

QS18AF Sensors with Foreground Suppression



Compact sensors featuring precise adjustment of cutoff distance and foreground suppression



Features

- Short-range models for precise adjustment of cutoff distance
- Exceptional optical performance; 15 to 40 mm adjustable range in compact QS18 housing
- Foreground suppression models for reliable detection when a fixed background is present and the object color or shape varies
- Objects detected to the face of the sensor (no dead zone)
- Simple multi-turn screw adjustment of cutoff distance
- Enhanced immunity to fluorescent lights
- Crosstalk immunity algorithm allows two sensors to be used in close proximity
- Visible red emitter

Models

Short Range Models			
Models	Supply Voltage	Sensing Range	Output Type
QS18VN6AFF40	10 to 30V dc	15 to 40 mm adjustable range	NPN
QS18VP6AFF40			PNP
QS18AB6AFF40			Bipolar (1 NPN & 1 PNP)

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

For 9 m (30') cable, add suffix "W/30" to the model number (e.g., **QS18WE W/30**).

QD models: For 150 mm (6") pigtail cable with 4-pin AC Micro-style QD, add suffix "Q2" to the model number (e.g., **QS18WEQ2**).

A model with a QD connector requires an accessory mating cordset; see [Quick-Disconnnet \(QD\) Cordsets](#) on page 7.

600V cable models: Standard models are supplied with 300V cable. For 600V cable, add suffix "C1" to the model number (e.g., **QS18WEC1**).

† MOSFET: Metal oxide semiconductor field-effect transistor.

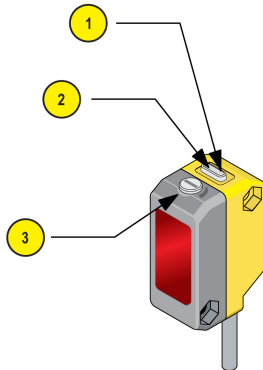


Overview

WORLD-BEAM® QS18 Adjustable-Field Sensors with Foreground Suppression detect the light reflected from the background. The output changes when the light from the background is blocked.

In general, if the background is fixed and the color or shape of the objects in the foreground vary, foreground suppression mode will provide reliable detection. A foreground suppression sensor uses the background in the same way a retroreflective sensor would use a reflector. The sensor output will change whenever an object passes between itself and the background.

The short range models offer precise cutoff capability for short range applications. With an adjustable cutoff distance of 15 to 40 mm, thinner objects closer to the background can be detected with even sharper background suppression.



1	Green: Power Indicator
2	Yellow: Light Sensed Indicator (Flashes for Marginal Conditions)
3	Cutoff Point Adjustment Screw

Figure 1. Sensor features

Sensor Installation

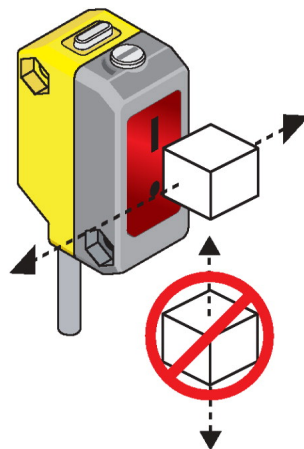


Figure 2. Required Orientation of Object to Sensor



WARNING: Not To Be Used for Personnel Protection

Never use this product as a sensing device for personnel protection. Doing so could lead to serious injury or death. This product does NOT include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

Sensor Setup - Foreground Suppression

1. Mount the sensor within 40 mm of the fixed background.
2. Turn adjustment pot **clockwise** until it clicks (5 turns).
3. Turn the adjustment pot **counter-clockwise** until the yellow indicator turns **on**. This places the cutoff distance in front of the fixed background (see figure 3).
4. Place the application's darkest object into the sensor's field of view at the maximum sensor to object distance, and verify that the yellow indicator turns **off**. The sensor is optimized for detecting thin objects close to the fixed background and is ready for operation.

For maximum sensing reliability in applications with variations in background position or color (i.e. conveyor belts with flutter), follow these additional steps.

5. Continuing from step 4, turn adjustment pot **counter-clockwise**, counting the revolutions, until the yellow indicator turns **on**.
6. Turn adjustment pot **clockwise** half the number of revolutions from step 5. This will place the cutoff distance midway between the object and the background. The sensor is optimized for reliable detection in applications with thick objects and modest variation in background. The sensor is ready for operation.

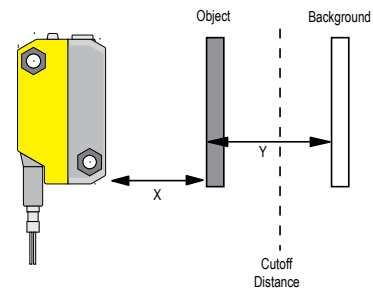


Figure 3. Set cutoff distance in front of the fixed background

X: Distance to Background

Y: Minimum Separation Between Object and Background

Setup Example

Foreground Suppression Mode (also called Background Detection): The light reflected off the background is detected. The output changes when the light from the background is blocked.

In general, if the background is fixed and the color or shape of the objects in the foreground vary, foreground suppression mode will provide reliable detection. A foreground suppression sensor uses the background in the same way a retroreflective sensor would use a reflector. The sensor output will change whenever an object passes between itself and the background.

To ensure reliable foreground suppression, a minimum separation distance between the object and the background is necessary. See "Minimum Separation Distance Between Object and Background: Foreground Suppression Mode" (Figure 6) to determine the minimum separation distance.

Example: The sensor is positioned above a black conveyor belt at a distance of 30 mm. The objects on the conveyor are boxes of varying colors. According to Figure 6, the box height must be greater than 0.7 mm for reliable detection against a black background. In this application, reliable detection will be achieved when set up according to the procedure outlined in [Sensor Setup - Foreground Suppression](#) on page 3.

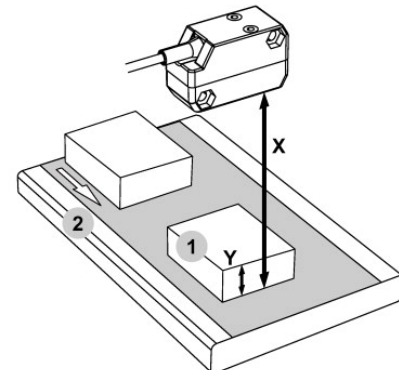


Figure 4. Foreground Suppression Mode application example

1. Object
2. Background (Conveyor)

X: Distance to Background = 30 mm

Y: Minimum Separation Between Object and Background > 0.7 mm

Output States

Foreground Suppression Mode			
Sensor Model Type	Output	Object Between Sensor Face and Cutoff Distance	No Object Between Sensor Face and Fixed Background
All Models	Yellow Indicator Light	OFF	ON
Complementary Models	Black Wire (Pin 4)	OFF	ON
	White Wire (Pin 2)	ON	OFF
Bipolar Models	Black Wire (Pin 4)	OFF	ON
	White Wire (Pin 2)	OFF	ON

Performance Curves

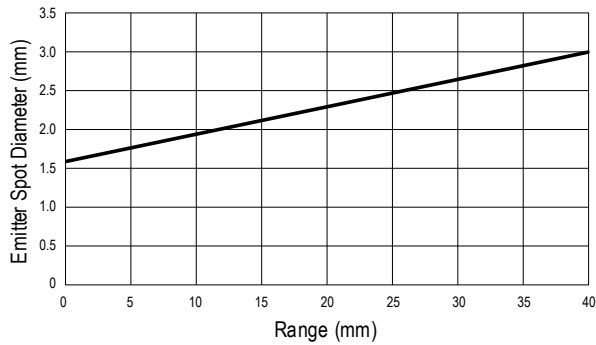


Figure 5. Typical Emitter Spot Diameter vs. Distance

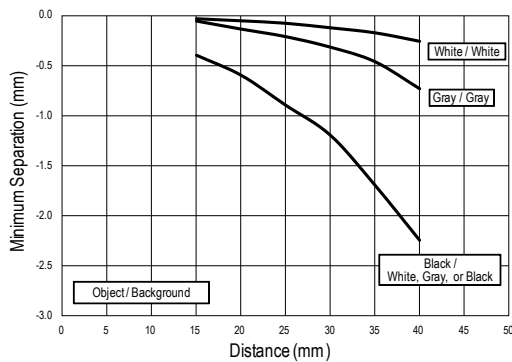
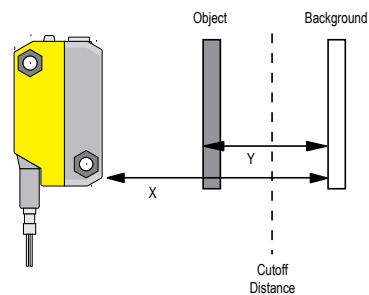
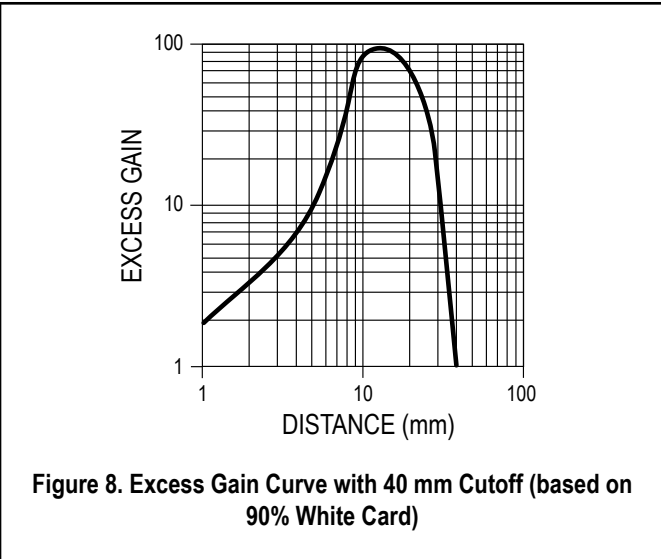
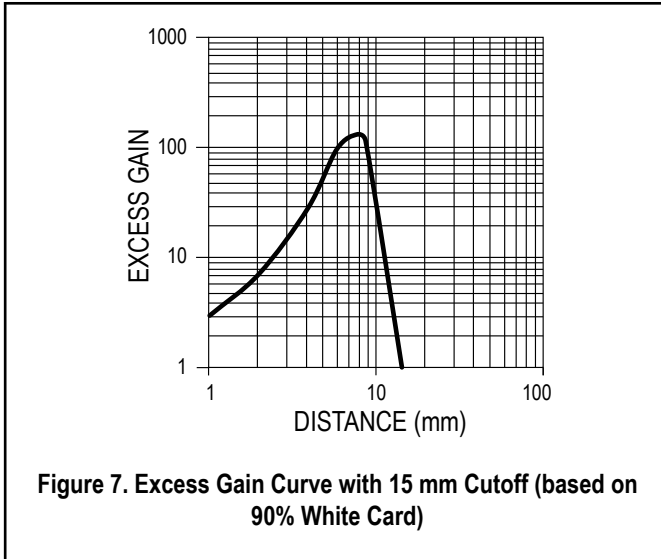


Figure 6. Minimum Separation Distance Between Object and Background



X: Distance to Background (mm)
 Y: Minimum Separation Between Object and Background (mm)

Excess Gain Curves



Specifications

Supply Voltage

10 to 30V dc (10% maximum ripple within specified limits) at less than 27 mA, exclusive of load

Sensing Beam

Visible red LED, 630 nm

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Output Configuration

Solid-state complementary (SPDT): NPN or PNP (current sinking or sourcing), or bipolar (both sinking and sourcing) depending on model;

Rating: 100 mA total output current

Off-state leakage current:

NPN: less than 200 μ A @ 30V dc (See Application Note 1)

PNP: less than 10 μ A @ 30V dc

ON-state saturation voltage:

NPN: less than 1.6V @ 100 mA

PNP: less than 3.0V @ 100 mA

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

Output Response

2.8 millisecond ON/OFF

NOTE: 200 millisecond delay on power-up; outputs do not conduct during this time

Adjustments

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

Repeatability

250 μ s

Indicators

2 LED indicators on sensor top:

Green ON steady: Power ON

Yellow ON steady: Light sensed

Yellow flashing: Marginal sensing condition

Construction

ABS housing, acrylic lens cover; PVC cable, nickel-plated brass connector, acetal adjustment pot

Environmental Rating

Rated IEC IP67; NEMA 6; UL Type 1

Connections

2 m (6.5') 4-wire PVC cable, 9 m (30') PVC cable, or 4-pin Pico-style or Euro-style 150 mm (6") pigtail QD, depending on model

Operating Conditions

Relative Humidity: 95% @ 50° C (non-condensing)

Temperature: -20° to +55° C (-4° to +131° F)

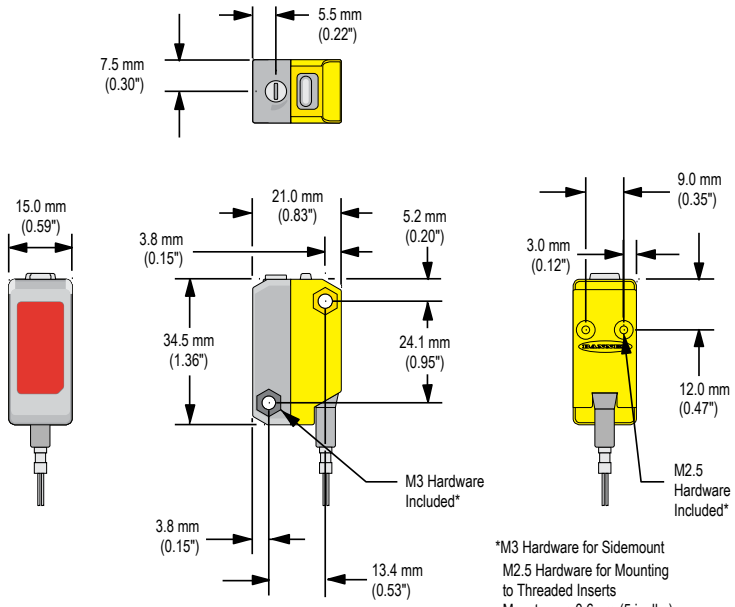
Application Notes

1. NPN off-state leakage current is < 200 μ A for load resistances > 3 k Ohms or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current.
2. For emitter spot alignment, cover the receiver (top lens position) to temporarily turn emitter for maximum brightness.
3. For mirror-like objects, minimize the sensor to object mounting distance and tilt the sensor so reflected light is directed away from the sensor when the object is present.

Certifications



Dimensions

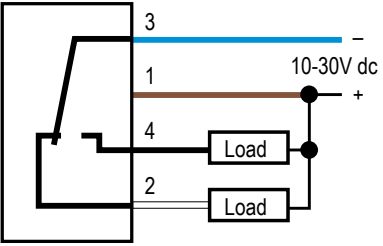


*M3 Hardware for Sidemount
 M2.5 Hardware for Mounting to Threaded Inserts
 Max. torque 0.6 nm (5 in. lbs)

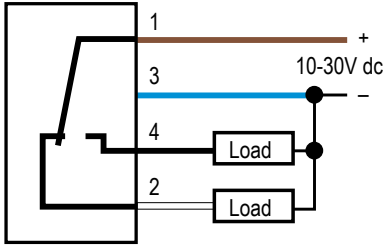
- (2) M3 x 0.5 x 20 mm ss screw
- (2) M3 x 0.5 ss hex nut
- (2) M3 ss washer
- (2) M2.5 x 0.45 x 5 mm ss screw
- (2) M2.5 ss washer

Wiring

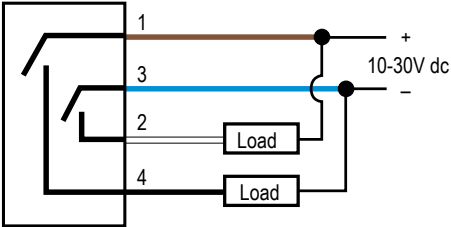
NPN (Sinking) Outputs



PNP (Sourcing) Outputs



Bipolar Outputs



Wiring Key

- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black

Quick-Disconnect (QD) Cordsets

Description	Dimensions	Pinouts	
4-Pin Pico-Style Cordsets (straight, snap-on, connector) PKG4-2, 2 m (6.5')			1 = Brown 2 = White 3 = Blue 4 = Black
4-Pin M12/Euro-Style Cordsets (straight connector) MQDC-406, 2 m (6.5') MQDC-415, 5 m (15') MQDC-430, 9 m (30')			

Mounting Brackets

SMBQS18A	<ul style="list-style-type: none"> • Wrap-around protection bracket • Die-cast bracket • Base fits 18 mm threaded hole • Metal hex nut, lock washer and grommet included • Mounting holes specially designed for QS18AF sensors 	
SMBQS18AF	<ul style="list-style-type: none"> • Right-angle mounting bracket • 14-ga. 304 stainless steel 	

Banner Engineering Corp Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.