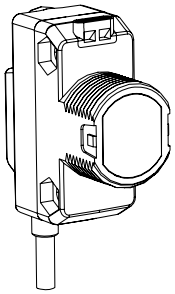
QS18VxAF250 Electronically Adjustable Background Suppression Sensor (30-250mm)

Features

Compact sensors featuring adjustable range background suppression mode

- Two optical designs optimized for reliable long-range target detection and stable detection of colorfully printed packages
  - High visibility red LED spot AF250 model recommended for long-range detection to 250 mm on black or white targets
  - Small bright red LED spot AF120 model recommended for reliable detection of colorfully printed packages and small parts or features
- Simple single-turn potentiometer adjustment of cutoff distance
- Enhanced immunity to fluorescent lights
- Crosstalk immunity algorithm allows two sensors to be used in close proximity
- High-intensity, bright red LED spot makes sensor alignment fast and easy
- Convenient mounting options are available for 18 mm barrel or side mount
- Bright indicator LEDs show operating status from 360˚



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	Output Type	Sensing Range	Supply Voltage
QS18VN6AF250	Complementary NPN	Adjustable Cutoff: 30 mm to 250 mm	10 V DC to 30 V DC
QS18VP6AF250	Complementary PNP		
QS18K6AF250Q8	IO-Link		
QS18VN6AF120	Complementary NPN	Adjustable Cutoff: 30 mm to 120 mm	
QS18VP6AF120	Complementary PNP		
QS18K6AF120Q8	IO-Link		

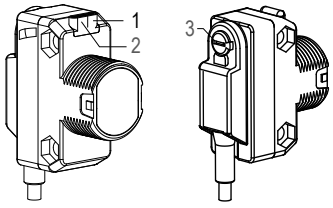
2 m (6.5 ft) PVC cabled models are listed for the complementary output models. 2 m (6.5 ft) and 9 m (30 ft) PVC cabled options are not available on IO-Link models.

- To order the 9 m (30 ft) PVC cable model, add the suffix "W/30" to the cabled model number. For example, QS18VN6AF250 W/30.
- To order the 4-pin M12 integral quick disconnect model, add the suffix "Q8" to the model number. For example, QS18VN6AF250Q8.
- To order the 4-pin M8 integral quick disconnect model, add the suffix "Q7" to the model number. For example, QS18VN6AF250Q7.
- 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, QS18VN6AF250Q5.
- 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, QS18VN6AF250Q.
- Models with a quick disconnect require a mating cordset.

Overview

The WORLD-BEAM QS18AF250 Series Sensor detects targets within the cutoff distance while ignoring objects in the background. Background suppression mode is recommended when target position is repeatable, but target color and background conditions vary.

1 Green LED: Power Indicator
2 Amber LED: Light Sensed Indicator (Flashes for Marginal Conditions)
3 Cutoff Point Adjustment Potentiometer



Installation Instructions

Sensor Orientation

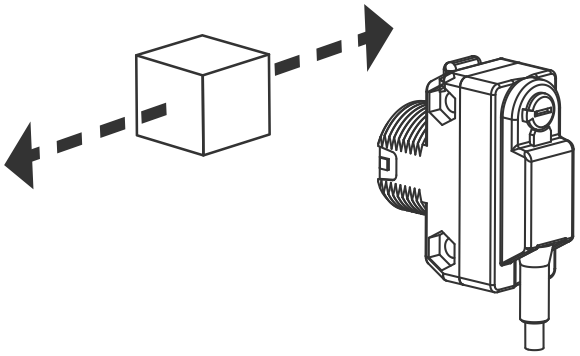
Optimize detection reliability and minimum object separation performance with correct sensor-to-target orientation. To ensure reliable detection, orient the sensor as shown in relation to the target to be detected.

Original Instructions
26-Sep-24

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201339
p/n: 201339 Rev. F

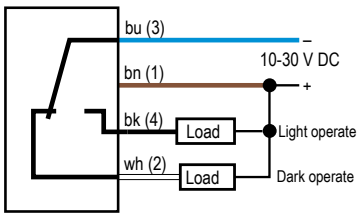
Optimal Orientation of Target to Sensor



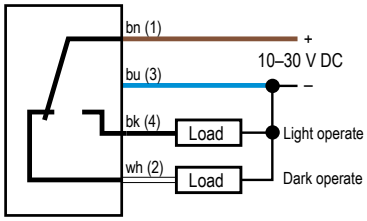
Wiring Diagrams

Cabled wiring diagrams are shown. Quick disconnect wiring diagrams are functionally identical.

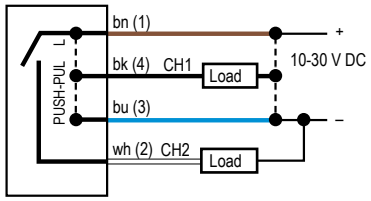
NPN output



PNP output



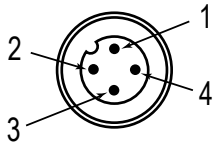
Light Operate Bipolar Outputs



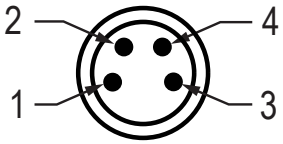
White wire: Light operate

Black wire: Configurable via IO-Link

4-pin male M12 pinout



4-pin male M8 pinout



Key

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

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

Sensor Setup (Background Suppression Mode)

Background Suppression Mode: Objects beyond the set cutoff distance will not be detected. Background suppression mode can be used in most situations with varying object colors and positions or with varying background conditions.

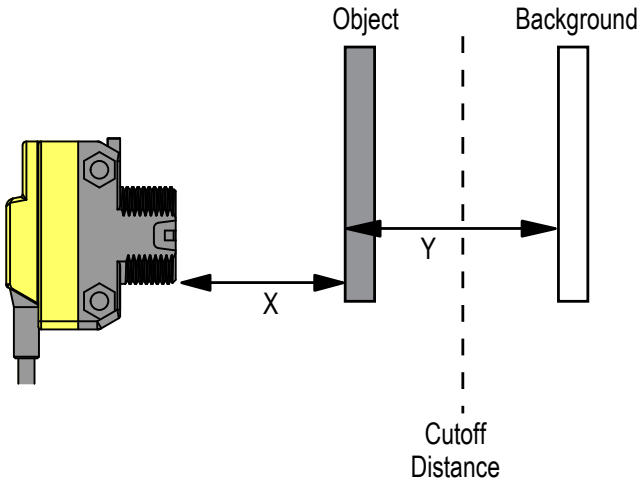
To ensure reliable background suppression, a minimum separation distance between the object and the background is necessary.
To determine the minimum separation distance, see " Performance Curves" on page 5.

1. Mount the sensor with the darkest object at the longest application distance. The distance to the object must be less than shown in "Figure: Minimum separation between object and background (Background Suppression Mode) for AF250 models on page 5, or "Figure: Minimum separation between object and background (Background Suppression Mode) for AF120 models on page 5 for your object color, depending on the model.
2. Turn the adjustment potentiometer counterclockwise until the yellow indicator turns off.
3. Turn the adjustment potentiometer clockwise until the yellow indicator turns on.
4. Replace the darkest object with the brightest background at the closest application distance.
5. Turn the adjustment potentiometer clockwise until the yellow indicator turns on.

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6. Turn the adjustment potentiometer counterclockwise approximately half of the adjustment rotation from step 5. This places the cutoff distance approximately half-way between the object and the background switch points.
   If sufficient separation exists between the object and the background, the sensor is ready for operation.

Minimum Separation Distance



X: Distance to the Object

Y: Minimum Separation Between the Object and the Background

Set the cutoff distance approximately midway between the farthest object and the closest background

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 QS18's IO-Link IODD package (p/n 206635) 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 QS18, 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.

Specifications

Supply Voltage
10 V DC to 30 V DC (10% maximum ripple within specified limits)

Maximum Power Consumption (exclusive of load)
AF120 Models less than 300 mW
AF250 Models less than 475 mW

Sensing Beam
Visible red LED, 640 nm

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

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Output Configuration

Solid-state complementary: NPN or PNP, or push/pull, depending on model

Rating: 50 mA per output

Output Voltage High: Greater than Vsupply - 2.5 V

Output Voltage Low: Less than 2.5 V

For loads less than 1 Meg Ohm

Protected against false pulse on power-up and continuous overload or short circuit of outputs

Output Response

1.7 milliseconds ON; 1.1 milliseconds OFF

Note: 200-millisecond delay on power-up; outputs do not conduct during this time

Adjustments

Single-turn adjustment potentiometer sets the cutoff distance between minimum and maximum positions

Repeatability

130 µs (standard mode)

Indicators

Two LED indicators on sensor top:

Green solid: Power on

Amber: Light sensed

Amber flashing: Marginal sensing condition

Construction

ABS housing, acrylic lens cover, nickel-plated brass connector, acetal adjustment pot

Connections

2 m (6.5 ft) unterminated 4-wire PVC-jacketed cable; 9 m (30 ft) unterminated 4-wire PVC-jacketed cable; 150 mm (6 in) PVC-jacketed cable with a 4-pin M8 male quick-disconnect connector; 150 mm (6 in) PVC-jacketed cable with a 4-pin M12 male quick-disconnect connector; Integral 4-pin M8 male quick-disconnect connector or Integral 4-pin M12 male quick-disconnect connector, depending on model

Models with a quick disconnect require a mating cordset

Environmental Rating

IEC IP67; NEMA 6; UL Type 1

IO-Link Interface

Supports Smart Sensor Profile: Yes

Baud Rate: 38400 bps

Process Data Widths: 16 bits

IODD Files: Provides all programming options plus additional functionality; please see the IO-Link Data Reference Guide for more details

Operating Conditions

95% relative humidity at 50 °C (non-condensing)

–40 °C to +60 °C (–40 °F to +140 °F)

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

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.

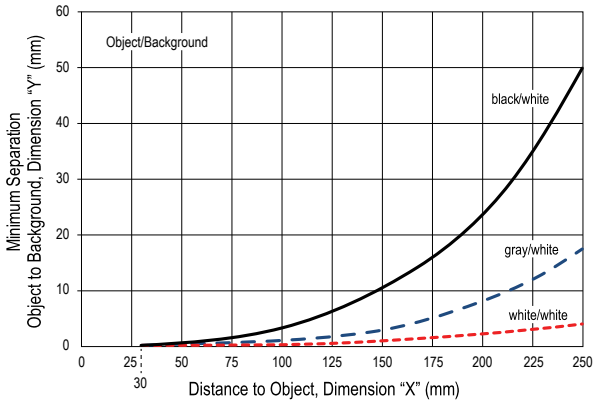
Supply Wiring (AWG)	Required Overcurrent Protection (A)	Supply Wiring (AWG)	Required Overcurrent Protection (A)
20	5.0	26	1.0
22	3.0	28	0.8
24	1.0	30	0.5

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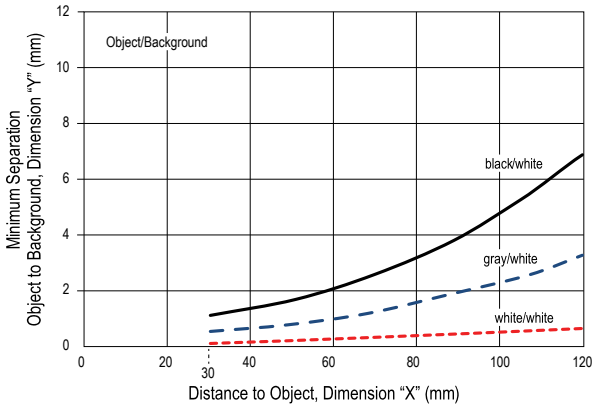
Performance Curves

Long Range: The minimum sensing range is 8 mm for 6% reflectivity. Short Range: The minimum sensing range is 13 mm for 6% reflectivity.

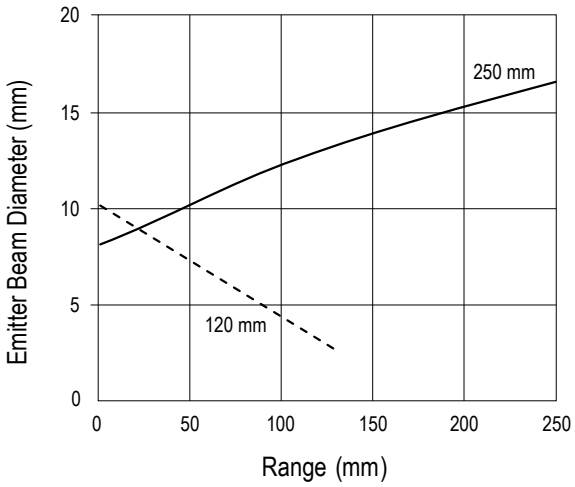
Minimum separation between object and background (Background Suppression Mode) for AF250 models



Minimum separation between object and background (Background Suppression Mode) for AF120 models



Typical emitter spot diameter vs. distance for AF250 and AF120

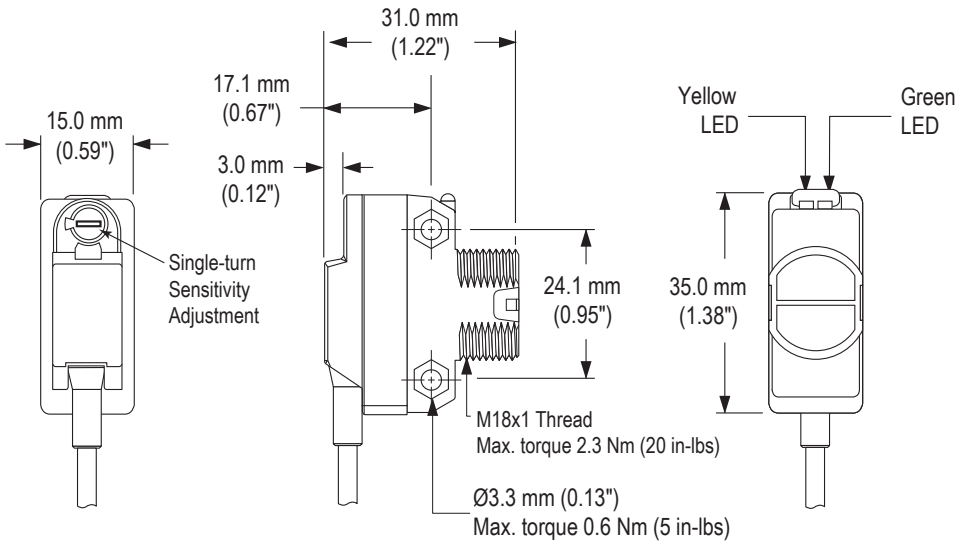


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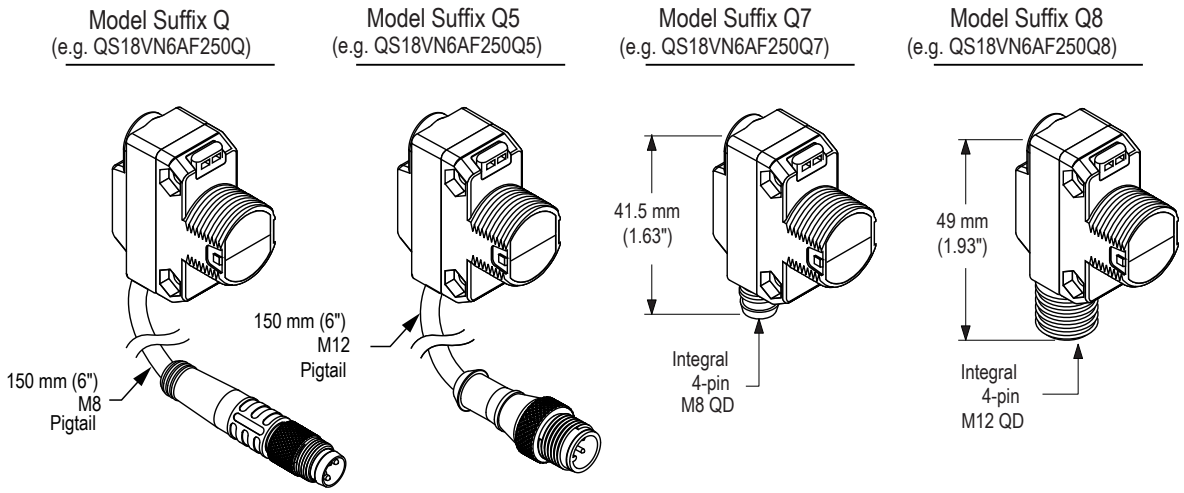
Dimensions

All measurements are listed in millimeters, unless noted otherwise. The measurements provided are subject to change.

Base dimensions for the QS18 models



Dimensions for each connection type



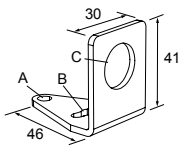
Accessories

Brackets

SMB18A

- Right-angle mounting bracket with a curved slot for versatile orientation
- 12-ga. stainless steel
- 18 mm sensor mounting hole
- Clearance for M4 (#8) hardware

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

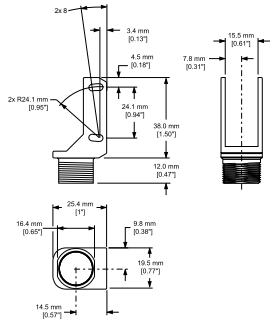


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SMBQS18Y

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

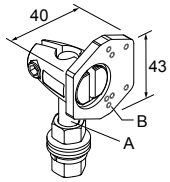
Hole size: A = ø 15.3



SMBQ4X..

- Swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolts are available
- Side mounting of some sensors with the 3 mm screws included with the sensor

B = 7 × M3 × 0.5
Bolt thread (A): 3/8 - 16 × 2¼ in for SMBQ4XFA; M10 - 1.5 × 50 for SMBQ4XFAM10; n/a; no bolt included. Mounts directly to 12 mm (½ in) rods for SMBQ4XFMA1



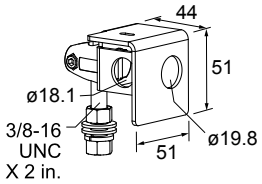
SMB18AFA..

- Protective, swivel bracket with tilt and pan movement for precision adjustment
- Easy sensor mounting to extruded rail T-slots
- Metric and inch size bolts available
- Mounting hole for 18 mm sensors

Hole size: B = ø 18.1

Bolt Thread (A):

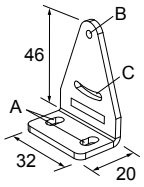
SMB18AFA = 3/8 - 16 × 2 in
SMB18AFAM10 = M10 - 1.5 × 50



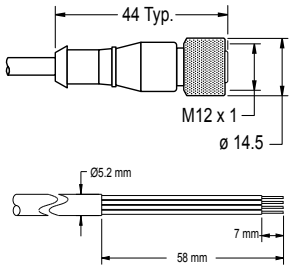
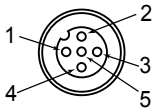
SMB312S

- Stainless steel 2-axis, side-mount bracket

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



Cordsets

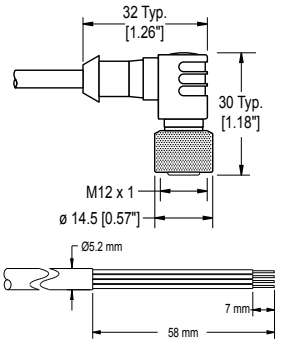
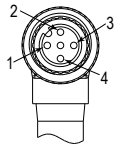
4-Pin Single-Ended M12 Female Cordsets					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
MQDC-406	2 m (6.56 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused
MQDC-415	5 m (16.4 ft)				
MQDC-430	9 m (29.5 ft)				
MQDC-450	15 m (49.2 ft)				

Continued on page 8

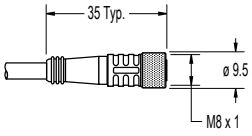
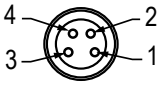
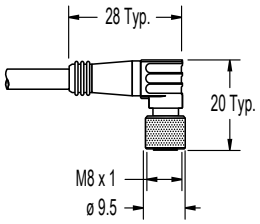
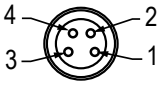
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Continued from page 7

4-Pin Single-Ended M12 Female Cordsets

Model	Length	Style	Dimensions	Pinout (Female)
MQDC-406RA	2 m (6.56 ft)	Right-Angle		
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 M8 Female Cordsets

Model	Length	Style	Dimensions	Pinout (Female)	
PKG4M-2	2 m (6.56 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black
PKG4M-5	5 m (16.4 ft)				
PKG4M-9	9 m (29.52 ft)				
PKW4M-2	2 m (6.56 ft)	Right Angle			
PKW4M-5	5 m (16.4 ft)				
PKW4M-9	9 m (29.5 ft)				

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.

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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