VALU-BEAM 915 Series Sensors

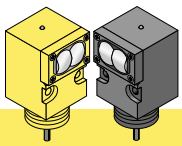
With Electromechanical Relay Output

VALU-BEAM 915 Series Features

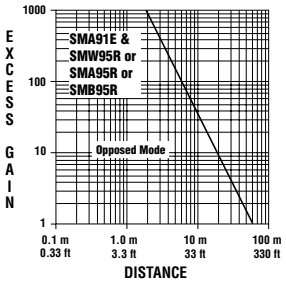
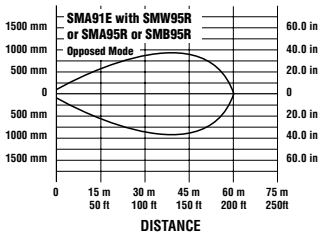
- Models available for:
  - 12 to 28V ac/dc
  - 90 to 130V ac
  - 210 to 250V ac
- SPDT electromechanical relay output is rated for up to 5 amps switching capacity
- Rear panel sensitivity adjustment; top-mounted alignment indicator
- Visible red beam on most models, simplifies alignment
- Choose models with integral 2 m (6.5') cable or Mini-style QD (quick-disconnect) connector; 9 m (30') cables are also available

Infrared, 880 nm

Opposed-mode sensors have higher excess gain than other models, and so should be used whenever possible. Visible red "tracer beam" simplifies sensor alignment.



915 Series Opposed-Mode Emitter (E) and Receiver (R)

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
SMA91E **SMW95R** **SMA91EQD** **SMW95RQD**	60 m (200')	2 m (6.5') 2 m (6.5') 3-Pin Mini QD 5-Pin Mini QD	**Emitter:** 10 to 250V ac/dc **Receiver:** 12 to 28V ac/dc	SPDT E/m Relay		Effective Beam: 13 mm 
SMA91E **SMA95R** **SMA91EQD** **SMA95RQD**		2 m (6.5') 2 m (6.5') 3-Pin Mini QD 5-Pin Mini QD	**Emitter:** 10 to 250V ac/dc **Receiver:** 90 to 130V ac			
SMA91E **SMB95R** **SMA91EQD** **SMB95RQD**		2 m (6.5') 2 m (6.5') 3-Pin Mini QD 5-Pin Mini QD	**Emitter:** 10 to 250V ac/dc **Receiver:** 210 to 250V ac			

*NOTES:

- 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g. **SMA91E W/30**).
- A model with a QD connector requires an accessory mating cable. See page 8 for more information.

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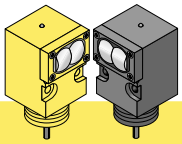
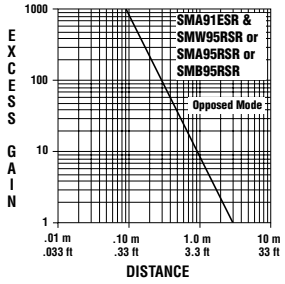
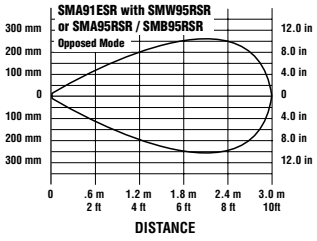
VALU-BEAM – 915 Series



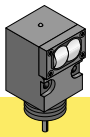
Opposed-mode sensors have higher excess gain than other models, and so should be used whenever possible. ESR and RSR models' small effective beam size enables them to reliably detect relatively small objects; their wide beam angle allows forgiving alignment within the 10' range.

Infrared, 880 nm

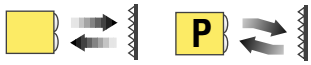
915 Series Opposed-Mode Emitter (E) and Receiver (R)

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
SMA91ESR **SMW95RSR** **SMA91ESRQD** **SMW95RSRQD**	3 m (10')	2 m (6.5') 2 m (6.5') 3-Pin Mini QD 5-Pin Mini QD	**Emitter:** 10 to 250V ac/dc **Receiver:** 12 to 28V dc	SPDT E/m Relay		Effective Beam: 3.5 mm 
SMA91ESR **SMA95RSR** **SMA91ESRQD** **SMA95RSRQD**		2 m (6.5') 2 m (6.5') 3-Pin Mini QD 5-Pin Mini QD	**Emitter:** 10 to 250V ac/dc **Receiver:** 90 to 130V ac			
SMA91ESR **SMB95RSR** **SMA91ESRQD** **SMB95RSRQD**		2 m (6.5') 2 m (6.5') 3-Pin Mini QD 5-Pin Mini QD	**Emitter:** 10 to 250V ac/dc **Receiver:** 210 to 250V ac			

Non-Polarized, Polarized

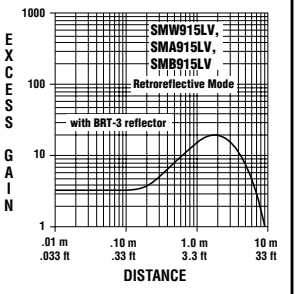
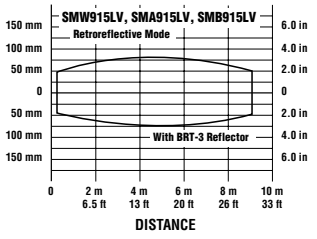
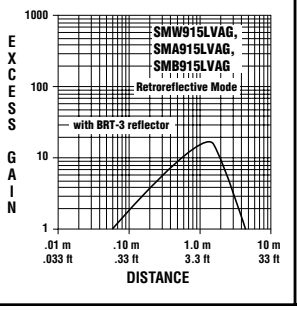
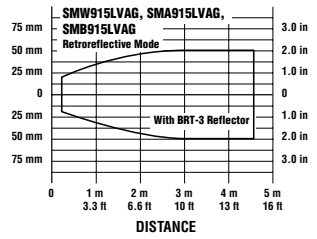


An excellent alternative when opposed-mode sensing is not possible. A visible red beam reduces the potential for false signals from reflective objects ("proxing") and simplifies alignment. AG (anti-glare) models polarize the emitted light and filter out unwanted reflections.



Non-Polarized *Visible red, 650 nm Polarized*

915 Series Retroreflective Mode

Models	Range**	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Non-Polarized						
SMW915LV **SMW915LVQD**	0.15 to 9 m (6" to 30')	2 m (6.5') 5-Pin Mini QD	12 to 28V ac/dc	SPDT E/m Relay		
SMA915LV **SMA915LVQD**		2 m (6.5') 5-Pin Mini QD	90 to 130V ac			
SMB915LV **SMB915LVQD**		2 m (6.5') 5-Pin Mini QD	210 to 250V ac			
Polarized						
SMW915LVAG **SMW915LVAGQD**	0.3 to 4.5 m (1' to 15')	2 m (6.5') 5-Pin Mini QD	12 to 28V ac/dc	SPDT E/m Relay		
SMA915LVAG **SMA915LVAGQD**		2 m (6.5') 5-Pin Mini QD	90 to 130V ac			
SMB915LVAG **SMB915LVAGQD**		2 m (6.5') 5-Pin Mini QD	210 to 250V ac			

**Retroreflective range is specified using one model BRT-3 retroreflector (3" diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) in use. See your Banner Photoelectric catalog for more information.

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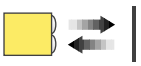
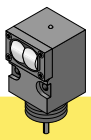
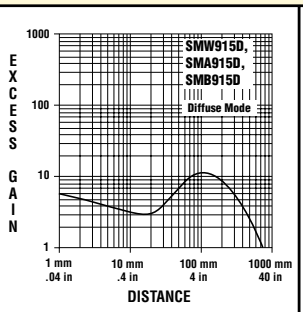
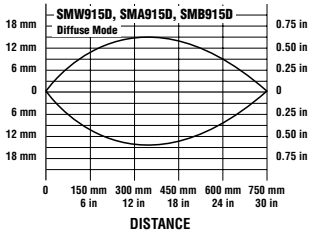
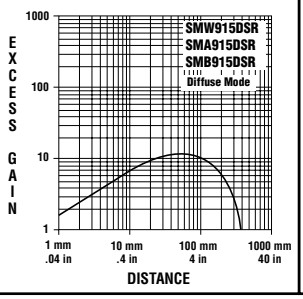
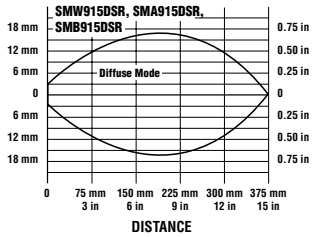


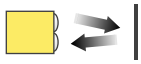
Infrared, 880 nm

These sensors detect the reflection of their own light from the object being sensed, and so require no special reflectors. They are ideal for applications where the reflectivity and profile of the object are sufficient to return a large portion of the emitted light back to the sensor. Choose DSR models for best response to objects at close range.



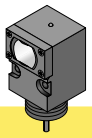
915 Series Diffuse Mode

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
SMW915D **SMW915DQD**	760 mm (30")	2 m (6.5') 5-Pin Mini QD	12 to 28V ac/dc	SPDT E/m Relay		
SMA915D **SMA915DQD**		2 m (6.5') 5-Pin Mini QD	90 to 130V ac			
SMB915D **SMB915DQD**		2 m (6.5') 5-Pin Mini QD	210 to 250V ac			
SMW915DSR **SMW915DSRQD**	380 mm (15")	2 m (6.5') 5-Pin Mini QD	12 to 28V ac/dc	SPDT E/m Relay		
SMA915DSR **SMA915DSRQD**		2 m (6.5') 5-Pin Mini QD	90 to 130V ac			
SMB915DSR **SMB915DSRQD**		2 m (6.5') 5-Pin Mini QD	210 to 250V ac			

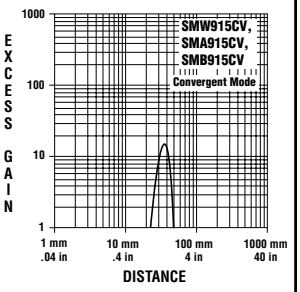
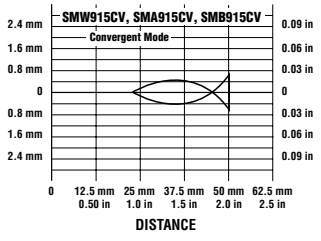


Visible red, 650 nm

Due to their narrow depth of field, these sensors excel at detecting small objects only a fraction of an inch in front of their backgrounds. The precise 0.06" dia. sensing spot focuses 1.5" in front of the sensor lens. The visible red beam simplifies alignment.



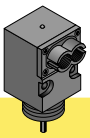
915 Series Convergent Mode

Models	Focus	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
SMW915CV **SMW915CVQD**	38 mm (1.5")	2 m (6.5') 5-Pin Mini QD	12 to 28V ac/dc	SPDT E/m Relay		
SMA915CV **SMA915CVQD**	**Spot Size at Focus:** 1.5 mm (0.06")	2 m (6.5') 5-Pin Mini QD	90 to 130V ac			
SMB915CV **SMB915CVQD**		2 m (6.5') 5-Pin Mini QD	210 to 250V ac			

*NOTES:

- 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g. **SMW915CV W/30**).
- A model with a QD connector requires an accessory mating cable. See page 8 for more information.

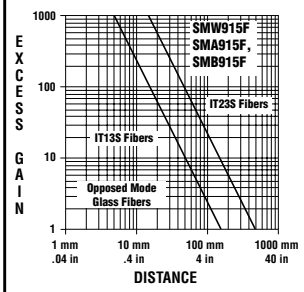
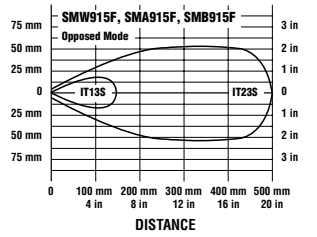
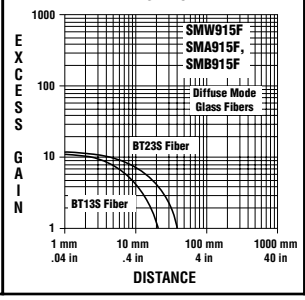
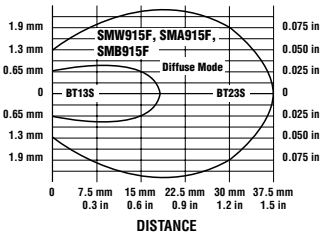
VALU-BEAM – 915 Series

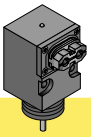


An excellent option where sensing must be accomplished in tight, inaccessible or volatile areas. Withstands vibration and shock; immune to electrical noise. Glass fibers withstand high temperatures, extreme moisture and corrosive materials. Not recommended for applications requiring bending or repeated flexing of fibers.

Infrared, 880 nm

915 Series Glass Fiber Optic Sensors

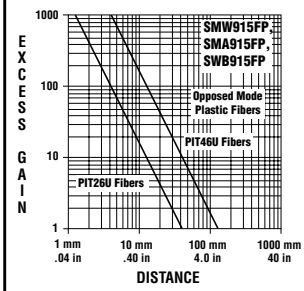
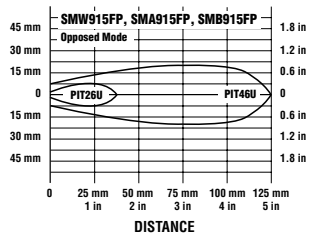
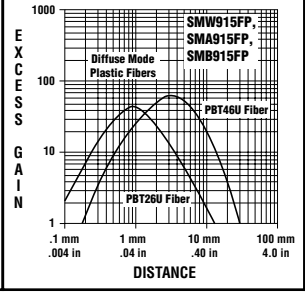
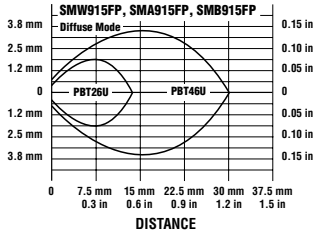
Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
SMW915F **SMW915FQD**	Range varies by sensing mode and fiber used.	2 m (6.5') 5-Pin Mini QD	12 to 28V ac/dc	SPDT E/m Relay		
SMA915F **SMA915FQD**		2 m (6.5') 5-Pin Mini QD	90 to 130V ac			
SMB915F **SMB915FQD**		2 m (6.5') 5-Pin Mini QD	210 to 250V ac			



Compatible with most Banner plastic fiber optic assemblies. Excellent option for sensing in tight, inaccessible or volatile areas. Withstands vibration and shock; immune to electrical noise. Functions well at temperatures between -30° and +70°C (-20° and +158°F), withstands repeated flexing. Most are easy to shorten in the field. Not recommended for severe environments.

Visible red, 650 nm

915 Series Plastic Fiber Optic Sensors

Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
SMW915FP **SMW915FPQD**	Range varies by sensing mode and fiber used.	2 m (6.5') 5-Pin Mini QD	12 to 28V ac/dc	SPDT E/m Relay		
SMA915FP **SMA915FPQD**		2 m (6.5') 5-Pin Mini QD	90 to 130V ac			
SMB915FP **SMB915FPQD**		2 m (6.5') 5-Pin Mini QD	210 to 250V ac			

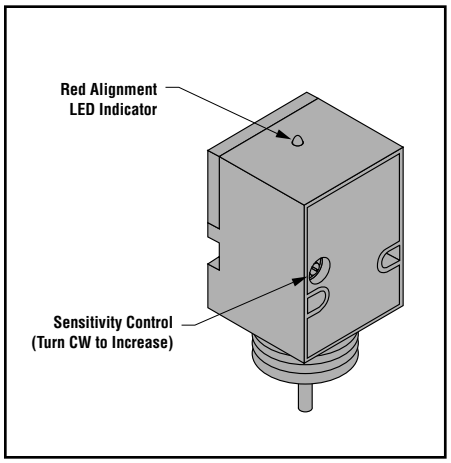


Figure 1. VALU-BEAM 915 Series sensor features

915 Series Sensors Description

VALU-BEAM® 915 Series sensors are rugged, self-contained photoelectric sensors designed for especially demanding industrial applications where economy, performance, and durability are important. They feature SPDT (single-pole, double-throw, form "C") electromechanical relay output and operate from a variety of supply voltages.

Powerful, modulated LED light sources provide a wide sensing range. The sensors are extremely robust; being totally epoxy-encapsulated, they are highly resistant to shock, vibration, moisture and corrosion.

915 Series sensors may be mounted from either the front or the rear, using the two through-mount holes, or by their threaded base (mounting nut supplied), making them ideal for conveyor and other production line applications.

The easy-to-see top-mounted red LED indicator (see Figure 1) simplifies alignment and system monitoring. It lights whenever the sensor "sees" its own modulated light source. Turn the Sensitivity control (on the sensor back panel) clockwise to increase gain.

Light or dark operate is selected by connecting the appropriate output relay contact to the circuit under control (see Hookups, page 7).

Fiber Optic Models

Banner offers a complete line of both plastic and glass fiber optic assemblies to fit VALU-BEAM 915 Series fiber optic model sensors. Glass fiber assemblies are recommended for environments with high temperatures, extreme moisture and corrosive materials; they are not recommended for applications requiring bending or repeated flexing of fibers.

Plastic fiber optics are an economical alternative for piping photoelectric sensing light into and out of confined areas where the environmental conditions allow, and they can withstand repeated flexing. Banner plastic fiber optic assemblies are available in several core sizes; the highest excess gain will be obtained with the larger fiber cores. Standard plastic fiber optic assemblies are unterminated on the control (sensor) end. These assemblies are approximately 2 m (6') long and may be used as-is, or may be cut to length as needed, using the supplied fiber cutter. Cutting and installation instructions also are included with the fiber assembly.

Both plastic and glass fibers are offered in individual and bifurcated styles. Individual fibers are used in pairs in the opposed sensing mode; one fiber transmits the light to the sensing location, while the other fiber returns the received light to the sensor. Bifurcated plastic fiber assemblies are two-way fibers, having a single sensing end that both emits and receives light and dual control (sensor) ends, which attach separately to the sensor. Fiber optic assemblies are available with a wide variety of sensing end styles. Refer to your current Banner Photoelectric Catalog for a full selection.

*NOTES:

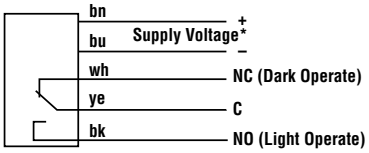
- 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g. - **SMW915FP W/30**).
- A model with a QD connector requires an accessory mating cable. See page 8 for more information.

915 Series Specifications

Supply Voltage and Current	**SMW915 Series:** 12 to 28V ac or dc at 50 mA maximum, exclusive of load **SMA915 Series:** 90 to 130V ac (50-60 Hz) at 20 mA maximum, exclusive of load **SMB915 Series:** 210 to 250V ac (50-60 Hz) at 20 mA maximum, exclusive of load **Exceptions:** SMA91E and ESR emitters, which operate from 10-250V ac (50-60 Hz) or dc (10 mA max.)
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	One internal “form C” (single-pole double-throw) electromechanical relay
Output Rating	**Max. switching power (resistive load):** 150 W, 600 VA **Max. switching voltage (resistive load):** 250V ac or 30 V dc (120V ac max. per UL & CSA) **Max. switching current (resistive load):** 5A **Min. voltage and current:** 1 amp at 5V dc, 0.1 amp at 24V dc **Peak switching voltage:** 750V ac (transient suppression recommended) **Mechanical life of relay:** 10,000,000 operations
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	20 milliseconds ON and OFF; independent of signal strength (NOTE: 100 millisecond delay on power-up; relay de-energized during this time)
Adjustments	Sensitivity control on rear of sensor allows precise gain setting (turn clockwise to increase gain)
Indicators	Top-mounted red LED indicator lights whenever the sensor sees “light” condition. Models SMA91E and SMA91ESR emitters have visible-red “tracer beam” which indicates “power on” and enables easy “line-of-sight” alignment.
Construction	Reinforced black thermoplastic polyester housing, totally encapsulated, molded acrylic lenses and stainless steel hardware
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 12 and 13; IEC IP66
Connections	**Emitters:** PVC-jacketed 2 m (6.5') or 9 m (30') cable or 3-pin Mini-style quick-disconnect (QD) fitting available. See page 8. **All Other Sensors:** PVC-jacketed 2 m (6.5') or 9 m (30') cable or 5-pin Mini-style quick-disconnect (QD) fitting available. See page 8.
Operating Conditions	**Temperature:** -40° to +50° C (-40° to +122°F) **Maximum relative humidity:** 90% at 50°C (non-condensing)
Application Notes	Install transient suppressor (MOV) across any output contact which switches an inductive load
Certifications	

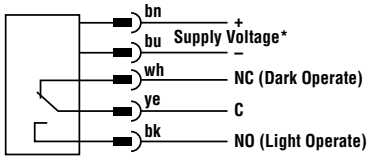
915 Series Hookups

Sensors with Attached Cable



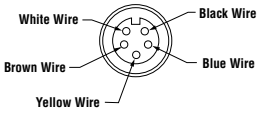
*see Specifications

Sensors with Quick-Disconnect (5-Pin Mini-Style)

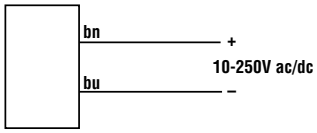


*see Specifications

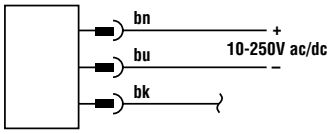
5-Pin Mini-Style Pin-out (Cable Connector Shown)



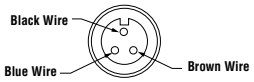
Emitters with Attached Cable



Emitters with Quick-Disconnect (3-Pin Mini-Style)



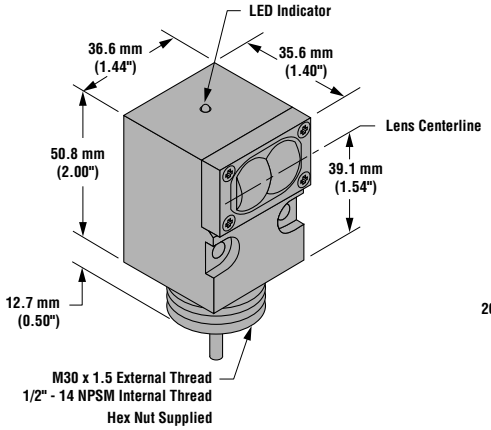
3-Pin Mini-Style Pin-out (Cable Connector Shown)



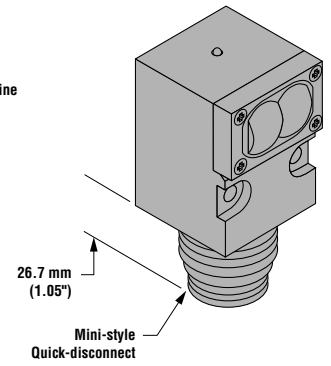
915 Series Dimensions

Opposed, Retro, and Diffuse Sensing Modes (model suffix E, ESR, R, RSR, LV, D & DSR)

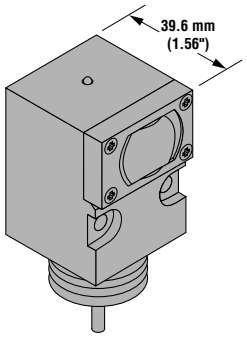
With Attached Cable



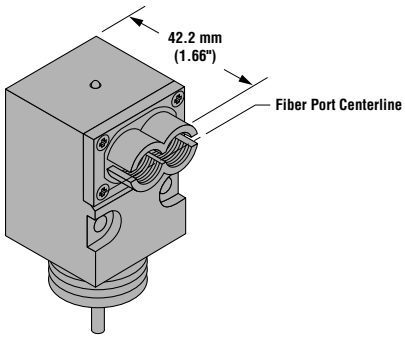
With Quick-Disconnect



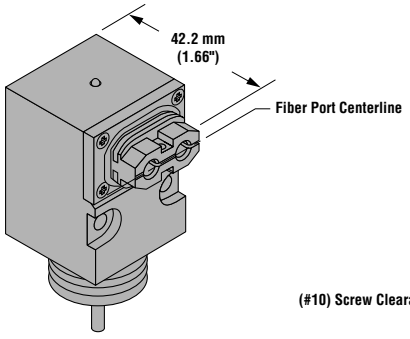
Convergent Sensing Mode (model suffix LVAG & CV)



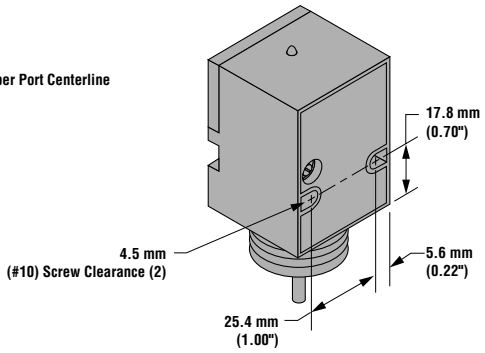
Glass Fiber Optic Models (model suffix F)



Plastic Fiber Optic Models (model suffix FP)



Rear View, All Models



Accessories

VALU-BEAM Modifications

Model Suffix	Modification	Description	Example of Model Number
W/30	9 m (30') cable	All VALU-BEAM sensors may be ordered with an integral 9 m (30') cable in place of the standard 2 m (6.5') cable	SMW915D W/30

Quick-Disconnect (QD) Cables

Style	Model	Length	Connector	Used with:
3-Pin Mini	**MBCC-306** **MBCC-312** **MBCC-330**	2 m (6.5') 4 m (12') 9 m (30')	Straight Straight Straight	All VALU-BEAM emitters
5-Pin Mini	**MBCC-506** **MBCC-512** **MBCC-530**	2 m (6.5') 4 m (12') 9 m (30')	Straight Straight Straight	915 Series, other than emitters

Cabling Accessories

Model	Description	
AC-6	2 m (6.5') armored cable jacket	I.D. $^{5}/_{16}$"; O.D. $^{7}/_{16}$"
PVC-6	2 m (6.5') flexible PVC tubing (not for QD models)	I.D. $^{1}/_{4}$"; O.D. $^{3}/_{8}$"
RF1-2NPS	Compression fitting for attaching armored cable or PVC tubing	—
HF1-2NPS	• Flexible black nylon cable protector • Includes a neoprene gland that compresses around the VALU-BEAM cable to provide an additional seal against moisture • Resistant to gasoline, alcohol, oil, grease, solvents and weak acids • Working temperature range of -30° to +100°C (-22° to +212°F)	

Extension Cables (without connectors)

The following cables are available for extending the length of existing sensor cable. These are 30 m (100') lengths of VALU-BEAM cable. This cable may be spliced to existing cable. Connectors, if used, must be user-supplied.

Model	Type	Used with:
EC312A-100	2-conductor	For all emitters
EC915-100	5-conductor	915 Series sensors, other than emitters

Replacement Lens Assemblies

VALU-BEAM lens assemblies are field-replaceable. In addition, some lenses may be used to convert from one sensing mode to another, or to change the sensing range of a particular sensor. The possible conversions are listed in the table below.

Model	Description	Possible Sensing Mode or Range Changes	
UC-900AG	Replacement lens for LVAG	Change LV to LVAG	
UC-900C	Replacement lens for C and CV	Change LV to CV	
UC-900DSR	Replacement lens for DSR, ESR & RSR	Change D or F to DSR, EF to ESR and RF to RSR	
UC-900F	Replacement lens for F	Change D to F and DSR to F	
UC-900FP	Replacement lens for FP	–	
UC-900L	Replacement lens for E, R, LV & D	Change LVAG to LV, CV to LV, DSR to D & F to D	
UC-900J	Attach to VALU-BEAMs E, R, ESR, RSR, LV and D	Flat Lexan® dust cover	

Lexan® is a registered trademark of General Electric Co.

Retroreflective Tape

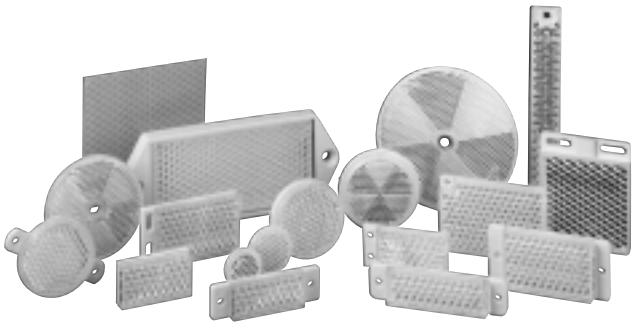
Model	Reflectivity Factor	Maximum Temperature	Size	Unit	
BRT-THG-3X3-10	0.7	60°C (140°F)	75 x 75 mm (3" x 3")	Package of 10	
BRT-THG-4X4-5	0.7	60°C (140°F)	100 x 100 mm (4" x 4")	Package of 5	
BRT-THG-8.5X11-2	0.7	60°C (140°F)	216 x 280 mm (8.5" x 11")	Package of 2	
BRT-THG-18X36	0.7	60°C (140°F)	457 x 914 mm (18" x 36")	Single Sheet	
BRT-THG-1-100	0.7	60°C (140°F)	25 mm (1") wide	2.5 m (100") length	
BRT-THG-2-100	0.7	60°C (140°F)	50 mm (2") wide	2.5 m (100") length	
BRT-THG-3-100	0.7	60°C (140°F)	75 mm (3") wide	2.5 m (100") length	
BRT-T-100*	0.2	65°C (150°F)	25 mm (1") wide	2.5 m (100") length	
BRT-THT-100*	0.07	175°C (350°F)	25 mm (1") wide	2.5 m (100") length	

* Targets are not recommended for polarized retroreflective sensors

VALU-BEAM – 915 Series

Retroreflective Targets

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-3*	1.0	65°C (150°F)	84 mm diameter
BRT-34	1.4	65°C (150°F)	84 mm diameter
BRT-2A	1.0	65°C (150°F)	56 mm diameter
BRT-50	1.0	65°C (150°F)	51 mm diameter
BRT-1.5	1.0	65°C (150°F)	46 mm diameter
BRT-1	1.0	65°C (150°F)	25 mm diameter
BRT-.6	1.0	65°C (150°F)	20 mm diameter
BRT-50D*	1.0	65°C (150°F)	51 mm diameter
BRT-42D	1.0	50°C (120°F)	42 mm diameter
BRT-35DM**	1.2	50°C (120°F)	35 mm diameter
BRT-50R*	1.0	50°C (120°F)	51 mm diameter
BRT-25R	1.0	50°C (120°F)	25 mm diameter
BRT-42A	1.0	50°C (120°F)	42 mm diameter
BRT-100X55A	1.5	50°C (120°F)	132 mm x 55 mm
BRT-80X50	1.4	65°C (150°F)	50 mm x 80 mm
BRT-92X92C*	3.0	50°C (120°F)	100 mm x 100 mm
BRT-77X77C*	2.0	50°C (120°F)	85 mm x 85 mm
BRT-100X50	1.5	50°C (120°F)	101 mm x 51 mm
BRT-2X2	1.0	50°C (120°F)	51 mm x 61 mm
BRT-36X40BM	1.2**	50°C (120°F)	51 mm x 61 mm
BRT-60X40C*	1.4	50°C (120°F)	41 mm x 60 mm
BRT-48X32	1.0	50°C (120°F)	33 mm x 48 mm
BRT-48X32A	1.0	50°C (120°F)	33 mm x 65 mm
BRT-48X32B	1.0	50°C (120°F)	33 mm x 57 mm
BRT-23X14CM**	1.2	65°C (150°F)	14 mm x 23 mm
BRT-40X23	1.4	50°C (120°F)	24 mm x 40 mm
BRT-40X23B	1.4	50°C (120°F)	24 mm x 48 mm
BRT-32X20AM**	1.2	65°C (150°F)	24 mm x 32 mm
BRT-35X20A	1.4	50°C (120°F)	24 mm x 55 mm
BRT-40X18A	1.0	50°C (120°F)	18 mm x 60 mm
BRT-62X10AM**	1.2	65°C (150°F)	10 mm x 62 mm
BRT-53X19A	1.4	50°C (120°F)	19 mm x 72 mm
BRT-100X18A	1.4	50°C (120°F)	19 mm x 120 mm
BRT-L	.08	65°C (150°F)	165 mm x 19 mm
BRT-41AHT	1.0	200°C (390°F)	41 mm diameter
BRT-4HT***	.15	480°C (900°F)	100 mm x 100 mm

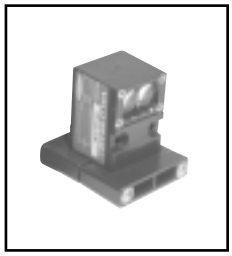


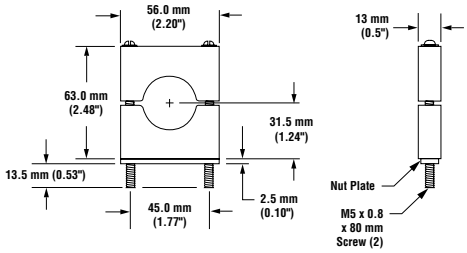
NOTE: The range of all retroreflective sensors is specified using target model BRT-3. Sensing range and signal strength at any given sensor-to-target distance will vary due to target reflectivity and target area. A "Reflectivity Factor" is included for each target model to help predict sensor performance, relative to the excess gain curve plotted for target model BRT-3. Consider, also, target area when predicting performance.

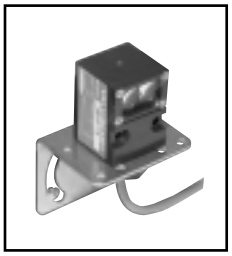
* Optional brackets are available; see Banner Photoelectric Product Catalog
** Target has micro-prism geometry
*** Targets are not recommended for polarized retroreflective sensors

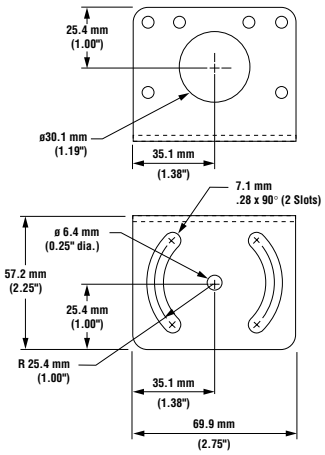
MINI-BEAM Mounting Brackets

SMB30C	• 30 mm split clamp bracket • Black reinforced thermoplastic polyester • Includes stainless steel mounting hardware
SMB30MM	• 30 mm, 12-ga, stainless steel bracket with curved mounting slots for versatility and orientation • Clearance for M6 (1/4") hardware

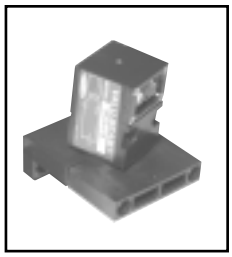


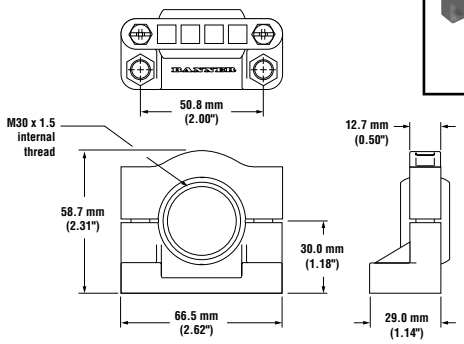






SMB30SC	• 30 mm swivel bracket • Black reinforced thermoplastic polyester • Includes stainless steel mounting and swivel locking hardware





VALU-BEAM – 915 Series

the photoelectric specialist

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.

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