WORLD-BEAM® QS18E Clear Object Detection with IO-Link

Quick Start Guide

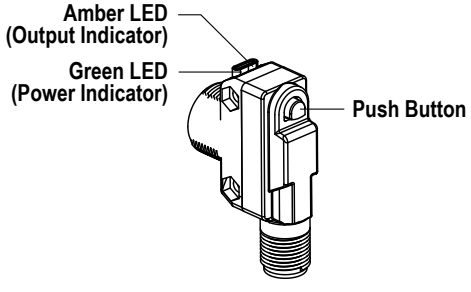
Expert™ Coaxial Polarized Retroreflective Sensor for Clear Object Detection with IO-Link

This guide is designed to help you set up and install the QS18E Clear Object Detection with IO-Link. For complete information on programming, performance, troubleshooting, dimensions, and accessories, please refer to the Instruction Manual at *www.bannerengineering.com*. Search for p/n 196873 to view the Instruction Manual. Use of this document assumes familiarity with pertinent industry standards and practices.

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.

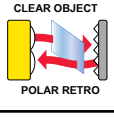
Overview



The Banner QS18 sensor is a high performance clear object detection sensor with an IO-link and multifunction output. 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.

Indicators (Two LEDs: One Green, One Amber)		
Sensor Condition (Run Mode)	Green LED	Amber LED
Output OFF	ON	OFF
Output ON	ON	ON
Notification — Sensor needs to be reconfigured for reliable detection	Flashing at 5 Hz	ON/OFF
Notification — Push button has been locked out	Flashes 4 times and returns to solid on	ON/OFF

Models

Model	Mode	Range	Channel 1	Channel 2	Connector[1]
QS18EK6XLPC		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-60X40C 0 to 3.0 m (0 to 9.8 ft) on BRT-92X92C	IO-Link, Push/pull output, programmable PNP or NPN output	Multi-function remote input/ output, programmable PNP or NPN	2 m (6.5 ft) cable

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.

[1] Integral 2 m (6.5 ft) unterminated cable models are listed.

- To order the 9 m (30 ft) PVC cable model, add the suffix "W/30" to the cabled model number. For example, QS18EK6XLPC W/30.
- To order the 4-pin M12/Euro-style integral quick disconnect model, add the suffix "Q8" to the model number. For example, QS18EK6XLPCQ8.
- 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, QS18EK6XLPCQ5.
- To order the 4-pin M8/Pico-style integral quick disconnect model, add the suffix "Q7" to the model number. For example, QS18EK6XLPCQ7.
- 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, QS18EK6XLPCQ.

Original Document
196874 Rev. A

27 December 2016

196874

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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

IO-Link with PNP Output (Factory Default)

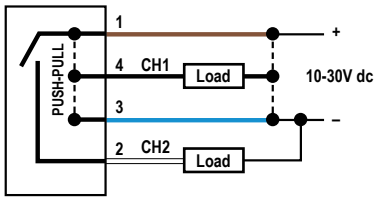


Figure 1. Channel 1 = IO-Link, Channel 2 = PNP Output

IO-Link with PNP Remote Input

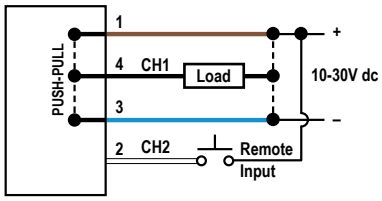


Figure 2. Channel 1 = IO-Link, Channel 2 = PNP Remote Input

Key

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

NOTE: NPN/PNP and Remote Input configurations are programmable using IO-Link.

NOTE: The remote input wire function needs to be enabled using IO-Link. The default for the remote input wire function is Detection Output.

Sensor Configuration

Sensor configuration can be performed using IO-Link, the push button, or the remote input wire once enabled through IO-link. Options include three sensing modes: Transparent, Film, and Opaque. Other configuration options include: output delay timing, health output, offset percentages, and the ClearTracking auto compensation algorithm. For more detail, see the IO-Link IODD package (p/n 198215), which includes an IO-Link Data Map, on the Banner Website at *http://www.bannerengineering.com*.

For configuration using the push button, see the Push Button Input Flowchart. For configuration using the remote program wire, please refer to the Instruction Manual at *http://www.bannerengineering.com*. Search for p/n 196873 .

Sensor Push Button (configuration using user interface push button)

User Interface Push Button
Hold is > 2 sec. and < 4 sec.
Click is > 40 ms and < 800 ms

- **Press and hold push button > 2 sec.** → Initiate Translucent, Film or Opaque Selection
- Click 2X → **Basic Configuration** (alternating flashing Green and Amber LEDs at 1Hz)
  - Click 1X → Set output to Light Operate (flashing Green and Amber 1X followed by acceptance flash)
  - Click 2X → Set output to Dark Operate (flashing Green and Amber 2X followed by acceptance flash) **default**
  - Click 3X → Set offset to 8% offest (flashing Green and Amber 3X followed by acceptance flash)
  - Click 4X → Set offset to 16% offest (flashing Green and Amber 4X followed by acceptance flash) **default**
  - Click 5X → Set offset to 32% offest (flashing Green and Amber 5X followed by acceptance flash)
- Click 3x → **Advanced Configuration** (simultaneous flashing both Green and Amber LEDs at 1Hz)
  - Click 1X → Unlock push buttons (flashing Green and Amber 1X followed by acceptance flash) **default**
  - Click 2X → Lock push buttons (flashing Green and Amber 2X followed by acceptance flash)
  - Click 3X → Enable Auto compensation (flashing Green and Amber 3X followed by acceptance flash)
  - Click 4X → Disable Auto compensation (flashing Green and Amber 4X followed by acceptance flash) **default**
  - Click 5X → Enable 30 ms Off Delay (flashing Green and Amber 5X followed by acceptance flash)
  - Click 6X → Disable 30 ms Off Delay (flashing Green and Amber 6X followed by acceptance flash) **default**
- Click 5x → **Select Sensor Mode** (flashing Amber LED at 1Hz)
  - Click 1X → Select Translucent Mode **default**
  - Click 2X → Select Film Mode
  - Click 3X → Select Opaque Mode

Note: Initiate Sensor Mode Selection is required before the selected Mode takes effect.

Transparent Mode Set

Use Transparent mode for low contrast applications where the object is not present during the teach process. Transparent mode is the default sensing mode and is best for most clear object detection applications.

Example Applications For Offset Percentages	
8%	Recommended for very low contrast applications with stable environmental conditions.
16%	Recommended for most clear object detection applications in typical machine industrial environments.
32%	Recommended for high contrast detections such as brown or green bottles, or opaque objects. This setting tolerates environmental challenges such as vibrations and dust build-up.

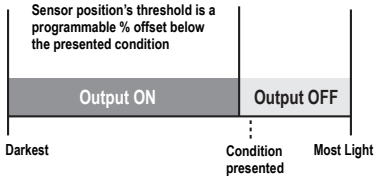
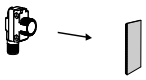


Figure 3. Transparent Mode

Setup	Action	Result
Clear the light path to the reflector. 	Press and hold the button 2 to 4 seconds. 	Transparent Mode Configuration Accepted Green LED Indicator: Flashes 3 times. Green and Amber LED Indicators: Acceptance Flash—both LEDs flash 5 times rapidly in unison. The sensor returns to Run mode with Transparent mode as the sensing condition. Transparent Mode Configuration Not Accepted If there is not enough return signal the sensor will perform an Opaque mode configuration indicated by: Green and Amber LED Indicators: Flash 2 times. Green and Amber LED Indicators: Acceptance Flash—both LEDs flash 5 times rapidly in unison and the Green LED will continue to flash. The sensor is not ready for transparent detection due to insufficient light from the reflector, but is ready for maximum range Opaque object detection. Re-optimize alignment, check the reflector size for required range, and re-configure the sensor for transparent object detection.
	Send Single Value Teach command using IO-Link. IO-Link®	
	Pulse the remote line 1-time. 	

Film Mode Set

Film mode is useful when the transparent target cannot be removed from the light path during the teach procedure. This is common on continuous web processes such as shrink wrapping machinery. The sensor learns the dark state with the web present and switches the output if the web breaks or runs out.

Example Applications For Offset Percentages	
8%	Recommended for very low contrast applications with stable environmental conditions.
16%	Recommended for most clear object detection applications in typical machine industrial environments.
32%	Recommended for high contrast detections such as brown or green bottles, or opaque objects. This setting tolerates environmental challenges such as vibrations and dust build-up.

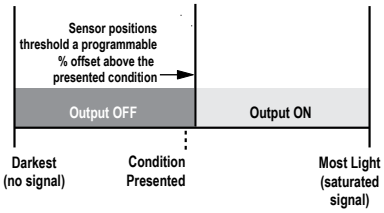
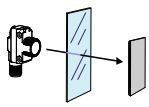


Figure 4. Film Mode

Setup	Action	Result
Align the light path to the reflector through a plastic film. 	Press and hold the button 2 to 4 seconds. 	Film Mode Configuration Accepted Green LED Indicator: Flashes 3 times. Green and Amber LED Indicators: Acceptance Flash - both LEDs flash 5 times rapidly in unison. The sensor returns to Run mode with Film mode as the sensing condition. Film Mode Configuration Not Accepted If there is not enough return signal the sensor will perform an Opaque mode configuration indicated by: Green and Amber LED Indicators: Flash 2 times. Green and Amber LED Indicators: Acceptance Flash - both LEDs flash 5 times rapidly in unison and the Green LED will continue to flash. The sensor is not ready for film detection due to insufficient light from the reflector, but is ready for maximum range Opaque object detection. Re-optimize alignment, check the reflector size for required range, and re-configure the sensor for film detection.
	Send Single Value Teach Command using IO-Link. IO-Link®	
	Pulse the remote line 1-time. 	

Specifications

Supply Voltage and Current
10 V dc to 30 V dc (10% max. ripple) at 30 mA

Repeatability
100 µs

Supply Protection Circuitry
Protected against reverse polarity and transient overvoltages

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

Output Configuration
Channel 1: IO-Link, Push/pull output, configurable PNP or NPN output
Channel 2: Multi-function remote input/output, configurable PNP or NPN

Output Response Time
Momentary delay on power-up, < 0.5 s, output does not conduct during this period
400 µs ON/OFF

IO-Link Interface
Supports Smart Sensor Profile: Yes
Baud Rate: 38400 bps
Process Data Widths: 16 bits
IODD Files: Provides all programming options of button and remote input wire, plus additional functionality. Please see the IO-Link Datamap document for more details.

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

Setting	Factory Default
Sensing Mode	Transparent Mode
Output Logic	Dark Operate
Offset Percent	16%
Push Button	Unlocked
Auto Compensation	Disabled
OFF Delay	Disabled
Pin 4 Output	IO-Link Enabled Detection Output (Push-pull)
Pin 2 Output	Detection Output: High speed output when using IO-Link on Pin 4 (PNP)

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*.

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

Construction
ABS housing, PMMA window

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)

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
−40 °C to +70 °C (−40 °F to +158 °F)
95% at +50 °C maximum relative humidity (non-condensing)

Environmental Rating
IEC IP67

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

Certifications

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.

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