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Q12 Series Sensor

Original Instructions
p/n: 119223 Rev. Q
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Chapter Contents

Models 3

Chapter 1 Features

Miniature self-contained photoelectric sensors in a universal housing



- Bright, visible red (640 nm) light source
- Standard models available with 4-wire 2 m (6.5 ft) or 9 m (30 ft) cable or 3 or 4-wire 150 mm (6 in) pigtail with Pico-style M8 threaded connector
- Solid-state, bipolar outputs: one current sourcing (PNP) and one current sinking (NPN) standard on 4-wire models
- Single output solid-state PNP or NPN standard on Q3 models
- Light Operate (LO) or Dark Operate (DO), depending on model
- Compact 8 mm (0.31 in) housing mounts almost anywhere
- Crosstalk avoidance circuitry for applications with multiple sensors
- LED status indicators for Power ON, Output Overload, Signal Received, and Marginal Signal
- Advanced ASIC technology makes the sensor resistant to optical and electrical noise sources

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

Opposed mode emitter (640 nm visible red) and receiver (effective beam 5.7 mm) models (2 m range)

Model	Connection	Output
Q126E (emitter)	2 m (6.5 ft) cable	N/A
Q126EQ3 (emitter)	150 mm (6 in) cable with a 3-pin M8 QD	N/A
Q12AB6R	2 m (6.5 ft) cable	Bipolar LO
Q12RB6R	2 m (6.5 ft) cable	Bipolar DO
Q12AP6RQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP LO
Q12RP6RQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP DO
Q12AN6RQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN LO
Q12RN6RQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN DO

Retroreflective range is specified using one model **BRT-60X40C** retroreflector. The actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) used.

Polarized retroreflective models (640 nm visible red) (1 m range)

Models	Connection	Output
Q12AB6LP	2 m (6.5 ft) cable	Bipolar LO
Q12RB6LP	2 m (6.5 ft) cable	Bipolar DO
Q12AP6LPQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP LO

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Models	Connection	Output
Q12RP6LPQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP DO
Q12AN6LPQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN LO
Q12RN6LPQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN DO

Retroreflective models (640 nm visible red) (1.5 m range)

Models	Connection	Output
Q12AB6LV	2 m (6.5 ft) cable	Bipolar LO
Q12RB6LV	2 m (6.5 ft) cable	Bipolar DO
Q12AP6LVQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP LO
Q12RP6LVQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP DO
Q12AN6LVQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN LO
Q12RN6LVQ3	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN DO

Fixed-field visible red models (640 nm)

Models	Range	Connection	Output
Q12AB6FF15	15 mm (0.6 in) cutoff, 10 mm (0.4 in) focus	2 m (6.5 ft) cable	Bipolar LO
Q12RB6FF15	15 mm (0.6 in) cutoff, 10 mm (0.4 in) focus	2 m (6.5 ft) cable	Bipolar DO
Q12AP6FF15Q3	15 mm (0.6 in) cutoff, 10 mm (0.4 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP LO
Q12RP6FF15Q3	15 mm (0.6 in) cutoff, 10 mm (0.4 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP DO
Q12AN6FF15Q3	15 mm (0.6 in) cutoff, 10 mm (0.4 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN LO
Q12RN6FF15Q3	15 mm (0.6 in) cutoff, 10 mm (0.4 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN DO
Q12AB6FF30	30 mm (1.2 in) cutoff, 16 mm (0.63 in) focus	2 m (6.5 ft) cable	Bipolar LO
Q12RB6FF30	30 mm (1.2 in) cutoff, 16 mm (0.63 in) focus	2 m (6.5 ft) cable	Bipolar DO
Q12AP6FF30Q3	30 mm (1.2 in) cutoff, 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP LO
Q12RP6FF30Q3	30 mm (1.2 in) cutoff, 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP DO
Q12AN6FF30Q3	30 mm (1.2 in) cutoff, 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN LO
Q12RN6FF30Q3	30 mm (1.2 in) cutoff, 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN DO
Q12AB6FF50	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	2 m (6.5 ft) cable	Bipolar LO
Q12RB6FF50	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	2 m (6.5 ft) cable	Bipolar DO
Q12AP6FF50Q3	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP LO
Q12RP6FF50Q3	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 PNP DO
Q12AN6FF50Q3	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN LO
Q12RN6FF50Q3	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	150 mm (6 in) cable with a 3-pin M8 QD	1 NPN DO

Performance is based on the use of a 90% reflectance white test card.

- To order the 150 mm (6 in) cable with a 4-pin M8 QD model, add the suffix **Q** to the model number. For example, **Q126EQ**.
- To order the 150 mm (6 in) cable with a 4-pin M12 QD model, add the suffix **Q5** to the model number. For example **Q126EQ5**.

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Chapter 2 Indicator Features



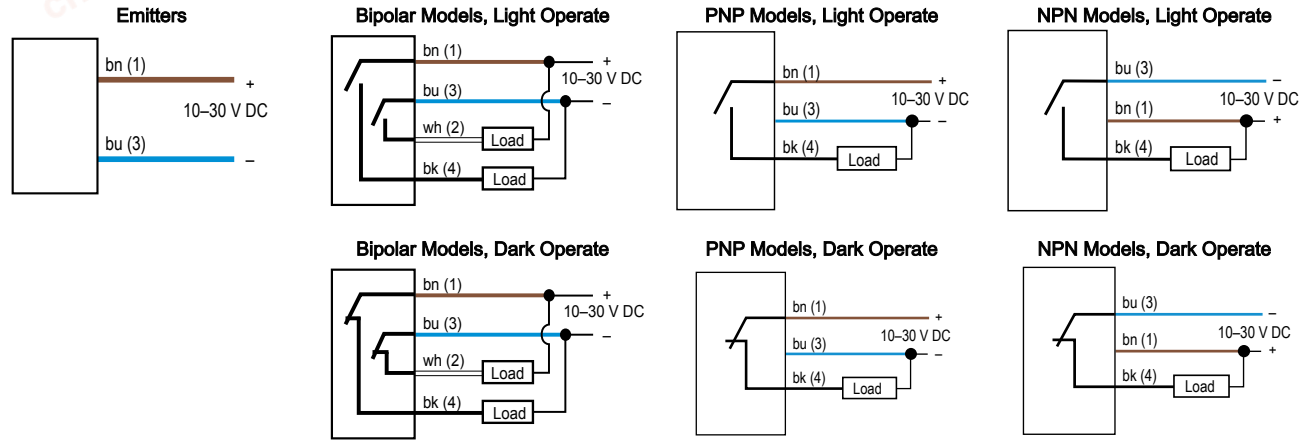
1 - Amber and green LEDs

- Green on: the power to the sensor is on
- Amber on: received signal
- Amber flashing: marginal signal

Wiring

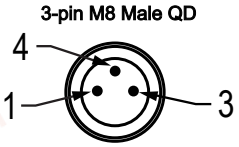
Emitters have no connection to black and white.

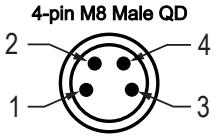
CAUTION: Observe proper ESD precautions (grounding) when connecting QD models.

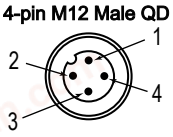


Key

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







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Chapter 3 Specifications

Supply Voltage and Current

10 to 30 V DC (10% maximum ripple) at 20 mA maximum current

Sensing Beam

640 nm visible red

Supply Protection Circuitry

Protected against reverse polarity and transient voltages

Sensing Range

Opposed Mode Models: 2 m (6.5 ft)

Polarized Retroreflective Mode Models: 1 m (40 in)

Retroreflective Mode Models: 1.5 m (59 in)

Fixed Field FF15 Models: 15 mm (0.6 in) cutoff, 10 mm (0.4 in) focus

Fixed Field FF30 Models: 30 mm (1.2 in) cutoff, 16 mm (0.63 in) focus

Fixed Field FF50 Models: 50 mm (2 in) cutoff; 16 mm (0.63 in) focus

Output Configuration

Bipolar (1 NPN and 1 PNP) solid-state output or Single output (PNP or NPN), LO or DO, depending on model

Repeatability

125 microseconds

Switching Frequency

Opposed Mode: 385 Hz

LP/LV Mode: 715 Hz

FF Mode: 590 Hz

Output Protection Circuitry

Protected against false pulse on power-up, short-circuit protected

Output Response Time

Opposed Mode: 1.3 ms ON; 900 µs OFF

LP/LV Mode: 700 µs ON/OFF

FF Mode: 850 µs ON/OFF

NOTE: 120 ms delay on power-up; outputs do not conduct during this time.

Output Ratings

OFF-state leakage current for NPN: 200 µA; PNP: 10 µA

ON-state saturation voltage for NPN: 2 V at 50 mA; PNP: 2 V at 50 mA

Indicators

One Yellow and one Green LED (see Figure 1)

Construction

Polarized Retro Models: Polyamide housing with glass lens

All Other Standard Models: Polyamide housing with polycarbonate lens

Connections

Standard Models: 2 m (6.5 ft) attached PVC cable, or 150 mm (6 in) pigtail with M8 or M12 threaded connection, depending on the model ordered

Conditions

Operating Temperature: –20 °C to +55 °C (–4 °F to +131°F)

Storage Temperature: –30 °C to +75 °C (–22 °F to +167 °F)

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

Environmental Rating

Standard Models: IEC IP67

Certifications

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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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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.

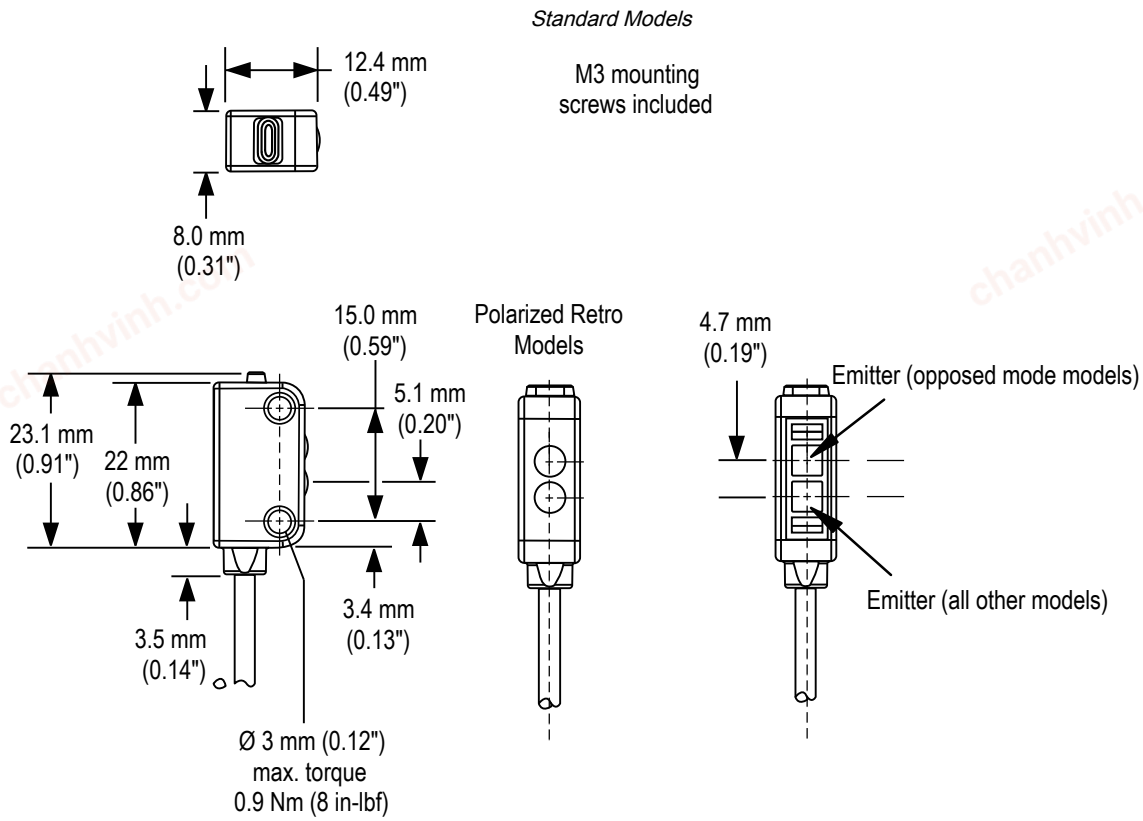
(Part 15.21) Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

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



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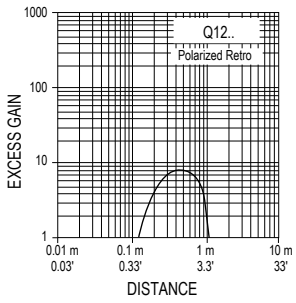
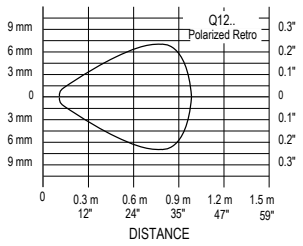
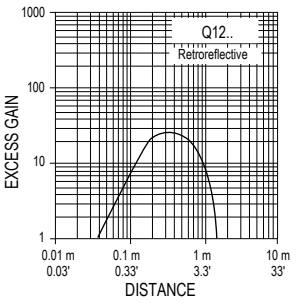
Q12 Retroreflective Mode Performance Curves

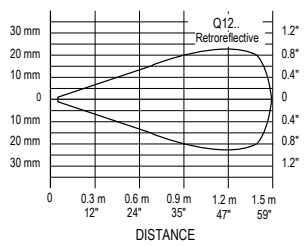
Performance is based on the use of a model **BRT-60X40C** retroreflector.

Polarized Retroreflective		Retroreflective	
Excess Gain	**Beam Pattern**	**Excess Gain**	**Beam Pattern**



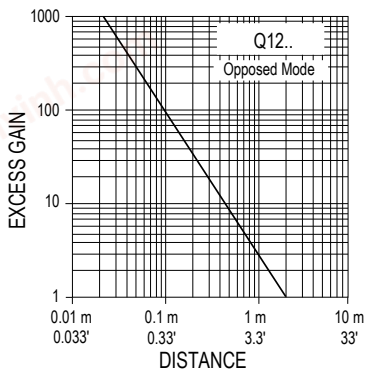


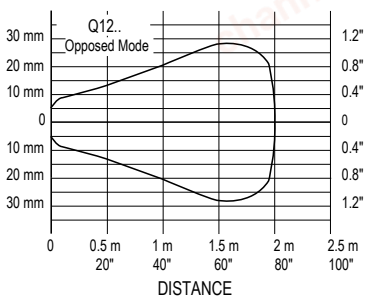




Q12 Opposed Mode Performance Curves

Excess Gain	Beam Pattern





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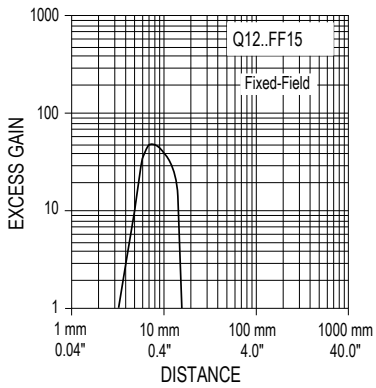
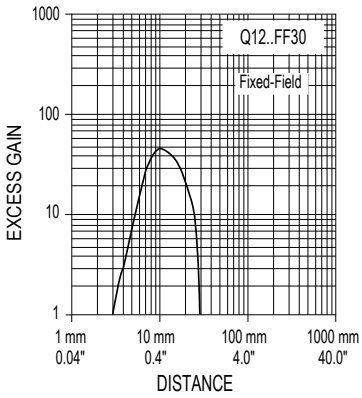
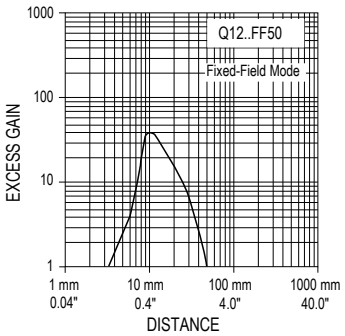
Q12 Fixed-Field Performance Curves

Focus and spot sizes are typical. Performance based on use of 90% reflectance white test card.*

Fixed Field – 15 mm	Fixed Field – 30 mm	Fixed Field – 50 mm
		
Ø 0.4 mm spot size at 10 mm focus Ø 1.5 mm spot size at 15 mm cutoff *** Using the 18% gray test card** the cutoff distance will be 95% of the value shown. **Using the 6% black test card** the cutoff distance will be 90% of the value shown.	Ø 0.5 mm spot size at 16 mm focus Ø 3.0 mm spot size at 30 mm cutoff *** Using the 18% gray test card** the cutoff distance will be 90% of the value shown. **Using the 6% black test card** the cutoff distance will be 80% of the value shown.	Ø 0.5 mm spot size at 16 mm focus Ø 6.5 mm spot size at 50 mm cutoff *** Using the 18% gray test card** the cutoff distance will be 80% of the value shown. **Using the 6% black test card** the cutoff distance will be 60% of the value shown.

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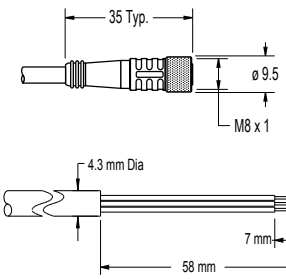
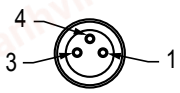
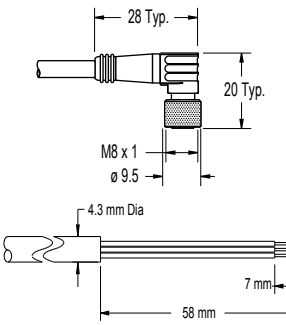
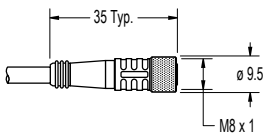
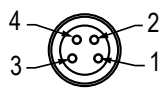
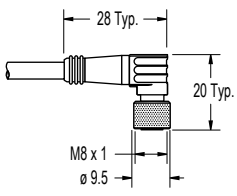
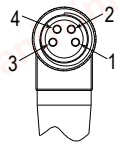
Chapter 4 Accessories

Cordsets

3-pin Single-Ended Threaded M8 Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
PKG3M-2	2 m (6.56 ft)	Straight		 1 = Brown 3 = Blue 4 = Black
PKG3M-4	4 m (13.12 ft)			
PKG3M-5	5 m (16.4 ft)			
PKG3M-7	7 m (22.96 ft)			
PKG3M-9	9 m (29.52 ft)			
PKG3M-10	10 m (32.81 ft)			
PKW3M-2	2 m (6.56 ft)	Right-Angle		
PKW3M-5	5 m (16.40 ft)			
PKW3M-9	9 m (29.53 ft)			

4-Pin Threaded M8 Cordsets—Single Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
PKG4M-2	2.04 m (6.68 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black
PKG4M-5	5 m (16.4 ft)				
PKG4M-9	9.04 m (29.6 ft)				
PKW4M-2	2 m (6.56 ft)	Right Angle			
PKW4M-5	5 m (16.4 ft)				
PKW4M-9	9 m (29.5 ft)				

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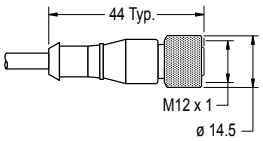
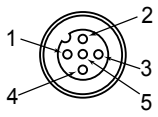
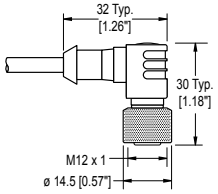
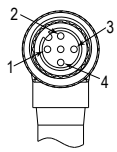
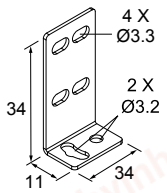
4-Pin Threaded M12 Cordsets—Single Ended					
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**	
MQDC-406	2 m (6.56 ft)	Straight			1 = Brown 2 = White 3 = Blue 4 = Black 5 = Unused
MQDC-415	5 m (16.4 ft)				
MQDC-430	9 m (29.5 ft)				
MQDC-450	15 m (49.2 ft)				
MQDC-406RA	2 m (6.56 ft)	Right-Angle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

Brackets

SMBQ12T

- Right-angle bracket
- 20-ga. 300 series stainless steel

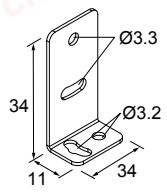
Hole center spacing: A to B = 7.6
Hole size: A = 3.5 x 8.1, B=ø 3.2



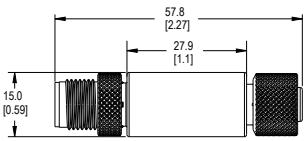
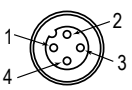
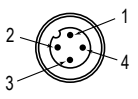
SMBQ12A

- Adjustable right-angle bracket
- 20-ga. 300 series stainless steel

Hole center spacing: A to B = 7.6
Hole size: A = 3.5 x 8.1, B=ø 3.2



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					

Apertures

Opposed-mode sensors (standard models only) may be fitted with apertures to narrow or shape the sensor's effective beam to more closely match the size or profile of the objects being sensed. A common example is using "line" (or "slot") type apertures to sense thread.

NOTE: The use of apertures will reduce the sensing range (see table below).

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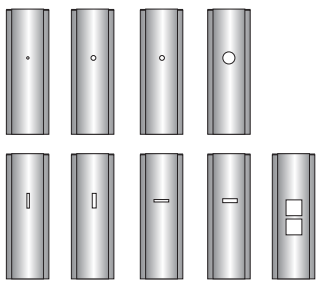
Model	Description	Pieces	Reduced Sensor Range (Two Apertures Used)	
Circular				
APQ12-.5	0.5 mm (0.02 in) diameter	10	60 mm (2.4 in)	
APQ12-1	1 mm (0.04 in) diameter	10	190 mm (7.5 in)	
APQ12-1.5	1.5 mm (0.06 in) diameter	10	400 mm (15.7 in)	
APQ12-2	2 mm (0.08 in) diameter	10	725 mm (28.5 in)	
Horizontal Slot				
APQ12-.5H	0.5 mm (0.02 in)	10	350 mm (13.8 in)	
APQ12-1H	1 mm (0.04 in)	10	725 mm (28.5 in)	
Vertical Slot				
APQ12-.5V	0.5 mm (0.02 in)	10	450 mm (17.7 in)	
APQ12-1V	1 mm (0.04 in)	10	900 mm (35.4 in)	
Protective Jacket				
APQ12-4S	4 mm (0.16 in) square	10	2000 mm (78.7 in)	
APKQ12	Kit containing two of each aperture above	18	—	



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Chapter 5 Product Support and Maintenance

Clean with Mild Detergent and Warm Water

Handle the sensor with care during installation and operation. Sensor windows soiled by fingerprints, dust, water, oil, etc. create stray light that may degrade the peak performance of the sensor.

Wipe down the device with a soft cloth dampened with a mild detergent and warm water solution. Do not use any other chemicals for cleaning.

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.

Banner Engineering Corp Limited Warranty

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