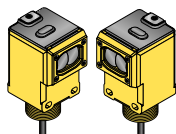


## Q45VR2 Series Sensors

90 to 250V ac photoelectric sensors with electromechanical relay output



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

### Features

- Advanced one-piece photoelectric sensors with outstanding optical performance and extremely rugged design
- Operate from 90 to 250V ac (50/60Hz)
- SPDT electromechanical relay output for economical, high-capacity switching and immunity to electrical noise
- Multiple sensing modes include: opposed, diffuse, retroreflective and convergent, plus glass and plastic fiber optic models
- Switchable light/dark operate
- Versatile plug-in modules available for output timing logic and/or signal strength display
- Highly visible Power, Signal (AID™ System\*), and Output indicator LEDs
- Choice of prewired 2 m (6.5') or 9 m (30') unterminated cable or Mini-style quick-disconnect fitting
- Versatile mounting options
- Designed to withstand 1200 psi washdown; exceeds its NEMA 6P and IEC IP67 rating

\*U.S. Patent no. 4356393

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

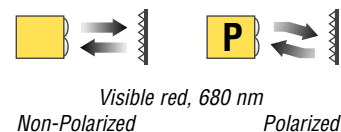
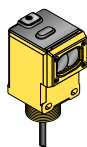
Models	Range	Cable†	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Q452E Emitter	60 m (200')	2-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro-mechanical Relay		
Q45VR2R Receiver		5-wire 2 m (6.5') cable				
Q452EQ Emitter		3-Pin Mini-style QD				
Q45VR2RQ Receiver		5-Pin Mini-style QD				

† 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., Q452E W/30). A model with a QD connector requires a mating cable; see page 9.

**IMPORTANT: SEE SAFETY USE WARNING ON BACK PAGE**

# Q45VR2 Series — ac-Voltage Sensors

The visible red sensing beam of these sensors makes them very easy to align. Model Q45VR2LP polarizes the emitted light and filters out unwanted reflections, making sensing possible in applications otherwise considered unsuited to retroreflective sensing. Specified using the model BRT-3 3" reflector (see the Accessories section of your current Banner Photoelectric Sensors catalog for further information).

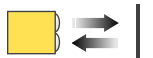


## Retroreflective-Mode Models

Models	Range	Cable <sup>†</sup>	Supply Voltage	Output Type	Excess Gain	Beam Pattern
<b>Non-Polarized</b>						
Q45VR2LV	0.08 to 9 m (3" to 30')	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro- mechanical Relay		
Q45VR2LVQ		5-Pin Mini-style QD				
<b>Polarized</b>						
Q45VR2LP	0.15 to 6 m (6" to 20')	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro- mechanical Relay		
Q45VR2LPQ		5-Pin Mini-style QD				

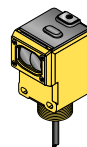
<sup>†</sup> 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., Q45VR2LV W/30). A model with a QD connector requires a mating cable; see page 9.

# Q45VR2 Series — ac-Voltage Sensors



Infrared, 880 nm

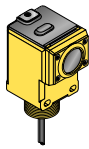
These diffuse-mode models detect objects by sensing the reflection of their own emitted light. Ideal for use when the reflectivity and profile of the object to be sensed are sufficient to return a large percentage of emitted light back to the sensor. Model Q45VR2DX is the first choice for diffuse-mode applications when there are no background objects to falsely return light.



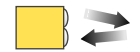
## Diffuse-Mode Models

Models	Range	Cable†	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
<b>Short Range</b>						
Q45VR2D	45 cm (18")	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro- mechanical Relay		
Q45VR2DQ		5-Pin Mini-style QD				
<b>Long Range</b>						
Q45VR2DL	1.8 m (6')	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro- mechanical Relay		
Q45VR2DLQ		5-Pin Mini-style QD				
<b>High Power</b>						
Q45VR2DX	3 m (10')	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro- mechanical Relay		
Q45VR2DXQ		5-Pin Mini-style QD				

# Q45VR2 Series — ac-Voltage Sensors



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

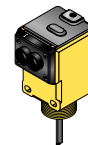
## Convergent-Mode Models

Models	Focus	Cable†	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Q45VR2CV	38 mm (1.5") Spot Size at Focus: 1.3 mm (0.05")	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro-mechanical Relay		
Q45VR2CVQ		5-Pin Mini-style QD				
Q45VR2CV4	100 mm (4") Spot Size at Focus: 1.5 mm (0.06")	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro-mechanical Relay		
Q45VR2CV4Q		5-Pin Mini-style QD				

† 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., Q45VR2CV W/30). A model with a QD connector requires a mating cable; see page 9.

# Q45VR2 Series — ac-Voltage Sensors

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 (.020") dia. may be used successfully for diffuse-mode sensing when using sensor model Q45VR2F(Q). For more information on compatible glass fiber optics, refer to your current Banner Photoelectric Sensors catalog.

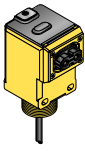


Infrared, 880 nm and Visible Red, 650 nm

## Glass Fiber-Optic Models

Models	Range	Cable†	Supply Voltage	Output Type	Excess Gain		Beam Pattern	
					Diffuse mode performance based on 90% reflectance white test card			
<b>Infrared, 880 nm</b>								
Q45VR2F	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro-mechanical Relay				
Q45VR2FQ		5-Pin Mini-style QD						
<b>Visible Red, 650 nm</b>								
Q45VR2FV	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro-mechanical Relay				
Q45VR2FVQ		5-Pin Mini-style QD						

# Q45VR2 Series — ac-Voltage Sensors



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, refer to your current Banner Photoelectric Sensors catalog.



Visible red, 660 nm

## Plastic Fiber-Optic Models

Models	Range	Cable†	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Q45VR2FP	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') cable	90 to 250V ac	SPDT Electro- mechanical Relay		
Q45VR2FPQ		5-Pin Mini-style QD				

† 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., **Q45VR2FP W/30**). A model with a QD connector requires a mating cable; see page 9.

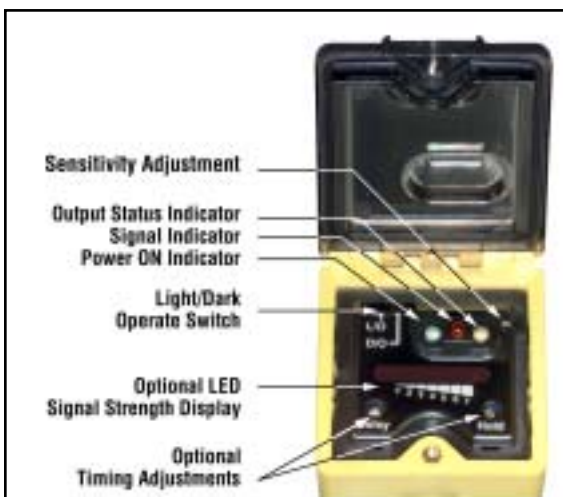


Figure 1. Q45VR2 Series sensor indicators and controls

## 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. The Power indicator lights whenever power is applied to the sensor. The Signal LED lights whenever 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\*. The Output indicator lights whenever 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.

Also located beneath the sensor's o-ring-sealed cover are controls for Light/Dark Operate selection and Sensitivity adjustment.

\* US patent no. 4356393

# Q45VR2 Series — ac-Voltage Sensors

## Specifications

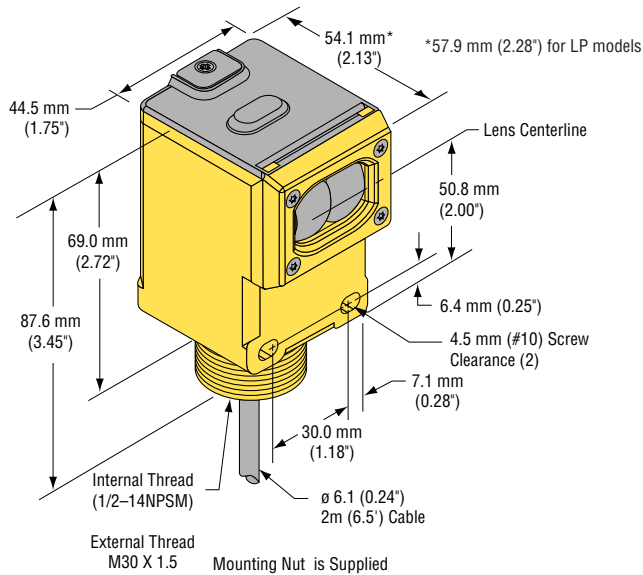
<b>Supply Voltage and Current</b>	90 to 250V ac (50/60 Hz). Average current 20 mA. Peak current 500 mA at 120V ac, 750 mA at 250V ac.
<b>Supply Protection Circuitry</b>	Protected against transient voltages.
<b>Output Configuration</b>	SPDT (Single-Pole Double-Throw) electromechanical relay output. All models except emitters.
<b>Output Rating</b>	<b>Max. switching power (resistive load):</b> 150W, 600VA <b>Max. switching voltage (resistive load):</b> 250V ac, 30V dc <b>Max. switching current (resistive load):</b> 5A @ 250V ac <b>Min. voltage and current:</b> 5V dc, 0.1mA <b>Mechanical life of relay:</b> 10,000,000 operations <b>Electrical life of relay at full resistive load:</b> 100,000 operations
<b>Output Protection Circuitry</b>	Protected against false pulse on power-up
<b>Output Response Time</b>	15 milliseconds ON and OFF (NOTE: 100 millisecond delay on power-up. Output is de-energized during this time.)
<b>Repeatability</b>	<b>Opposed mode:</b> 0.25 milliseconds <b>All other sensing modes:</b> 0.5 milliseconds Response time and repeatability specifications are independent of signal strength.
<b>Adjustments</b>	Beneath 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 (see page 10).
<b>Indicators</b>	Indicator LEDs are clearly visible beneath a raised transparent Lexan® dome on top of the sensor. <b>Power (green) LED</b> lights whenever 90 to 250V ac power is applied <b>Signal (red) AID™ System LED</b> lights whenever the sensor sees its modulated light source, and pulses at a rate proportional to the strength of the received light signal <b>Load (yellow) LED</b> lights whenever the output relay is energized <b>Optional 7-element LED</b> signal strength display modules
<b>Construction</b>	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" NPS integral internal conduit thread.
<b>Environmental Rating</b>	NEMA 6P, IEC IP67
<b>Connections</b>	PVC-jacketed 2-wire (emitters) or 5-wire (all others) 2 m (6.5') or 9 m (30') unterminated cables, or 3-pin (emitters) or 5-pin (all others) Mini-style quick-disconnect (QD) fittings are available ("Q" - suffix models). QD cables are ordered separately; see page 10.
<b>Operating Conditions</b>	<b>Temperature:</b> -40° to +70°C (-40° to +158°F) <b>Maximum relative humidity:</b> 90% at 50°C (non-condensing)
<b>Application Notes</b>	Transient suppression is recommended for contacts switching inductive loads. Optional output timing modules are available. See page 10 for more information.
<b>Certifications</b>	 

# Q45VR2 Series — ac-Voltage Sensors

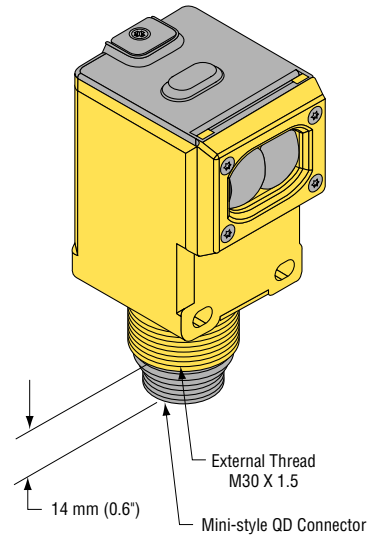
## Dimensions

### Opposed, Retro, and Diffuse Sensing Modes (model suffix E, R, D, DL, DX, LP and LV)

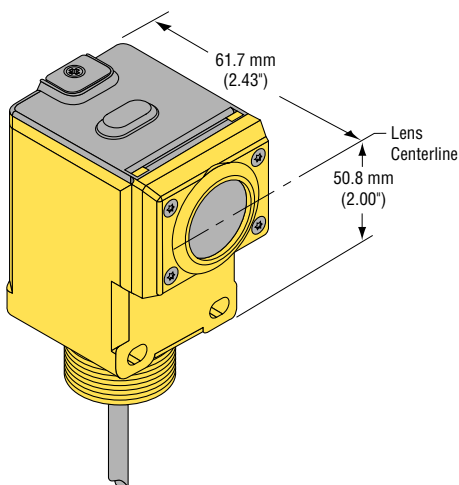
#### Cabled



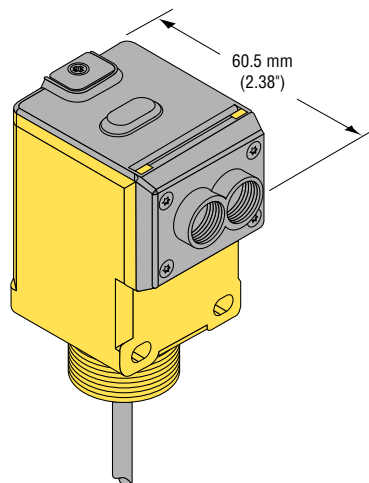
#### Quick-Disconnect



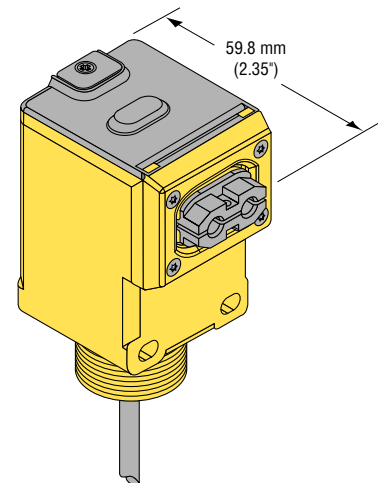
### Convergent Sensing Mode (model suffix CV and CV4)



### Glass Fiber Optic (model suffix F and FV)



### Plastic Fiber Optic (model suffix FP)

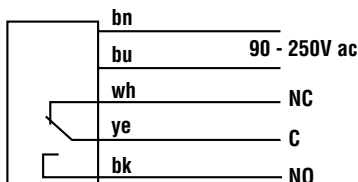




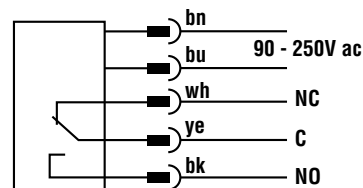
# Q45VR2 Series — ac-Voltage Sensors

## Hookups

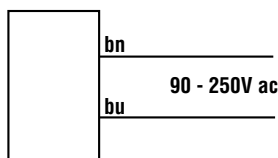
### Q45VR2 Sensors with Attached Cable



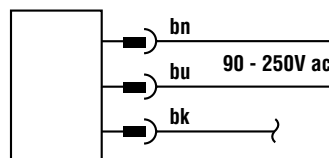
### Q45VR2 Sensors with Quick-Disconnect 5-Pin Mini-Style (model suffix Q)



### Q452E Emitter with Attached Cable



### Q452E Emitter with Quick-Disconnect 3-Pin Mini-Style (model suffix Q)



## Accessories

### Quick-Disconnect Cables

**Cable:** PVC jacket, polyurethane connector body, nylon coupling nut  
**Conductors:** 18 AWG high-flex stranded, PVC insulation, gold plated contacts  
**Temperature:** -40° to +80°C (-40° to +176°F)  
**Voltage Rating:** 250V ac/300V dc

Style	Model	Length	Dimensions	Pin-out
3-Pin Mini-style Straight	<b>MBCC-306</b> <b>MBCC-312</b> <b>MBCC-330</b>	2 m (6.5') 4 m (12') 9 m (30')		
5-Pin Mini-style Straight	<b>MBCC-506</b> <b>MBCC-512</b> <b>MBCC-530</b>	2 m (6.5') 4 m (12') 9 m (30')		

Contact factory for right-angle connectors.

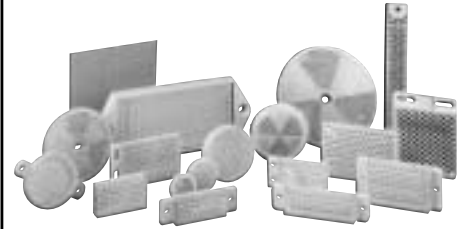
# Q45VR2 Series — ac-Voltage Sensors

## Accessories

### Retroreflective Targets

Banner offers a wide selection of high-quality retroreflective targets. See the Accessories section of your current Banner Photoelectric Sensors catalog for complete information.

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



### 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 which 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. See the data sheet packed with the module for more information.

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

# Q45VR2 Series — ac-Voltage Sensors

Mounting Brackets		
Model	Description	Dimensions
<b>SMB30C</b>	<ul style="list-style-type: none"> <li>30 mm split clamp, black reinforced thermoplastic polyester bracket</li> <li>Stainless steel mounting hardware included</li> </ul>	
<b>SMB30MM</b>	<ul style="list-style-type: none"> <li>30 mm, 11-gauge, stainless steel bracket with curved mounting slots for versatility and orientation</li> <li>Clearance for M6 (1/4") hardware</li> </ul>	
<b>SMB30SC</b>	<ul style="list-style-type: none"> <li>30 mm swivel, black reinforced thermoplastic polyester bracket</li> <li>Stainless steel mounting hardware included</li> </ul>	

# Q45VR2 Series — ac-Voltage Sensors

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**WARRANTY:** Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.



## **WARNING . . . Not To Be Used for Personnel Protection**

**Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.**

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.