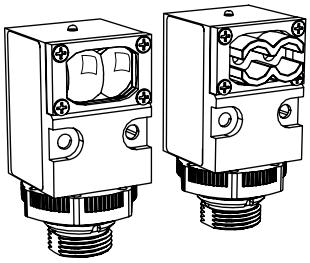
VALU-BEAM® 912 Series

AC- and DC-powered sensors with solid-state outputs

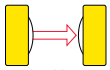
For the latest technical information about this product, including specifications, dimensions, and wiring, see *www.BannerEngineering.com*

Features



- Choose models for 10 to 30V dc or 24 to 250V ac operation
- DC models have bipolar solid-state outputs: one NPN (sinking) and one PNP (sourcing)
- AC models have an SPST solid-state output rated for up to 3/4 amp with simple 2-wire hookup
- All models have a rear panel sensitivity adjustment and light/dark operate switch
- DC models include Banner's Alignment Indicating Device (AID™) system
- Choose models with integral 2 m (6.5') cable or Mini-style QD (quick-disconnect) connector; 9 m (30') cables are also available

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



Infrared, 880 nm

Models	Range	Cable*	Supply Voltage	Output Type
SMA91E	60 m (200')	2 m (6.5')	10-250V ac/dc	-
SMA91EQD		3-pin Mini QD		
SM91R		2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM91RQD		4-pin Mini QD		
SM2A91R		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-wire
SM2A91RQD		3-pin Mini QD		
SMA91ESR	3 m (10')	2 m (6.5')	10-250V ac/dc	-
SMA91ESRQD		3-pin Mini QD		
SM91RSR		2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM91RSRQD		4-pin Mini QD		
SM2A91RSR		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-wire
SM2A91RSRQD		3-pin Mini QD		

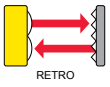
* 9 m cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., SMA91E W/30).

A model with a QD connector requires a mating cable; see *Quick-Disconnect Cables* on page 10.

WARNING: Not To Be Used for Personnel Protection

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

Retroreflective Mode Models

Visible Red, 650 nm 

Non-Polarized 

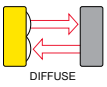
Polarized

Models	Range†	Cable*	Supply Voltage	Output Type
Non-Polarized				
SM912LV	0.15 to 9 m (6" to 30')	2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM912LVQD		4-Pin Mini QD		
SM2A912LV		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A912LVQD		3-Pin Mini QD		
Polarized††				
SM912LVAG	0.3 to 4.5 m (1' to 15')	2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM912LVAGQD		4-Pin Mini QD		
SM2A912LVAG		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A912LVAGQD		3-Pin Mini QD		

† 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 used.

†† Use polarized models when shiny objects will be sensed.

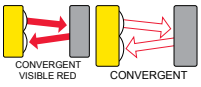
Diffuse Mode Models



Infrared, 880 nm

Models	Range†	Cable*	Supply Voltage	Output Type
SM912D	760 mm (30")	2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM912DQD		4-Pin Mini QD		
SM2A912D		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A912DQD		3-Pin Mini QD		
SM912DSR	380 mm (15")	2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM912DSRQD		4-Pin Mini QD		
SM2A912DSR		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A912DSRQD		3-Pin Mini QD		

Convergent Mode Models



Visible Red or Infrared; see below

Models	Range	Cable*	Supply Voltage	Output Type
Visible Red 650 nm				
SM912CV	38 mm (1.5") Spot Size at Focus: 1.5 mm (0.06")	2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM912CVQD		4-Pin Mini QD		
SM2A912CV		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A912CVQD		3-Pin Mini QD		
Infrared 880 nm				
SM912C	38 mm (1.5")	2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM912CQD		4-Pin Mini QD		
SM2A912C		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A912CQD		3-Pin Mini QD		

Glass Fiber Optic Individual Emitter or Receiver Models

Infrared, 880 nm

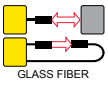
Use where the separation between emitting and receiving fibers is more than a few feet, or where it is inconvenient to run both fibers from a single sensor. Watertight o-ring-sealed sensor/fiber interface.

Models	Range	Cable*	Supply Voltage	Output Type
SMA91EF	Range varies with fiber used	2 m (6.5')	10-250V ac/dc	–
SMA91EFQD		3-Pin Mini QD		
SM91RF		2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM91RFQD		4-Pin Mini QD		
SM2A91RF		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A91RFQD		3-Pin Mini QD		

* 9 m (30') cables are available by adding suffix “W/30” to the model number of any cabled sensor (e.g., SMA91EF W/30).

A model with a QD connector requires a mating cable; see *Quick-Disconnect Cables* on page 10.

Glass Fiber Optic Models



Infrared 880 nm

Watertight o-ring-sealed sensor/fiber interface.

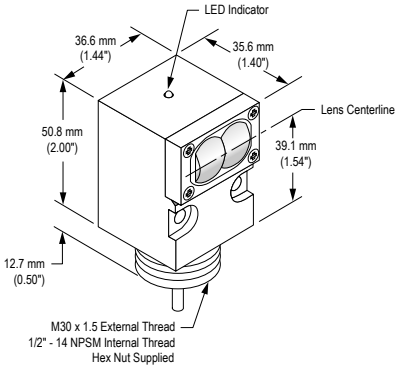
Models	Range	Cable*	Supply Voltage	Output Type
SM912F	Range varies with sensing mode and fiber optics used	2 m (6.5')	10-30V dc	Bipolar NPN/PNP
SM912FQD		4-Pin Mini QD		
SM2A912F		2 m (6.5')	24-250V ac	SPST SCR Solid-state 2-Wire
SM2A912FQD		3-Pin Mini QD		

* 9 m (30') cables are available by adding suffix “W/30” to the model number of any cabled sensor (e.g., SM912F W/30).

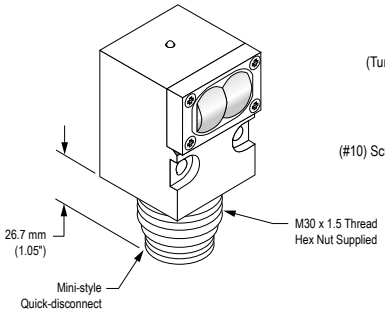
A model with a QD connector requires a mating cable; see *Quick-Disconnect Cables* on page 10.

Dimensions

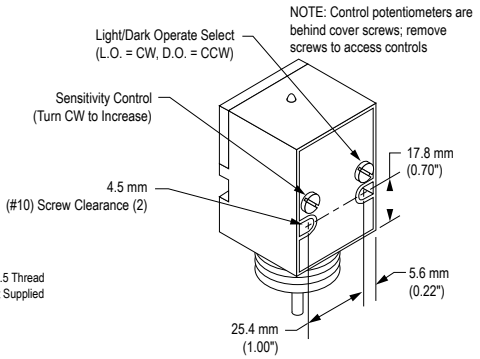
Cabled Models



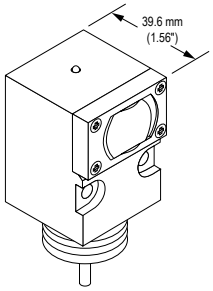
QD Models



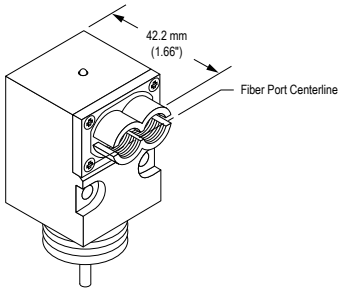
Rear View



Convergent Sensing Mode
(model suffix LVAG, C and CV)



Glass Fiber Optic
(model suffix F, EF and RF)



Specifications - DC Models

Supply Voltage and Current
10 to 30V dc at 20 mA maximum, exclusive of load; except for SMA91E, ESR and EF emitters, which operate from 10 to 250V ac or dc

Supply Protection Circuitry
Protected against reverse polarity and transient voltages

Output Configuration
Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor

Output Rating
250 mA continuous, each output
Off-state leakage current: less than 10 microamps
Output saturation voltage: (PNP output) less than 1 volt at 10 mA and less than 2 volts at 250 mA
Output saturation voltage: (NPN output) less than 200 millivolts at 10 mA and less than 1 volt at 250 mA

Output Response Time
Receivers only: 8 milliseconds ON and 4 milliseconds OFF, independent of signal strength.
All other models: 4 milliseconds ON/OFF
NOTE: millisecond delay on power-up; outputs do not conduct during this delay.

Repeatability
Opposed and Glass Fiber Optic Emitter-Receiver pairs: 1.0 millisecond
Retro, Diffuse, Convergent and Glass Fiber Optic Models: 1.3 milliseconds

Adjustments
Light/Dark Operate select switch and Sensitivity control potentiometer, both located at rear of sensor

Indicators
Alignment Indicating Device (AID™) lights a top-mounted red LED indicator whenever the sensor sees a "light" condition; its pulse rate is proportional to the light signal strength (the stronger the signal, the faster the pulse rate).
Model SMA91E and SM91ESR emitters: visible-red "tracer beam" indicates "Power ON" and enables line-of-sight alignment.

Construction
Reinforced 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

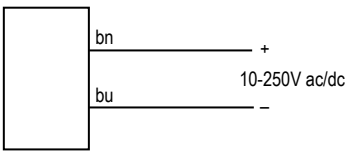
Connections
PVC-jacketed 2 m (6.5') or 9 m (30') cables or 4-pin Mini-style quick-disconnect (QD) fitting available.
NOTE: Opposed-mode emitters use 3-pin Mini-style QD fitting. See *Quick-Disconnect Cables* on page 10.

Operating Conditions
Temperature: -20° to +70° C (-4° to +158° F)
Maximum relative humidity: 90% at 50° C (non-condensing)

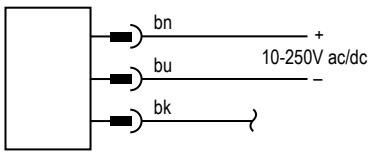
Certifications

DC Hookups

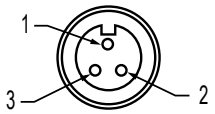
Emitters - Cabled



Emitters - QD (3-Pin Mini-Style)

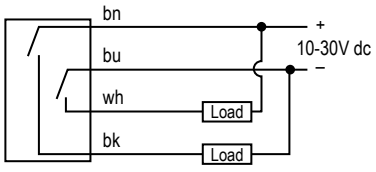


3-Pin Mini-Style Pinout (Cable Connector Shown)

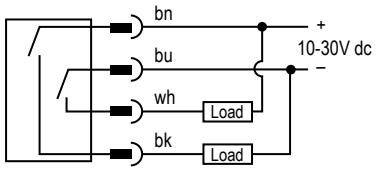


1 = Black
2 = Brown
3 = Blue

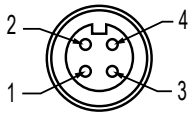
Other DC Models - Cabled



Other DC Models - QD (4-Pin Mini-Style)



4-Pin Mini-Style Pinout (Cable Connector Shown)



1 = Brown
2 = White
3 = Blue
4 = Black

Specifications - AC Models

Supply Voltage and Current
24 to 250V ac (50/60 Hz);
except for SMA91E, ESR and EF emitters, which operate from 10 to 250V ac or dc

Supply Protection Circuitry
Protected against transient voltages

Output Configuration
SPST SCR solid-state relay with either normally closed or normally open contact (light/dark operate selectable); 2-wire hookup

Output Rating
Minimum load current 10 mA, max. steady-state load capability 750 mA to 50° C ambient (122° F), 500 mA to 70° C ambient (158° F)
Inrush capability: 4 amps for 1 second (non-repetitive)
Off-state leakage: current less than 1.7 mA rms
On-state voltage drop: ≤ 5 volts rms at 750 mA load, ≤ 10 volts rms at 15 mA load

Output Protection Circuitry
Protected against false pulse on power-up

Output Response Time
Receivers only: 8 milliseconds ON and 4 milliseconds OFF, independent of signal strength.
All other models: 4 milliseconds ON/OFF
OFF time does not include load response of up to 1/2 ac cycle (8.3 milliseconds).
Response time specification of the load should be considered when total response time is important.
NOTE: millisecond delay on power-up; outputs do not conduct during this delay.

Repeatability
Opposed and Glass Fiber Optic Emitter-Receiver pairs: 1.0 millisecond
Retro, Diffuse, Convergent and Glass Fiber Optic Models: 2.6 milliseconds

Adjustments
Light/Dark Operate select switch and Sensitivity control potentiometer, both located at rear of sensor

Indicators
Top-mounted red LED indicator lights when output is conducting.
Model SMA91E and SM91ESR emitters: visible-red "tracer beam" indicates "Power ON" and enables line-of-sight alignment.

Construction
Reinforced 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
PVC-jacketed 2 m (6.5') or 9 m (30') cables or 3-pin Mini-style (QD) fitting available. See *Quick-Disconnect Cables* on page 10.

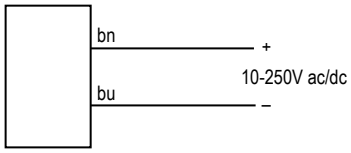
Operating Conditions
Temperature: -20° to +70° C (-4° to +158° F)
Maximum relative humidity: 90% at 50° C (non-condensing)

Application Notes
1.) 912 Series ac sensors can be destroyed from overload conditions.
2.) Use on low voltage requires careful analysis of the load to determine if the leakage current or on-state voltage of the sensor will interfere with proper operation of the load.
3.) The false-pulse protection feature may cause momentary drop-out of the load when the sensor is wired in series or parallel with mechanical switch contacts.

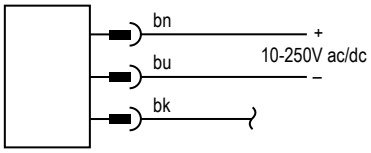
Certifications

AC Hookups

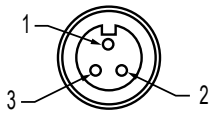
Emitters - Cabled



Emitters - QD (3-Pin Mini-Style)

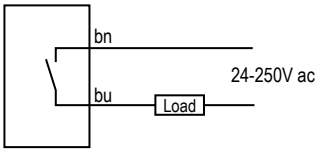


3-Pin Mini-Style Pinout (Cable Connector Shown)

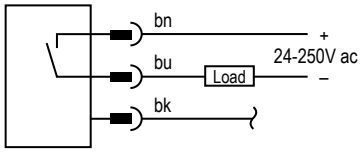


1 = Black
2 = Brown
3 = Blue

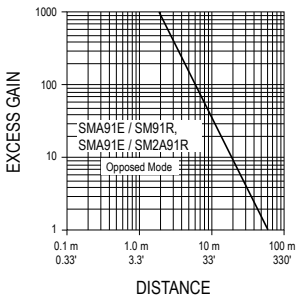
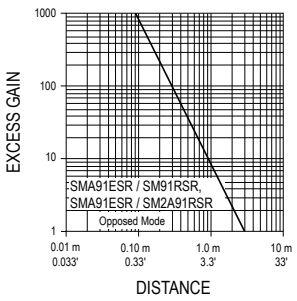
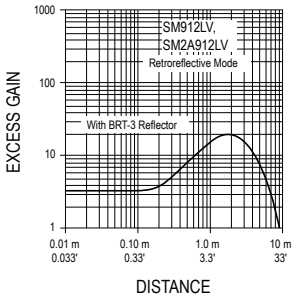
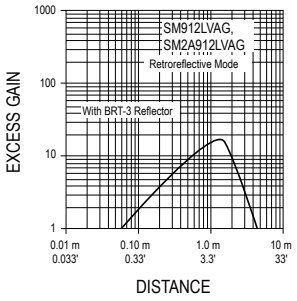
Other AC Models - Cabled

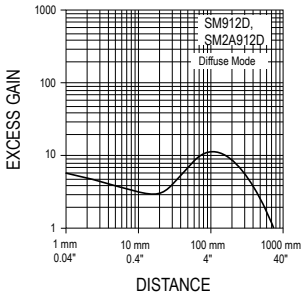
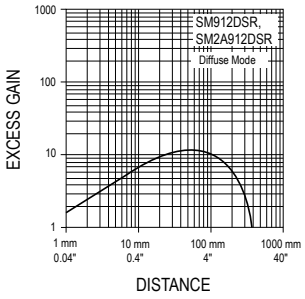
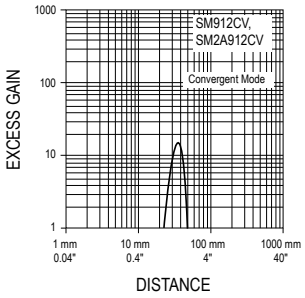
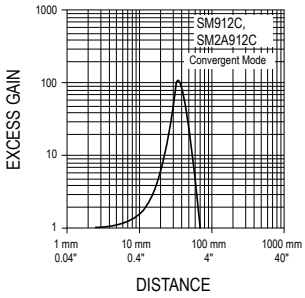
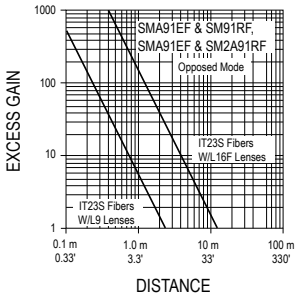
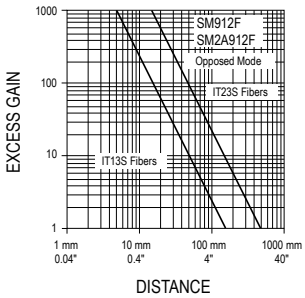
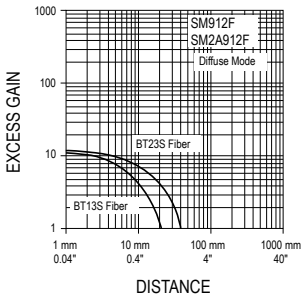


Other AC Models - QD (3-Pin Mini-Style)

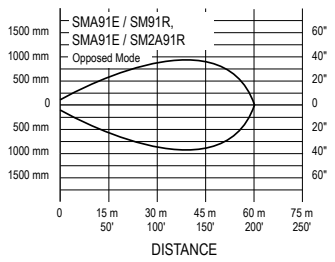
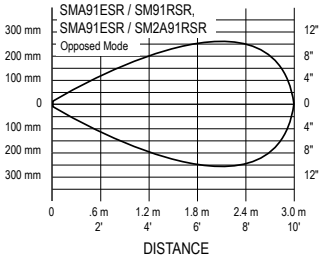
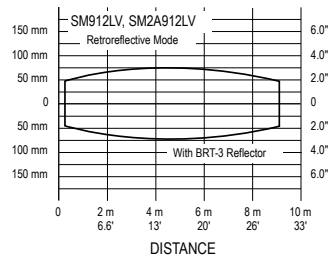
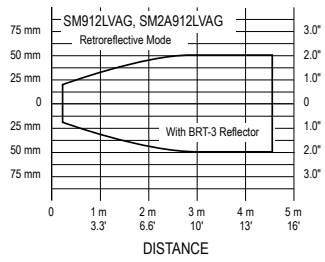
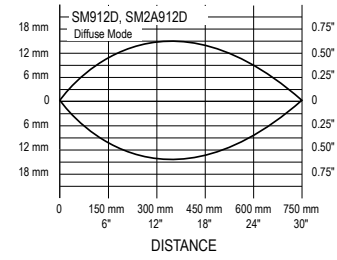
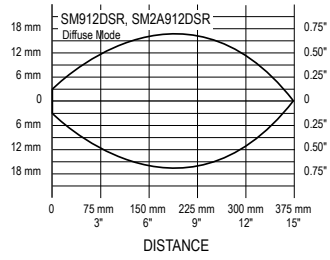
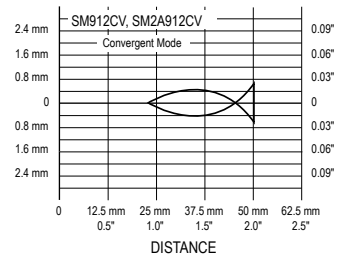
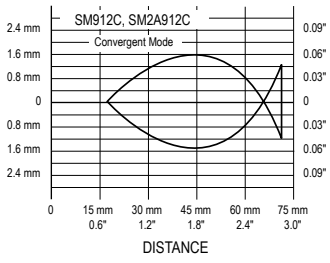
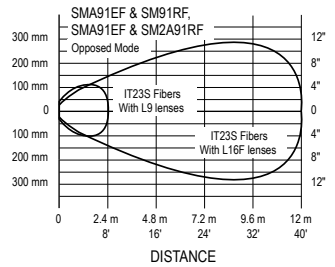


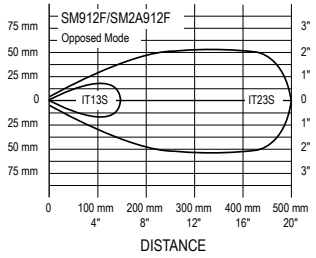
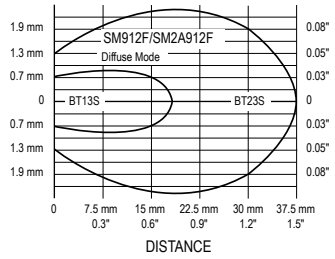
Excess Gain

Mode		
Opposed Mode Emitter and Receiver Models		
Retroreflective Mode Models		

Mode		
Diffuse Mode Models		
Convergent Mode Models	**Visible Red 650 nm** 	**Infrared 880 nm** 
Glass Fiber Optic Individual Emitter or Receiver Models		
Glass Fiber Optic Models		

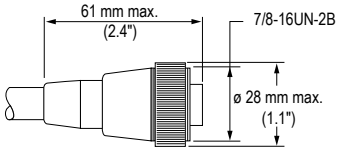
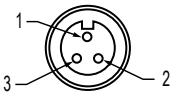
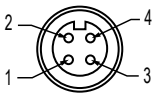
Beam Patterns

Mode		
Opposed Mode Emitter and Receiver Models		
Retroreflective Mode Models	**Non-Polarized** 	**Polarized** 
Diffuse Mode Models		
Convergent Mode Models	**Visible Red 650 nm** 	**Infrared 880 nm** 
Glass Fiber Optic Individual Emitter or Receiver Models		

Mode		
Glass Fiber Optic Models		

Accessories

Quick-Disconnect Cables

Model	Length	Style	Dimensions	Pinout (Female View)
MBCC-306	2 m (6.5')	3-Pin Mini-style straight		 1 = Black 2 = Brown 3 = Blue
MBCC-312	4 m (12')			
MBCC-330	9 m (30')			
MBCC-406	2 m (6.5')	4-Pin Mini-style straight		 1 = Brown 2 = White 3 = Blue 4 = Black
MBCC-412	4 m (12')			
MBCC-430	9 m (30')			

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)

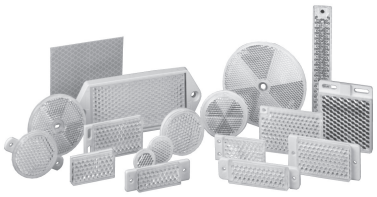
The following cables are available for extending the length of existing sensor cable. These are 30 m (100') lengths of VALU-BEAM cable. This cable may be spliced to existing cable. Connectors, if used, must be customer-supplied.

Model	Type	Used With:
EC312-100	4-conductor	SM912 Series dc sensors
EC312A-100	2-conductor	For all emitters and SM2A912 Series ac sensors

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. Non-polarized sensors may use any retroreflective target.



Replacement Lens Assemblies

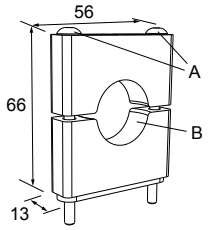
VALU-BEAM lens assemblies are field-replaceable. In addition, some lenses may be used to convert from one sensing mode to another, or to change the sensing range of a particular sensor. The possible conversions are listed in the table below.

Models	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, and 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, and D	Change LVAG to LV, CV to LV, DSR to D, and F to D
UC-900J	Attach to E, R, ESR, RSR, LV, and D models	Flat polycarbonate dust cover

Mounting Brackets

SMB30C

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

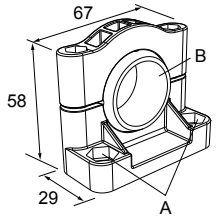


Hole center spacing: A=ø 45

Hole size: B=ø 27.2

SMB30SC

- Swivel bracket with 30 mm mounting hole for sensor
- Black reinforced thermoplastic polyester
- Stainless steel mounting and swivel locking hardware included

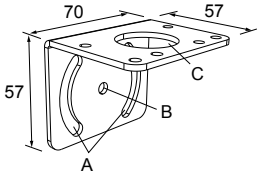


Hole center spacing: A=ø 50.8

Hole size: A=ø 7.0, B=ø 30.0

SMB30MM

- 12-ga. stainless steel bracket with curved mounting slots for versatile orientation
- Clearance for M6 (¼") hardware
- Mounting hole for 30 mm sensor



Hole center spacing: A = 51, A to B = 25.4

Hole size: A = 42.6 x 7, B = ø 6.4, C = ø 30.1

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