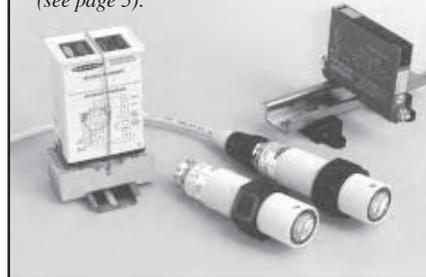
UL 913	CSA 22.2 #142-M1987	FM 3610
UL 1604	CSA 22.2 #157-92	FM3611
UL 508	CSA 22.2 #213-M1987	



**WARNING** These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in *either* an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death. Only MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

SMI30 Series sensors, shown with Intrinsic Safety Kit (see page 5).



KEMA No. 03ATEX1441

II 2 G E Ex ib IIC T5



ENTITY - I.S. CL I, II, III  
DIV. 1 GP A, B, C, D, E, F, G  
N.I. CL I, II, III  
DIV. 2 GP A, B, C, D, G



INTRINSICALLY SAFE/  
SECURITE INTRINSEQUE  
CL I DIV. 1 GP A, B, C, D  
CL I DIV. 2 GP A, B, C, D

## Specifications

### SUPPLY VOLTAGE:

**Emitters:** 10 to 30V dc at 25mA.

**Receivers:** 10 to 30V dc at 15mA max. Division 1 use, with barriers, requires *minimum system supply voltage* of 10V. See hookup information, pages 3-4.

### OUTPUT:

**Receivers only:** Current sinking NPN open-collector transistor. Three-wire hookup sinks 15mA maximum continuous, 10-30V dc. Two-wire hookup sinks  $\leq 10\text{mA}$  (OFF state) and  $\geq 20\text{mA}$  (ON state), 10-30V dc. Outputs are short-circuit protected.

**SENSING BEAM:** 880 nanometers, infrared; effective beam size 0.75" diameter.

**RESPONSE TIME:** 10 milliseconds on/off (models with 1ms response are available by special order)

**REPEATABILITY:** See chart, page 5

*Response Time* and *Repeatability* specifications are independent of signal strength.

**INDICATOR:** Internal red LED lights whenever the receiver sees its modulated light source. *Emitters* have red "power on" indicator LED. All indicators are visible through the lens or from side of the sensor.

**CONSTRUCTION:** NEMA 6P, IEC IP67.

30mm diameter tubular threaded PBT housing, positive sealing at both ends; quad-ring sealed acrylic lens. Electronics are fully epoxy encapsulated. Two PBT jam nuts are provided.

**CABLE:** Three-wire mini-type QD cable (12 ft. long model SMICC-312 or 30 ft. long model SMICC-330). Cable electrical properties: 40pf/ft.; .20 $\mu\text{H}$ /ft. Order cable separately from sensor.

### MOUNTING ALTERNATIVES:

30mm clearance hole;

SMB30C split clamp mounting bracket (page 6);

SMB30MM two-axis mounting bracket (page 6);

SMB30S swivel mounting bracket (page 6).

### OPERATING TEMPERATURE RANGE:

-40 to +70°C (-40 to +18°F).

# SMI30 Series Intrinsically Safe Sensors

SMI30 Series receivers have a red LED alignment indicator that lights whenever the receiver "sees" its modulated light source. Emitters have a red LED to indicate "power on". All LED indicators are mounted internally to preserve the waterproof integrity of the sensor housing, and are visible from both the side and front of the sensor through the sensor's quad-ring sealed acrylic lens.

The innovative circuitry used in SMI30 Series emitters and receivers provides the best noise immunity of any self-contained opposed mode sensor pair. For applications where optical crosstalk between sensors might be a problem, SMI30 Series emitters and receivers are available with a choice of three modulation frequencies (frequency "A", frequency "B", or frequency "C"). This makes it possible to use high-powered sensor pairs of different frequencies in close proximity to each other without crosstalk. (NOTE: frequency "A" is standard; frequencies "B" and "C" are available by special order. An emitter and its receiver must be of the same modulation frequency.) See the chart on page 5 for a summary of models.

Each unit is supplied with two hexagonal jam nuts. A 30mm clearance hole is required for mounting, and mounting bracket models SMB30MM, SMB30S, and SMB30C are available (page 6). All models have a built-in standard quick-disconnect ("QD") connector. "QD" models mate with 12-foot long model SMICC-312 or 30-foot long model SMICC-330 mini-type QD cable (sold separately from sensor).

## Hookup Information

SMI30 Series sensors are certified intrinsically safe ONLY when used with certified energy-limiting intrinsically safe barriers. Emitter units use a two-wire hookup (there is no output connection). Note from the hookup diagram (page 3) that the receiver installation may be made using either a single barrier (2-wire hookup) or with a dual channel barrier (3-wire hookup). In the 2-wire configuration, the sensor acts as a current sink, drawing less than 10mA in the OFF state and more than 20mA in the ON state. The customer must provide a current sensing device ("current sensor" in the diagram) to convert the current to a logic level. SMI30 Series sensors may be used with Banner Current Amplifier Control Module CI3RC2.

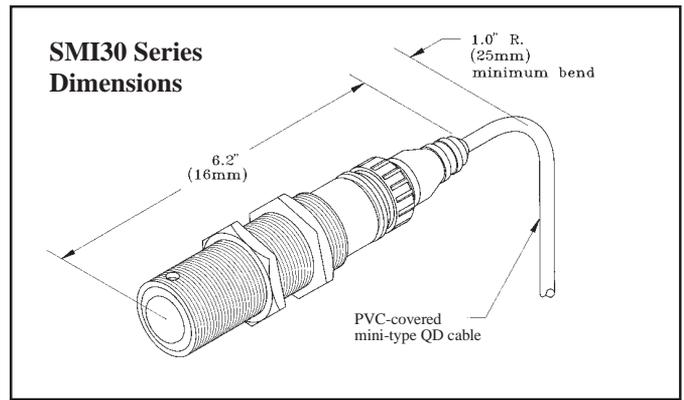
The CI3RC2 module may be purchased (with model RS-11 module socket, one dual-channel barrier, and DIN rail barrier mounts included) by specifying kit model CI2BK-2. One dual-channel intrinsic barrier (alone) may be ordered by specifying model CI2B-1. See the photo, page 5.

In the 3-wire configuration, the output may be used directly to control loads of less than 15mA.

In selecting the barrier, it is important to consider the barrier's resistance. *The sensors must have at least 10 volts across the brown and blue power leads for proper operation, and the barrier will cause a voltage drop due to its resistance.* The formula that determines how much resistance is allowed is:

$$R = 40 (\text{supply voltage} - 10 \text{ volts}).$$

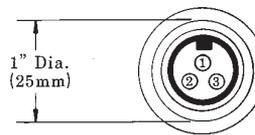
If the supply voltage is 24V dc, then the maximum resistance is 560 ohms. If the supply voltage is 18V dc, then the maximum resistance is 320 ohms. This includes the resistance of any current sensing device used (in the 2-wire configuration), so the barrier resistance must be further reduced by the current sensor resistance.



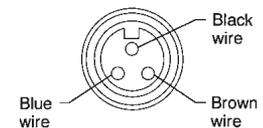
## MBCC Series QD Cable (order separately)

**SMICC-312** (12 feet, p/n 36356) or **SMICC-330** (30 feet, p/n 36357)  
3-wire QD cable for emitters and receivers

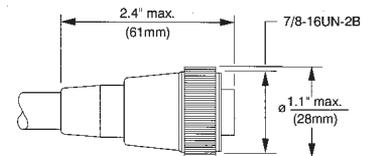
Sensor end (male connector)



Cable end (female connector)



Cable connector (female, for SMICC cable, side view)



Note that, in the 3-wire hookup, the barrier is in series with the load. This results in an apparent saturation voltage of the output that is higher than the sensor output by the amount of  $I \times R$  (current times voltage) drop through the barrier.

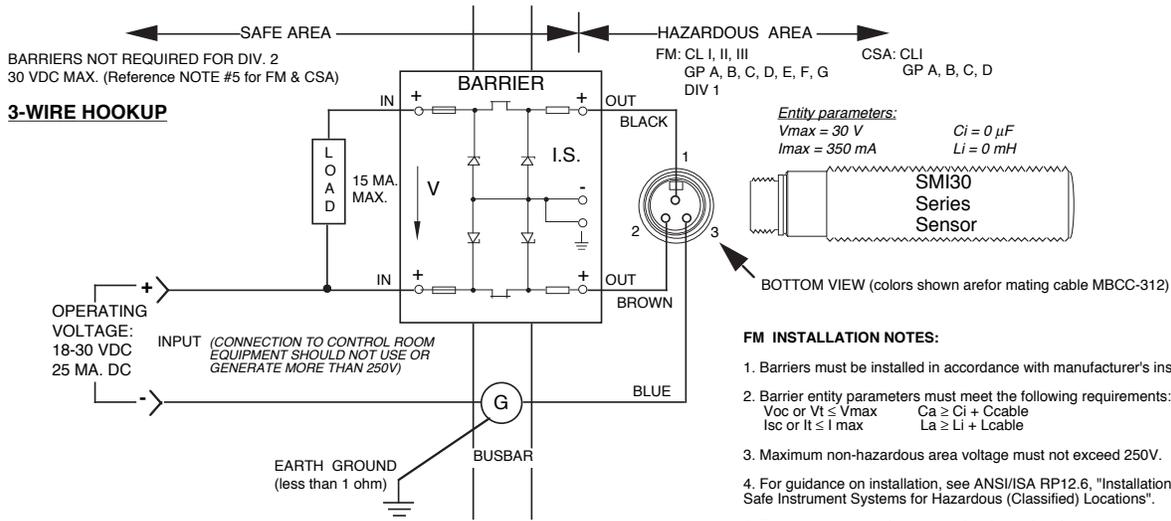
Emitters use the 2-wire hookup; receivers use either 2- or 3-wire hookup. See the chart (page 5) for a summary of models.

Barriers are generally classified as either "positive input" or "negative input". SMI30 Series intrinsically safe sensors require "positive input" barriers for both supply and load. The blue (negative supply) lead of the sensor is normally connected to the ground terminal of the barrier.

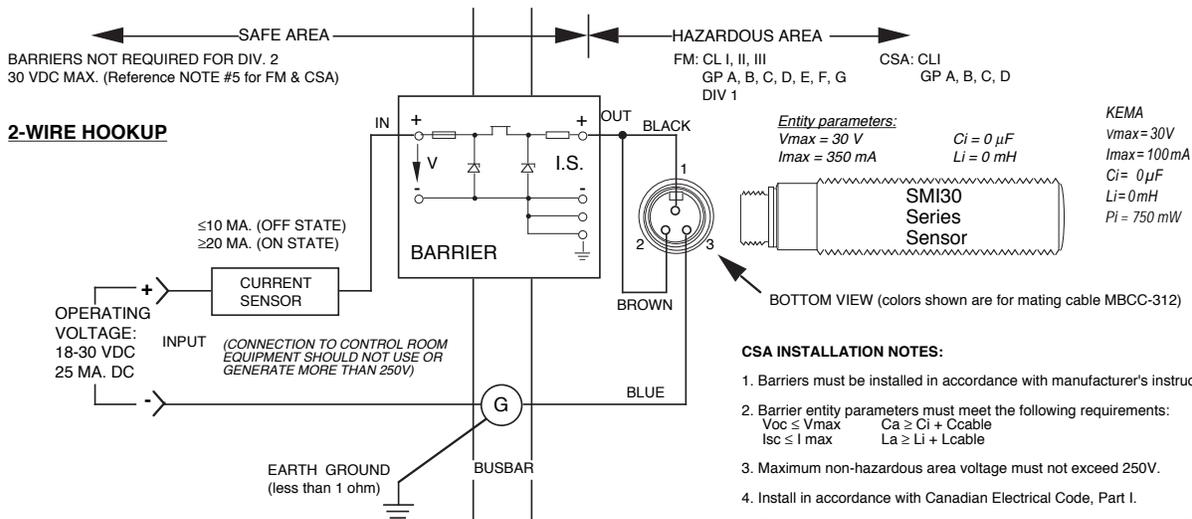
The user of this equipment is responsible for proper installation and maintenance of the equipment, and must conform with the certification requirements relating to barriers and to maximum allowable capacitance and inductance of the field wiring. If you are in doubt about these requirements, our applications engineers can refer you to the appropriate authority.

# SMI30 Series Intrinsically Safe Sensors

## Hookup Diagrams



NOTE: Emitters have no output connection (no connection to black wire)



**KEMA**  
 $v_{max} = 30\text{V}$   
 $I_{max} = 100\text{mA}$   
 $C_i = 0\ \mu\text{F}$   
 $L_i = 0\text{mH}$   
 $P_i = 750\text{mW}$

**CSA INSTALLATION NOTES:**

- Barriers must be installed in accordance with manufacturer's instructions.
- Barrier entity parameters must meet the following requirements:  
 $V_{oc} \leq V_{max}$      $C_a \geq C_i + C_{cable}$   
 $I_{sc} \leq I_{max}$      $L_a \geq L_i + L_{cable}$
- Maximum non-hazardous area voltage must not exceed 250V.
- Install in accordance with Canadian Electrical Code, Part I.
- The sensors are suitable for installation without barriers in Class I Div. 2 Groups A, B, C, D when installed in (or through the wall of) a suitable enclosure with provision for connection of rigid metal conduit per the Canadian Electrical Code, as acceptable to the local inspection authority having jurisdiction.

In Div. 2 installations (without barriers), observe the following warnings:

**WARNING: EXPLOSION HAZARD**

DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

**AVERTISSEMENT: RISQUE D'EXPLOSION**

AVANT DE DECONNECTER L'EQUIPEMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENTS EST DESIGNÉ NON DANGEREUX.

6. If barriers with Volt/Ohm parameters are used, the following parameters shall apply:

One Single-Channel Barrier Systems  
- one 28 V (max), 300  $\Omega$  (min)

Two Single-Channel Barrier or One Dual-Channel Systems  
- two 28 V (max), 600  $\Omega$  (min)  
- one 28 V (max), 300  $\Omega$  (min) and one 10 V (max), 50  $\Omega$  (min)  
- one 28 V (max), 300  $\Omega$  (min) and one 28 V diode return

Sensor Models		Frequency "A"	Frequency "B"	Frequency "C"
10ms Models	Emitter	<b>SMI306EQ</b>	<b>SMI306EBQ</b>	<b>SMI306ECQ</b>
	Receiver Lt. Opr.	<b>SMI30AN6RQ</b>	<b>SMI30AN6RBQ</b>	<b>SMI30AN6RCQ</b>
	Receiver Dk. Opr.	<b>SMI30RN6RQ</b>	<b>SMI30RN6RBQ</b>	<b>SMI30RN6RCQ</b>
1ms Models	Emitter	<b>SMI306EYQ</b>	_____	<b>SMI306EYCQ</b>
	Receiver Lt. Opr.	<b>SMI30AN6RYQ</b>	_____	<b>SMI30AN6RYCQ</b>
	Receiver Dk. Opr.	<b>SMI30RN6RYQ</b>	_____	<b>SMI30RN6RYCQ</b>

NO CHANGES MAY BE MADE TO THIS DRAWING WITHOUT PRIOR APPROVAL OF FACTORY MUTUAL AND CSA



Banner Engineering Corp.  
9714 Tenth Avenue North  
Minneapolis, MN 55441

MANUFACTURING DRAWING #35392 rev. A

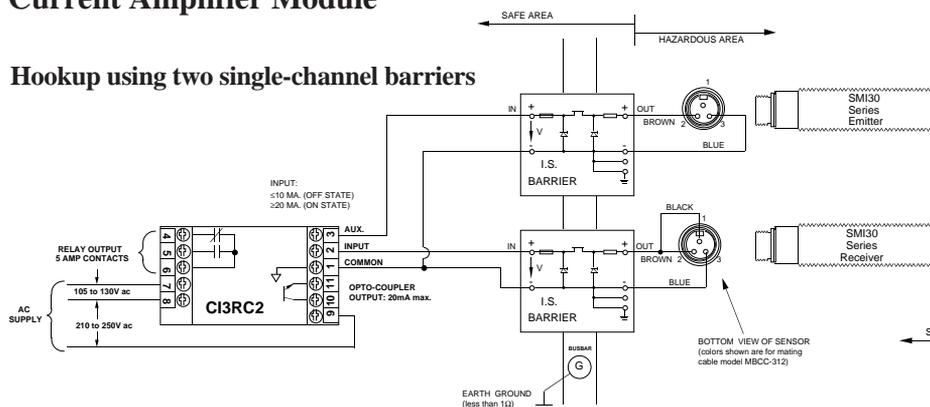
**HOOKUP DIAGRAM: SMI30 SERIES  
INTRINSICALLY-SAFE SENSORS**

# CI3RC2 Current Amplifier Module

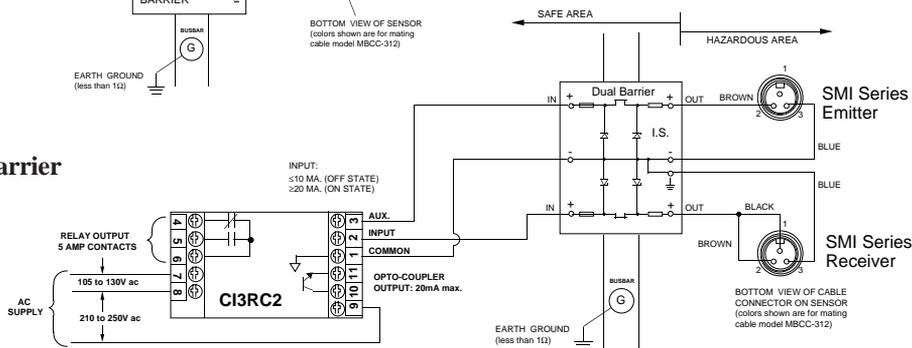
## Hookup to Banner MAXI-AMP CI3RC2 Current Amplifier Module

(see the data sheet packed with the CI3RC2 for more information)

### Hookup using two single-channel barriers



### Hookup using one dual-channel barrier



## MAXI-AMP™ CI3RC2 Module

Banner MAXI-AMP module model CI3RC2 (part number 36606) is a self-contained module which converts the current output signal of an SMI30 Series sensor to a trip point switch.

Both sensors of the opposed mode pair are wired to model CI3RC2 using the two-wire hookup, which requires the use of two single channel or one dual channel intrinsic safety barrier(s). In this mode, the SMI30 receiver sinks  $\leq 10$  milliamps in the "OFF" state and  $\geq 20$  milliamps in the "ON" state. The CI3RC2 senses this current change and switches internal relays which are easily wired to most loads and/or additional control circuitry.

Model CI3RC2 is powered by either 105-130 or 210-250V ac. The CI3RC2 supplies power to operate both the emitter and receiver.

Inputs are protected against short circuits. Built-in circuit diagnostics indicate an overload of either input by pulsing an LED status light.

The CI3RC2 module has two isolated output switches. There is a 5 amp rated SPDT electromechanical relay, and a solid-state transistor switch which may be used for logic-level interfaces.

### SPECIFICATIONS, CI3RC2

**SUPPLY VOLTAGE:** 105 to 130 or 210 to 250V ac, 50/60 Hz (8VA).

#### OUTPUT CONFIGURATION:

*SPDT electromechanical relay:*

Contact rating: 250V ac max., 24V dc max., 5 amps max. (resistive load), 1/10 HP at 240V ac. Install transient suppressor (MOV) across contacts that switch inductive loads.

Closure time: 10 milliseconds max.

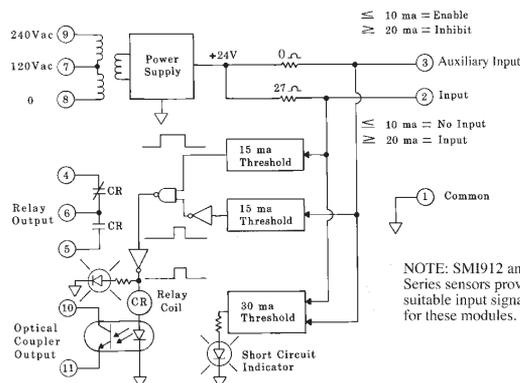
Release time: 10 milliseconds max.

Maximum switching speed: 20 operations/second.

Mechanical life: 20,000,000 operations

*Solid-state dc relay:* SPST optically-coupled transistor; 30V dc max., 20mA max.

### Functional Schematic, CI3RC2



NOTE: SMI912 and SMI30 Series sensors provide suitable input signals for these modules.

#### INPUTS:

Trip point for output "OFF":  $\leq 10$  milliamps

Trip point for output "ON":  $\geq 20$  milliamps

Trip point range for input overload indication:  $30\text{mA} \leq I \leq 80\text{mA}$ .

**INDICATOR LEDs:** Status indicator for OUTPUT "ON" and INPUT overload/short.

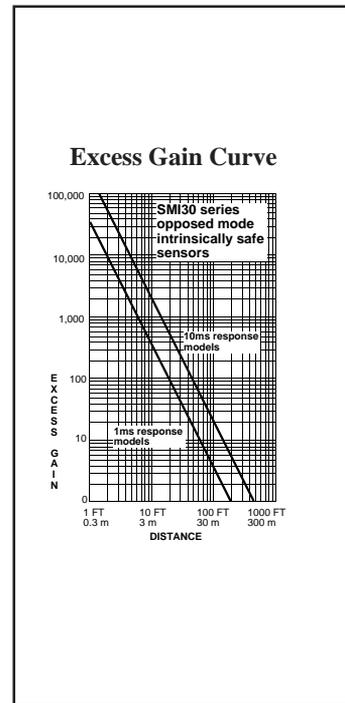
**OPERATING TEMPERATURE:** 0 to 50°C (32 to 122°F).

**CONSTRUCTION:** rugged NORYL® polyphenylene oxide (PPO™) housing, 1.6" x 2.3" x 4". Standard round-pin 11-pole base. Use RS-11 socket or equivalent.

# SMI30 Series Intrinsically Safe Sensors

## Models: part numbers, frequencies, and response times

SMI30 Series Intrinsically Safe Sensors and Part Numbers				
Sensor Models		Frequency "A" (standard)	Frequency "B" (special order)	Frequency "C" (special order)
Models with 10 ms response time	Emitters	Repeatability: 1 ms <b>SMI306EQ</b> (35268)	Repeatability: 1.6 ms <b>SMI306EBQ</b> (35269)	Repeatability: 2.3 ms <b>SMI306ECQ</b> (35270)
	Receivers (light operate)	<b>SMI30AN6RQ</b> (35271)	<b>SMI30AN6RBQ</b> (35272)	<b>SMI30AN6RCQ</b> (35273)
	Receivers (dark operate)	<b>SMI30RN6RQ</b> (35274)	<b>SMI30RN6RBQ</b> (35275)	<b>SMI30RN6RCQ</b> (35276)
Models with 1 ms response time	Emitters	Repeatability: 360 μs <b>SMI306EYQ</b> (35277)	—	Repeatability: 210 μs <b>SMI306EYCQ</b> (35278)
	Receivers (light operate)	<b>SMI30AN6RYQ</b> (35279)	—	<b>SMI30AN6RYCQ</b> (35280)
	Receivers (dark operate)	<b>SMI30RN6RYQ</b> (35281)	—	<b>SMI30RN6RYCQ</b> (35282)



## Accessories: apertures, barriers, kits, and mounting brackets

### APG30S Aperture Kit for SM30 Series Sensors (27533)

These new water-tight apertures for SM30 Series sensors may be used to size and shape the effective beam or to limit excess gain for avoiding "burn-through" effects. Apertures are sold as a kit, which includes a thread-on stainless steel housing, a flat glass lens, two quad-ring seals, and 3 round and 3 slotted aperture disks.



The stainless steel aperture housing functions equally well with VALOX® and stainless steel sensor models. The glass lens is useful for protecting the SM30's acrylic lens against substances that are hostile to acrylics, such as concentrated acids and alkalis and industrial solvents.

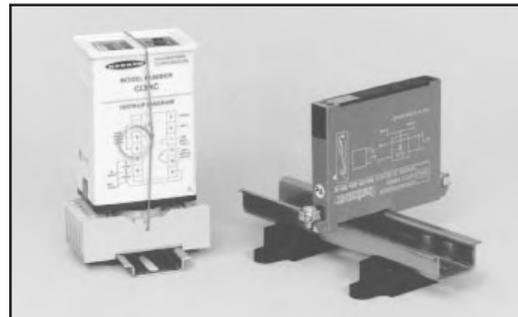
Aperture sizes include the following.

- Round: .06", .12", and .70" diameter
- Slotted: .04", .10", and .20" wide

### Intrinsic Safety Kits for use with Intrinsic Safe Sensors

**Kit CI2BK-1** (36860) includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount, and one single-channel intrinsically safe barrier.

**Kit CI2BK-2** (36605) includes a CI3RC2 current amplifier, one RS-11 socket, one DIN-rail mount, and one dual-channel intrinsically safe barrier.



Barriers are available separately:

- Single channel barrier (model CIB-1, p/n 27030)
- Dual channel barrier (model CI2B-1, p/n 36865)

# Mounting Brackets

**Accessory mounting bracket model SMB30MM (27162)** has curved mounting slots for versatility in mounting and orientation. The sensor mounts to the bracket using the two jam nuts provided. Bracket material is 11-gauge zinc-plated steel. Curved mounting slots have clearance for 1/4" screws.

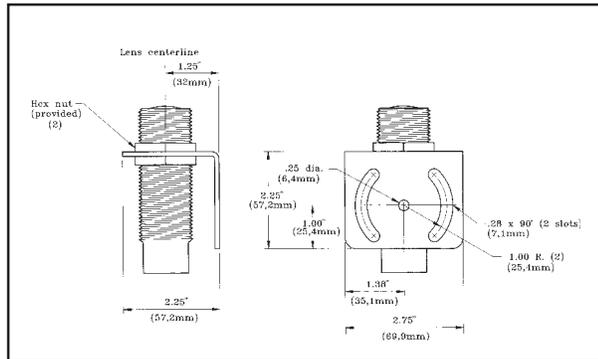
**The model SMB30S swivel-mount bracket (33204, right)** offers the ultimate in mounting versatility for SMI30s and other sensors with M30 x 1,5 threads. The SMI30 threads into the adjustable captive ball of the bracket, which is then held firmly in place when two locking bolts are tightened. Bracket material is black PBT. Stainless steel mounting hardware is included.

**Split Clamp Bracket model SMB30C (32636, right)** is similar to the SMB30S, but without the adjustable captive swivel ball. It grips an M30x1,5 threaded sensor by its threaded barrel (S30 EZ-BEAM sensor shown). Bracket material is black PBT. Stainless steel mounting hardware is included.

## Special Conditions for Safe Use

Parts of the enclosure are non-conducting and may generate an ignition-capable level of ESD. Cleaning of the equipment shall be done only with a damp cloth.

**SMB30MM Mounting Bracket (27162)**



**SMB30S Swivel Bracket (33204)**



**SMB30C Split Clamp (32636)**



**WARRANTY:** Banner Engineering Corporation warrants its products to be free from defects for one year. Banner Engineering Corporation 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 use of Banner products. This warranty is in lieu of any other warranty either expressed or implied.