

VALU-BEAM[®] Sensors

Opposed mode sensor pairs with enhanced sunlight immunity



SM91EN Series emitters/SM91RN Series receivers

- Opposed mode sensing to 100 feet (30 meters); enhanced sunlight immunity for difficult applications
- Choice of three modulation codes enables adjacent sensor pairs to operate without crosstalk
- 10 to 30V dc, three-wire operation (2-wire emitters)
- Solid-state bipolar outputs, 150 mA max. (continuous); sinking or sourcing hookup (useable simultaneously)
- Totally encapsulated circuitry in a rugged, molded plastic housing, rated NEMA 6P (IEC IP67)

Description

These rugged, powerful VALU-BEAM[®] opposed mode emitter/receiver pairs are designed to function in difficult environments. Excess gain is conservatively rated at 100x at an emitter-to-receiver separation distance of 10 feet (3 meters). See excess gain curve and beam pattern, page 2.

Receivers will not false-trigger when pointed directly into a light source of 120,000 lux. Even under these conditions, a receiver will respond only to the light signal from its modulated emitter. Receivers are also immune to false triggering by sunlight reflected from water droplets.

Receivers are immune to interference from flashing strobe lights as are typically found on plant lift trucks. Sensors are also immune to interference from a 5-watt walkie-talkie, operating on specified frequencies, held six inches away from the sensor (see specs).

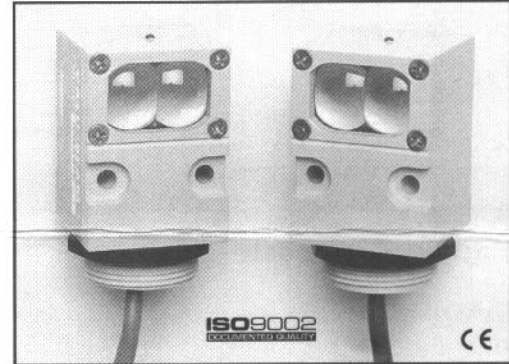
Emitters and receivers that are to be used together must carry the same modulation code designation (A, B, or C). Sensor pairs of one code may be used alongside sensor pairs of another code, without interference or crosstalk. See page 3 for more information on modulation codes and a table of available sensor models.

These sensors are ruggedly constructed in reinforced, molded VALOX[®] housings with replaceable acrylic lenses. Electronics are fully epoxy-encapsulated. Sensors are constructed to NEMA 6P (IEC IP67) standards. These sensors will withstand temporary submersion (see specifications). Operating temperature range is 0 to 70°C (+32 to 158°F).

The sensors operate from 10-30V dc (reverse polarity and short-circuit protected). Receivers have one solid-state light-operate PNP (sourcing) output and one solid-state light-operate NPN (sinking) output with a continuous load capability of 150 milliamperes maximum (each output). A green indicator LED on each emitter lights whenever the infrared sensing beam is being emitted. Receivers have Banner's patented AID[™] (Alignment Indicating Device) System*, which lights a red LED whenever the output is conducting and pulses the LED at a rate proportional to the strength of the received light signal.

*US patent number 4356393

VALOX[®] is a registered trademark of General Electric Co.



Specifications

Beam: Opposed mode; modulated infrared, 880 nanometers.

Range: 100x excess gain at 10 feet (3 meters) emitter-receiver separation distance (see excess gain curve, page 2).

Effective beam diameter: 1 inch (25 mm).

Response time: 12 to 28 ms, depending upon code (see page 3).

Supply voltage: 10 to 30V dc at 20 mA maximum for receivers (exclusive of load current) and 25 mA maximum for emitters.

Output configuration: Bipolar solid-state dc PNP sourcing and NPN sinking outputs, light operate only (outputs conduct when the receiver sees the modulated light from its emitter).

Output rating: 150 mA maximum (continuous, each output). Off-state leakage current is 100 microamps, maximum.

On-state saturation voltage: <1V at 10 mA and <2V at 150 mA (PNP); <200 millivolts at 10 mA and <1V at 150 mA (NPN).

Indicators: Top-mounted LED indicator. A red LED (on receivers) lights when the output is conducting, and pulses at a rate proportional to the strength of the received light signal. A green LED (on emitters) lights when the infrared sensing beam is "on".

Operating temperature range: 0 to 70°C (+32 to 158°F).

Construction: Reinforced black VALOX[®] housing, electronics totally epoxy-encapsulated. Molded, replaceable acrylic lenses. Rated NEMA 6P (IEC IP 67). 6-1/2 foot (2 m) or 30-ft (9 m) attached PVC-jacketed cable or integral mini-style quick disconnect (QD) fitting. QD connector housing and pins are isolated to 2500 volts.

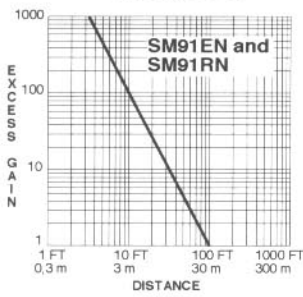
Water immersion: Emitters and receivers are rated NEMA 6P (IEC IP67). Sensors will continue to operate during and after being submerged in water at a depth of 6 feet for a period of 48 hours. NOTE: Immersion greatly reduces the efficiency of the lens, which results in greatly diminished sensing range.

Sunlight immunity: Receivers may be pointed into a light source of 120,000 lux without false-triggering, and will still respond only to the infrared beam from their modulated emitters. Receivers will not respond to sunlight reflected from water spray droplets.

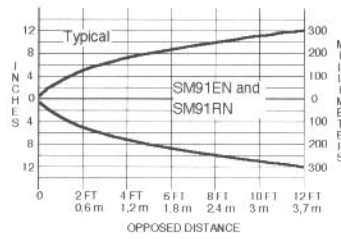
Strobe light immunity: Receivers are totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe.

EMI-RFI immunity: Emitters and receivers will not respond to transmissions from a 5-watt output walkie-talkie on the test frequencies of 464.500 and 151.625 megahertz when the walkie-talkie's antenna is held 6 inches or more away from the sensor.

Excess Gain

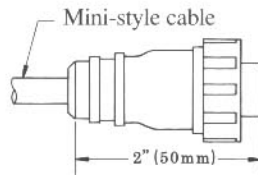


Beam Pattern



Quick disconnect models

SM91ExNQD models (emitters) and SM91RxNQD models (receivers)

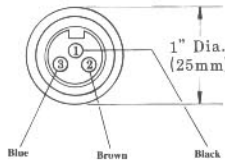


SM91ExNQD emitters use MBCC-312 cable (12' long) p/n 25236

"QD" Receptacle Pin Numbering (Male Pins)

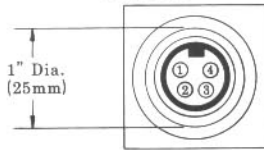


Cable Plug Pin Numbering (Female Pins)

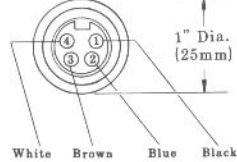


SM91RxNQD receivers use MBCC-412 cable (12' long) p/n 25226

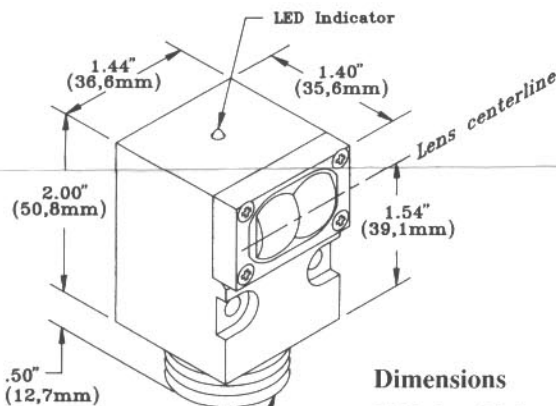
"QD" Receptacle Pin Numbering (Male Pins)



Cable Plug Pin Numbering (Female Pins)



Dimension Drawing



M30 X 1.5 external thread
1/2" -14 NPSM internal thread

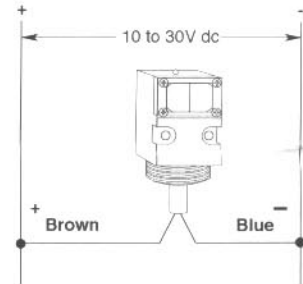
Dimensions

Cabled model shown. Quick disconnect fitting adds 0.5" (13 mm) in overall height to "QD" sensor models.

Hookup Information

Hookup of emitters

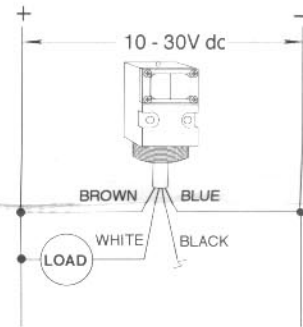
Emitters operate from 10-30V dc. The brown wire connects to +Vdc, and the blue wire connects to -Vdc. MBCC-312 mini-style QD cable is purchased separately.



Wire colors apply to both integral cable and QD cable. The black wire of the QD cable (not shown) is not used.

Hookup of NPN sinking receiver output*

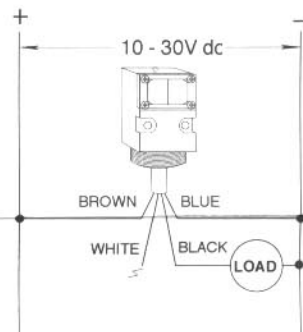
Receivers operate from 10-30V dc. MBCC-412 mini-style QD cable is purchased separately.



Wire colors apply to both integral cable and QD cable. The black wire is not used.

Hookup of PNP sourcing receiver output*

Receivers operate from 10-30V dc. MBCC-412 mini-style QD cable is purchased separately.



Wire colors apply to both integral cable and QD cable. The white wire is not used.

*NOTE: NPN and PNP outputs **may** be used simultaneously.

Sensor Codes and Response Times

Emitters and receivers that are to be used together must carry the same code letter. Sensors of one code may be used side-by-side with sensors of another code, without interference or crosstalk. Sensor pairs carrying the same code must be separated by a minimum side-to-side distance of 22 inches (assuming an emitter/receiver separation distance of 10 feet; see beam pattern) to avoid crosstalk.

The codes A, B, and C are used to designate different sensing pulse modulation frequencies and different intervals between sets of pulses. These design differences are necessary in order to enable differently coded sensor pairs to operate in close proximity without interfering with each other.

These internal timing differences result in differing response times to light and dark signals in the differently-coded sensor pairs. Table 1 lists these response times when each sensor pair is operated alone, *outside the field of view of another sensor pair*.

Differently-coded sensor pairs in a common field of view may not perform as described in Table 1. In order to prevent unwanted response, a receiver operating under worst-case conditions may require some additional time to verify that the signal it sees is actually coming from its own companion emitter. These worst-case response times are given in Table 2.

Table 1.
Response time of individual sensor pairs, alone

Sensor Code =	A	B	C
Response to dark signal	12 ms	20 ms	20 ms
Response to light signal	20 ms	17 ms	28 ms

Table 2. Response time of adjacent sensor pairs in a common field of view

Sensor Codes =	A+B	A+C	A+B+C
Response to dark signal	A = 12 ms B = 20 ms	A = 12 ms C = 20 ms	A = 12 ms B = 20 ms C = 40 ms
Response to light signal	Doubles A, B	Doubles A, C	Triples A, B, C

Model Listing

P/N	Model	Description, Code, and Cabling		
39515	SM91EAN	Emitter	Code A	6-1/2 foot attached cable
41290	SM91EAN W/30	Emitter	Code A	30 foot attached cable
39517	SM91EANQD	Emitter	Code A	3-pin mini-style QD
39516	SM91IRAN	Receiver	Code A	6-1/2 foot attached cable
41291	SM91IRAN W/30	Receiver	Code A	30 foot attached cable
39554	SM91IRANQD	Receiver	Code A	4-pin mini-style QD
41282	SM91EBN	Emitter	Code B	6-1/2 foot attached cable
41292	SM91EBN W/30	Emitter	Code B	30 foot attached cable
41284	SM91EBNQD	Emitter	Code B	3-pin mini-style QD
41283	SM91RBN	Receiver	Code B	6-1/2 foot attached cable
41293	SM91RBN W/30	Receiver	Code B	30 foot attached cable
41285	SM91RBNQD	Receiver	Code B	4-pin mini-style QD
41286	SM91ECN	Emitter	Code C	6-1/2 foot attached cable
41294	SM91ECN W/30	Emitter	Code C	30 foot attached cable
41288	SM91ECNQD	Emitter	Code C	3-pin mini-style QD
41287	SM91RCN	Receiver	Code C	6-1/2 foot attached cable
41295	SM91RCN W/30	Receiver	Code C	30 foot attached cable
41289	SM91RCNQD	Receiver	Code C	4-pin mini-style QD



WARNING These photoelectric presence sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can result in either an energized or a de-energized sensor output condition.

Never use these products as sensing devices for personnel protection. Their use as safety devices may create an unsafe condition which could lead to serious injury or death.

Only MINI-SCREEN, MACHINE-GUARD and PERIMETER-GUARD Systems, and other systems so designated, are designed to meet OSHA and ANSI machine safety standards for point-of-operation guarding devices. No other Banner sensors or controls are designed to meet these standards, and they must NOT be used as sensing devices for personnel protection.

VALU-BEAM Accessories

Cabling accessories

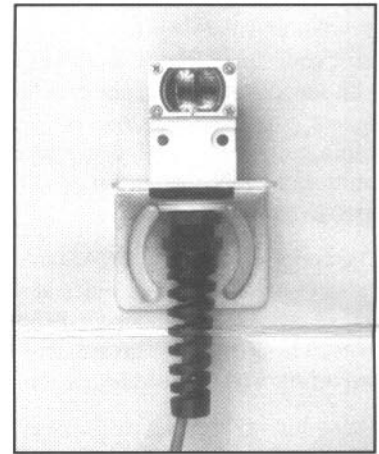
HF1-2NPS Flexible Cable Protector (27329)

This black nylon assembly easily slips over the prewired cable and threads into the base of a VALU-BEAM sensor. The flexible extender prevents sharp cable bends and extends the life of cable that is subject to repeated flexing.

The HF1-2NPS includes a neoprene gland that compresses around the VALU-BEAM cable to provide an additional seal against moisture.

This flexible conduit protector is resistant to gasoline, alcohol, oil, grease, solvents, and weak acids. It has a working temperature range of -30° to +100°C (-22 to +212°F). It is UL recognized and CSA certified.

The HF1-2NPS also threads into the base of OMNI-BEAM, MULTI-BEAM, MAXI-BEAM, and SM30 Series sensors. It is sold in packages of 10 pieces.

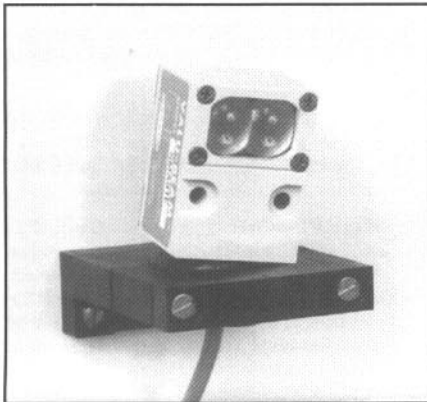


Mounting brackets

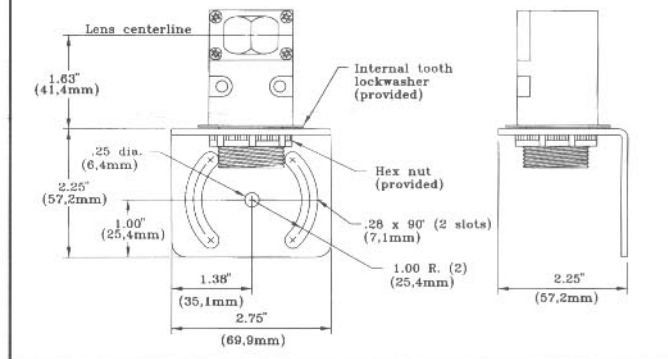
Accessory mounting bracket model **SMB30MM** (27162), right, has curved mounting slots for versatility in mounting and orientation. The sensor mounts to the bracket by its threaded base, using a jam nut and lockwasher (both included). The bracket material is 11-gauge stainless steel. The curved mounting slots have clearance for 1/4" screws.

The model **SMB30S** swivel-mount bracket (33204), below, offers the ultimate in mounting versatility for VALU-BEAM and other sensors with M30 x 1.5 threads. The VALU-BEAM's base threads into the captive ball of the bracket, which is then locked in place. Stainless steel mounting hardware is included.

SMB30S Swivel Bracket (33204)



SMB30MM (27162)



SMB30C Split Clamp Bracket (32636)

Accessory mounting bracket model SMB30C (below) is a split clamp bracket similar in appearance to model SMB30S (left). The SMB30C does not have an adjustable ball, but rather grips the sensor by its threaded base. Bracket material is black VALOX®. Hardware is stainless steel, and mounting bolts are included. This bracket may be used with VALU-BEAMS and other sensors having M30 x 1.5 threads. Bracket dimensions are given below.

