Datasheet

Compact Sensors Featuring Adjustable Range Background Suppression Mode

- Two optical designs optimized for reliable long-range target detection and stable detection of colorfully printed packages
  - High visibility red LED spot AF250 model recommended for long range detection to 250 mm on black or white targets
  - Small bright red LED spot AF120 model recommended for reliable detection of colorfully printed packages and small parts or features
- Simple single-turn potentiometer adjustment of cutoff distance
- Enhanced immunity to fluorescent lights
- Crosstalk immunity algorithm allows two sensors to be used in close proximity
- High-intensity, bright red LED spot makes sensor alignment fast and easy
- Convenient mounting options available for 18 mm barrel or side mount
- Bright indicator LEDs show operating status from 360˚

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

<table>
<thead>
<tr>
<th>Model</th>
<th>Output Type</th>
<th>Sensing Range</th>
<th>Supply Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>QS18VN6AF250</td>
<td>Complementary NPN</td>
<td>Adjustable Cutoff: 30 mm to 250 mm</td>
<td>10 V dc to 30 V dc</td>
</tr>
<tr>
<td>QS18VP6AF250</td>
<td>Complementary PNP</td>
<td>Adjustable Cutoff: 30 mm to 120 mm</td>
<td>10 V dc to 30 V dc</td>
</tr>
<tr>
<td>QS18K6AF250Q8</td>
<td>IO-Link</td>
<td></td>
<td></td>
</tr>
<tr>
<td>QS18VN6AF120</td>
<td>Complementary NPN</td>
<td>Adjustable Cutoff: 30 mm to 250 mm</td>
<td>10 V dc to 30 V dc</td>
</tr>
<tr>
<td>QS18VP6AF120</td>
<td>Complementary PNP</td>
<td>Adjustable Cutoff: 30 mm to 120 mm</td>
<td>10 V dc to 30 V dc</td>
</tr>
<tr>
<td>QS18K6AF120Q8</td>
<td>IO-Link</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Overview

The WORLD-BEAM® QS18 Sensor with Background Suppression detects targets within the cutoff distance while ignoring objects in the background. Background suppression mode is recommended when target position is repeatable, but target color and background conditions vary.

Key

1 Green LED: Power Indicator  
2 Amber LED: Light Sensed Indicator (Flashes for Marginal Conditions)  
3 Cutoff Point Adjustment Potentiometer

1 2 m (6.5 ft) PVC cabled models are listed for the complementary output models. 2 m (6.5 ft) and 9 m (30 ft) PVC cabled options are not available on IO-Link models.
- To order the 9 m (30 ft) PVC cable model, add the suffix “W/30” to the cabled model number. For example, QS18VN6AF250 W/30.
- To order the 4-pin M12/Euro-style integral quick disconnect model, add the suffix “Q8” to the model number. For example, QS18VN6AF250Q8.
- To order the 4-pin M8/Pico-style integral quick disconnect model, add the suffix “Q7” to the model number. For example, QS18VN6AF250Q7.
- To order the 150 mm (6 in) PVC cable model with a 4-pin M12/Euro-style quick disconnect, add the suffix “Q5” to the model number. For example, QS18VN6AF250Q5.
- To order the 150 mm (6 in) PVC cable model with a 4-pin M8/Pico-style quick disconnect, add the suffix “Q” to the model number. For example, QS18VN6AF250Q.
- Models with a quick disconnect require a mating cordset.
Installation Instructions

Sensor Orientation

Optimize detection reliability and minimum object separation performance with correct sensor-to-target orientation. To ensure reliable detection, orient the sensor as shown in relation to the target to be detected.

Figure 1. Optimal Orientation of Target to Sensor

Wiring Diagrams

NPN Output

PNP Output

IO-Link with PNP Output

Key

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

Cabled wiring diagrams are shown. Quick disconnect wiring diagrams are functionally identical.

Sensor Setup

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 3 on page 4 for AF250 models or Figure 4 on page 4 for AF120 models 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 3 on page 4, or Figure 4 on page 4 for your object color, depending on the model.
2. Turn the adjustment potentiometer counter-clockwise until the yellow indicator turns off.
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 until the yellow indicator turns on.
6. Turn the adjustment potentiometer counter-clockwise approximately half of the adjustment rotation from step 5. This places the cutoff distance approximately half-way between the object and the background switch points.

If sufficient separation exists between the object and background, the sensor is ready for operation.

Figure 2. Minimum Separation Distance

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

Set the cutoff distance approximately midway between the farthest object and the closest background.
IO-Link Interface

IO-Link is a point-to-point communication link between a master device and sensor. It can be used to automatically parameterize sensors and transmit process data. For the latest IO-Link protocol and specifications, please visit the web site at [http://www.io-link.com](http://www.io-link.com).

The IO-Link IODD package (P/N 206635) is contained on the Banner Website at [http://www.bannerengineering.com](http://www.bannerengineering.com).

Specifications

**Supply Voltage**
- 10 V dc to 30 V dc (10% maximum ripple within specified limits)

**Maximum Power Consumption (exclusive of load)**
- AF120 Models less than 300 mW
- AF250 Models less than 475 mW

**Sensing Beam**
- Visible red LED, 640 nm

**Supply Protection Circuitry**
- Protected against reverse polarity and transient voltages

**Output Configuration**
- Solid-state complementary: NPN or PNP, or push/pull, depending on model
- Rating: 50 mA per output
- Output Voltage High: Greater than Vsupply - 2.5 V
- Output Voltage Low: Less than 2.5 V
- For loads less than 1 Meg Ohm
- Protected against false pulse on power-up and continuous overload or short circuit of outputs

**Connections**
- 2 m (6.5 ft) unterminated 4-wire PVC cable; 9 m (30 ft) unterminated 4-wire PVC cable; 150 mm (6 in) PVC cable with a 4-pin M8/Pico-style quick disconnect; 150 mm (6 in) PVC cable with a 4-pin M12/Euro-style quick disconnect; Integral 4-pin M8/Pico-style quick disconnect or Integral 4-pin M12/Euro-style quick disconnect, depending on model
- Models with a quick disconnect require a mating cordset

**IO-Link Interface**
- Supports Smart Sensor Profile: Yes
- Baud Rate: 38400 bps
- Process Data Widths: 16 bits
- IODD Files: Provides all programming options plus additional functionality; please see the IO-Link Data Reference Guide for more details

**Environmental Rating**
- IEC IP67; NEMA 6; UL Type 1

**Operating Conditions**
- 95% relative humidity at 50 °C (non-condensing)
- –40 °C to +60 °C (–40 °F to +140 °F)

**Certifications**
- CE
- cUL
- IO-Link®

**Output Response**
- 1.7 milliseconds ON; 1.1 milliseconds OFF
- Note: 200 millisecond delay on power-up; outputs do not conduct during this time

**Adjustments**
- Single-turn adjustment potentiometer sets the cutoff distance between minimum and maximum positions

**Repeatability**
- 130 µs (standard mode)

**Indicators**
- 2 LED indicators on sensor top:
  - Green solid: Power on
  - Amber: Light sensed
  - Amber flashing: Marginal sensing condition

**Construction**
- ABS housing, acrylic lens cover, nickel-plated brass connector, acetal adjustment pot

**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 [www.bannerengineering.com](http://www.bannerengineering.com).

<table>
<thead>
<tr>
<th>Supply Wiring (AWG)</th>
<th>Required Overcurrent Protection (Amps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>5.0</td>
</tr>
<tr>
<td>22</td>
<td>3.0</td>
</tr>
<tr>
<td>24</td>
<td>2.0</td>
</tr>
<tr>
<td>26</td>
<td>1.0</td>
</tr>
<tr>
<td>28</td>
<td>0.8</td>
</tr>
<tr>
<td>30</td>
<td>0.5</td>
</tr>
</tbody>
</table>

**Dimensions**

[WORLD-BEAM® QS18 Electronically Adjustable Background Suppression Sensor (30-250mm)](http://www.bannerengineering.com)

P/N 201339 Rev. C  www.bannerengineering.com - Tel: +1-763-544-3164 3
Performance Curves

Long Range: The minimum sensing range is 8 mm for 6% reflectivity.

Short Range: The minimum sensing range is 13 mm for 6% reflectivity.
Accessories

Brackets

**SMB18A**
- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware

**Hole center spacing:** A to B = 24.2
**Hole size:** A = ø 4.6, B = 17.0 × 4.6, C = ø 18.5

**SMBQ4XFA**
- Swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolts available
- Side mounting of some sensors with the 3 mm screws included with the sensor

**B** = 7 × M3 × 0.5

<table>
<thead>
<tr>
<th>Model</th>
<th>Bolt Thread (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMBQ4XFA</td>
<td>3/8 - 16 × 2 1/4 in</td>
</tr>
<tr>
<td>SMBQ4XFAM10</td>
<td>M10 - 1.5 × 50</td>
</tr>
<tr>
<td>SMBQ4XFAM12</td>
<td>n/a; no bolt included. Mounts directly to 12 mm (½ in) rods</td>
</tr>
</tbody>
</table>

**SMB18AFA**
- Protective, swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolts available
- Mounting hole for 18 mm sensors

**Hole size:** B = ø 18.1

<table>
<thead>
<tr>
<th>Model</th>
<th>Bolt Thread (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMB18AFA</td>
<td>3/8 - 16 × 2 in</td>
</tr>
<tr>
<td>SMB18AFAM10</td>
<td>M10 - 1.5 × 50</td>
</tr>
</tbody>
</table>

**SMB312S**
- Stainless steel 2-axis, side-mount bracket

**A** = 4.3 × 7.5, **B** = diam. 3, **C** = 3 × 15.3
## Cordsets

### 4-Pin Threaded M12/Euro-Style Cordsets

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Style</th>
<th>Dimensions</th>
<th>Pinout (Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQDC-406</td>
<td>1.83 m (6 ft)</td>
<td>Straight</td>
<td>ø 14.5</td>
<td>1 = Brown</td>
</tr>
<tr>
<td>MQDC-415</td>
<td>4.57 m (15 ft)</td>
<td>Straight</td>
<td>ø 14.5</td>
<td>2 = White</td>
</tr>
<tr>
<td>MQDC-430</td>
<td>9.14 m (30 ft)</td>
<td>Straight</td>
<td>ø 14.5</td>
<td>3 = Blue</td>
</tr>
<tr>
<td>MQDC-450</td>
<td>15.2 m (50 ft)</td>
<td>Right-Angle</td>
<td>ø 14.5 [0.57&quot;]</td>
<td>4 = Black</td>
</tr>
</tbody>
</table>

### 4-Pin Threaded M8/Pico-Style Cordsets

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Style</th>
<th>Dimensions</th>
<th>Pinout (Female)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKG4M-2</td>
<td>2 m (6.56 ft)</td>
<td>Straight</td>
<td>ø 9.5</td>
<td>1 = Brown</td>
</tr>
<tr>
<td>PKG4M-5</td>
<td>5 m (16.4 ft)</td>
<td>Straight</td>
<td>ø 9.5</td>
<td>2 = White</td>
</tr>
<tr>
<td>PKG4M-9</td>
<td>9 m (29.5 ft)</td>
<td>Right-Angle</td>
<td>ø 9.5 [0.35&quot;]</td>
<td>3 = Blue</td>
</tr>
<tr>
<td>PKW4M-2</td>
<td>2 m (6.56 ft)</td>
<td>Right-Angle</td>
<td>ø 9.5</td>
<td>4 = Black</td>
</tr>
<tr>
<td>PKW4M-5</td>
<td>5 m (16.4 ft)</td>
<td>Right-Angle</td>
<td>ø 9.5</td>
<td></td>
</tr>
<tr>
<td>PKW4M-9</td>
<td>9 m (29.5 ft)</td>
<td>Right-Angle</td>
<td>ø 9.5</td>
<td></td>
</tr>
</tbody>
</table>

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