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WORLD-BEAM® QS18E Series

Family of Expert™ Sensors in a Compact Universal Housing

Features

- Easy-to-use *Expert*-style Static and Dynamic TEACH options, plus Window, Light, and Dark SET, via push button or remote input
- Smart power-control algorithm to maximize performance in low-contrast applications
- Easy push-button or remote sensor setup options:
  — Dark-Operate/Light-Operate select
  — Selectable 30 ms output OFF-delay
- Less than 1 millisecond output response for excellent sensing repeatability
- Tough ABS housing is rated IEC IP67; NEMA 6
- Bright LED operating status indicators are visible from 360°
- Discrete PNP or NPN output, depending on model
- Multiple connection options available (see Models)
- Compact housing, easy barrel-mount (some models) or side-mount installation

Models

Sensing Mode		Model*	Range	Output Type
Polarized Retro	*Visible Red 660 nm* 	**QS18EN6LP**	3.5 m (12')**	NPN
		QS18EP6LP		PNP
Diffuse	*Infrared 940 nm* 	**QS18EN6D**	800 mm (31.5")	NPN
		QS18EP6D		PNP
		QS18EN6DB	500 mm (19.7")	NPN
		QS18EP6DB		PNP
		QS18EN6W	300 mm (11.8")	NPN
		QS18EP6W		PNP
	Visible Red 660 nm 	**QS18EN6DV**	600 mm (23.6")	NPN
		QS18EP6DV		PNP

** Specified using **BRT-84** reflector (sold separately).

Sensing Mode		Model*	Range	Output Type
Convergent	*Visible Red 660 nm* 	**QS18EN6CV15**	16 mm (0.65")	NPN
		QS18EP6CV15		PNP
		QS18EN6CV45	43 mm (1.7")	NPN
		QS18EP6CV45		PNP
Fiber Optic – Plastic	*Visible Red 660 nm* 	**QS18EN6FP**	Range varies by sensing mode and fiber optics used	NPN
		QS18EP6FP		PNP

* Only standard 2 m (6.5') cable models are listed. For 9 m (30') cable, add suffix "**W/30**" to the model number (e.g., **QS18EN6FP W/30**). A model with a QD connector requires a mating cordset; see page 7.

QD models:

- For 4-pin 150 mm (6") Euro-style pigtail, add suffix "**Q5**" (e.g., **QS18EN6FPQ5**).
- For 4-pin 150 mm (6") Pico-style pigtail, add suffix "**Q**" (e.g., **QS18EN6FPQ**).
- For 4-pin Integral Euro-style QD, add suffix "**Q8**" (e.g., **QS18EN6FPQ8**).
- For 4-pin Integral Pico-style QD, add suffix "**Q7**" (e.g., **QS18EN6FPQ7**).

⚠ WARNING . . . Not To Be Used for Personnel Protection

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

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Overview

The QS18 *Expert* family of sensors provides high-performance sensing in a compact package. The sensors feature a discrete output (NPN or PNP, depending on model), two bright LEDs for easy status monitoring during configuration and operation, multiple configuration options, remote configuration, and security lockout options.

Sensor Configuration

The sensor can be configured via any of five TEACH or SET options (by push button or the remote wire) to define the sensing limits. Then a SETUP procedure may be used to enable a 30 ms OFF-delay or to change the Light-/Dark-Operate setting (see page 5). Sensing limit configuration options include:

- Static TEACH: one switching threshold, determined by two taught conditions
- Dynamic (on-the-fly) TEACH: one switching threshold, determined by multiple sampled conditions
- Light SET and Dark SET: one switching threshold, offset from a single sensing condition (the "dark" condition or the "light" condition; see Figure 2)
- Window SET: a sensing window, centered around a single sensing condition

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 Static TEACH, the Output ON condition (Light- or Dark-Operate setting) will remain as it was last configured. To change that setting or the OFF-delay setting, see page 5.

Remote Configuration

Use the remote function to configure the sensor remotely or to disable the push button for security. Connect the white wire of the sensor to ground (0V dc), through a remote programming switch. Pulse the remote line according to the diagrams in the configuration procedures. The length of the individual programming pulses is equal to the value T:

0.04 seconds ≤ T ≤ 0.8 seconds

Push Button Enable/Disable

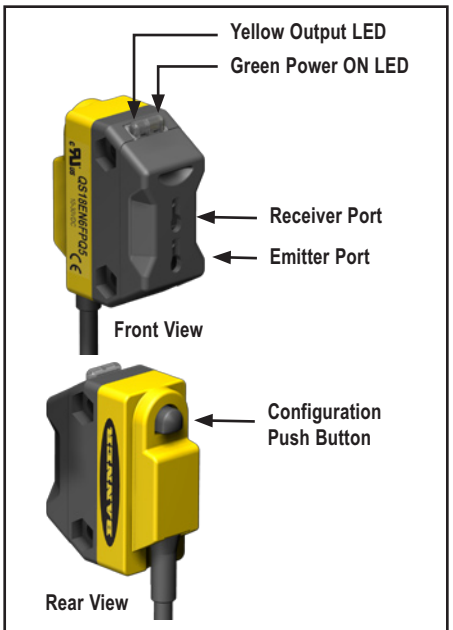
The remote input may be used to disable the sensor push button to prevent unauthorized adjustment. Connect the white wire of the sensor as described above to perform the procedure below to either enable or disable the feature.

	Push Button	Remote Line 0.04 seconds ≤ T ≤ 0.8 seconds	Result
Push Button Enable/Disable	• Not available	• From RUN mode, four-pulse the remote line. 	Sensor toggles between enable/disable settings and returns to RUN mode. **Power LED:** Flashes 3x, then ON Green **Output LED:** OFF,* then ON or OFF, depending on output state

* Initial Output LED condition is simultaneous with Power LED 3-flash.

Returning to RUN Mode without Saving Settings

Static TEACH and SET modes may be exited either after the automatic 60-second time-out, or by manually exiting the process: press and hold the push button (or hold the remote line low) for 2 seconds. The sensor returns to RUN mode without saving any new settings.



Indicators (Two LEDs: One Green, One Yellow)

	Sensor Condition	Green LED	Yellow LED
RUN Mode	Output OFF	ON	OFF
	Output ON	ON	ON
	Output ON, Marginal Signal	ON	Flashing
	Output Short Circuit	Flashing	OFF

Figure 1. Features — fiber optic model shown

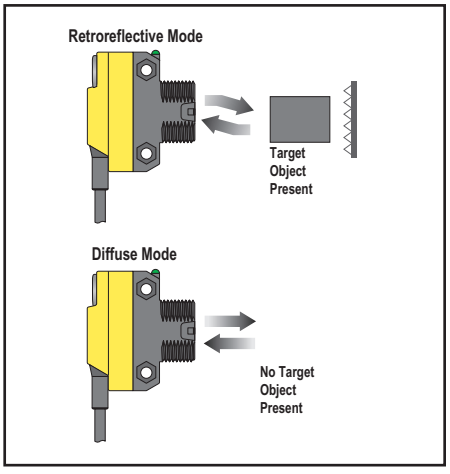


Figure 2. Dark sensing condition

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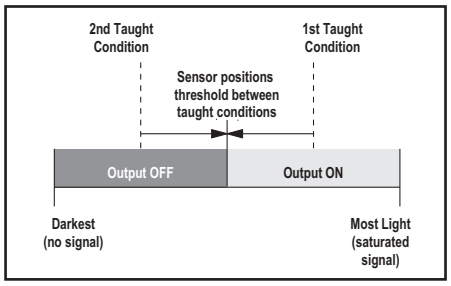

Figure 3. Static TEACH (Light Operate shown)

Static TEACH

- Locates a single switching threshold (switchpoint) at the optimal location between the two taught conditions, with the Output ON condition on one side, and the Output OFF condition on the other (see Figure 3).
- The first condition taught is the ON condition. Output ON and OFF conditions can be reversed by reversing the teach order or by changing the Light-/Dark-Operate setting in SETUP mode (see page 5).
- Recommended for applications where two conditions can be presented individually.

	Push Button 0.04 seconds ≤ "Click" ≤ 0.8 seconds	Remote Line 0.04 seconds ≤ T ≤ 0.8 seconds	Result	
Access Static TEACH Mode	• Press and hold push button 2–4 seconds.	No action required; sensor is ready for 1st sensing condition.	Sensor waits for 1st sensing condition. **Power LED:** OFF **Output LED:** Slow flash (1 Hz)	
Teach 1st Sensing Condition	• Present 1st sensing condition. • Click push button. 1	• Present 1st sensing condition. • Single-pulse remote line. T	**Power LED:** OFF **Output LED:** Double-flash	
Teach 2nd Sensing Condition	• Present 2nd sensing condition. • Click push button. 1	• Present 2nd sensing condition. • Single-pulse remote line. T	Accepted	**Power LED:** Flashes 3x, then ON Green **Output LED:** OFF Sensor returns to RUN mode with new settings.
			Not Accepted	**Power LED:** OFF **Output LED:** Slow flash (1 Hz) Sensor returns to wait state, ready for 1st sensing condition.

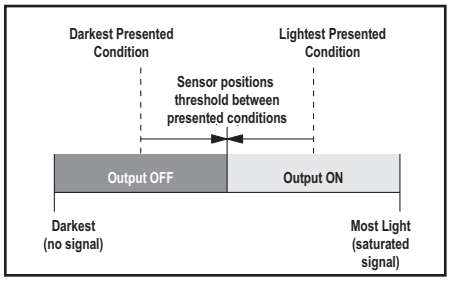

Figure 4. Dynamic TEACH (Light Operate shown)

Dynamic TEACH

- Teach on-the-fly during actual sensing conditions, taking multiple samples of the light and dark conditions and automatically setting the threshold at the optimum level (see Figure 4).
- Sets a single switching threshold (switchpoint).
- Output ON state (Light- or Dark-Operate setting) will remain as it was last configured. To change the Light-/Dark-Operate setting, see page 5.
- Recommended for applications where a machine or process may not be stopped for teaching.

	Push Button	Remote Line	Result	
Access Dynamic TEACH Mode	• Press and hold push button > 4 seconds.	• Hold remote line low (to ground) > 2 seconds. > 2 seconds	**Power LED:** OFF **Output LED:** Quick flash (2 Hz)	
Teach Sensing Conditions	• Continue to hold push button. • Present Output ON and OFF conditions.	• Continue to hold remote line low (to ground). • Present Output ON and OFF conditions.	**Power LED:** OFF **Output LED:** Quick flash (2 Hz)	
Return to RUN Mode	• Release push button.	• Release remote line/switch.	Accepted	**Power LED:** Flashes 3x, then ON Green **Output LED:** OFF,* then ON or OFF, depending on output state Sensor returns to RUN mode with new settings.
			Not Accepted	**Power LED:** Flashes 3x, then ON Green **Output LED:** ON,* then ON or OFF, depending on output state Sensor returns to RUN mode without changing settings.

* Initial Output LED condition is simultaneous with Power LED 3-flash.

Light SET

- Sets a threshold approximately 12.5% below the presented sensing condition (see Figure 5).
- Any condition darker than the threshold causes the output to change state.
- In Light-Operate mode, the presented condition is the Output ON condition. In Dark-Operate mode, the presented condition is the Output OFF condition. To change the Light-/Dark-Operate setting, see page 5.
- Recommended for applications where only one condition is known, for example a stable light background with varying darker targets, or in retroreflective applications.

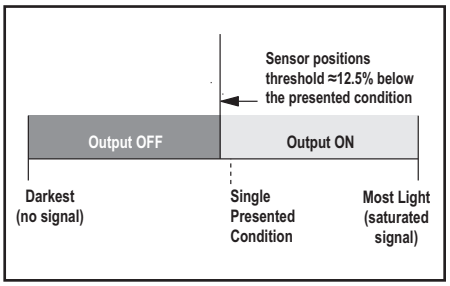

Figure 5. Light SET (Light Operate shown)

	Push Button 0.04 seconds ≤ "Click" ≤ 0.8 seconds	Remote Line 0.04 seconds ≤ T ≤ 0.8 seconds	Result	
Access Light SET Mode	• Press and hold push button 2–4 seconds.	• Single-pulse remote line. T	Sensor waits for sensing condition.	
			Push Button **Power LED:** OFF **Output LED:** Slow flash (1 Hz)	**Remote Line** **Power LED:** OFF **Output LED:** Double-flash
Set Sensing Condition	• Present sensing condition. • Four-click push button. 4	• Present sensing condition. • Four-pulse remote line. T T T T T T T T	Accepted	**Power LED:** Flashes 3x, then ON Green **Output LED:** OFF,* then ON or OFF, depending on output state Sensor returns to RUN mode with new settings.
			Not Accepted	**Power LED:** OFF **Output LED:** Slow flash (1 Hz) Sensor returns to wait state, ready for sensing condition.

Dark SET

- Sets a threshold approximately 12.5% above the presented sensing condition (see Figure 6).
- Any condition lighter than the threshold causes the output to change state.
- In Light-Operate mode, the presented condition is the Output OFF condition. In Dark-Operate mode, the presented condition is the Output ON condition. To change the Light-/Dark-Operate setting, see page 5.
- Recommended for applications where only one condition is known, for example a stable dark background with varying lighter targets, or when maximum excess gain is required.

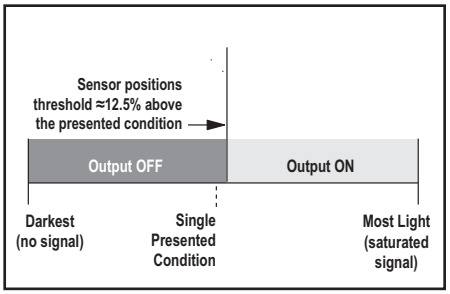

Figure 6. Dark SET (Light Operate shown)

	Push Button 0.04 seconds ≤ "Click" ≤ 0.8 seconds	Remote Line 0.04 seconds ≤ T ≤ 0.8 seconds	Result	
Access Dark SET Mode	• Press and hold push button 2–4 seconds.	• Single-pulse remote line. T	Sensor waits for sensing condition.	
			Push Button **Power LED:** OFF **Output LED:** Slow flash (1 Hz)	**Remote Line** **Power LED:** OFF **Output LED:** Double-flash
Set Sensing Condition	• Present sensing condition. • Five-click push button. 5	• Present sensing condition. • Five-pulse remote line. T T T T T T T T T T	Accepted	**Power LED:** Flashes 3x, then ON Green **Output LED:** OFF,* then ON or OFF, depending on output state Sensor returns to RUN mode with new settings.
			Not Accepted	**Power LED:** OFF **Output LED:** Slow flash (1 Hz) Sensor returns to wait state, ready for sensing condition.

* Initial Output LED condition is simultaneous with Power LED 3-flash.

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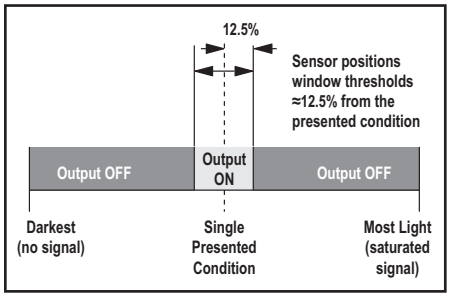


Figure 7. Window SET (Light Operate shown)

Window SET

- Single ON condition window extends approximately 12.5% above and below the presented condition when Light Operate is selected (see Figure 7). Output ON and OFF conditions can be reversed by changing the Light-/Dark-Operate setting (see below).
- Lighter or darker conditions ("outside" the window) cause the output to change state.
- Recommended for applications where the target to be sensed may not always appear in the same place, or when other unwanted signals may appear.

	Push Button 0.04 seconds ≤ "Click" ≤ 0.8 seconds	Remote Line 0.04 seconds ≤ T ≤ 0.8 seconds	Result	
Access Window SET Mode	• Press and hold push button 2–4 seconds.	• Single-pulse remote line.	Sensor waits for sensing condition.	
			Push Button **Power LED:** OFF **Output LED:** Slow flash (1 Hz)	**Remote Line** **Power LED:** OFF **Output LED:** Double-flash
Set Sensing Condition	• Present sensing condition. • Double-click push button.	• Present sensing condition. • Double-pulse remote line.	Accepted	**Power LED:** Flashes 3x, then ON Green **Output LED:** OFF,* then ON or OFF, depending on output state Sensor returns to RUN mode with new settings.
			Not Accepted	**Power LED:** OFF **Output LED:** Slow flash (1 Hz) Sensor returns to wait state, ready for sensing condition.

Sensor SETUP

Access SETUP functions directly from RUN mode, using the procedures detailed below.

30 ms OFF-Delay (Pulse Stretcher) Enable/Disable

	Push Button 0.04 seconds ≤ "Click" ≤ 0.8 seconds	Remote Line 0.04 seconds ≤ T ≤ 0.8 seconds	Result
OFF-Delay Enable/Disable	• From RUN mode, six-click the push button.	• From RUN mode, six-pulse remote line.	Sensor toggles between enable/disable settings and returns to RUN mode. **Power LED:** Flashes 3x, then ON Green **Output LED:** Enabled – ON,* Disabled – OFF,* Then ON or OFF, depending on output state

Light-Operate/Dark-Operate Select

	Push Button 0.04 seconds ≤ "Click" ≤ 0.8 seconds	Remote Line 0.04 seconds ≤ T ≤ 0.8 seconds	Result
Light-/Dark-Operate Select	• From RUN mode, seven-click the push button.	• From RUN mode, seven-pulse remote line.	Sensor toggles between Light-/Dark-Operate settings and returns to RUN mode. **Power LED:** Flashes 3x, then ON Green **Output LED:** Light Operate – ON,* Dark Operate – OFF,* Then ON or OFF, depending on output state

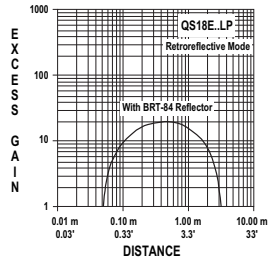
* Initial Output LED condition is simultaneous with Power LED 3-flash.

Performance Curves

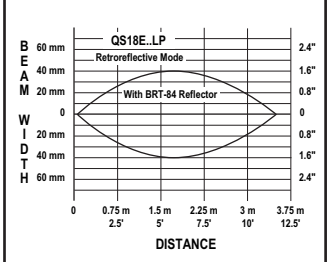
Performance using Dark SET, performed in no-light condition. Diffuse-mode performance based on use of 90% reflectance white test card.

Polarized Retro

Excess Gain

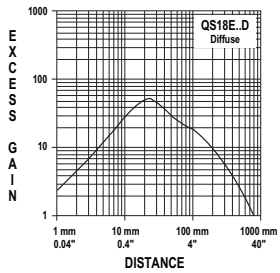


Beam Pattern



Diffuse

Excess Gain



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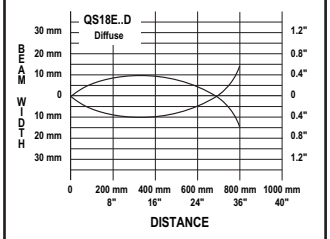
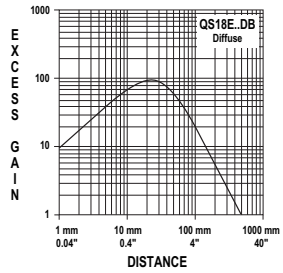


Excess Gain



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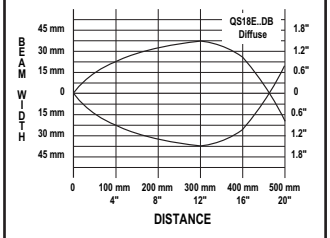
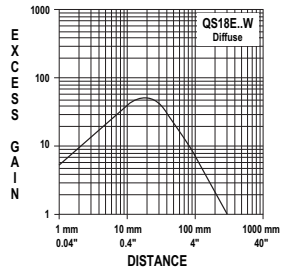


Excess Gain



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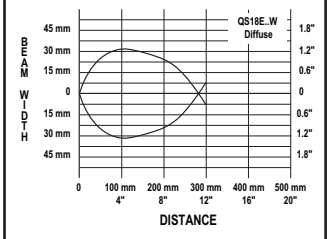
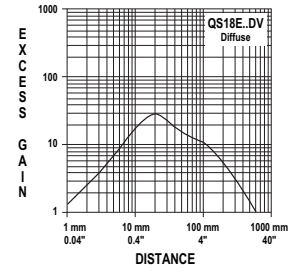
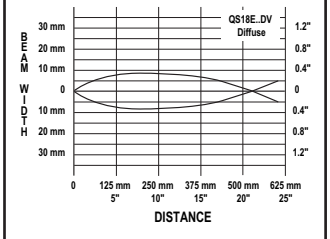


Excess Gain

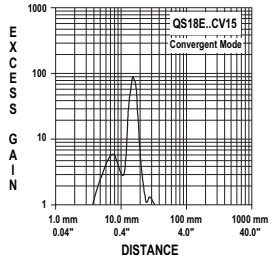


Beam Pattern

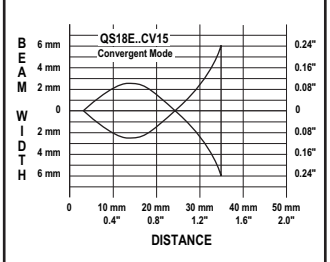


Convergent

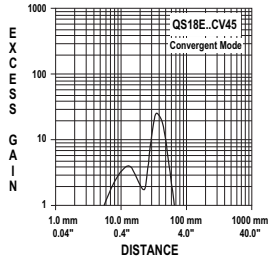
Excess Gain



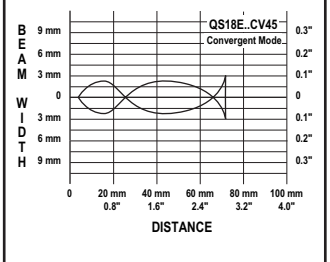
Beam Pattern



Excess Gain

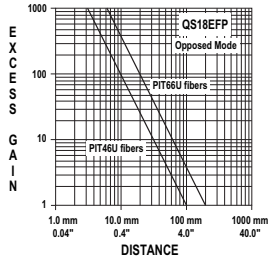


Beam Pattern

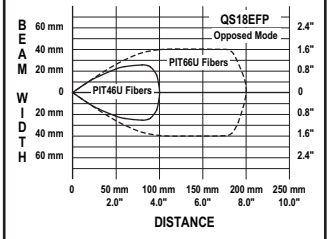


Fiber Optic – Plastic

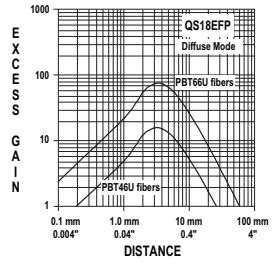
Excess Gain



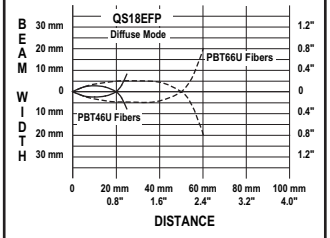
Beam Pattern



Excess Gain

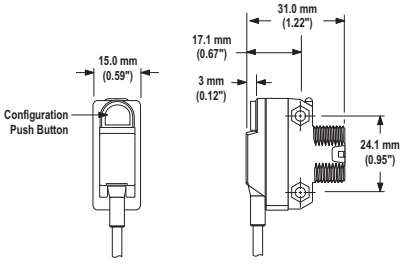


Beam Pattern

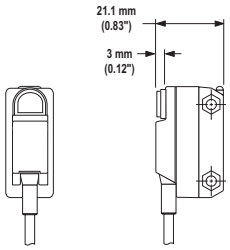


Dimensions

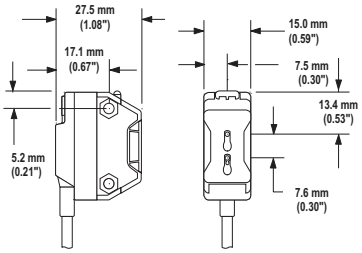
Model suffix: LP, D, CV15, CV45, DV



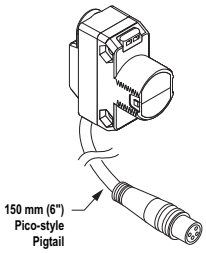
Model suffix: DB, W



Model suffix: FP



Model suffix: Q
(e.g., QS18EN6LPQ)



Model suffix: Q5
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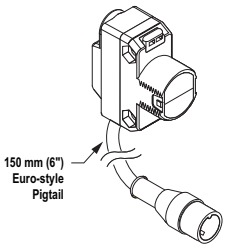

Model suffix: Q7
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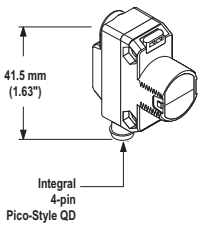
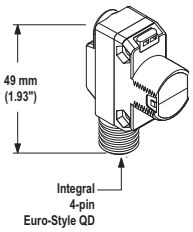
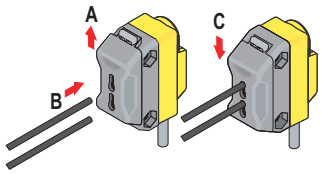


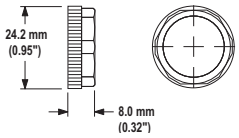
Model suffix: Q8
(e.g., QS18EN6LPQ8)



Fiber Mounting



M18 x 1 Jam Nut

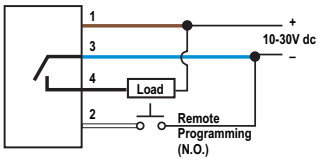


Packing List
Sensor
M18 jam nut (some models)
M3 hardware packet
Data sheet, P/N 136564

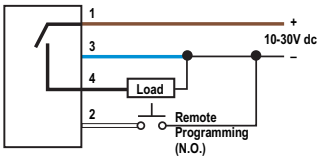
M3 Hardware Packet Contents:
2 – M3 x 0.5 x 20 mm SS Screw
2 – M3 x 0.5 SS-Hex Nut
2 – M3 SS Washer

Hookups

NPN (Sinking) Output Models



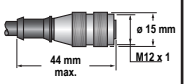
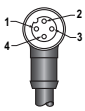
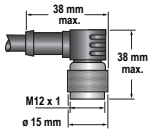
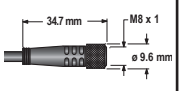
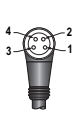
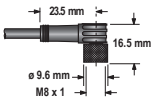
PNP (Sourcing) Output Models



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

Cabled hookups only are shown.
QD hookups are functionally identical.

Accessory Quick-Disconnect (QD) Cordsets

Style	Model	Length	Dimensions	Pinout
4-pin Euro-style straight	**MQDC-406** **MQDC-415** **MQDC-430**	2 m (6.5') 5 m (15') 9 m (30')		
4-pin Euro-style right-angle	**MQDC-406RA** **MQDC-415RA** **MQDC-430RA**	2 m (6.5') 5 m (15') 9 m (30')		1 = Brown 2 = White 3 = Blue 4 = Black
4-pin Pico-style straight	**PKG4-2**	2 m (6.5')		
4-pin Pico-style right-angle	**PKW4-2**	2 m (6.5')		1 = Brown 2 = White 3 = Blue 4 = Black

WORLD-BEAM® QS18E Series

Specifications

Supply Voltage and Current
10 to 30V dc (10% max. ripple) at less than 35 mA, exclusive of load
10 to 24V dc at > 55° C

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Configuration
Current sourcing (PNP) or current sinking (NPN), depending on model.
Light- or dark-operate selectable (see page 5).
Selectable 30 ms output OFF-delay (see page 5).

Output Rating
100 mA max.
OFF-state leakage current: less than 50µA @ 30V dc
ON-state saturation voltage: less than 1.5V (1.7V for 30' cable models)

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

Output Response Time
600 µs ON/OFF
NOTE: Momentary delay on power-up; output does not conduct during this time.

Repeatability
75 µs

Construction
ABS housing, PMMA lens

Environmental Rating
Meets NEMA 6; IEC IP67; UL Type 1

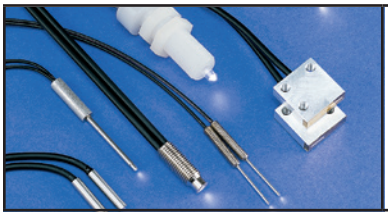
Connections
PVC-jacketed 4-conductor 2 m (6.5') or 9 m (30') unterminated cable, or 4-pin Euro-style or 4-pin Pico-style quick-disconnect (QD), either integral or 150 mm (6") pigtail, are available. QD cordsets are ordered separately (page 7).

Operating Conditions
Temperature: –20° to +70°C (–4° to +158°F)
Max. rel. humidity: 90% at 50°C (non-condensing)

Application Notes
- If the push button does not appear to be responsive, perform the push button enable procedure (page 2).
- To maintain backwards compatibility with earlier models, 3 remote line pulses or a push button hold followed by 3 push button clicks will perform a Dark SET.

Certifications

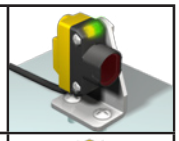
Accessory Reflectors and Fiber Optics



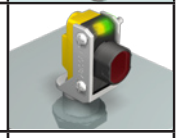
See the Accessories section of your current Banner Sensors catalog or visit www.bannerengineering.com for complete information.

Accessory Mounting Brackets

SMB312S
- 2-axis, side-mounting bracket
- Stainless steel



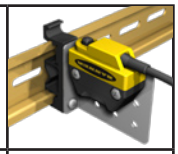
SMBQS18Y
- Die-cast bracket mounts into 18 mm holes
- Accommodates Euro-style QD connections



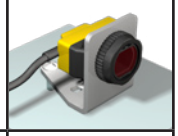
SMB4050YL
- Heavy-duty die-cast bracket designed for industrial protection
- Replaceable window
- M18 vertical mount option
- Includes nuts and lock washer

For bracket dimensions, visit www.bannerengineering.com.

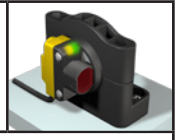
SMBQS18DIN
- 2-piece bracket mounts to 35 mm DIN rail
- 300 series stainless steel and glass-filled nylon; zinc-plated steel screw



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



SMB3018SC
- 18 mm swivel barrel for side mount bracket
- Black reinforced thermoplastic polyester
- Stainless steel swivel locking hardware included



Additional available brackets:
SMB46A, SMB18SF, SMBQS18RA, SMB18FA, SMBQS18A

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more sensors, more solutions

P/N 136564 rev. A