MINI-BEAM®
Product Line Catalog

MINI-BEAM Features

- MINI-BEAM sets the performance standards for small photo-electric sensors
- Choose standard or intrinsically safe (NAMUR) models
- Rear-panel alignment indicator and 15-turn sensitivity adjustment
- Choice of integral unterminated cable or quick-disconnect connector
- Wide array of mounting options, including 18 mm in-line thread
- Solid-state circuitry is epoxy-encapsulated in reinforced VALOX® housing

BANNER®
the photoelectric specialist

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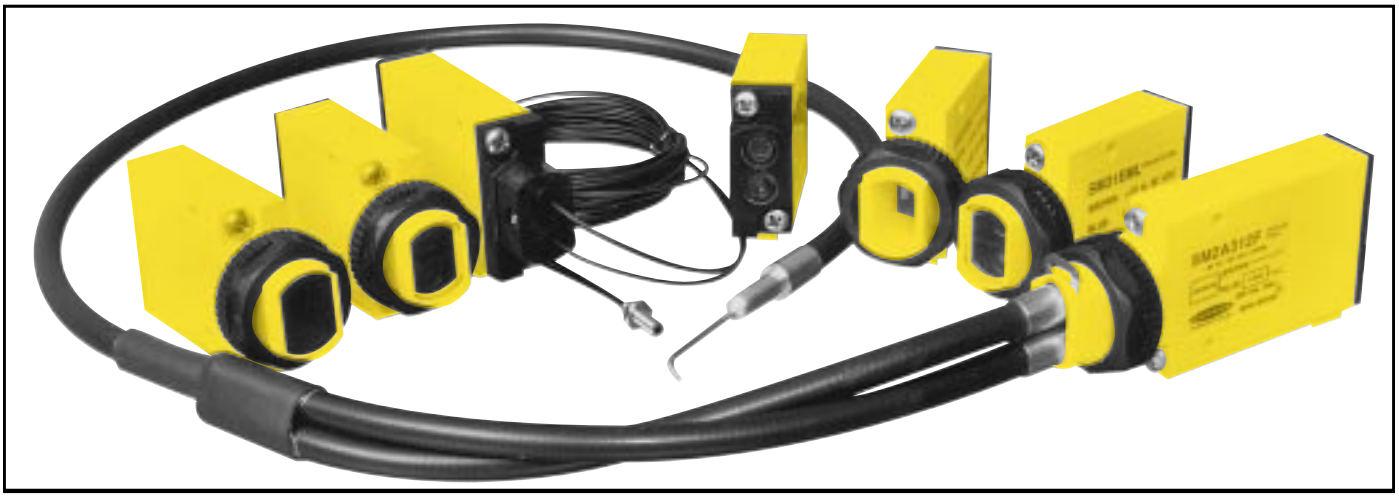
P/N 32886K7A

MINI-BEAM®

Small sensors that excel in close-quarter, opposed, convergent, retroreflective, diffuse and fiber optic sensing modes.



Banner MINI-BEAMs are small sensors with large-sensor performance. Available in both ac and dc models and in all sensing modes (opposed, convergent, divergent, retroreflective, diffuse, and fiber optic), **MINI-BEAM**s offer superior close-quarters sensing performance with sensing ranges until now found only in larger photoelectric sensors.

NAMUR intrinsically safe dc sensors are available for use in hazardous (volatile) sensing environments (see page 18).

A **MINI-BEAM** system incorporates a powerful, modulated LED light source, a sensitive phototransistor, an LED alignment indicator, and a custom-designed, state-of-the-art CMOS modulator/demodulator/amplifier circuit; it features inherently high immunity to ambient light interface. A convenient control enables selection of either "light operate" or "dark operate" in the same sensor, and a rugged, 15-turn Gain control allows precise adjustment of sensitivity. A red LED alignment indicator on the rear of the sensor lights to simplify alignment, adjustment, and performance monitoring. DC models have Banner's exclusive patented Alignment Indicating Device (AID™) system, which lights an LED indicator whenever the sensor sees a "light" condition, and pulses the LED at a rate proportional to the received light signal strength. **MINI-BEAM**s are totally self-contained (sensor and amplifier in one complete compact package). No external amplification is required. **MINI-BEAM**s are totally solid-state for unlimited life.

Leakage current and saturation voltage are low for easy interfacing to PLCs and to other solid state circuitry. Additionally, ac models connect directly (in series) with compatible ac loads, and dc models interface directly to Banner logic modules. **MINI-BEAM**s are protected against false pulse on power-up, inductive load transients, and various output conditions (see SPECIFICATIONS, pages 12 and 14).

The **MINI-BEAM**'s wide array of mounting options (pages 28 and 29) enables installation in nearly any location. Stacking capability on 1/2" centers allows multiple units to be nested together for scanning large areas or for code-reading applications.

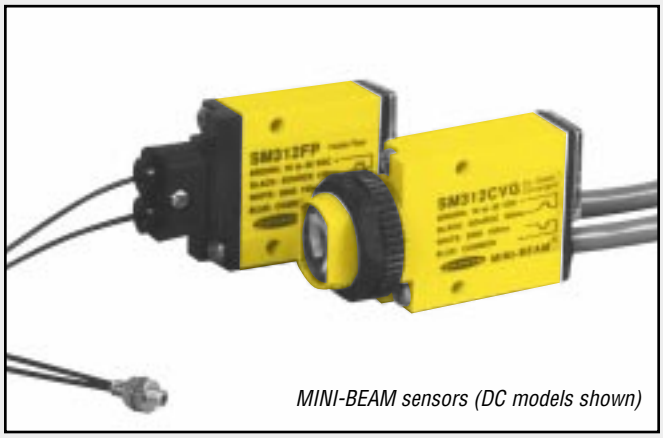
All Banner **MINI-BEAM** sensors are CE and CSA certified and UL recognized.

WARNING . . . Not A Safety Device

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 a safety device may create an unsafe condition which could lead to serious injury or death.

Only MICRO-SCREEN™, MINI-SCREEN®, MULTI-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.

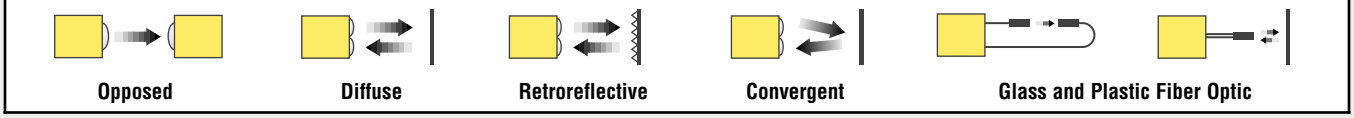


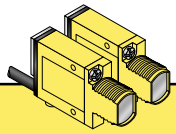
MINI-BEAM sensors (DC models shown)

MINI-BEAM STANDARD SENSORS

- Select 4-wire dc or simple 2-wire ac models
- DC models have bipolar outputs (one NPN and one PNP)
- Rear-panel Light/Dark Operate Select switch
- DC models include patented Alignment Indicating Device (AID™) signal strength monitoring indicator
- Models with blue or green light source for use in mainstream color mark-sensing applications
- 2 m (6.5') integral cable length is standard; 9 m (30') length is also available
- Integral quick-disconnect (QD) fitting is standard; 150 mm (6") pigtail QD cable is also available
- DC models may be ordered with 0.3 millisecond response (add suffix "MHS" to model number)

MINI-BEAM Sensing Mode Options

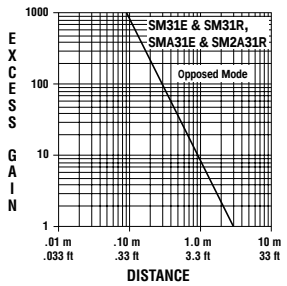
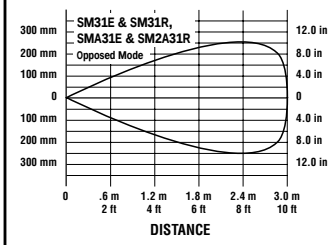
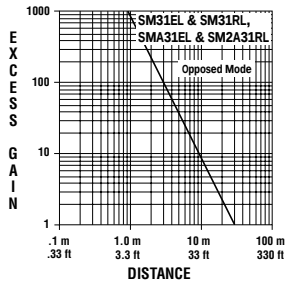
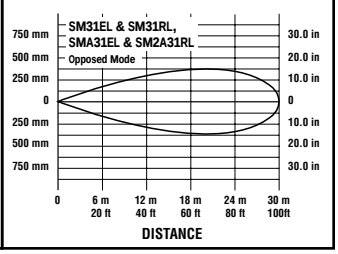




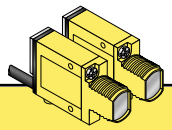
Their small effective beam size is ideal for accuracy-dependent applications, particularly when used with an aperture (see page 27). They have the capability to burn through even contaminated areas and may even sense opaque materials through a thin-walled container.

Infrared, 880 nm

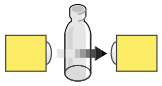
MINI-BEAM Opposed Mode Emitter (E) and Receiver (R)

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
SM31E **SM31R** **SM31EQD** **SM31RQD**	3 m (10')	2 m (6.5') 2 m (6.5') 4-Pin Euro-style QD 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SMA31E **SM2A31R** **SMA31EQD** **SM2A31RQD**		2 m (6.5') 2 m (6.5') 3-Pin Micro-style QD 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
SM31EL **SM31RL** **SM31ELQD** **SM31RLQD**	30 m (100')	2 m (6.5') 2 m (6.5') 4-Pin Euro-style QD 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SMA31EL **SM2A31RL** **SMA31ELQD** **SM2A31RLQD**		2 m (6.5') 2 m (6.5') 3-Pin Micro-style QD 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		

MINI-BEAM Standard Sensors



Opposed-mode sensors' unique optical arrangement reliably detects clear plastic, differentiating it from all other materials.

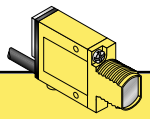


Visible red, 650 nm

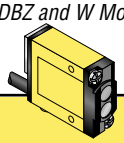
MINI-BEAM Opposed-Mode Clear Plastic Detection System

Models	Range	Cable	Supply Voltage	Output Type	Application Information
SM31EPD **SM31RPD** **SM31EPDQD** **SM31RPDQD**	0 - 0.3 m (0 - 1')	2 m (6.5') 2 m (6.5') 4-Pin Euro-style QD 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP	• Commonly used for manufacture or processing of clear plastic bottles or webs • All MINI-BEAM Clear Plastic Detection System sensors include a mounting bracket Actual range is dependent upon the light transmission properties of the plastic material being sensed. Some clear plastic materials may not be detected due to their molecular structure. When in doubt, ask your salesperson to evaluate material samples.
SMA31EPD **SM2A31RPD** **SMA31EPDQD** **SM2A31RPDQD**		2 m (6.5') 2 m (6.5') 3-Pin Micro-style QD 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire	

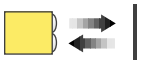
D Models



DBZ and W Models

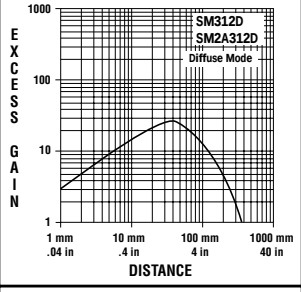
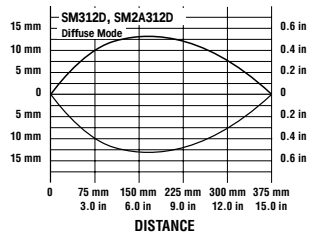
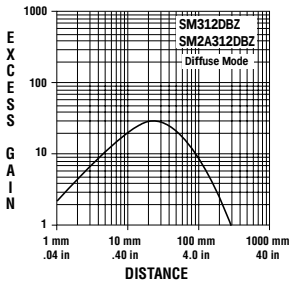
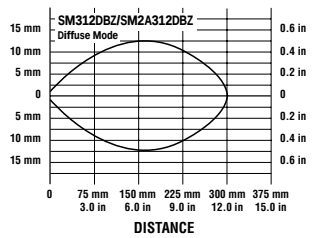
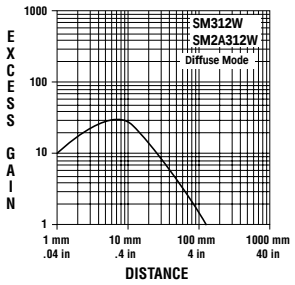
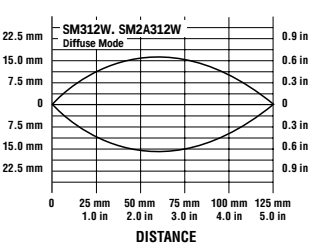


These economical single-unit sensors are excellent for sensing objects of adequate size and reflectivity at short range. Divergent models are useful for sensing small items and translucent or transparent materials at close range.

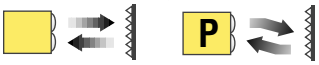


Infrared, 880 nm

MINI-BEAM Diffuse-Mode Sensors

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
SM312D **SM312DQD**	380 mm (15")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312D **SM2A312DQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
SM312DBZ **SM312DBZQD**	300 mm (12")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312DBZ **SM2A312DBZQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
Divergent Diffuse						
SM312W **SM312WQD**	130 mm (5")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312W **SM2A312WQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPDT Solid-state 2-Wire		

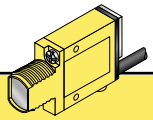
Visible red, 650 nm



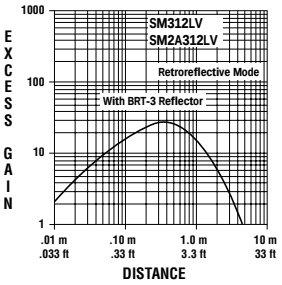
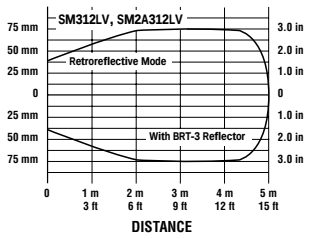
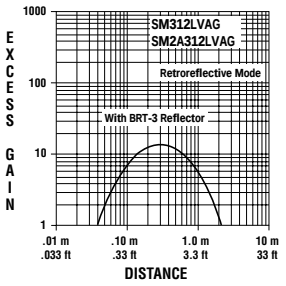
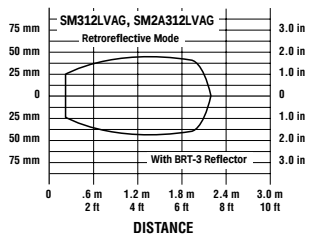
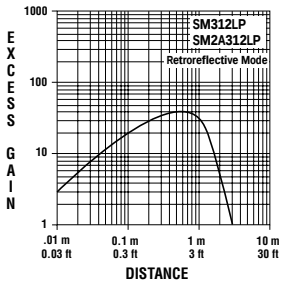
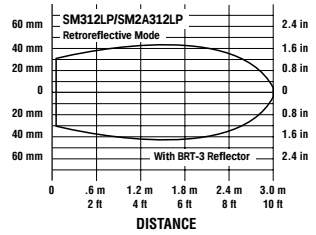
Non-Polarized *Polarized*

Excellent for sensing even small items where sensing is possible from one side only. Recommended for relatively clean environments where excess gain is not required. Polarized models filter out unwanted reflections.

Non-Polarized, Polarized



MINI-BEAM Retroreflective-Mode Sensors

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Non-Polarized						
SM312LV **SM312LVQD**	5 m (15')	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312LV **SM2A312LVQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
Polarized						
SM312LVAG **SM312LVAGQD**	50 mm to 2 m (2" to 7')	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312LVAG **SM2A312LVAGQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
Polarized Extended Range						
SM312LP **SM312LPQD**	10 mm to 3 m (0.4" to 10')	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312LP **SM2A312LPQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		

NOTE: 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 page 26 for more information.

For Standard MINI-BEAMs:

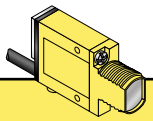
i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SM312LV W/30**).

ii) A 150 mm (6") long pigtail cable with attached QD connector is available by adding suffix **"QDP"** to the model number of any MINI-BEAM sensor (e.g., **SM312LVQDP**). See page 25 for more information.

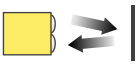
iii) A model with a QD connector requires an accessory mating cable. See page 24 for more information.

iv) 10 to 30V dc models may be ordered with 0.3 millisecond ON/OFF response by adding suffix **"MHS"** to the model numbers (e.g., **SM312LVMHS**). This modification reduces sensing range (and excess gain).

MINI-BEAM Standard Sensors

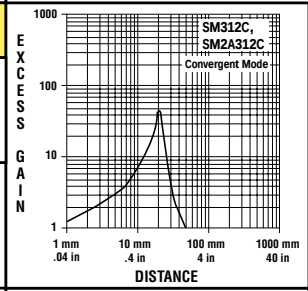
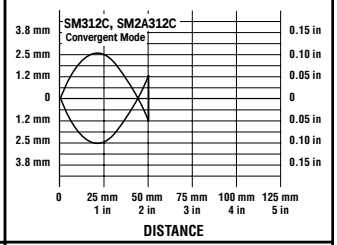
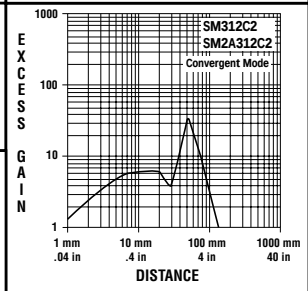
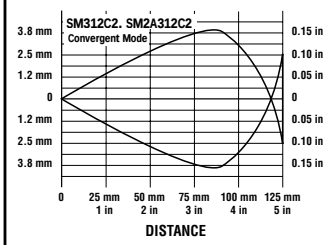
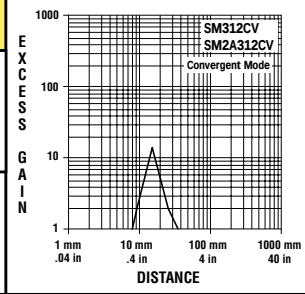
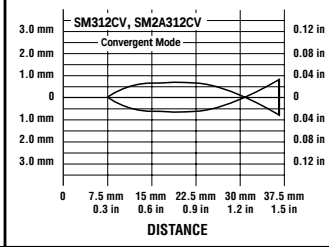
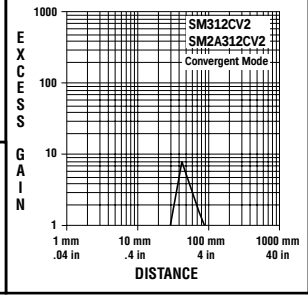
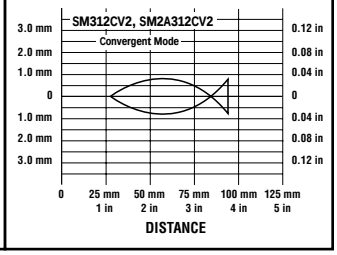


Convergent-mode sensors feature high excess gain and can detect objects of low reflectivity. They also are a good choice for counting radiused objects with no space between them, for accurate position sensing, and for sensing of clear materials that travel near the scan beam's focus.



See Sensing Beam Information Below

MINI-BEAM Convergent-Mode Sensors

Models	Focus	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Infrared 880 nm						
SM312C **SM312CQD**	16 mm (0.65")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312C **SM2A312CQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
SM312C2 **SM312C2QD**	43 mm (1.7")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312C2 **SM2A312C2QD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
Visible Red 650 nm						
SM312CV **SM312CVQD**	16 mm (0.65") Spot Size at Focus: 1.3 mm (0.05")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312CV **SM2A312CVQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
SM312CV2 **SM312CV2QD**	43 mm (1.7") Spot Size at Focus: 3.0 mm (0.12")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312CV2 **SM2A312CV2QD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		

For Standard MINI-BEAMs:

i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SM312CV W/30**).

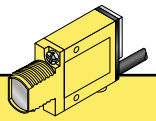
ii) A 150 mm (6") long pigtail cable with attached QD connector is available by adding suffix **"QDP"** to the model number of any MINI-BEAM sensor (e.g., **SM312CVQDP**). See page 25 for more information.

iii) A model with a QD connector requires an accessory mating cable. See page 24 for more information.

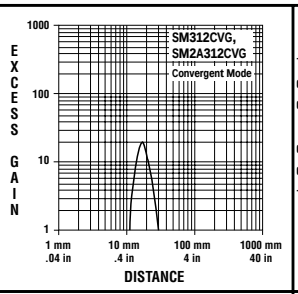
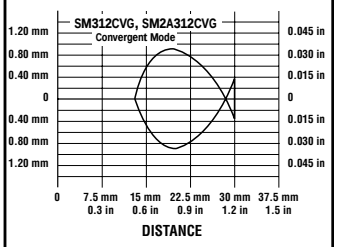
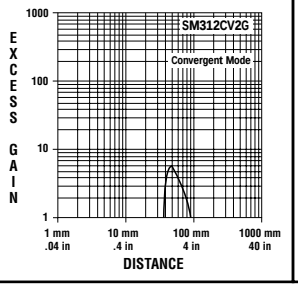
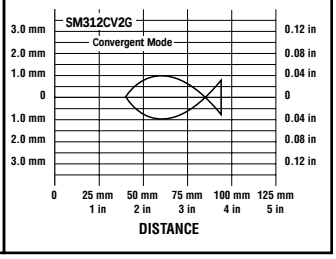
iv) 10 to 30V dc models may be ordered with 0.3 millisecond ON/OFF response by adding suffix **"MHS"** to the model numbers (e.g., **SM312CVMHS**). This modification reduces sensing range (and excess gain).

Recommended for color mark sensing.

Visible green, 525 nm

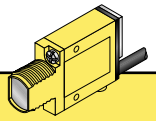


Green LED MINI-BEAM Convergent-Mode Sensors

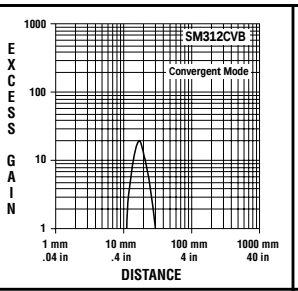
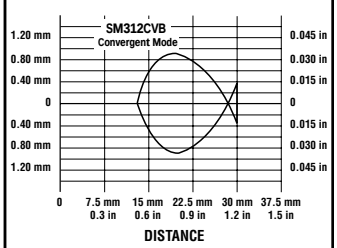
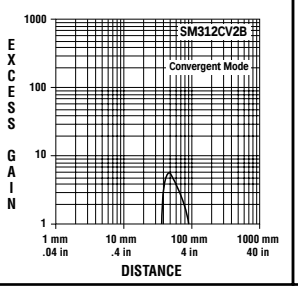
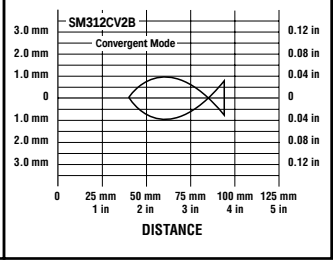
Models	Focus	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Visible Green 525 nm						
SM312CVG **SM312CVGQD**	16 mm (0.65")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312CVG **SM2A312CVGQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire		
SM312CV2G **SM312CV2GQD**	49 mm (1.9")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

Recommended for color mark sensing.

Visible blue, 475 nm

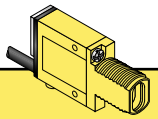


Blue LED MINI-BEAM Convergent-Mode Sensors

Models	Focus	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Visible Blue 475 nm						
SM312CVB **SM312CVBQD**	16 mm (0.65")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM312CV2B **SM312CV2BQD**	49 mm (1.9")	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

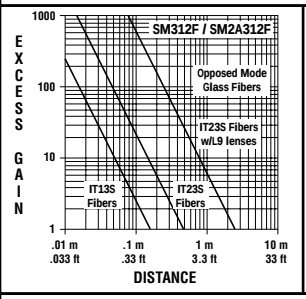
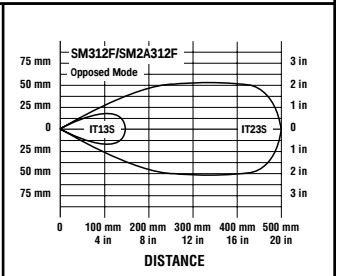
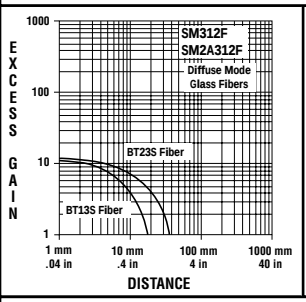
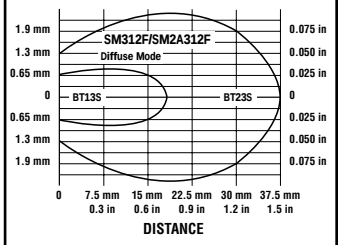
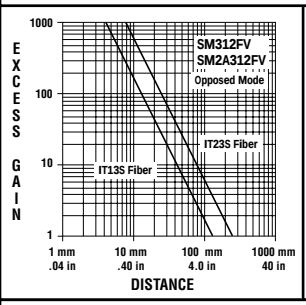
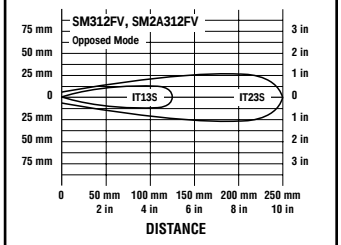
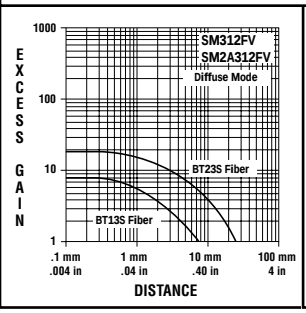
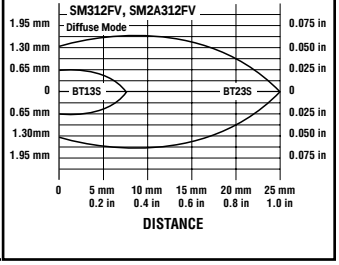
MINI-BEAM Standard Sensors

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.



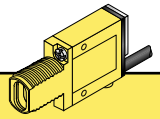
See Sensing Beam Information Below

MINI-BEAM Glass Fiber Optic Sensors

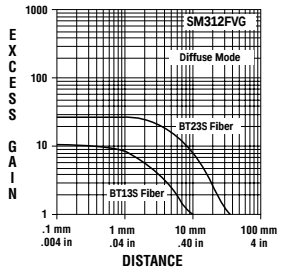
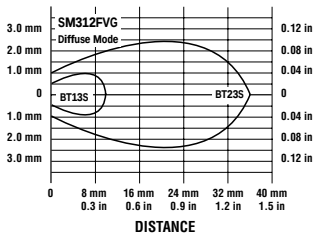
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Infrared 880 nm					OPPOSED MODE – INDIVIDUAL FIBERS	
SM312F **SM312FQD**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312F **SM2A312FQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire	DIFFUSE MODE – BIFURCATED FIBERS	
						
Visible Red 650 nm					OPPOSED MODE – INDIVIDUAL FIBERS	
SM312FV **SM312FVQD**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312FV **SM2A312FVQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire	DIFFUSE MODE – BIFURCATED FIBERS	
						

Recommended for color mark sensing.

Visible green, 525 nm

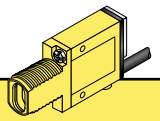


Green LED MINI-BEAM Glass Fiber Optic Sensors

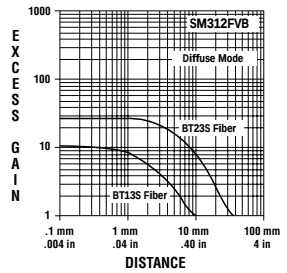
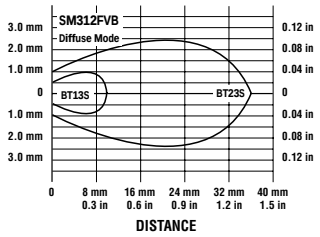
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
SM312FVG **SM312FVGQD**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

Recommended for color mark sensing.

Visible blue, 475 nm



Blue LED MINI-BEAM 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	
SM312FVB **SM312FVBQD**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

For Standard MINI-BEAMs:

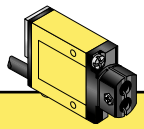
i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SM312FV W/30**).

ii) A 150 mm (6") long pigtail cable with attached QD connector is available by adding suffix **"QDP"** to the model number of any MINI-BEAM sensor (e.g., **SM312FVQDP**). See page 25 for more information.

iii) A model with a QD connector requires an accessory mating cable. See page 24 for more information.

iv) 10 to 30V dc models may be ordered with 0.3 millisecond ON/OFF response by adding suffix **"MHS"** to the model numbers (e.g., **SM312FVMHS**). This modification reduces sensing range (and excess gain).

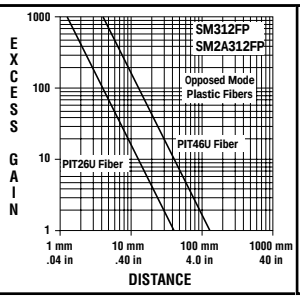
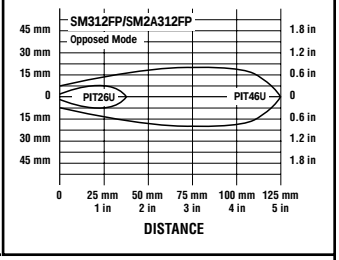
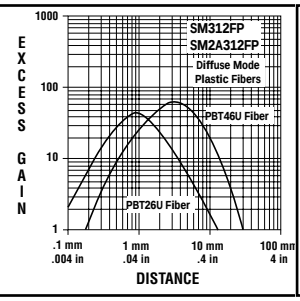
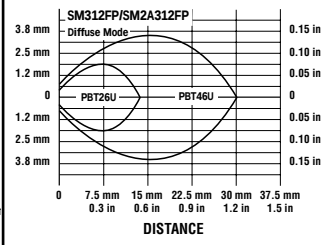
MINI-BEAM Standard Sensors



An excellent option where sensing must be accomplished in tight, inaccessible or volatile areas. Withstands vibration and shock; immune to electrical noise. Plastic fibers function well at temperatures between -30º and +70ºC (-20ºF to +158ºF), and stand up to repeated flexing. Most are easy to shorten in the field, to develop custom installations. Not recommended for severe environments.

Visible red, 650 nm

MINI-BEAM 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	
Infrared 880 nm					OPPOSED MODE – INDIVIDUAL FIBERS	
SM312FP **SM312FPQD**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SM2A312FP **SM2A312FPQD**		2 m (6.5') 3-Pin Micro-style QD	24-240V ac	SPST Solid-state 2-Wire	DIFFUSE MODE – BIFURCATED FIBERS	
						

For Standard MINI-BEAMs:

i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SM312FP W/30**).

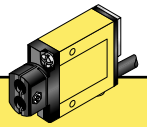
ii) A 150 mm (6") long pigtail cable with attached QD connector is available by adding suffix **"QDP"** to the model number of any MINI-BEAM sensor (e.g., **SM312FPQDP**). See page 25 for more information.

iii) A model with a QD connector requires an accessory mating cable. See page 24 for more information.

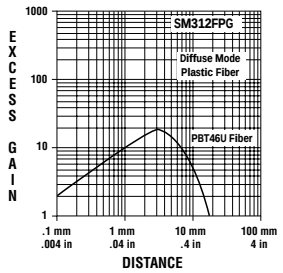
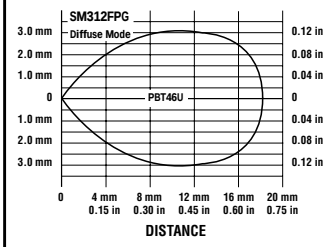
iv) 10 to 30V dc models may be ordered with 0.3 millisecond ON/OFF response by adding suffix **"MHS"** to the model numbers (e.g., **SM312FPMHS**). This modification reduces sensing range (and excess gain).

Recommended for color mark sensing.

Visible green, 525 nm

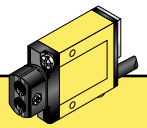


Green LED MINI-BEAM Plastic Fiber Optic Sensors

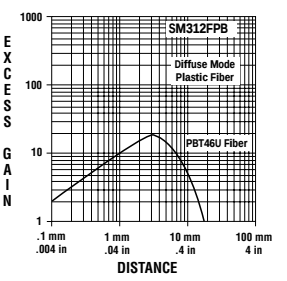
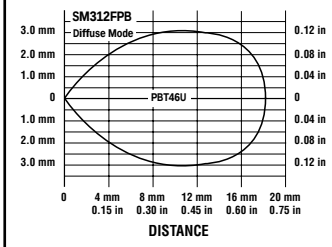
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
SM312FPG **SM312FPGQD**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

Recommended for color mark sensing.

Visible green, 525 nm



Blue LED MINI-BEAM 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	
SM312FPB **SM312FPBQD**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

Specifications for All DC-powered MINI-BEAM Standard Series Sensors

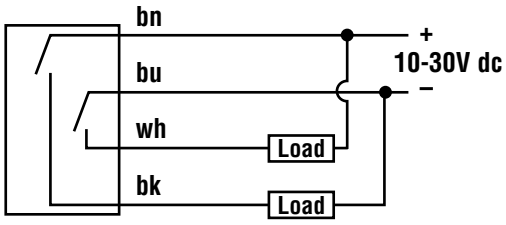
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor
Δ`4 Output Rating	150mA maximum each output at 25°C, derated to 100 mA at 70°C (derate ≈1 mA per °C) **Off-state leakage current:** less than 1 microamp **Output saturation voltage:** (PNP output) less than 1 volt at 10 mA and less than 2 volts at 150 mA **Output saturation voltage:** (NPN output) less than 200 millivolts at 10 mA and less than 1 volt at 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	Sensors will respond to either a "light" or a "dark" signal of 1 millisecond or longer duration, 500 Hz max. 0.3 millisecond response modification is available. NOTE: 100 millisecond delay on power-up; outputs are non-conducting during this time.
Repeatability	**Opposed:** 0.14 milliseconds; **Non-Polarized and Polarized Retro, Diffuse, Convergent, Glass and Plastic Fiber Optic:** 0.3 milliseconds. Response time and repeatability specifications are independent of signal strength.
Adjustments	Light/Dark Operate Select switch, and 15-turn slotted brass screw Gain (sensitivity) adjustment potentiometer (clutched at both ends of travel). Both controls are located on rear panel of sensor and are protected by a gasketed, clear acrylic cover.
Indicators	Exclusive, patented Alignment Indicating Device system (AID™, US patent #4356393) lights a rear-panel-mounted red LED indicator whenever the sensor sees a "light" condition, with a superimposed pulse rate proportional to the light signal strength (the stronger the signal, the faster the pulse rate).
Construction	Reinforced VALOX® housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws.
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 12, and 13; IEC IP67.
Connections	PVC-jacketed 4-conductor 2 m (6.5') or 9 m (30') unterminated cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately; see page 24.
Operating Temperature	**Temperature:** -20° to +70°C (-4° to +158°F) **Maximum relative humidity:** 90% at 50°C (non-condensing)
Application Notes	The NPN (current sinking) output of dc MINI-BEAM sensors is directly compatible as an input to Banner logic modules, including all non-amplified MAXI-AMP and MICRO-AMP modules. MINI-BEAMs are TTL compatible.
Certifications	

VALOX® is a registered trademark of General Electric Co.

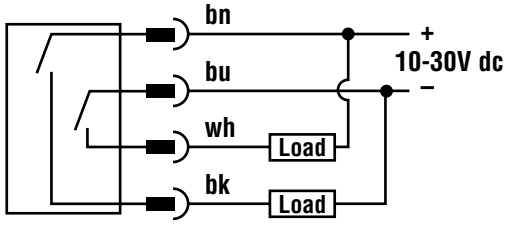
NOTE: DC MINI-BEAMs may be ordered with 0.3 millisecond ON/OFF response by adding suffix **"MHS"** to the model number (e.g., **SM312LVMHS**). This modification reduces sensing range (and excess gain).

Hookups for All DC-powered MINI-BEAM Standard Series Sensors

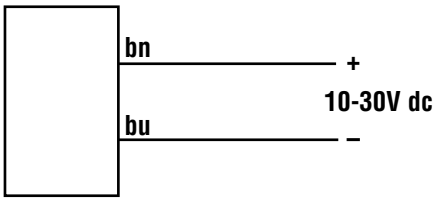
DC Sensors with Attached Cable



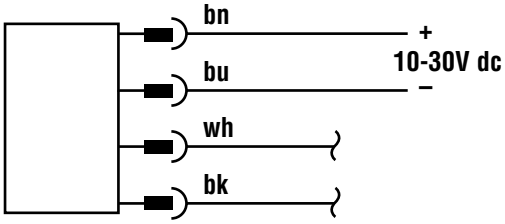
DC Sensors with Quick-Disconnect (4-Pin Euro-Style)



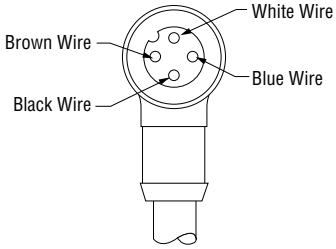
DC Emitters with Attached Cable



DC Emitters with Quick-Disconnect (4-Pin Euro-style)



4-Pin Euro-style Pin-out
(Cable Connector Shown)



Quick-Disconnect (QD) Option

DC MINI-BEAM sensors are sold with either a 2 m (6.5') or a 9 m (30') unterminated attached PVC-covered cable, or with a 4-pin Euro-style QD cable fitting.

DC QD sensors are identified by the suffix letters “QD” in their model numbers. For information on mating QD cables, see page 24.

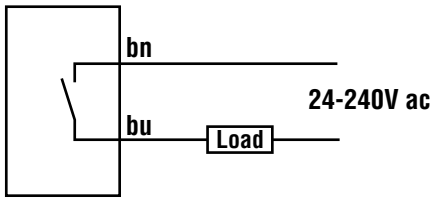
Specifications for All AC-powered MINI-BEAM Standard Series Sensors

Supply Voltage and Current	24 to 240V ac (50/60 Hz), 250V ac max
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 5 mA; maximum steady-state load capability 300 mA to 50°C ambient (122°F) 100 mA to 70°C ambient (158°F) **Inrush capability:** 3 amps for 1 second (non repetitive); 10 amps for 1 cycle (non repetitive) **Off-state leakage current:** Less than 1.7 mA rms **On-state voltage:** Drop ≤5 volts at 300 mA load, ≤10 volts at 15 mA load
Output Protection Circuitry	Protected against false pulse on power-up
Output Response Time	**Opposed Mode:** 2 millisecond on and 1 millisecond off; **Non-Polarized and Polarized Retro, Convergent, Plastic Fiber Optic:** 4 milliseconds on and off; **Diffuse and Glass Fiber Optic:** 8 milliseconds on and off. OFF response time specification does not include load response of up to ½ ac cycle (8.3 milliseconds). Response time specification of load should be considered when important. (NOTE: 300 millisecond delay on power-up.)
Repeatability	**Opposed:** 0.3 milliseconds; **Non-Polarized and Polarized Retro, and Convergent and Plastic Fiber Optic:** 1.3 milliseconds; **Diffuse and Glass Fiber Optics:** 2.6 milliseconds. Response time and repeatability specifications are independent of signal strength.
Adjustments	Light/Dark Operate Select switch and 15-turn slotted brass screw Gain (sensitivity) adjustment potentiometer (clutched at both ends of travel). Both controls are located on rear panel of sensor and are protected by a gasketed, clear acrylic cover.
Indicators	Red indicator LED on rear of sensor is ON when the load is energized.
Construction	Reinforced VALOX® housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws.
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 12, and 13; IEC IP67.
Connections	PVC-jacketed 2-conductor 2 m (6.5') or 9 m (30') unterminated cables, or 3-pin Micro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately; see page 24.
Operating Temperature	**Temperature:** -20° to +70°C (-4° to +158°F) **Maximum Relative Humidity:** 90% at 50°C (non-condensing)
Application Notes	i) AC MINI-BEAMs may be destroyed from overload conditions. ii) 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. iii) The false-pulse protection feature may cause momentary drop-out of the load when the sensor is wired in series or in parallel with mechanical switch contacts.
Certifications	CE CSA® ®

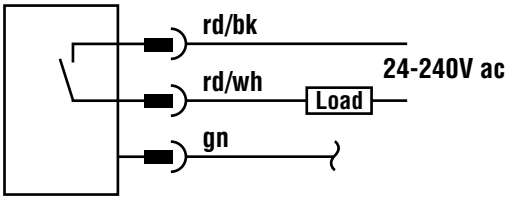
VALOX® is a registered trademark of General Electric Co.

Hookups for All AC-powered MINI-BEAM Standard Series Sensors

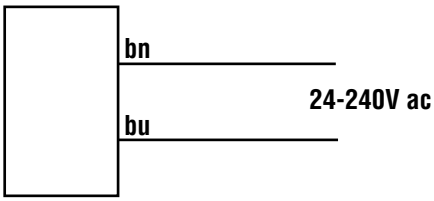
AC Sensors with Attached Cable



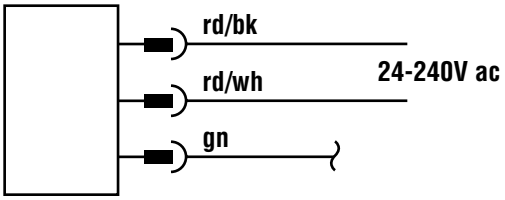
AC Sensors with Quick-Disconnect (3-Pin Micro-style)



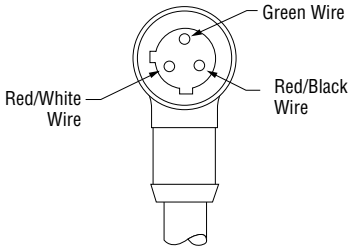
AC Emitters with Attached Cable



AC Emitters with Quick-Disconnect (3-Pin Micro-style)



3-Pin Micro-style Pin-out
(Cable Connector Shown)



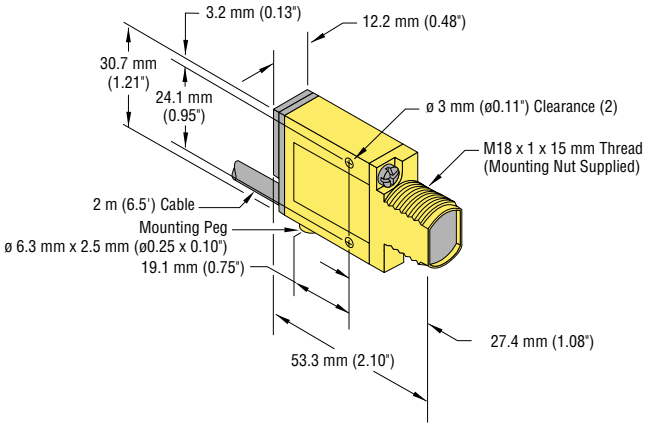
Quick-Disconnect (QD) Option

AC MINI-BEAM sensors are sold with either a 2 m (6.5') or a 9 m (30') attached PVC-covered unterminated cable, or with a 3-pin Micro-style QD cable fitting.

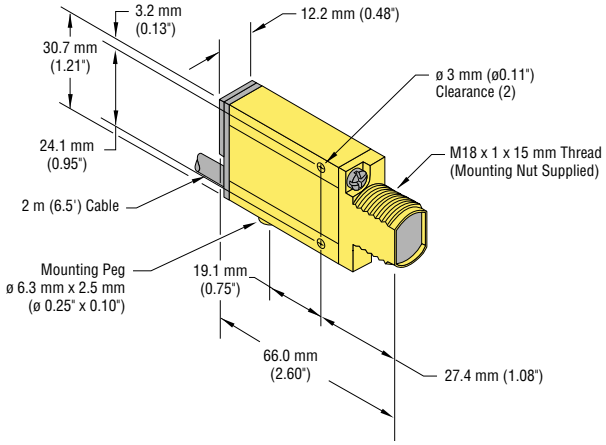
AC QD sensors are identified by the suffix letters “QD” in their model numbers. For information on mating QD cables, see page 24.

Dimensions for All MINI-BEAM Standard Series Sensors

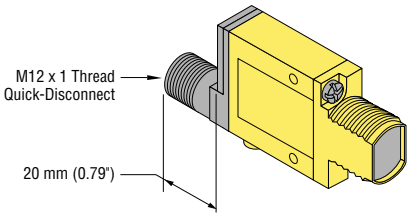
MINI-BEAM DC Sensor



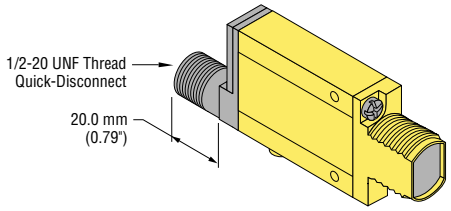
MINI-BEAM AC Sensor



MINI-BEAM DC Sensor with Quick-Disconnect

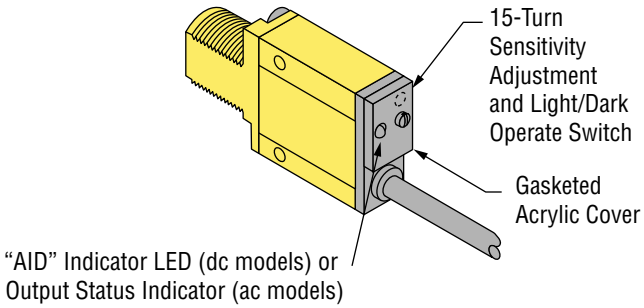


MINI-BEAM AC Sensor with Quick-Disconnect



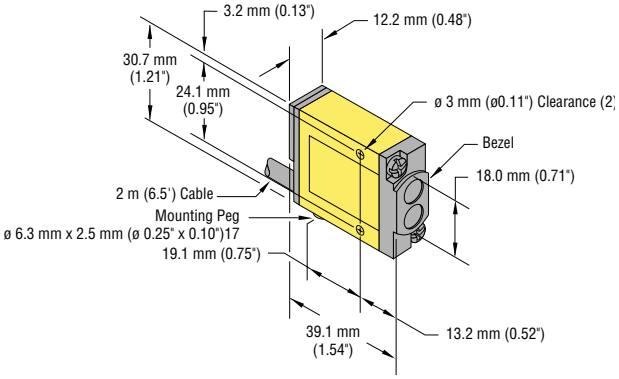
NOTE: The above four drawings apply to model numbers with suffix E, EL, EPD, R, RL, RPD, LV, LVAG, D, C, C2, CV, CV2, CVB, CV2B, CVG and CV2G.

MINI-BEAM Sensor – Rear View

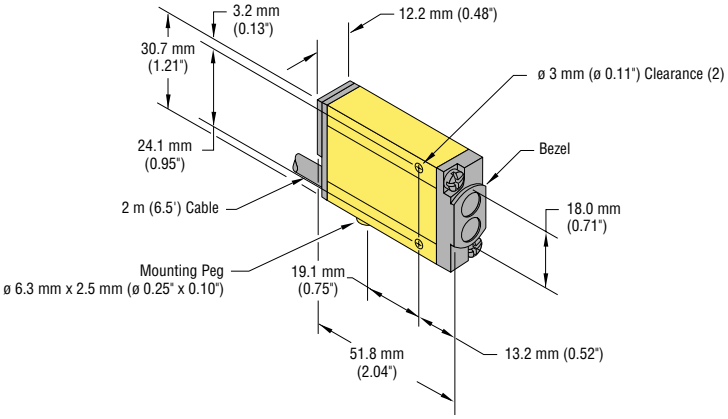


Dimensions for All MINI-BEAM Standard Series Sensors

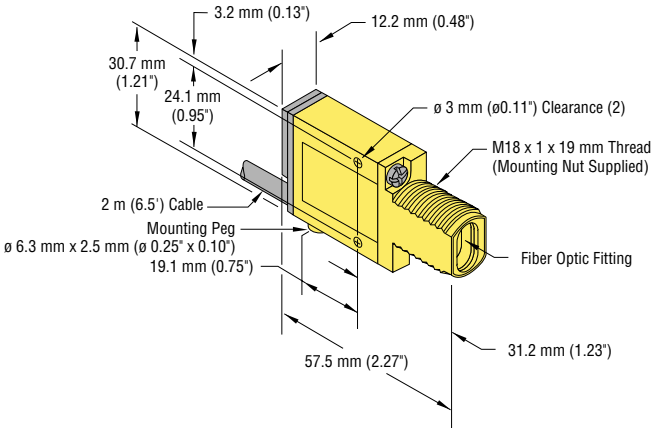
MINI-BEAM DC Sensor – Diffuse Mode (models with suffix DBZ and W)



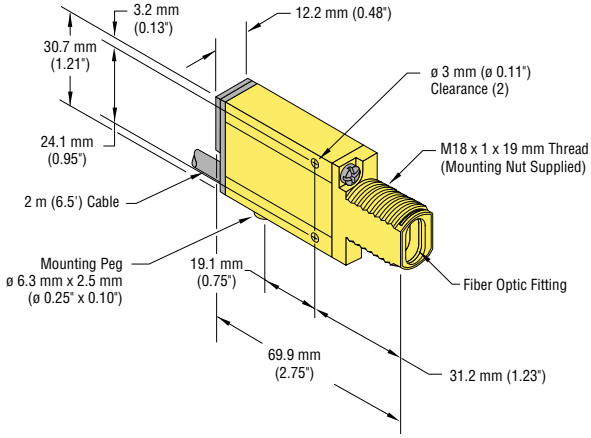
MINI-BEAM AC Sensor – Diffuse Mode (models with suffix DBZ and W)



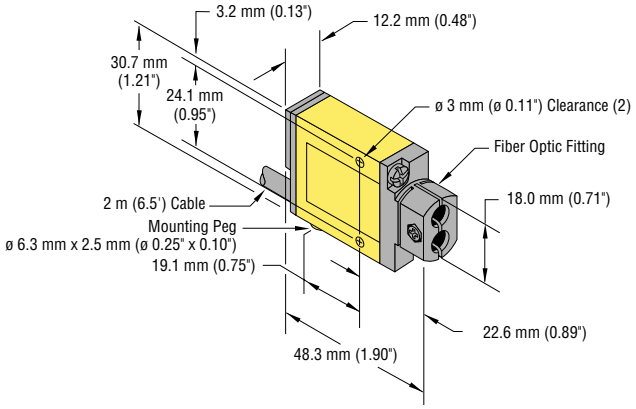
MINI-BEAM DC Sensor – Glass Fiber Optic (models with suffix F, FV, FVB and FVG)



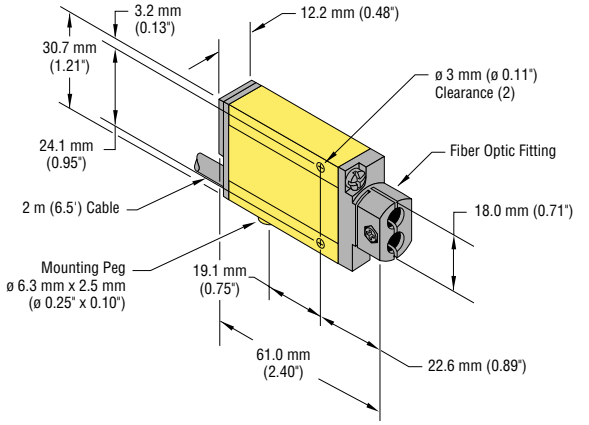
MINI-BEAM AC Sensor – Glass Fiber Optic (models with suffix F & FV)



MINI-BEAM DC Sensor – Plastic Fiber Optic (models with suffix FP, FPB and FPG)



MINI-BEAM AC Sensor – Plastic Fiber Optic (models with suffix FP)



Model MIAD9CV2Q shown with accessory model SMB312S bracket and optional MQD9-415RA QD cable

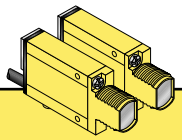
NAMUR INTRINSICALLY SAFE DC SENSOR SERIES

for use in hazardous (volatile) environments

- Intrinsically safe sensors offering MINI-BEAM performance and small size
- Use with approved switching amplifiers which have intrinsically safe input circuits
- Output passes ≤ 1 mA in the "dark" condition and ≥ 2 mA in the "light" condition
- Choose models with unterminated integral cable or quick-disconnect connector

MINI-BEAM Sensing Mode Options

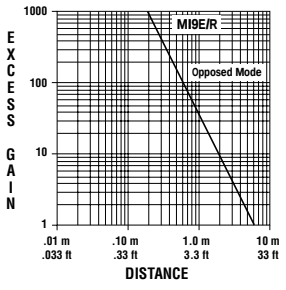
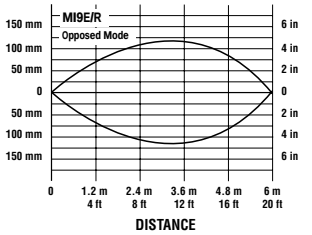
Opposed | Retroreflective | Diffuse | Convergent | Glass Fiber Optic



Their small effective beam size is ideal for accuracy-dependent applications. Recommended for use in volatile environments.

Infrared, 880 nm

NAMUR Opposed-Mode Emitter (E) and Receiver (R)

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
MI9E **MIAD9R** **MI9EQ** **MIAD9RQ**	6 m (20')	2 m (6.5') 2 m (6.5') 4-Pin Euro-style QD 4-Pin Euro-style QD	5-15V dc	Constant current ≤1 mA dark ≥2 mA light		

For NAMUR MINI-BEAMs:

i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **MIAD9R W/30**).

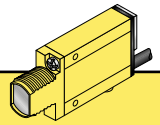
ii) A model with a QD connector requires an accessory mating cable. See page 24 for more information.

iii) The MINI-BEAM mounting bracket shown in the photographs is optional. See page 28 for bracket information.

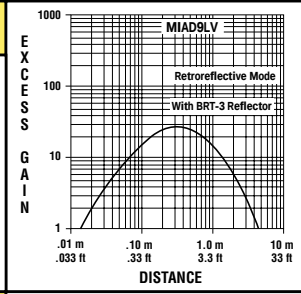
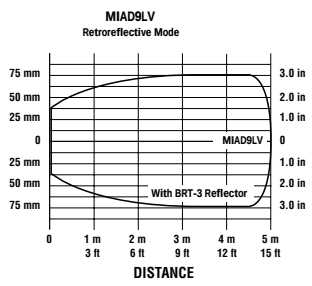
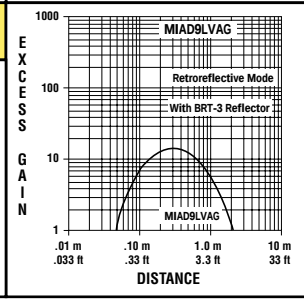
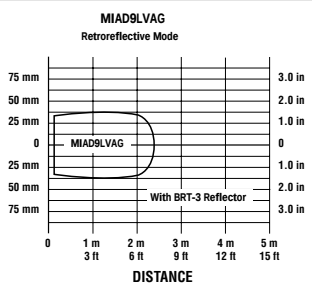
Visible red, 650 nm

Excellent for sensing even small items where sensing is possible from one side only, especially for relatively clean environments. Recommended for use in volatile environments.

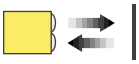
Non-Polarized, Polarized



NAMUR Retroreflective-Mode Sensors

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Non-Polarized						
MIAD9LV **MIAD9LVQ**	5 m (15')	2 m (6.5') 4-Pin Euro-style QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		
Polarized						
MIAD9LVAG **MIAD9LVAGQ**	50 mm to 2 m (2" to 7')	2 m (6.5') 4-Pin Euro-style QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		

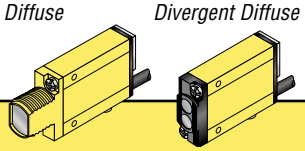
NOTE: Retroreflective range is specified using one model BRT-3 retroreflector (3" diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) used. See the Banner Photoelectric Catalog for more information.



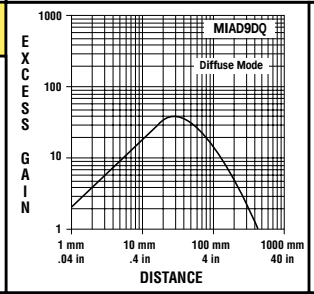
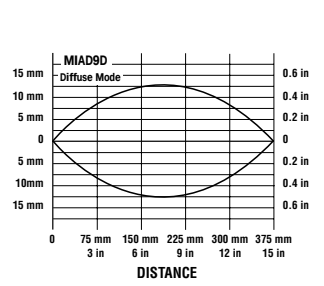
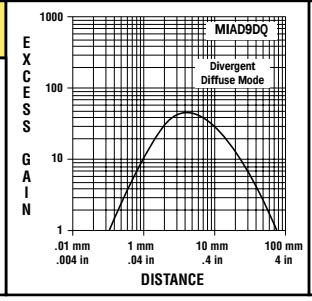
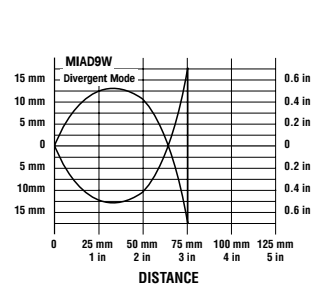
Infrared, 880 nm

These economical single-unit sensors are excellent for sensing objects of adequate size and reflectivity at short range. Divergent models are useful for sensing small, translucent or transparent items at close range. Recommended for use in volatile environments.

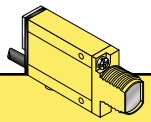
Diffuse *Divergent Diffuse*



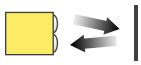
NAMUR Diffuse-Mode Sensors

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Diffuse						
MIAD9D **MIAD9DQ**	380 mm (15")	2 m (6.5') 4-Pin Euro-style QD	5-15V dc	Constant current ≤1 mA dark ≥2 mA light		
Divergent Diffuse						
MIAD9W **MIAD9WQ**	75 mm (3")	2 m (6.5') 4-Pin Euro-style QD	5-15V dc	Constant current ≤1 mA dark ≥2 mA light		

MINI-BEAM NAMUR Sensors

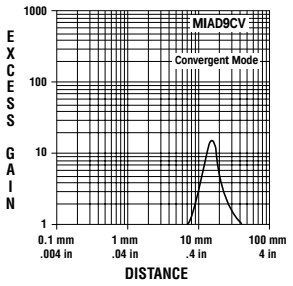
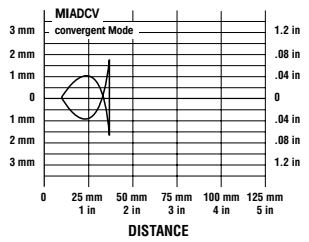
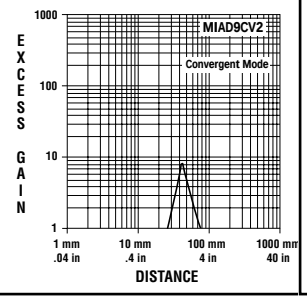
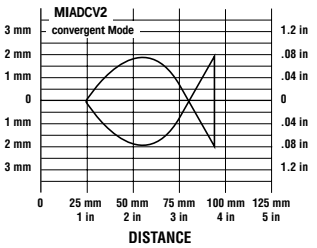


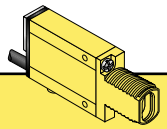
Convergent-mode sensors feature high excess gain and can detect objects of low reflectivity. They also are a good choice for counting radiused objects with no space between them, for accurate position sensing, and for sensing of clear materials that travel near the scan beam's focus. Recommended for use in volatile environments.



Visible red, 650 nm

NAMUR Convergent-Mode Sensors

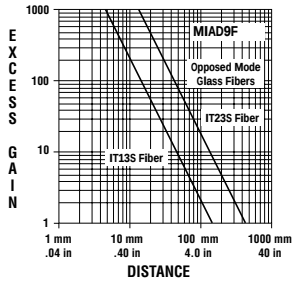
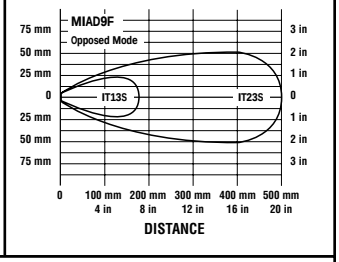
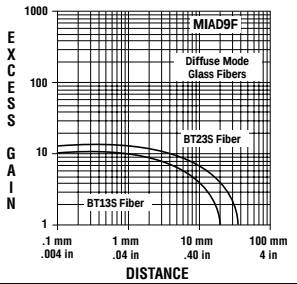
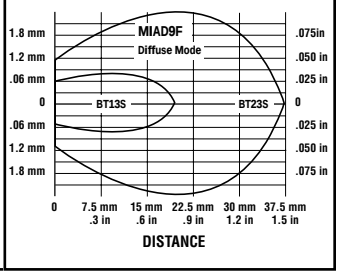
Models	Focus	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
MIAD9CV **MIAD9CVQ**	16 mm (0.65")	2 m (6.5') 4-Pin Euro-style QD	5-15V dc	Constant current ≤1 mA dark ≥2 mA light		
MIAD9CV2 **MIAD9CV2Q**	43 mm (1.7")	2 m (6.5') 4-Pin Euro-style QD	5-15V dc	Constant current ≤1 mA dark ≥2 mA light		



An excellent option for sensing in tight or inaccessible areas. Withstands vibration and shock; immune to electrical noise. Glass fibers withstand high temperatures, extreme moisture and corrosive materials. Recommended for use in volatile environments.

Infrared, 880 nm

NAMUR 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	
					OPPOSED MODE – INDIVIDUAL FIBERS	
MIAD9F **MIAD9FQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-Pin Euro-style QD	5-15V dc	Constant current ≤1 mA dark ≥2 mA light		
					DIFFUSE MODE – BIFURCATED FIBERS	
						

Specifications for All MINI-BEAM NAMUR Series Sensors

Supply Voltage	5 to 15V dc (provided by the amplifier to which the sensor is connected).
Output	**Constant current output:** ≤1 mA in the "dark" condition and ≥2 mA in the "light" condition
Output Response Time	**Opposed mode receiver:** 2 milliseconds on/400 µs off; **All other models:** 5 milliseconds on/off (does not include amplifier response)
Adjustment	15-turn slotted brass screw Gain (sensitivity) adjustment potentiometer (clutched at both ends of travel); located on rear panel and protected by a clear gasketed acrylic cover.
Indicator	Red LED alignment indicator located on rear panel lights when the sensor sees a "light" condition
Construction	Reinforced VALOX® housing, totally encapsulated, o-ring sealing, acrylic lenses, and stainless steel screws
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 12 and 13; IEC IP 67
Connections	PVC-jacketed 2-conductor 2 m (6.5') or 9 m (30') unterminated cables, or 4-pin Euro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately; see page 24.
Operating Temperature	**Temperature:** -40° to +70°C (-40° to +158°F) **Maximum Relative Humidity:** 90% at 50°C (non-condensing)
Design Standards	MIAD9 Series sensors comply with the following standards: DIN 19 234, EN 50 014 Part 1. 1977, EN50 020 Part 7. 1977, Factory Mutual #3610 and 3611, CSA 22.2 #157-92 and 22.2 #213-M1987
Certifications	CE, CSA Exia ® NRTL/C, KEMA, ETL LISTED 107674, FM APPROVED

VALOX® is a registered trademark of General Electric Co.

APPROVALS

CSA:	#LR 41887	Intrinsically Safe, with Entity for: Class I, Groups A-D Class I, Div. 2, Groups A-D
FM:	#J.I. 5Y3A4.AX	Intrinsically Safe, with Entity for: Class I, II, III, Div. 1, Groups A-G Class I, II, III, Div. 2, Groups A-D and G
KEMA:	#Ex-94.C.7937	EEx ia IIC T6
ETL:	#553868	

For NAMUR MINI-BEAMs:

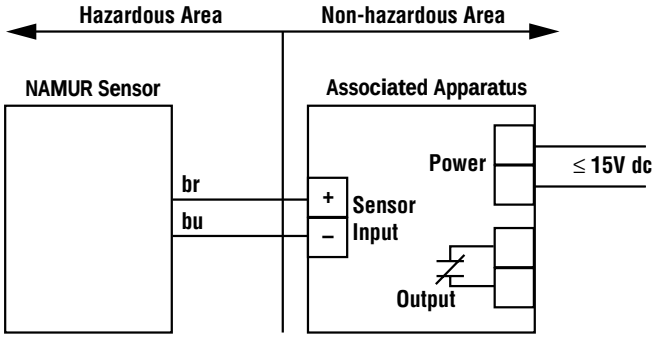
i) 9 m (30') unterminated cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **MIAD9CV W/30**).

ii) A model with a QD connector requires an accessory mating cable. See page 24 for more information.

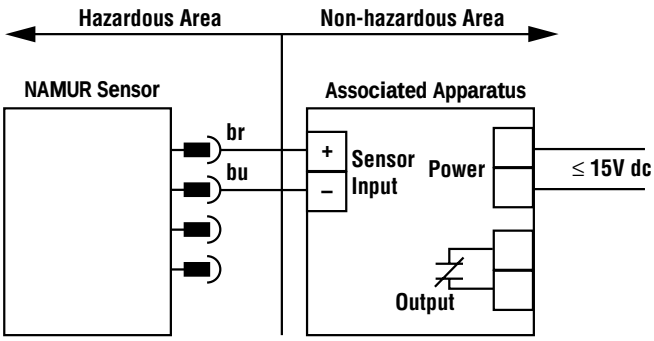
iii) The MINI-BEAM mounting bracket shown in the photographs is optional. See page 28 for bracket information.

Hookups for All MINI-BEAM NAMUR Series Sensors

Sensors with Attached Cable



Sensors with Quick-Disconnect (QD)



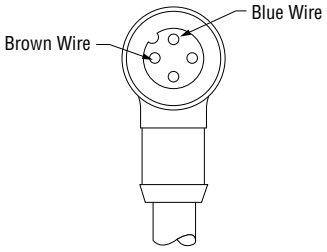
Entity Parameters

Associated Apparatus	Sensor
V_{oc} ≤ 15V dc	V_{max} = 15V dc
I_{sc} ≤ 60 mA	I_{max} = 60 mA
C_a ≤ *C(cable) + Ci	C_i = 0
L_a ≤ *L(cable) + Li	L_i = 0
$^*C_{(cable)}$ = 60 pF/ft	$^*L_{(cable)}$ = 0.2 µH/ft

Application Notes

The "Associated Apparatus" may include intrinsically safe amplifiers and barriers to monitor the sensor supply current, which is the sensor's output signal. The associated apparatus must limit both supply voltage and supply current in the event of failure.

Micro-style Pin-out
(Cable Connector Shown)



Quick-Disconnect (QD) Option for NAMUR Sensors

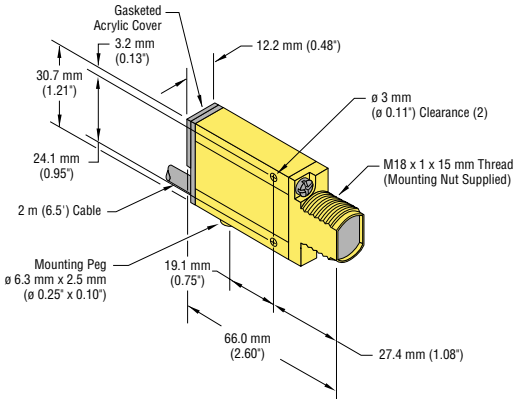
MINI-BEAM series MIAD9 NAMUR sensors are sold with either a 2 m (6.5') or 9 m (30') attached PVC-covered unterminated 2-wire cable or with a 4-pin QD cable fitting.

NAMUR QD sensors are identified by the suffix "Q" in their model numbers, and are provided with a 4-pin Euro-style connector. For more information on mating QD cables, see page 24.

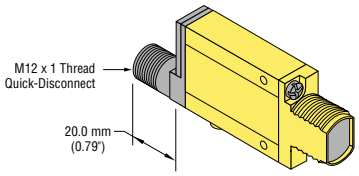
Dimensions for All MINI-BEAM NAMUR Series Sensors

NAMUR Opposed, Retro, Diffuse and Convergent Sensing Modes (model numbers with suffix E, R, LV, LVAG, D, CV & CV2)

NAMUR Sensor with Attached Cable

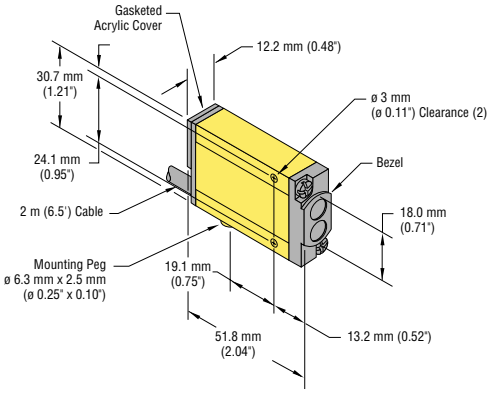


NAMUR Sensor with Quick-Disconnect

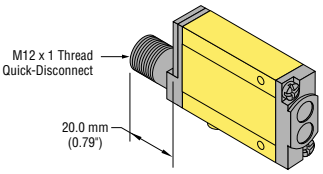


NAMUR Divergent Diffuse Sensing Mode (model numbers with suffix W)

NAMUR Sensor with Attached Cable

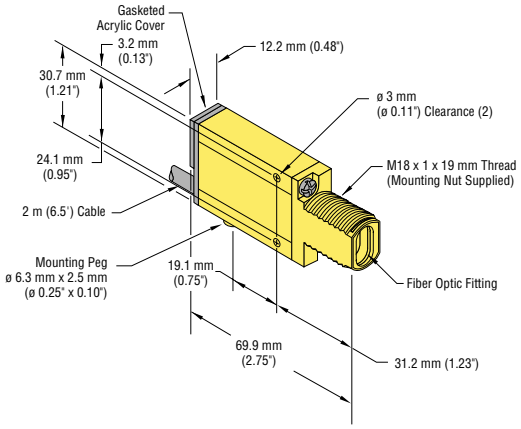


NAMUR Sensor with Quick-Disconnect

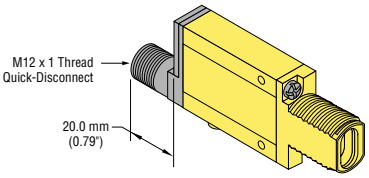


NAMUR Glass Fiber Optic Sensing (model numbers with suffix F)

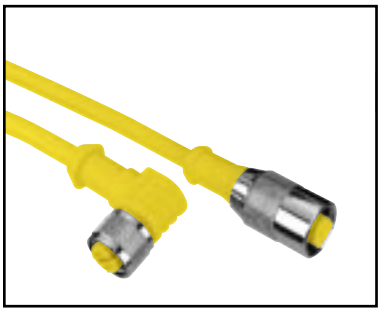
NAMUR Sensor with Attached Cable



NAMUR Sensor with Quick-Disconnect

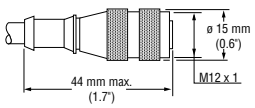
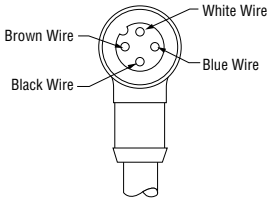
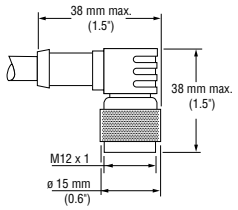
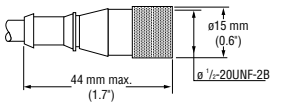
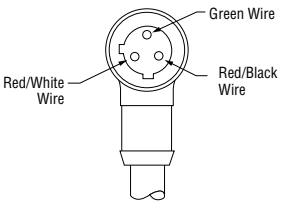
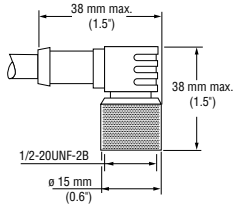
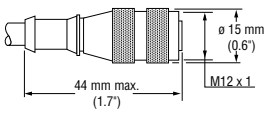
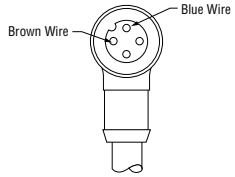
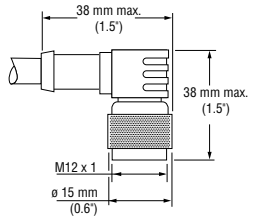


MINI-BEAM Accessories



Accessory Mating Cables for Quick-Disconnect (QD) MINI-BEAM Models

The following is a selection of cables available for the MINI-BEAM QD models

Style	Model	Length	For use with	DImensions	Pin-out
4-pin Euro-style straight	**MQDC-406** **MQDC-415** **MQDC-430**	2 m (6.5') 5 m (15') 9 m (30')	SM312 Series dc model MINI-BEAMs		
4-pin Euro-style right-angle	**MQDC-406RA** **MQDC-415RA** **MQDC-430RA**	2 m (6.5') 5 m (15') 9 m (30')			
3-pin Micro-style straight	**MQAC-306** **MQAC-315** **MQAC-330**	2 m (6.5') 5 m (15') 9 m (30')	SM2A312 Series ac model MINI-BEAMs		
3-pin Micro-style right-angle	**MQAC-306RA** **MQAC-315RA** **MQAC-330RA**	2 m (6.5') 5 m (15') 9 m (30')			
4-Pin Euro-style straight	**MQD9-406** **MQD9-415**	2 m (6.5') 5 m (15')	NAMUR Series MINI-BEAMs		
4-Pin Euro-style right-angle	**MQD9-406RA** **MQD9-415RA**	2 m (6.5') 5 m (15')			

MINI-BEAM Modifications Available

Model Suffix	Modification	Description	Example of Model Number
W/30	9 m (30') cable	All MINI-BEAM sensors may be ordered with an integral 9 m (30') unterminated cable in place of the standard 2 m (6.5') cable	SM312LV W/30
MHS	Modified for High Speed	Standard dc MINI-BEAM sensors with 1 millisecond output response may be modified for 0.3 millisecond (300 µs) response. NOTE: Faster response comes at the expense of lower excess gain.	SM312LVMHS
QDP	Pigtail Quick-Disconnect	All MINI-BEAMs may be built with a 150 mm (6") long integral cable which is terminated with the appropriate QD connector. 	SM312LVQDP

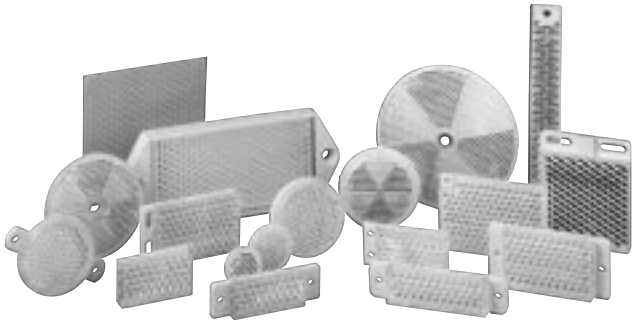
MINI-BEAM Extension Cables (Without Connectors)

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

Model	Type	Used with:
EC312A-100	2-conductor	MINI-BEAM emitters, SM2A312 ac models
EC312-100	4-conductor	All MINI-BEAM SM312 dc models, except emitters
ECAD9-100	2-conductor	MINI-BEAM NAMUR models

Retroreflective Targets

Model	Reflectivity Factor	Maximum Temperature	Size
BRT-3*	1.0	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-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-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-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-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-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.

Retroreflective Tape

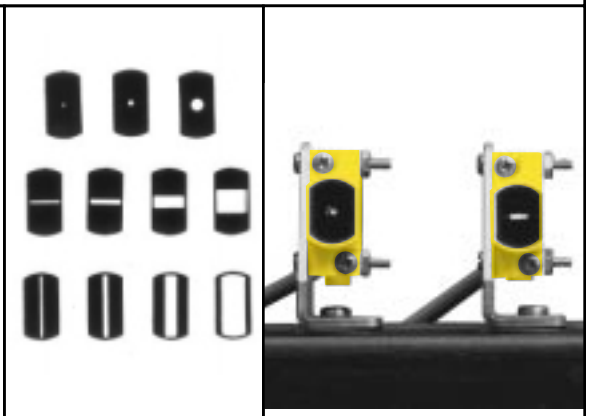
Model	Reflectivity Factor	Maximum Temperature	Size	Unit
BRT-THG-3X3-10	0.7	60°C (140°F)	75 x 75 mm (3" x 3")	Package of 10
BRT-THG-4X4-5	0.7	60°C (140°F)	100 x 100 mm (4" x 4")	Package of 5
BRT-THG-8.5X11-2	0.7	60°C (140°F)	216 x 280 mm (8.5" x 11")	Package of 2
BRT-THG-18X36	0.7	60°C (140°F)	457 x 914 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

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

Apertures

Opposed-mode MINI-BEAM sensors may be fitted with apertures which narrow or shape the effective beam of the sensor to more closely match the size or profile of the object to be sensed, for example, the use of "line" (or "slit") apertures for sensing wire or thread. Each model contains 20 apertures.

Model	Description
AP31-020	0.5 mm (0.02") diameter, circular
AP31-040	1.0 mm (0.04") diameter, circular
AP31-100	2.5 mm (0.10") diameter, circular
AP31-020H	0.5 x 6.4 mm (0.02" x 0.25"), horizontal slotted
AP31-040H	1.0 x 6.4 mm (0.04" x 0.25"), horizontal slotted
AP31-100H	2.5 x 6.4 mm (0.10" x 0.25"), horizontal slotted
AP31-200H	5.1 x 6.4 mm (0.20" x 0.25"), horizontal slotted
AP31-020V	0.5 x 12.7 mm (0.02" x 0.50"), vertical slotted
AP31-040V	1.0 x 12.7 mm (0.04" x 0.50"), vertical slotted
AP31-100V	2.5 x 12.7 mm (0.10" x 0.50"), vertical slotted
AP31-200V	5.1 x 12.7 mm (0.20" x 0.50"), vertical slotted
AP31-DVHX2	Kit containing two of each aperture



Range of MINI-BEAM Opposed-Mode Sensor Pairs when Used with Apertures

Definitions

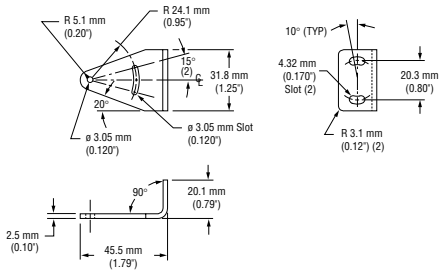
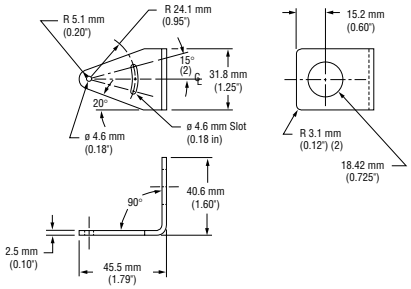
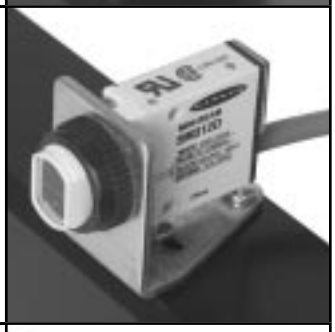
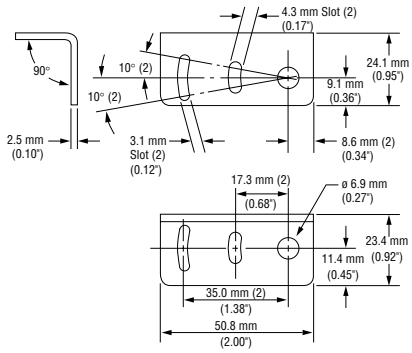
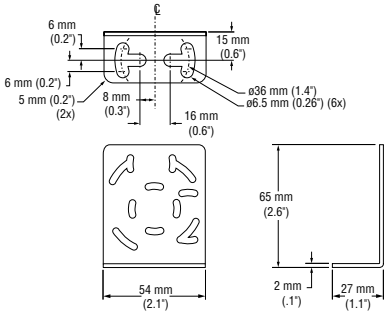
GROUP I Emitter/ Receiver Pairs (see RANGE columns at right):
SM31E/SM31R
SMA31E/SM2A31R

GROUP II Emitter/ Receiver Pairs (see RANGE columns at right):
SM31EL/SM31RL
SMA31EL/SM2A31RL

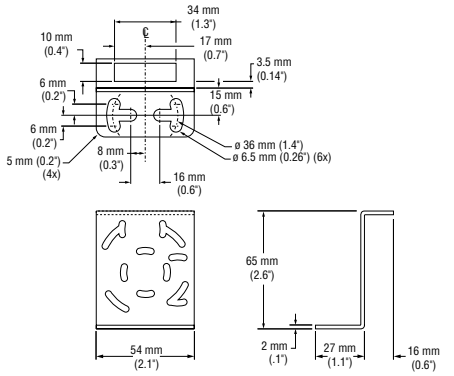
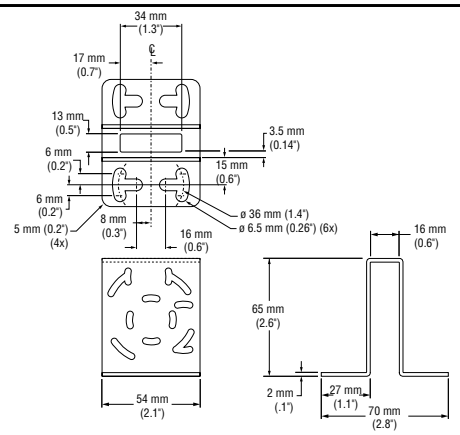
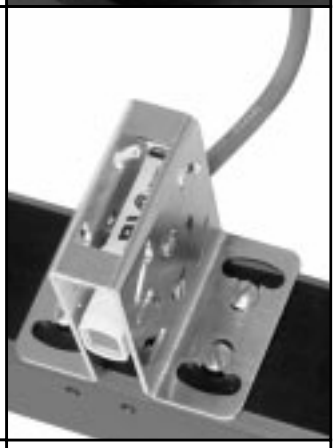
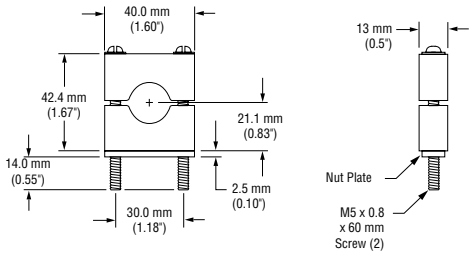
Example:
The MINI-BEAM SM31E/ SM31R sensor pair is in **Group I**. With an **AP31-040 circular** aperture on the *receiver only*, range is 940 mm (37"). With AP31-040 apertures on *both emitter and receiver*, range is 330 mm (13"). Group I range with AP31-040 apertures and UC-300EL upper covers on both units is 483 mm (19"); range with only receiver apertures is 2.0 m (80").

Aperture(s) Used	RANGE Standard Group I and II Sensor Pairs				RANGE Group I Sensor Pairs with UC-300EL Upper Covers Substituted	
	Emitter & Receiver Both Apertured		Receiver Only Apertured			
	Group I Sensors	Group II Sensors	Group I Sensors	Group II Sensors	Emitter & Receiver Both Apertured	Receiver Only Apertured
AP31-020	89 mm (3.5")	102 mm (4.0")	457 mm (18'")	1.5 m (60")	127 mm (5.0")	914 mm (36")
AP31-040	330 mm (13 ")	457 mm (18")	940 mm (37")	3.2 m (10.5't)	483 mm (19")	2.0 m (80")
AP31-100	1.5 m (60")	3.0 m (10')	2.5 m (100")	8.2 m (27')	2.1 m (84")	5.8 m (19')
AP31-020H	406 mm (16")	1.8 m (70")	965 mm (38")	9.1 m (30')	864 mm (34")	3.4 m (11')
AP31-040H	914 mm (36")	4.0 m (13')	1.8 m (72")	12.5 m (41')	1.8 m (72")	5.2 m (17')
AP31-100H	2.3 m (90")	10.4 m (34')	2.9 m (114")	20.7 m (68')	5.2 m (17')	8.5 m (28')
AP31-200H	2.8 m (110")	21.3 m (70')	3.0 m (120")	24.4 m (80')	8.2 m (27')	11.0 m (36')
AP31-020V	457 mm (18")	1.7 m (65")	1.0 m (40")	8.2 m (27')	1.0 m (40")	3.4 m (11')
AP31-040V	1.0 m (40")	5.5 m (18')	1.8 m (70")	15.8 m (52')	2.1 m (84")	5.5 m (18')
AP31-100V	2.3 m (90")	10.7 m (35')	2.9 m (114")	22.9 m (75')	6.1 m (20')	8.5 m (28')
AP31-200V	2.8 m (110")	22.9 m (75')	3.0 m (120")	25.9 m (85')	8.5 mm (28')	11.0 m (36')

MINI-BEAM Mounting Brackets

Model	Description	Dimensions	
SMB312S	Stainless steel 2-axis, side mounting bracket		
SMB312PD	Stainless steel 18 mm barrel mounting bracket		
SMB312B	Stainless steel 2-axis, bottom mounting bracket		
SMB46L	• "L" bracket • 14 ga 316 stainless steel		

MINI-BEAM Mounting Brackets

Model	Description	Dimensions	
SMB46S	• "S" bracket • 14 ga 316 stainless steel		
SMB46U	• "U" bracket • 14 ga 316 stainless steel		
SMB18C	• 18 mm split clamp black VALOX® bracket • Stainless steel mounting hardware included		
SMB18S	• 18 mm swivel, black VALOX® bracket • Stainless steel mounting hardware included