BANNER®
more sensors, more solutions

WORLD-BEAM® QS30 – DC Voltage

Compact, self-contained photoelectric sensors in universal-style housing

Features

- Advanced one-piece photoelectric sensors with exceptional long-range optical performance
- Compact housing with mounting versatility, via its popular 30 mm threaded barrel or side-mount holes
- 10 to 30V dc operation with bipolar discrete outputs, NPN and PNP
- Selectable Light or Dark Operate, depending on hookup
- Tough ABS/polycarbonate blend housing is rated to IEC IP67; NEMA 6
- Easy-to-see sensor status indicators: two status LEDs visible from 360°; extra-large Output indicator on back of sensor housing (except emitters) visible from long distance
- Opposed, retroreflective, polarized retroreflective, diffuse and fixed-field (200, 400, or 600 mm cutoff) models available
- Retroreflective, polarized retroreflective, and diffuse models have potentiometer on back of housing for easy sensor range adjustment
- Choose 2 m integral cable or Euro-style integral QD models

Models

Sensing Mode		Model*	Range	Output
Opposed	875 nm Infrared Effective Beam: 18 mm (0.7")	**QS30E** emitter	60 m (200')	–
		QS30R receiver		Bipolar NPN/PNP
Polarized Retro	630 nm Visible Red	**QS30LP**	8 m (26')†	
Retro	630 nm Visible Red	**QS30LV**	12 m (40')†	

Sensing Mode		Model*	Range	Output
Diffuse	940 nm Infrared	**QS30D**	1 m (3.3')	Bipolar NPN/PNP
Fixed-Field	680 nm Visible Red	**QS30FF200**	200 mm (8")	
		QS30FF400	400 mm (16")	
		QS30FF600	600 mm (24")	

*Only standard 2 m (6.5') cable models are listed. For 9 m (30') integral cable, add suffix **"W/30"** to the model number (e.g., **QS30E W/30**).
QD models: For 5-pin integral Euro-style QD, add suffix "**Q**" (e.g., **QS30EQ**).
† Range is specified using a model **BRT-84** retroreflector.

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.

Fixed-Field Mode Overview

QS30 Series self-contained fixed-field sensors are small, powerful, visible red diffuse mode sensors with far-limit cutoff (a type of background suppression). Their high excess gain and fixed-field technology allow them to detect objects of low reflectivity that are directly in front of another surface, while ignoring the surface in the background.

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

Fixed-Field Sensing – Theory of Operation

In operation, the QS30FF compares the reflections of its emitted light beam (E) from an object back to the sensor's two differently-aimed detectors R1 and R2 (see Figure 2). If the near detector (R1) light signal is stronger than the far detector (R2) light signal (see object A, closer than the cutoff distance), the sensor responds to the object. If the far detector (R2) light signal is stronger than the near detector (R1) light signal (see object B, object beyond the cutoff distance), the sensor ignores the object.

The cutoff distance for model QS30FF sensors is fixed at 200, 400 or 600 millimeters (8", 16", or 24"). Objects lying beyond the cutoff distance are ignored, even if they are highly reflective. However, it is possible to falsely detect a background object, under certain conditions (see Background Reflectivity and Placement).

In the drawings and discussion on these pages, the letters E, R1, and R2 identify how the sensor's three optical elements (Emitter "E", Near Detector "R1", and Far Detector "R2") line up across the face of the sensor. The location of these elements defines the sensing axis (see Figure 2). The sensing axis becomes important in certain situations, such as those illustrated in Figures 5 and 6.

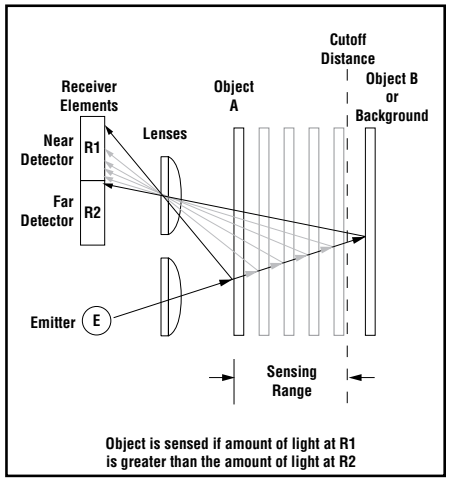


Figure 1. Fixed-field concept

Sensor Setup

Sensing Reliability

For best sensing reliability, the sensor-to-object distance should be positioned to maximize excess gain. The excess gain curves for these products are shown on page 5. Sensing at higher excess gains will make maximum use of each sensor's available sensing power. The background must be placed beyond the cutoff distance; more reflective backgrounds must be placed further back. Following these two guidelines will improve sensing reliability.

Background Reflectivity and Placement

Avoid mirror-like backgrounds that produce specular reflections. False sensor response will occur if a background surface reflects the sensor's light more strongly to the near detector, or "sensing" detector (R1) than to the far detector, or "cutoff" detector (R2). The result is a false ON condition (Figure 3). Use of a diffusely-reflective (matte) background will cure this problem. Other possible solutions are to angle the sensor or angle the background (in any plane) so the background does not reflect light back to the sensor (see Figure 4). Position the background as far beyond the cutoff distance as possible.

An object beyond the cutoff distance, either stationary (and when positioned as shown in Figure 5), or if it moves past the face of the sensor in a direction perpendicular to the sensing axis, can cause unwanted triggering of the sensor if it reflects more light to the near detector than to the far detector. The problem is easily remedied by rotating the sensor 90° (Figure 6). The object then reflects the R1 and R2 fields equally, resulting in no false triggering. A better solution, if possible, may be to reposition the object or the sensor.

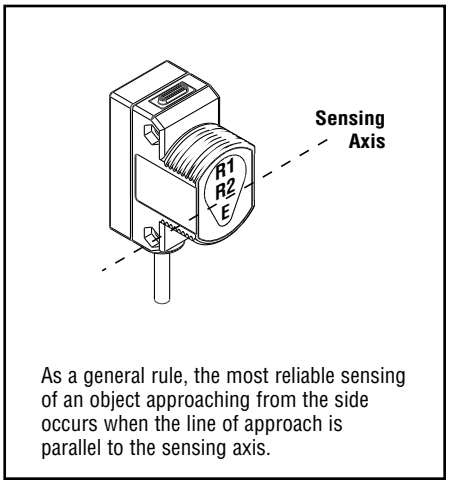


Figure 2. Fixed-field sensing axis

Banner Engineering Corp. • Minneapolis, MN U.S.A.
www.bannerengineering.com • Tel: 763.544.3164

Color Sensitivity

The effects of object reflectivity on cutoff distance, though small, may be important for some applications. It is expected that at any given cutoff setting, the actual cutoff distance for lower reflectance targets will be slightly shorter than for higher reflectance targets. This behavior is known as color sensitivity.

For example, an excess gain of 1 (see page 5) for an object that reflects 1/10 as much light as the 90% white card is represented by the horizontal graph line at excess gain = 10. This line intersects the curve at approximately 190 mm. Thus, an object of this reflectivity results in a far limit cutoff of approximately 190 mm (7.5") for the 200 mm cutoff model, for example; and 190 mm represents the cutoff for this sensor and target.

The excess gain curves on page 5 were generated using a white test card of 90% reflectance. Objects with reflectivity of less than 90% reflect less light back to the sensor, and thus require proportionately more excess gain in order to be sensed with the same reliability as more reflective objects. When sensing an object of very low reflectivity, it may be especially important to sense it at or near the distance of maximum excess gain.

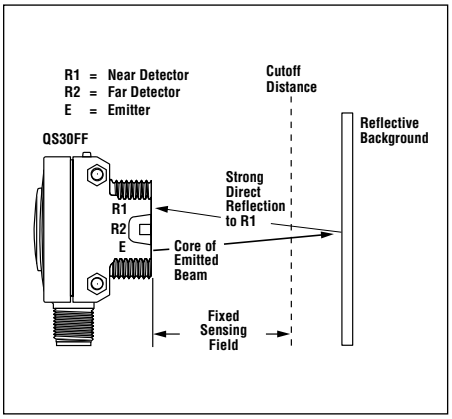


Figure 3. Reflective background – problem

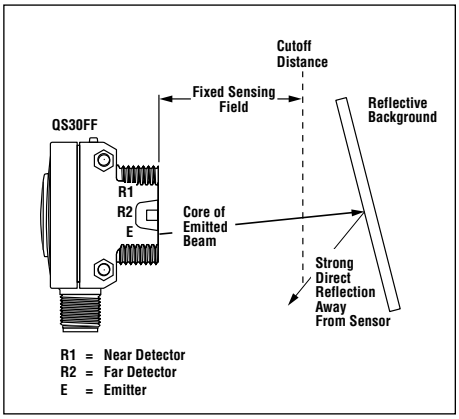


Figure 4. Reflective background – solution

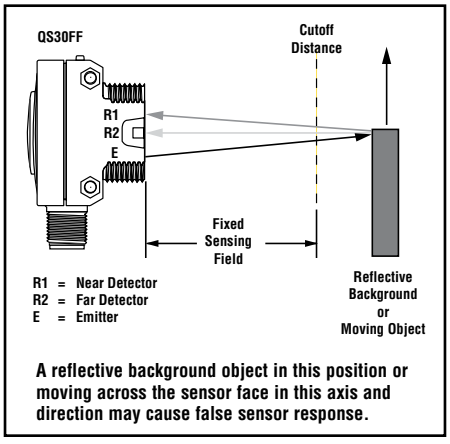


Figure 5. Object beyond cutoff – problem

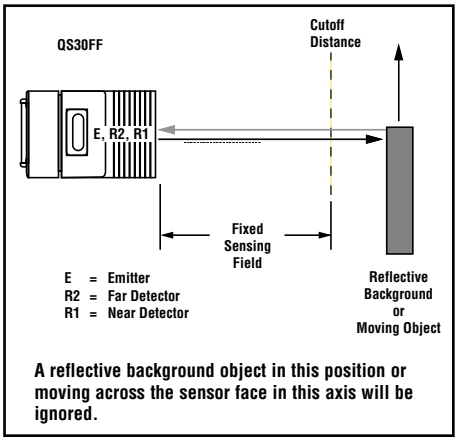


Figure 6. Object beyond cutoff – solution

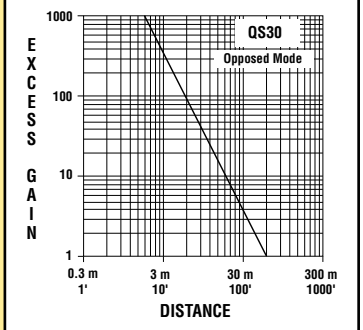
Specifications

Supply Voltage	10 to 30V dc (10% maximum ripple) at less than 40 mA, exclusive of load; Protected against reverse polarity and transient voltages
Output Configuration	**Bipolar:** One current sourcing and one current sinking **Rating:** 100 mA maximum each output at 25°C **Off-state leakage current: NPN:** less than 200 µA **PNP:** less than 10 µA **ON-state saturation voltage: NPN:** less than 1.6V @ 100 mA **PNP:** less than 2.0V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response	**Opposed Mode:** 5 milliseconds ON and OFF **All others:** 2 milliseconds NOTE: 100 millisecond delay on power-up; outputs do not conduct during this time
Repeatability	**Opposed Mode:** not applicable **All others:** 500 microseconds
Cutoff Point Tolerance	**Fixed-Field only:** ± 5% of nominal cutoff distance
Adjustments	Selectable Light/Dark Operate is achieved via the gray wire. **Opposed, Retroreflective, and Polarized Retroreflective models:** **Light Operate** - Low (0 to 3V)* **Dark Operate** - High (open or 5 to 30V)* **Diffuse and Fixed-Field models:** **Light Operate** - High (open or 5 to 30V)* **Dark Operate** - Low (0 to 3V)* **Diffuse, Retroreflective, and Polarized Retroreflective mode models (only):** Single-turn Sensitivity (Gain) adjustment potentiometer * Input impedance 10 kΩ
Indicators	2 LED indicators on sensor top: **Green ON steady:** Power ON **Green flashing:** Output overloaded (except receivers) **Yellow ON steady:** Light sensed **Yellow flashing:** Marginal excess gain (1.0 to 1.5x excess gain) Large oval LED indicator on sensor back (except emitters): **Yellow ON steady:** Output conducting
Construction	ABS housing, rated IEC IP67; NEMA 6; Acrylic lens cover 3 mm mounting hardware included
Connections	2 m (6.5') or 9 m (30') 5-wire PVC cable or 5-pin Euro-style integral QD connector
Operating Conditions	**Temperature:** -20° to +70° C (-4° to +158° F) **Relative Humidity:** 90% @ 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements method 201A (vibration: 10 to 60 Hz max., double amplitude 0.06", maximum acceleration 10G). Also meets IEC 947-5-2; 30G 11 ms duration, half sine wave.
Application Tip for the QS30LV Model	For best sensing reliability, targets should be a minimum of 0.5m from the sensor.
Certifications	Approvals in process

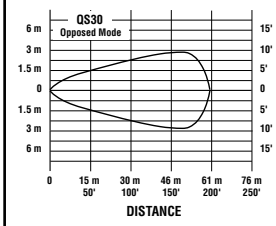
Performance Curves

Excess Gain

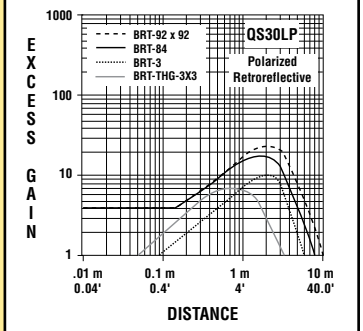
Opposed

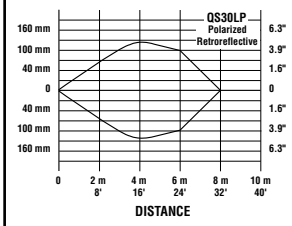


Beam Pattern

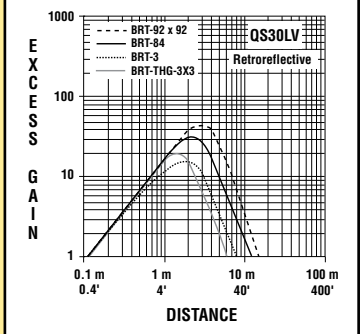


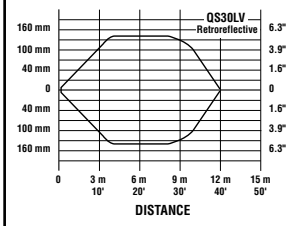
Polarized Retro††



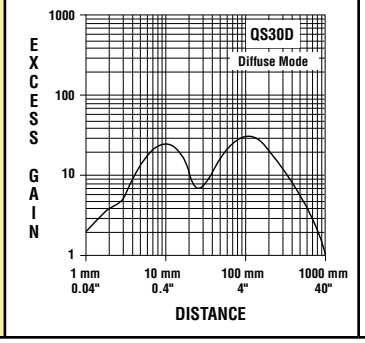


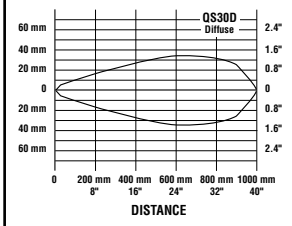
Retro††





Diffuse†††





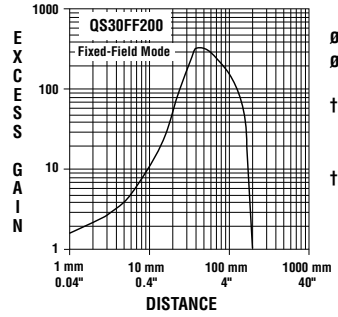
††Performance based on use of the specified retroreflector.

†††Performance based on use of a 90% reflectance white test card.

Excess Gain

Performance based on use of a 90% reflectance white test card.†

Fixed-Field – 200 mm

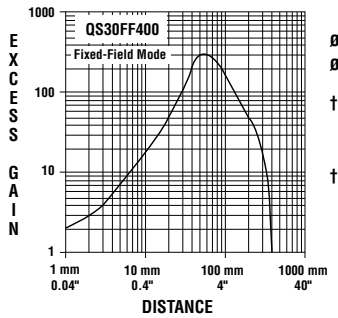


ø 10 mm spot size @ 160 mm focus
ø 7 mm spot size @ 200 mm cutoff

†Using 18% gray test card: performance will be 95% of values shown.

†Using 6% black test card: performance will be 90% of values shown.

Fixed-Field – 400 mm

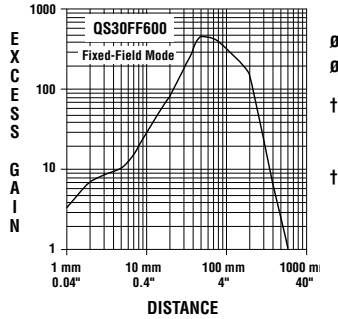


ø 10 mm spot size @ 160 mm focus
ø 10 mm spot size @ 400 mm cutoff

†Using 18% gray test card: performance will be 90% of values shown.

†Using 6% black test card: performance will be 85% of values shown.

Fixed-Field – 600 mm



ø 10 mm spot size @ 160 mm focus
ø 15 mm spot size @ 600 mm cutoff

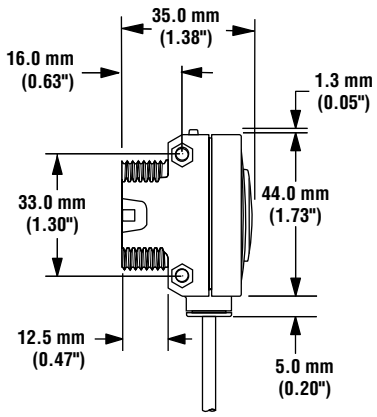
†Using 18% gray test card: performance will be 85% of values shown.

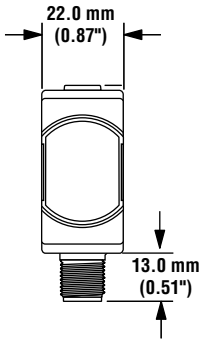
†Using 6% black test card: performance will be 75% of values shown.

WORLD-BEAM® QS30 – DC Voltage

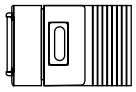
Dimensions

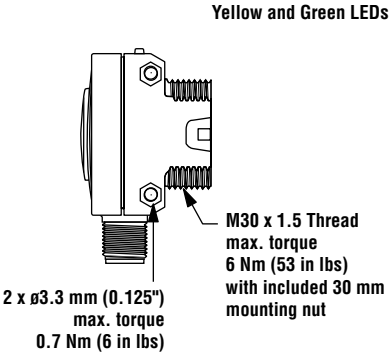
Cabled Models





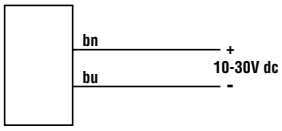
QD Models



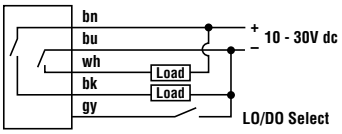


Hookups

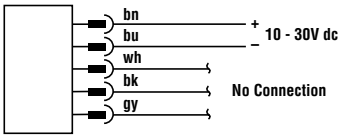
Cabled Emitters



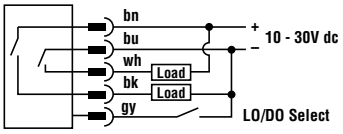
Other Cabled Models



QD Emitters

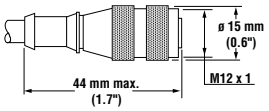
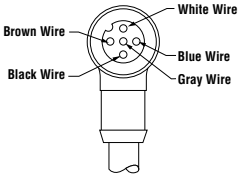
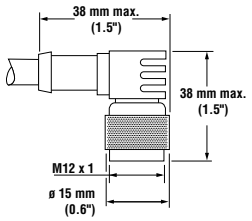


Other QD Models



Accessories

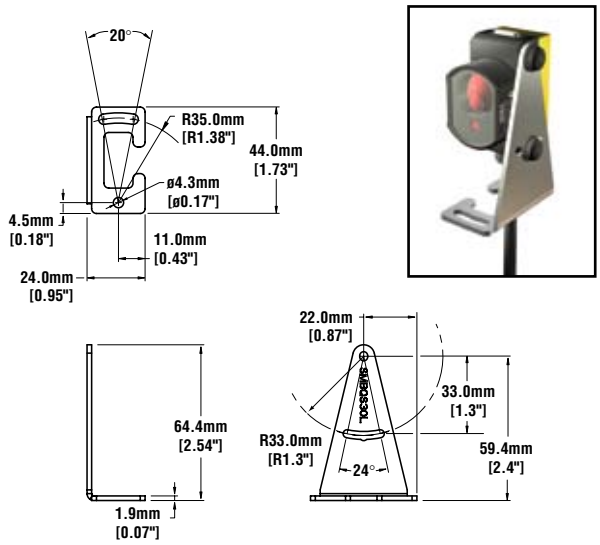
Quick-Disconnect Cables

Style	Model	Length	Dimensions	Pin-Out
5-pin Euro-style straight	**MQDC1-506** **MQDC1-515** **MQDC1-530**	2 m (6.5') 5 m (15') 9 m (30')		
5-pin Euro-style right-angle	**MQDC1-506RA** **MQDC1-515RA** **MQDC1-530RA**	2 m (6.5') 5 m (15') 9 m (30')		

Accessory Brackets

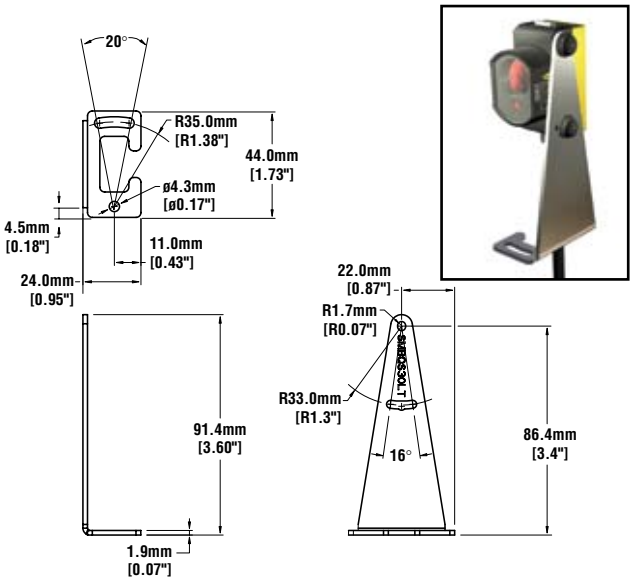
SMBQS30L

- 14-gauge, stainless steel right-angle bracket for cable models
- Clearance for M4 (#8) hardware
- ± 12° tilt adjustment



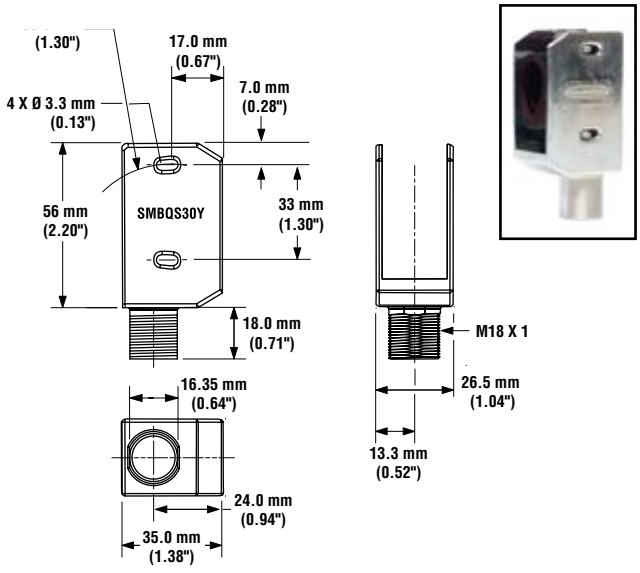
SMBQS30LT

- 14-gauge stainless steel for QD models with right-angle cables
- Tall right-angle mounting bracket
- ± 8° tilt adjustment



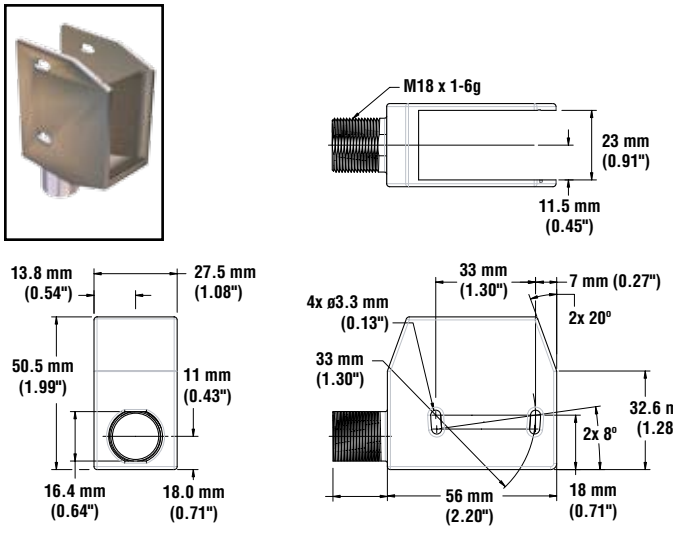
SMBQS30Y

- Heavy-duty die-cast bracket
- M18 vertical mounting option
- ± 8° tilt adjustment with cabled units
- Nuts and lockwasher included

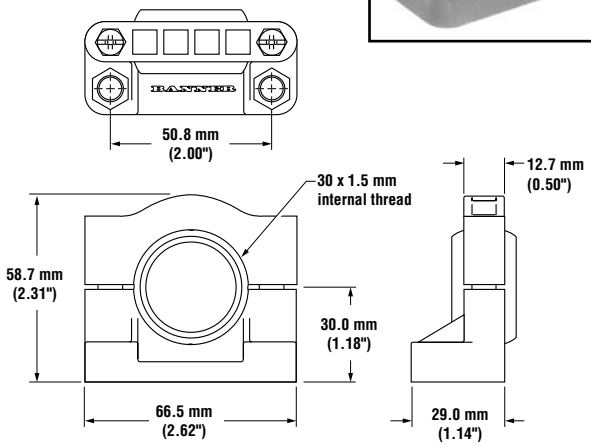


SMBQS30YL

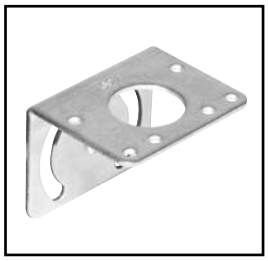
- Die-cast bracket with replaceable acrylic window to protect sensor from weld flash
- Designed for use with long-range opposed-mode (EX/RX) sensors
- Not recommended for diffuse-mode sensors; call factory for suitability with other models



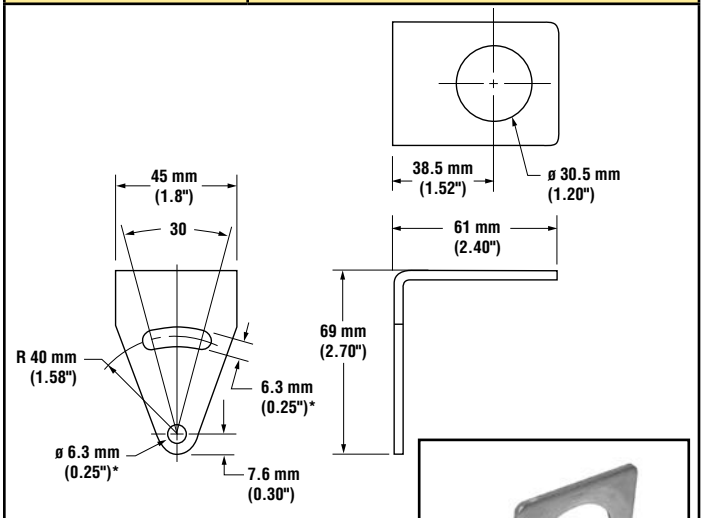
SMB30SC	• 30 mm split clamp with swivel, black reinforced thermoplastic polyester • Stainless steel hardware included



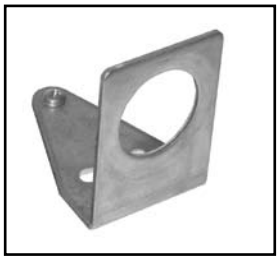
SMB30MM	• 30 mm, 11-gauge, stainless steel bracket with curved mounting slots for versatility and orientation • Clearance for M6 (1/4") hardware



SMB30A	• 30 mm 12-gauge, 304 stainless steel, right-angle mounting bracket with a curved mounting slot for versatility and orientation • Clearance for M6 (1/4") hardware



* Use 5 mm (#10) screws to mount bracket. Drill screw holes 40.0 mm (1.58") apart.



Apertures

Opposed-mode QS30 sensors may be fitted with apertures to narrow or shape the sensor's effective beam to more closely match the size or profile of the objects being sensed. A common example is the use of "line" (or "slot") type apertures to sense thread.

NOTE: The use of apertures will reduce the sensing range (see table below).

Aperture model APQS30-040V shown

Model	Description	
APQS30-040	Circular hole	1 mm (0.04") diameter – 6 each
APQS30-100		2.5 mm (0.10") diameter – 6 each
APQS30-200		5 mm (0.20") diameter – 6 each
APQS30-040H	Horizontal slot	1 x 12 mm (0.04" x 0.47") – 6 each
APQS30-100H		2.5 x 12 mm (0.10" x 0.47") – 6 each
APQS30-200H		5 x 12 mm (0.20" x 0.47") – 6 each
APQS30-040V	Vertical slot	1 x 17 mm (0.04" x 0.67") – 6 each
APQS30-100V		2.5 x 17 mm (0.10" x 0.67") – 6 each
APQS30-200V		5 x 17 mm (0.20" x 0.67") – 6 each
APQS30-DVHX2	Kit containing two of each aperture above – 18 total	

Reduced Range for QS30E and QS30R Pair with Apertures

Model	Maximum Range	
	Aperture on Both Emitter and Receiver	Aperture on Receiver Only
APQS30-040	0.5 m (1.5')	4.1 m (13.5')
APQS30-100	2.4 m (8')	14.3 m (47')
APQS30-200	11.6 m (38')	23.5 m (77')
APQS30-040H	7 m (23')	16.8 m (23')
APQS30-100H	16.5 m (54')	24.7 m (54')
APQS30-200H	28.7 m (94')	36.6 m (94')
APQS30-040V	7 m (23')	16.8 m (23')
APQS30-100V	16.5 m (54')	24.7 m (54')
APQS30-200V	28.7 m (94')	36.6 m (94')

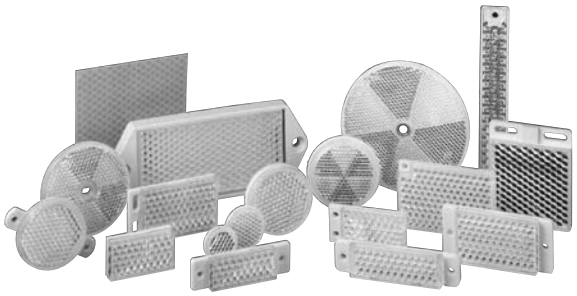
Example: The QS30E/QS30R sensor pair is used with apertures APQS30-040. Using the circular aperture on only the receiver, the range reduces to 4.1 m. When the APQS30-040 aperture is installed on both the receiver and emitter, the sensor range reduces to 0.5 m.

WORLD BEAM® QS30 – DC Voltage

Retroreflective Targets

See the Accessories section of your current Banner Photoelectric Sensors catalog for complete information.

NOTE: Polarized sensors require corner cube type retroreflective targets only.



more sensors, more solutions

P/N 119165 rev. A

Banner Engineering Corp., 9714 Tenth Ave. No., Minneapolis, MN USA 55441 • Phone: 763.544.3164 • www.bannerengineering.com • Email: sensors@bannerengineering.com