WORLD-BEAM® Q12 Series Sensor

Datasheet

Miniature self-contained photoelectric sensors in universal housing



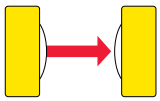
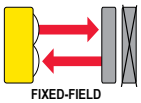
Standard Model **Chemical-Resistant Model**

- 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 (L.O.) or Dark Operate (D.O.), depending on model
- Models available with PFA chemical-resistant jacket (1200 psi washdown rated) for use in harsh environments
- 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
- Models with black housing are available

WARNING:

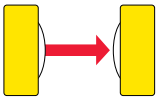
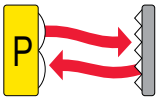
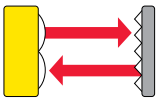
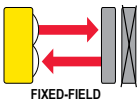
- **Do not use this device for personnel protection**
- Using this device for personnel protection could result in serious injury or death.
- This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A device failure or malfunction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

Chemical-Resistant Models

Sensing Mode	Model[1] [2]	Range	Output
640 nm Visible Red	**Q126ECR**	1.5 m (4.9 ft)	N/A
 OPPOSED Effective Beam: 5.7 mm (0.22 in)	**Q12AB6RCR**		Bipolar LO
	Q12RB6RCR		Bipolar DO
Performance based on use of 90% reflectance white test card.			
 FIXED-FIELD VISIBLE RED 640 nm Visible Red	**Q12AB6FF15CR**	13 mm (0.5 in) cutoff; 8 mm (0.3 in) focus	Bipolar LO
	Q12RB6FF15CR		Bipolar DO
	Q12AB6FF30CR	28 mm (1.1 in) cutoff; 14 mm (0.6 in) focus	Bipolar LO
	Q12RB6FF30CR		Bipolar DO
	Q12AB6FF50CR	48 mm (1.9 in) cutoff; 14 mm (0.6 in) focus	Bipolar LO
	Q12RB6FF50CR		Bipolar DO

[1] Only standard 2 m (6.5 ft) cables are available for chemical-resistant models.
[2] To order the black housing model, add the prefix **D** to the model number, for example, **DQ12AB6FF15CR**.

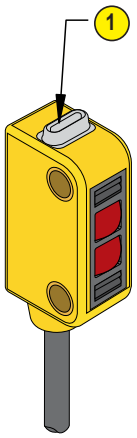
Standard Models

Sensing Mode	Model[3]	Range	Connection	Output
640 nm Visible Red	**Q126E (emitter)**	2 m (6.5 ft)	2 m (6.5 ft) cable	N/A
 OPPOSED Effective Beam: 5.7 mm (0.22 in)	**Q12AB6R**	2 m (6.5 ft)	2 m (6.5 ft) cable	Bipolar LO
	Q12RB6R			Bipolar DO
	Q12AP6RQ3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	Q12RP6RQ3			1 PNP DO
	Q12AN6RQ3			1 NPN LO
	Q12RN6RQ3			1 NPN DO
 POLAR RETRO 640 nm Visible Red	**Q12AB6LP**	1 m (40 in) [4]	2 m (6.5 ft) cable	Bipolar LO
	Q12RB6LP			Bipolar DO
	Q12AP6LPQ3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	Q12RP6LPQ3			1 PNP DO
	Q12AN6LPQ3			1 NPN LO
	Q12RN6LPQ3			1 NPN DO
 RETRO 640 nm Visible Red	**Q12AB6LV**	1.5 m (59 in) [4]	2 m (6.5 ft) cable	Bipolar LO
	Q12RB6LV			Bipolar DO
	Q12AP6LVQ3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	Q12RP6LVQ3			1 PNP DO
	Q12AN6LVQ3			1 NPN LO
	Q12RN6LVQ3			1 NPN DO
Performance based on use of 90% reflectance white test card.				
 FIXED-FIELD VISIBLE RED 640 nm Visible Red	**Q12AB6FF15**	15 mm (0.6 in) cutoff; 10 mm (0.4 in) focus	2 m (6.5 ft) cable	Bipolar LO
	Q12RB6FF15			Bipolar DO
	Q12AP6FF15Q3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	Q12RP6FF15Q3			1 PNP DO
	Q12AN6FF15Q3			1 NPN LO
	Q12RN6FF15Q3			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			Bipolar DO
	Q12AP6FF30Q3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	Q12RP6FF30Q3			1 PNP DO
	Q12AN6FF30Q3			1 NPN LO
	Q12RN6FF30Q3			1 NPN DO
	Q12AB6FF50	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	2 m (6.5 ft) cable	Bipolar LO
	Q12RB6FF50			Bipolar DO
	Q12AP6FF50Q3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	Q12RP6FF50Q3			1 PNP DO
	Q12AN6FF50Q3			1 NPN LO
	Q12RN6FF50Q3			1 NPN DO

[3]
- To order the black housing model, add the prefix **D** to the model number, for example **DQ12AB6FF15.**
- To order the 9 m (30 ft) cable model, add the suffix **W/30** to the model number. For example, **Q126E W/30**.
- To order the 150 mm (6 in) cable with a 4-pin M8/Pico-style (M8 threaded) 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/Euro-style QD model, add the suffix **Q5** to the model number. For example **Q126EQ5**.

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

Indicator Features



1 - Amber and green LEDs

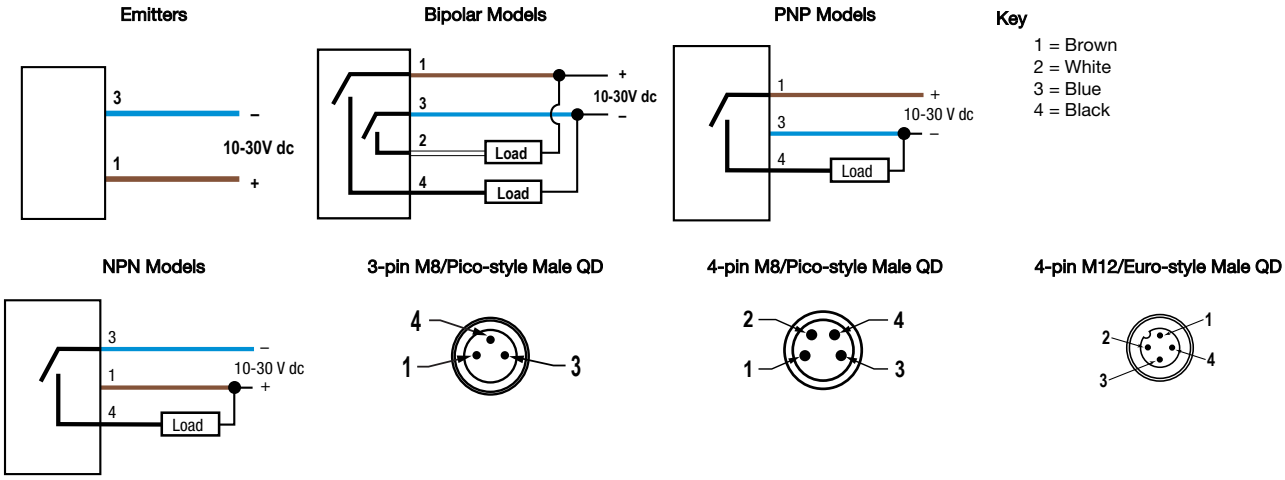
- Green on: power to sensor is on
- Green flashing: output is overloaded
- Amber on: received signal
- Amber flashing: marginal signal

Chemical-Resistant models: LEDs are visible through translucent PFA jacket. Rated to 1200 psi washdown.

Wiring

Cabled wiring diagrams are shown. Connections for QD models are functionally identical. (Emitters have no connection to black and white.)

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



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

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

Repeatability
175 microseconds

Switching Frequency
Opposed Mode: 385 Hz
All Other Modes: 715 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
All Other Modes: 700 µs ON/OFF
NOTE: 120 ms delay on power-up; outputs do not conduct during this time.

Indicators
One Yellow and one Green LED (see Figure 1)

Construction
Polarized Retro Models: Thermoplastic elastomer housing with glass lens
All Other Standard Models: Thermoplastic elastomer housing with polycarbonate lens
Chemical-Resistant Models: Housing encased in PFA jacket; cable encased in 3/16 in O.D. PFA tubing

Connections
Standard Models: 2 m (6.5 ft) or 9 m (30 ft) attached PVC cable, or 150 mm (6 in) pigtail with M8 or M12 threaded connection, depending on the model ordered
Chemical-Resistant Models: 2 m (6.5 ft) cable encased in 3/16 in O.D. PFA tubing

Environmental Rating
Standard Models: IEC IP67
Chemical-Resistant Models: IEC IP67 (NEMA6) and PW12 1200 psi washdown per NEMA ICS5, Annex F-2002

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)

Certifications

(Chemical-resistant models are not UR/UL approved.)

Output Ratings
OFF-state leakage current:
NPN: 200 µA
PNP: 10 µA
ON-state saturation voltage:
NPN: 1.25 V at 50 mA
PNP: 1.45 V at 50 mA

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

Required Overcurrent Protection

WARNING: Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

Overcurrent protection is required to be provided by end product application per the supplied table.
Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.
Supply wiring leads < 24 AWG shall not be spliced.
For additional product support, go to *www.bannerengineering.com*.

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

Dimensions

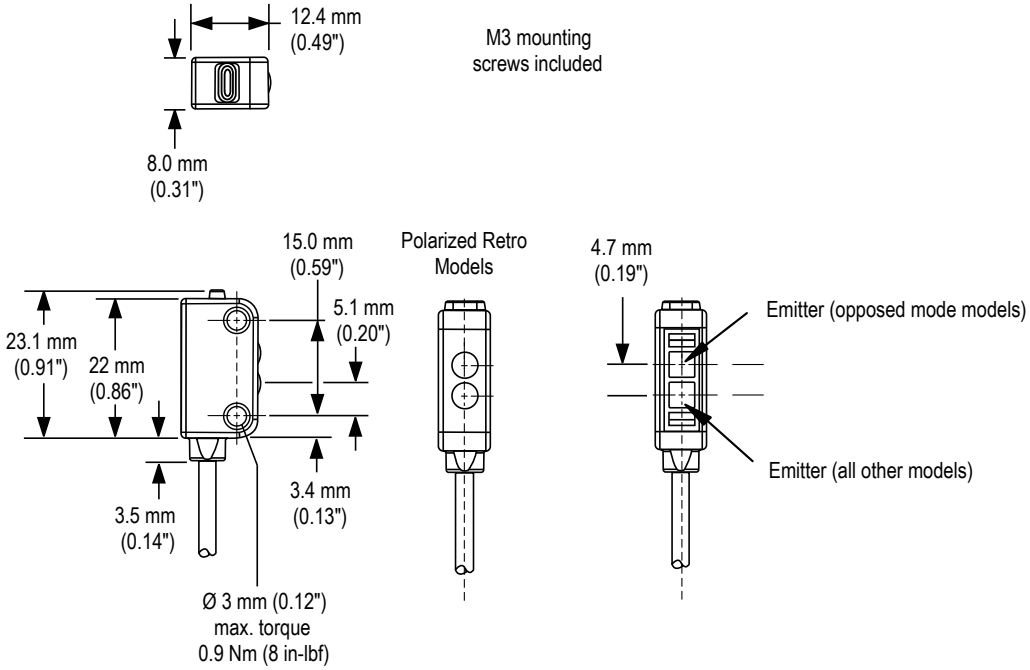


Figure 1. Standard Models

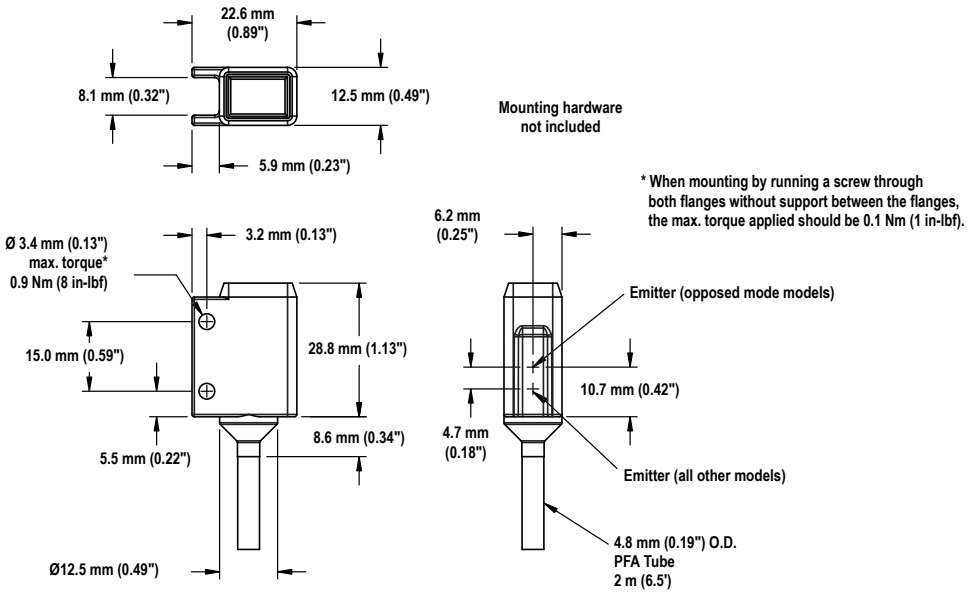
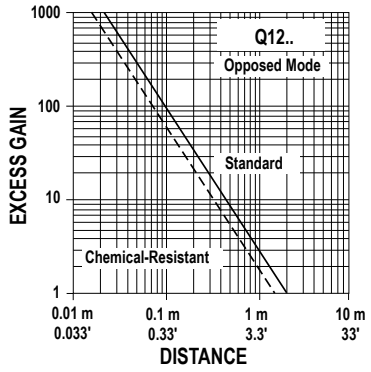
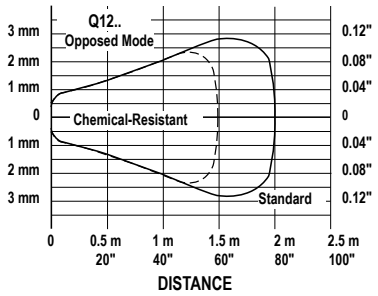


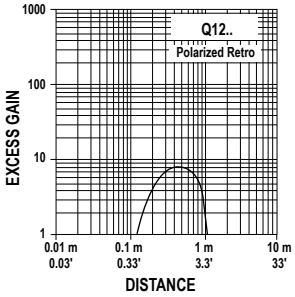
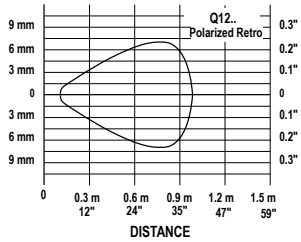
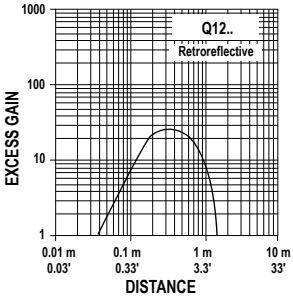
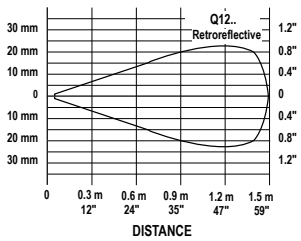
Figure 2. Chemical-Resistant Models

Performance Curves - Opposed Mode

Excess Gain	Beam Pattern
	

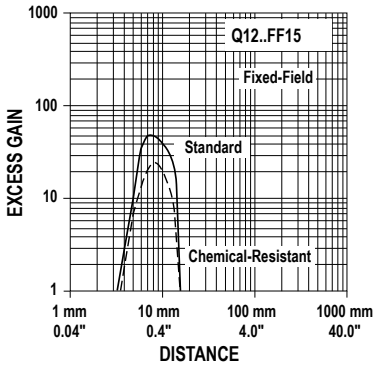
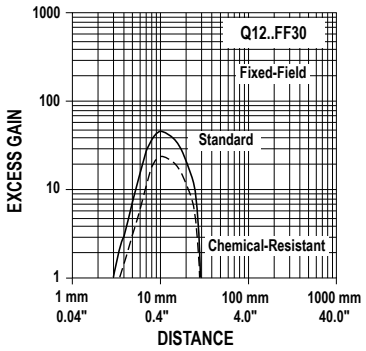
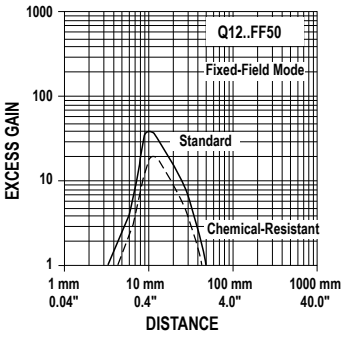
Performance Curves - Retroreflective Mode

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

Polarized Retroreflective		Retroreflective	
Excess Gain	Beam Pattern	Excess Gain	Beam Pattern
			

Performance Curves - Fixed-Field

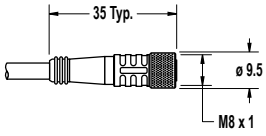
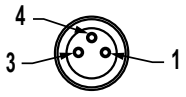
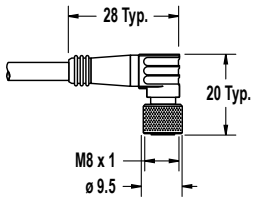
Focus and spot sizes are typical. Performance based on use of 90% reflectance white test card.*

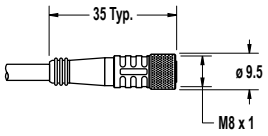
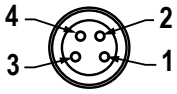
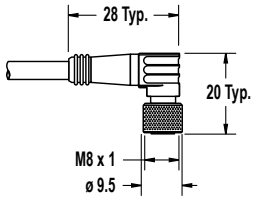
Fixed Field -- 15 mm	Fixed Field -- 30 mm	Fixed Field -- 50 mm
		
Standard Models: • Ø 0.4 mm spot size at 10 mm focus • Ø 1.5 mm spot size at 15 mm cutoff **Chemical-Resistant Models:** • Ø 0.4 mm spot size at 8 mm focus • Ø 1.5 mm spot size at 13 mm cutoff *** Using 18% gray test card:** cutoff distance will be 95% of value shown. **Using 6% black test card:** cutoff distance will be 90% of value shown.	**Standard Models:** • Ø 0.5 mm spot size at 16 mm focus • Ø 3.0 mm spot size at 30 mm cutoff **Chemical-Resistant Models:** • Ø 0.5 mm spot size at 14 mm focus • Ø 3.0 mm spot size at 28 mm cutoff *** Using 18% gray test card:** cutoff distance will be 90% of value shown. **Using 6% black test card:** cutoff distance will be 80% of value shown.	**Standard Models:** • Ø 0.5 mm spot size at 16 mm focus • Ø 6.5 mm spot size at 50 mm cutoff *** Using 18% gray test card:** cutoff distance will be 80% of value shown. **Using 6% black test card:** cutoff distance will be 60% of value shown. **Chemical-Resistant Models:** • Ø 0.5 mm spot size at 14 mm focus • Ø 6.5 mm spot size at 48 mm cutoff *** Using 18% gray test card:** cutoff distance will be 70% of value shown. **Using 6% black test card:** cutoff distance will be 50% of value shown.

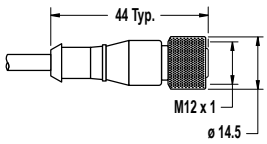
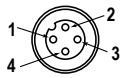
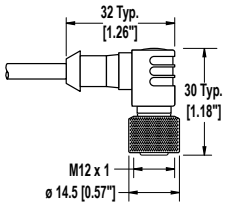
Accessories

Cordsets

3-Pin Threaded M8/Pico-Style Cordsets

Model	Length	Style	Dimensions	Pinout (Female)
PKG3M-2	2 m (6.56 ft)	Straight		 1 = Brown 3 = Blue 4 = Black
PKG3M-5	5 m (16.40 ft)			
PKG3M-7	7 m (22.97 ft)			
PKG3M-9	9 m (29.53 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)			

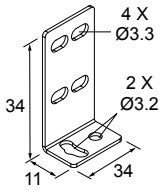
4-Pin Threaded M8/Pico-Style Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
PKG4M-2	2 m (6.56 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
PKG4M-5	5 m (16.4 ft)			
PKG4M-9	9 m (29.5 ft)			
PKW4M-2	2 m (6.56 ft)	Right Angle		
PKW4M-5	5 m (16.4 ft)			
PKW4M-9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

4-Pin Threaded M12/Euro-Style Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQDC-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MQDC-415	4.57 m (15 ft)			
MQDC-430	9.14 m (30 ft)			
MQDC-450	15.2 m (50 ft)			
MQDC-406RA	1.83 m (6 ft)	Right-Angle		
MQDC-415RA	4.57 m (15 ft)			
MQDC-430RA	9.14 m (30 ft)			
MQDC-450RA	15.2 m (50 ft)			

Brackets

SMBQ12T

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

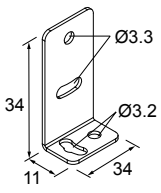


Hole center spacing: A to B = 7.6

Hole size: A = 3.5 x 8.1, B=ø 3.2

SMBQ12A

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



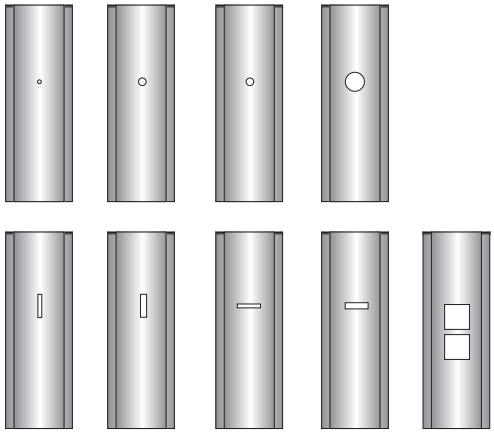
Hole center spacing: A to B = 7.6

Hole size: A = 3.5 x 8.1, B=ø 3.2

Apertures

Opposed-mode Q12 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 the use of "line" (or "slot") type apertures to sense thread.

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

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	—	

Banner Engineering Corp. Limited Warranty

Banner Engineering Corp. warrants its products to be free from defects in material and workmanship for one year following the date of shipment. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture which, at the time it is returned to the factory, is found to have been defective during the warranty period. This warranty does not cover damage or liability for misuse, abuse, or the improper application or installation of the Banner product.

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

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

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

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

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

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