

## Datasheet

Midsized sensors featuring extended range and background suppression mode

### Features



- Bipolar discrete outputs, PNP and NPN
- 128 element photo receiver for superior performance on varying colors and textures
- 600 mm sensing range (90% White Card) in midsize QS30 housing
- Background suppression models for reliable detection of objects when the background condition is not controlled or fixed
- Linear multi-turn screw adjustment of cutoff distance
- Enhanced immunity to fluorescent lights
- Improved temperature compensation to minimize cutoff distance variation due to ambient temperature changes
- Powerful, highly collimated visible red sensing beam allows two sensors to be used in close proximity
- Models available with 2 m or 9 m (6.5 ft or 30 ft) cable or integral metal quick-disconnect; or 150 mm (6 in) pigtail
- Tough ABS housing is rated IEC IP67; NEMA 6
- Mounting versatility via popular 30 mm threaded barrel or side-mount



#### 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 - Background Suppression

| Model     | Supply Voltage | Sensing Range   | Output Type               |
|-----------|----------------|---|---------------------------|
| QS30AF600 | 10 to 30 V DC  | Adjustable Cutoff Range: 50 to 600 mm<br>Maximum Sensing Range: 400mm - 6% Black Card; 500mm - 18% Gray Card; 600mm - 90% White Card<br>Minimum Sensing Range (Dead Zone): 30mm - 6% Black Card | Bipolar (1 NPN and 1 PNP) |

Only standard 2 m (6.5 ft) cable models are listed.

- To order the 9 m (30 ft) cable model, add the suffix **W/30** to the model number (for example, **QS30AF600 W/30**).
- To order the 5-pin integral QD, add the suffix **Q** to the model number (for example, **QS30AF600Q**)
- To order the 150 mm (6 inch) PVC cable with a 5-pin M12 connector, add the suffix **Q5** to the model number (for example, **QS30AF600Q5**)

### Overview

Banner's WORLD-BEAM® QS30 Adjustable-Field Sensors with Background Suppression ignore objects beyond the set cutoff distance. Background suppression mode can be used in most situations with varying object color and position or with varying background conditions. The default mode for background suppression sensors is Light Operate (LO).



Figure 1. Sensor Features



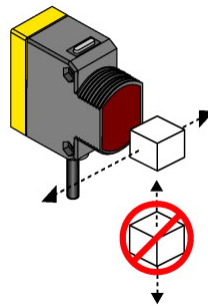
1. Green: Power Indicator LED
2. Yellow: Light Sensed Indicator LED (Flashes for Marginal Conditions)
3. Blue/Red: End-of-travel (EOT) Indicator LED
4. Cutoff Distance Adjustment Screw
5. Yellow: Output Indicator LED

## Configuration Instructions

### Sensor Orientation

To ensure reliable detection, orient the sensor as shown in relation to the target to be detected.

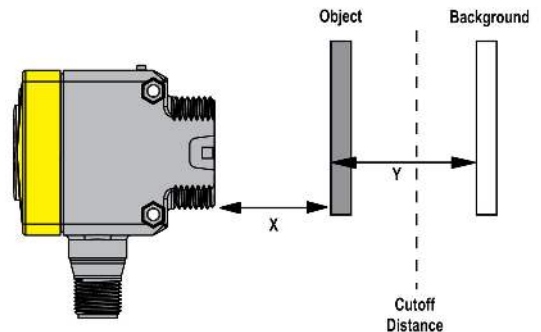
Figure 2. Optimal Orientation of Target to Sensor



### Sensor Setup - Background Suppression (LO mode)

1. Mount the sensor with the darkest object at the longest application distance (the distance to object must be less than shown in [Figure 7](#) on p. 6 for your object color).
2. Turn adjustment pot **counter-clockwise** until it clicks and EOT LED turns **on red** (4 turns).
3. Turn the adjustment pot **clockwise** until the yellow indicator turns **on**.
4. Replace darkest object with the brightest background at the closest application distance.
5. Turn the adjustment pot **clockwise**, counting the revolutions, until the Yellow Output LED turns **on**.
6. Turn the adjustment pot **counter-clockwise** half the number of turns from step 5. This will place the cutoff distance midway between the object and the background switchpoints (See Figure at right).

Figure 3. Set cutoff distance approximately midway between the farthest target and the closest background



X: Distance to Object  
 Y: Minimum Separation Between Object and Background

## Setup Example

### Background Suppression Mode Application Example

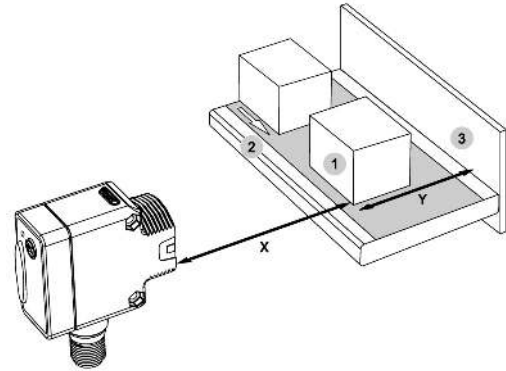
**Background Suppression Mode:** Objects beyond the set cutoff distance will not be detected.

Background suppression mode can be used in most situations with varying object color and position or with varying background conditions.

To ensure reliable background suppression, a minimum separation distance between the object and the background is necessary. See Figure 7 on p. 6 to determine the minimum separation distance.

Example: An object with a reflectivity similar to black paper is set 300 mm away from the sensor. A background with reflectivity similar to white paper is set 350 mm away from the sensor. According to Figure 7 on p. 6, the minimum separation distance between the object and the background is 20 mm. In this application, reliable detection will be achieved when set up according to the procedure outlined in Sensor Setup - Background Suppression Mode.

Figure 4.



1. Object
2. Conveyor
3. Background

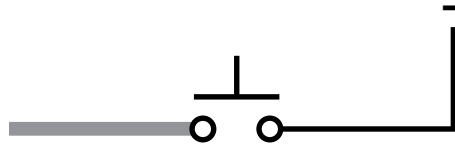
X: Distance to Object = 300 mm

Y: Minimum Separation Between Object and Background > 20 mm

## Remote Configuration

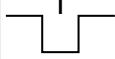
The Remote Configuration function may be used to SET the sensor's cutoff distance remotely or to disable the cutoff distance adjustment screw for security. Connect the gray/Input wire of the sensor to ground (0V dc), with a remote switch connected between them. Pulse the gray/Input wire according to the diagrams in the configuration procedures. The length of the individual pulses is equal to the value T where  $0.04 \text{ s} \leq T \leq 0.8 \text{ s}$ .

Figure 5. Connecting the gray/Input wire

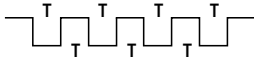
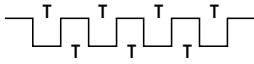


### Object SET:

The distance to the target object is sampled; the sensor optimizes the cutoff distance beyond the distance to the target object. In RUN mode, objects located between the minimum sensing range and the cutoff distance are sensed; anything beyond the cutoff distance (e.g., other objects or background surfaces) is ignored.

| Step                        | Procedure  | Result  |
|-----------------------------|--|---|
| <b>Sample Target Object</b> | Present target object<br>Single-pulse the gray/Input wire<br> | Green Power and Yellow Light Sensed LEDs flash alternately 3 times (EOT LED alternately flashes Red/Blue 3 times at the same time)  |
| <b>Return to Run Mode</b>   | Sensor returns automatically to RUN mode   | <b>SET accepted:</b> Sensor returns directly to RUN mode<br><b>SET failed:</b> Feedback is displayed for 2 seconds (Yellow Light Sensed LED OFF, Green Power LED flashes 4 times) |

Cutoff Distance Adjustment Screw Disable/Enable:

| Step           | Procedure   | Result  |
|----------------|---|---|
| <b>Disable</b> | Quad-pulse the gray/Input wire<br> | EOT LED flashes Red 4 times<br>Cutoff point adjustment screw disabled |
| <b>Enable</b>  | Quad-pulse the gray/Input wire<br> | EOT LED flashes Blue 4 times<br>Cutoff point adjustment screw enabled |

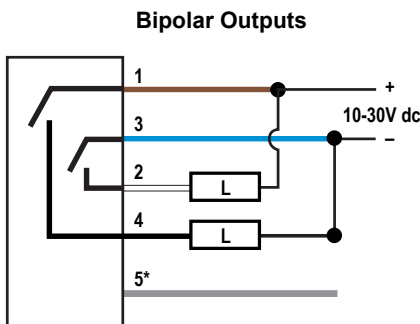
End-of-Travel (EOT) Indicator LED

| Cutoff Distance Adjustment Screw Status   | Result                                       |
|---|--|
| Cutoff distance adjustment screw in between max. and min. end-of-travel limits        | EOT LED OFF                                  |
| Cutoff distance adjustment screw turned clockwise to max. end-of-travel limit         | EOT LED ON Blue                              |
| Cutoff distance adjustment screw turned counter-clockwise to min. end-of-travel limit | EOT LED ON Red                               |
| Cutoff distance adjustment screw turned while disabled                                | EOT LED alternately flashes Red/Blue 4 times |

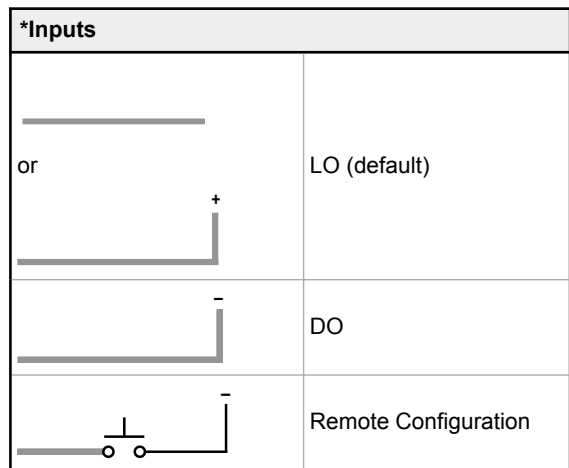
Output States

| Background Suppression Mode |                                     |  |     |                               |    |
|-----------------------------|-------------------------------------|--|-----|-------------------------------|----|
| Output                      | Object Inside Minimum Sensing Range | Object Between Minimum Sensing Range and Cutoff Distance |     | Object Beyond Cutoff Distance |    |
|                             |                                     | LO   | DO  | LO                            | DO |
| Yellow Output LED           | Undefined                           | ON   | OFF | OFF                           | ON |
| Black Wire (Pin 4)          | Undefined                           | ON   | OFF | OFF                           | ON |
| White Wire (Pin 2)          | Undefined                           | ON   | OFF | OFF                           | ON |
| Yellow Light Sensed LED     | Undefined                           | ON or Flashing (if < 1.5x excess gain)                   |     | OFF                           |    |

Wiring Diagrams



**Key:**  
 1 = Brown  
 2 = White  
 3 = Blue  
 4 = Black  
 5 = Gray (Input\*)  
 L = Load



## Specifications

### Sensing Range

Adjustable Cutoff Range: 50 to 600 mm  
 Maximum Sensing Range: 400 mm - 6% Black Card, 500 mm - 18% Gray Card, 600 mm - 90% White Card  
 Minimum Sensing Range (Dead Zone): 30 mm - 6% Black Card

### Supply Voltage and Current

10 to 30 V dc (10% maximum ripple within specified limits); Current consumption: < 80 mA at 10 V dc; < 40 mA at 30 V dc

### Supply Protection

Protected against reverse polarity and transient voltages

### Sensing Beam

Visible red LED, 660 nm

### Output Configuration

**Bi-polar Models:** Solid-state bipolar (SPDT): both sinking and sourcing  
 Off-state leakage current: < 5 µA at 30 V dc

### ON-state saturation voltage:

- **NPN:** less than 1.5 V at 100 mA
- **PNP:** less than 2.0 V at 100 mA

### Output Protection Circuitry

Protected against false pulse on power-up and continuous overload or short circuit of outputs.

### Output Response

5 millisecond ON/OFF;  
 200 ms delay on power-up; outputs do not conduct during this time

### Repeatability

750 µs

### Adjustments

Four-turn adjustment screw sets cutoff distance between min. and max. positions, clutched at both ends of travel

### Indicators

2 Indicator LEDs on sensor top:

- **Green solid:** Power ON
- **Amber solid:** Light sensed (excess gain > 1.5x)
- **Amber flashing:** Marginal sensing condition (excess gain < 1.5x)

2 Indicator LEDs on sensor back:

- Small Blue/Red End-of-travel (EOT) LED
- Large Amber Output LED

### Construction

ABS housing  
**QD models:** nickel-plated brass

### Environmental Rating

IEC IP67; NEMA 6

### Connections

2 m (6.5 ft) 5-wire PVC cable, 9 m (30 ft) PVC cable, or 5-pin Integral QD or Euro-style 150 mm (6 in) pigtail QD, depending on model

### Operating Conditions

**Temperature:** -20 °C to +60 °C (-4 °F to +140 °F)

**Humidity:** 95% at +50 °C maximum relative humidity (non-condensing)

### Certifications



## Performance Curves

Figure 6. Typical emitter spot diameter vs. distance

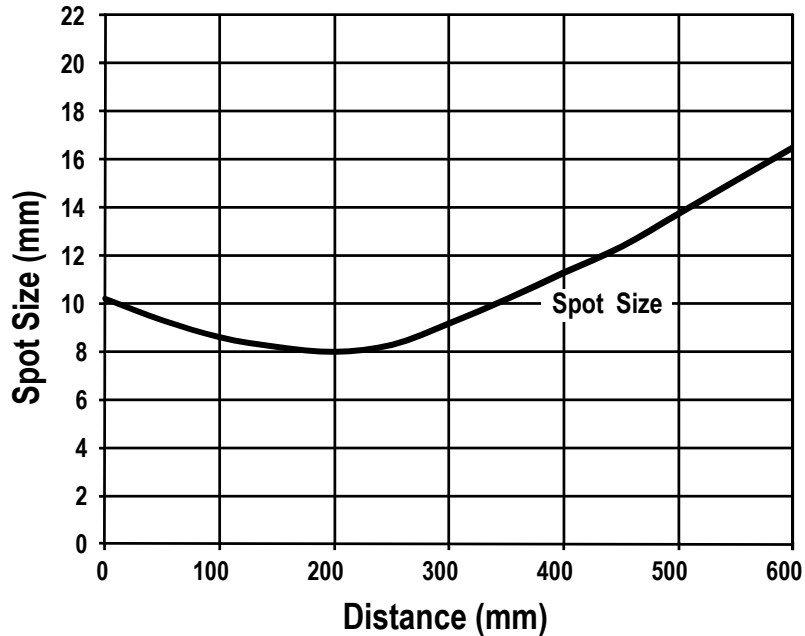
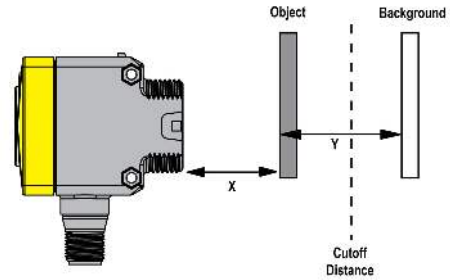
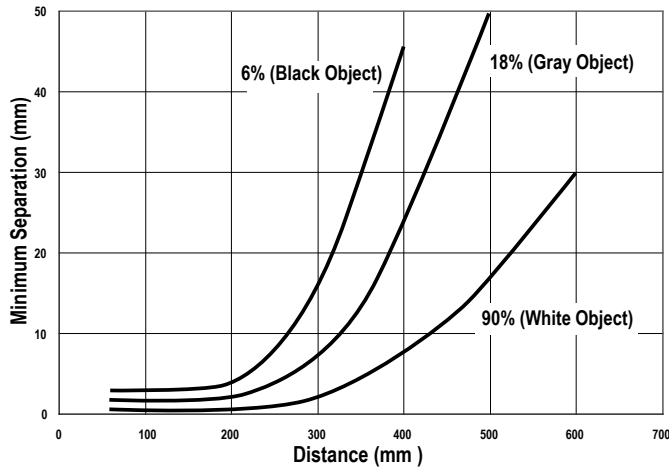


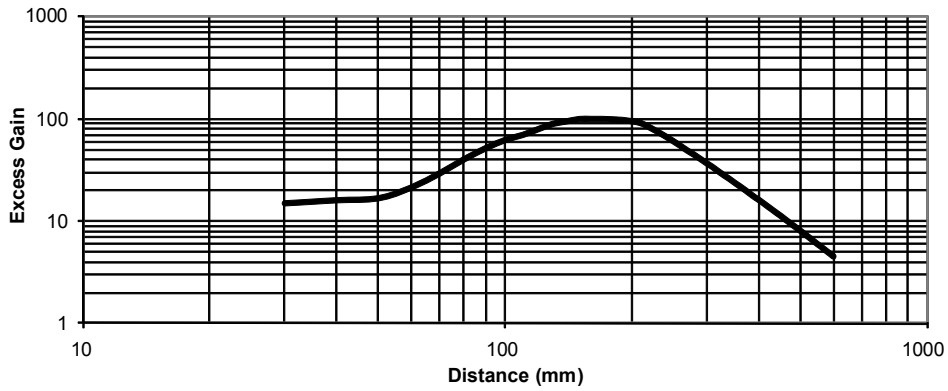
Figure 7. Minimum separation distance\* between object and background: background suppression mode



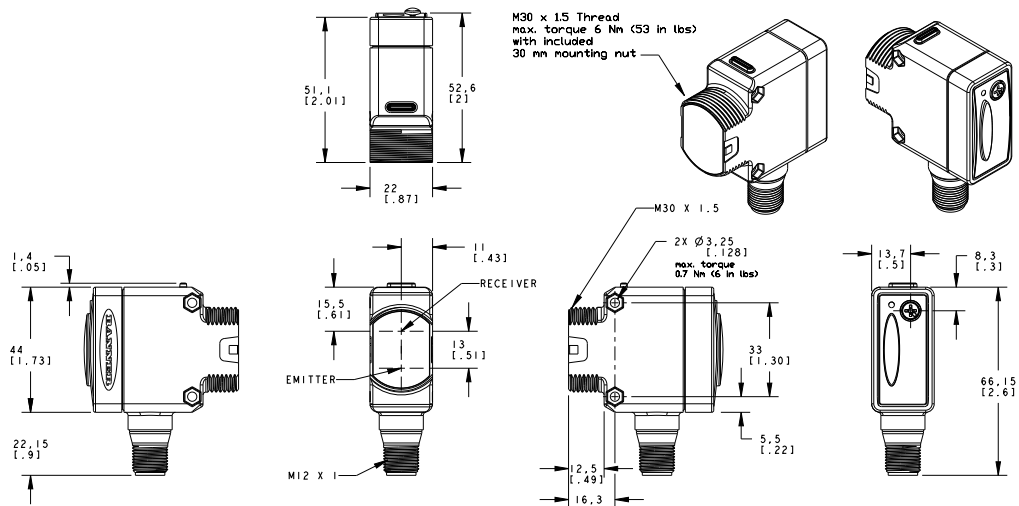
\* Targets with severe color contrasts can increase the Minimum Separation Distance

Excess Gain Curves

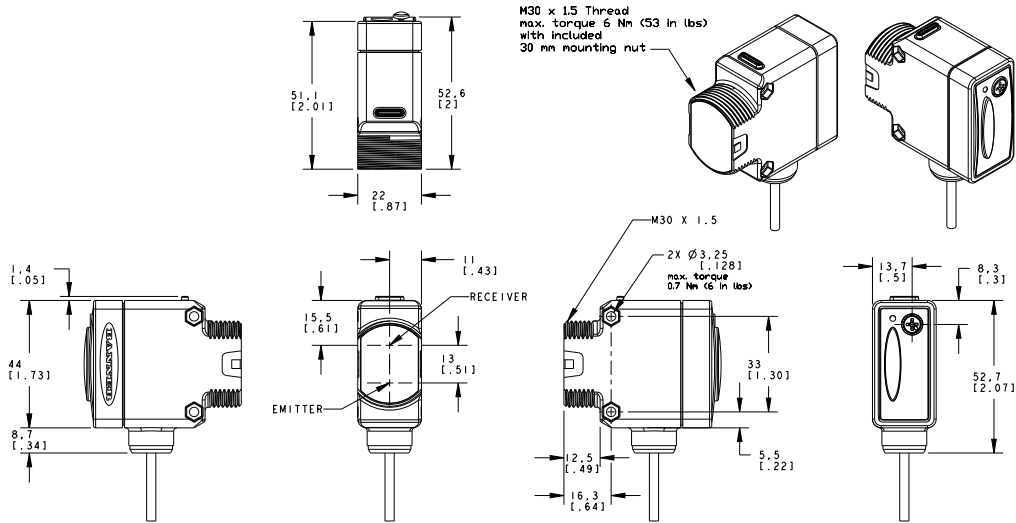
Figure 8. QS30AF600 Excess Gain Curve (based on 90% White Card)



Dimensions (QD Models)



### Dimensions (Cable Models)



### Quick-Disconnect (QD) Cordsets

| 5-Pin Threaded M12 Cordsets—Single Ended |                |             |            |  |
|--|----------------|-------------|------------|--|
| Model                                    | Length         | Style       | Dimensions | Pinout (Female)  |
| MQDC1-501.5                              | 0.5 m (1.5 ft) | Straight    |            | <p>1 = Brown<br/>2 = White<br/>3 = Blue<br/>4 = Black<br/>5 = Gray</p> |
| MQDC1-506                                | 2 m (6.5 ft)   |             |            |  |
| MQDC1-515                                | 5 m (16.4 ft)  |             |            |  |
| MQDC1-530                                | 9 m (29.5 ft)  |             |            |  |
| MQDC1-506RA                              | 2 m (6.5 ft)   | Right-Angle |            |  |
| MQDC1-515RA                              | 5 m (16.4 ft)  |             |            |  |
| MQDC1-530RA                              | 9 m (29.5 ft)  |             |            |  |

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