WORLD-BEAM® QS18 Expert Opposed-Mode with IO-Link

Quick Start Guide

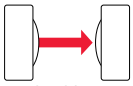
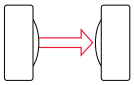
Expert™ Opposed-Mode Sensor with IO-Link

This guide is designed to help you set up and install the QS18 Expert Opposed-Mode 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 196872 to view the Instruction Manual. Use of this document assumes familiarity with pertinent industry standards and practices.

WARNING:

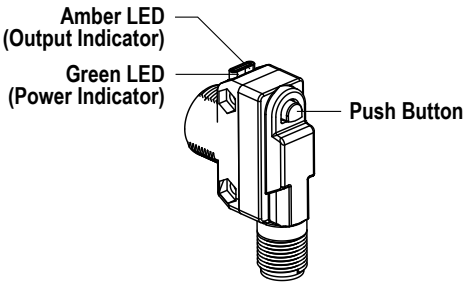
- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction can cause either an energized (on) or de-energized (off) output condition.

Models

Model [1]	Opposed-Mode	Range	Teachable Range	Output
QS18EK6EVQ8 (Visible red, 625 nm)	 OPPOSED	High Power Emitter Setting: 20m Low Power Emitter Setting: 4m	High Power Emitter Setting: 1 m to 20 m Low Power Emitter Setting: 0 m to 4 m	IO-Link and multi-function input
QS18EK6RVQ8				IO-Link push/pull output and multi-function input/output
QS18EK6EQ8 (Infrared, 940 nm)	 OPPOSED			IO-Link and multi-function input
QS18EK6RQ8				IO-Link push/pull output and multi-function input/output

Overview

The Banner QS18E sensor is a high performance photoelectric sensor with IO-link. The receiver has a configurable multifunction input/output. The emitter has a configurable multifunction input.



Receiver		
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 OR The emitter is set to High Power, and the receiver is saturated. Set the emitter to Low Power.	Flashing	ON/OFF
Notification—Push button has been locked out	Flashes four times and returns to solid On after button press	ON/OFF

Emitter		
Sensor Condition	**Green LED**	**Amber LED**
Power On	ON	OFF
Notification—Push button has been locked out	Flashes four times and returns to solid On after button press	OFF

[1] 4-Pin M12/Euro-style integral quick disconnect models listed.

- To order the 150 mm (6 in) PVC cable model with a 4-pin M12/Euro-style quick disconnect, replace the suffix "Q8" with "Q5" in the model number. For example, QS18EK6EVQ5.
- To order the 4-pin M8/Pico-style integral quick disconnect model, replace the suffix "Q8" with "Q7" in the model number. For example, QS18EK6EVQ7.
- To order the 150 mm (6 in) PVC cable model with a 4-Pin M8/Pico-style quick disconnect model, replace the suffix "Q8" with "Q" in the model number. For example, QS18EK6EVQ.
- To order the 2 m (6.5 ft) PVC cable model, remove the suffix "Q8" from the quick-disconnect model number. For example, QS18EK6EV.
- Models with a quick disconnect require a mating cordset.

Original Document
211477 Rev. E

11 February 2021

211477

Mount the Device

1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or the device and the bracket) in the aligned position.

Wiring Diagrams

The following wiring diagrams apply to the receivers. The wiring diagram that includes remote input applies to the emitters.

Figure 1. Channel 1 = IO-Link, Channel 2 = PNP Output (factory default)

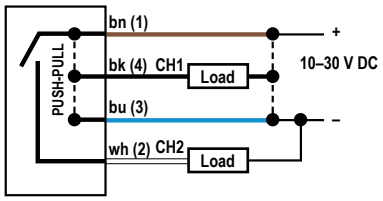
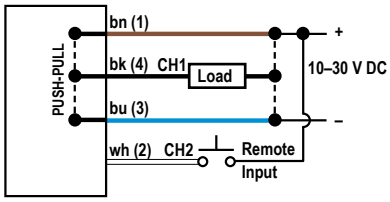


Figure 2. Channel 1 = IO-Link, Channel 2 = PNP Remote Input



Key

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

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

Note: Enable the remote input wire function using IO-Link. The default for the remote input wire function is Detection Output.

Figure 3. Sensor Pinout M12/Euro-style Models (Male)

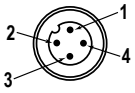


Figure 4. Sensor Pinout M8/Pico-Style Models (Male)

Sensor Configuration

Configure the receiver using any of six TEACH or SET methods to define the sensing limits. Use the setup procedure to enable a 30 ms OFF-delay or to change the Light/Dark Operate setting.

Sensing limit configuration options include:

- Two-Point Static TEACH: one switching threshold, determined by two taught conditions
- Dynamic TEACH: one switching threshold, determined by multiple sampled conditions
- Window SET: a sensing window, centered around a single sensing condition
- Light SET and Dark SET: One switching threshold, offset from a single sensing condition
- Opaque Mode: One switching threshold set to maximum excess gain

The sensor's output is disabled during all TEACH and SET procedures, and is enabled upon return to Run mode.

Following any TEACH or SET procedure other than Two-Point Static TEACH, the Output ON condition (Light or Dark Operate setting) remains as it was last configured. To change that setting, or the OFF-delay setting, see Figure 6 on p. 4 for receiver setup.

Push Button Configuration

Use the push button to configure either the emitter or the receiver. Click the push button according to the Input Flowchart, see Figure 5 on p. 3 for emitter setup and see Figure 6 on p. 4 for receiver setup.

Remote Input Configuration

Enable the remote input wire 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 Input Flowchart, see Figure 5 on p. 3 for emitter setup and see Figure 6 on p. 4 for receiver setup.

[2] IO-Link only on emitters.

Figure 5. Emitter Input Flowchart

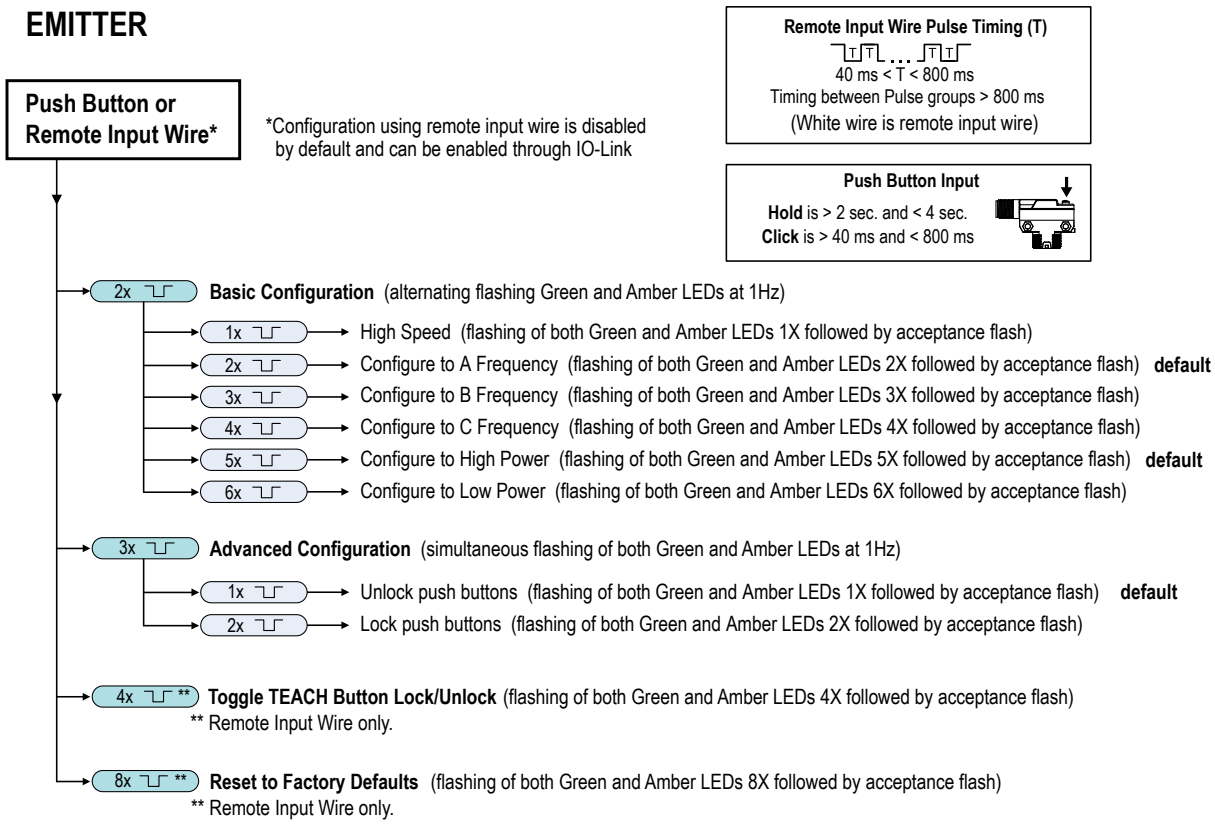
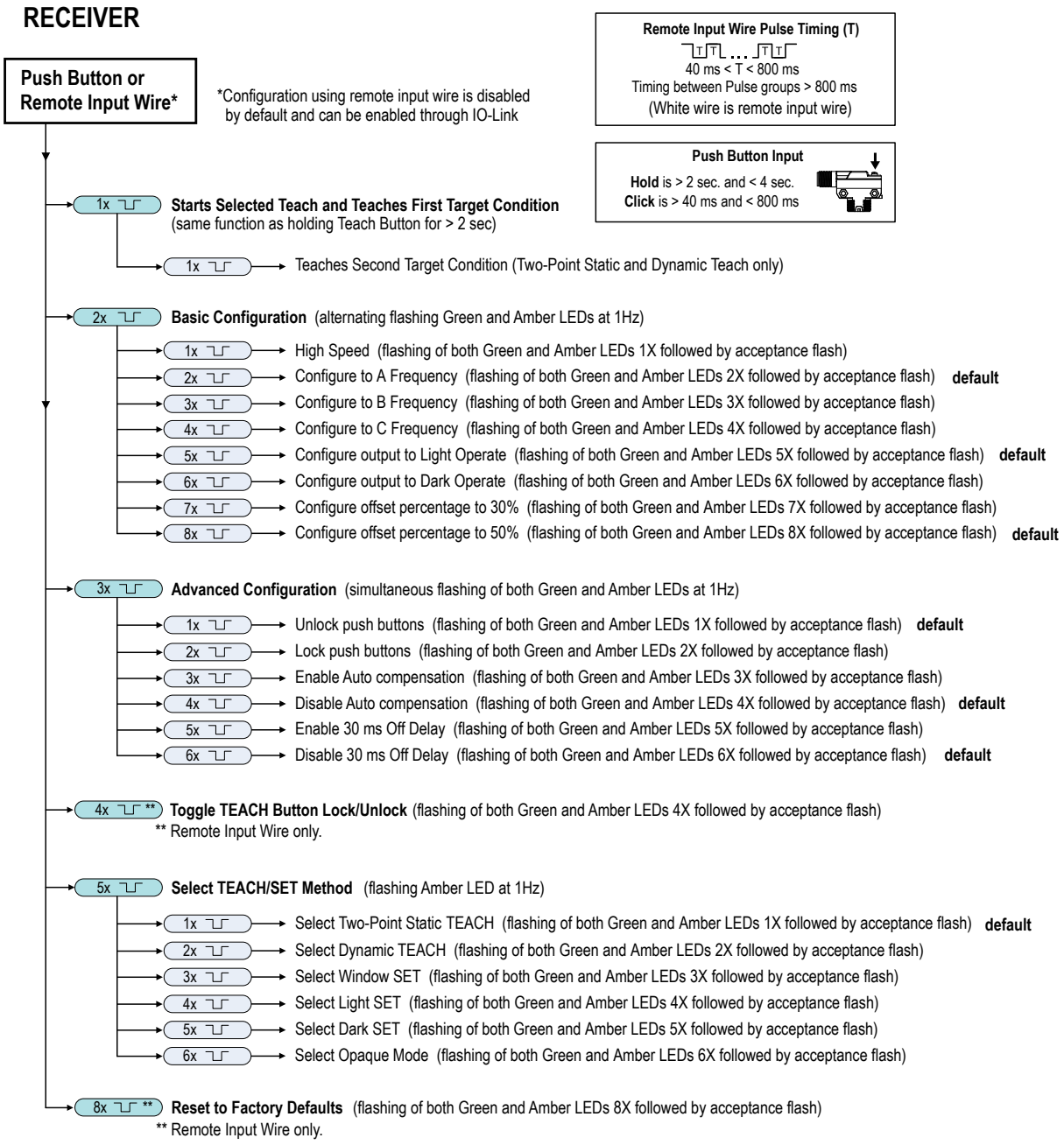


Figure 6. Receiver Input Flowchart



IO-Link Interface

IO-Link is a point-to-point communication link between a master device and sensor. Use IO-Link to parameterize sensors and transmit process data automatically.

For the latest IO-Link protocol and specifications, see www.io-link.com.

Each IO-Link device has an IODD (IO Device Description) file that contains information about the manufacturer, article number, functionality etc. This information can be easily read and processed by the user. Each device can be unambiguously identified via the IODD as well as via an internal device ID. Download the QS18E's IO-Link IODD package (p/n 209310 for the emitter and p/n 209311 for the receiver) from Banner Engineering's website at www.bannerengineering.com.

Banner has also developed Add On Instruction (AOI) files to simplify ease-of-use between the QS18E, multiple third-party vendors' IO-Link masters, and the Logix Designer software package for Rockwell Automation PLCs. Three types of AOI files for Rockwell Allen-Bradley PLCs are listed below. These files and more information can be found at www.bannerengineering.com.

Process Data AOIs—These files can be used alone, without the need for any other IO-Link AOIs. The job of a Process Data AOI is to intelligently parse out the Process Data word(s) in separate pieces of information. All that is required to make use of this AOI is an EtherNet/IP connection to the IO-Link Master and knowledge of where the Process Data registers are located for each port.

Parameter Data AOIs—These files require the use of an associated IO-Link Master AOI. The job of a Parameter Data AOI, when working in conjunction with the IO-Link Master AOI, is to provide quasi-realtime read/write access to all IO-Link parameter data in the sensor. Each Parameter Data AOI is specific to a given sensor or device.

IO-Link Master AOIs—These files require the use of one or more associated Parameter Data AOIs. The job of an IO-Link Master AOI is to translate the desired IO-Link read/write requests, made by the Parameter Data AOI, into the format a specific IO-Link Master requires. Each IO-Link Master AOI is customized for a given brand of IO-Link Master.

Add and configure the relevant Banner IO-Link Master AOI in your ladder logic program first; then add and configure Banner IO-Link Device AOIs as desired, linking them to the Master AOI as shown in the relevant AOI documentation.

Banner has also developed Function Blocks to simplify ease-of-use between the QS18E, multiple third-party vendors' IO-Link masters, and the Siemens TIA Portal software package for Siemens PLCs. Two types of Function Blocks files for TIA Portal are listed below. The files and more information can be found at www.bannerengineering.com.

Process Data Function Blocks—These files can be used alone, without the need for any other IO-Link Function Blocks. A Process Data Function Block intelligently parses out the Process Data byte(s) in separate pieces of information. To make use of this Function Block, a Profinet connection to the Io-Link Master and knowledge of where the Process Data registers are located for each port is required.

Parameter Data Function Blocks—These files require the Siemens TIA Portal Function Block IO_Link_Device. This is available from the Siemens website. A Parameter Function Block provides quasi-realtime read/write access to all IO-Link parameter data in the sensor. Each Parameter Function Block is specific to a given sensor.

Specifications

Supply Voltage and Current
10 V DC to 30 V DC (10% maximum ripple within specified limits) at 30 mA

Power and Current Consumption, exclusive of load
Normal Run Mode: 1.2W, Current consumption < 50 mA at 24 V DC

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
Rating: 50 mA maximum each output at 25 °C

Power Up Delay
Momentary delay on power-up, < 1.5 s, output does not conduct during this time

Gain
The gain setting can be changed via IO-Link
Gain values are: **Auto** and the fixed modes **High**, **Mid**, and **Low**

Response Time and Response Repeatability
When gain = **Auto**, the receiver optimizes the gain during Run mode for the current condition.
When gain = **Fixed**, the receiver optimizes the power for the presented configured condition(s).

Frequency	Gain Mode	Response Time (µs)	Response Repeatability (µs)
High Speed	Fixed	300	140
High Speed	Auto	350	212
A,B,C	Fixed	1000	400
A,B,C	Auto	1100	600

Emitter Power
High Power is Power 5.
Low Power is Power 0.
The following power levels are available via IO-Link to set intermediate power levels when looking for good contrast control with separation distances > 4 m: Power 5, Power 4, Power 3, Power 2, Power 1, and Power 0

IO-Link Interface
Supports Smart Sensor Profile: Yes
Baud Rate: 38400 bps
Process Data Widths: 32 bits In, 8 bits Out
IODD Files: Provides all programming options of push button and remote input wire, plus additional functionality. See the IO-Link Data Reference Guide (p/n 209308) for more details.

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

Emitter LED
EV model: Visible red, 625 nm
E models: Infrared, 940 nm

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

Factory Default Settings—Receiver

Setting	Factory Default
Basic Configuration	Frequency A
TEACH/SET	Two-Point Static TEACH
Output Logic	Light Operate
Output Response Time	Standard
Offset Percentage	50%
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
Gain	Auto

Factory Default Settings—Emitter

Setting	Factory Default
Basic Configuration	Frequency A
Power Setting	High Power
Push Button	Unlocked
Pin 4 Output	IO-Link (Push-pull)
Pin 2 Input	Detection Input: Deactivated
Power	High

Construction
Housing: ABS
Window: PMMA

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)

Vibration and Mechanical Shock
All models meet MIL-STD-202G, Method 201A (Vibration: 10 Hz to 60 Hz, 0.06 inch (1.52 mm) double amplitude, 2 hours each along X, Y and Z axes) requirements. Also meets IEC 60947-5-2 (Shock: 30G 11 ms duration, half sine wave) requirements.

Connections
PVC-jacketed 4-conductor 2 m (6.5 ft) or 9 m (30 ft) unterminated cable, or 4-pin M12/ Euro-style or 4-pin M8/Pico-style quick-disconnect, either integral or 150 mm (6 in) cable, are available.
Models with a quick disconnect require a mating cordset

Operating Conditions
–20 °C to +70 °C (–4 °F to +158 °F)
95% at +50 °C maximum relative humidity (non-condensing)
Storage Temperature: –65 °C to +125 °C (-85 °F to 257 °F)

Environmental Rating
IEC IP65, 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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For patent information, see www.bannerengineering.com/patents.

FCC Part 15 and CAN ICES-3 (B)/NMB-3(B)

This device complies with part 15 of the FCC Rules and CAN ICES-3 (B)/NMB-3(B). Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules and CAN ICES-3 (B)/NMB-3(B). These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the manufacturer.

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QS18EK6E QS18EK6EQ QS18EK6EQ5 QS18EK6EQ7 QS18EK6EQ8 QS18EK6EVQ QS18EK6EVQ5 QS18EK6EVQ7 QS18EK6EVQ8 QS18EK6RQ QS18EK6RQ5 QS18EK6RQ7 QS18EK6RQ8 QS18EK6RV QS18EK6RVQ QS18EK6RVQ5 QS18EK6RVQ7 QS18EK6RVQ8 QS18EK6EV QS18EK6R