

QS18 Series Sensor Instruction Manual



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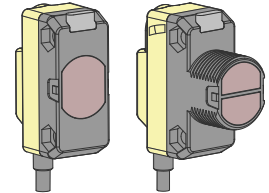
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Chapter 1 Features

Miniature self-contained photoelectric sensor in a universal housing

- Easily fits (or retrofits) almost any mounting situation
- Exceptional optical performance, comparable to larger “MINI-style” or barrel sensors
- 10 V DC to 30 V DC operation, with complementary (SPDT) NPN or PNP outputs, depending on model
- Bright LED operating status indicators are visible from 360°
- Rugged sealed housing, protected circuitry
- Models available with or without 18 mm threaded “nose”
- Less than 1-millisecond output response for excellent sensing repeatability
- Choose 2 m (6.5 ft), 9 m (30 ft), or 150 mm (6 in) cable with a M8 quick disconnect connector



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 | Opposed Mode | Range | Output |
|------------------------------|----------------------------------|--------------|--------|
| QS186EV (624 nm Visible red) | Effective beam: 13 mm (0.5 inch) | 20 m (66 ft) | — |
| QS186E (940 nm Infrared) | | | — |
| QS18VN6R | | | NPN |
| QS18VP6R | | | PNP |
| QS186EB (940 nm Infrared) | Effective beam: 13 mm (0.5 inch) | 3 m (10 ft) | — |
| QS18VN6RB | | | NPN |
| QS18VP6RB | | | PNP |

| Model | Polarized Retroreflective Mode | Range | Output |
|-----------|--------------------------------|---------------|--------|
| QS18VN6LP | 630 nm Visible red | 3.5 m (12 ft) | NPN |
| QS18VP6LP | | | PNP |

| Model | Retroreflective Mode | Range | Output |
|-----------|----------------------|---------------|--------|
| QS18VN6LV | 628 nm Visible red | 6.5 m (21 ft) | NPN |
| QS18VP6LV | | | PNP |

| Model | Convergent Mode | Range | Output |
|-------------|--------------------|-----------------|--------|
| QS18VN6CV15 | 630 nm Visible red | 16 mm (0.63 in) | NPN |
| QS18VP6CV15 | | | PNP |

Continued on page 4

Continued from page 3

| Model | Convergent Mode | Range | Output |
|-------------|-----------------|----------------|--------|
| QS18VN6CV45 | | 43 mm (1.7 in) | NPN |
| QS18VP6CV45 | | | PNP |

| Model | Diffuse Mode | Range | Output |
|------------------|--------------------|----------------|--------|
| QS18VN6D | 940 nm Infrared | 450 mm (18 in) | NPN |
| QS18VP6D | | | PNP |
| QS18VN6DL | | 600 mm (24 in) | NPN |
| QS18VP6DL | | | PNP |
| QS18VN6DVS | 630 nm Visible red | 250 mm (10 in) | NPN |
| QS18VP6DVS | | | PNP |
| QS18VN6DB (Wide) | Infrared | 450 mm (18 in) | NPN |
| QS18VP6DB (Wide) | | | PNP |

| Model | Divergent Mode | Range | Output |
|----------|-----------------|---------------|--------|
| QS18VN6W | 940 nm Infrared | 100 mm (4 in) | NPN |
| QS18VP6W | | | PNP |

| Model | Fixed Field Mode | Range | Output |
|--------------|--------------------|---------------|--------|
| QS18VN6FF50 | 630 nm Visible red | 50 mm (2 in) | NPN |
| QS18VP6FF50 | | | PNP |
| QS18VN6FF100 | | 100 mm (4 in) | NPN |
| QS18VP6FF100 | | | PNP |
| QS18VP6FF125 | | 125 mm (5 in) | PNP |
| QS18VN6FF150 | | 150 mm (6 in) | NPN |
| QS18VP6FF150 | | | PNP |

| Model | Plastic Fiber Optic Mode | Range | Output |
|-----------|--------------------------|--|--------|
| QS18VN6FP | 660 nm Visible Red | Range varies by sensing mode and fiber optics used | NPN |
| QS18VP6FP | | | PNP |

| Model | Glass Fiber Optic Mode | Range | Output |
|----------|------------------------|--|--------|
| QS18VN6F | 940 nm Infrared | Range varies by sensing mode and fiber optics used | NPN |
| QS18VP6F | | | PNP |

- To order the 4-pin M12 integral quick disconnect model, add the suffix "Q8" to the model number. For example, QS186EQ8.
- To order the 4-pin M8 integral quick disconnect model, add the suffix "Q7" to the model number. For example, QS186EQ7.
- To order the 150 mm (6 in) PVC cable model with a 4-pin M12 quick disconnect, add the suffix "Q5" to the model number. For example, QS186EQ5.
- To order the 150 mm (6 in) PVC cable model with a 4-pin M8 quick disconnect, add the suffix "Q" to the model number. For example, QS186EQ.
- Models with a quick disconnect require a mating cordset.

Specifications

Supply Voltage

10 V DC to 30 V DC (10% maximum ripple) at less than 25

mA, exclusive of load
Protected against reverse polarity and transient voltages

Light Source

Glass Fiber Optic, Opposed and Diffuse mode models:
Infrared, 940 nm
Plastic Fiber Optic, Retroreflective, Convergent models:
Visible red, 660 nm
Fixed-Field and DVS models: Visible red, 630 nm

Adjustments

Glass Fiber Optic, Plastic Fiber Optic, Convergent, Diffuse, and Retroreflective mode models (only): Single-turn sensitivity (Gain) adjustment potentiometer

Indicators

Two LED indicators on the sensor top
Green: Power on
Amber: Light sensed
Amber flashing: Marginal excess gain (1 to 1.5 times excess gain)

Construction

ABS housing
3 mm mounting hardware included

Connections

2 m (6.5 ft) 4-wire PVC cable; 9 m (30 ft) 4-wire PVC cable; 4-pin M8 or M12 QD; or 150 mm (6 in) cable with a 4-pin M8 or M12 QD, depending on the model

Repeatability

Opposed Mode: 100 microseconds
DVS, DL and FF Modes: 90 microseconds
All Other Modes: 150 microseconds

Output Configuration

Solid-state complementary (SPDT): NPN or PNP (current sinking or sourcing), depending on model
Rating: 100 mA maximum each output at 25 °C
DVS, DL and FF Modes ON-state Saturation Voltage: less than 1.5 V at 10 mA; less than 3 V at 100 mA
All Other Modes: ON-state Saturation Voltage: less than 1 V at 10 mA; less than 1.5 V at 100 mA
Protected against false pulse on power-up and continuous overload or short circuit of outputs

Output Response

Opposed Mode: 750 microseconds ON; 375 microseconds OFF
DVS, FF, and DL Modes: 850 microseconds ON/OFF
All Other Modes: 600 microseconds ON/OFF
100-millisecond delay on power-up; outputs do not conduct during this time

Environmental


IEC IP67; NEMA 6

Operating Conditions

-20 °C to +70 °C (-4 °F to +158 °F)
95% at +50 °C maximum relative humidity (non-condensing)

Vibration and Mechanical Shock

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 (A) | Supply Wiring (AWG) | Required Overcurrent Protection (A) |
|---------------------|-------------------------------------|---------------------|-------------------------------------|
| 20 | 5.0 | 26 | 1.0 |
| 22 | 3.0 | 28 | 0.8 |
| 24 | 1.0 | 30 | 0.5 |

Certifications

 Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

 Turck Banner LTD Blenheim House
Blenheim Court
Wickford, Essex SS11 8YT
GREAT BRITAIN



NOTE: For performance specifications of the FF50 and FF100 models built prior to date code 17090, refer to document p/n [63908](#).

FCC Part 15 Class A for Unintentional Radiators

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

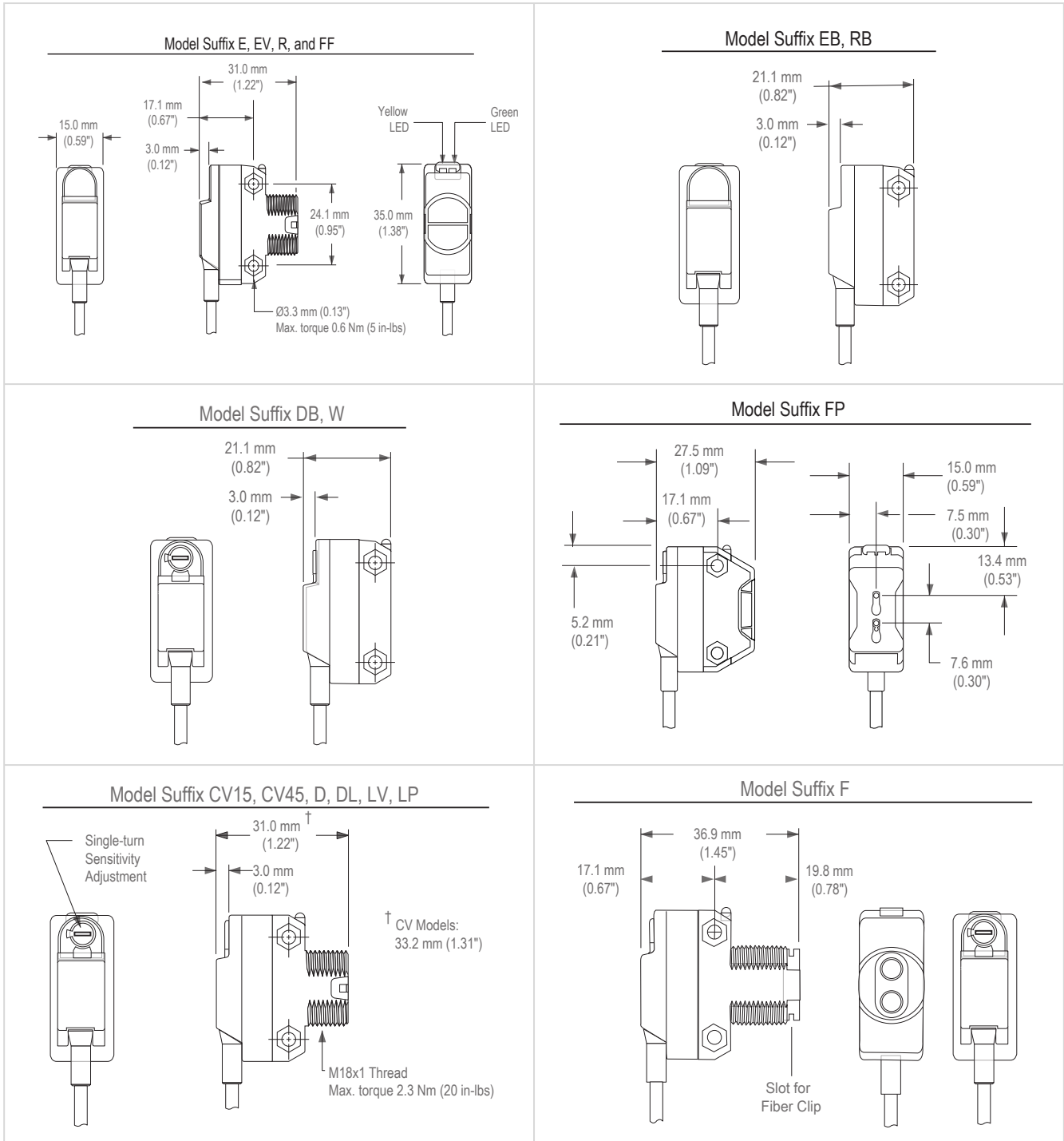
(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

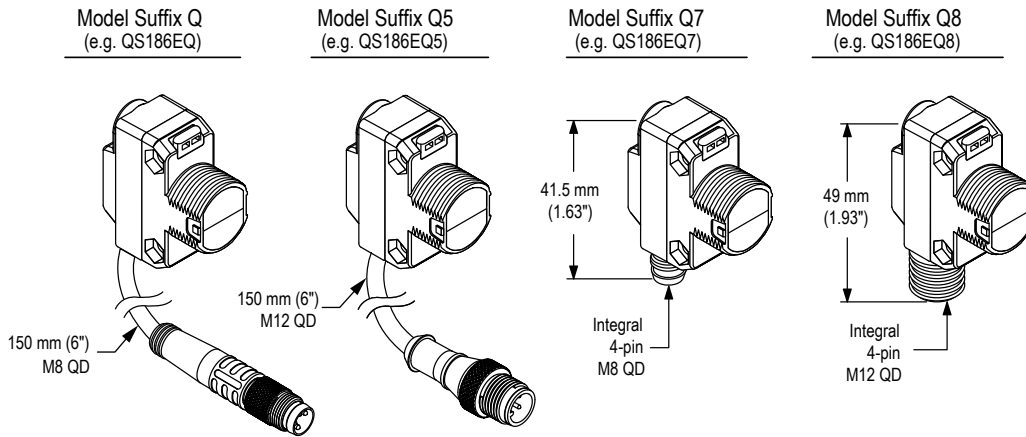
Industry Canada ICES-003(A)

This device complies with CAN ICES-3 (A)/NMB-3(A). 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.

Cet appareil est conforme à la norme NMB-3(A). Le fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne peut pas occasionner d'interférences, et (2) il doit tolérer toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité du dispositif.

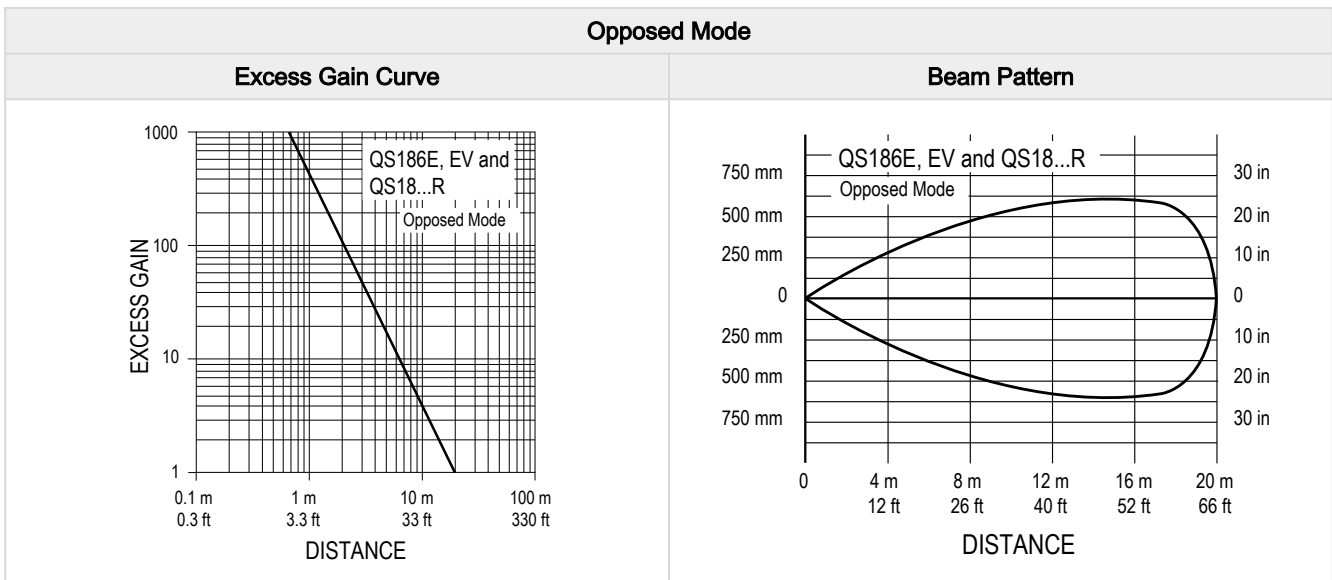
Dimensions





| | | |
|-------------------------------|--|---|
| <p>M18 x 1 Jam Nut</p> | <p>M3 hardware packet contents:</p> <ul style="list-style-type: none"> • 2 - M3 x 0.5 x 20 mm stainless steel screw • 2 - M3 x 0.5 stainless steel hex nut • 2 - M3 stainless steel washer | <p>Packing list:</p> <ul style="list-style-type: none"> • Sensor • M18 x 1 jam nut • M3 hardware packet • Quick Start Guide, p/n 63687 |
|-------------------------------|--|---|

Performance Curves

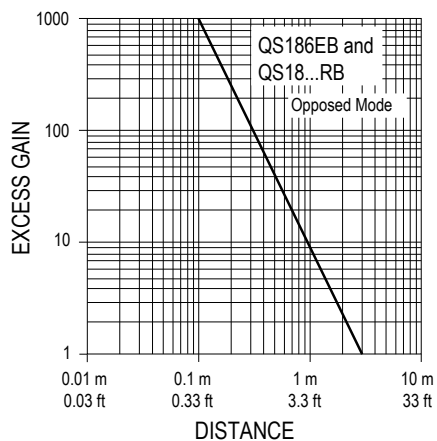


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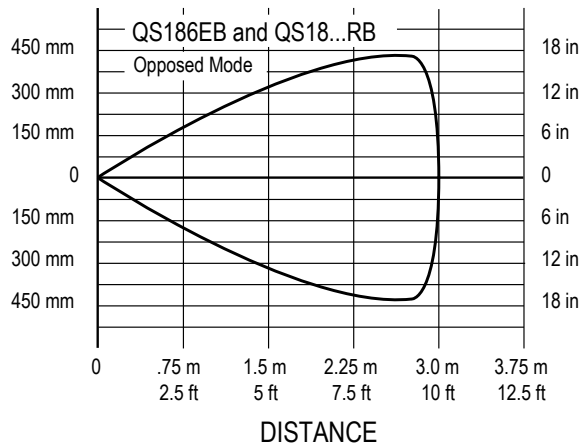
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Opposed Mode

Excess Gain Curve

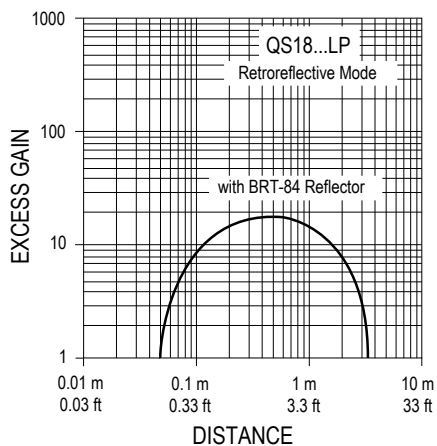


Beam Pattern

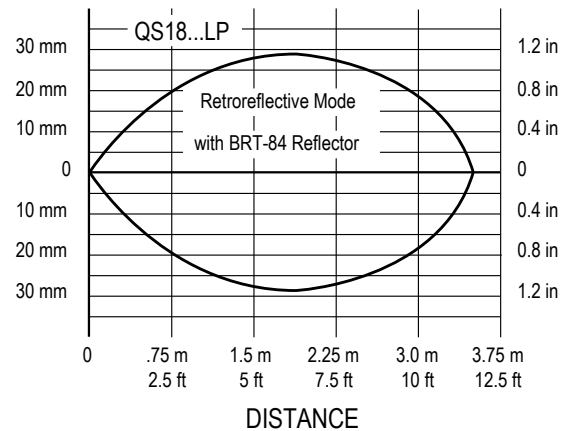


Polarized Retroreflective

Excess Gain Curve

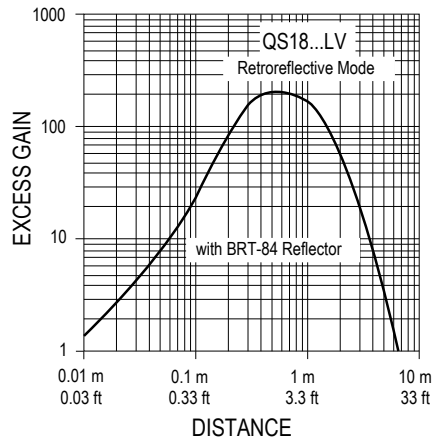


Beam Pattern

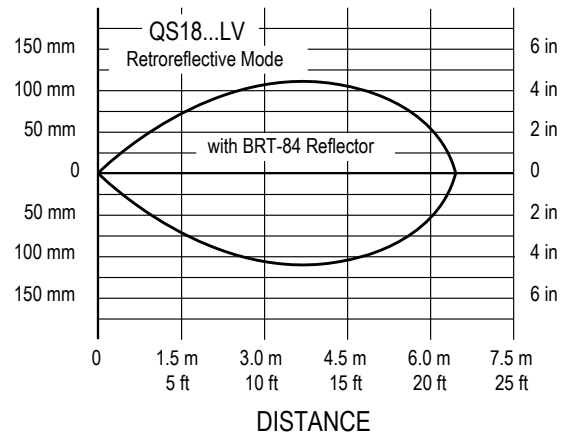


Retroreflective

Excess Gain Curve

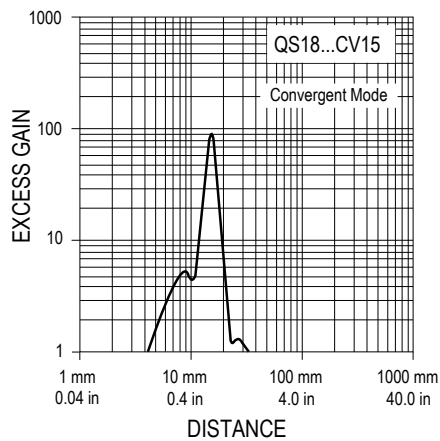


Beam Pattern

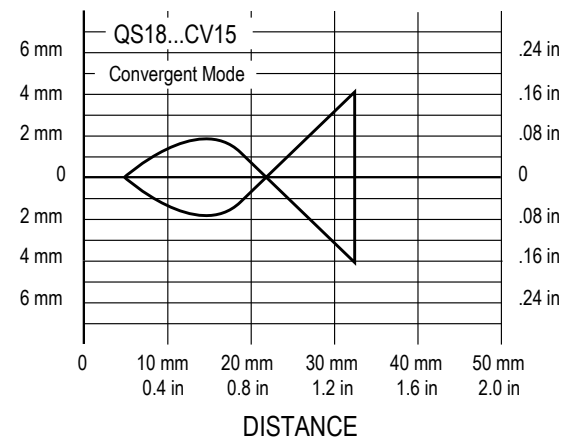


Convergent (Performance is based on a 90% reflectance white test card.)

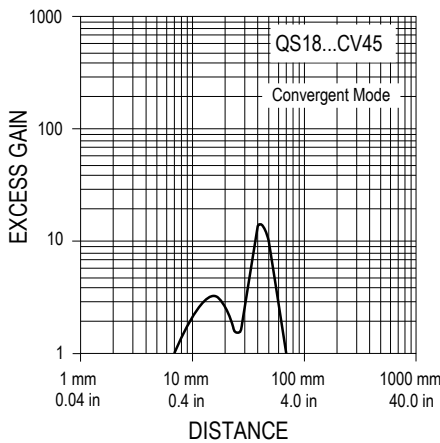
Excess Gain Curve



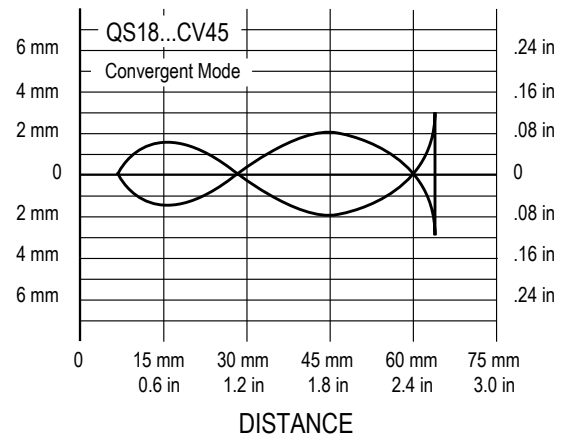
Beam Pattern



Excess Gain Curve

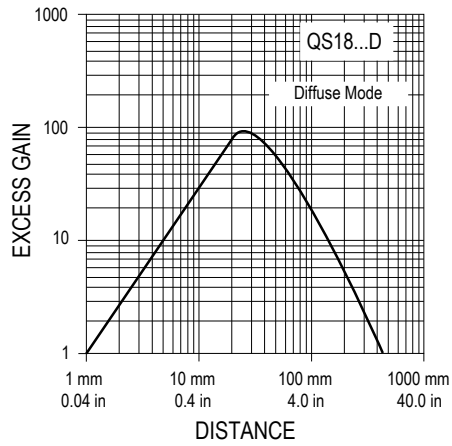


Beam Pattern

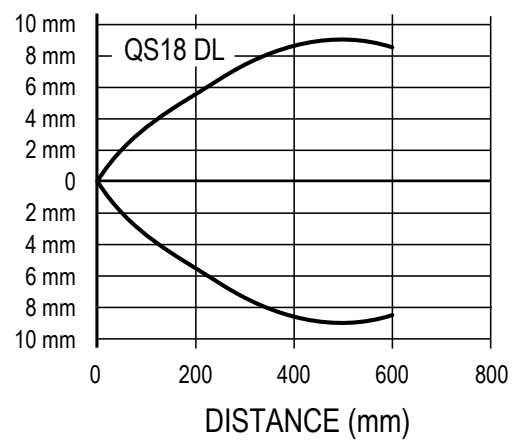
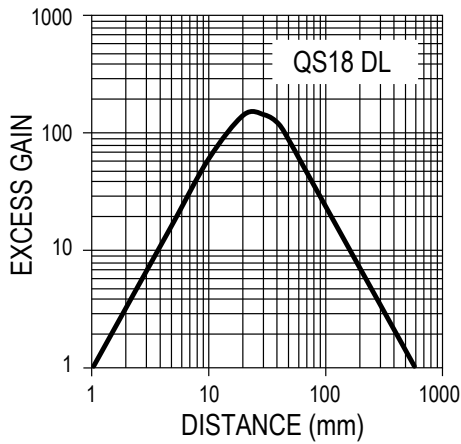
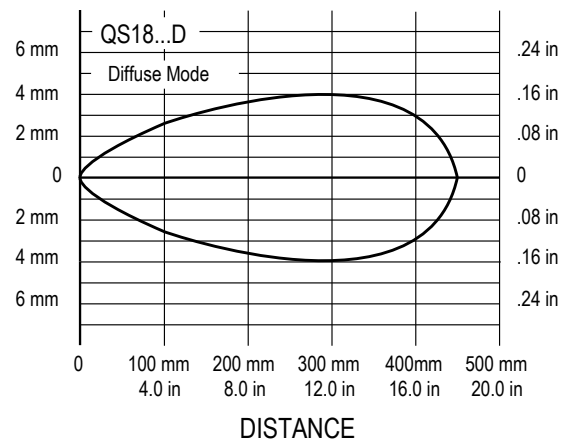


Diffuse (Performance is based on a 90% reflectance white test card.)

Excess Gain Curve

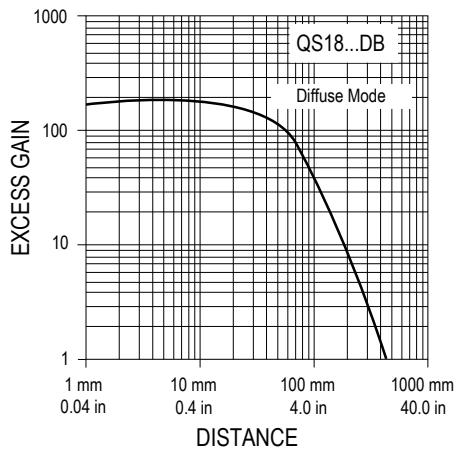


Beam Pattern

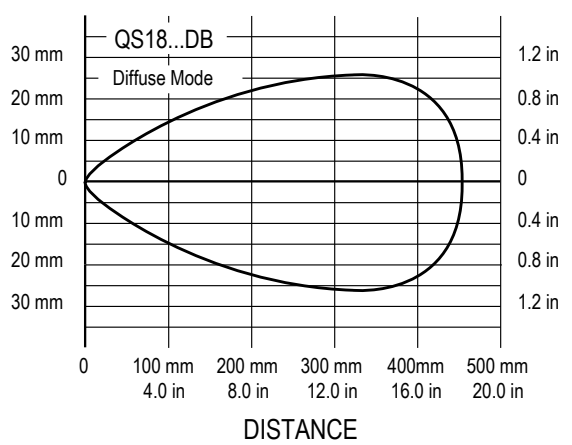


Diffuse (Performance is based on a 90% reflectance white test card.)

Excess Gain Curve



Beam Pattern

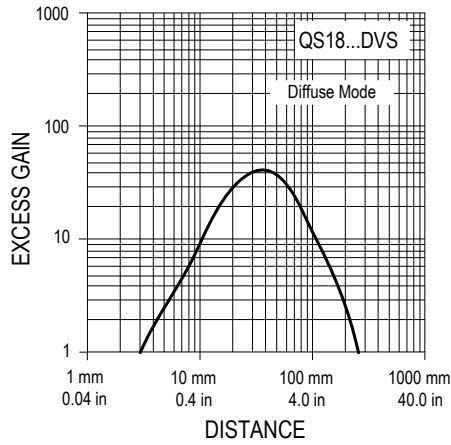


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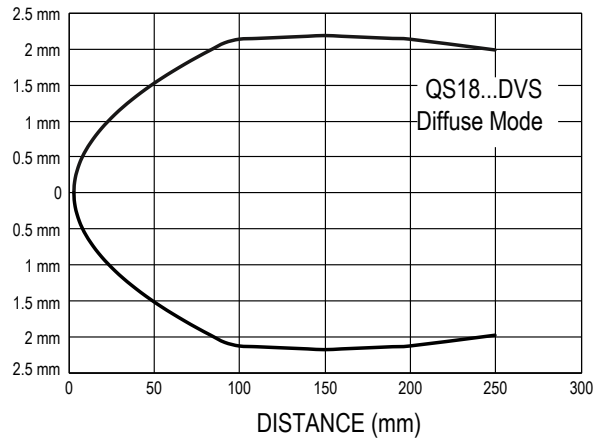
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Diffuse (Performance is based on a 90% reflectance white test card.)

Excess Gain Curve

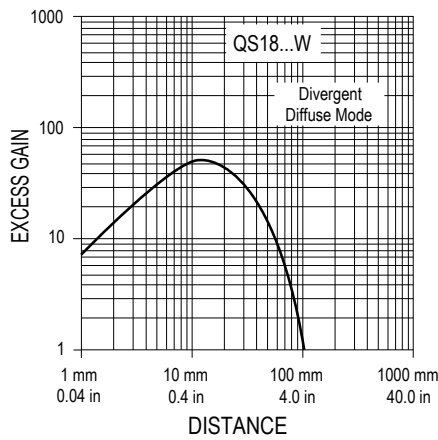


Beam Pattern

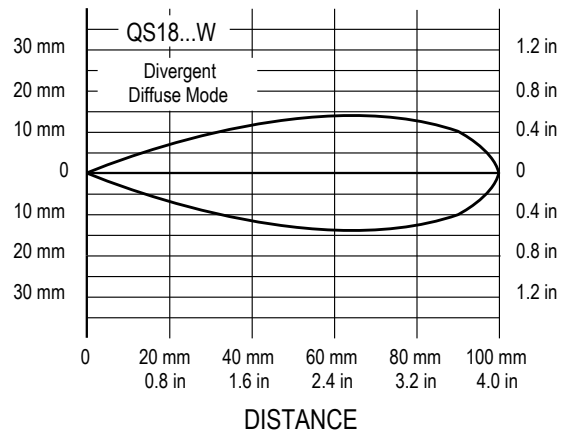


Divergent (Performance is based on a 90% reflectance white test card.)

Excess Gain Curve

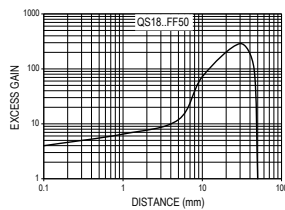


Beam Pattern

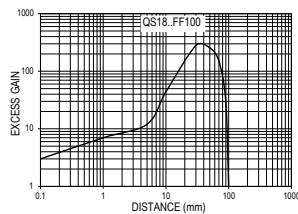


Fixed Field

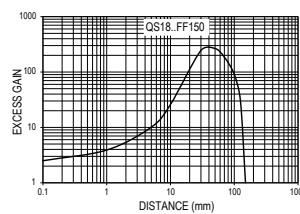
Excess Gain Curve (50 mm)



Excess Gain Curve (100 mm)



Excess Gain Curve (150 mm)

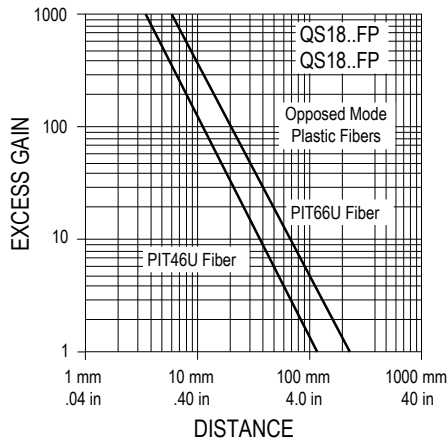


Spot Sizes

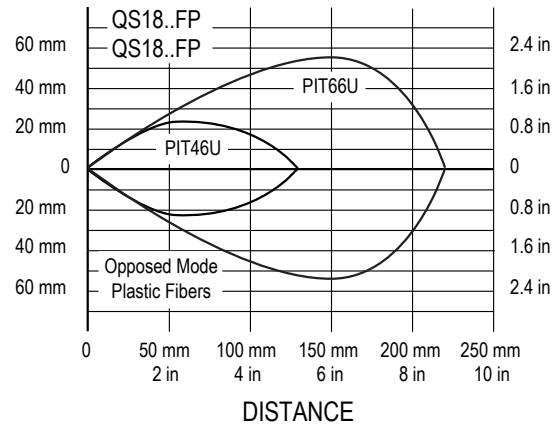
- 50 mm Models:
 At 25 mm: 8 × 5.5 mm
 At 50 mm: 6 × 5 mm
- 100 mm Models
 At 50 mm: 6 × 4 mm
 At 100 mm: 3 × 3 mm
- 150 mm Models
 At 75 mm: 5 × 3.5 mm
 At 150 mm: 6 × 6 mm

Opposed - Plastic Fiber

Excess Gain Curve

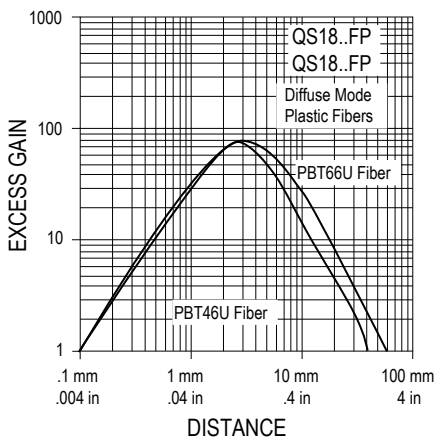


Beam Pattern

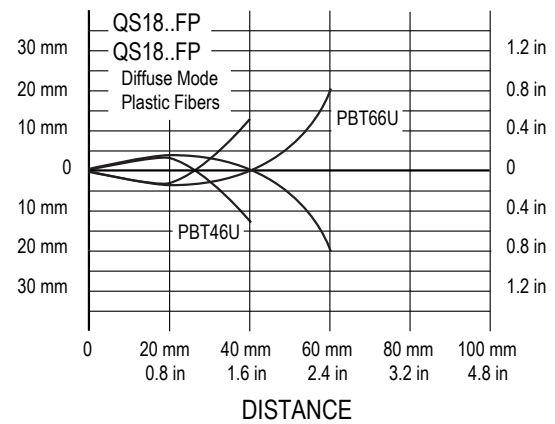


Bifurcated - Plastic Fiber (Performance is based on a 90% reflectance white test card.)

Excess Gain Curve

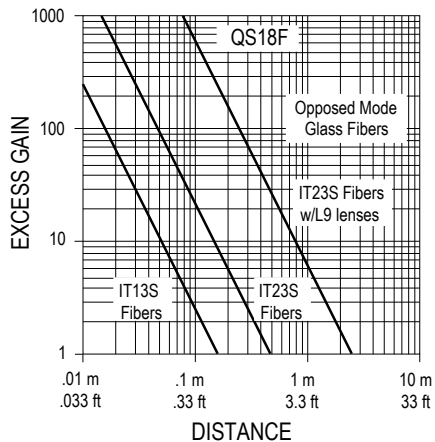


Beam Pattern

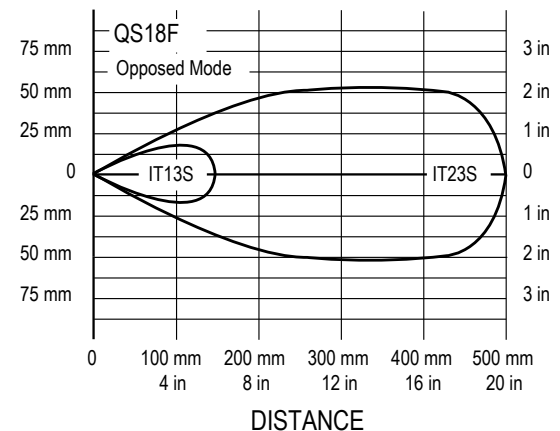


Opposed - Glass Fiber (Performance is based on a 90% reflectance white test card.)

Excess Gain Curve

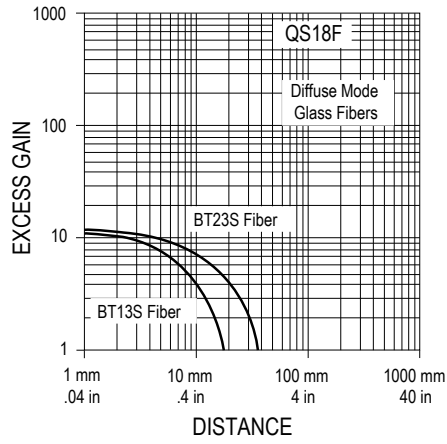


Beam Pattern

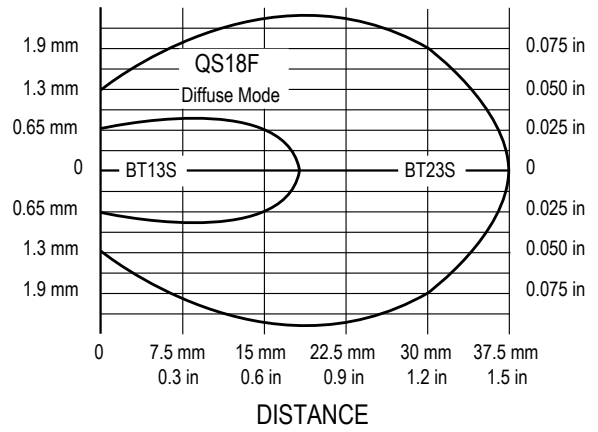


Bifurcated - Glass Fiber (Performance is based on a 90% reflectance white test card.)

Excess Gain Curve



Beam Pattern

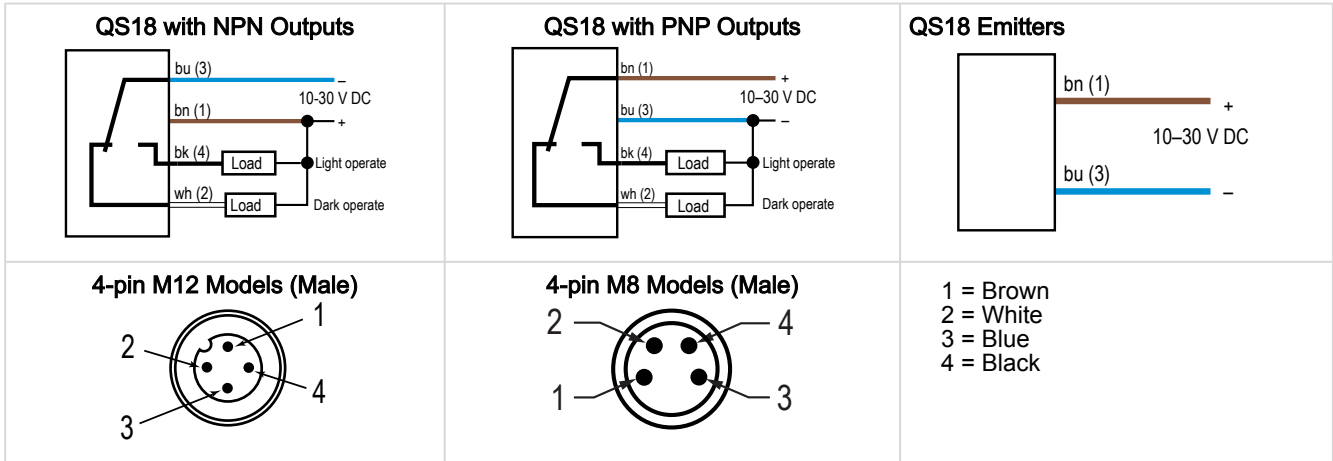


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Chapter 2 Installation Instructions

Wiring Diagrams



In dark operate (DO) mode, the output is ON when the target returns less light to the sensor than the configured target and OFF when the sensor detects more light than the configured/taught target.

In light operate (LO) mode, the output is ON when the target returns the same or more light to the sensor and OFF when the sensor detects less light than the configured/taught target.

In **opposed and retroreflective sensing modes**, light operate is active when the beam is unblocked and dark operate is active when the beam is blocked.

In **diffuse and fixed field sensing modes**, light operate is active when the target is present and dark operate is active when the target is absent.

Installing Fibers

Cutting Unterminated Plastic Fibers

Unterminated plastic fibers are designed to be cut by the user to the length required for the application.

To facilitate cutting, a Banner model **PFC-1** cutting device is supplied with the fiber. Cut the fiber as follows:

PFC-1 Cutting Device

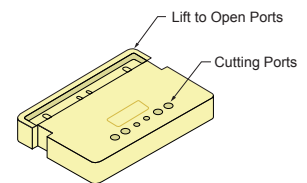
Use small ports for fiber sizes:

- 0.25 mm (0.01 inches)
- 0.5 mm (0.02 inches)

Use large ports for fiber sizes:

- 0.75 mm (0.03 inches)
- 1.0 mm (0.04 inches)
- 1.5 mm (0.06 inches)

1. Locate the control end of the fiber (the unfinished end).



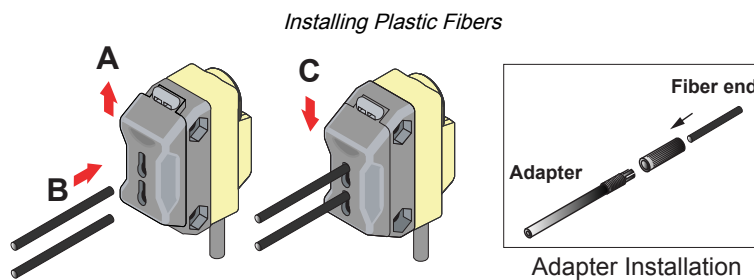
2. Determine the length of fiber required for the application. If using a bifurcated fiber, separate the two halves of the fiber at least 51 mm (2 inches) beyond the fiber-cutting location.
3. Lift the top (blade) of the cutter to open the cutting ports.
4. Insert one of the control ends through one of the cutting ports on the cutter so that the excess fiber protrudes from the back of the cutter.
5. Double-check the fiber length, and close the cutter until the fiber is cut.
6. Using a different cutting port, cut the second control end to the required length.

NOTE: To ensure a clean cut each time, do not use a cutting port more than once.

7. Gently wipe the cut ends of the fiber with a clean, dry cloth to remove any contamination. Do not use solvents or abrasives on any exposed optical fiber.

Install the Plastic Fibers

Follow these steps to install the plastic fibers.

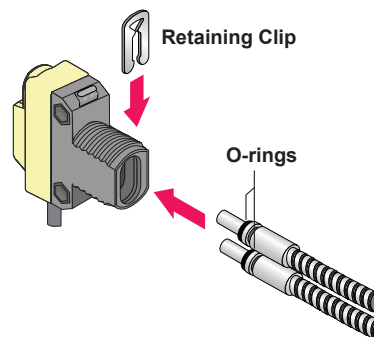


1. Slide the fiber gripper up to unlock it (A).
2. If using 0.25 mm or 0.5 mm core fibers, slide the plastic fiber adapters onto the fibers, flush with the fiber ends.
3. Carefully insert the prepared plastic fiber ends into the ports (B) as far as possible without applying extra force.
4. Slide the fiber gripper down to lock the fibers in place (C).

Install the Glass Fibers

Follow these steps to install the glass fibers.

Installing the glass fibers in a QS18 sensor



1. Slide the supplied o-ring on the sensor end of the fibers, as shown.
2. Press the fiber ends firmly into the ports located on the front of the sensor.
3. Slide the supplied u-shaped retaining clip into the slot in the sensor's barrel until the clip snaps into place.

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.

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Sensor Sensitivity Adjustment

After the sensor and retroreflector have been properly installed, the sensor is ready to be adjusted to ensure detection of the desired object. Sensor sensitivity is adjusted with the single turn adjuster.

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 Plastic and Glass Fiber Optics 19

Chapter 4 QS18 Accessories

Cordsets

| 4-Pin Single-Ended M12 Female Cordsets | | | | | |
|--|----------------|-------------|------------|-----------------|---|
| Model | Length | Style | Dimensions | Pinout (Female) | |
| MQDC-406 | 2 m (6.56 ft) | Straight | | | 1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused |
| MQDC-415 | 5 m (16.4 ft) | | | | |
| MQDC-430 | 9 m (29.5 ft) | | | | |
| MQDC-450 | 15 m (49.2 ft) | | | | |
| MQDC-406RA | 2 m (6.56 ft) | Right-Angle | | | 1 = Brown 2 = White 3 = Blue 4 = Black |
| MQDC-415RA | 5 m (16.4 ft) | | | | |
| MQDC-430RA | 9 m (29.5 ft) | | | | |
| MQDC-450RA | 15 m (49.2 ft) | | | | |

| 4-Pin Single-Ended Snap-on M8 Female Cordsets | | | | | |
|---|------------------|-------------|------------|-----------------|---|
| Model | Length | Style | Dimensions | Pinout (Female) | |
| PKG4-2 | 2.03 m (6.66 ft) | Straight | | | 1 = Brown 2 = White 3 = Blue 4 = Black |
| PKW4Z-2 | 2 m (6.56 ft) | Right-Angle | | | |

Sensor Status Indicators

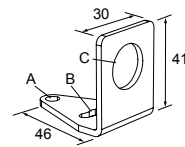
| S15L Series In-Line Sensor Status Indicator | | | | | | |
|---|------------|---|------------|--------|------|---|
| Model | Input Type | LED Color | Dimensions | Female | Male | Wiring |
| S15LGYPQ | PNP | Power ON = Green Input Active = Yellow | | | | 1 = Brown, 10 to 30 V DC 2 = White 3 = Blue, DC common 4 = Black, Sensor Input |
| S15LGYNQ | NPN | | | | | |

QS18 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

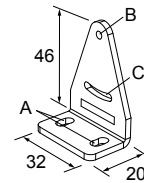
Hole center spacing: A to B = 24.2
Hole size: A = \varnothing 4.6, B = 17.0 × 4.6, C = \varnothing 18.5



SMB312S

- Stainless steel 2-axis, side-mount bracket

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



All measurements are in millimeters.

Retroreflective Targets

Go to www.bannerengineering.com for complete information.

NOTE: Polarized sensors require corner cube-type retroreflective targets only.

Plastic and Glass Fiber Optics

Go to www.bannerengineering.com for a list of plastic and glass fiber optic cables.

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Chapter 5 Product Support and Maintenance

Clean with Compressed Air Then Isopropyl Alcohol

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. may create stray light that may degrade the peak performance of the sensor. Blow dust from the sensor using filtered, compressed air. If the sensor is still dirty, gently wipe the sensor with a dry optical cloth. If the dry optical cloth does not remove all residue, use 70% isopropyl alcohol on a clean optical cloth, then dry with a clean dry optical cloth and blow with filtered, compressed air.

Repairs

Contact Banner Engineering for troubleshooting of this device. **Do not attempt any repairs to this Banner device; it contains no field-replaceable parts or components.** If the device, device part, or device component is determined to be defective by a Banner Applications Engineer, they will advise you of Banner's RMA (Return Merchandise Authorization) procedure.

IMPORTANT: If instructed to return the device, pack it with care. Damage that occurs in return shipping is not covered by warranty.

Contact Us

Banner Engineering Corp. headquarters is located at: 9714 Tenth Avenue North | Plymouth, MN 55441, USA | Phone: + 1 888 373 6767

For worldwide locations and local representatives, visit www.bannerengineering.com.

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