BANNER®
the photoelectric specialist

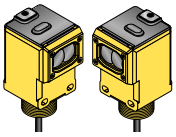
Q45VR3 Series Sensors

Universal voltage photoelectric sensors with electromechanical relay output



Q45VR3 Series Features

- Advanced one-piece photoelectric sensors with outstanding optical performance and extremely rugged design
- Universal supply voltage: 12 to 250V dc or 24 to 250V ac
- Electromechanical relay for economical, high-capacity switching and immunity to electrical noise
- Full line includes opposed, diffuse, retroreflective, convergent, and glass and plastic fiber optic sensing modes
- 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

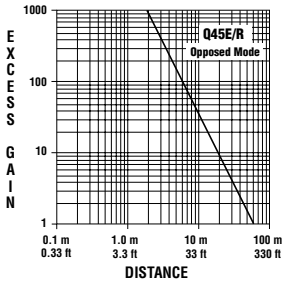
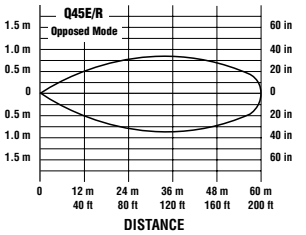


Because of their extremely high excess gain, these opposed-mode sensors are an excellent option for sensing in contaminated or dirty areas, and are also the best choice for long-range sensing.



Infrared, 880 nm

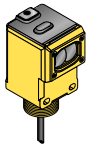
Q45VR3 Series Opposed-Mode Emitter (E) and Receiver (R) Models

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Q453E Emitter **Q45VR3R** Receiver	60 m (200')	2-wire 2m (6.5') 5-wire 2m (6.5')	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		**Effective Beam: 13 mm** 
Q453EQ Emitter **Q45VR3RQ** Receiver		3-Pin Mini-style QD 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., **Q453E W/30**)
A model with a QD connector requires a mating cable; see page 10.

IMPORTANT: SEE SAFETY USE WARNING ON BACK PAGE

Q45VR3 Series

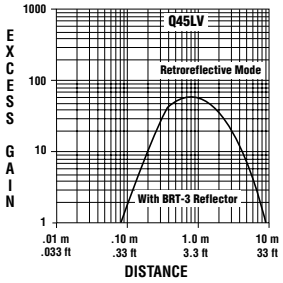
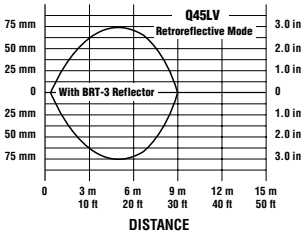
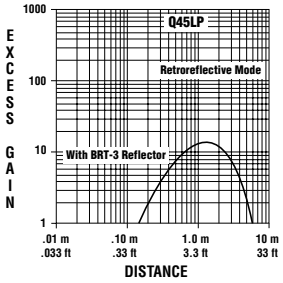
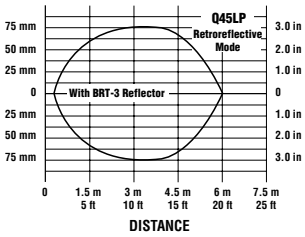


The visible red sensing beam of these sensors makes them very easy to align. Model Q45VR3LP polarizes the emitted light and filters out unwanted reflections, making sensing possible in applications otherwise considered unsuited to retroreflective sensing performance. Specified using the model BRT-3 3" reflector (see the Accessories section of your current Banner Photoelectric Sensors catalog for further information).



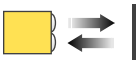
Visible red, 680 nm
Non-Polarized *Polarized*

Q45VR3 Series Retroreflective-Mode Models

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Non-Polarized						
Q45VR3LV **Q45VR3LVQ**	0.08 to 9 m (3" to 30')	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		
Polarized						
Q45VR3LP **Q45VR3LPQ**	0.15 to 6 m (6" to 20')	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		

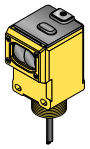
* 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., **Q45VR3LV W/30**)
A model with a QD connector requires a mating cable; see page 10.

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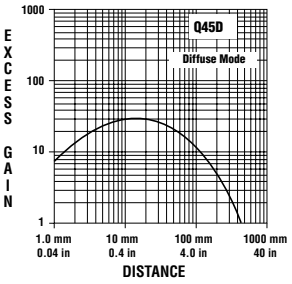
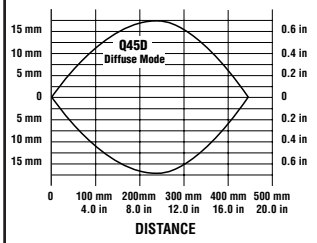
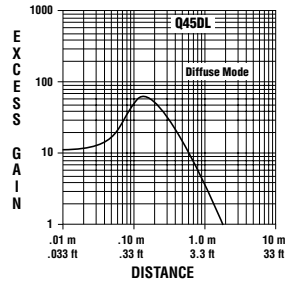
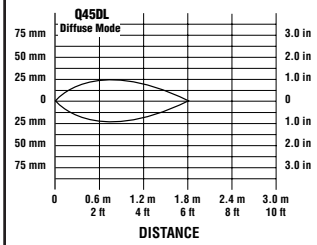
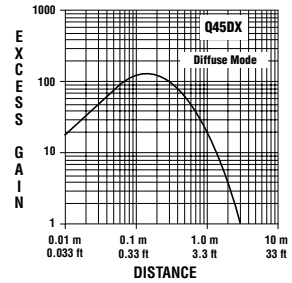
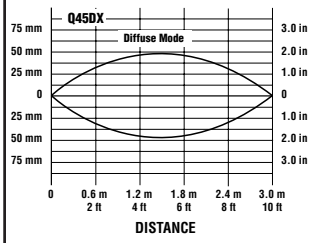


Infrared, 880 nm

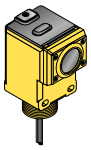
These diffuse-mode models detect objects by sensing the reflection of their own emitted light. Ideal for use when the reflectivity and profile of the object to be sensed are sufficient to return a large percentage of emitted light back to the sensor. Model Q45VR3DX is the first choice for diffuse-mode applications when there are no background objects to falsely return light.



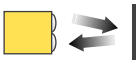
Q45VR3 Series Diffuse-Mode Models

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Short Range						
Q45VR3D **Q45VR3DQ**	45 cm (18")	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		
Long Range						
Q45VR3DL **Q45VR3DLQ**	1. 8 m (6')	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		
High Power						
Q45VR3DX **Q45VR3DXQ**	3 m (10')	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		

Q45VR3 Series

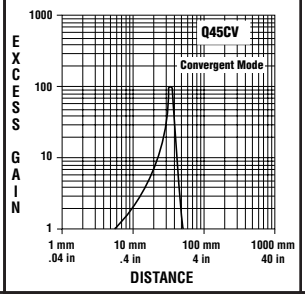
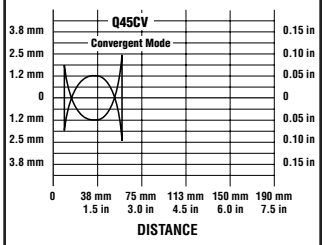
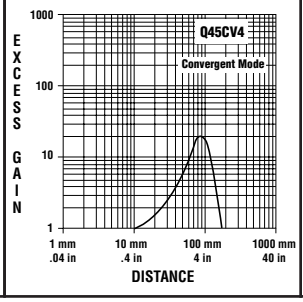
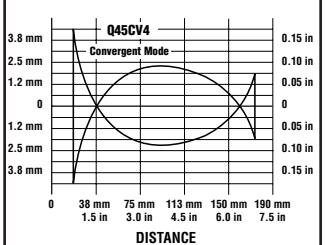


These sensors are ideal for reflective sensing of very small parts or profiles, and can accurately sense the position of parts approaching from the side. Will ignore all but highly reflective objects that are outside the sensing range.



Visible red. 680 nm

Q45VR3 Series Convergent-Mode Models

Models	Focus	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Q45VR3CV **Q45VR3CVQ**	38 mm (1.5") **Spot Size at Focus:** 1.3 mm (0.05")	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		
Q45VR3CV4 **Q45VR3CV4Q**	100 mm (4") **Spot Size at Focus:** 1.5 mm (0.06")	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay		

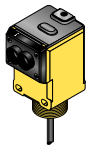
* 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., **Q45VR3CV W/30**)
A model with a QD connector requires a mating cable; see page 10.

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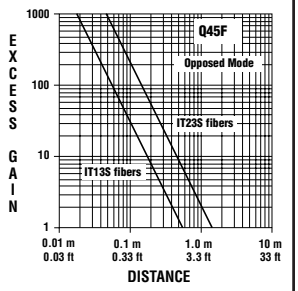
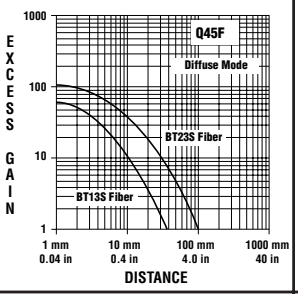
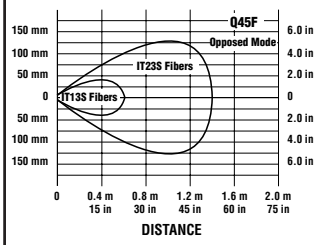
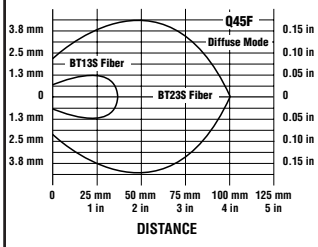
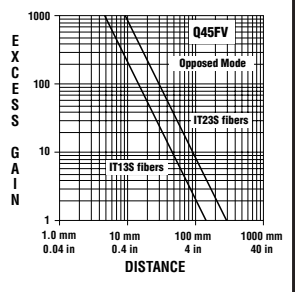
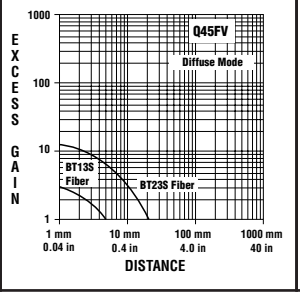
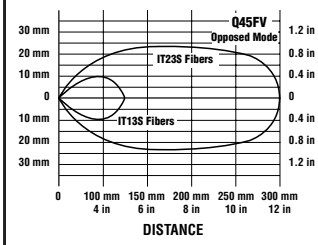
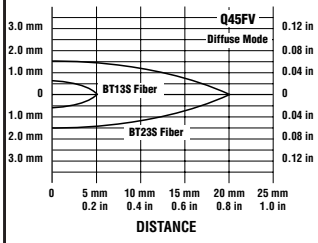


Infrared, 880 nm and Visible Red, 650 nm

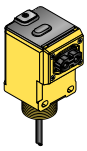
These models are an excellent choice for glass fiber optic applications where faster sensor response is not important. Their high excess gain means that opposed individual fibers can operate reliably in many very hostile environments. Also, special miniature bifurcated fiber optic assemblies with bundle sizes as small as 0.5 mm (.020") dia. may be used successfully for diffuse-mode sensing when using sensor model Q45VR3F(Q). For more information on compatible glass fiber optics, refer to your current Banner Photoelectric Sensors catalog.



Q45VR3 Series 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	
Infrared, 880 nm						
Q45VR3F **Q45VR3FQ**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay	 	 
Visible Red, 650 nm						
Q45VR3FV **Q45VR3FVQ**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay	 	 

Q45VR3 Series

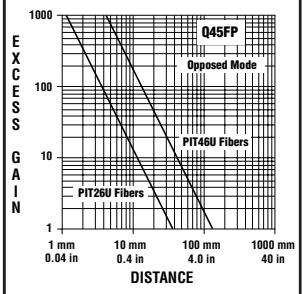
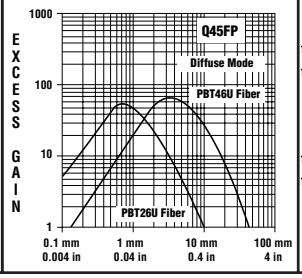
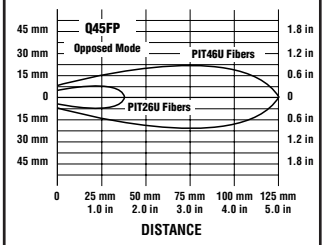
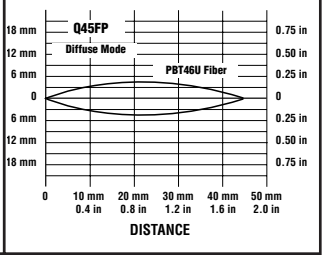


Lower in cost than glass fiber optics, plastic fiber optics are ideal for use in situations where environmental conditions allow (for example, low levels of acids, alkalis, and solvents). Most are easily cut to length in the field, and are available in a variety of sensing end styles. For more information on compatible plastic fiber optics, refer to your current Banner Photoelectric Sensors catalog.



Visible red, 660 nm

Q45VR3 Series 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	
Q45VR3FP **Q45VR3FPQ**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-Pin Mini-style QD	Universal 12 - 250V dc or 24 - 250V ac	SPDT Electro-mechanical Relay	 	 

* 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., **Q45VR3FP W/30**)
A model with a QD connector requires a mating cable; see page 10.

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Q45VR3 Series Specifications

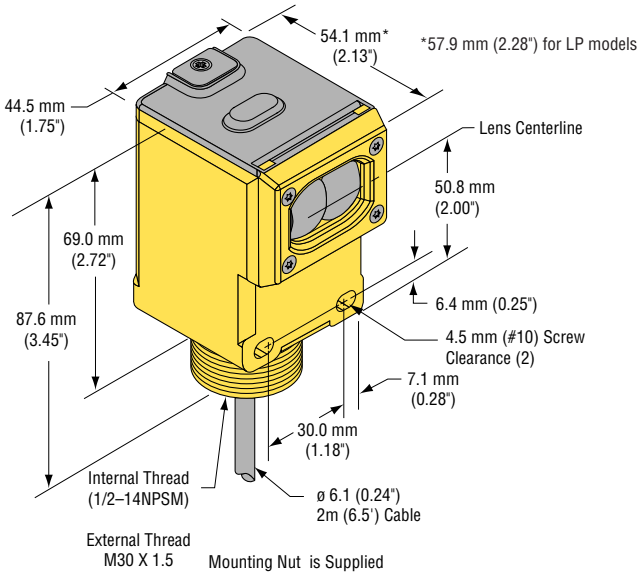
Supply Voltage and Current	Universal voltage: 24 to 250V ac, 50/60 Hz or 12 to 250V dc (1.5 watts maximum)
Supply Protection Circuitry	Protected against transient voltages. DC hookup is without regard to polarity.
Output Configuration	SPDT (Single-Pole, Double-Throw) electromechanical relay output. All models except emitters.
Output Rating	**Max. switching power (resistive load):** 1250VA, 150W **Max. switching voltage (resistive load):** 250V ac, 125V dc **Max. switching current (resistive load):** 5A @ 250V ac, 5A @ 30V dc derated to 200 mA @ 125V dc **Min. voltage and current:** 5V dc, 10mA **Mechanical life of relay:** 50,000,000 operations **Electrical life of relay at full resistive load:** 100,000 operations
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	15 milliseconds ON and OFF (NOTE: 100 millisecond delay on power-up. Relay is de-energized during this time.)
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 (see page 10).
Indicators	Indicator LEDs are clearly visible beneath a raised transparent Lexan® dome on top of the sensor. **Power (green) LED** lights whenever 24 to 250V ac, or 12 to 250V 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 (yellow) 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 Lexan® 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.
Environmental Rating	NEMA 6P, IEC IP67
Connections	PVC-jacketed 2 m (6.5') or 9 m (30') unterminated cables, or Mini-style quick-disconnect (QD) fittings are available ("Q"- suffix models). QD cables are ordered separately. See page 10.
Operating Conditions	**Temperature:** -25° to +55° C (-13° to +131°F) **Maximum relative humidity:** 90% at 50°C (non-condensing)
Application Notes	Transient suppression is recommended for contacts switching inductive loads. Optional output timing modules are available. See page 10 for more information.
Certifications	

Lexan® is a registered trademark of General Electric Co.

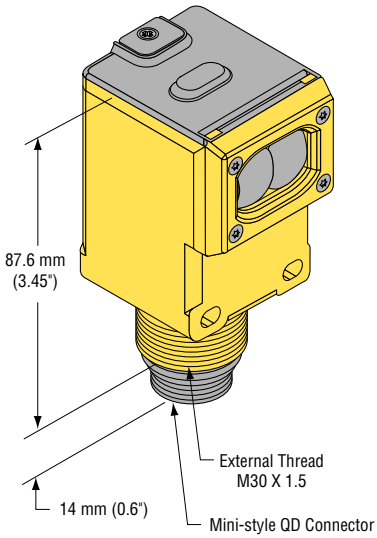
Q45VR3 Series Dimensions

Q45VR3 Series Sensors – Opposed, Retro, and Diffuse Sensing Modes (model suffix E, R, D, DL, DX, LP & LV)

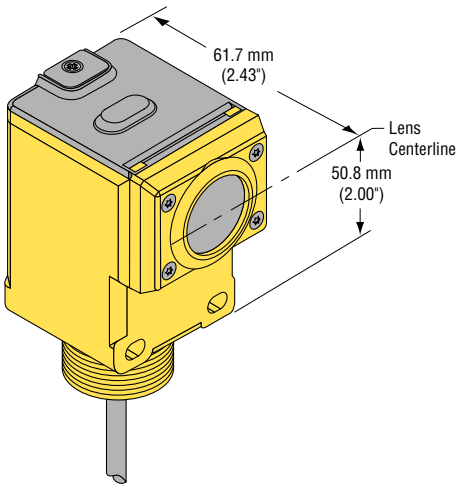
Cabled



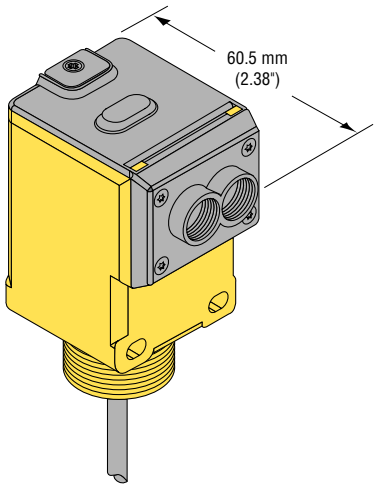
Quick-Disconnect



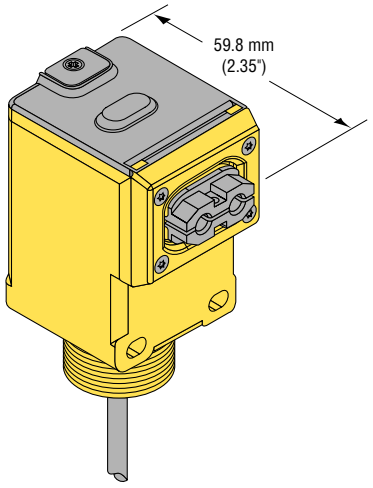
Convergent Sensing Mode (model suffix CV & CV4)



Glass Fiber Optic (model suffix F and FV)



Plastic Fiber Optic (model suffix FP)



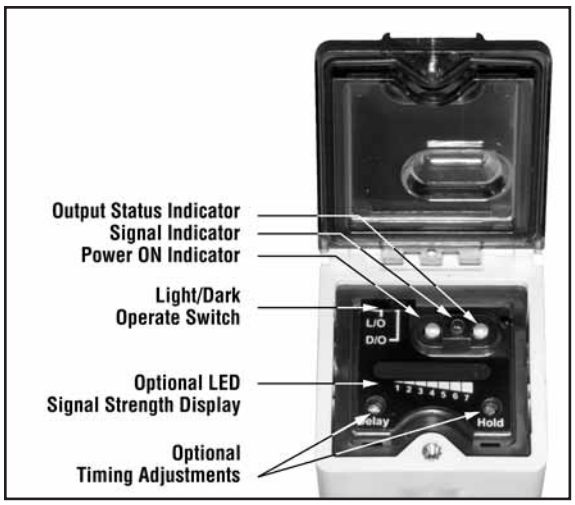


Figure 1. Indicators and controls on the Q45VR3 Series Sensors

Q45VR3 Series Indicators and Controls

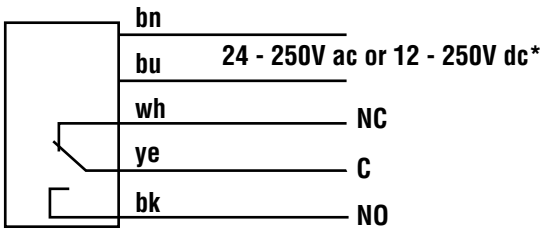
Status indicator LEDs for Power, Signal and Output are clearly visible beneath a raised dome in the sensor's transparent o-ring-sealed Lexan® cover. The Power indicator lights whenever power is applied to the sensor. The Signal LED lights whenever the sensor sees its modulated light source, and pulses 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 relay is energized. 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.

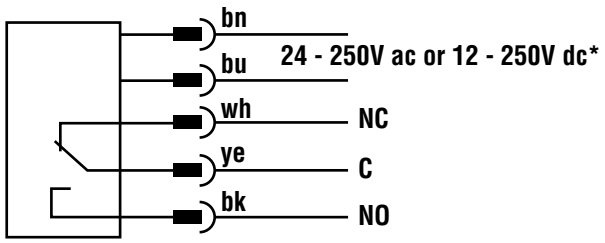
* US patent no. 4356393

Q45VR3 Series Hookups

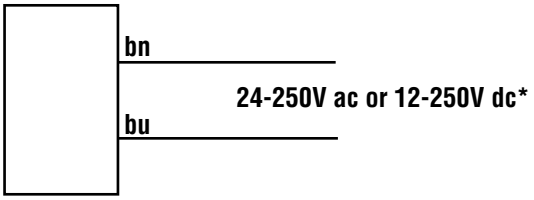
Q45VR3 Sensors with Attached Cable



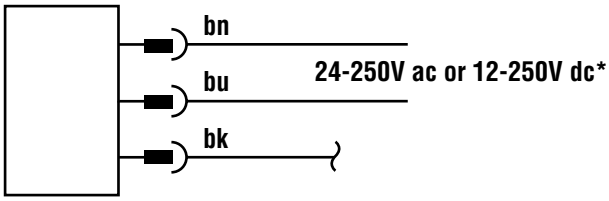
Q45VR3 Sensors with Quick-Disconnect 5-Pin Mini-Style (model suffix Q)



Q453E Emitters with Attached Cable



Q453EQ Emitters with Quick-Disconnect 3-Pin Mini-Style



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

Quick-Disconnect (QD) Option

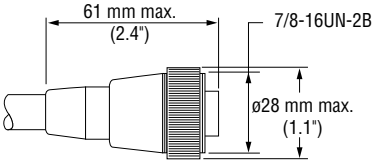
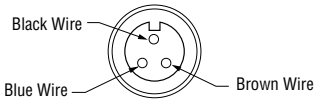
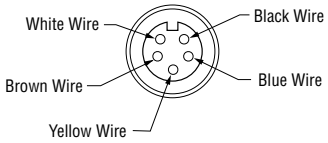
AC Q45VR3 Series sensors are sold with either a 2 m (6.5') or a 9 m (30') attached PVC-covered cable, or with a 3-pin Mini-style (opposed mode emitter) or 5-pin Mini-style Quick-Disconnect (QD) cable fitting.

Mini-style QD sensors are identified by the suffix "Q" in their model number suffix. Mating cables for QD Q45VR3 sensors are specified on page 10.

Accessories

Mini-Style Quick-Disconnect Cables

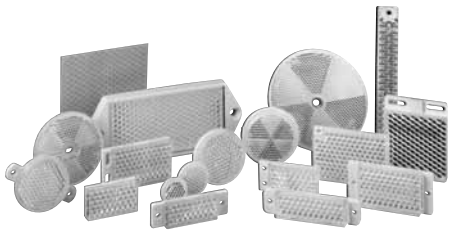
Cable: PVC jacket, polyurethane connector body, nylon coupling nut
Conductors: 18 AWG high-flex stranded, PVC insulation, gold plated contacts
Temperature: -40° to +80°C (-40 to +176°F)
Voltage Rating: 250V ac/300V dc

Style	Model	Length	Dimensions	Pin-Out (Female View)
3-Pin Female Pin-out Straight	**MBCC-306** **MBCC-312** **MBCC-330**	2 m (6.5') 4 m (12') 9 m (30')		
5-Pin Female Pin-out Straight	**MBCC-506** **MBCC-512** **MBCC-530**	2 m (6.5') 4 m (12') 9 m (30')		

Retroreflective Targets

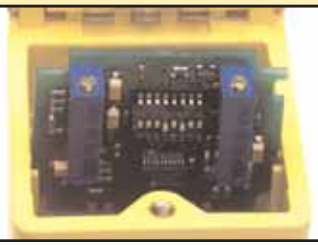
Banner offers a wide selection of high-qualitity retroreflective targets. See the Accessories section of your current Banner Photoelectric Sensors catalog for complete information.

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



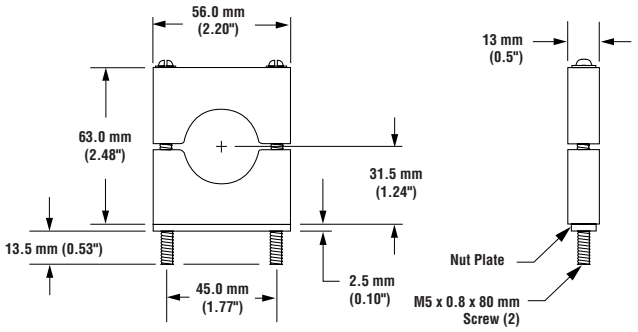
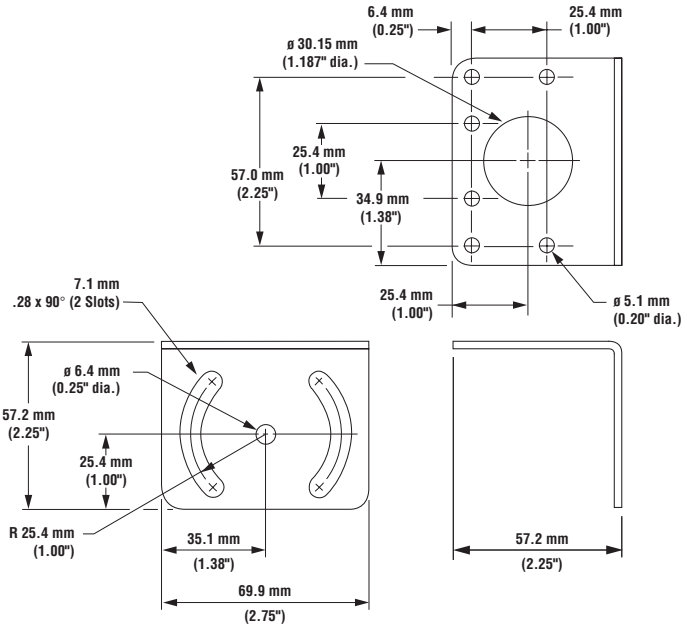
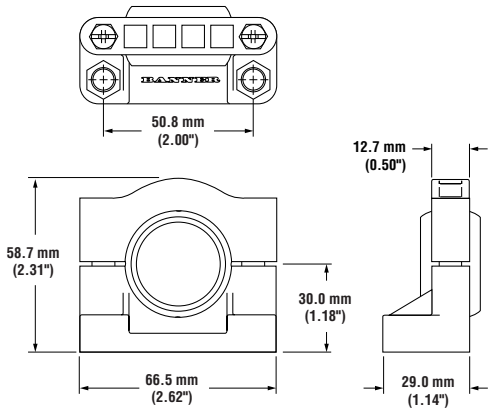
Output Timing Logic and Signal Strength Display Modules

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 “finer” 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 Q45VR3 sensors. See the data sheet packed with the module for more information.

Model	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)	

Banner Engineering Corp. • Minneapolis, U.S.A.
www.bannerengineering.com • Tel: 763.544.3164

Mounting Brackets

Model	Description	Dimensions
SMB30C	• 30 mm split clamp, black PBT bracket • Stainless steel mounting hardware included	
SMB30MM	• 30 mm, 11-gauge, stainless steel bracket with curved mounting slots for versatility and orientation • Clearance for M6 (¼") hardware	
SMB30SC	• 30 mm swivel, black PBT bracket • Stainless steel mounting hardware included	

Warranty

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.

THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED (INCLUDING, WITHOUT LIMITATION, ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), AND WHETHER ARISING UNDER COURSE OF PERFORMANCE, COURSE OF DEALING OR TRADE USAGE.

This Warranty is exclusive and limited to repair or, at the discretion of Banner Engineering Corp., replacement. **IN NO EVENT SHALL BANNER ENGINEERING CORP. BE LIABLE TO BUYER OR ANY OTHER PERSON OR ENTITY FOR ANY EXTRA COSTS, EXPENSES, LOSSES, LOSS OF PROFITS, OR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES RESULTING FROM ANY PRODUCT DEFECT OR FROM THE USE OR INABILITY TO USE THE PRODUCT, WHETHER ARISING IN CONTRACT OR WARRANTY, STATUTE, TORT, STRICT LIABILITY, NEGLIGENCE, OR OTHERWISE.**

Banner Engineering Corp. reserves the right to change, modify or improve the design of the product without assuming any obligations or liabilities relating to any product previously manufactured by Banner Engineering Corp.

BANNER®
the photoelectric specialist

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.