Features

- Advanced one-piece photoelectric sensors with outstanding optical performance and extremely rugged design
- 90 V AC to 250 V AC
- Protected solid-state relay output; 300 mA maximum load at up to 250 V AC
- Multiple sensing modes include: opposed, diffuse, retroreflective and convergent, plus glass and plastic fiber optic models
- Selectable light/dark operate
- Versatile plug-in modules available for output timing logic and/or signal strength display
- Highly visible Power, Signal (AID™ System[1]), and Output indicator LEDs
- Choice of prewired 2 m (6.5 ft) or 9 m (30 ft) unterminated cable, plus Mini-style or Micro-style quick-disconnect fittings
- Versatile mounting options
- Designed to withstand 1200 psi washdown; exceeds its NEMA 6P and IEC IP67 rating



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.

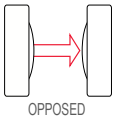
Models

To order the 9 m (30 ft) PVC cable model, add the suffix "W/30" to the cabled model number. For example, **Q452E W/30**. A model with a quick disconnect (QD) connector requires a mating cable.

For a list of discontinued models, see Discontinued Models.

Q45W22 Opposed-Mode Emitter (E) and Receiver (R) Models

In opposed-mode sensing, the sensor's emitter and receiver are housed in two separate units. The emitter is placed opposite the receiver so that the light beam goes directly from the emitter to the receiver. An object is detected when it breaks the working part of the light beam, known as the effective beam.



Because of their extremely high excess gain, these opposed-mode sensors are an excellent option for sensing in contaminated or dirty areas, and are also the best choice for long-range sensing.

Sensing beam: Infrared, 880 nm

Models	Range	Cable	Supply Voltage	Output Type
Q452E Emitter	60 m (200 ft)	2-wire 2m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22R Receiver		3-wire 2m (6.5 ft)		
Q452EQ Emitter		3-pin Mini QD		
Q452EQ1 Emitter		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		
Q45BW22RQ Receiver		3-pin Mini QD		
Q45BW22RQ1 Receiver		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

Q45BW22 Retroreflective-Mode Models

A retroreflective sensor contains both the emitter and receiver elements. The effective beam is established between the emitter, the retroreflector, and the receiver. As with an opposed-mode sensor, an object is sensed when it interrupts or "breaks" the effective beam.

[1] U.S. Patent no. 4356393

Original Instructions
12-May-26

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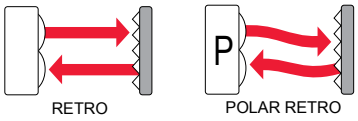
37209
p/n: 37209 Rev. I

ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

The visible red sensing beam of these sensors makes them very easy to align. Model Q45BW22LP polarizes the emitted light and filters out unwanted reflections, making sensing possible in applications otherwise considered unsuited to retroreflective sensing.

Performance is specified using the model BRT-3 3-inch reflector (go to www.bannerengineering.com for more information).

Sensing beam: Visible red, 680 nm

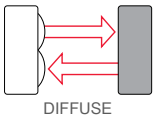


Non-Polarized Models				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW22LV	0.08 to 9 m (3 in to 30 ft)	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22LVQ		3-pin Mini QD		
Q45BW22LVQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

Polarized Models				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW22LP	0.15 to 6 m (6 in to 20 in)	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22LPQ		3-pin Mini QD		
Q45BW22LPQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

Q45BW22 Diffuse-Mode Models

In diffuse-mode sensing, light emitted from the sensor strikes the surface of the object to be detected and is reflected back to the receiver, which is housed with the emitter. With a diffuse-mode sensor, the object is detected when it "makes" the beam, that is, the object reflects the sensor's transmitted light energy back to the sensor.



These diffuse-mode models detect objects by sensing the reflection of their own emitted light. Ideal for use when the reflectivity and profile of the object to be sensed are sufficient to return a large percentage of emitted light back to the sensor.

Model Q45BW22DX is the first choice for diffuse-mode applications when there are no background objects to falsely return light.

Sensing beam: Infrared, 880 nm

Short Range				
Model	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW22D	45 cm (18 in)	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22DQ		3-pin Mini QD		
Q45BW22DQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

Long Range				
Model	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW22DL	1.8 m (6 ft)	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22DLQ		3-pin 7/8 in-16UNF QD		
Q45BW22DLQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

High Power				
Model	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW22DX	3 m (10 ft)	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22DXQ		3-pin 7/8 in-16UNF QD		
Q45BW22DXQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

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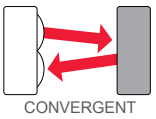
Q45BW22 Convergent-Mode Models

Convergent-mode sensors use a lens system to focus the emitter and receiver elements to an exact point in front of the sensor. Like diffuse-mode and divergent-mode sensors, convergent-mode sensors detect an object when that object completes or "makes" the light beam. This design produces a small, intense, and well-defined sensing area, at a fixed distance from the sensor lens. It is a very efficient use of reflective energy.



These sensors are ideal for reflective sensing of very small parts or profiles, and can accurately sense the position of parts approaching from the side. Ignores all but highly reflective objects that are outside of the sensing range.

Sensing beam: Visible red, 680 nm

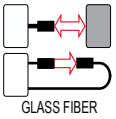
Models	Focus	Cable	Supply Voltage	Output Type
Q45BW22CV	38 mm (1.5 in) Spot Size at Focus: 1.3 mm (0.05 in)	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22CVQ		3-pin Mini QD		
Q45BW22CV4Q	100 mm (4 in) Spot Size at Focus: 1.5 mm (0.06 in)	3-pin Mini QD	90 V AC to 250 V AC	SPST Solid-state Relay

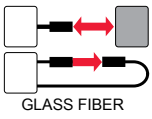
Q45BW22 Glass Fiber-Optic Models

These models are an excellent choice for glass fiber optic applications where faster sensor response is not important. Their high excess gain means that opposed individual fibers can operate reliably in many very hostile environments.

Also, special miniature bifurcated fiber optic assemblies with bundle sizes as small as 0.5 mm (0.020 in) dia. may be used successfully for diffuse-mode sensing when using sensor model Q45BW22F(Q).

For more information on compatible glass fiber optics, go to www.bannerengineering.com.



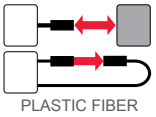


Infrared, 880 nm				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW22F	Range varies by sensing mode and fiber optics used	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22FQ		3-pin Mini QD		
Q45BW22FQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

Q45BW22 Plastic Fiber-Optic Models

Lower in cost than glass fiber optics, plastic fiber optics are ideal for use in situations where environmental conditions allow (for example, low levels of acids, alkalis, and solvents). Most are easily cut to length in the field, and are available in a variety of sensing end styles.

For more information on compatible plastic fiber optics, go to www.bannerengineering.com.



Sensing beam: Visible red, 660 nm

Model	Range	Cable	Supply Voltage	Output Type
Q45BW22FP	Range varies by sensing mode and fiber optics used	3-wire 2 m (6.5 ft)	90 V AC to 250 V AC	SPST Solid-state Relay
Q45BW22FPQ		3-pin 7/8 in-16UNF QD		
Q45BW22FPQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD		

Overview

Status indicator LEDs for power, signal, and output are clearly visible beneath a raised dome in the sensor's transparent o-ring-sealed polycarbonate cover. Also located beneath the sensor's o-ring-sealed cover are controls for light/dark operate selection and the sensitivity adjustment.

- The power indicator (green) lights when power is applied to the sensor.
- The signal indicator (red) lights when the sensor sees its modulated light source and pulses at a rate proportional to the strength of the received light signal; this is the AID™ Alignment Indicating Device[(2)].

[(2)] US patent no. 4356393

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- The output indicator (amber) lights when the sensor's output is conducting. This indicator is especially useful when a timing logic module is used and signal and output conditions are not concurrent.

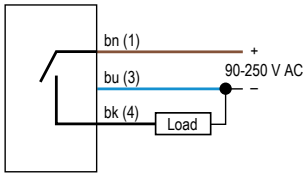
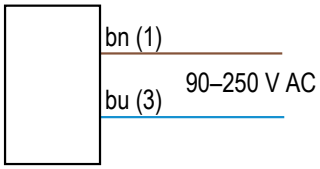
In dark operate (DO) mode, the output is ON when the target returns less light to the sensor than the configured target and OFF when the sensor detects more light than the configured/taught target. In light operate (LO) mode, the output is ON when the target returns the same or more light to the sensor and OFF when the sensor detects less light than the configured/taught target. In **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.

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.

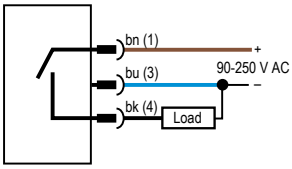
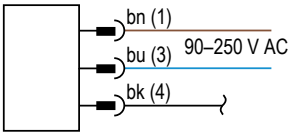
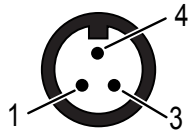
1. LEDs
   - Green LED: Power on indicator
   - Red LED: Signal indicator
   - Amber LED: Output status indicator
2. Optional LED signal strength display
3. Optional timing adjustment
4. Optional timing adjustment
5. Light/dark operate switch



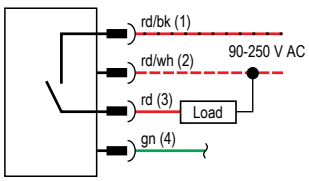
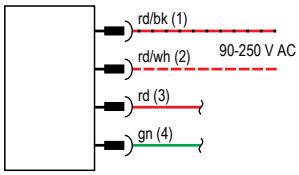
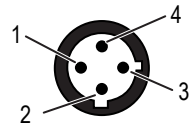
Wiring Diagram

Attached Cable	Emitter with Attached Cable	
		1 = Brown 3 = Blue 4 = Black

3-pin Mini quick disconnect models

3-pin (model suffix Q)	Emitter with 3-pin (model suffix Q)	3-pin Mini male pinout
		 1 = Brown 3 = Blue 4 = Black

1/2 in-20UNF (1/2-in dual key) quick disconnect models

4-pin QD (model suffix Q1)	Emitter with 4-pin QD (model suffix Q1)	4-pin male pinout
		 1 = Red and black 2 = Red and white 3 = Red 4 = Green

Specifications

Supply Voltage and Current

90 V AC to 250 V AC (50 to 60 Hz)

Average current: 20 mA

Peak current: 500 mA at 120 V AC, 750 mA at 250 V AC

Supply Protection Circuitry

Protected against transient voltages

Output Configuration

Short circuit/overload protected FET solid-state relay

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Repeatability

Opposed mode: 0.25 milliseconds

All other sensing modes: 0.5 milliseconds

Response time and repeatability specifications are independent of signal strength.

Adjustments

Located under the sensor's transparent cover: Light/Dark Operate select switch; and multi-turn Sensitivity control (allows precise sensitivity setting—turn clockwise to increase gain). Optional logic and logic/display modules have adjustable timing functions.

Output Rating

Continuous current: 300 mA max. to 50 °C (derate to 200 mA at 70 °C, 5 mA/°C)

Inrush current: 3 A maximum for 100 milliseconds, 5 A maximum for 1 millisecond

Off-state leakage current: <100 microamps

Saturation voltage: <3 V at 200 mA

Construction

Molded reinforced thermoplastic polyester housing, o-ring-sealed transparent polycarbonate cover, molded acrylic lenses, and stainless steel hardware. Q45s are designed to withstand 1200 psi washdown. The base of cabled models has a 1/2-in NPS integral internal conduit thread.

Output Protection Circuitry

Manually-resettable output latch-out trips in the event of an output overload or short circuit condition. The green Power LED flashes to indicate the latch-out. To reset the output, remove power to the sensor and load for 5 seconds, then restore power.

Output Response Time

Opposed mode: 2 milliseconds ON, 1 millisecond OFF

All other sensing modes: 2 milliseconds ON/OFF

NOTE: 100 millisecond delay on power-up. Output is non-conducting during this time.

Indicators

Indicator LEDs are clearly visible beneath a raised transparent polycarbonate dome on top of the sensor.

Power (green) LED: Lights whenever 90 V ac to 250 V ac power is applied, and flashes to indicate output overload or output short circuit

Signal (red) AID™ System LED: Lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal

Load (amber) LED: Lights whenever the output relay is energized

Optional 7-element LED: Signal strength display module

Connections

PVC-jacketed 2 m (6.5 ft), 9 m (30 ft) cables, 3-pin Mini (Q suffix models), or 4-pin 1/2 in-20UNF (1/2-in Dual Key) (Q1 suffix models) quick-disconnect (QD) fittings, depending on the model ordered. QD cables are ordered separately.

Application Notes

Optional output timing modules are available.

Operating Conditions

–40 °C to +70 °C (–40 °F to +158 °F)

90% at +50 °C maximum relative humidity (non-condensing)

Environmental Rating

NEMA 6P, IP67

Certifications

Banner Engineering BV
Park Lane, Culliganlaan 2F bus 3
1831 Diegem, BELGIUM

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

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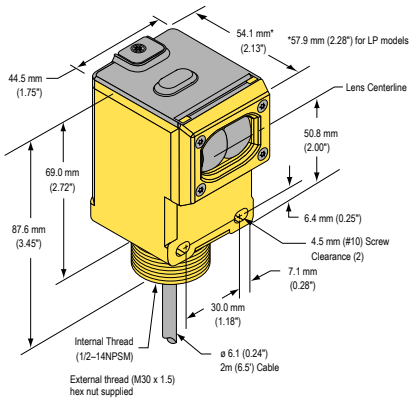
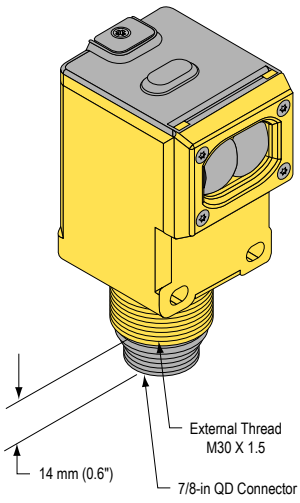
Dimensions

Opposed, Retro, and Diffuse Sensing Modes (Model Suffix E, R, D, DL, DX, LP, and LV)

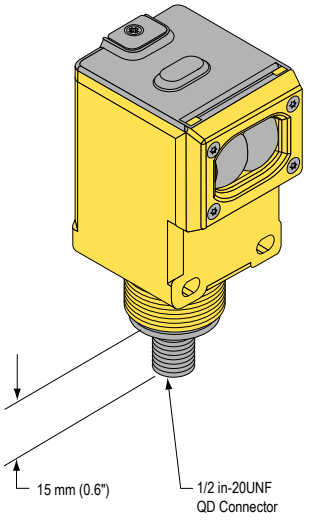
Cabled models



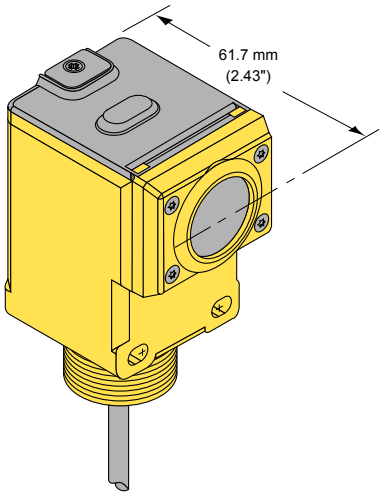
Mini QD models



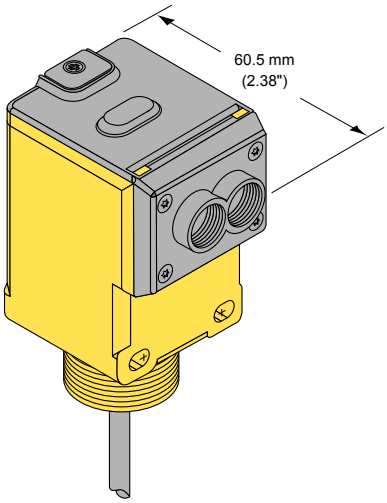
1/2 in-20UNF (1/2-in Dual Key) QD models



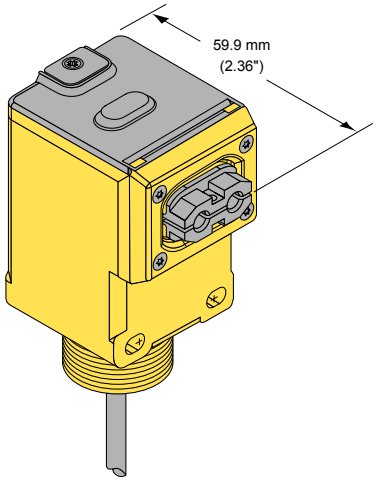
Convergent Sensor Models (CV and CV4)



Glass Fiber Optic Models (F and FV)



Plastic Fiber Optic Models (FP)



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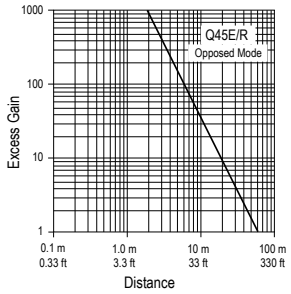
Performance Curves

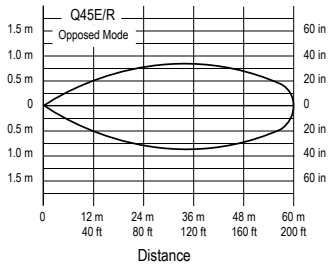
Opposed

Excess Gain



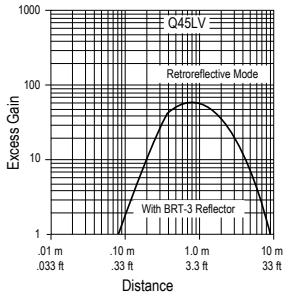
Beam Pattern

Effective Beam: 13 mm

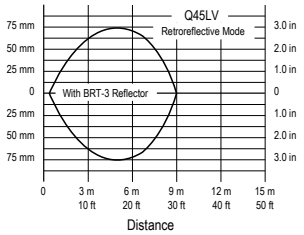


Retroreflective Non-Polarized

Excess Gain

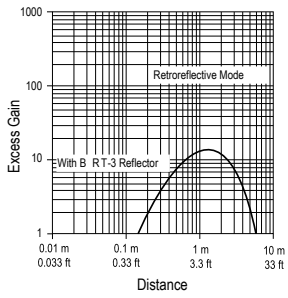


Beam Pattern

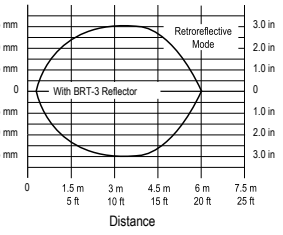


Retroreflective Polarized

Excess Gain



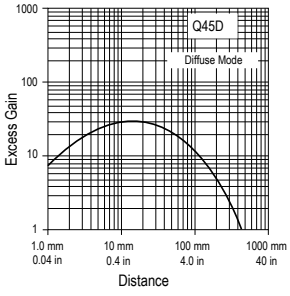
Beam Pattern



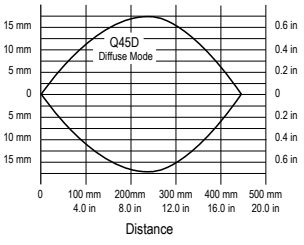
Diffuse-mode performance curves are based on a 90% reflectance white test card.

Diffuse Short Range

Excess Gain

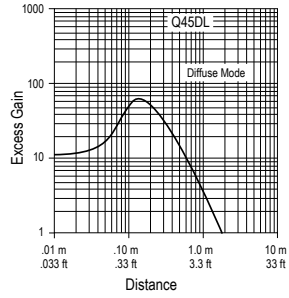


Beam Pattern

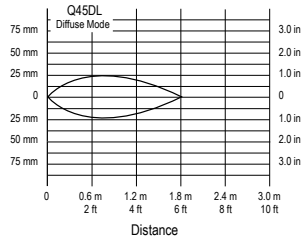


Diffuse Long Range

Excess Gain



Beam Pattern



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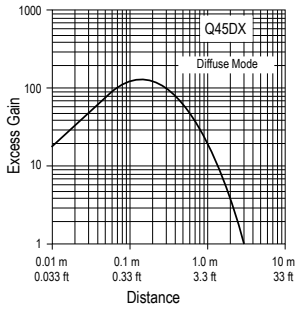
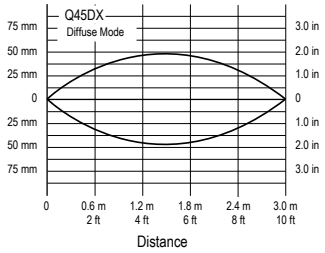
Diffuse High Power

Excess Gain



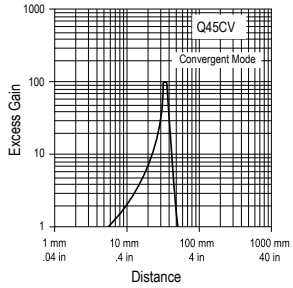
Beam Pattern



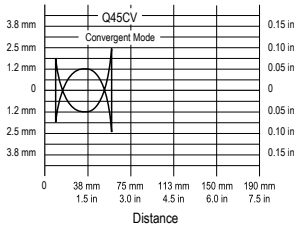
Convergent mode performance curves are based on a 90% reflectance white test card.

Convergent (CV and CVQ Models)

Excess Gain

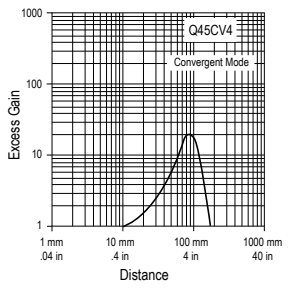


Beam Pattern

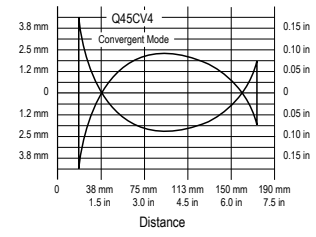


Convergent (CV4 and CV4Q Models)

Excess Gain



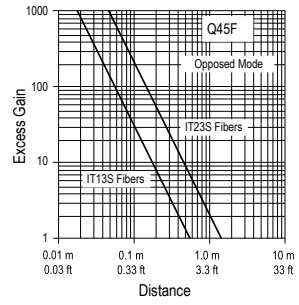
Beam Pattern



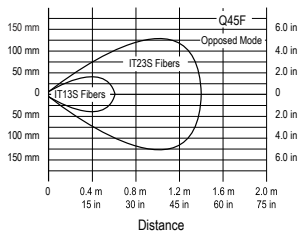
Glass fiber optic diffuse mode performance curves are based on a 90% reflectance white test card.

Glass Fiber Optic, Infrared (Opposed Mode)

Excess Gain

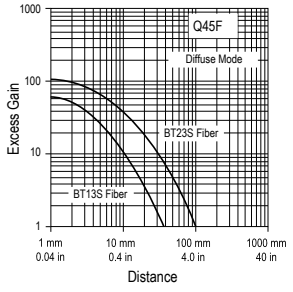


Beam Pattern

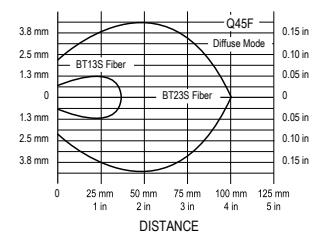


Glass Fiber Optic, Infrared (Diffuse Mode)

Excess Gain

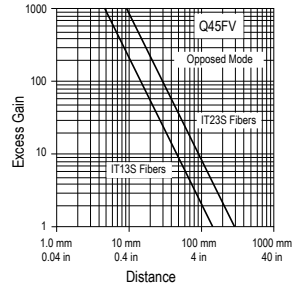


Beam Pattern

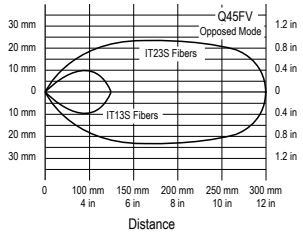


Glass Fiber Optic, Visible Red (Opposed Mode)

Excess Gain

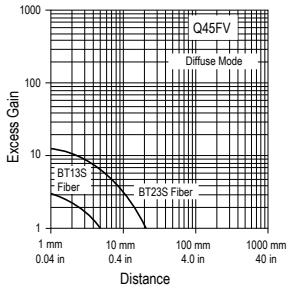


Beam Pattern

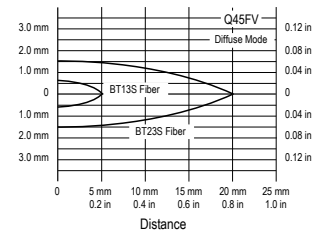


Glass Fiber Optic, Visible Red (Diffuse Mode)

Excess Gain



Beam Pattern



Plastic fiber optic Diffuse mode performance curves are based on a 90% reflectance white test card.

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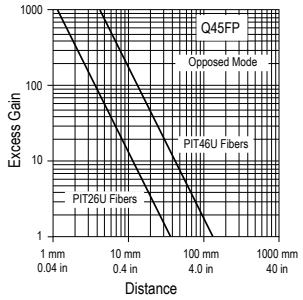
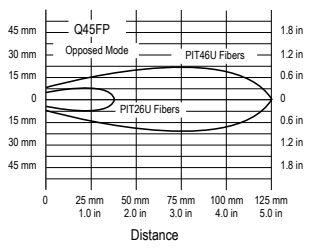
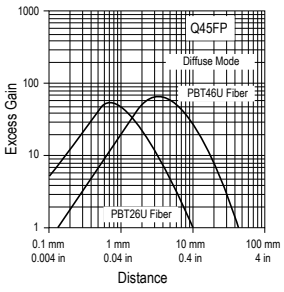
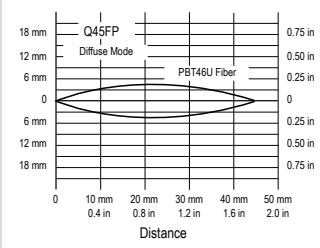
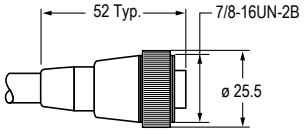
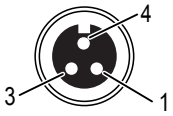
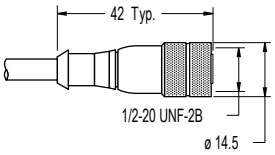
Plastic Fiber Optic (Opposed Mode)		Plastic Fiber Optic (Diffuse Mode)	
Excess Gain	**Beam Pattern**	**Excess Gain**	**Beam Pattern**
			

Q45BW22 Accessories

Cordsets

3-pin Single-Ended Mini Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MBCC-306	1.83 m (6 ft)	Straight		 1 = Brown 3 = Blue 4 = Black
MBCC-312	3.66 m (12 ft)			
MBCC-330	9.14 m (30 ft)			

4-Pin Single-Ended 1/2-in Dual Key Female Cordsets				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MQAC-406	2 m (6.56 ft)	Straight		 1 = Red/Black 2 = Red/White 3 = Red 4 = Green
MQAC-415	5 m (16.4 ft)			
MQAC-430	9.14 m (30 ft)			

Retroreflective Targets

Banner offers a wide selection of high-quality retroreflective targets. See www.bannerengineering.com for complete information.

NOTE: Polarized sensors require corner cube-type retroreflective targets. Non-polarized sensors may use any retroreflective target.



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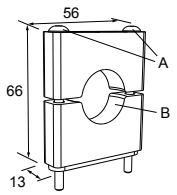
Brackets

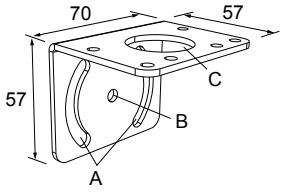
SMB30C
- 30 mm split clamp, black PBT bracket
- Stainless steel mounting hardware included
- Mounting hole for 30 mm sensor
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A=ø 45
Hole size: B=ø 27.2



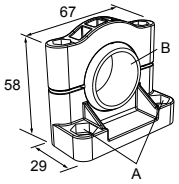
SMB30MM
- 12-gauge stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A=51, A to B=25.4
Hole size: A=42.6 × 7, B=ø 6.4, C=ø 30.1



SMB30SC
- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included
- CAD Files: DXF, PDF, IGS, STP

Hole center spacing: A=ø 50.8
Hole size: A=ø 7.0, B=ø 30.0



Output Timing Logic and Signal Strength Display Modules

Q45 sensors easily accept the addition of output timing logic and signal strength display functions. Display modules have a seven-element display that gives a more precise indication of excess gain than does the AID™ system LED that is standard on Q45 sensors. The modules listed below may be used with all Q45BW22 sensors. Refer to the module's datasheet for more information.

Models	Logic and/or Display Function
45LM58	Programmable output timing logic
45LM58D	Programmable output timing logic plus signal strength display
45LMD	Signal strength display only (no timing function)

Product Support and Maintenance

Discontinued Models

The following models are no longer available for order but are still covered by the information in this document.

Models	Sensing Mode	Cable
Q45BW22CV W/30	Convergent mode sensors; 38 mm (1.5 in); Spot Size at Focus: 1.3 mm (0.05 in)	3-wire 9 m
Q45BW22CVQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD
Q45BW22CV4	Convergent mode sensors; 100 mm (4 in); Spot Size at Focus: 1.5 mm (0.06 in)	3-wire 2 m (6.5 ft) cable
Q45BW22CV4 W/30		3-wire 9 m cable
Q45BW22CV4Q1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD
Q45BW22FV	Glass fiber mode sensors	3-wire 2 m (6.5 ft) cable
Q45BW22FVQ		3-pin Mini QD
Q45BW22FVQ1		4-pin 1/2 in-20UNF (1/2-in Dual Key) QD

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