

# 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<sup>†</sup>), 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.

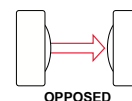
## Models

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		

<sup>†</sup> U.S. Patent number 4356393



### 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](http://www.bannerengineering.com) for more information).



Visible red, 680 nm (non-polarized)

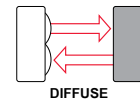
Visible red, 680 nm (polarized)

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.

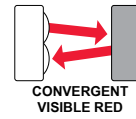


Infrared, 880 nm

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.

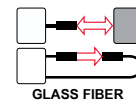


Visible red, 680 nm

Models	Focus	Cable	Supply Voltage	Output Type
Q45BW13CV	38 mm (1.5 in) Spot Size at Focus: 1.3 mm (0.05 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
Q45BW13CVQ		4-pin 7/8-in quick disconnect		
Q45BW13CV4	100 mm (4 in) Spot Size at Focus: 1.5 mm (0.06 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
Q45BW13CV4Q		4-pin 7/8-in quick disconnect		

### 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](http://www.bannerengineering.com).

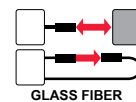


Infrared, 880 nm and Visible red, 650 nm

Infrared, 880 nm				
Models	Range	Cable	Supply Voltage	Output Type
Q45BW13F	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
Q45BW13FQ		4-Pin 7/8-in quick disconnect		
Visible red, 650 nm				
Models	Range	Cable	Supply Voltage	Output Type
Q45BW13FV	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
Q45BW13FVQ		4-Pin 7/8-in quick disconnect		

### 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](http://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.

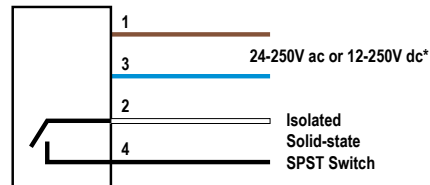
- The power indicator (green) lights when power is applied to the sensor.
- The signal indicator (red) lights when the sensor sees its modulated light source and pulses at a rate proportional to the strength of the received light signal; this is the AID™ Alignment Indicating Device <sup>2</sup>.
- The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

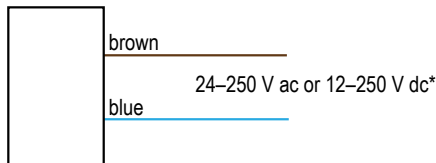
### Sensors with Attached Cable and Sensors with Quick-Disconnect 4-Pin 7/8-in(model suffix Q)



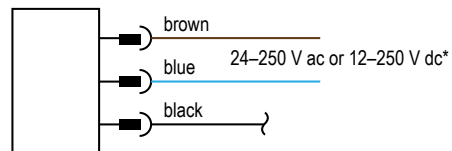
\*NOTE: Connection of dc power is without regard to polarity.

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.

<sup>2</sup> 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](http://www.bannerengineering.com).

Supply Wiring (AWG)	Required Overcurrent Protection (Amps)
20	5.0
22	3.0
24	2.0
26	1.0
28	0.8
30	0.5

### 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

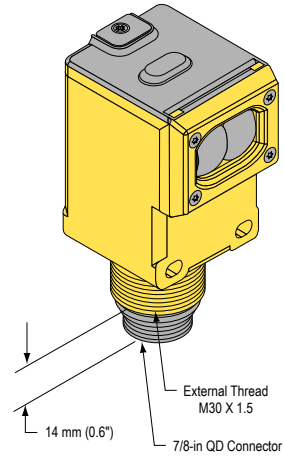
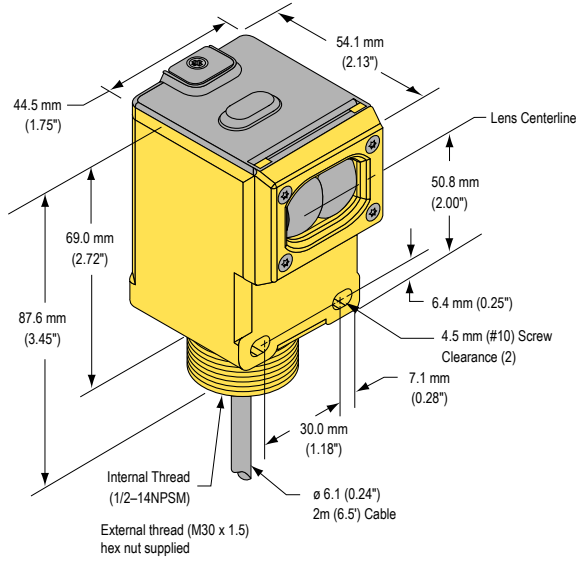


Dimensions

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

Cabled Models

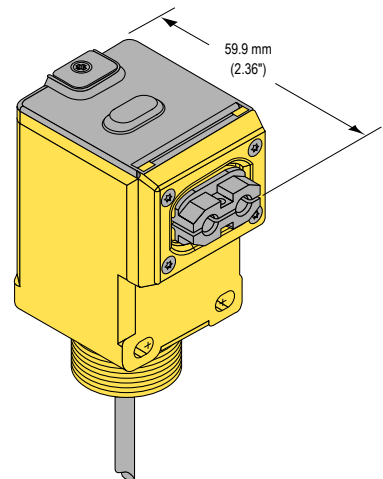
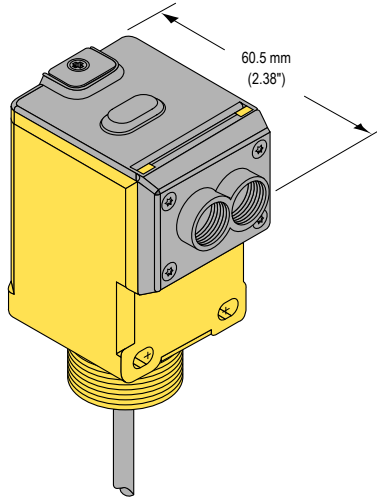
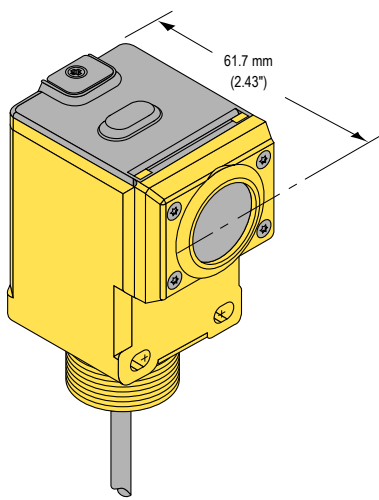
Quick-Disconnect Models



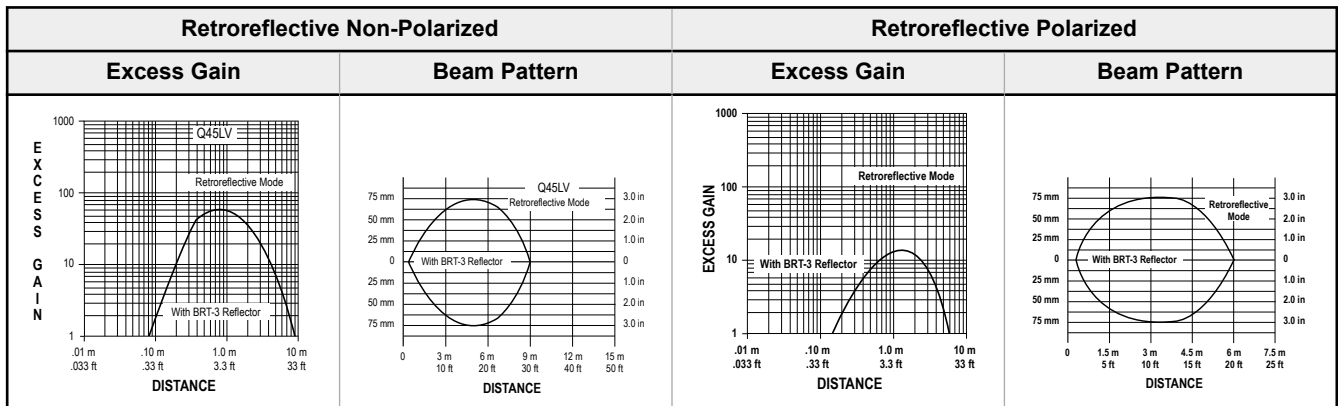
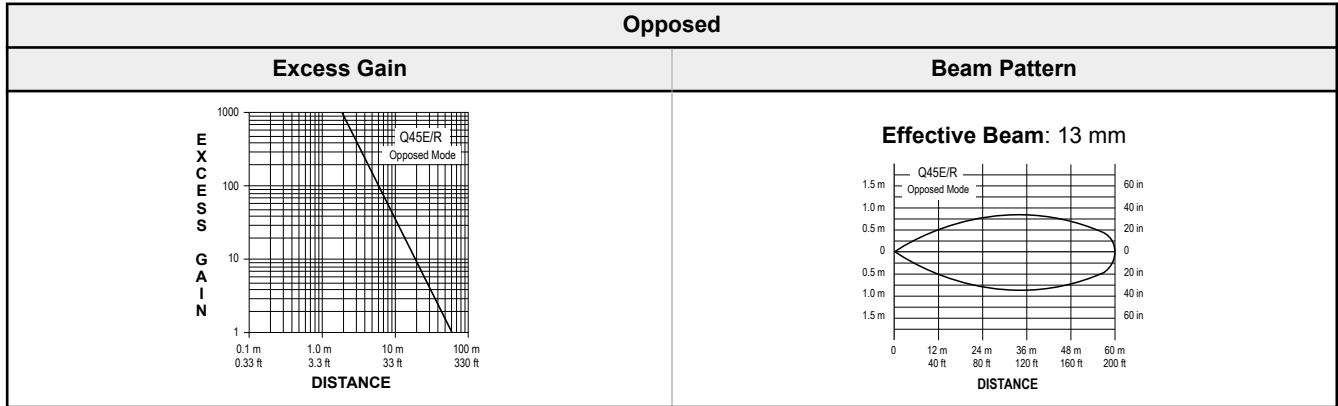
Convergent Sensor Models (CV and CV4)

Glass Fiber Optic Models (F and FV)

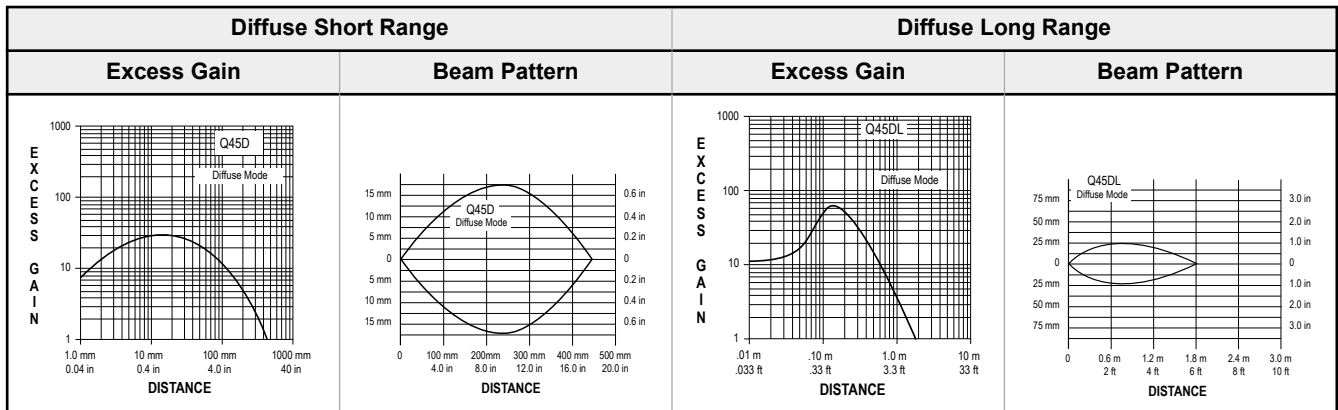
Plastic Fiber Optic Models (FP)

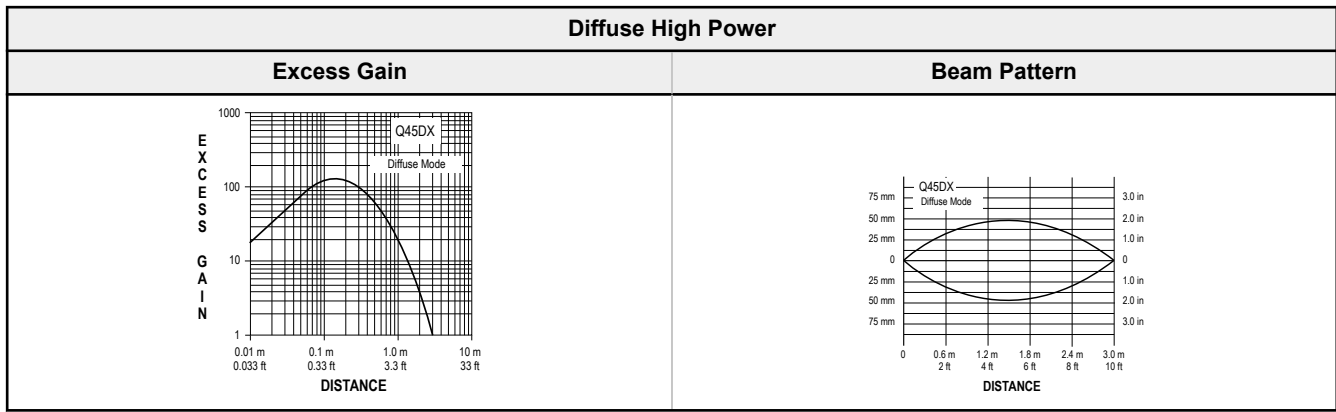


Performance Curves

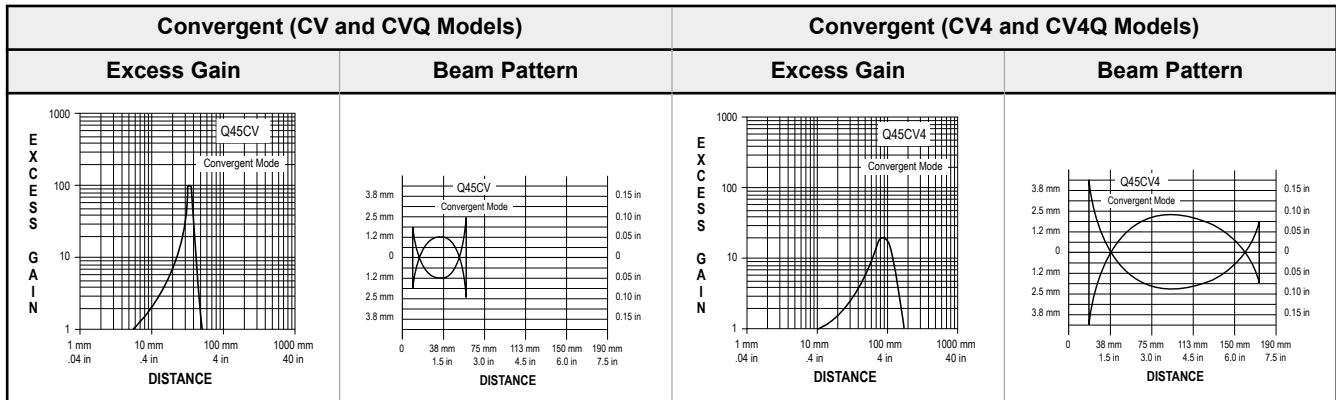


Diffuse-mode performance curves are based on a 90% reflectance white test card.

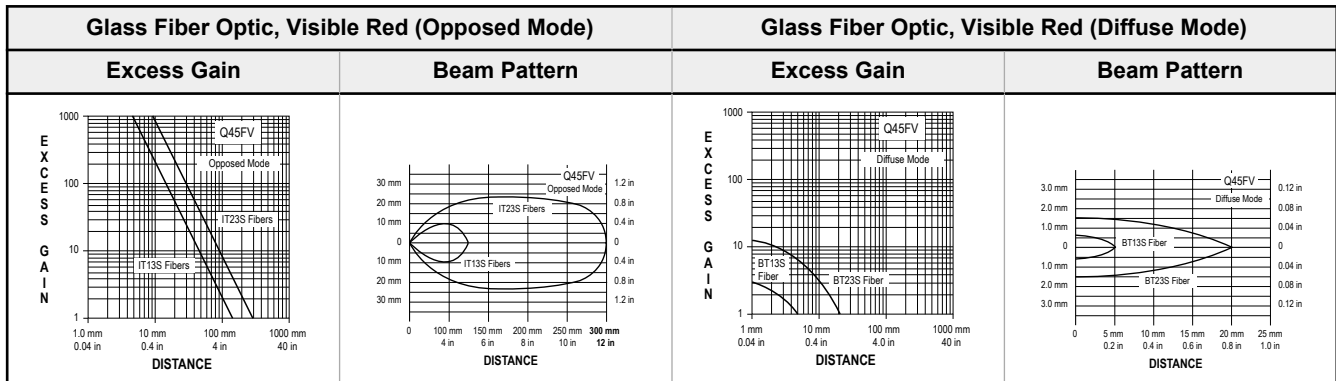
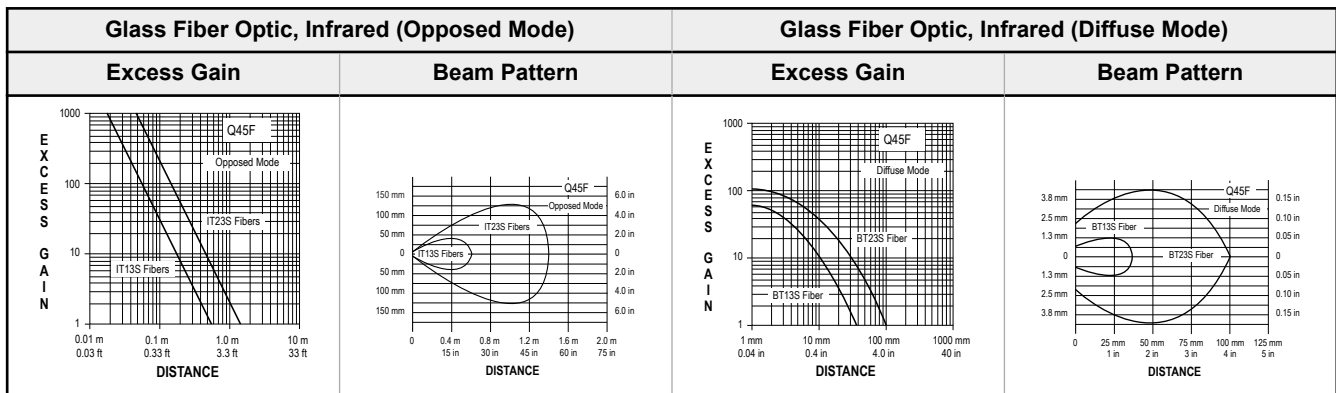




Convergent mode performance curves are based on a 90% reflectance white test card.

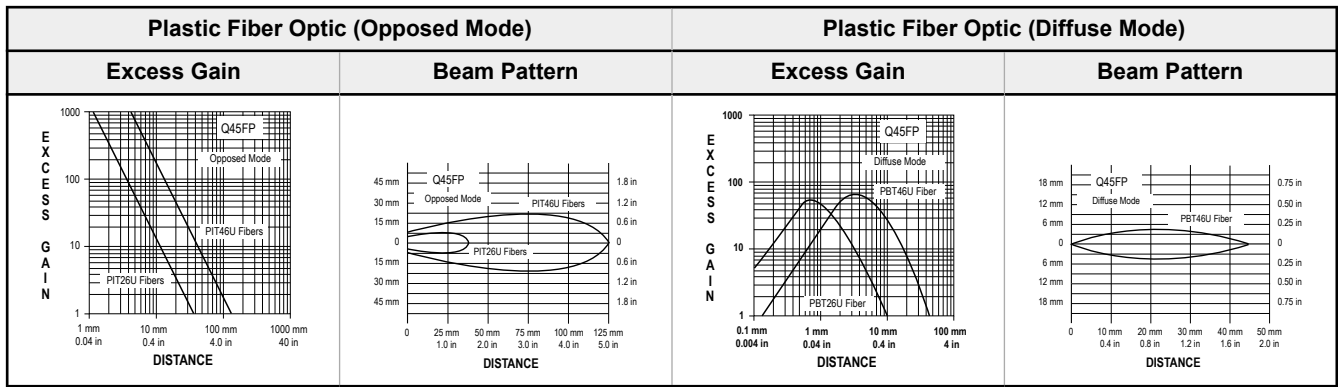


Glass fiber optic diffuse mode performance curves are based on a 90% reflectance white test card.



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





## Accessories

### Cordsets

3-pin 7/8-in Cordsets—Single Ended				
Model	Length	Style	Dimensions	Pinout (Female)
MBCC-306	1.83 m (6 ft)	Straight		<p>1 = Brown 3 = Blue 4 = Black</p>
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		<p>1 = Brown 2 = White 3 = Blue 4 = Black</p>
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](http://www.bannerengineering.com) for complete information.



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

