

## Datasheet

Miniature self-contained photoelectric sensors in universal housing



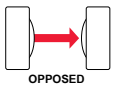

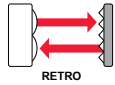
- Bright, visible red (645 nm) light source
- Standard models available with 4-wire, 2 m (6.5 ft) long cable; 150 mm (6 in) PVC cable with a 3-pin M8/Pico-style male quick disconnect; or a 150 mm (6 in) PVC cable with a 4-pin M8/Pico-style male quick disconnect
- Solid-state, bipolar outputs: one current 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
- Compact 8 mm (0.31 in) housing mounts almost anywhere
- Crosstalk avoidance circuitry for applications with multiple sensors
- LED status indicators for Power ON, Signal Received, and Marginal Signal
- Advanced ASIC technology makes sensor resistant to optical and electrical noise source



### 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

Sensing Mode	Model <sup>1</sup>	Range	Connection	Output
 OPPOSED Effective Beam: 5.7 mm (0.22 in)	<b>DQ126E (emitter)</b>	3 m	2 m (6.5 ft) cable	N/A
	<b>DQ12AB6R</b>		2 m (6.5 ft) cable	Bipolar LO
	<b>DQ12RB6R</b>			Bipolar DO
	<b>DQ12AP6RQ3</b>		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	<b>DQ12RP6RQ3</b>			1 PNP DO
	<b>DQ12AN6RQ3</b>			1 NPN LO
	<b>DQ12RN6RQ3</b>			1 NPN DO
 POLAR RETRO Visible red, 645 nm	<b>DQ12AB6LP</b>	2 m	2 m (6.5 ft) cable	Bipolar LO
	<b>DQ12RB6LP</b>			Bipolar DO
	<b>DQ12AP6LPQ3</b>		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	<b>DQ12RP6LPQ3</b>			1 PNP DO
	<b>DQ12AN6LPQ3</b>			1 NPN LO
	<b>DQ12RN6LPQ3</b>			1 NPN DO
	 RETRO Visible red, 645 nm		<b>DQ12AB6LV</b>	3 m
<b>DQ12RB6LV</b>		Bipolar DO		
<b>DQ12AP6LVQ3</b>		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO	
<b>DQ12RP6LVQ3</b>			1 PNP DO	
<b>DQ12AN6LVQ3</b>			1 NPN LO	
<b>DQ12RN6LVQ3</b>			1 NPN DO	

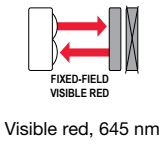
<sup>1</sup>

- To order the 9 m (30 ft) cable model, add the suffix **W/30** to the model number. For example, **DQ126E 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, **DQ126EQ**.
- 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 **DQ126EQ5**.

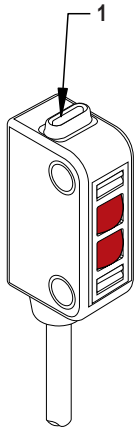
<sup>2</sup>

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.



Sensing Mode	Model <sup>1</sup>	Range	Connection	Output
Performance based on use of 90% reflectance white test card.				
 <p>Visible red, 645 nm</p>	DQ12AB6FF15	15 mm (0.6 in) cutoff; 10 mm (0.4 in) focus	2 m (6.5 ft) cable	Bipolar LO
	DQ12RB6FF15		Bipolar DO	
	DQ12AP6FF15Q3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	DQ12RP6FF15Q3			1 PNP DO
	DQ12AN6FF15Q3			1 NPN LO
	DQ12RN6FF15Q3			1 NPN DO
	DQ12AB6FF30	30 mm (1.2 in) cutoff; 16 mm (0.63 in) focus	2 m (6.5 ft) cable	Bipolar LO
	DQ12RB6FF30		Bipolar DO	
	DQ12AP6FF30Q3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	DQ12RP6FF30Q3			1 PNP DO
	DQ12AN6FF30Q3			1 NPN LO
	DQ12RN6FF30Q3			1 NPN DO
	DQ12AB6FF50	50 mm (2 in) cutoff; 16 mm (0.63 in) focus	2 m (6.5 ft) cable	Bipolar LO
	DQ12RB6FF50		Bipolar DO	
	DQ12AP6FF50Q3		150 mm (6 in) cable with a 3-pin M8/Pico-style QD	1 PNP LO
	DQ12RP6FF50Q3			1 PNP DO
	DQ12AN6FF50Q3			1 NPN LO
	DQ12RN6FF50Q3			1 NPN DO

## Indicator Features



### 1 - Amber and green LEDs

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

## Wiring

Emitters have no connection to black and white.



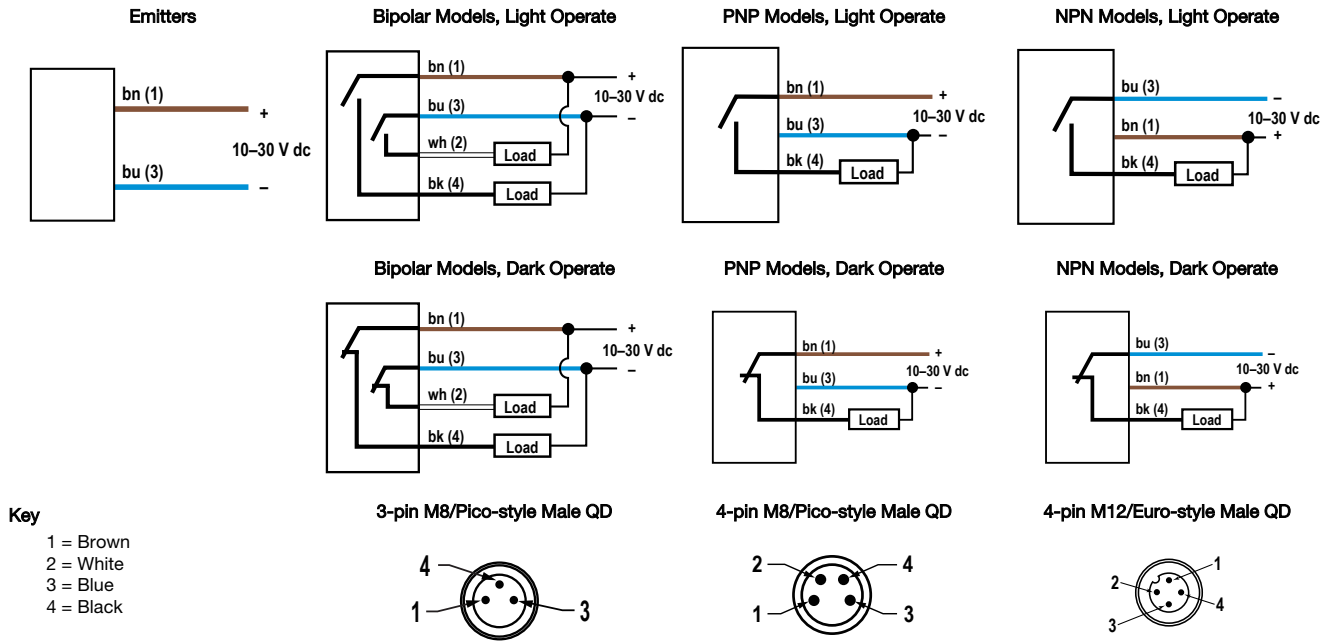
**CAUTION:** Observe proper ESD precautions (grounding) when connecting QD models.

<sup>1</sup>

- To order the 9 m (30 ft) cable model, add the suffix **W/30** to the model number. For example, **DQ126E 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, **DQ126EQ**.
- 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 **DQ126EQ5**.

<sup>2</sup>

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.



## Specifications

### Supply Voltage and Current

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

### Sensing Beam

Visible red, 645 nm

### Supply Protection Circuitry

Protected against reverse polarity and transient voltages

### Output Protection Circuitry

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

### Output Response Time

Opposed Mode: 1.3 ms ON; 900  $\mu$ s OFF

All Other Modes: 850  $\mu$ s ON/OFF

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

### Construction

Polarized Retro Models: Polyamide housing with glass lens

All Other Models: Polyamide housing with polycarbonate lens

### Output Configuration

Bipolar (1 NPN and 1 PNP) solid-state output or single output (PNP or NPN), light operate (LO) or dark operate (DO), depending on model

### Repeatability

125 microseconds

### Switching Frequency

Opposed Mode: 385 Hz

All Other Modes: 590 Hz

### Output Ratings

OFF-state leakage current:

NPN: 10  $\mu$ A

PNP: 10  $\mu$ A

ON-state saturation voltage:

NPN: 2 V at 50 mA

PNP: 2 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.

**Connections**

Standard Models: 2 m (6.5 ft) or 9 m (30 ft) attached PVC cable, or 150 mm (6 in) cable with M8 or M12 threaded connection, depending on the model ordered

**Environmental Rating**

Standard Models: IEC IP67

**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**



**Required Overcurrent Protection**

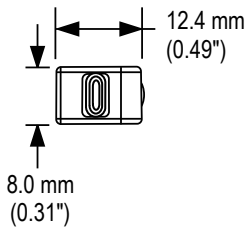


**WARNING:** Electrical connections must be made by qualified personnel in accordance with local and national electrical codes and regulations.

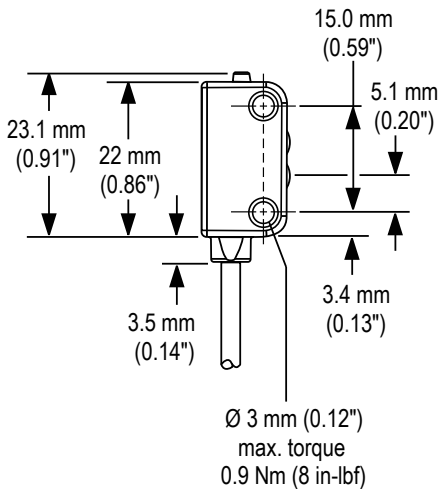
Overcurrent protection is required to be provided by end product application per the supplied table.  
 Overcurrent protection may be provided with external fusing or via Current Limiting, Class 2 Power Supply.  
 Supply wiring leads < 24 AWG shall not be spliced.  
 For additional product support, go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

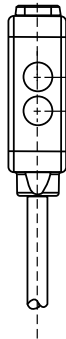
**Dimensions**



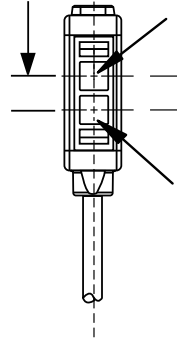
M3 mounting screws included



Polarized Retro Models



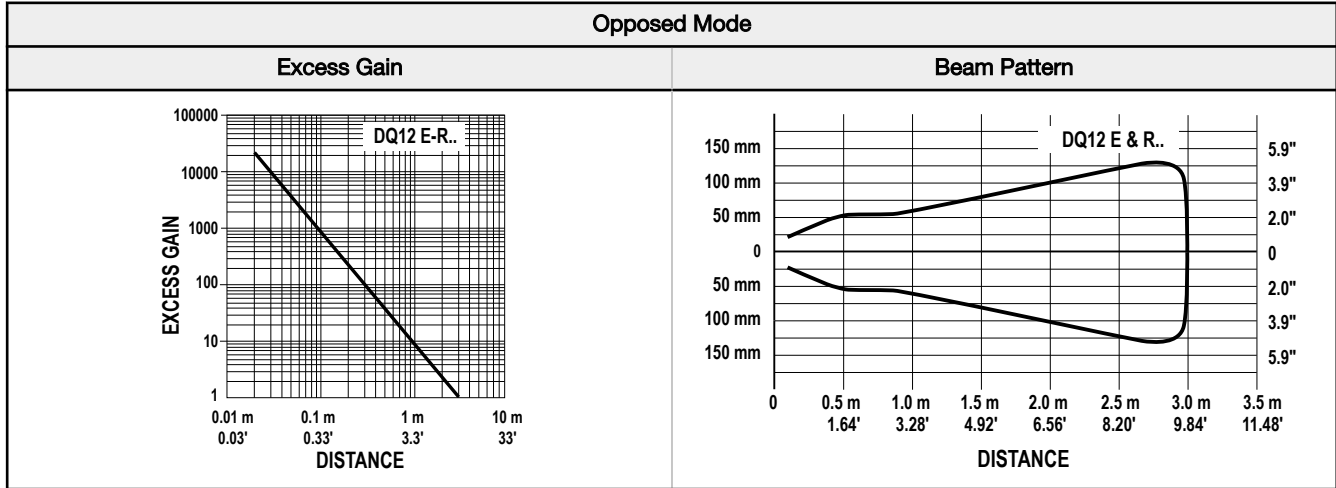
4.7 mm (0.19 inch)



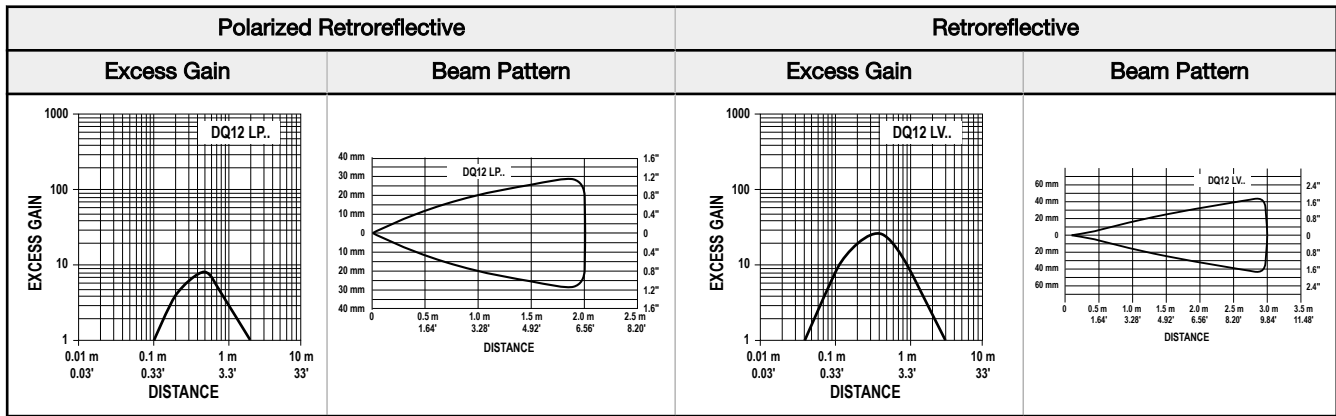
Emitter (opposed mode models)

Emitter (all other models)

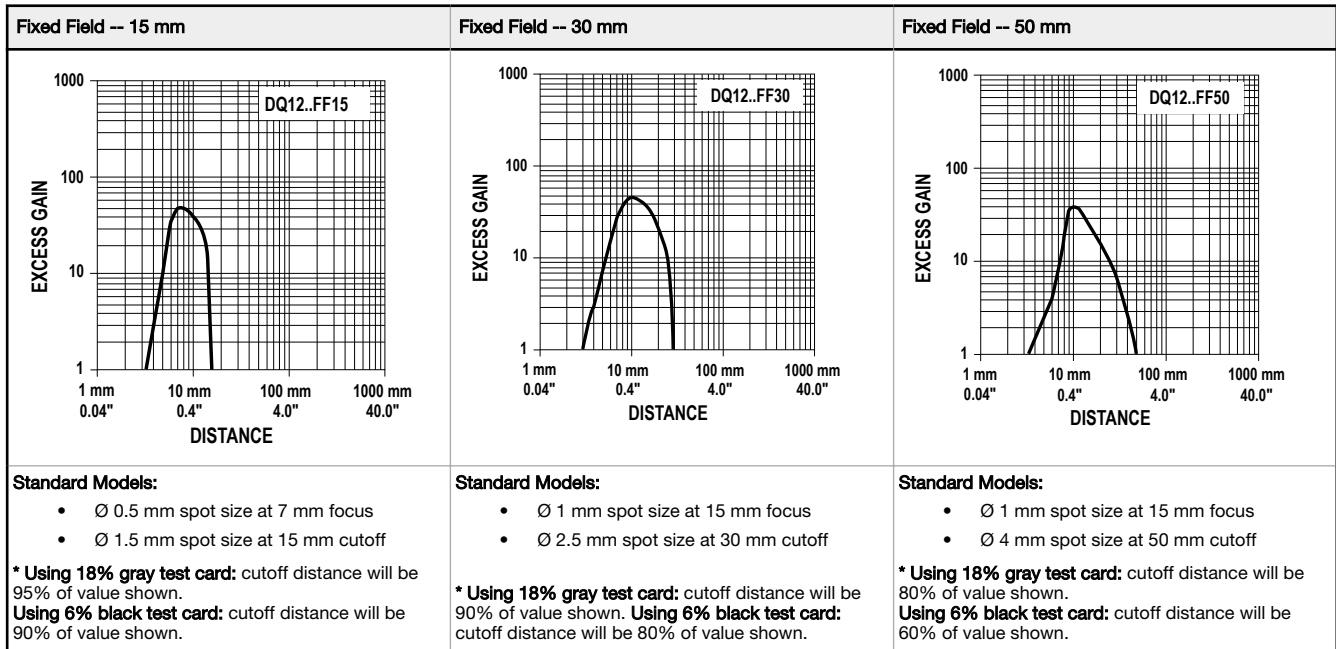
## Performance Curves



Retroreflective and polarized retroreflective performance is based on the use of a model **BRT-60X40C** retroreflector.

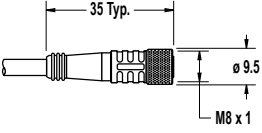
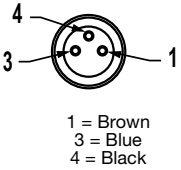
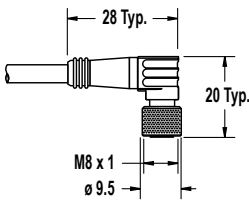


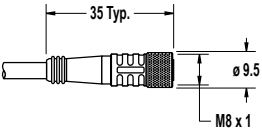
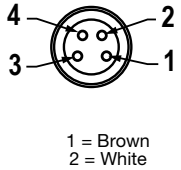
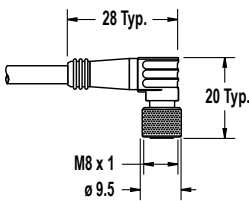
Fixed-field focus and spot sizes are typical. Performance based on use of 90% reflectance white test card.\*

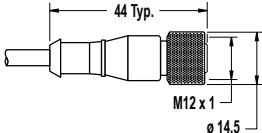
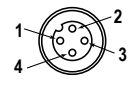
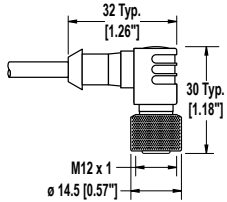


## Accessories

### Cordsets

3-Pin Threaded M8/Pico-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
PKG3M-2	2 m (6.56 ft)	Straight		 <p>1 = Brown 3 = Blue 4 = Black</p>
PKG3M-5	5 m (16.40 ft)			
PKG3M-7	7 m (22.97 ft)			
PKG3M-9	9 m (29.53 ft)			
PKW3M-2	2 m (6.56 ft)	Right-Angle		
PKW3M-5	5 m (16.40 ft)			
PKW3M-9	9 m (29.53 ft)			

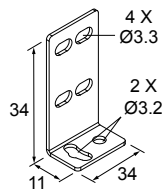
4-Pin Threaded M8/Pico-Style Cordsets—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
PKG4M-2	2 m (6.56 ft)	Straight		 <p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
PKG4M-5	5 m (16.4 ft)			
PKG4M-9	9 m (29.5 ft)			
PKW4M-2	2 m (6.56 ft)	Right Angle		
PKW4M-5	5 m (16.4 ft)			
PKW4M-9	9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

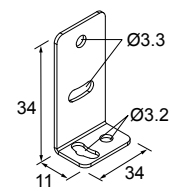


Hole center spacing: A to B = 7.6

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 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)	
<b>Circular</b>				
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)	
<b>Horizontal Slot</b>				
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)	
<b>Vertical Slot</b>				
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)	
<b>Protective Jacket</b>				
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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For patent information, see [www.bannerengineering.com/patents](http://www.bannerengineering.com/patents).

## 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.