# Q2XLP Polarized Retroreflective and Q2XER Opposed Mode Sensor

Original Instructions
p/n: 226597 Rev. E
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ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

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# Chapter 1 Features

Compact sensors featuring extended range and background suppression mode

- Compact 8 mm (0.31 in) wide sensor for installation in the smallest of spaces
- Exceptional optical performance with long detection range
- Emitter/receiver pair with a large spot for easy alignment
- Polarized retroreflective models for one-sided installation with a retroreflective target
- Emitter/receiver and polarized retroreflective models are ideal for detecting dark and shiny targets
- Bright visible red LED for easy alignment of the sensor
- Many connection types and output configurations are available by model number



**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 | Models | Sensing Range | Connection | Output Type |
|---|---|---|---|---|
| Polarized Retro-reflective, Visible red, 645 nm | Q2XAPLPF-2M | Maximum 3300 mm using BRT-60X40C reflector | 2 m (6.5 ft) unterminated 3-wire PVC-jacketed cable | 1 PNP Light Operate (LO) |
| | Q2XANLPF-2M | | | 1 NPN LO |
| | Q2XABLPF-Q | | 150 mm (6 in) PVC-jacketed cable with a 4-pin M8 male quick-disconnect connector | Bipolar LO |
| Opposed Emitter; Visible red, 645 nm | Q2XNAE-2M | Maximum 3000 mm | 2 m (6.5 ft) unterminated 2-wire PVC-jacketed cable | N/A |
| | Q2XNAE-Q | | 150 mm (6 in) PVC-jacketed cable with a 4-pin M8 male quick-disconnect connector | N/A |
| Opposed Receiver | Q2XAPR-2M | | 2 m (6.5 ft) unterminated 3-wire PVC-jacketed cable | 1 PNP LO |
| | Q2XANR-2M | | 2 m (6.5 ft) unterminated 3-wire PVC-jacketed cable | 1 NPN LO |
| | Q2XABR-Q | | 150 mm (6 in) PVC-jacketed cable with a 4-pin M8 male quick-disconnect connector | Bipolar LO |

- To order Dark Operate (DO) models, replace "**AP**", "**AN**", or "**AB**" with "**RP**", "**RN**", or "**RB**", respectively.
- To order PNP or NPN models with a 150 mm (6 in) PVC cable and a 3-pin M8 male quick disconnect, replace "**-2M**" with "**-Q3**".
- To order Bipolar models with a 150 mm (6 in) PVC cable and a 4-pin M12 male quick disconnect, replace "**-Q**" with "**-Q5**".


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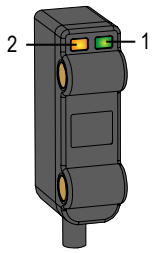
# Overview

The Q2X opposed and polarized retroreflective sensors offer excellent sensing performance in a compact plastic housing which are easily integrated into tight spaces. The brass inserts provide stable mounting points, and the bright indicators provide user feedback of the sensor status.

*Sensor features*




1. Green: Power Indicator
2. Yellow: Light Sensed Indicator (Flashes for Marginal Conditions)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# Chapter 2 Installation

## Mount the Device

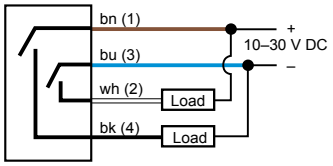
1. If a bracket is needed, mount the device onto the bracket.
2. Mount the device (or the device and the bracket) to the machine or equipment at the desired location. Do not tighten the mounting screws at this time.
3. Check the device alignment.
4. Tighten the mounting screws to secure the device (or the device and the bracket) in the aligned position.

## Wiring

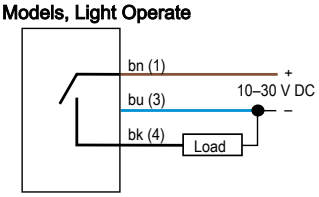
Cabled wiring diagrams are shown. Quick disconnect wiring diagrams are functionally identical.

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

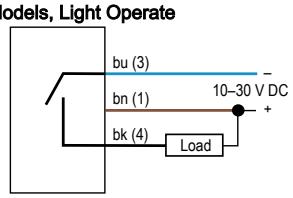
**Bipolar Models, Light Operate**



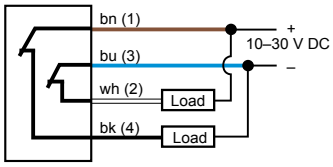

**PNP Models, Light Operate**



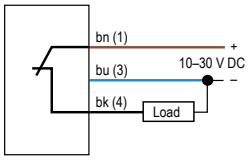

**NPN Models, Light Operate**



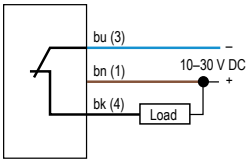

**Bipolar Models, Dark Operate**




**PNP Models, Dark Operate**



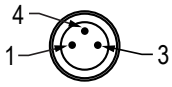

**NPN Models, Dark Operate**



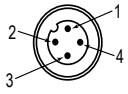

**4-pin M8 Male Quick Disconnect**




**3-pin M8 Male Quick Disconnect**



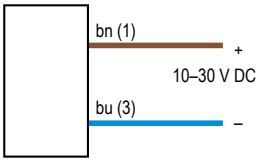

**4-pin M12 Male Quick Disconnect**




**Key**

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

**Emitter**




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. In **diffuse, fixed field, and adjustable field sensor modes**, light operate is active when the target is present.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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 **opposed and retroreflective sensing modes**, dark operate is active when the beam is blocked. In **diffuse, fixed field, and adjustable field sensor modes**, dark operate is active when the target is absent.


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# Chapter 3 Specifications

**Supply Voltage**

10 V DC to 30 V DC (10% maximum ripple within specified limits) at less than 16 mA, exclusive of load

**Sensing Beam**

Visible red LED, 645 nm

**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), light operate (LO) or dark operate (DO), depending on model

Rating: 50 mA total output current

**Off-state leakage current:** < 10 µA at 30 V DC

**ON-state saturation voltage:** < 2 V at 50 mA

Protected against output short-circuit, continuous overload, and false pulse on power-up

**Output Response**

Polarized Retroreflective models: 600 µs, OFF to ON and ON to OFF

Opposed Receiver models: 1 ms ON, 0.6 ms OFF

**Repeatability**

Polarized Retroreflective models: 144 µs

Opposed Receiver models: 133 µs

**Indicators**

Polarized Retroreflective and Opposed Receiver:

Two LED indicators on sensor top:
Green solid: Power on
Amber solid: Light sensed
Amber flashing: Marginal sensing condition

Opposed Emitter:

Green solid: Power on

**Construction**

PC/ABS housing, acrylic lens cover; PVC cable, acetal adjustment potentiometer

**Environmental Rating**

IP67

**Connections**

2 m (6.5 ft) unterminated 2-wire PVC-jacketed cable, 2 m (6.5 ft) unterminated 3-wire PVC-jacketed cable,150 mm (6 in) PVC-jacketed cable with a 3-pin M8 male quick-disconnect connector, 150 mm (6 in) PVC-jacketed cable with a 4-pin M8 male quick-disconnect connector, or 150 mm (6 in) PVC-jacketed cable with a 4-pin M12 male quick-disconnect connector, depending on model.

**Operating Conditions**

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

Temperature: –25 °C to +50 °C (–13 °F to +122 °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

c UL us LISTED Industrial Control Equipment 3TJJ

**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 | 2.0 | 30 | 0.5 |

# FCC Part 15 Class B for Unintentional Radiators

(Part 15.105(b)) 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. 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.


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- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

(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.

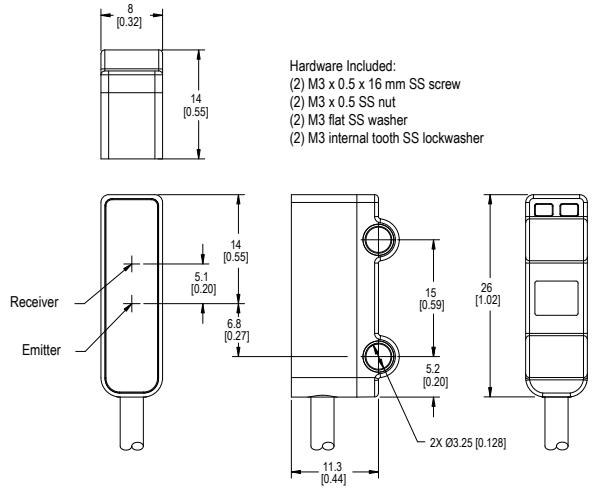
# Industry Canada ICES-003(B)

This device complies with 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.

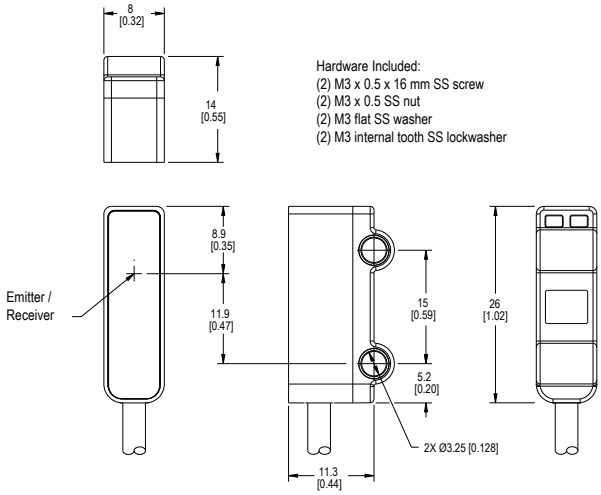
Cet appareil est conforme à la norme NMB-3(B). Le fonctionnement est soumis aux deux conditions suivantes : (1) ce dispositif ne peut pas occasionner d'interférences, et (2) il doit tolérer toute interférence, y compris celles susceptibles de provoquer un fonctionnement non souhaité du dispositif.

# Dimensions

**Polarized retroreflective models**




**Opposed mode models**

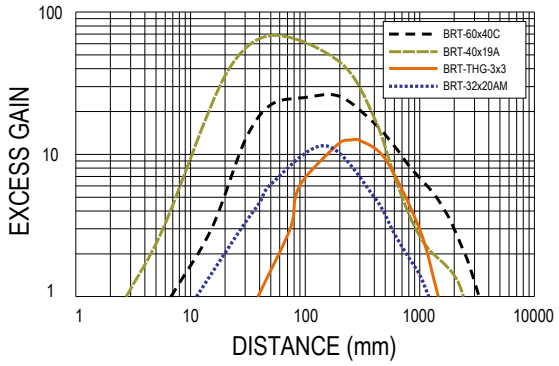



All measurements are listed in millimeters [inches], unless noted otherwise. The measurements provided are subject to change. Maximum torque 0.9 Nm (8 in-lbf).

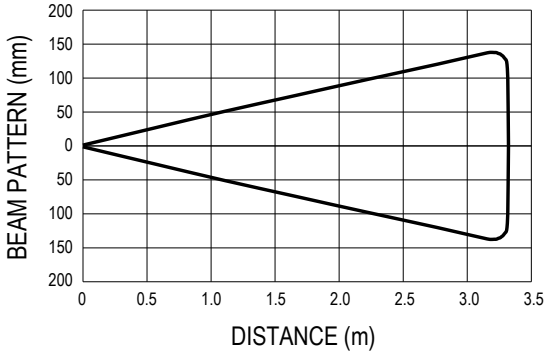
# Performance Curves

**Polarized Retroreflective Models**

**Excess Gain**




**Beam Pattern**





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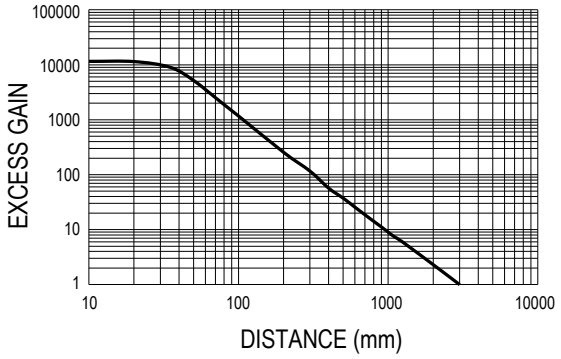
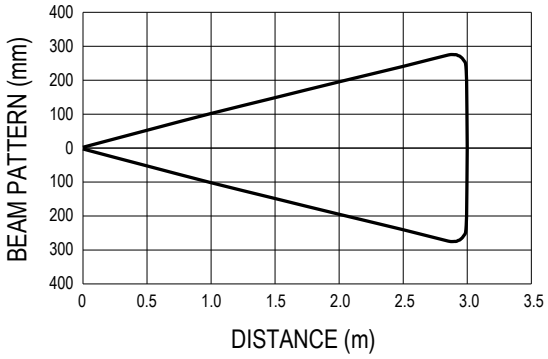
## Emitter/Receiver Models (Effective Beam size: 4.3 mm)

### Excess Gain




### Beam Pattern





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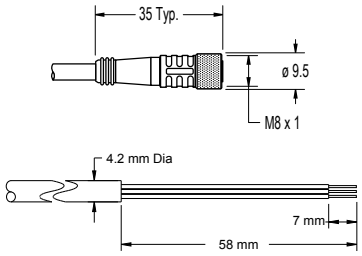
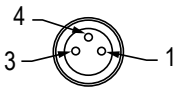
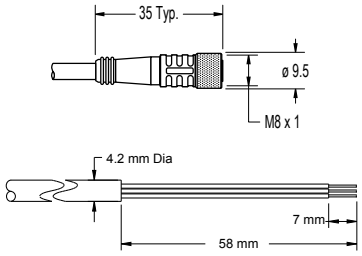
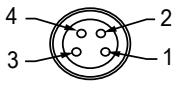
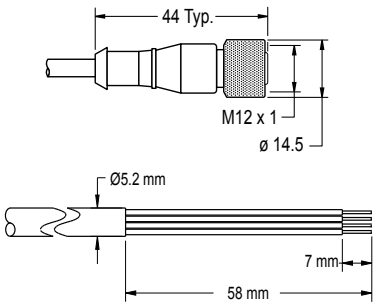
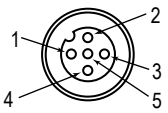
# Chapter 4 Accessories

## Cordsets

| 3-pin Single-Ended M8 Female Cordsets | | | | |
|---|---|---|---|---|
| **Model** | **Length** | **Dimensions (mm)** | **Pinout (Female)** | |
| **BC-M8F3-24-0.5** | 0.5 m (1.64 ft) |  |  | 1 = Brown<br>3 = Blue<br>4 = Black |
| **BC-M8F3-24-1** | 1 m (3.28 ft) | | | |
| **BC-M8F3-24-2** | 2 m (6.56 ft) | | | |
| **BC-M8F3-24-5** | 5 m (16.4 ft) | | | |
| **BC-M8F3-24-8** | 8 m (26.25 ft) | | | |
| **BC-M8F3-24-10** | 10 m (30.81 ft) | | | |

| 4-pin Single-Ended M8 Female Cordsets | | | | |
|---|---|---|---|---|
| **Model** | **Length** | **Dimensions (mm)** | **Pinout (Female)** | |
| **BC-M8F4-24-0.5** | 0.5 m (1.64 ft) |  |  | 1 = Brown<br>2 = White<br>3 = Blue<br>4 = Black |
| **BC-M8F4-24-1** | 1 m (3.28 ft) | | | |
| **BC-M8F4-24-2** | 2 m (6.56 ft) | | | |
| **BC-M8F4-24-5** | 5 m (16.4 ft) | | | |
| **BC-M8F4-24-8** | 8 m (26.25 ft) | | | |
| **BC-M8F4-24-10** | 10 m (30.81 ft) | | | |

| 4-pin Single-Ended M12 Female Cordsets | | | | |
|---|---|---|---|---|
| **Model** | **Length** | **Dimensions (mm)** | **Pinout (Female)** | |
| **BC-M12F4-22-1** | 1 m (3.28 ft) |  |  | 1 = Brown<br>2 = White<br>3 = Blue<br>4 = Black<br>5 = Unused |
| **BC-M12F4-22-2** | 2 m (6.56 ft) | | | |
| **BC-M12F4-22-5** | 5 m (16.4 ft) | | | |
| **BC-M12F4-22-8** | 8 m (26.25 ft) | | | |
| **BC-M12F4-22-10** | 10 m (30.81 ft) | | | |
| **BC-M12F4-22-15** | 15 m (49.2 ft) | | | |
| **BC-M12F4-22-20** | 20 m (65.61 ft) | | | |
| **BC-M12F4-22-25** | 25 m (82.02 ft) | | | |
| **BC-M12F4-22-30** | 30 m (98.42 ft) | | | |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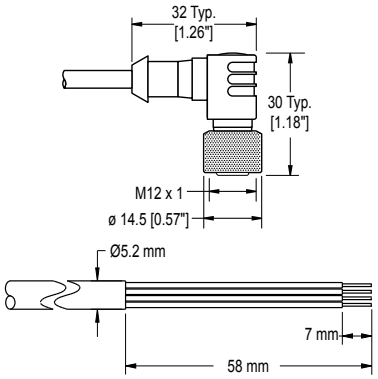
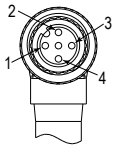
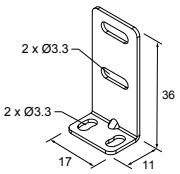
| 4-pin Single-Ended M12 Female Right-Angle Cordsets | | | | |
|---|---|---|---|---|
| **Model** | **Length** | **Dimensions (mm)** | **Pinout (Female)** | |
| **BC-M12F4A-22-1** | 1 m (3.28 ft) |  |  | 1 = Brown<br>2 = White<br>3 = Blue<br>4 = Black<br>5 = Unused |
| **BC-M12F4A-22-2** | 2 m (6.56 ft) | | | |
| **BC-M12F4A-22-5** | 5 m (16.4 ft) | | | |
| **BC-M12F4A-22-8** | 8 m (26.25 ft) | | | |
| **BC-M12F4A-22-10** | 10 m (30.81 ft) | | | |
| **BC-M12F4A-22-15** | 15 m (49.2 ft) | | | |

# Brackets

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

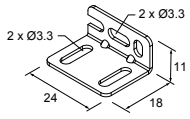
**SMBQ2XA**

- Vertical L-shaped bracket
- 20-ga stainless steel



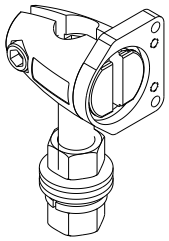

**SMBQ2XB**

- Rear L-shaped bracket
- 20-ga stainless steel




**SMBQ20FA**

- Includes 3/8-16 × 2 in socket head cap screw (SHCS)
- 304 stainless steel

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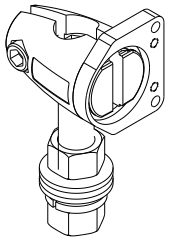
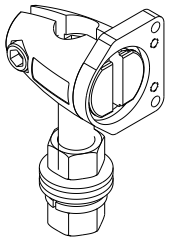
**SMBQ20FAM10**

- Kit for 10 mm (3/8 in) Rod Bracket Systems for Q2X, Q20, Q12, VS1, VS3, VS8
- Includes M10-1.5 x 50 mm Socket Head Cap Screw (SHCS)



**SMBQ20FAM12**

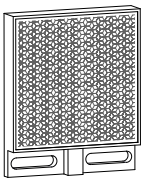
- Kit for 12 mm (1/2 in) Rod Bracket Systems for Q2X, Q20, Q12, VS1, VS3, VS8
- No socket head cap screw (SHCS) included



# Reflectors

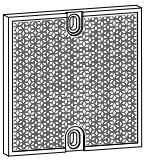
**BRT-2X2**

- Square, acrylic target
- Reflectivity factor: 1.0
- Max. temperature: +50 °C (+122 ºF)
- Optional brackets are available
- Approximate size: 51 mm × 51 mm



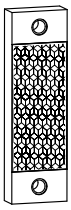
**BRT-84X84A**

- Square, acrylic target
- Reflectivity Factor: 2.0
- Temperature:
- Approximate size: 84 mm × 84 mm



**BRT-40X19A**

- Rectangular, acrylic target
- Reflectivity Factor: 1.3
- Temperature:
- Approximate size: 19 mm × 60 mm overall; 19 mm × 40 mm reflector

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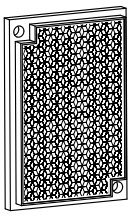
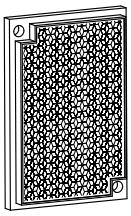
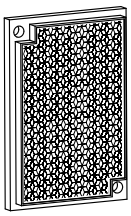
**BRT-60X40C**
- Rectangular, acrylic target
- Reflectivity Factor: 1.4
- Temperature:
- Optional brackets are available
- Approximate size: 40 mm × 60 mm



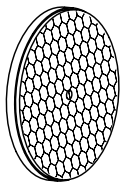
**BRT-60X40IP69K**
- Rectangular, acrylic target (color is amber)
- Reflectivity Factor: 0.7
- Temperature: –20 °C to +140 °C (–4 °F to +284 °F)
- Chemically resistant
- IP69K washdown rated
- Optional brackets are available
- Approximate size: 40 mm × 60 mm



**BRT-60X40AF**
- Rectangular, acrylic target
- Reflectivity Factor: 1.4
- Temperature:
- Anti-fogging coating for use around steam
- Optional brackets are available
- Approximate size: 40 mm × 60 mm



**BRT-84**
- Round, acrylic target
- Reflectivity Factor: 1.4
- Temperature:
- Optional brackets are available
- Size: 84 mm diameter
- Mounting Hole: 4.5 mm diameter



### Retroreflective Tape

| Model | Reflectivity Factor | Maximum Temperature | Size |
|---|---|---|---|
| **BRT-THG-2-100** | 0.7 | +60 °C (+140 °F) | 50 mm (2 in) wide, 2.5 m (100 in) long |

# Aperture Kits

| Model | Description | Pieces |
|---|---|---|
| **APQ2X-1** | Circular aperture, 1 mm (0.04 in) diameter | 2 |
| **APQ2X-1.5** | Circular aperture, 1.5 mm (0.06 in) diameter | 2 |
| **APQ2X-2** | Circular aperture, 2 mm (0.08 in) diameter | 2 |
| **APQ2X-VH** | Cross-talk avoidance polarizing filter | 4 |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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. | 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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