

# QS18 AF Sensors with Background Suppression



## Datasheet

Compact sensors featuring precise adjustment of cutoff distance and background suppression mode



- Short-range models for precise adjustment of cutoff distance
- Exceptional optical performance; 15 to 40 mm adjustable range in compact QS18 housing
- Background suppression models for reliable detection of objects when the background condition is not controlled or fixed
- 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



**WARNING: Not To Be Used for Personnel Protection**

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device 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.

## Models

Short Range Models			
Models <sup>1</sup>	Supply Voltage	Sensing Range	Output Type
QS18VN6AF40	10 to 30 V dc	15 to 40 mm adjustable range	NPN
QS18VP6AF40			PNP
QS18AB6AF40			Bipolar (1 NPN & 1 PNP)

## Overview

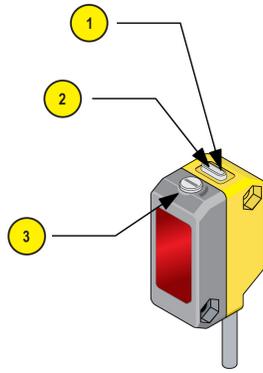
WORLD-BEAM® QS18 Adjustable-Field Sensors with Background Suppression ignore objects beyond the set cutoff distance. Background suppression mode can be used in most situations with varying object color and position or with varying background conditions.

The 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.

<sup>1</sup> Only standard 2 m (6.5 ft) cable models are listed.

- For 9 m (30 ft) cables: add suffix "W/30" to the model number (for example, QS18VN6AF40 W/30)
- For QD models: For 150 mm (6 in) pigtail cable with 4-pin AC Micro-style QD, add suffix "Q2" to the model number (for example, QS18VN6AF40Q2). A model with a QD connector requires an accessory mating cordset; see [Quick-Disconnect \(QD\) Cordsets](#) on page 6
- For 600 V cable models: Standard models are supplied with 300 V cable. For 600 V cable, add suffix "C1" to the model number (for example, QS18VN6AF40C1).





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

Figure 1. Sensor features

## Sensor Orientation

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

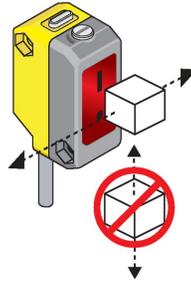
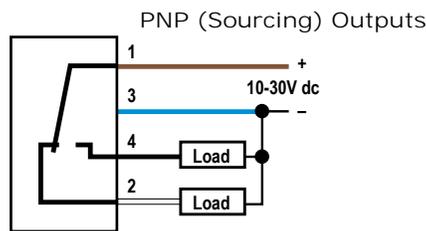
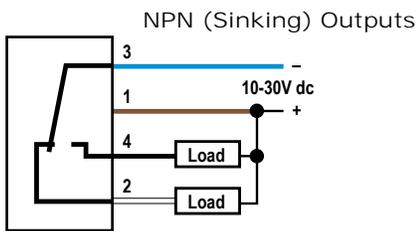
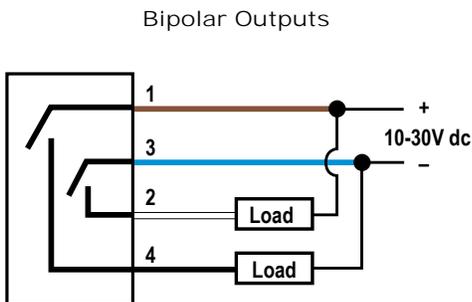


Figure 2. Optimal Orientation of Target to Sensor

## Wiring Diagrams



Wiring Key  
 1 = Brown  
 2 = White  
 3 = Blue  
 4 = Black



Cabled wiring diagrams are shown. Quick disconnect (QD) wiring diagrams are functionally identical.

## Sensor Setup - Background Suppression

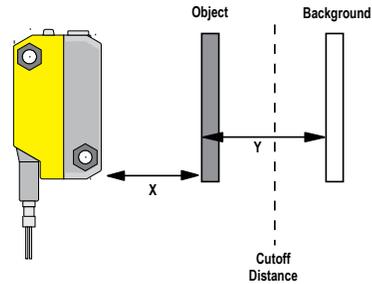
Background Suppression Mode: Objects beyond the set cutoff distance will not be detected.

Background suppression mode can be used in most situations with varying object colors and positions 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 page 6 to determine the minimum separation distance.

1. Mount the sensor with the darkest object at the longest application distance. The distance to the object must be less than shown in [Figure 7](#) on page 6 for your object color.
2. Turn the adjustment potentiometer counter-clockwise until the yellow indicator turns off (5 turns maximum).
3. Turn the adjustment potentiometer clockwise until the yellow indicator turns on.
4. Replace the darkest object with the brightest background at the closest application distance.
5. Turn the adjustment potentiometer clockwise, counting the revolutions, until the yellow indicator turns on.
6. Turn the adjustment potentiometer counter-clockwise half of the number of turns from step 5. This places the cutoff distance midway between the object and the background switchpoints (see [Figure 3](#) on page 3).

The sensor is ready for operation.



X: Distance to the Object

Y: Minimum Separation Between the Object and the Background

Figure 3.

Set the cutoff distance approximately midway between the farthest object and the closest background

## Setup Example

An object with a reflectivity similar to black paper is set 30 mm away from the sensor. A background with a reflectivity similar to white paper is set 40 mm away from the sensor. According to [Figure 7](#) on page 6, the minimum separation distance between the object and the background is 0.7 mm. In this application, reliable detection is achieved when set up according to the procedure outlined in [Sensor Setup - Background Suppression](#) on page 3.

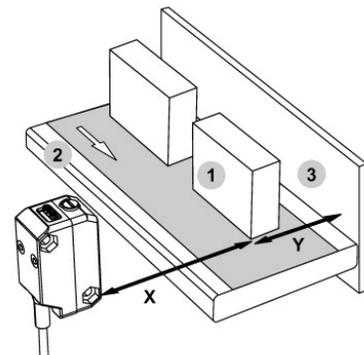


Figure 4. Background Suppression Mode Application Example

1. Object
  2. Conveyor
  3. Background
- X: Distance to the Object = 30 mm  
 Y: Minimum Separation Between the Object and the Background > 0.7 mm

## Output States

Background Suppression Mode				
Sensor Model Type	Output	Object Inside Minimum Sensing Range	Object Between Minimum Sensing Range and Cutoff Distance	Object Beyond Cutoff Distance
All Models	Yellow Indicator Light	Undefined	ON	OFF
Complementary Models	Black Wire (Pin 4)	Undefined	ON	OFF
	White Wire (Pin 2)	Undefined	OFF	ON
Bipolar Models	Black Wire (Pin 4)	Undefined	ON	OFF
	White Wire (Pin 2)	Undefined	ON	OFF

## Specifications

### Supply Voltage

10 to 30 V 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: 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 µA at 30 V dc (See Application Note 1)

PNP: less than 10 µA at 30 V dc

ON-state saturation voltage:

NPN: less than 1.6 V at 100 mA

PNP: less than 3.0 V at 100 mA

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

### Required Overcurrent Protection



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

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

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

Supply wiring leads < 24 AWG shall not be spliced.

For additional product support, go to <http://www.bannerengineering.com>.

Supply Wiring	Required Overcurrent Protection
20	5.0 Amps
22	3.0 Amps
24	2.0 Amps
26	1.0 Amps
28	0.8 Amps
30	0.5 Amps

### 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 µs

### Indicators

2 LED indicators on sensor top:

Green solid: Power on

Amber solid: Light sensed

Amber flashing: Marginal sensing condition

### Construction

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

### Environmental Rating

IEC IP67; NEMA 6; UL Type 1

### Connections

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

### Operating Conditions

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

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

### Application Notes

1. NPN off-state leakage current is < 200 µA for load resistances > 3 kΩ or optically isolated loads. For load current of 100 mA, leakage is < 1% of load current.

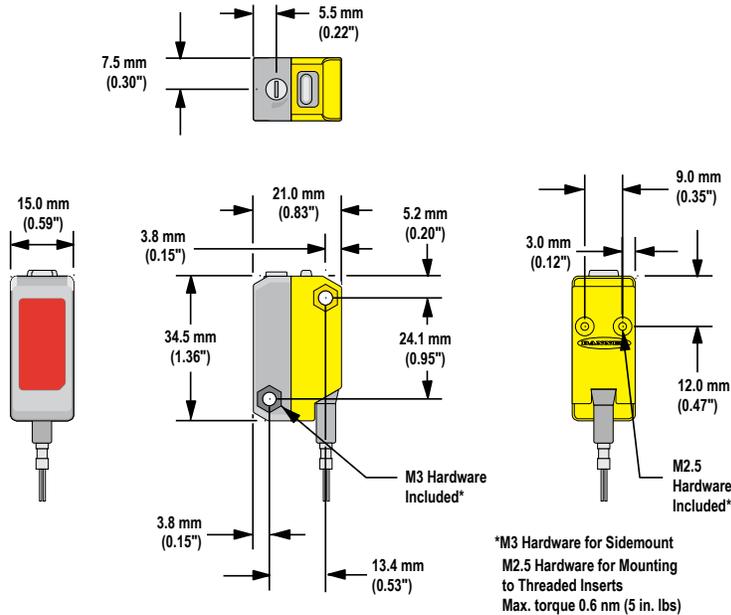
2. For emitter spot alignment, cover the receiver (top lens position) to temporarily turn emitter for maximum brightness.

### Certifications



## Dimensions

All measurements are listed in millimeters (inches), unless noted otherwise.



- (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

## Performance Curves

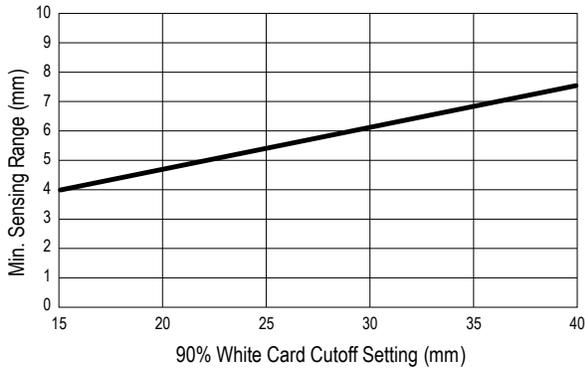


Figure 5. Minimum Sensing Range (Dead Zone) vs. 90% White Cutoff Setting

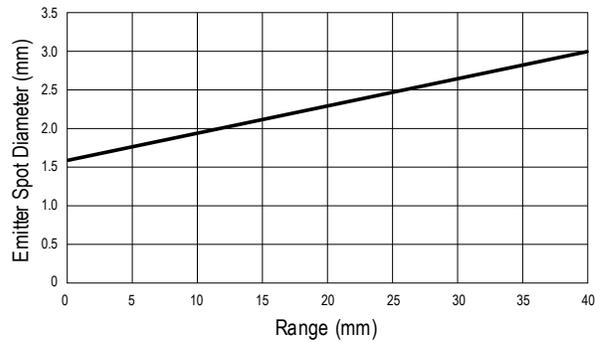
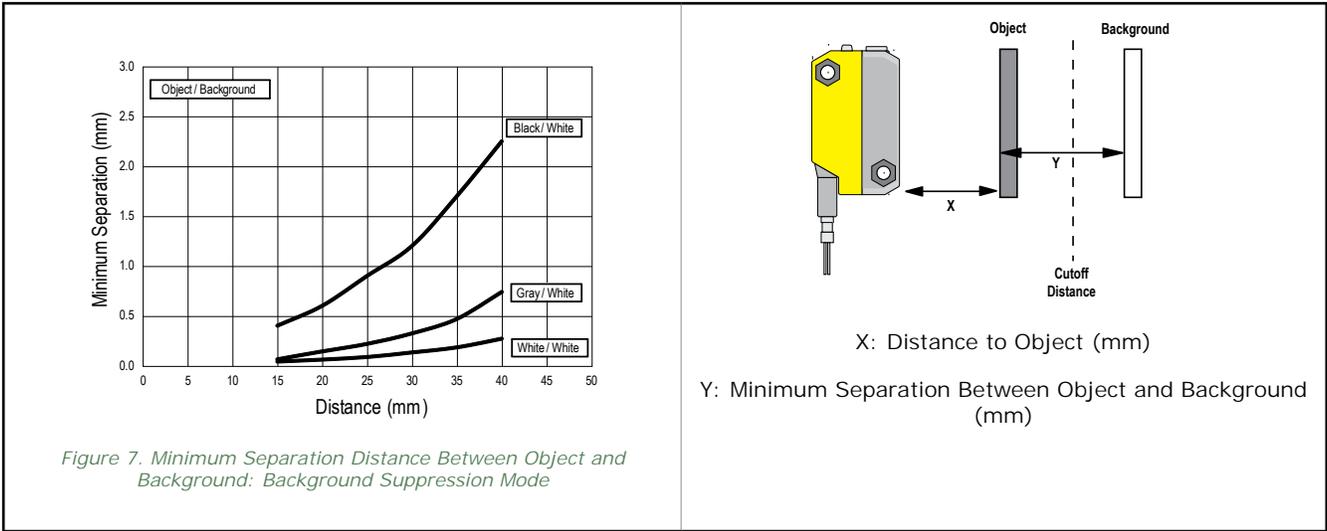
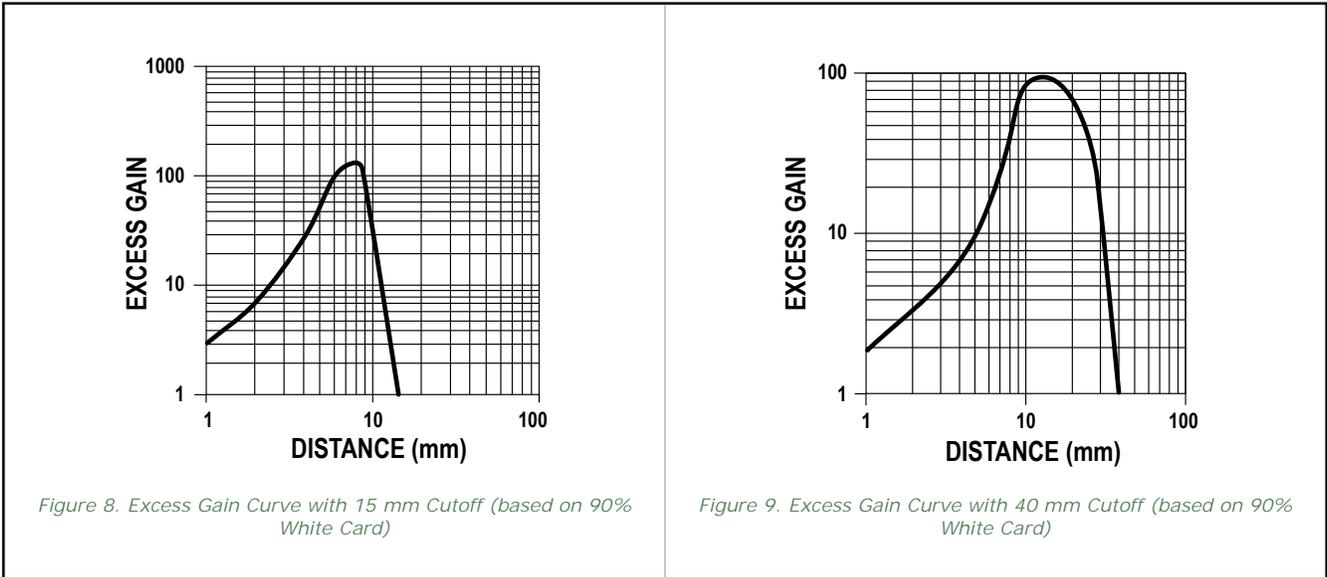


Figure 6. Typical Emitter Spot Diameter vs. Distance



Excess Gain Curves



Accessories

Quick-Disconnect (QD) Cordsets

4-Pin Snap-on M8/Pico-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
PKG4-2	2 m (6.56 ft)	Straight		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>

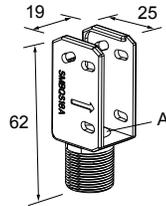
4-Pin Threaded M12/Euro-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MQDC-406	1.83 m (6 ft)	Straight		
MQDC-415	4.57 m (15 ft)			
MQDC-430	9.14 m (30 ft)			
MQDC-450	15.2 m (50 ft)			

## Mounting Brackets

All measurements are listed in millimeters, unless noted otherwise.

### SMBQS18A

- 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

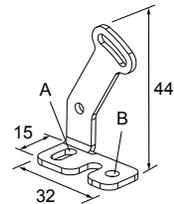


Hole size: A =  $\varnothing$  15.3

### SMBQS18AF

- Right-angle mounting bracket
- 14-ga. 304 stainless steel

Hole center spacing: A to B = 20.3  
 Hole size: A = 4.3 x 9.4, B =  $\varnothing$  4.3



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