Q45BW13 Series Sensors

Datasheet

Universal voltage photoelectric sensors with isolated solid-state output



- Advanced one-piece photoelectric sensors with outstanding optical performance and extremely rugged design
- Universal supply voltage: 12 V DC to 250 V DC or 24 V AC to 250 V AC
- Opto-isolated solid-state relay output; 300 mA max. load at up to 250 V AC, 250 V DC
- Full line includes opposed, diffuse, retroreflective, convergent, and glass and plastic fiber optic sensing modes
- 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 or 7/8-in quick-disconnect fitting
- 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.

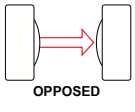
Models

To order the 9 m (30 ft) cable models, add the suffix "W/30" to the cabled model number. For example: Q453E W/30.

Models with a quick disconnect connector require a mating cable.

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

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.



Infrared, 880 nm

Models	Range	Cable	Supply Voltage	Output Type
Q453E Emitter	60 m (200 ft)	2-wire 2 m (6.5 ft)	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13R Receiver		4-wire 2 m (6.5 ft)		
Q453EQ Emitter		3-pin 7/8-in quick disconnect		
Q45BW13RQ Receiver		4-pin 7/8-in quick disconnect		

[1] U.S. Patent number 4356393

Original Document
53999 Rev. E

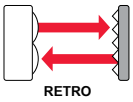
1 March 2021

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ПРОМЭЛЕКТРОНИКА/ sales@prom-elec.com

Retroreflective Mode Models

The visible red sensing beam of these sensors makes them very easy to align. Model Q45BW13LP 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).



Visible red, 680 nm (non-polarized)



Visible red, 680 nm (polarized)

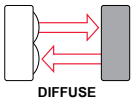
Retroreflective range is specified using one model BRT-3 retroreflector (3-inch diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector used.

Non-Polarized				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW13LV	0.08 to 9 m (3 in to 30 ft)	4-wire 2 m (6.5 ft)	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13LVQ		4-Pin 7/8-in quick disconnect		

Polarized				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW13LP	0.15 to 6 m (6 in to 20 ft)	4-wire 2 m (6.5 ft)	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13LPQ		4-Pin 7/8-in quick disconnect		

Diffuse Mode Models

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 Q45BW13DX is the first choice for diffuse-mode applications when there are no background objects to falsely return light.



Infrared, 880 nm

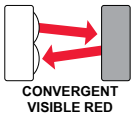
Short Range				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW13D	450 mm (18 in)	4-wire 2 m (6.5 ft)	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13DQ		4-Pin 7/8-in quick disconnect		

Long Range				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW13DL	1. 8 m (6 ft)	4-wire 2 m (6.5 ft)	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13DLQ		4-Pin 7/8-in quick disconnect		

High Power				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW13DX	3 m (10 ft)	4-wire 2 m (6.5 ft)	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13DXQ		4-Pin 7/8-in quick disconnect		

Convergent Mode Models

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. Will ignore all but highly reflective objects that are outside the sensing range.

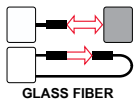


Visible red, 680 nm

Models	Focus	Cable	Supply Voltage	Output Type
Q45BW13CV Q45BW13CVQ	38 mm (1.5 in) Spot Size at Focus: 1.3 mm (0.05 in)	4-wire 2 m (6.5 ft) 4-pin 7/8-in quick disconnect	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13CV4 Q45BW13CV4Q	100 mm (4 in) Spot Size at Focus: 1.5 mm (0.06 in)	4-wire 2 m (6.5 ft) 4-pin 7/8-in quick disconnect	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch

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 Q45BW13F(Q). For more information on compatible glass fiber optics, go to www.bannerengineering.com.



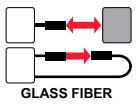
Infrared, 880 nm and
Visible red, 650 nm

Infrared, 880 nm				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW13F **Q45BW13FQ**	Range varies by sensing mode and fiber optics used	4-wire 2 m (6.5 ft) 4-Pin 7/8-in quick disconnect	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch

Visible red, 650 nm				
Models	**Range**	**Cable**	**Supply Voltage**	**Output Type**
Q45BW13FV **Q45BW13FVQ**	Range varies by sensing mode and fiber optics used	4-wire 2 m (6.5 ft) 4-Pin 7/8-in quick disconnect	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch

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.



Visible red, 660 nm

Models	Range	Cable	Supply Voltage	Output Type
Q45BW13FP	Range varies by sensing mode and fiber optics used	4-wire 2 m (6.5 ft)	Universal 12 V DC to 250 V DC or 24 V AC to 250 V AC	Isolated SPST Solid-state Switch
Q45BW13FPQ		4-Pin 7/8-in quick disconnect		

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.

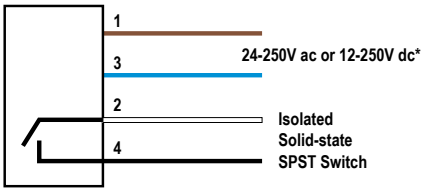
- The power indicator (green) lights when power is applied to the sensor.
- The signal indicator (red) lights when the sensor sees its modulated light source and pulses at a rate proportional to the strength of the received light signal; this is the AID™ Alignment Indicating Device [2].
- The output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



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 Diagrams

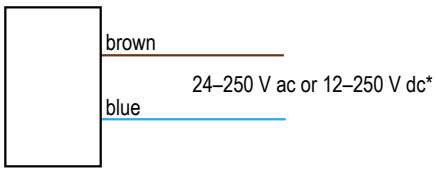
Sensors with Attached Cable and Sensors with Quick-Disconnect 4-Pin 7/8-in(model suffix Q)



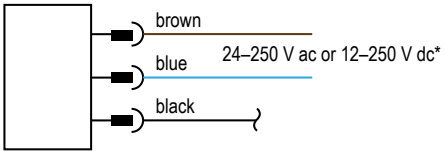
*NOTE: Connection of dc power is without regard to polarity.

Quick disconnect wiring diagrams are functionally identical.

Emitters with Attached Cable



Emitters with Quick-Disconnect 3-Pin 7/8-in



*Connection of dc power is without regard to polarity.

[2] US patent no. 4356393

Specifications

Supply Voltage and Current
Universal voltage: 24 V AC to 250 V AC, 50/60 Hz or 12 V DC to 250 V DC (1.5 watts maximum)

Supply Protection Circuitry
Protected against transient voltages
DC wiring is without regard to polarity

Output Configuration
All models except emitters: Optically isolated SPST solid-state switch

Output Rating
250 V AC, 250 V DC, 300 mA
Output saturation voltage: 3 V at 300 mA, 2 V at 15 mA
Off-state leakage current: <50 microamps
Inrush current: 1 amp for 20 milliseconds, non-repetitive

Output Protection Circuitry
Protected against false pulse on power-up

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.

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

Repeatability
Opposed mode: 0.25 milliseconds
All other sensing modes: 0.5 milliseconds
Response time and repeatability specifications are independent of signal strength.

Adjustments
Light/Dark Operate select switch; and multi-turn Sensitivity control on top of sensor beneath a transparent o-ring-sealed Lexan® cover, allows precise sensitivity setting (turn clockwise to increase gain). Optional logic and logic/display modules have adjustable timing functions

Indicators
Indicator LEDs are clearly visible beneath a raised transparent Lexan® dome on top of the sensor.
Power (green) LED lights whenever 24 V AC to 250 V AC, or 12 V DC to 250 V DC power is applied
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

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 1/20-in NPS integral internal conduit thread.

Environmental Rating
NEMA 6P, IEC IP67

Connections
2 m (6.5 ft) unterminated 3-wire PVC-jacketed cable or 9 m (30 ft) unterminated PVC-jacketed cable, or 7/8-in quick disconnect (QD) fittings are available (“Q”- suffix models). QD cables are ordered separately.

Operating Conditions
–25 °C to +55 °C (–13 °F to +131 °F)
90% at +50 °C maximum relative humidity (non-condensing)

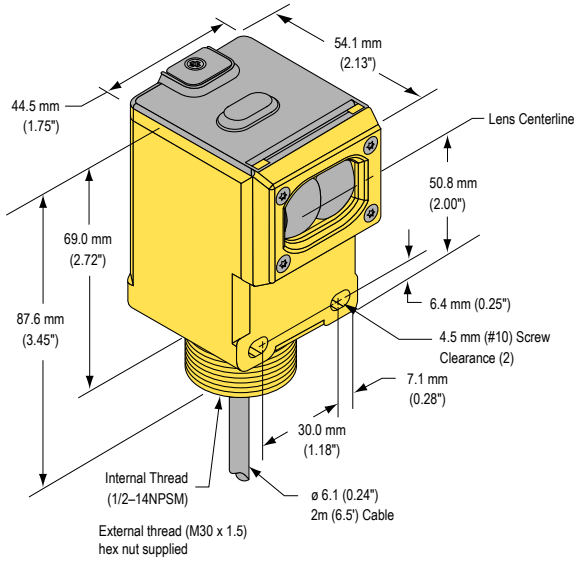
Application Notes
Optional output timing modules are available. See page 10 for more information.
Output is not short-circuit protected. Exercise care when making wiring connections.

Certifications

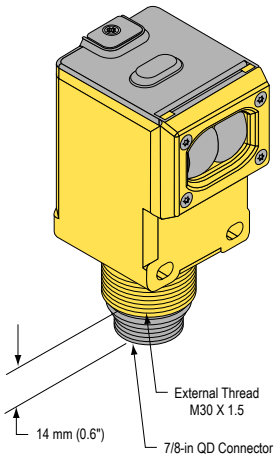
Dimensions

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

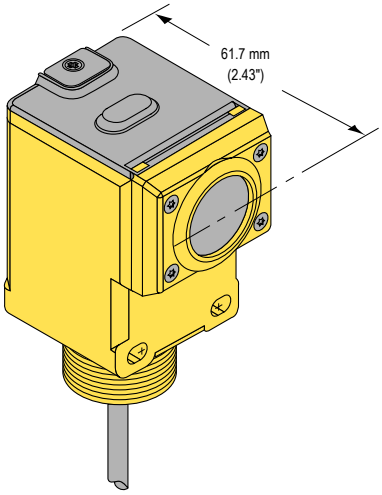
Cabled Models



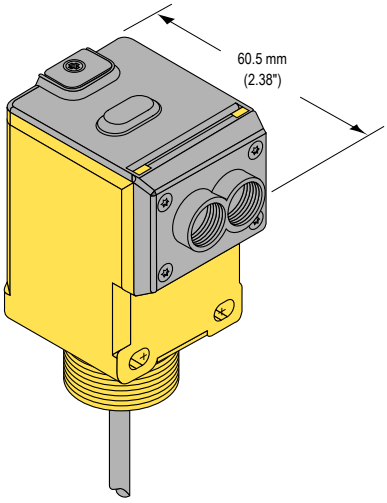
Quick-Disconnect Models



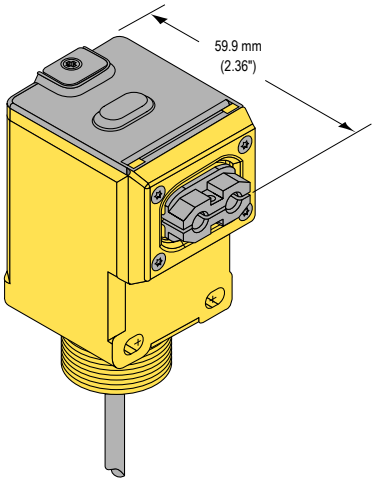
Convergent Sensor Models (CV and CV4)



Glass Fiber Optic Models (F and FV)



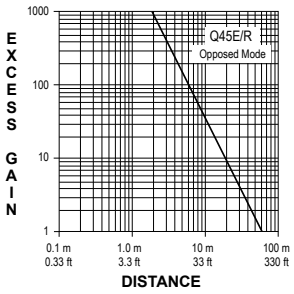
Plastic Fiber Optic Models (FP)



Performance Curves

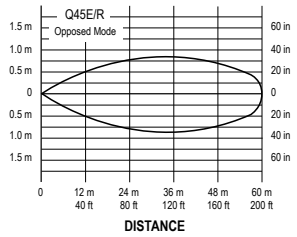
Opposed

Excess Gain



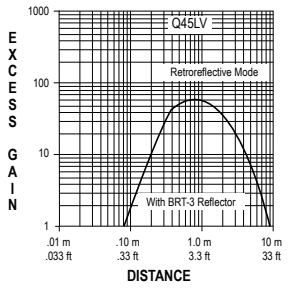
Beam Pattern

Effective Beam: 13 mm

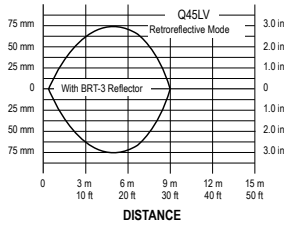


Retroreflective Non-Polarized

Excess Gain

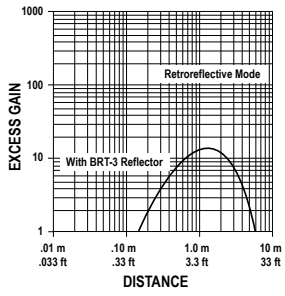


Beam Pattern

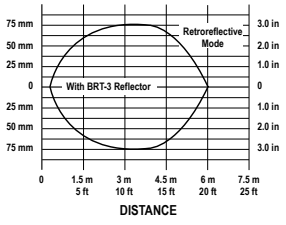


Retroreflective Polarized

Excess Gain



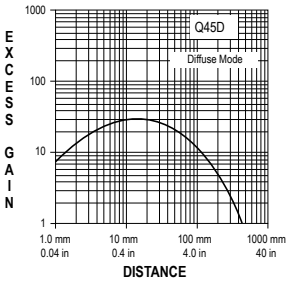
Beam Pattern



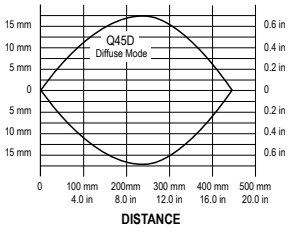
Diffuse-mode performance curves are based on a 90% reflectance white test card.

Diffuse Short Range

Excess Gain

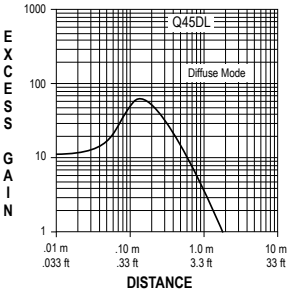


Beam Pattern

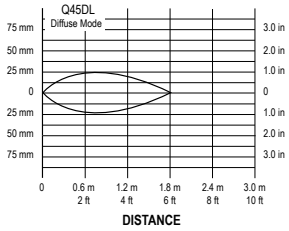


Diffuse Long Range

Excess Gain

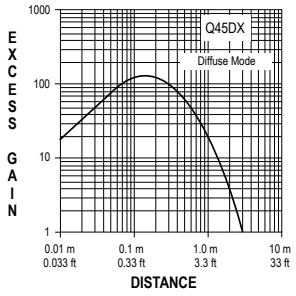


Beam Pattern

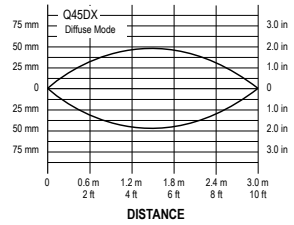


Diffuse High Power

Excess Gain



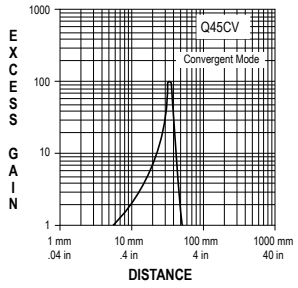
Beam Pattern



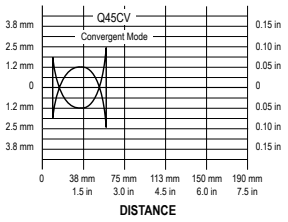
Convergent mode performance curves are based on a 90% reflectance white test card.

Convergent (CV and CVQ Models)

Excess Gain

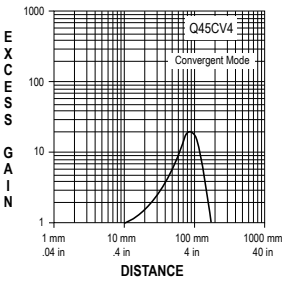


Beam Pattern

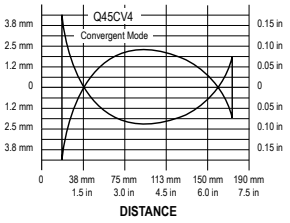


Convergent (CV4 and CV4Q Models)

Excess Gain



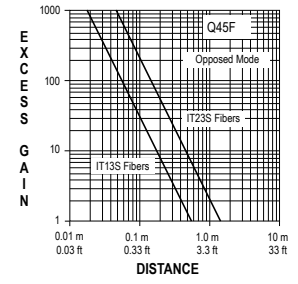
Beam Pattern



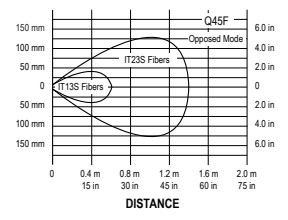
Glass fiber optic diffuse mode performance curves are based on a 90% reflectance white test card.

Glass Fiber Optic, Infrared (Opposed Mode)

Excess Gain

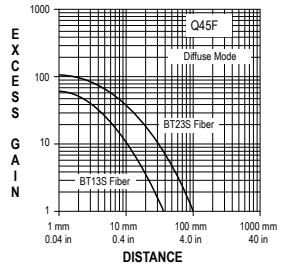


Beam Pattern

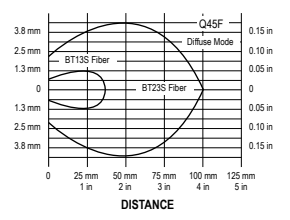


Glass Fiber Optic, Infrared (Diffuse Mode)

Excess Gain

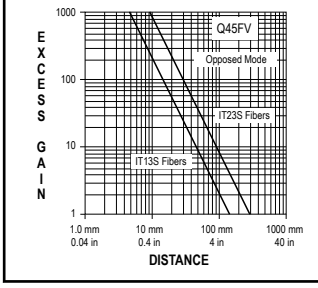


Beam Pattern

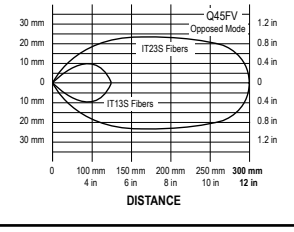


Glass Fiber Optic, Visible Red (Opposed Mode)

Excess Gain

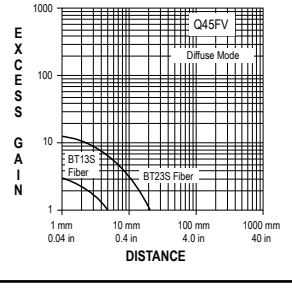


Beam Pattern

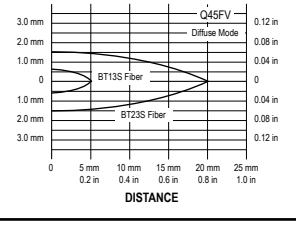


Glass Fiber Optic, Visible Red (Diffuse Mode)

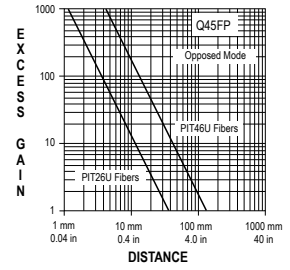
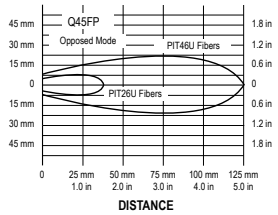
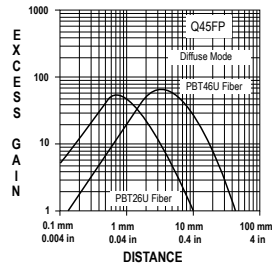
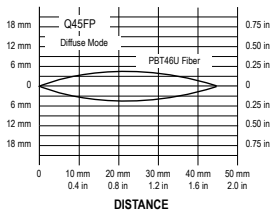
Excess Gain



Beam Pattern

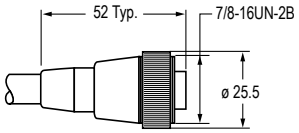
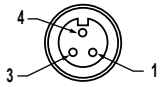


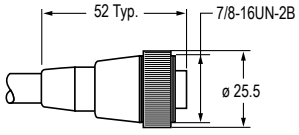
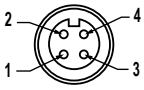
Plastic fiber optic Diffuse mode performance curves are based on a 90% reflectance white test card.

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

Accessories

Cordsets

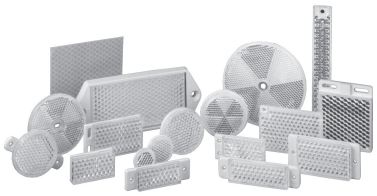
3-pin 7/8-in Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MBCC-306	1.83 m (6 ft)	Straight		 1 = Brown 3 = Blue 4 = Black
MBCC-312	3.66 m (12 ft)			
MBCC-330	9.14 m (30 ft)			

4-Pin 7/8-in Cordsets—Single Ended				
Model	**Length**	**Style**	**Dimensions**	**Pinout (Female)**
MBCC-406	1.83 m (6 ft)	Straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MBCC-412	3.66 m (12 ft)			
MBCC-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.

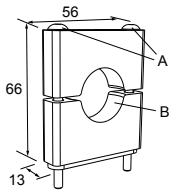
Note: Polarized sensors require corner cube type retroreflective targets. Non-polarized sensors may use any retroreflective target.



Brackets

SMB30C

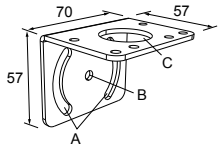
- 30 mm split clamp, black PBT bracket
- Stainless steel mounting hardware included
- Mounting hole for 30 mm sensor



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

SMB30MM

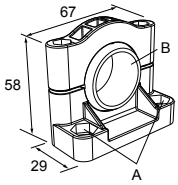
- 12-ga. stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor



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

SMB30SC

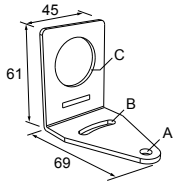
- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included



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

SMB30A

- Right-angle bracket with curved slot for versatile orientation
- Clearance for M6 (¼ in) hardware
- Mounting hole for 30 mm sensor
- 12-ga. stainless steel



Hole center spacing: A to B=40
Hole size: A=ø 6.3, B= 27.1 x 6.3, C=ø 30.5

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 Q45BW13 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)

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