Q45BW22 Series Sensors

Datasheet

90 V ac to 250 V ac photoelectric sensors with protected solid-state relay output

- 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 max. 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: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

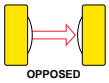
Models

To order the 9 m (30 ft) cable model, add the suffix "W/30" to the cabled model number. For example Q452E W/30.

A model with a QD connector requires 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
Q452E Emitter	60 m (200 ft)	2-wire 2m (6.5 ft)	90 V ac to 250V ac	SPST Solidstate Relay
Q45BW22R Receiver		3-wire 2m (6.5 ft)		
Q452EQ Emitter		3-Pin Mini-style QD		
Q452EQ1 Emitter		4-Pin Micro-style QD		
Q45BW22RQ Receiver		3-Pin Mini-style QD		
Q45BW22RQ1 Receiver		4-Pin Micro-style QD		

[1] U.S. Patent no. 4356393

Retroreflective-Mode Models

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).

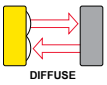
Visible red, 680 nm

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-style QD		
Q45BW22LVQ1		4-Pin Micro-style 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-style QD		
Q45BW22LPQ1		4-Pin Micro-style QD		

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



Infrared, 880 nm

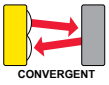
Short Range				
Model	Range	Cable	Supply Voltage	Output Type
Q45BW22D	45 cm (18 in)	3-wire 2 m (6.5 ft)	90 V ac to 250 V ac	SPST Solid-state Relay
Q45BW22DQ		3-Pin Mini-style QD		
Q45BW22DQ1		4-Pin Micro-style QD		

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 Mini-style QD		
Q45BW22DLQ1		4-Pin Micro-style 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 Mini-style QD		
Q45BW22DXQ1		4-Pin Micro-style QD		

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. Ignores all but highly reflective objects that are outside of the sensing range.

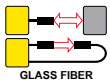


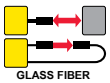
Visible red, 680 nm

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-style QD		
Q45BW22CVQ1		4-Pin Micro-style QD		
Q45BW22CV4	100 mm (4 in) Spot Size at Focus: 1.5 mm (0.06 in)	3-wire 2 m (6.5 ft)	90 V ac to 250 V ac	SPST Solid-state Relay
Q45BW22CV4Q		3-Pin Mini-style QD		
Q45BW22CV4Q1		4-Pin Micro-style QD		

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 .5 mm (.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*.





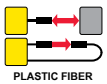
Infrared, 880 nm and Visible red, 650 nm

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-style QD		
Q45BW22FQ1		4-Pin Micro-style QD		

Visible red, 650 nm				
Models	Range	Cable	Supply Voltage	Output Type
Q45BW22FV	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
Q45BW22FVQ		3-Pin Mini-style QD		
Q45BW22FVQ1		4-Pin Micro-style QD		

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

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 Mini-style QD		
Q45BW22FPQ1		4-Pin Micro-style QD		

Overview

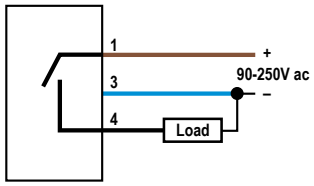
Status indicator LEDs for power, signal, and output are clearly visible beneath a raised dome in the sensor's transparent o-ring-sealed polycarbonate cover. Also located beneath the sensor's o-ring-sealed cover are controls for light/dark operate selection and the sensitivity adjustment.

- 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].
- 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.

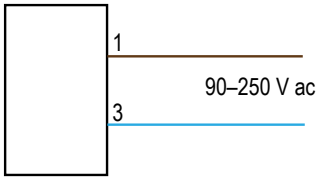
1. LEDs
   - Green LED: Power on indicator
   - Red LED: Signal indicator
   - Amber LED: Output status indicator
2. Optional LED signal strength display
3. Optional timing adjustment
4. Optional timing adjustment
5. Light/dark operate switch

Wiring Diagram

Attached Cable



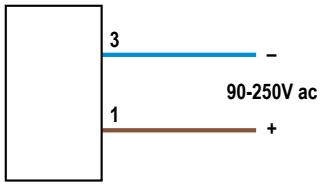
Emitter with Attached Cable



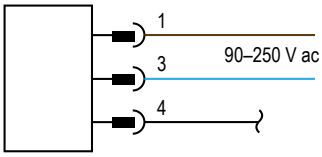
Key

1 = Brown
3 = Blue
4 = Black

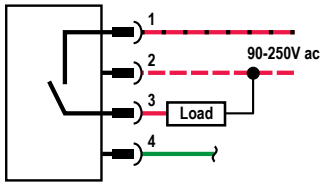
Quick-Disconnect 3-Pin Mini-Style (model suffix Q)



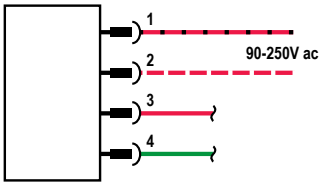
Emitter with Quick-Disconnect 3-Pin Mini-Style (model suffix Q)



Quick-Disconnect 4-Pin Micro-Style (model suffix Q1)



Emitter with Quick-Disconnect 4-Pin Micro-Style (model suffix Q1)



Key

1 = Red and black
2 = Red and white
3 = Red
4 = Green

[2] US patent no. 4356393

Specifications

Supply Voltage and Current
90 V ac to 250V 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

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

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.

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
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.

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

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.

Environmental Rating
NEMA 6P, IEC IP67

Connections
PVC-jacketed 2 m (6.5 ft) or 9 m (30 ft) cables, or 3-pin Mini-style ("Q" suffix models) or 4-pin Micro-style ("Q1" suffix models) quick-disconnect (QD) fittings are available. QD cables are ordered separately.

Operating Conditions
Temperature: –40 °C to +70 °C (–40 °F to +158 °F)
90% at +50 °C maximum relative humidity (non-condensing)

Application Notes
Optional output timing modules are available.

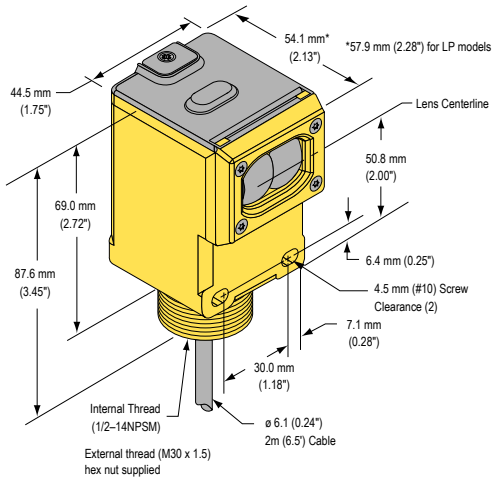
Certifications

NRTL/C

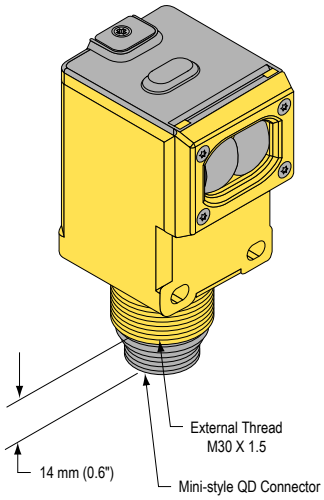
Dimensions

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

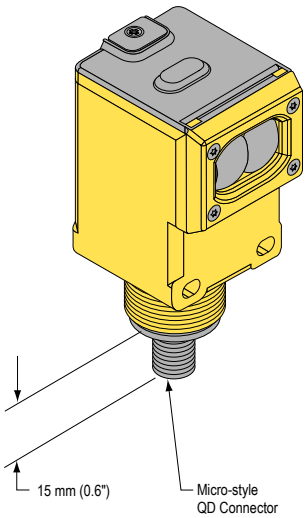
Cabled Models



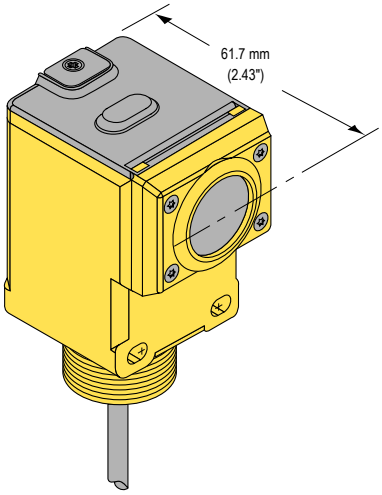
Mini-Style Quick-Disconnect Models



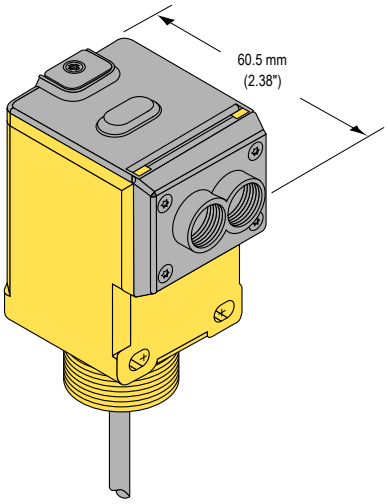
Micro-Style Quick Disconnect Models



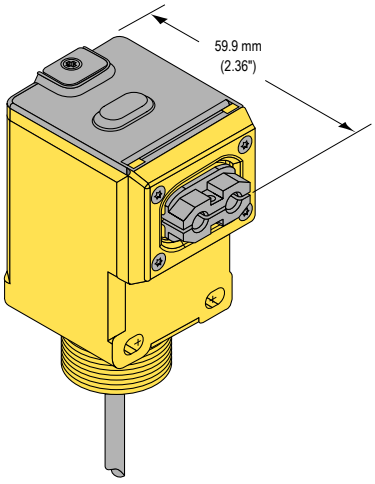
Convergent Sensor Models (CV and CV4)



Glass Fiber Optic Models (F and FV)



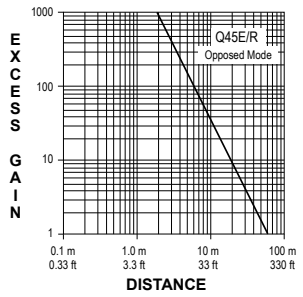
Plastic Fiber Optic Models (FP)



Performance Curves

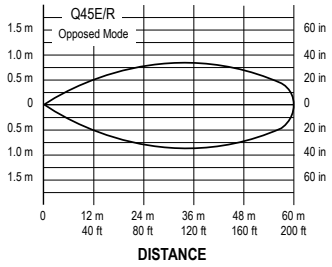
Opposed

Excess Gain



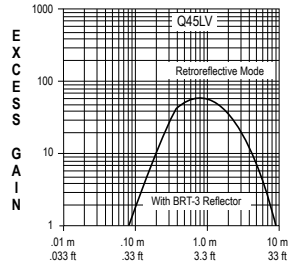
Beam Pattern

Effective Beam: 13 mm

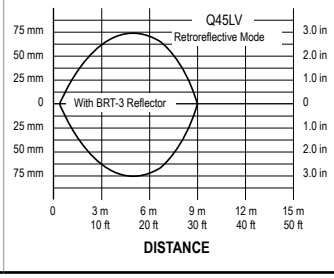


Retroreflective Non-Polarized

Excess Gain

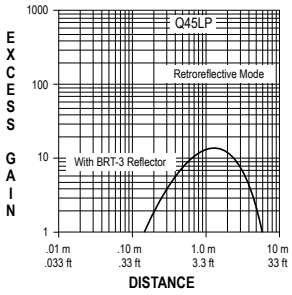


Beam Pattern

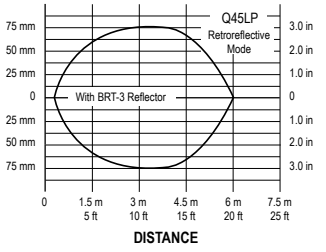


Retroreflective Polarized

Excess Gain



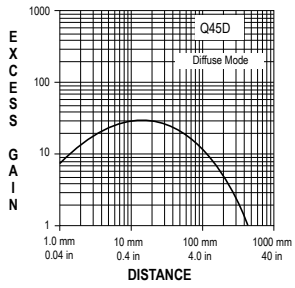
Beam Pattern



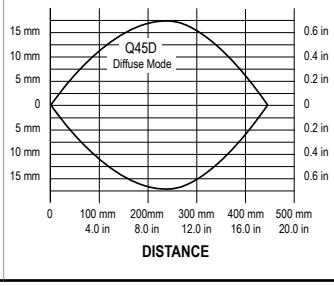
Diffuse-mode performance curves are based on a 90% reflectance white test card.

Diffuse Short Range

Excess Gain

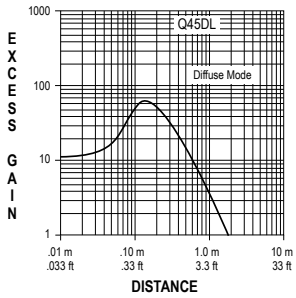


Beam Pattern

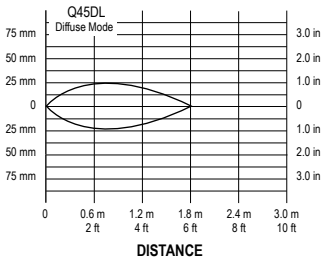


Diffuse Long Range

Excess Gain

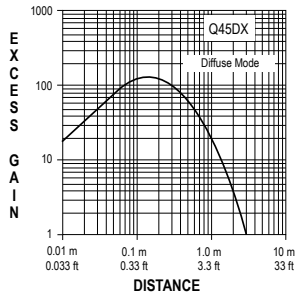


Beam Pattern

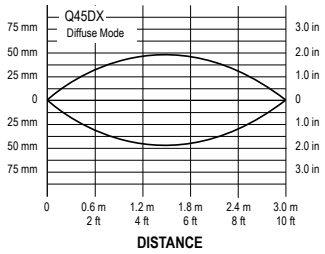


Diffuse High Power

Excess Gain



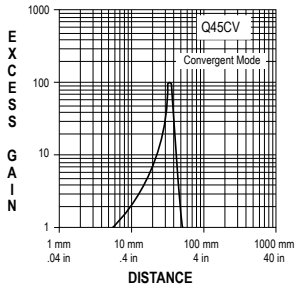
Beam Pattern



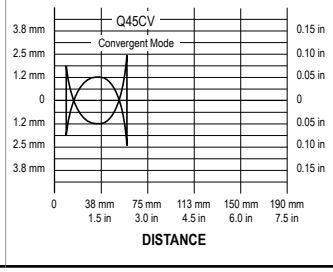
Convergent mode performance curves are based on a 90% reflectance white test card.

Convergent (CV and CVQ Models)

Excess Gain

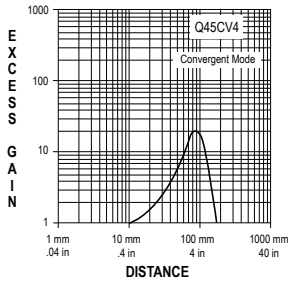


Beam Pattern

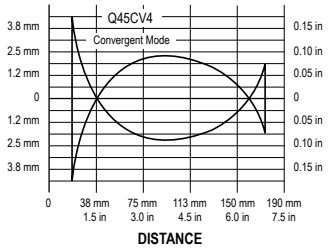


Convergent (CV4 and CV4Q Models)

Excess Gain



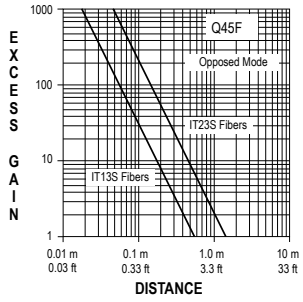
Beam Pattern



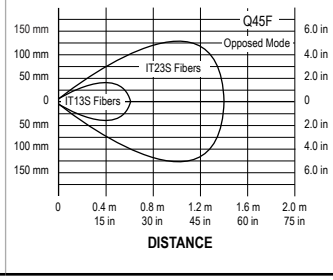
Glass fiber optic diffuse mode performance curves are based on a 90% reflectance white test card.

Glass Fiber Optic, Infrared (Opposed Mode)

Excess Gain

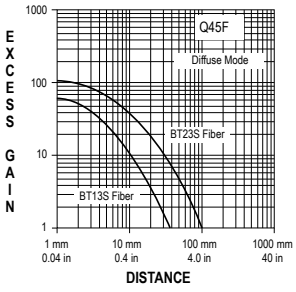


Beam Pattern

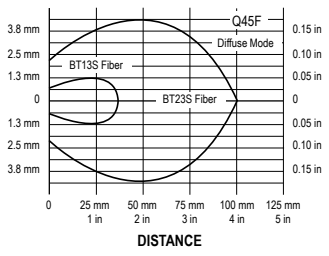


Glass Fiber Optic, Infrared (Diffuse Mode)

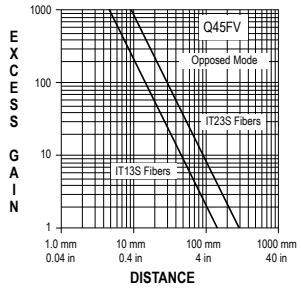
Excess Gain

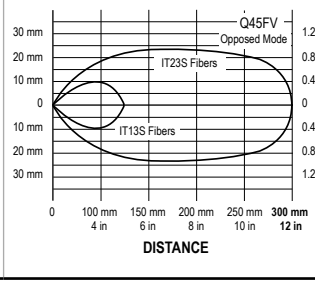


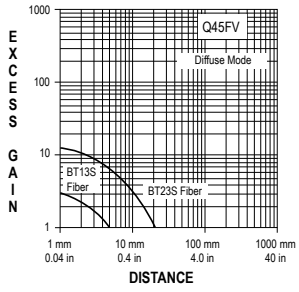
Beam Pattern

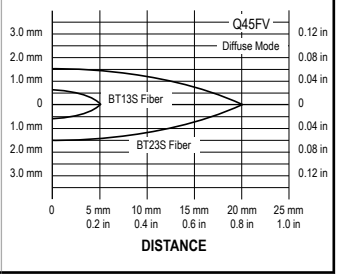


Glass Fiber Optic, Visible Red (Opposed Mode)		Glass Fiber Optic, Visible Red (Diffuse Mode)	
Excess Gain	Beam Pattern	Excess Gain	Beam Pattern



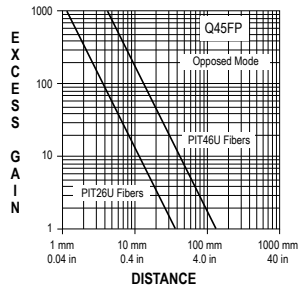


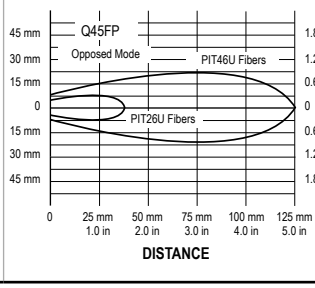


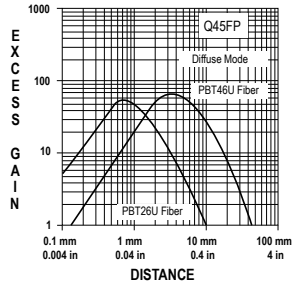


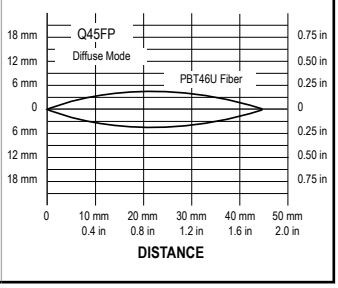
Plastic fiber optic Diffuse mode performance curves are based on a 90% reflectance white test card.

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



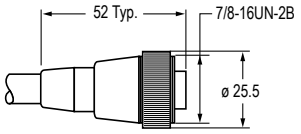
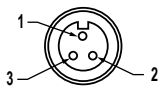




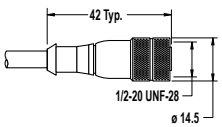
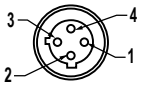


Accessories

Cordsets

3-Pin Mini-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MBCC-306	1.83 m (6.5 ft)	Straight		
MBCC-312	3.66 m (12 ft)			
MBCC-330	9.14 m (30 ft)			

1 = Black
2 = Brown
3 = Blue

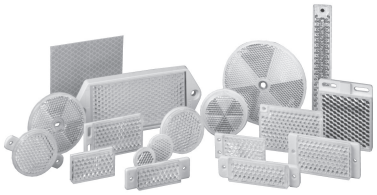
4-Pin Micro-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MQAC-406	1.83 m (6 ft)	Straight		
MQAC-415	4.57 m (15 ft)			
MQAC-430	9.14 m (30 ft)			

1 = Red/Black
2 = Red/White
3 = Red
4 = Green

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.

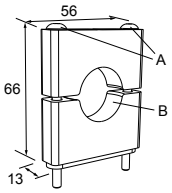


Brackets

SMB30C

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

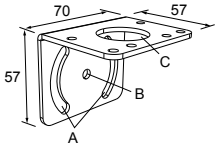
Hole center spacing: A=ø 45
Hole size: B=ø 27.2



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

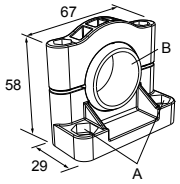
Hole center spacing: A = 51, A to B = 25.4
Hole size: A = 42.6 x 7, B = ø 6.4, C = ø 30.1



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



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 Q45VR2 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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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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Q45BW22 Series Sensors

Datasheet

90 V ac to 250 V ac photoelectric sensors with protected solid-state relay output

- 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 max. 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: Not To Be Used for Personnel Protection

Never use this device as a sensing device for personnel protection. Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

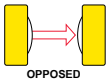
Models

To order the 9 m (30 ft) cable model, add the suffix "W/30" to the cabled model number. For example Q452E W/30.

A model with a QD connector requires 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
Q452E Emitter	60 m (200 ft)	2-wire 2m (6.5 ft)	90 V ac to 250V ac	SPST Solidstate Relay
Q45BW22R Receiver		3-wire 2m (6.5 ft)		
Q452EQ Emitter		3-Pin Mini-style QD		
Q452EQ1 Emitter		4-Pin Micro-style QD		
Q45BW22RQ Receiver		3-Pin Mini-style QD		
Q45BW22RQ1 Receiver		4-Pin Micro-style QD		

[1] U.S. Patent no. 4356393

Retroreflective-Mode Models

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).

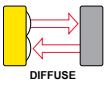
Visible red, 680 nm

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-style QD		
Q45BW22LVQ1		4-Pin Micro-style 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-style QD		
Q45BW22LPQ1		4-Pin Micro-style QD		

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



Infrared, 880 nm

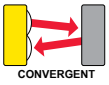
Short Range				
Model	Range	Cable	Supply Voltage	Output Type
Q45BW22D	45 cm (18 in)	3-wire 2 m (6.5 ft)	90 V ac to 250 V ac	SPST Solid-state Relay
Q45BW22DQ		3-Pin Mini-style QD		
Q45BW22DQ1		4-Pin Micro-style QD		

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 Mini-style QD		
Q45BW22DLQ1		4-Pin Micro-style 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 Mini-style QD		
Q45BW22DXQ1		4-Pin Micro-style QD		

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. Ignores all but highly reflective objects that are outside of the sensing range.

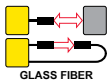


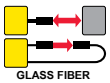
Visible red, 680 nm

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-style QD		
Q45BW22CVQ1		4-Pin Micro-style QD		
Q45BW22CV4	100 mm (4 in) Spot Size at Focus: 1.5 mm (0.06 in)	3-wire 2 m (6.5 ft)	90 V ac to 250 V ac	SPST Solid-state Relay
Q45BW22CV4Q		3-Pin Mini-style QD		
Q45BW22CV4Q1		4-Pin Micro-style QD		

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 .5 mm (.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*.





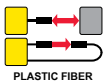
Infrared, 880 nm and Visible red, 650 nm

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-style QD		
Q45BW22FQ1		4-Pin Micro-style QD		

Visible red, 650 nm				
Models	Range	Cable	Supply Voltage	Output Type
Q45BW22FV	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
Q45BW22FVQ		3-Pin Mini-style QD		
Q45BW22FVQ1		4-Pin Micro-style QD		

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

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 Mini-style QD		
Q45BW22FPQ1		4-Pin Micro-style QD		

Overview

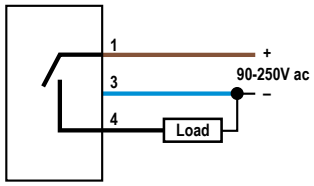
Status indicator LEDs for power, signal, and output are clearly visible beneath a raised dome in the sensor's transparent o-ring-sealed polycarbonate cover. Also located beneath the sensor's o-ring-sealed cover are controls for light/dark operate selection and the sensitivity adjustment.

- 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].
- 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.

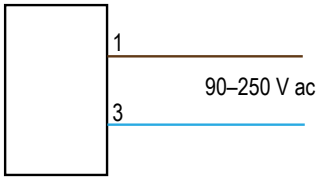
1. LEDs
   - Green LED: Power on indicator
   - Red LED: Signal indicator
   - Amber LED: Output status indicator
2. Optional LED signal strength display
3. Optional timing adjustment
4. Optional timing adjustment
5. Light/dark operate switch

Wiring Diagram

Attached Cable



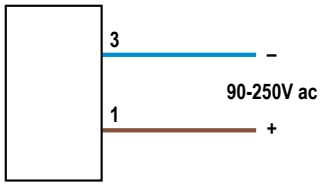
Emitter with Attached Cable



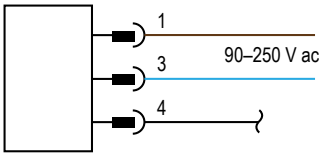
Key

1 = Brown
3 = Blue
4 = Black

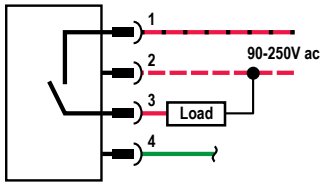
Quick-Disconnect 3-Pin Mini-Style (model suffix Q)



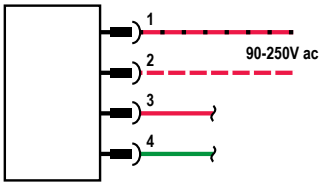
Emitter with Quick-Disconnect 3-Pin Mini-Style (model suffix Q)



Quick-Disconnect 4-Pin Micro-Style (model suffix Q1)



Emitter with Quick-Disconnect 4-Pin Micro-Style (model suffix Q1)



Key

1 = Red and black
2 = Red and white
3 = Red
4 = Green

[2] US patent no. 4356393

Specifications

Supply Voltage and Current
90 V ac to 250V 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

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

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.

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
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.

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

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.

Environmental Rating
NEMA 6P, IEC IP67

Connections
PVC-jacketed 2 m (6.5 ft) or 9 m (30 ft) cables, or 3-pin Mini-style ("Q" suffix models) or 4-pin Micro-style ("Q1" suffix models) quick-disconnect (QD) fittings are available. QD cables are ordered separately.

Operating Conditions
Temperature: –40 °C to +70 °C (–40 °F to +158 °F)
90% at +50 °C maximum relative humidity (non-condensing)

Application Notes
Optional output timing modules are available.

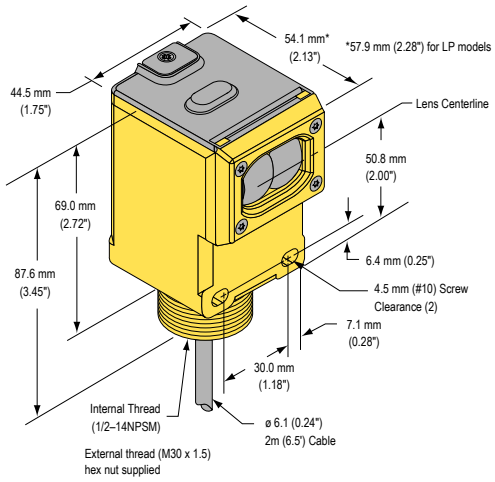
Certifications

NRTL/C

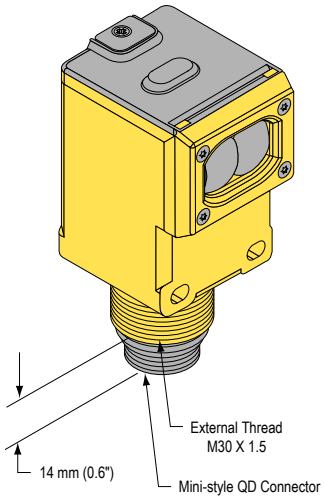
Dimensions

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

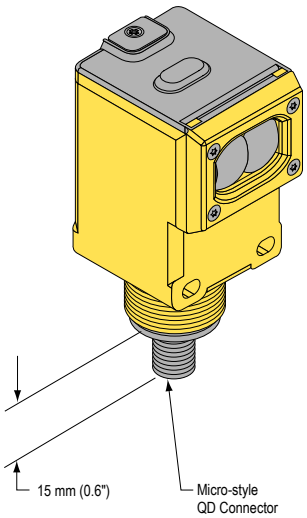
Cabled Models



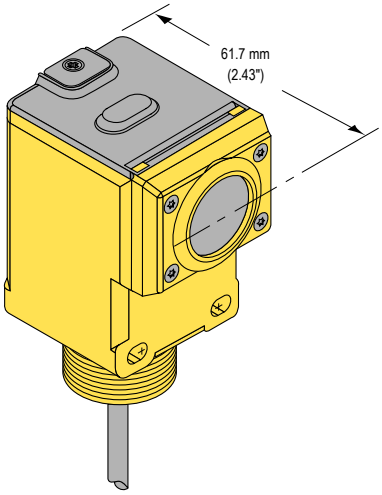
Mini-Style Quick-Disconnect Models



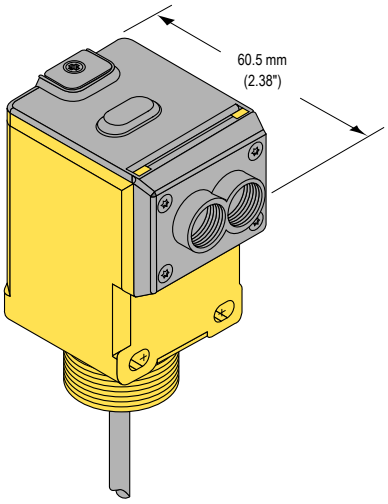
Micro-Style Quick Disconnect Models



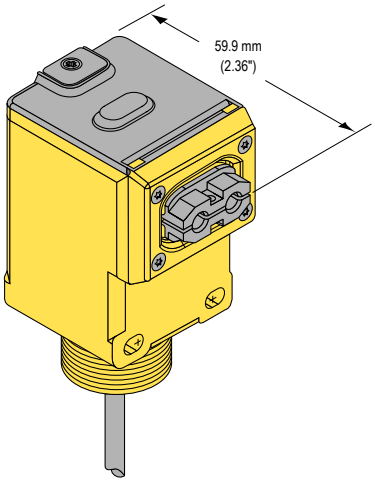
Convergent Sensor Models (CV and CV4)



Glass Fiber Optic Models (F and FV)



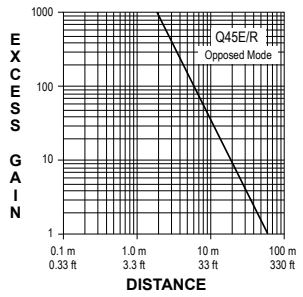
Plastic Fiber Optic Models (FP)



Performance Curves

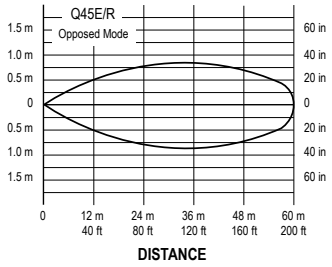
Opposed

Excess Gain



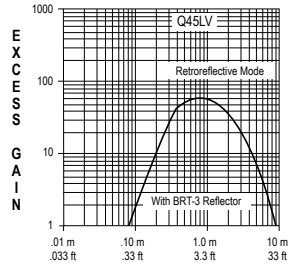
Beam Pattern

Effective Beam: 13 mm

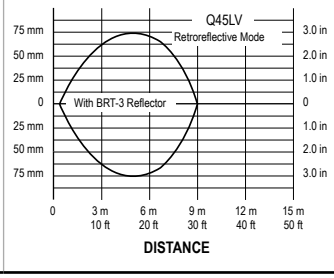


Retroreflective Non-Polarized

Excess Gain

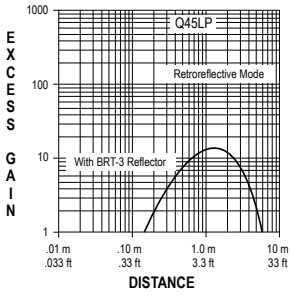


Beam Pattern

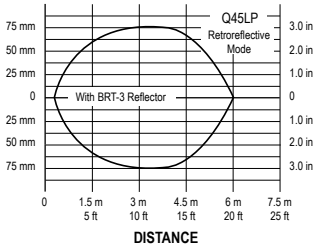


Retroreflective Polarized

Excess Gain



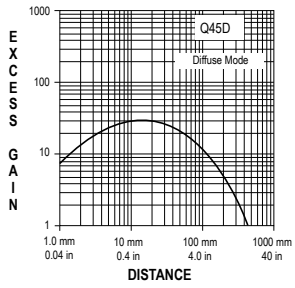
Beam Pattern



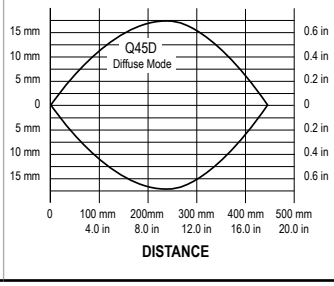
Diffuse-mode performance curves are based on a 90% reflectance white test card.

Diffuse Short Range

Excess Gain

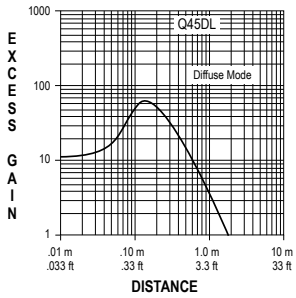


Beam Pattern

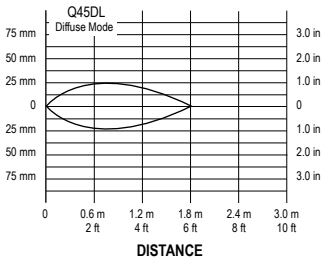


Diffuse Long Range

Excess Gain

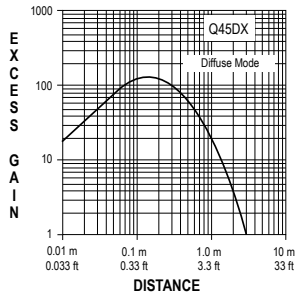


Beam Pattern

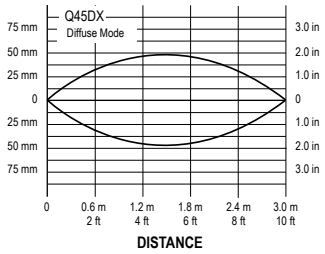


Diffuse High Power

Excess Gain



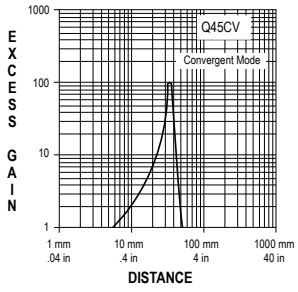
Beam Pattern



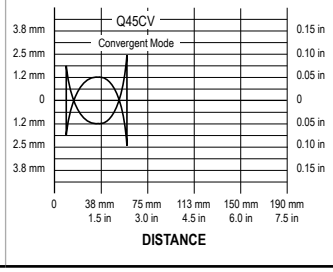
Convergent mode performance curves are based on a 90% reflectance white test card.

Convergent (CV and CVQ Models)

Excess Gain

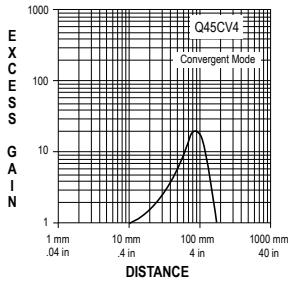


Beam Pattern

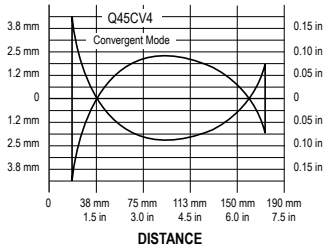


Convergent (CV4 and CV4Q Models)

Excess Gain



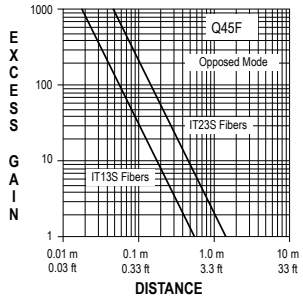
Beam Pattern



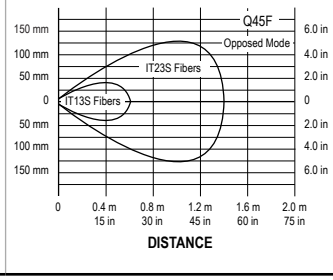
Glass fiber optic diffuse mode performance curves are based on a 90% reflectance white test card.

Glass Fiber Optic, Infrared (Opposed Mode)

Excess Gain

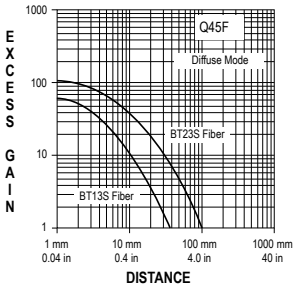


Beam Pattern

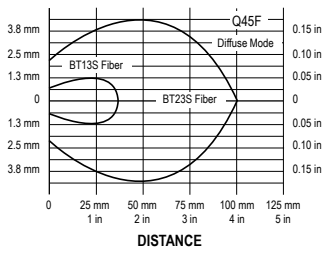


Glass Fiber Optic, Infrared (Diffuse Mode)

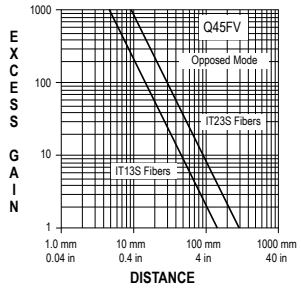
Excess Gain

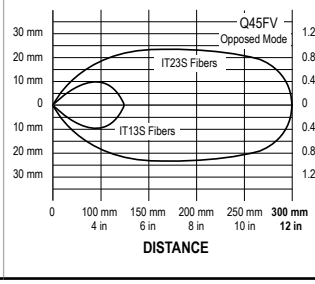


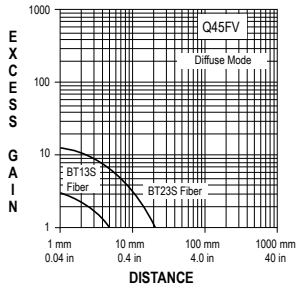
Beam Pattern

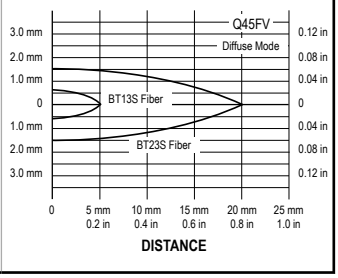


Glass Fiber Optic, Visible Red (Opposed Mode)		Glass Fiber Optic, Visible Red (Diffuse Mode)	
Excess Gain	Beam Pattern	Excess Gain	Beam Pattern



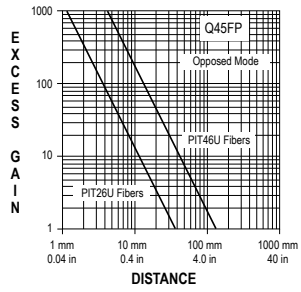


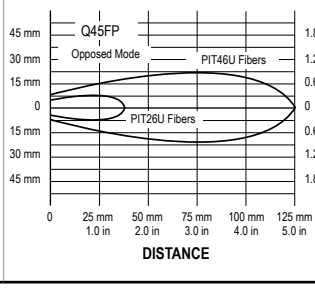


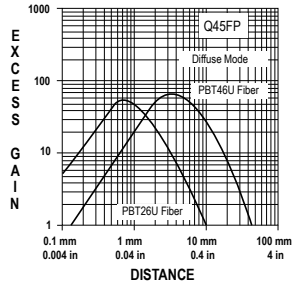


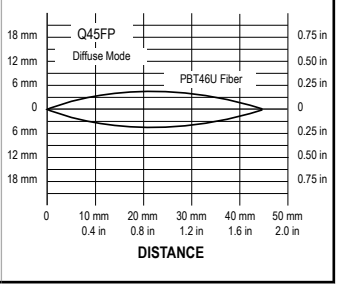
Plastic fiber optic Diffuse mode performance curves are based on a 90% reflectance white test card.

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



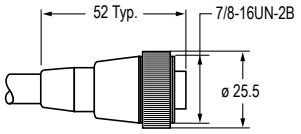
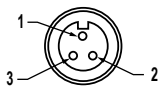




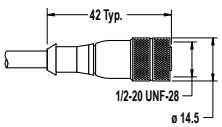
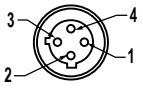


Accessories

Cordsets

3-Pin Mini-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MBCC-306	1.83 m (6.5 ft)	Straight		
MBCC-312	3.66 m (12 ft)			
MBCC-330	9.14 m (30 ft)			

1 = Black
2 = Brown
3 = Blue

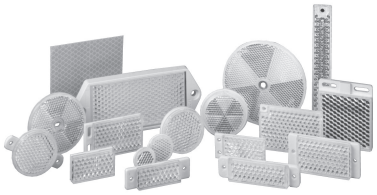
4-Pin Micro-Style Cordsets				
Model	Length	Style	Dimensions	Pinout (Female)
MQAC-406	1.83 m (6 ft)	Straight		
MQAC-415	4.57 m (15 ft)			
MQAC-430	9.14 m (30 ft)			

1 = Red/Black
2 = Red/White
3 = Red
4 = Green

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.

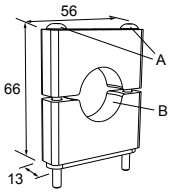


Brackets

SMB30C

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

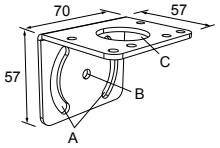
Hole center spacing: A=ø 45
Hole size: B=ø 27.2



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

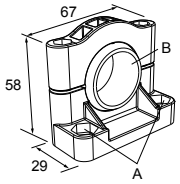
Hole center spacing: A = 51, A to B = 25.4
Hole size: A = 42.6 x 7, B = ø 6.4, C = ø 30.1



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



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 Q45VR2 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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