**WORLD-BEAM QS18E Clear Object Detection**

**Instruction Manual**

*Expert™ Coaxial Polarized Retroreflective Sensor for Clear Object Detection*

- Reliably detects clear, translucent, or opaque objects — including PET, glass containers, and transparent films
- Coaxial optics enable reliable detection of targets to the face of the sensor with no dead zone
- “Clear Tracking” automatic compensation algorithm provides long and reliable operation by compensating for dust build up and ambient temperature changes
- Fast response speed with low jitter for high speed bottling and packaging applications
- Bright, visible red light spot makes alignment easy
- 3 user-selectable thresholds optimize performance to the type of object being detected
- Easy configuration of sensor by remote teach input or tactile push button
- Convenient mounting options available for 18 mm barrel or side mount
- Bright indicator LEDs show operating status from 360°
- IP67 rated ABS housing
- Dedicated PNP or NPN output with matching remote input wire

**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>Models</th>
<th>Mode</th>
<th>Range</th>
<th>Output</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>QS18EN6XLPC</td>
<td>COAXIAL POLAR RETRO CLEAR OBJECT</td>
<td>0 to 1.3 m (0 to 4.2 ft) on BRT-40X19A 0 to 2.0 m (0 to 6.5 ft) on BRT-51X51BM 0 to 3.0 m (0 to 9.8 ft) on BRT-92X92C</td>
<td>NPN</td>
<td></td>
</tr>
<tr>
<td>QS18EP6XLPC</td>
<td>POLAR RETRO CLEAR OBJECT</td>
<td></td>
<td>PNP</td>
<td>2 m cable (6.5 ft)</td>
</tr>
</tbody>
</table>

1 The standard 2 m (6.5 ft) cable models are listed.
- To order the 9 m (30 ft) cable models, add the suffix “W/30” to the cabled model number (for example QS18EN6XLPC W/30)
- To order the 4 pin Euro M12 integral connector, add the suffix “Q8” (for example QS18EN6LPCQ8)
- To order the 4 pin Euro M12 150 mm (6 inch) cable, add the suffix “Q5” (for example QS18EN6LPCQ5)
- To order a 4 pin Pico M8 integral connector, add the suffix “Q7” (for example QS18EN6LPCQ7)
- To order a 4 pin Pico M8 150 mm (6 inch) cable, add the suffix “Q” (for example QS18EN6XLPCQ)
Overview

The Banner QS18 sensor is a high performance clear object detection sensor. The polarized coaxial optical design ensures reliable detection of transparent, translucent, and opaque targets at any distance between the sensor and the reflector. Low contrast sensing applications include PET bottles, glass containers, and shrink wrap. The sensor can also be used to detect optical surfaces such as: LCD panels with built in polarizing films, solar panels, and semiconductor wafers.

<table>
<thead>
<tr>
<th>Sensor Condition (Run Mode)</th>
<th>Green LED</th>
<th>Amber LED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output OFF</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Output ON</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Notification — Sensor needs to be reconfigured for reliable detection</td>
<td>Flashing at 5 Hz</td>
<td>ON/OFF</td>
</tr>
<tr>
<td>Notification — Push button has been locked out</td>
<td>Flashes 4 times and returns to solid on</td>
<td>ON/OFF</td>
</tr>
</tbody>
</table>

Installing and Mounting the Sensor for Low Contrast Applications

Reliable transparent object detection depends on the sensor always detecting the object as "dark state" and the reflector as the "light state". Using a recommended reflector, and proper orientation of the sensor to the reflector, is key to good clear object detection. Optimize the reliable detection of transparent and clear objects by applying the following steps when mounting the sensor and selecting a retroreflective target.

1. If a bracket is needed, mount the sensor onto the bracket.
2. Mount the sensor (or the sensor and the bracket) to the equipment at the desired location. Do not tighten at this time.
3. Align the sensor’s light spot to the middle of the retroreflector.
4. Mount the retroreflector perpendicular to the sensor optical axis (± 5°).
5. Tighten the screws to secure the sensor (or the sensor and the bracket) to the aligned position.

Mounting Considerations for Opaque Objects with Mirror Like Surfaces

To minimize the potential for reflections from mirror-like objects affecting the sensor, it is best to side mount the sensor.

Wiring Diagrams

Sensor Configuration

Sensor configuration can be implemented with the push button or the remote program wire. Configuration options include two sensing modes: Light Set and Dark Set. Configuration options include the features shown in Push Button Input Flowchart and Remote Input Flowchart.
Push Button Configuration

Use the push button to configure the sensor. Click the push button according to Push Button Input Flowchart. After a configuration has been selected the sensor flashes both the green and amber LED to show which configuration was selected followed by a rapid flashing of both the green and amber LED in unison to show acknowledgement and acceptance of the configuration.

Remote Input Configuration

Enabling the remote input wire is done using IO-Link. Use the remote input function to configure the sensor remotely. Connect the white wire of the sensor as shown in the wiring diagram. Pulse the remote line according to the Remote Input Flowchart. After a configuration has been selected, both the green and amber LEDs will flash to show which configuration was selected, followed by a rapid flashing of both the green and amber LED in unison to show acknowledgement and acceptance of the configuration.
Light Set

Use Light SET for low contrast applications. Use either the push button or remote input wire procedure to configure the sensor.

<table>
<thead>
<tr>
<th>Example Applications For Offset Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>8%</td>
</tr>
<tr>
<td>16%</td>
</tr>
<tr>
<td>32%</td>
</tr>
</tbody>
</table>

1. Prepare the sensor.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>Clear the light path to the reflector.</td>
<td></td>
</tr>
<tr>
<td>Remote Line</td>
<td>Clear the light path to the reflector.</td>
<td></td>
</tr>
</tbody>
</table>

2. Access Light Set mode and set the sensing condition.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>Press and hold the push button 2 to 4 seconds.</td>
<td>LIGHT SET Configuration Accepted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green LED Indicator; Flashes 3 times.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Green and Amber LED Indicators; Acceptance Flash - both LEDs flash 5 times rapidly in unison.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The sensor returns to Run mode with the new settings.</td>
</tr>
<tr>
<td>Remote Line</td>
<td>Single-pulse the remote line.</td>
<td>LIGHT SET Configuration Not Accepted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If there is not enough return signal, the sensor will perform in DARK SET indicated by the green and amber LED indicators flashing in unison 2 times followed by the green and amber LED indicators flashing rapidly in unison 5 times.</td>
</tr>
</tbody>
</table>

Dark Set

Dark SET (maximum operating range) is the factory default setting and provides maximum sensing range, ease of alignment, and reliable detection of opaque objects. Dark Set provides a fixed threshold whenever the sensor is taught an obstructed view.

Note: The sensor’s light spot is made brighter for 60 seconds to assist in aligning the sensor to the reflector. This is particularly useful for long range applications.
2. Access Dark Set mode and set the sensing condition.

<table>
<thead>
<tr>
<th>Method</th>
<th>Action</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push Button</td>
<td>Press and hold the push button 2 to 4 seconds.</td>
<td><strong>DARK SET Configuration Accepted</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Green and Amber LED Indicators:</strong> Flash 2 times.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Green and Amber LED Indicators:</strong> Acceptance flash - both LEDs flash 5 times in unison.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The sensor returns to Run mode with the new settings.</td>
</tr>
<tr>
<td>Remote Line</td>
<td>Single-pulse the remote line.</td>
<td><strong>DARK SET Configuration Not Accepted</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>If there is too much return signal, the sensor will perform in LIGHT SET indicated by the green LED indicator flashing 3 times followed by the green and amber LED indicators flashing rapidly in unison 5 times.</td>
</tr>
</tbody>
</table>

### Specifications

**Supply Voltage**
10 V to 30 V dc (10% maximum ripple)

**Supply Current (Exclusive of Load Current)**
- < 25 mA at 15 V
- < 40 mA at 24 V

**Repeatability**
100 µs

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

**Output Protection Circuitry**
Protected against false pulse on power-up and continuous overload or short-circuit of output

**Output Configuration**
Current sourcing (PNP) or current sinking (NPN), depending on model; Light- or dark-operate selectable; Selectable 30 ms output OFF-delay Rating: 100 mA max

**Off-state leakage current:**
- < 50 µA at 30 V
- ON-state saturation voltage: < 1.5 V at 10 mA; < 3 V 100 mA

**Output Response Time**
Note: Momentary delay on power-up; output does not conduct during this time
400 µs ON/OFF

**Required Overcurrent Protection**

**Emitter LED**
Visible red, 625 nm

**Indicators**
Two LEDs (1 green, 1 amber)
- Green solid: Indicates power applied and sensor ready
- Green flashing: Indicates sensor operating in marginal state, in need of reconfiguration
- Amber solid: Indicates output conducting

**Factory Default Settings**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Factory Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensing Mode</td>
<td>Dark Set</td>
</tr>
<tr>
<td>Output Logic</td>
<td>Dark Operate</td>
</tr>
<tr>
<td>Offset Percent</td>
<td>16%</td>
</tr>
<tr>
<td>Push Button</td>
<td>Unlocked</td>
</tr>
<tr>
<td>Auto Compensation</td>
<td>Disabled</td>
</tr>
<tr>
<td>OFF Delay</td>
<td>Disabled</td>
</tr>
</tbody>
</table>

**Mounting Torque**
- Nose mount: 18 mm mounting nut, 20 lbf-in (2.3 N·m)
- Side mount: Two M3 screws, 5 lbf-in (0.6 N·m)

**Construction**
ABS housing, PMMA window

**Connections**
PVC-jacketed 4-conductor 2 m (6.5 ft) or 9 m (30 ft) unterminated cable, or 4-pin Euro-style or 4-pin Pico-style quick-disconnect (QD), either integral or 150 mm (6 in) pigtail, are available. QD cordsets are ordered separately.

**Operating Conditions**
- Temperature: –40 °C to +70 °C (–40 °F to +158 °F)
- Relative Humidity: 90% at +50 °C (non-condensing)

**Environmental**
IEC IP67

**Application Notes**
If the push button does not appear to be responsive, perform the push button enable procedure

**Certifications**

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**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).
## Accessories

### 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>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>MQDC-406</td>
<td>1.83 m (6 ft)</td>
<td>Straight</td>
<td>[Diagram]</td>
<td>1 = Brown</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>MQDC-415</td>
<td>4.57 m (15 ft)</td>
<td></td>
<td></td>
<td>2 = White</td>
<td></td>
</tr>
<tr>
<td>MQDC-430</td>
<td>9.14 m (30 ft)</td>
<td></td>
<td></td>
<td>3 = Blue</td>
<td></td>
</tr>
<tr>
<td>MQDC-450</td>
<td>15.2 m (50 ft)</td>
<td></td>
<td></td>
<td>4 = Black</td>
<td></td>
</tr>
<tr>
<td>MQDC-406RA</td>
<td>1.83 m (6 ft)</td>
<td>Right-Angle</td>
<td></td>
<td>1 = Brown</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>MQDC-415RA</td>
<td>4.57 m (15 ft)</td>
<td></td>
<td></td>
<td>2 = White</td>
<td></td>
</tr>
<tr>
<td>MQDC-430RA</td>
<td>9.14 m (30 ft)</td>
<td></td>
<td></td>
<td>3 = Blue</td>
<td></td>
</tr>
<tr>
<td>MQDC-450RA</td>
<td>15.2 m (50 ft)</td>
<td></td>
<td></td>
<td>4 = Black</td>
<td>[Diagram]</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>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKG4M-2</td>
<td>2 m (6.56 ft)</td>
<td>Straight</td>
<td>[Diagram]</td>
<td>1 = Brown</td>
<td>[Diagram]</td>
</tr>
<tr>
<td>PKG4M-5</td>
<td>5 m (16.4 ft)</td>
<td></td>
<td></td>
<td>2 = White</td>
<td></td>
</tr>
<tr>
<td>PKG4M-9</td>
<td>9 m (29.5 ft)</td>
<td></td>
<td></td>
<td>3 = Blue</td>
<td></td>
</tr>
<tr>
<td>PKW4M-2</td>
<td>2 m (6.56 ft)</td>
<td></td>
<td></td>
<td>4 = Black</td>
<td></td>
</tr>
<tr>
<td>PKW4M-5</td>
<td>5 m (16.4 ft)</td>
<td></td>
<td></td>
<td>1 = Brown</td>
<td></td>
</tr>
<tr>
<td>PKW4M-9</td>
<td>9 m (29.5 ft)</td>
<td>Right-Angle</td>
<td></td>
<td>2 = White</td>
<td></td>
</tr>
</tbody>
</table>

### Retroreflectors

**BRT-51X51BM**
- Square, acrylic target
- Refractivity Factor: 1.5
- Temperature: –20 °C to +50 °C (–4 °F to +122 °F)
- Micro-prism geometry
- Optional brackets are available
- Approximate size: 51 mm × 51 mm

**BRT-60X40C**
- Rectangular, acrylic target
- Refractivity Factor: 1.4
- Temperature: –20 °C to +60 °C (–4 °F to +140 °F)
- Optional brackets are available
- Approximate size: 40 mm × 60 mm
BRT-92X92C
- Square, acrylic target
- Reflectivity Factor: 3.0
- Temperature: –20 °C to +60 °C (–4 °F to +140 °F)
- Optional brackets are available
- Approximate size: 92 mm × 92 mm

BRT-40X19A
- Rectangular, acrylic target
- Reflectivity Factor: 1.3
- Temperature: –20 °C to +60 °C (–4 °F to +140 °F)
- Approximate size: 19 mm × 60 mm overall; 19 mm × 40 mm reflector

BRT-60X40IP69K
- Rectangular, acrylic target (color is amber)
- Reflectivity Factor: 0.7
- Temperature: –20 °C to +140 °C (–4 °F to +284 °F)
- Chemically resistant
- IP69K washdown rated
- Optional brackets are available
- Approximate size: 40 mm × 60 mm

BRT-60X40C-PS
- Rectangular, polystyrene target
- Reflectivity Factor: 1.1
- Temperature: –20 °C to +60 °C (–4 °F to +140 °F)
- Optional brackets are available
- Chemically compatible with hydrogen peroxide
- Yellow back
- Approximate size: 40 mm × 60 mm

2 in retroreflective tape, 2.5 m (100 in)

<table>
<thead>
<tr>
<th>Model</th>
<th>Reflectivity Factor</th>
<th>Maximum Temperature</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRT-THG-2-100</td>
<td>0.7</td>
<td>+60 °C (+140 °F)</td>
<td>50 mm (2 in) wide, 2.5 m (100 in) long</td>
</tr>
</tbody>
</table>

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 4.8, B = 17.0 x 4.6, C = ø 18.5

SMBQS18Y
- Die-cast bracket for 18 mm holes
- Includes metal hex nut and lock washer
- Allows ± 8° for cabled sensors

Hole size: A = ø 15.3
SMBQ4X...
- 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

\[ B = 7 \times M3 \times 0.5 \]

<table>
<thead>
<tr>
<th>Model</th>
<th>Bolt Thread (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMBQ4XFA</td>
<td>3/8 - 16 x 2¾ in</td>
</tr>
<tr>
<td>SMBQ4XFAM10</td>
<td>M10 - 1.5 x 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: \[ B = \phi 18.1 \]

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

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

\[ A = 4.3 \times 7.5, B = \text{diam. } 3, C = 3 \times 15.3 \]

Banner Engineering Corp. Limited Warranty

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