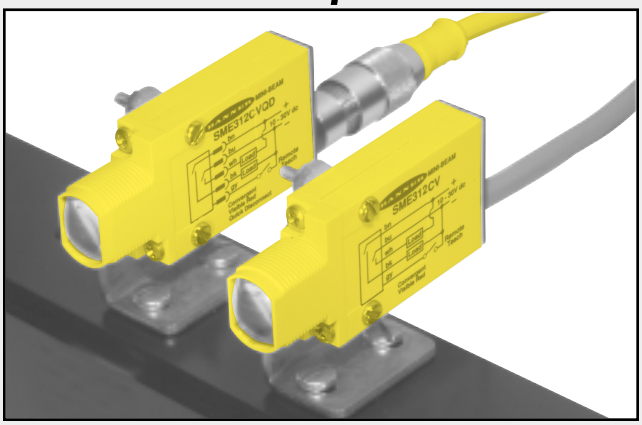
- MINI-BEAM sets performance standards for small photoelectric sensors
- Choose standard, *Expert*™, universal voltage or intrinsically safe (NAMUR) models
- *Expert*™ models feature Banner's patented push-button TEACH mode sensitivity adjustment
- Choice of integral cable or quick-disconnect connector
- Wide array of mounting options, including 18 mm in-line thread
- Solid-state circuitry is epoxy-encapsulated in reinforced thermoplastic polyester housing

SECTION CONTENTS

MINI-BEAM sensors are not suitable for use in personnel safety applications! See WARNING on inside front cover of catalog.

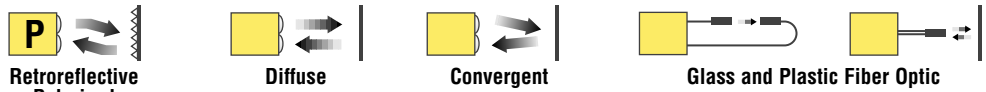


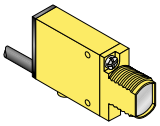
MINI-BEAM *Expert*™ SENSORS

- TEACH-mode sensors in the popular MINI-BEAM package
- Easy push-button programming automatically adjusts sensitivity to optimal setting*
- Fast, 500 microsecond (0.5 millisecond) output response
- Bipolar NPN (sinking) / PNP (sourcing) outputs
- Easy output programming eliminates the need for Light or Dark Operate selection
- Separate TEACH input allows remote programming by an external device, such as a switch or a process controller
- Green Stability indicator flashes when received signal level approaches the switching threshold, also indicates Power ON
- Choose models with integral 2 m (6.5 in) cable or 5-pin Euro-style quick-disconnect (QD) connector; 9 m (30 in) cables are also available

* U.S. Patent no. 5808296
** U.S. Patent no. 4356393

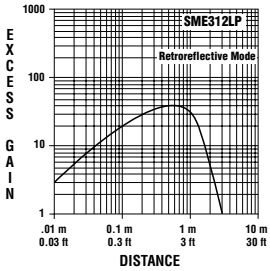
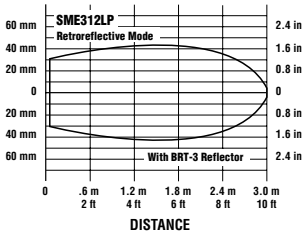
MINI-BEAM *Expert* Sensing Mode Options





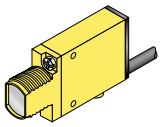
Polarized, Visible red, 650 nm

MINI-BEAM *Expert* Series Polarized Retroreflective Mode

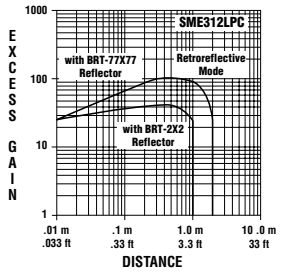
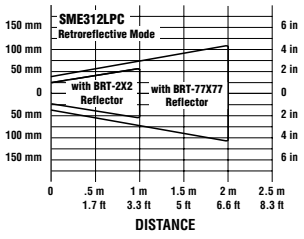
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Polarized						
SME312LP **SME312LPQD**	10 mm to 3 m (0.4 in to 10 ft)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

NOTE: Retroreflective range is specified using one model BRT-3 retroreflector (3 in diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) used. See page 238 and the Accessories section for more information.

Visible red, 650 nm

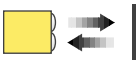


MINI-BEAM *Expert* Series Polarized Retroreflective Clear Object Detection

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
SME312LPC* **SME312LPCQD***	1 m (3.3 ft) with supplied reflector	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

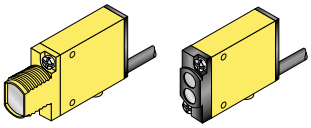
*NOTE: Sensing range will vary, according to the efficiency and reflective area of the retroreflector(s) used. For these low-contrast applications, the model BRT-2X2 (2 in x 2 in) reflector is recommended, and one is bundled with each SME312LPC(QD) sensor.

- For applications that involve high levels of vibration, the model BRT-36x40BM, with its micro-prism geometry, is recommended.
- For long-range applications, the BRT-77X77C reflector provides a range up to 2 m (6.5 ft).
- SME312LPC(QD) are for use with corner cube type reflectors only; reflective tape is not recommended. See the Accessories section for more information.



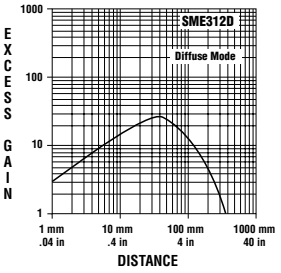
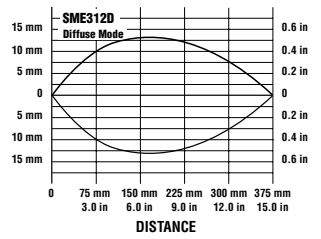
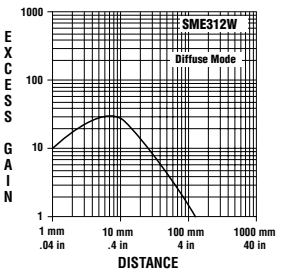
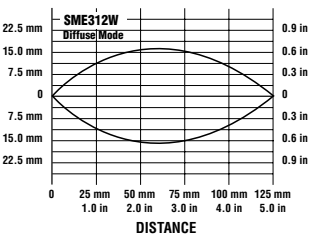
Infrared, 880 nm

†Note: Divergent diffuse models recommended for sensing clear materials.

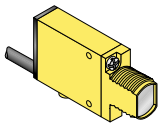


D Models *W Models*

MINI-BEAM *Expert* Series Diffuse Mode

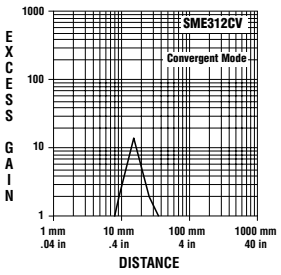
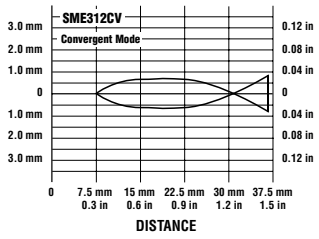
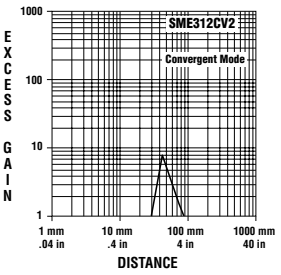
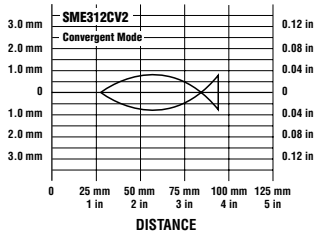
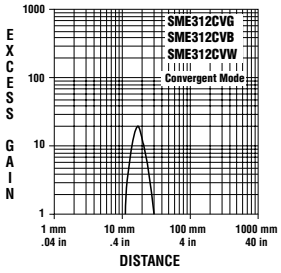
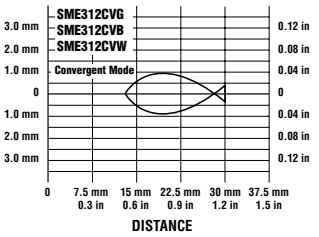
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
SME312D **SME312DQD**	380 mm (15 in)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Divergent Diffuse†						
SME312W **SME312WQD**	130 mm (5 in)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

NOTES: i) 9 m (30 ft) cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SME312D W/30**)
ii) A model with a QD connector requires a mating cable. See page 238 and the Accessories section for more information.

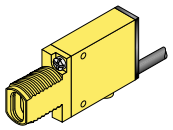


See Sensing Beam Information Below

MINI-BEAM *Expert* Series Convergent Mode

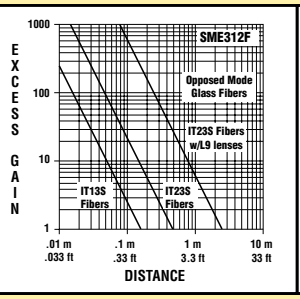
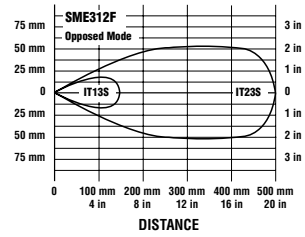
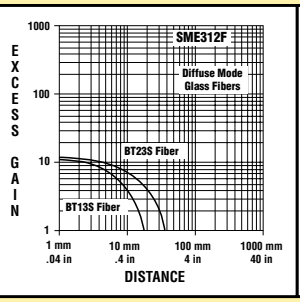
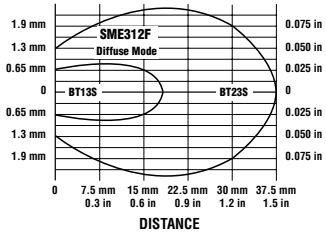
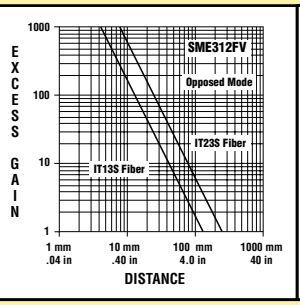
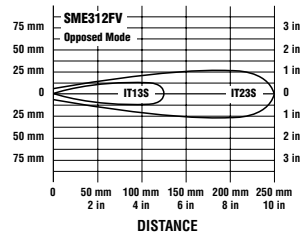
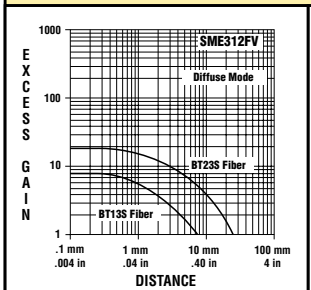
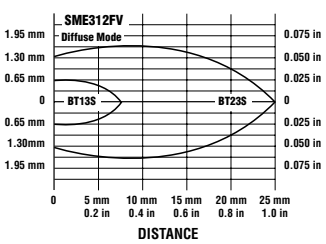
Models	Focus	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Visible Red 650 nm						
SME312CV **SME312CVQD**	16 mm (0.65 in) **Spot Size at Focus:** 1.3 mm (0.05 in)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
SME312CV2 **SME312CVQD**	43 mm (1.7 in) **Spot Size at Focus:** 3.0 mm (0.12 in)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Visible Green 525 nm*						
SME312CVG **SME312CVGQD**	16 mm (0.65 in) **Spot Size at Focus:** 1.0 mm (0.04 in)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Visible Blue 475 nm*						
SME312CVB **SME312CVBQD**	16 mm (0.65 in) **Spot Size at Focus:** 1.8 mm (0.07 in)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Visible White 450-650 nm*						
SME312CVW **SME312CVWQD**	16 mm (0.65 in) **Spot Size at Focus:** 1.8 mm (0.07 in)	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

*Note: Green, blue, and white LED models are recommended for color mark sensing applications. Consult your local or factory sales engineer for model selection assistance.



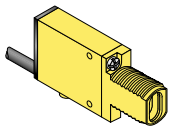
See Sensing Beam Information Below

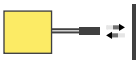
MINI-BEAM *Expert* Series Glass Fiber Optic

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**	
SME312F **SME312FQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
					DIFFUSE MODE – BIFURCATED FIBERS	
						
Visible Red 650 nm					**OPPOSED MODE – INDIVIDUAL FIBERS**	
SME312FV **SME312FVQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
					DIFFUSE MODE – BIFURCATED FIBERS	
						

NOTES: i) 9 m (30 ft) cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SME312F W/30**)

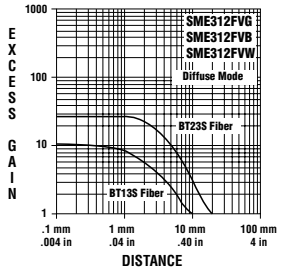
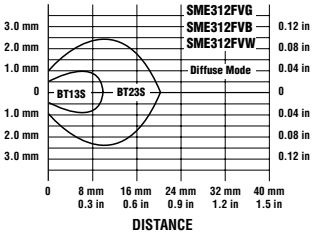
ii) A model with a QD connector requires a mating cable. See page 238 and the Accessories section for more information.





See Sensing Beam Information Below

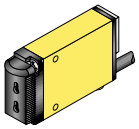
MINI-BEAM *Expert* Series Glass Fiber Optic

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Visible Green 525 nm					DIFFUSE MODE – BIFURCATED FIBERS	
SME312FVG **SME312FVGQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Visible Blue 475 nm						
SME312FVB **SME312FVBQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Visible White 450-650 nm						
SME312FVW **SME312FVWQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

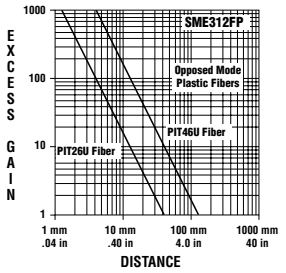
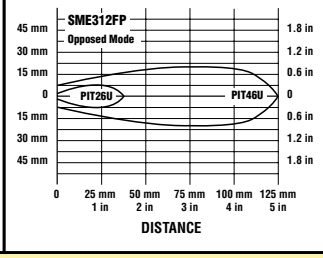
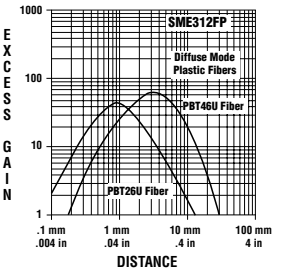
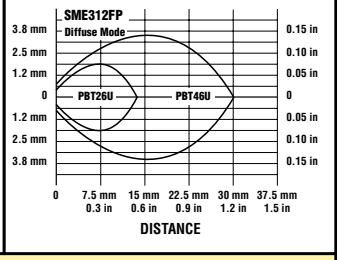
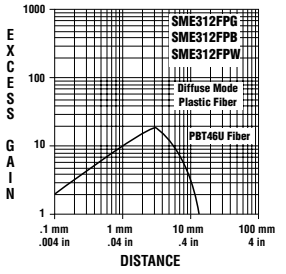
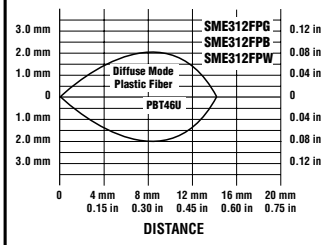
Note: Green, blue, and white LED models are recommended for color mark sensing applications. Consult your local or factory sales engineer for model selection assistance.

Banner Engineering Corp. • Minneapolis, U.S.A.
Website: http://www.baneng.com • Tel: 612.544.3164

See Sensing Beam Information Below



MINI-BEAM *Expert* Series Plastic Fiber Optic

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Visible Red 650 nm					**OPPOSED MODE – INDIVIDUAL FIBERS**	
SME312FP **SME312FPQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
					DIFFUSE MODE – BIFURCATED FIBERS	
						
Visible Green 525 nm					**DIFFUSE MODE – BIFURCATED FIBERS**	
SME312FPG **SME312FPGQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Visible Blue 475 nm						
SME312FPB **SME312FPBQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		
Visible White 450-650 nm						
SME312FPW **SME312FPWQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft) 5-Pin Euro-style QD	10-30V dc	Bipolar NPN/PNP		

NOTES: i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SME312FPB W/30**)

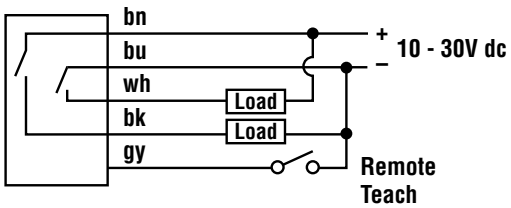
ii) A model with a QD connector requires a mating cable. See page 238 and the Accessories section for more information.

MINI-BEAM *Expert* Series Specifications

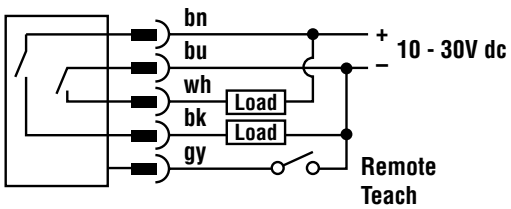
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Bipolar: One current sourcing (PNP) and one current sinking (NPN) open-collector transistor
Output 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 5µA @ 30V dc **ON-state saturation current:** less than 1V @ 10 mA; less than 1.5V @ 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 500 micro seconds or longer duration, 1 kHz max. NOTE: 1 second delay on power-up; outputs are non-conducting during this time.
Repeatability	100 microseconds (all models)
Adjustments	Push-button TEACH mode sensitivity setting; remote TEACH mode input is provided (gray wire)
Indicators	Two LEDs: Yellow and Bi-color Green/Red **Green (RUN Mode):** ON when power is applied Flashes when received light level approaches the switching threshold **Red (TEACH Mode):** OFF when no signal is received. Pulses to indicate signal strength (received light level). Rate is proportional to signal strength (the stronger the signal, the faster the pulse rate). This is a function of Banner's patented Alignment Indicating Device (AID™, US patent 4356393). **Yellow (TEACH Mode):** ON to indicate sensor is ready to learn output ON condition OFF to indicate sensor is ready to learn output OFF condition **Yellow (RUN Mode):** ON when outputs are conducting
Construction	Reinforced thermoplastic polyester housing, totally encapsulated, o-ring seal, acrylic lenses, and stainless steel screws.
Environmental Rating	Meets NEMA standards 1, 2, 3, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 5-conductor 2 m (6.5 ft) or 9 m (30 ft) unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately; see page 238.
Operating Conditions	**Temperature:** -20° to +70°C (-4° to +158°F) **Maximum relative humidity:** 90% at 50°C (non-condensing)
Application Notes	The first condition presented during TEACH mode becomes the output ON condition.
Certifications	CE c UL us

MINI-BEAM *Expert* Hookup Diagrams

MINI-BEAM Expert Series Sensor (Cabled models)



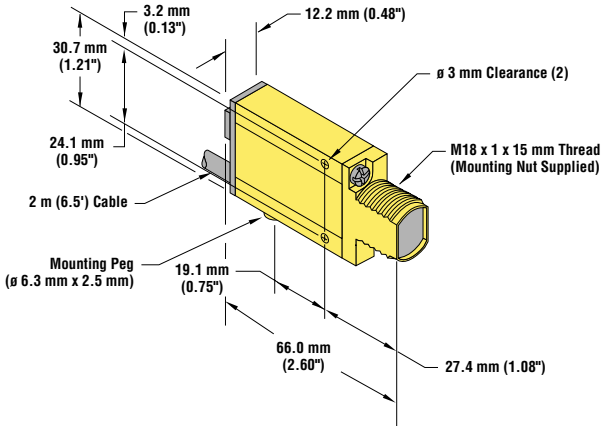
MINI-BEAM Expert Series Sensor (Quick-disconnect models)



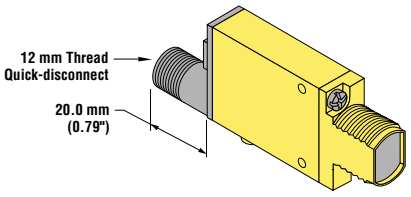
MINI-BEAM *Expert* Dimensions

MINI-BEAM *Expert* Series Sensor
(models with suffix LP, LPC, D, CV, CV2, CVG, CVB and CVW)

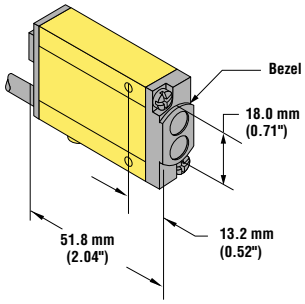
Cabled Models



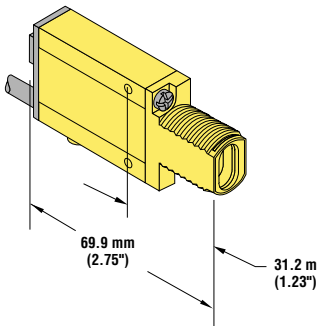
Quick-Disconnect Models



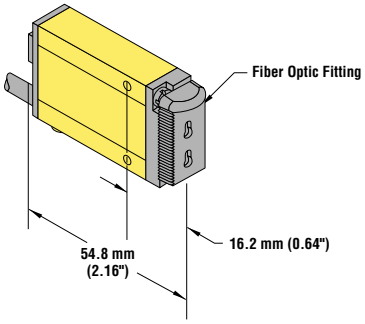
MINI-BEAM *Expert* Series Sensor
Divergent Diffuse Mode
(models with suffix W)



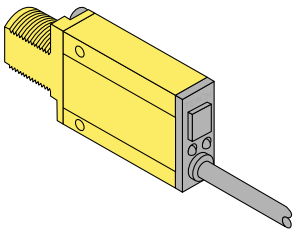
MINI-BEAM *Expert* Series Sensor
Glass Fiber Optic
(models with suffix F, FV, FVG, FVB and FVW)

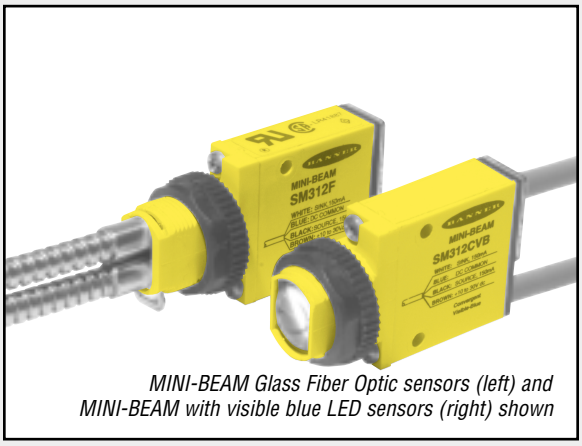


MINI-BEAM *Expert* Series Sensor
Plastic Fiber Optic
(models with suffix FP, FPG, FPB and FPW)



MINI-BEAM *Expert* Sensor - Rear View



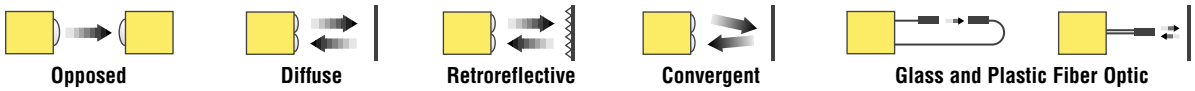


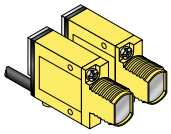
MINI-BEAM Glass Fiber Optic sensors (left) and MINI-BEAM with visible blue LED sensors (right) shown

MINI-BEAM 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 switch
- DC models include patented Alignment Indicating Device (AID™) signal strength monitoring indicator
- 475 nm visible blue and 525 nm green light sensors provide an economical solution to a large percentage of mainstream color mark applications; they reliably sense many difficult color combinations, including yellow-against-white and pink-against-white
- 2 m (6.5 ft) is standard integral cable length; 9 m (30 ft) is also available
- Integral quick-disconnect (QD) fitting is standard; 150 mm (6 in) pigtail QD is also available
- DC models may be ordered with 0.3 millisecond response (use model suffix "MHS")

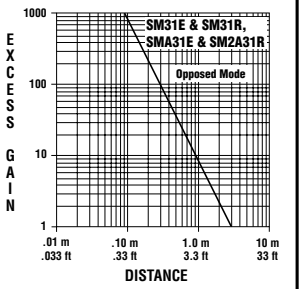
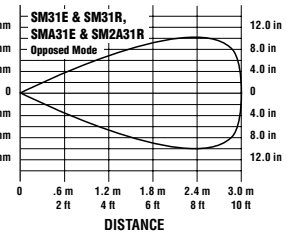
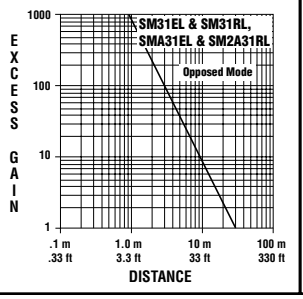
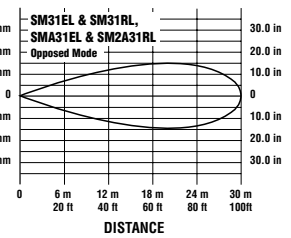
MINI-BEAM Sensing Mode Options



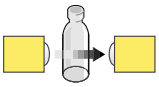


Infrared, 880 nm

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

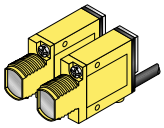
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
SM31E **SM31R** **SM31EQD** **SM31RQD**	3 m (10 ft)	2 m (6.5 ft) 2 m (6.5 ft) 4-Pin Euro QD 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		Effective Beam: 3.5 mm 
SMA31E **SM2A31R** **SMA31EQD** **SM2A31RQD**		2 m (6.5 ft) 2 m (6.5 ft) 3-Pin Micro QD 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		
SM31EL **SM31RL** **SM31ELQD** **SM31RLQD**	30 m (100 ft)	2 m (6.5 ft) 2 m (6.5 ft) 4-Pin Euro QD 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		Effective Beam: 13 mm 
SMA31EL **SM2A31RL** **SMA31ELQD** **SM2A31RLQD**		2 m (6.5 ft) 2 m (6.5 ft) 3-Pin Micro QD 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		

Banner Engineering Corp. • Minneapolis, U.S.A.
Website: http://www.baneng.com • Tel: 612.544.3164



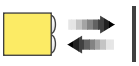
Visible red, 650 nm

- Unique optical arrangement actively detects clear plastic in the beam
- Clear plastic is reliably detected and differentiated from all other material
- Commonly used for manufacture or processing of clear plastic bottles or webs
- All MINI-BEAM Clear Plastic Detection System sensors include a mounting bracket

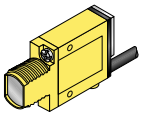


MINI-BEAM Opposed Mode Clear Plastic Detection System

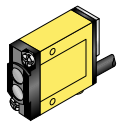
Models	Range	Cable	Supply Voltage	Output Type	Application Information
SM31EPD **SM31RPD** **SM31EPDQD** **SM31RPDQD**	0 - 0.3 m (0 - 1 ft)	2 m (6.5 ft) 2 m (6.5 ft) 4-Pin Euro QD 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP	Actual Range is dependent upon the light transmission properties of the plastic material 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 ft) 2 m (6.5 ft) 3-Pin Micro QD 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire	



Infrared, 880 nm

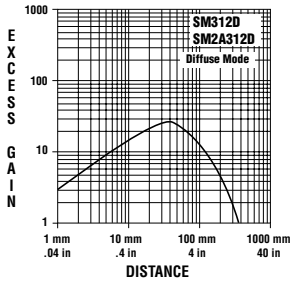
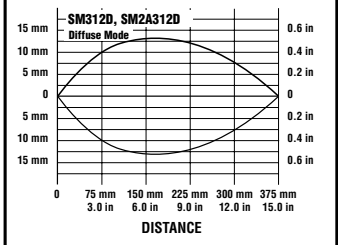
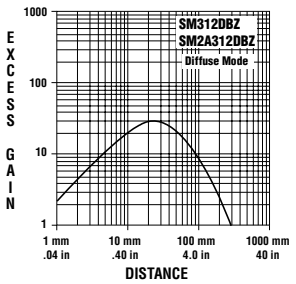
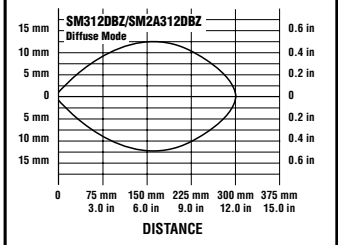
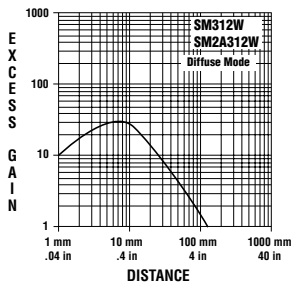
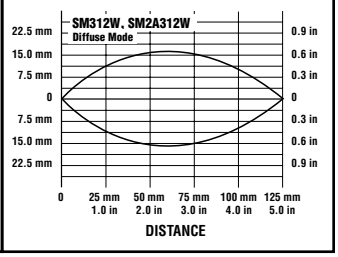


D Models

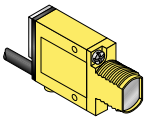


DBZ and W Models

MINI-BEAM Diffuse Mode

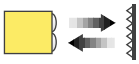
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
SM312D **SM312DQD**	380 mm (15 in)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM2A312D **SM2A312DQD**		2 m (6.5 ft) 3-Pin Micro QD	24-240V ac	SPST Solid-state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

*Note: Recommended for sensing clear materials.



Non-Polarized, Polarized

NOTE: Retroreflective range is specified using one model BRT-3 retroreflector (3-inch 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 636 for more information.

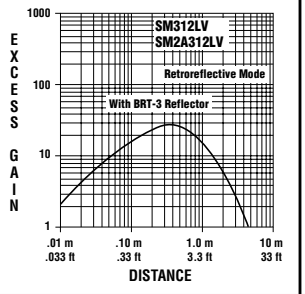
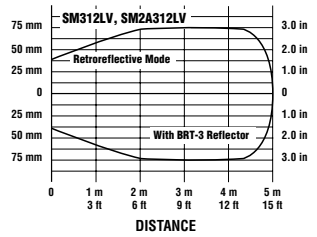
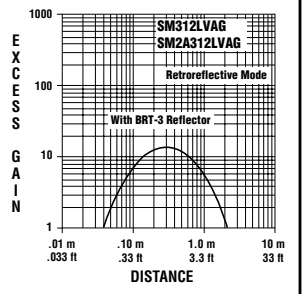
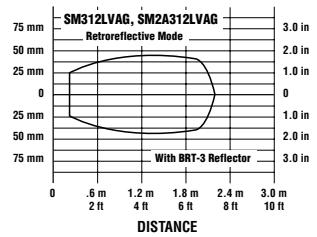
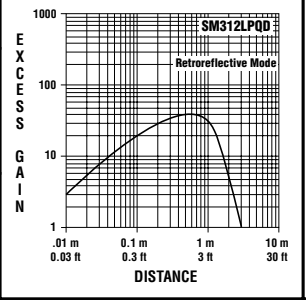
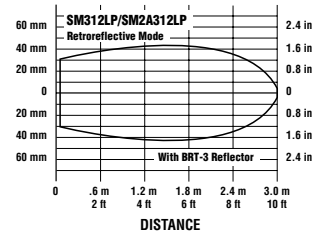


Non-Polarized

Visible red, 650 nm

Polarized

MINI-BEAM Retroreflective Mode

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

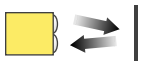
*Use polarized models when shiny objects will be sensed.

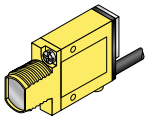
For Standard MINI-BEAMs:

i) 9 m (30 ft) 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 in.) 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 238 for more information.

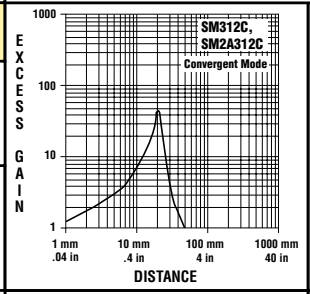
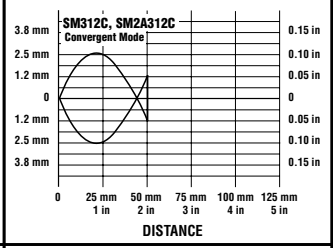
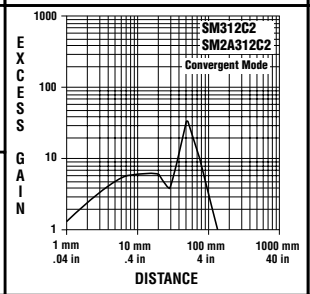
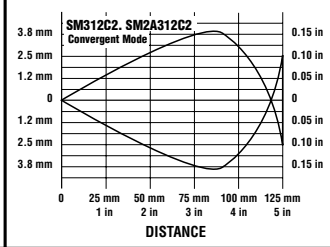
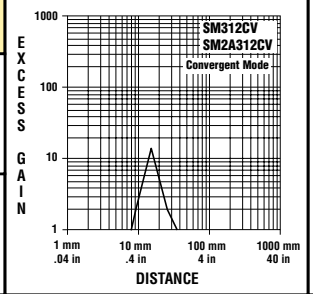
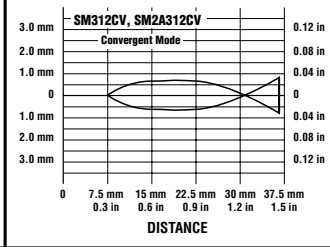
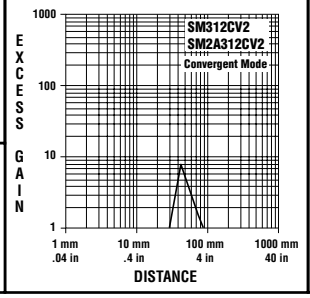
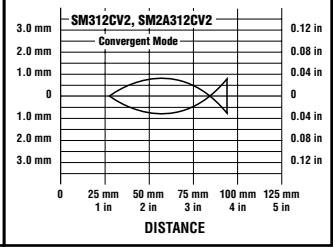
iii) A model with a QD connector requires an accessory mating cable. See pages 238 and the Accessories section for more information.

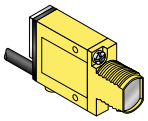




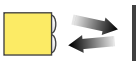
See Sensing Beam Information Below

MINI-BEAM Convergent Mode

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 in)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM2A312C **SM2A312CQD**		2 m (6.5 ft) 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		
SM312C2 **SM312C2QD**	43 mm (1.7 in)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM2A312C2 **SM2A312C2QD**		2 m (6.5 ft) 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		
Visible Red 650 nm						
SM312CV **SM312CVQD**	16 mm (0.65 in) Spot Size at Focus: 1.3 mm (0.05 in)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM2A312CV **SM2A312CVQD**		2 m (6.5 ft) 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		
SM312CV2 **SM312CV2QD**	43 mm (1.7 in) Spot Size at Focus: 3.0 mm (0.12 in)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM2A312CV2 **SM2A312CV2QD**		2 m (6.5 ft) 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		

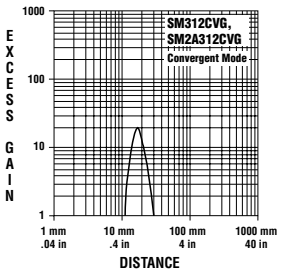
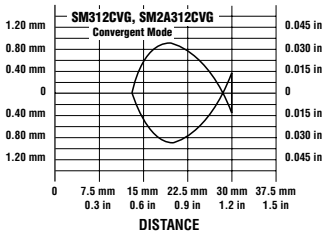
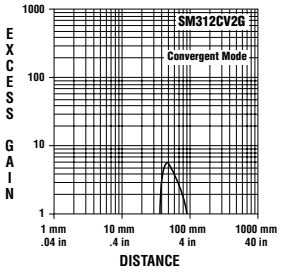
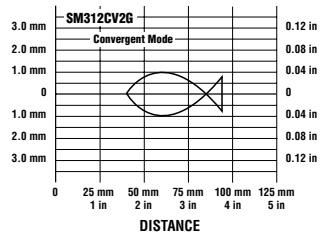
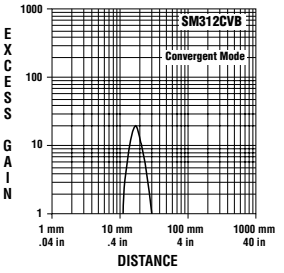
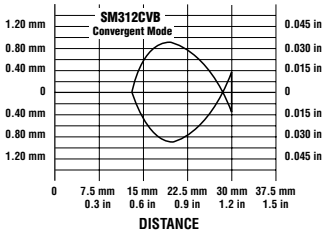
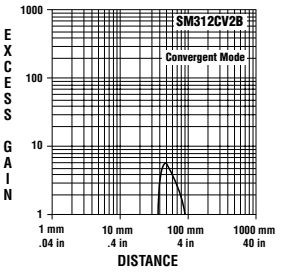
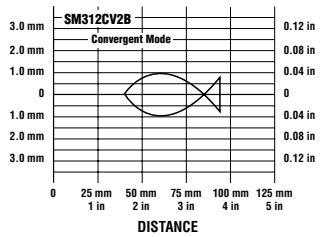


Green and blue LED models are recommended for color mark sensing applications.
Consult your local or factory sales engineer for model selection assistance.



See Sensing Beam Information Below

MINI-BEAM Convergent Mode

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 in) Spot Size at Focus: 1.0 mm (0.04 in)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM2A312CVG **SM2A312CVGQD**		2 m (6.5 ft) 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		
SM312CV2G **SM312CV2GQD**	49 mm (1.9 in.)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
Visible Blue 475 nm						
SM312CVB **SM312CVBQD**	16 mm (0.65 in) Spot Size at Focus: 1.8 mm (0.07 in)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM312CV2B **SM312CV2BQD**	49 mm (1.9 in.)	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		

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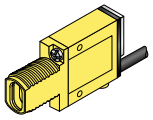
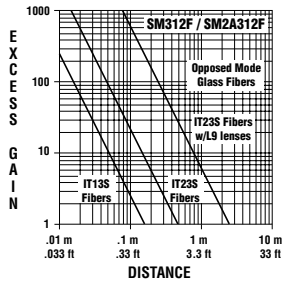
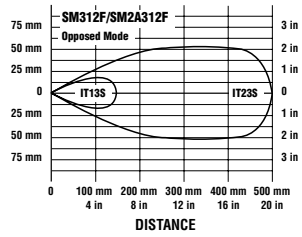
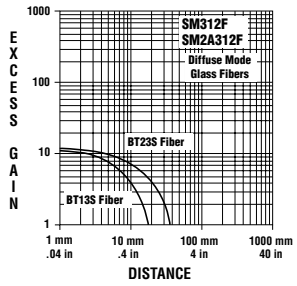
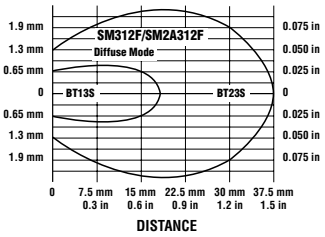
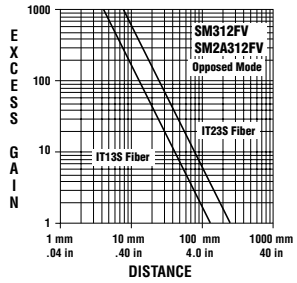
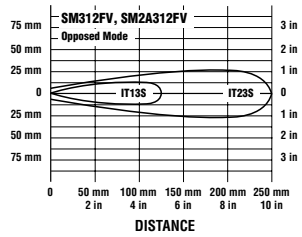
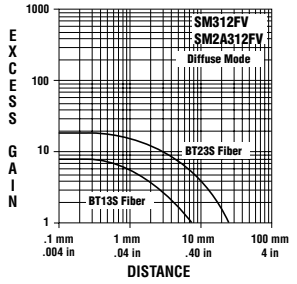
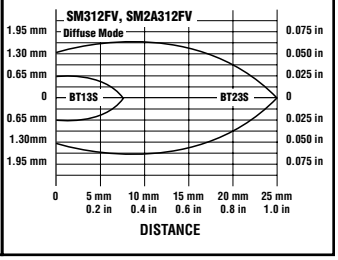


See Sensing Beam Information Below

MINI-BEAM Glass Fiber Optic

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

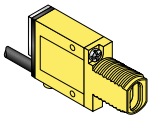
For Standard MINI-BEAMs:

i) 9 m (30 ft) 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 in.) 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 238 for more information.

iii) A model with a QD connector requires an accessory mating cable. See pages 238 and the Accessories section for more information

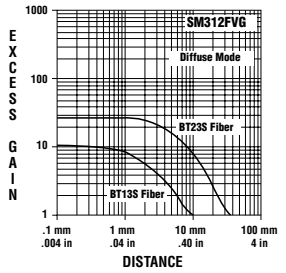
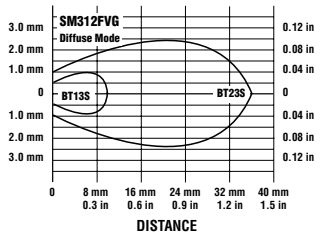
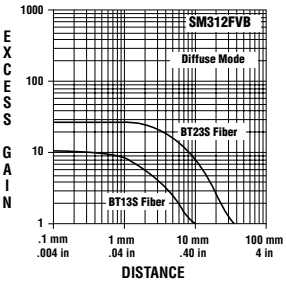
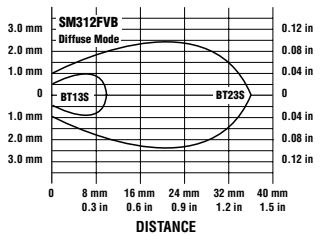
MINI-BEAM Sensors

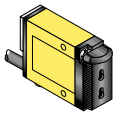


Green and blue LED models are recommended for color mark sensing applications. Consult your local or factory sales engineer for model selection assistance.

See Sensing Beam Information Below

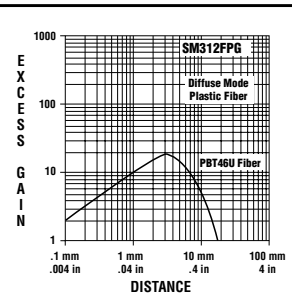
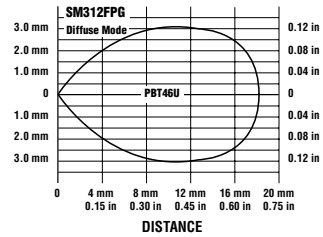
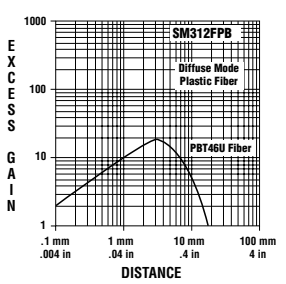
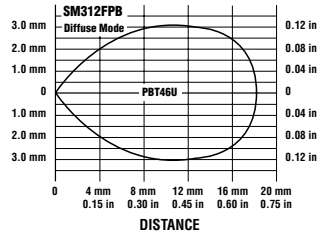
MINI-BEAM Glass Fiber Optic

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Visible Green 525 nm						
SM312FVG **SM312FVGQD**	Range varies by sensing mode and fiber optics used	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
Visible Blue 475 nm						
SM312FVB **SM312FVBQD**	Range varies by sensing mode and fiber optics used	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		

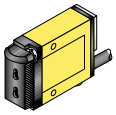


See Sensing Beam Information Below

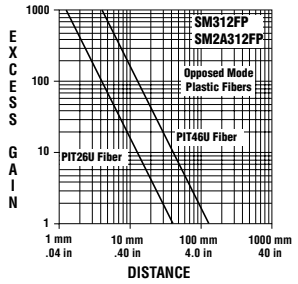
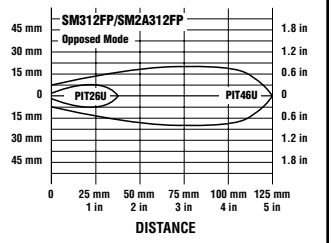
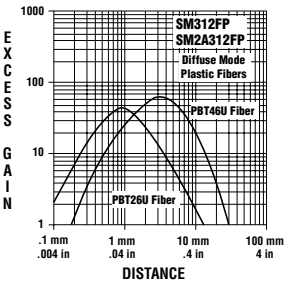
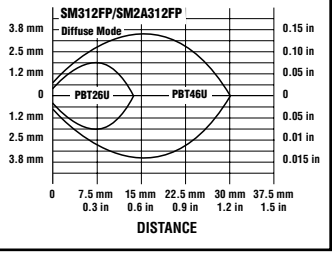
MINI-BEAM Plastic Fiber Optic

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Visible Green 525 nm						
SM312FPG **SM312FPGQD**	Range varies by sensing mode and fiber optics used	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
Visible Blue 475 nm						
SM312FPB **SM312FPBQD**	Range varies by sensing mode and fiber optics used	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		

Visible red, 650 nm



MINI-BEAM Plastic Fiber Optic

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
SM312FP **SM312FPQD**	Range varies by sensing mode and fiber optics used	2 m (6.5 ft) 4-Pin Euro QD	10-30V dc	Bipolar NPN/PNP		
SM2A312FP **SM2A312FPQD**		2 m (6.5 ft) 3-Pin Micro QD	24-240V ac	SPST Solid-state 2-Wire		

For Standard MINI-BEAMs:

i) 9 m (30 ft) 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 in.) 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 238 for more information.

iii) A model with a QD connector requires an accessory mating cable. See pages 238 and the Accessories section for more information.

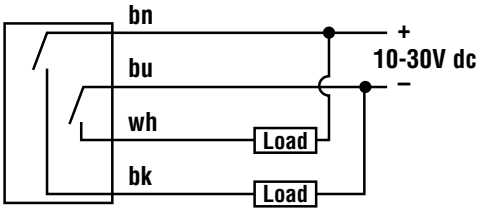
MINI-BEAM DC Specifications

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
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. See note below. (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 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 thermoplastic polyester 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 IP66
Connections	PVC-jacketed 4-conductor 2 m (6.5 ft) or 9 m (30 ft) cables, or 4-pin euro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately. See page 238 and Accessories section.
Operating Conditions	**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	

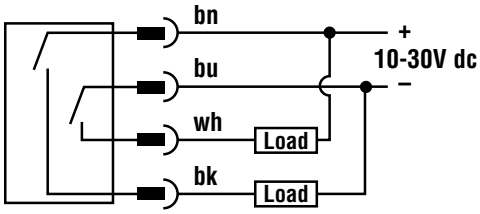
Note: DC MINI-BEAMs may be ordered with 0.3 millisecond on/off response by adding suffix **"MHS"** to the model number (e.g. - **SM312LVMHS**). This modification reduces sensing range (and excess gain).

MINI-BEAM DC Hookup Diagrams

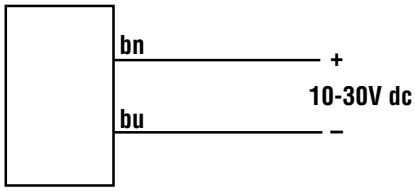
DC Sensors with Attached Cable



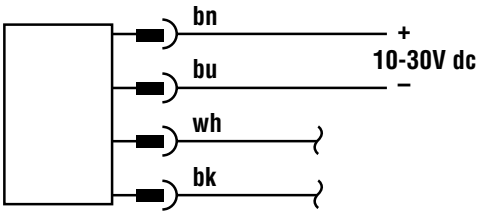
DC Sensors with Quick-Disconnect (4-Pin Euro-Style)



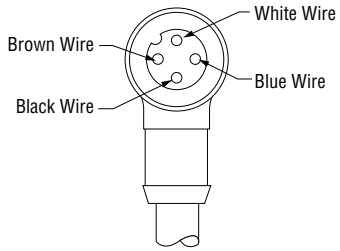
DC Emitters with Attached Cable



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 ft) or a 9 m (30 ft) attached PVC-covered cable, or with a 4-pin euro-style QD cable fitting.

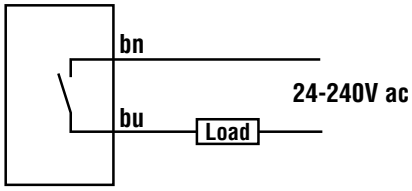
DC QD sensors are identified by the letters "QD" in their model number suffix. Mating cables for QD MINI-BEAM sensors are model MQDC-415 (straight connector) or MQDC-415RA (right-angled connector). Cables are supplied in a standard length of 5 m (15 ft). For more information on QD cables, see page 238 and the Accessories section.

MINI-BEAM AC Specifications

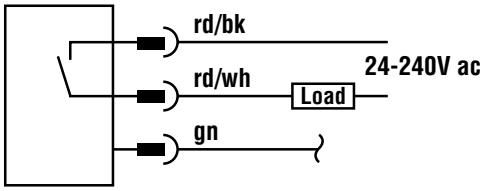
Supply Voltage and Current	24 to 240V ac (50/60 Hz), 250V ac max
Supply Protection Circuitry	Protected against transient voltages
Output Configuration	SPST SCR solid-state relay with either normally closed or normally open contact (light/dark operate selectable); 2-wire hookup
Output Rating	Minimum load 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 protected by a gasketed, clear acrylic cover.
Indicators	Red indicator LED on rear of sensor is "ON" when the load is energized
Construction	Reinforced thermoplastic polyester 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 (6.5ft) or 9 m (30ft) cables, or 3-pin micro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately. See page 238 and Accessories section.
Operating Conditions	**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 parallel with mechanical switch contacts
Certifications	CE CSA® UL®

MINI-BEAM AC Hookup Diagrams

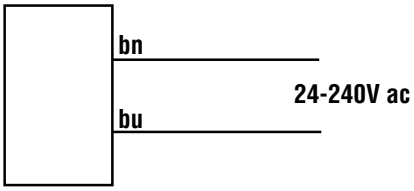
AC Sensors with Attached Cable



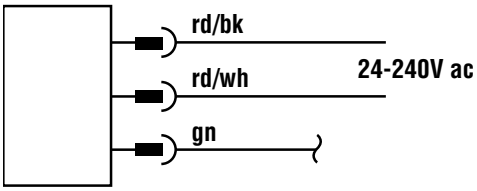
AC Sensors with Quick-Disconnect (3-Pin Micro-Style)



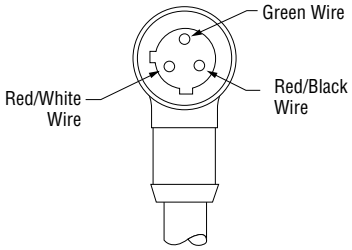
AC Emitters with Attached Cable



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



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



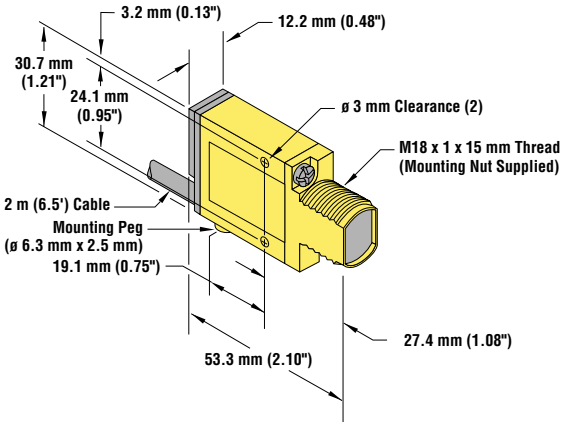
Quick-Disconnect (QD) Option

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

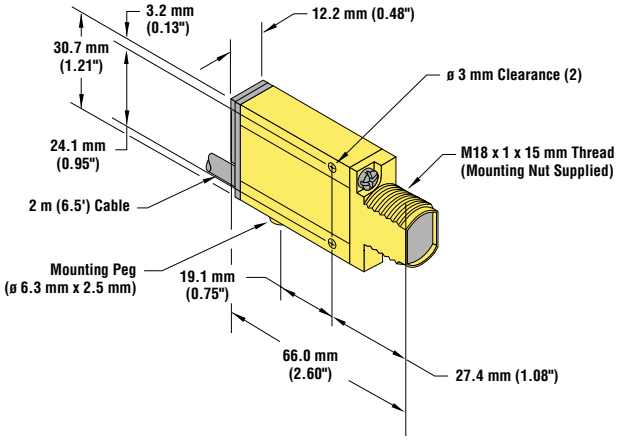
AC QD sensors are identified by the letters “QD” in their model number suffix. Mating cables for QD MINI-BEAM sensors are model MQDC-315 (straight connector) or MQDC-315RA (right-angled connector). Cables are supplied in a standard length of 5 m (15 ft). For more information on QD cables, see page 238 and the Accessories section.

MINI-BEAM Dimensions

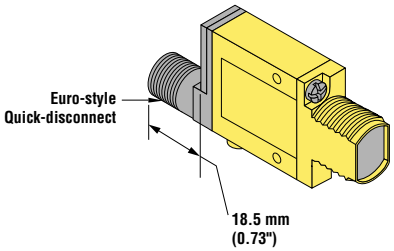
MINI-BEAM DC Sensor



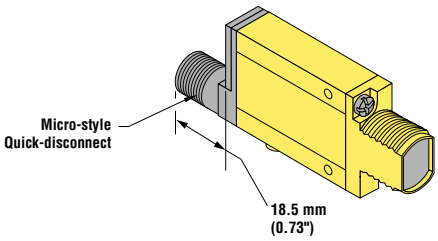
MINI-BEAM AC Sensor



MINI-BEAM DC Sensor with Quick-Disconnect

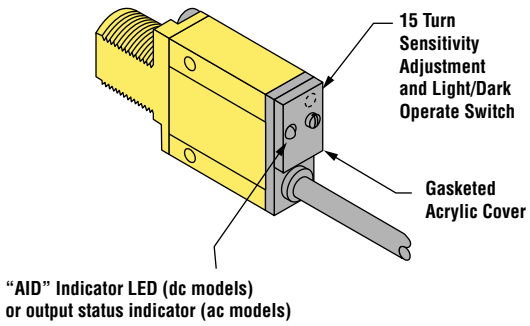


MINI-BEAM AC Sensor with Quick-Disconnect



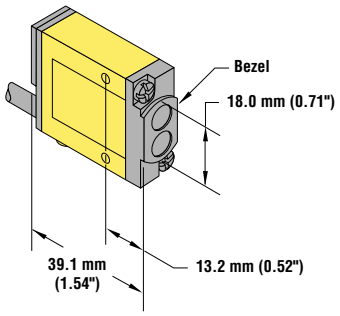
NOTE: The above four drawings apply to model suffix E, EL, EPD, R, RL, RPD, LV, LVAG, D, C, C2, CV, CV2, CV2G, CVG, CVB and CV2B.

MINI-BEAM Sensor - Rear View

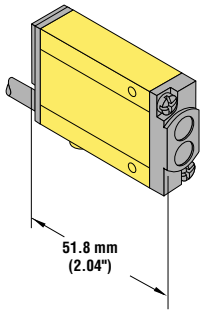


MINI-BEAM Dimensions

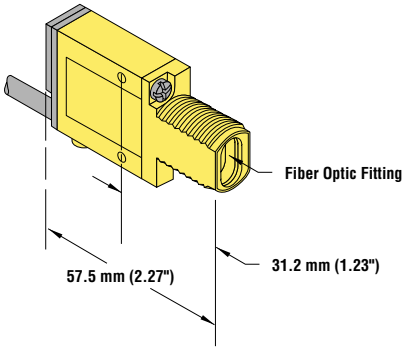
MINI-BEAM DC Sensor - Diffuse Mode (model suffix DBZ and W)



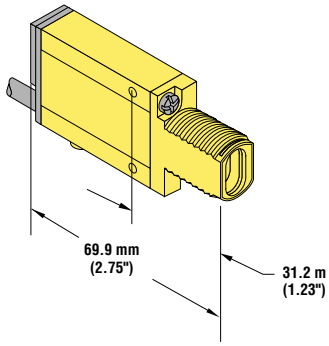
MINI-BEAM AC Sensor - Diffuse Mode (model suffix DBZ and W)



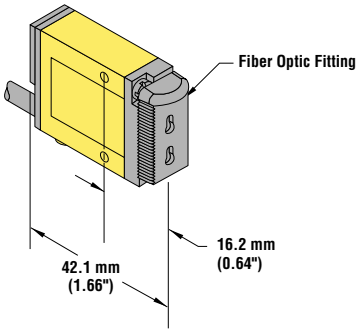
MINI-BEAM DC Sensor - Glass Fiber Optic (model suffix F, FV, FVB & FVG)



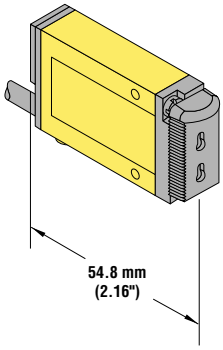
MINI-BEAM AC Sensor - Glass Fiber Optic (model suffix F & FV)

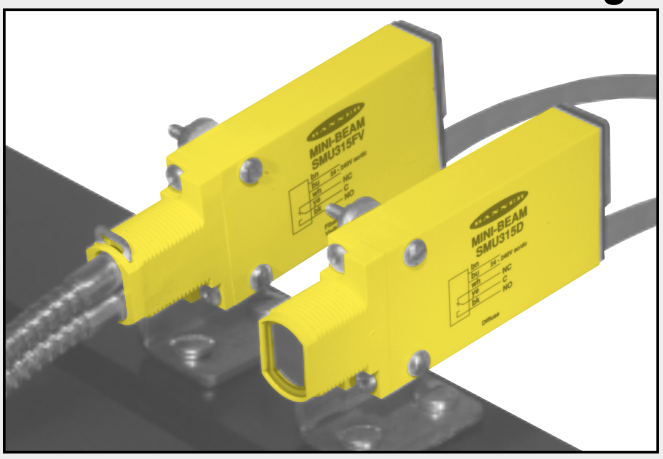


MINI-BEAM DC Sensor - Plastic Fiber Optic (model suffix FP, FPB & FPG)



MINI-BEAM AC Sensor - Plastic Fiber Optic (model suffix FP)



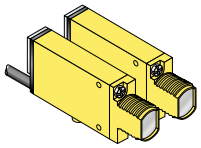


*U.S. Patent no. 4356393

MINI-BEAM UNIVERSAL VOLTAGE SENSORS

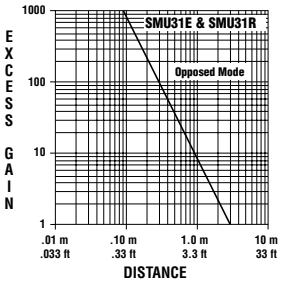
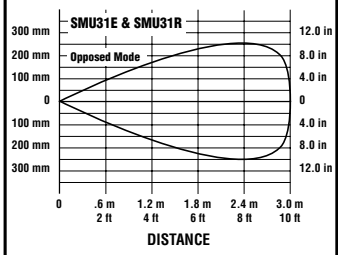
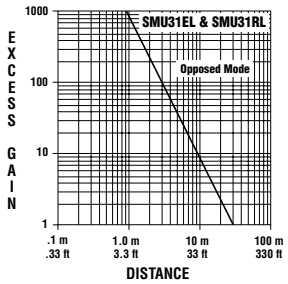
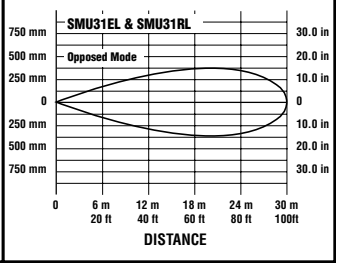
- Universal supply voltage: 24 to 240V ac or 24 to 240V dc
- Easy to install with few necessary adjustments
- 3-amp SPDT electromechanical relay
- Exclusive* Alignment Indicating Device system (AID™) lights a rear panel LED whenever sensing light is detected; superimposed pulse rate indicates received light signal strength
- Wide array of mounting options
- Integral, unterminated cables 2 m (6.5 ft) or 9 m (30 ft) long

MINI-BEAM Universal Voltage Sensing Mode Options



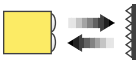
Infrared, 880 nm

Universal Voltage Opposed Mode Emitter (E) and Receiver (R)

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
SMU31E **SMU31R**	3 m (10 ft)	E: 2-wire 2 m (6.5 ft) R: 5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		
SMU31EL **SMU31RL**	30 m (100 ft)	E: 2-wire 2 m (6.5 ft) R: 5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		

Banner Engineering Corp. • Minneapolis, U.S.A.
Website: http://www.baneng.com • Tel: 612.544.3164

MINI-BEAM Universal Voltage Sensors

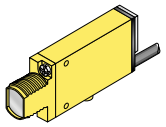


Visible red, 650 nm

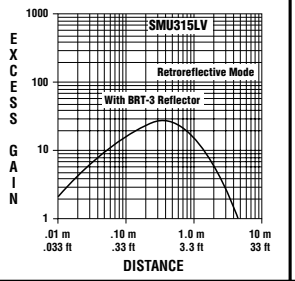
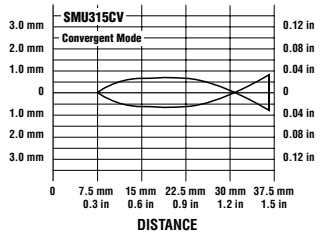
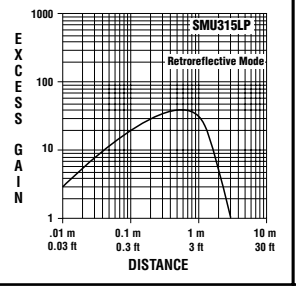
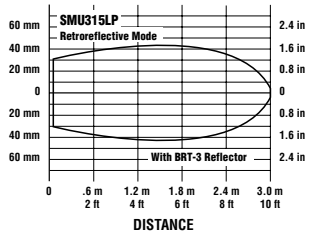
Non-Polarized

Polarized

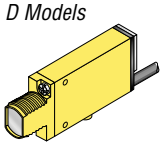
NOTE: Retroreflective range is specified using one model BRT-3 retroreflector (3-inch diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) in use. See page 636 for more information.



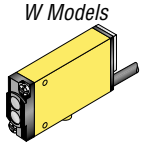
MINI-BEAM Universal Voltage Series Retroreflective Mode

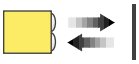
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Non-Polarized						
SMU315LV	5 m (15 in)	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		
Polarized Extended Range						
SMU315LP	10 mm to 3 m (0.4 in to 10 ft)	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		

D Models



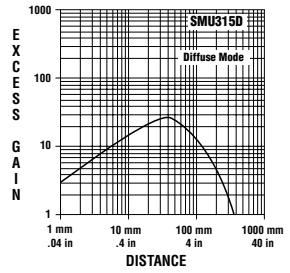
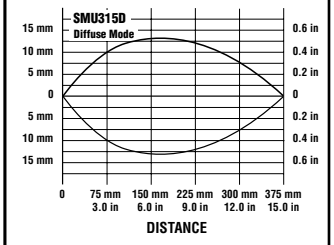
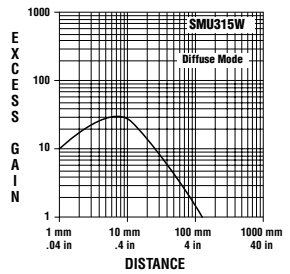
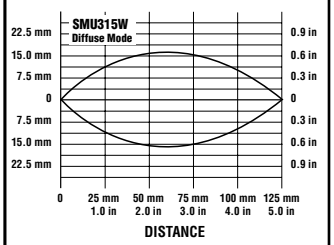
W Models



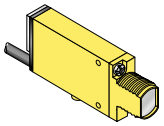


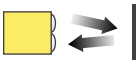
Infrared, 880 nm

MINI-BEAM Universal Voltage Series Diffuse Mode

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
SMU315D	380 mm (15 in)	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		
Divergent Diffuse						
SMU315W	130 mm (5 in)	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		

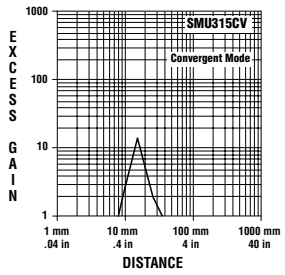
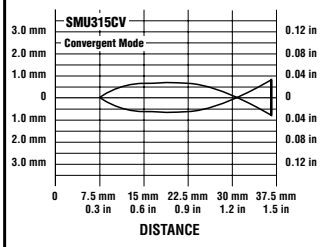
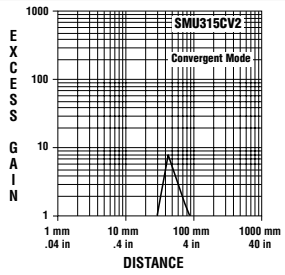
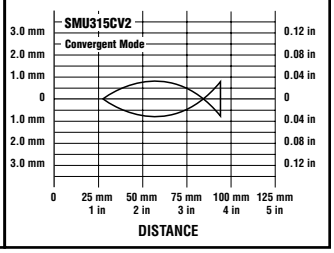
MINI-BEAM Universal Voltage Sensors

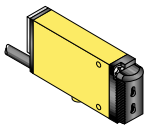




Visible red, 650 nm

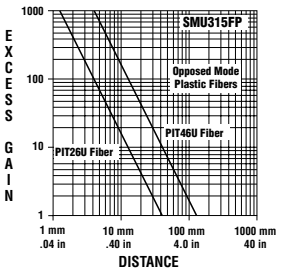
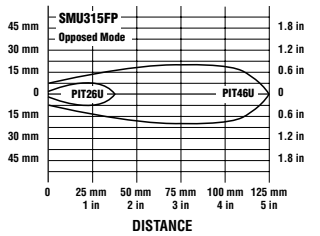
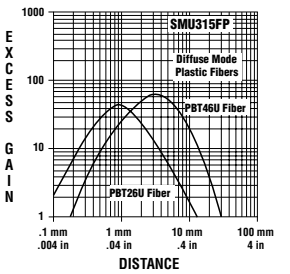
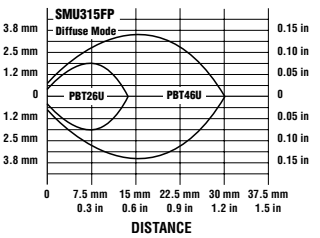
MINI-BEAM Universal Voltage Series Convergent Mode

Models	Focus	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Performance based on 90% reflectance white test card	
Visible Red 650 nm						
SMU315CV	16 mm (0.65 in) **Spot Size at Focus:** 1.3 mm (0.05 in)	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		
SMU315CV2	43 mm (1.7 in) **Spot Size at Focus:** 3.0 mm (0.12 in)	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		



Visible red, 650 nm

MINI-BEAM Universal Voltage Series Plastic Fiber Optic Sensors

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Visible Red 650 nm					OPPOSED MODE – INDIVIDUAL FIBERS	
SMU315FP	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		
					DIFFUSE MODE – BIFURCATED FIBERS	
						

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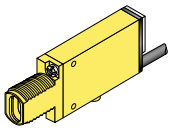
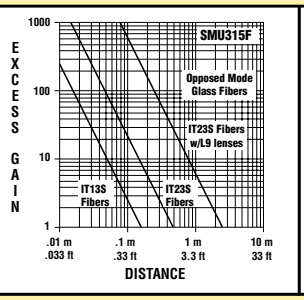
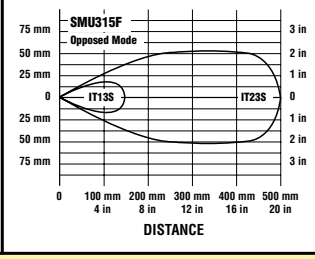
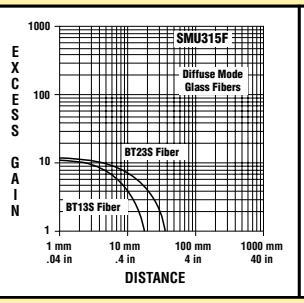
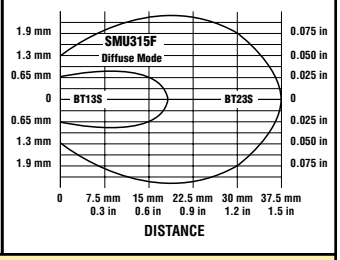
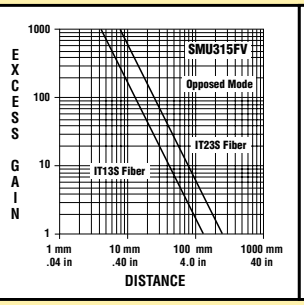
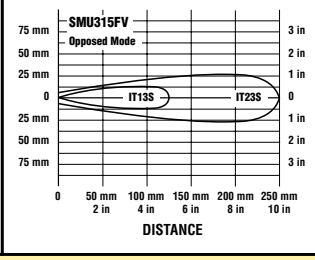
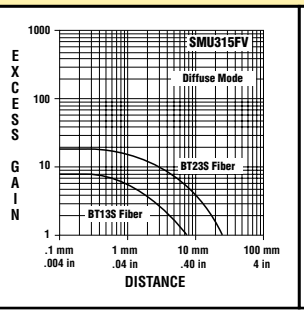
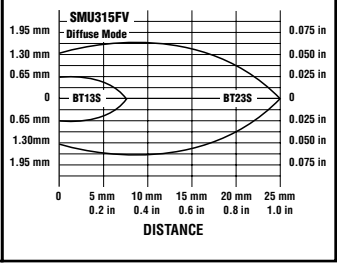


See Sensing Beam Information Below

MINI-BEAM Universal Voltage Series Glass Fiber Optic Sensors

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
Infrared 880 nm					**OPPOSED MODE – INDIVIDUAL FIBERS**	
SMU315F	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		
					DIFFUSE MODE – BIFURCATED FIBERS	
						
Visible Red 650 nm					**OPPOSED MODE – INDIVIDUAL FIBERS**	
SMU315FV	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5 ft)	Universal 24 to 240V dc or 24 to 240V ac	SPDT Electro-mechanical Relay		
					DIFFUSE MODE – BIFURCATED FIBERS	
						

NOTE: i) 9 m (30 ft) cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SMU315FV W/30**)

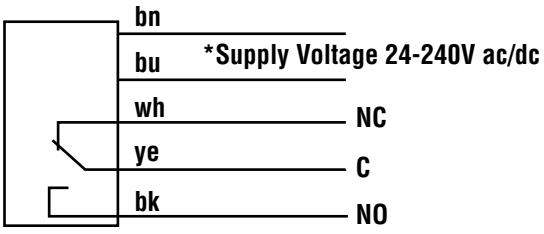
MINI-BEAM Universal Voltage Sensors

MINI-BEAM Universal Voltage Series Specifications

Supply Voltage and Current	**Universal voltage:** 24 to 240V ac, 50/60Hz or 24 to 240V dc (1.5 watts or 2.5 VA maximum)
Supply Protection Circuitry	Protected against transient voltages. DC hookup is without regard to polarity.
Output Configuration	SPDT (Single-Pole, Double Throw) (form C) electromechanical relay, ON/OFF output.
Output Rating	**Maximum switching power (resistive load):** 90W, 250VA **Maximum switching voltage (resistive load):** 250V ac or 30V dc **Maximum switching current (resistive load):** 3A **Minimum voltage and current:** 5V dc, 10 mA **Mechanical life:** 20,000,000 operations **Electrical life at full resistive load:** 100,000 operations
Output Protection Circuitry	Protected against false pulse on power-up.
Output Response Time	**Closure time:** 20 milliseconds max. **Release time:** 20 milliseconds max. **Maximum switching speed:** 25 operations per second
Repeatability	**All sensing modes:** 1 millisecond
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 Indicator Device system (AID™ US patent #4356393) lights a rear-panel-mounted 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 thermoplastic polyester housing, totally encapsulated, o-ring seal, 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 5-conductor 2 m (6.5 ft) or 9 m (30 ft) unterminated cable. Opposed mode emitter cables are 2-conductor.
Operating Conditions	**Temperature:** -20° to +55°C (-4° to +131°F) **Maximum relative humidity:** 90% at 50°C (non-condensing)
Application Notes	Install transient suppressor (MOV) across contacts switching inductive loads.

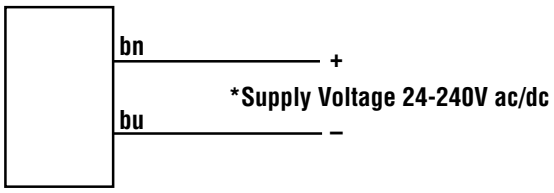
MINI-BEAM Universal Voltage Series Hookup Diagrams

All models except Emitters



NOTE: Install transient suppressor (MOV) across contacts switching inductive loads.

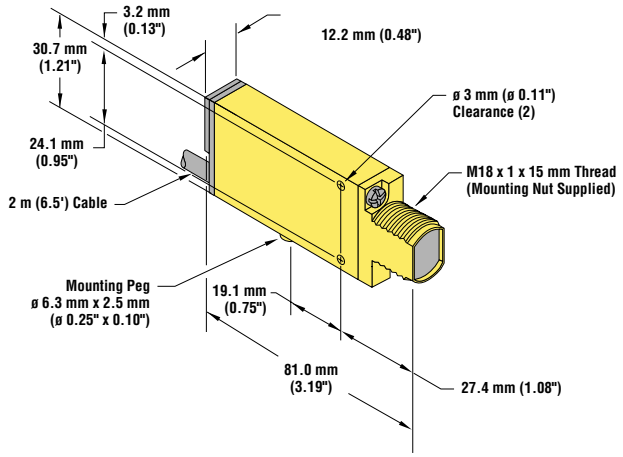
Emitters



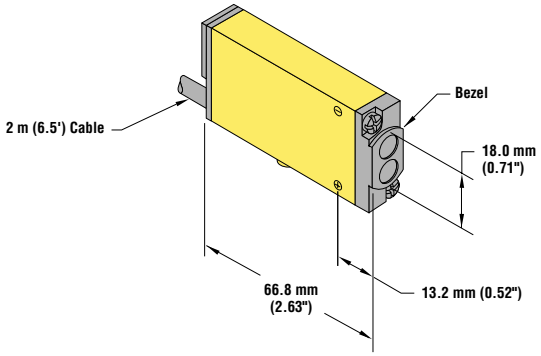
* Connection of DC power is without regard to polarity

MINI-BEAM Universal Voltage Series Dimensions

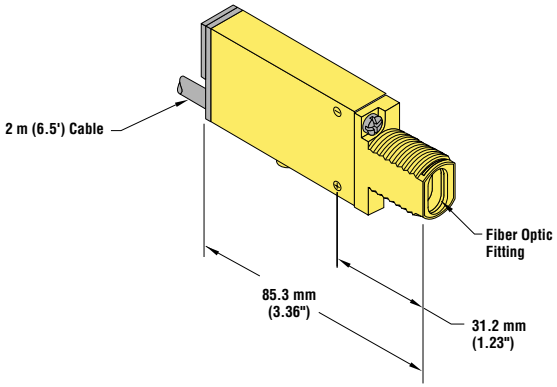
MINI-BEAM Universal Voltage Series Sensor Retroreflective, Diffuse, and Convergent Modes (models with suffix E, EL, R, RL, LP, LV, D, CV, CV2)



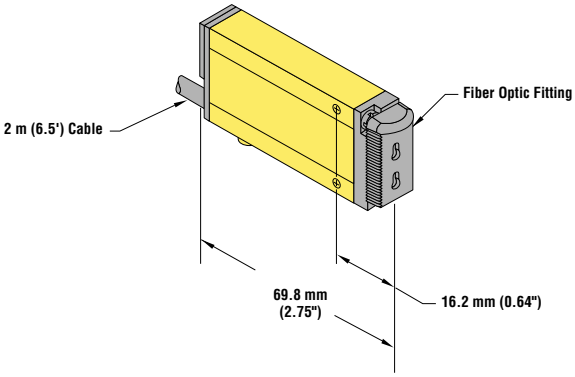
MINI-BEAM Universal Voltage Series Sensor Divergent Diffuse Mode (models with suffix W)



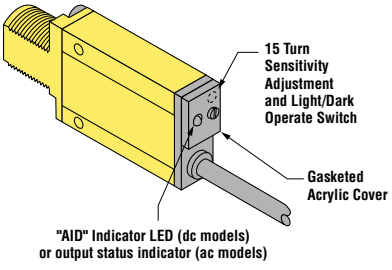
MINI-BEAM Universal Voltage Series Sensor Glass Fiber Optic (models with suffix F and FV)



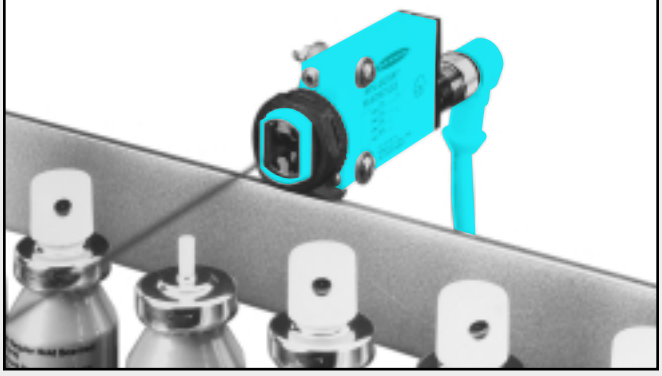
MINI-BEAM Universal Voltage Series Sensor Plastic Fiber Optic (models with suffix FP)



Universal Voltage Sensor - Rear View



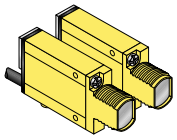
Model MIAD9CVQ shown with accessory model SMB312S bracket and optional MQD9-415RA QD cable



NAMUR INTRINSICALLY SAFE DC SENSORS

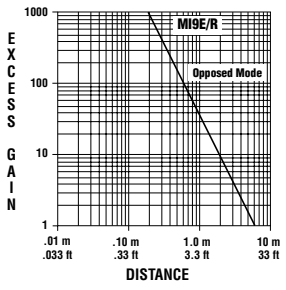
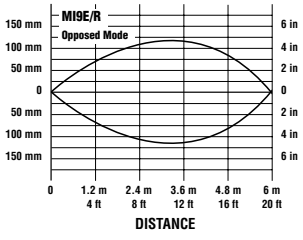
- Intrinsically safe sensors offering MINI-BEAM performance and small size
- Use with approved switching amplifiers which have intrinsically safe input circuits
- Output passes ≤ 1 mA in the "dark" condition and ≥ 2 mA in the "light" condition
- Choose models with integral cable or quick disconnect connector

NAMUR Sensing Mode Options



Infrared, 880 nm

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

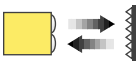
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
MI9E **MIAD9R** **MI9EQ** **MIAD9RQ**	6 m (20 ft)	2 m (6.5 ft) 2 m (6.5 ft) 4-Pin Euro QD 4-Pin Euro QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		Effective Beam: 13 mm 

For NAMUR MINI-BEAMs:

i) 9 m (30 ft) 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 238 and the Accessories section for more information.

iii) The MINI-BEAM mounting bracket shown in the photographs is optional. See page 241 for bracket information.

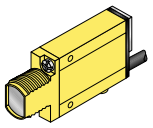


Visible red, 650 nm

Non-Polarized

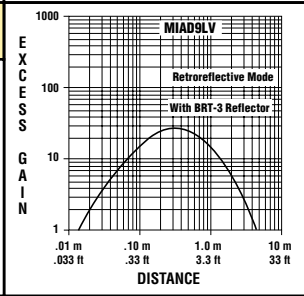
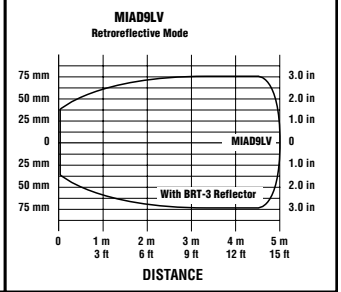
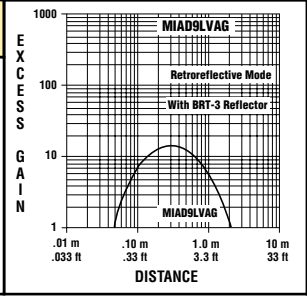
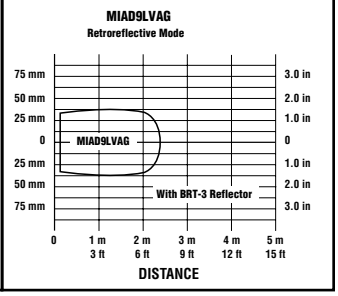
Polarized

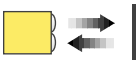
NOTE: Retroreflective range is specified using one model BRT-3 retroreflector (3-inch diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) in use. See page 636 for more information.



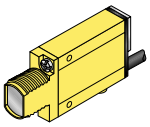
Non-Polarized, Polarized

NAMUR Retroreflective Mode

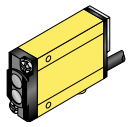
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Non-Polarized						
MIAD9LV **MIAD9LVQ**	5 m (15 ft)	2 m (6.5 ft) 4-Pin Euro QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		
Polarized						
MIAD9LVAG **MIAD9LVAGQ**	50 mm to 2 m (2 in to 7 ft)	2 m (6.5 ft) 4-Pin Euro QD	5-15V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



Infrared, 880 nm

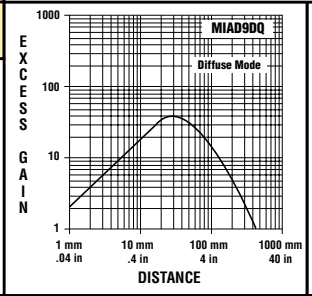
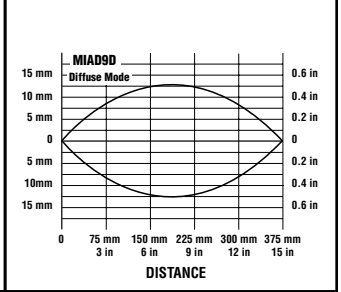
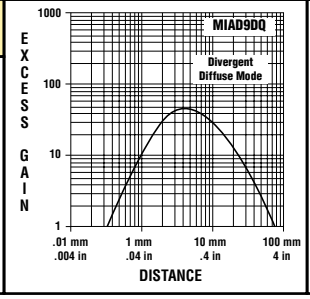
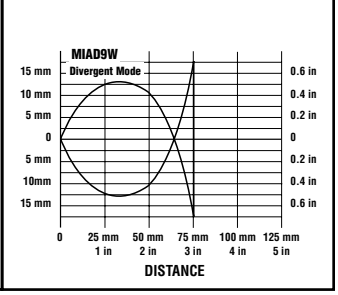


Diffuse

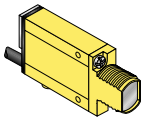


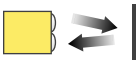
Divergent Diffuse

NAMUR Diffuse Mode

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 in)	2 m (6.5 ft) 4-Pin Euro QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		
Divergent Diffuse						
MIAD9W **MIAD9WQ**	75 mm (3 in)	2 m (6.5 ft) 4-Pin Euro QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		

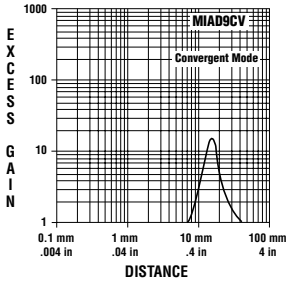
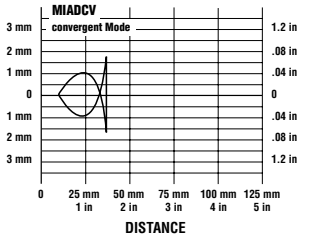
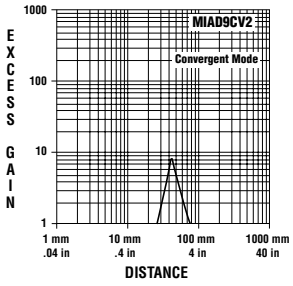
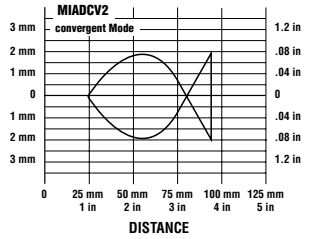
MINI-BEAM NAMUR Sensors

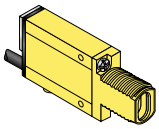




Visible red, 650 nm

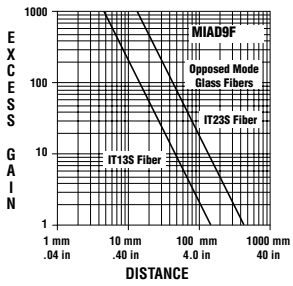
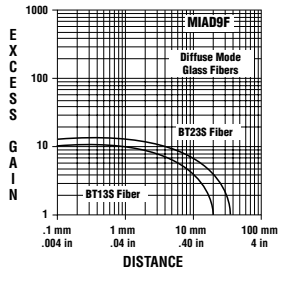
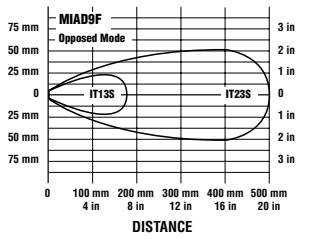
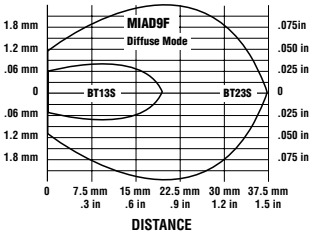
NAMUR Convergent Mode

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 in)	2 m (6.5 ft) 4-Pin Euro QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		
MIAD9CV2 **MIAD9CV2Q**	43 mm (1.7 in)	2 m (6.5 ft) 4-Pin Euro QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light		



Infrared, 880 nm

NAMUR Glass Fiber Optic

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
					Diffuse mode performance based on 90% reflectance white test card	
MIAD9F **MIAD9FQ**	Range varies by sensing mode and fiber optics used	2 m (6.5 ft) 4-Pin Euro QD	5-15V dc	Constant Current ≤1 mA dark ≥2 mA light	 	 

Banner Engineering Corp. • Minneapolis, U.S.A.
Website: http://www.baneng.com • Tel: 612.544.3164

NAMUR Specifications

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 thermoplastic polyester 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 ft) or 9 m (30 ft) cables, or 4-pin euro-style quick-disconnect (QD) fitting are available; QD cables are ordered separately (see page 238 and Accessories section)
Operating Conditions	**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

APPROVALS

CSA:	#LR 41887	Instrinsically 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:

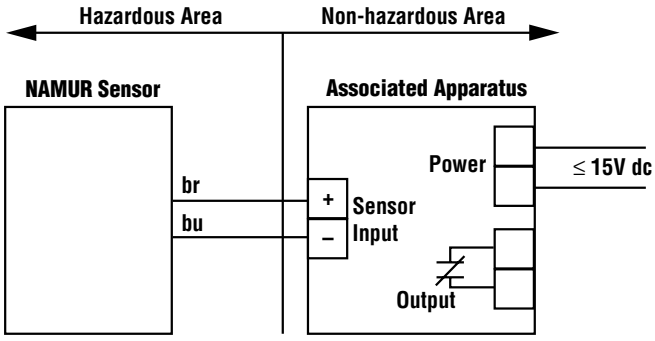
i) 9 m (30 ft) cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g. - **MIADCV W/30**)

ii) A model with a QD connector requires an accessory MQD9-4xx mating cable. See pages 238 and the Accessories section for more information.

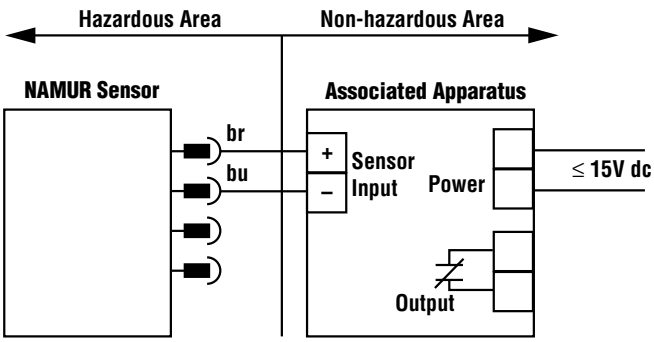
iii) The MINI-BEAM mounting bracket shown in the photographs is optional. See page 241 for bracket information.

NAMUR Hookup Diagrams

Sensors with Attached Cable



Sensors with Quick-Disconnect



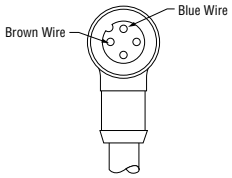
Entity Parameters

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.

Euro-Style Pin-out (Cable Connector Shown)



Quick-Disconnect (QD) Option for NAMUR Sensors

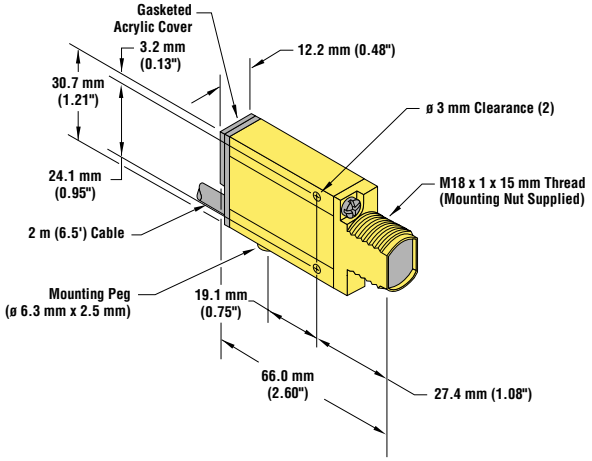
MINI-BEAM series MIAD9 NAMUR sensors are sold with either a 2 m (6.5 ft) or 9 m (30 ft) attached PVC-covered 2-wire cable or with a 4-pin QD cable fitting.

NAMUR QD sensors are identified by the "Q" in their model number suffix, and are provided with a 4-pin Euro type connector. Mating cables for NAMUR QD sensors are models MQD9-415 (straight connector) or MQD9-415RA (right angled connector). Mating QD cables are 5 m (15 ft) long and must be ordered separately from the sensor. For more information on QD cables, see page 238 and the Accessories section.

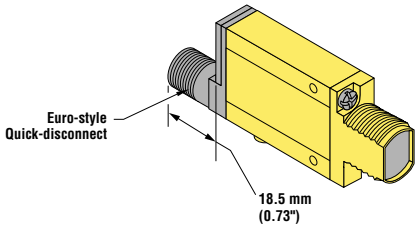
NAMUR Dimensions

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

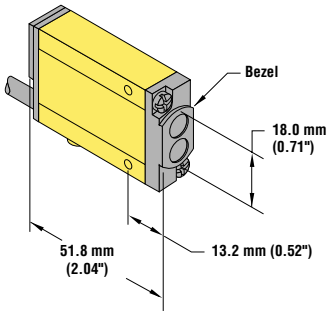
NAMUR Sensor with Attached Cable



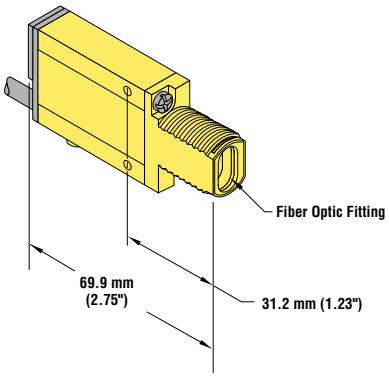
NAMUR Sensor with Quick-Disconnect



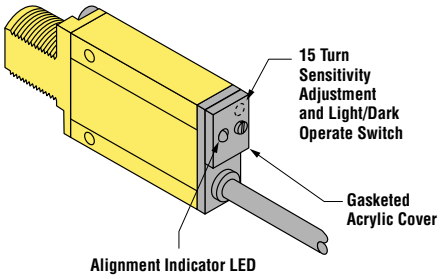
NAMUR Divergent Diffuse Sensing Mode (model suffix W)



NAMUR Glass Fiber Optic Sensing (model suffix F)



NAMUR Sensor - Rear View



MINI-BEAM Accessories

Modifications

Model Suffix	Modification	Description		Example of Model Number
W/30	9 m (30 ft) cable	All MINI-BEAM sensors may be ordered with an integral 9 m (30 ft) cable in place of the standard 2 m (6.5 ft) 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 in) long integral cable which is terminated with the appropriate QD connector. See the Accessories section for more information.		SM312LVQDP

Quick-Disconnect (QD) Cables

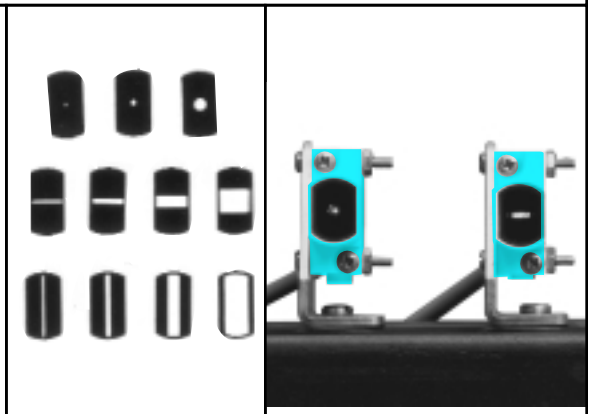
Following is the selection of cables available for MINI-BEAM QD models. See the Accessories section for more cable information.

Style	Model	Length	Connector	Used with:
3-Pin Micro	**MQDC-306** **MQDC-315** **MQDC-330** **MQDC-306RA** **MQDC-315RA** **MQDC-330RA**	2 m (6.5 ft) 5 m (15 ft) 9 m (30 ft) 2 m (6.5 ft) 5 m (15 ft) 9 m (30 ft)	Straight Straight Straight Right-angle Right-angle Right-angle	Standard ac MINI-BEAMs with QD connector
4-Pin Euro	**MQDC-406** **MQDC-415** **MQDC-430** **MQDC-406RA** **MQDC-415RA** **MQDC-430RA**	2 m (6.5 ft) 5 m (15 ft) 9 m (30 ft) 2 m (6.5 ft) 5 m (15 ft) 9 m (30 ft)	Straight Straight Straight Right-angle Right-angle Right-angle	Standard dc MINI-BEAMs with QD connector
5-Pin Euro	**MQDC1-506** **MQDC1-515** **MQDC1-530** **MQDC1-506RA** **MQDC1-515RA** **MQDC1-530RA**	2 m (6.5 ft) 5 m (15 ft) 9 m (30 ft) 2 m (6.5 ft) 5 m (15 ft) 9 m (30 ft)	Straight Straight Straight Right-angle Right-angle Right-angle	MINI-BEAM *Expert* Series with QD connector
4-Pin Euro (NAMUR)	**MQD9-406** **MQD9-415** **MQD9-406RA** **MQD9-415RA**	2 m (6.5 ft) 5 m (15 ft) 2 m (6.5 ft) 5 m (15 ft)	Straight Straight Right-angle Right-angle	MIAD9 Series NAMUR sensors with QD connector

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. A common example is the use of "line" or "slit" type aperture when wire or thread is be sensed. Each model contains 20 apertures.

Model	Description
AP31-020	0.5 mm (0.02 in) diameter, circular
AP31-040	1.0 mm (0.04 in) diameter, circular
AP31-100	2.5 mm (0.10 in) diameter, circular
AP31-020H	0.5 x 6.4 mm (0.02 x 0.25 in), horizontal slotted
AP31-040H	1.0 x 6.4 mm (0.04 x 0.25 in), horizontal slotted
AP31-100H	2.5 x 6.4 mm (0.10 x 0.25 in), horizontal slotted
AP31-200H	5.1 x 6.4 mm (0.20 x 0.25 in), horizontal slotted
AP31-020V	0.5 x 12.7 mm (0.02 x 0.50 in), vertical slotted
AP31-040V	1.0 x 12.7 mm (0.04 x 0.50 in), vertical slotted
AP31-100V	2.5 x 12.7 mm (0.10 x 0.50 in), vertical slotted
AP31-200V	5.1 x 12.7 mm (0.20 x 0.50 in), 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**
- **SM31EM/SM31R**

GROUP II Emitter/ Receiver Pairs (see RANGE columns at right):
- **SM31EL/SM31RL**
- **SMA31EL/SM2A31RL**
- **SM31EML/SM31RL**

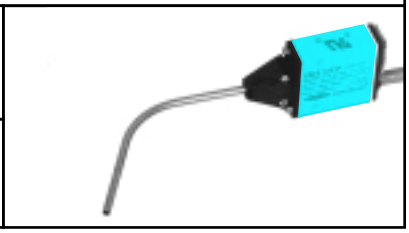
Example:
The MINI-BEAM SM31E/SM31R sensor pair is in **Group I**. With an **AP31-040 circular** aperture on the *receiver only*, range is 939.8 mm (37 in). With AP31-040 apertures on *both emitter and receiver*, range is 330.2 mm (13 in). Group I range with AP31-040 apertures and UC-300EL upper covers on both units is 482.6 mm (19 in); range with only receiver apertures is 2032 mm (80 in).

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 in)	102 mm (4.0 in)	457 mm (18 in)	1.5 m (60 in)	127 mm (5.0 in)	914 mm (36 in)
AP31-040	330 mm (13 in)	457 mm (18 in)	940 mm (37 in)	3.2 m (10.5 ft)	483 mm (19 in)	2.0 m (80 in)
AP31-100	1.5 m (60 in)	3.0 m (10 ft)	2.5 m (100 in)	8.2 m (27 ft)	2.1 m (84 in)	5.8 m (19 ft)
AP31-020H	406 mm (16 in)	1.8 m (70 in)	965 mm (38 in)	9.1 m (30 ft)	864 mm (34 in)	3.4 m (11 ft)
AP31-040H	914 mm (36 in)	4.0 m (13 ft)	1.8 m (72 in)	12.5 m (41 ft)	1.8 m (72 in)	5.2 m (17 ft)
AP31-100H	2.3 m (90 in)	10.4 m (34 ft)	2.9 m (114 in)	20.7 m (68 ft)	5.2 m (17 ft)	8.5 mm (28 ft)
AP31-200H	2.8 m (110 in)	21.3 m (70 ft)	3.0 m (120 in)	24.4 m (80 ft)	8.2 m (27 ft)	11.0 m (36 ft)
AP31-020V	457 mm (18 in)	1.7 m (65 in)	1.0 m (40 in)	8.2 m (27 ft)	1.0 m (40 in)	3.4 m (11 ft)
AP31-040V	1.0 m (40 in)	5.5 m (18 ft)	1.8 m (70 in)	15.8 m (52 ft)	2.1 m (84 in)	5.5 m (18 ft)
AP31-100V	2.3 m (90 in)	10.7 m (35 ft)	2.9 m (114 in)	22.9 m (75 ft)	6.1 m (20 ft)	8.5 m (28 ft)
AP31-200V	2.8 m (110 in)	22.9 m (75 ft)	3.0 m (120 in)	25.9 m (85 ft)	8.5 mm (28 ft)	11.0 m (36 ft)

MINI-BEAM Accessories

Bendable Bifurcated Plastic Fiber Optic Probes

The following plastic fiber optic probe assemblies are designed to bolt directly onto MINI-BEAM plastic fiber optic (FP) models. These are bifurcated assemblies used in the diffuse sensing mode. Performance is estimated using the excess gain curves for diffuse mode plastic fibers, found on page 205. Standard probe length is 94 mm (3.7 in). Longer and shorter probe lengths may be quoted. Probes are annealed stainless steel, and are bendable at the center of their length.

Model	Description	
FPA20	• 0.5 mm (0.02 in) diameter bifurcated fiber • Performance is equivalent to fiber model PBT26U	
FPA40	• 1.0 mm (0.04 in) diameter bifurcated fiber • Performance is equivalent to fiber model PBT46U	

Right-Angle Reflectors

MINI-BEAM right-angle reflectors are useful for tight sensing locations. NOTE: These reflectors significantly decrease excess gain.

Model	Description	
RAR300SM	• Side mount reflector that attaches to the MINI-BEAM with two #4 screws (supplied) • Creates a sensor which measures only 14 mm (0.56 in) in the direction of the scan • Use with sensor models 31E, EL, R, RL; 312D, DBZ, LV and W	
RAR300FM	• Front mount reflector that attaches directly to the threaded barrel of most MINI-BEAMs • Creates a sensor profile dimension in the direction of the scan that is 34 mm (1.35 in) • Use with sensor models 31E, EL, R, RL, 312D, and LV	

Replacement Lens Assemblies

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

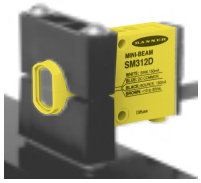
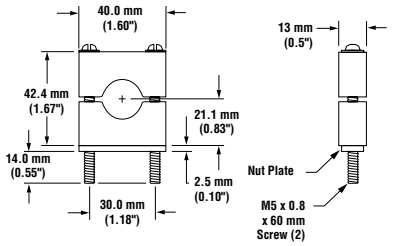
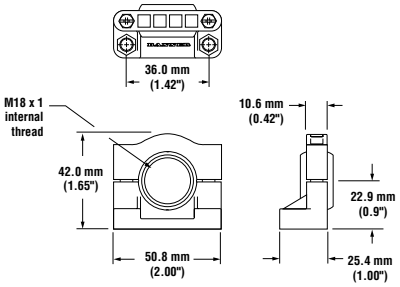
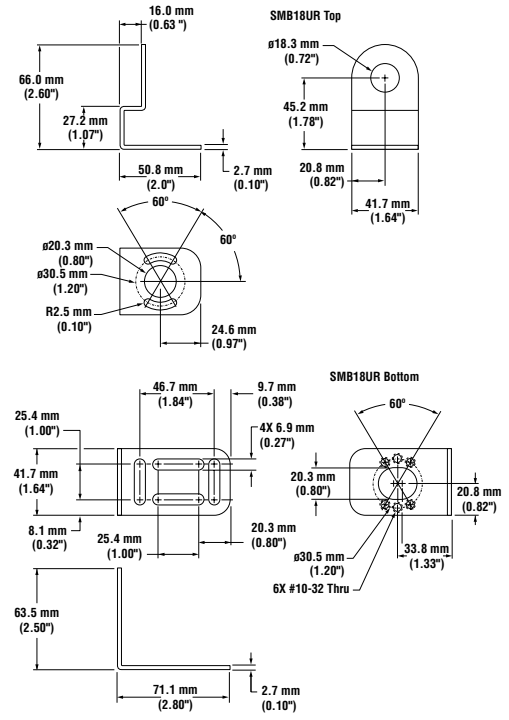
Model	Description	Possible Sensing Mode or Range Changes	
UC-300AG	Replacement lens for LVAG	Change LV to LVAG	
UC-300BZ	Replacement lens for W and DBZ	Change D to DBZ and F to DBZ	
UC-300C.7	Replacement lens for C, CV and CVG	Change CV2 to CV	
UC-300C2	Replacement lens for C2 and CV2	Change CV to CV2	
UC-300E	Replacement lens for E, & R	—	
UC-300EL	Replacement lens for EL, & RL	Extend range of E/R	
UC-300EPD	Replacement lens for EPD	—	
UC-300F	Replacement lens for F and FV	Change D to F and DBZ to F	
UC-300FP	Replacement lens for FP (Old style)	—	
UC-300FP2	Replacement lens for FP	—	
UC-300L	Replacement lens for LV and D	Change F to D, LVAG to LV and DBZ to D	
UC-300LP	Replacement lens for LP	—	
UC-300RPD	Replacement lens for RPD	—	

Extension Cables (without connectors)

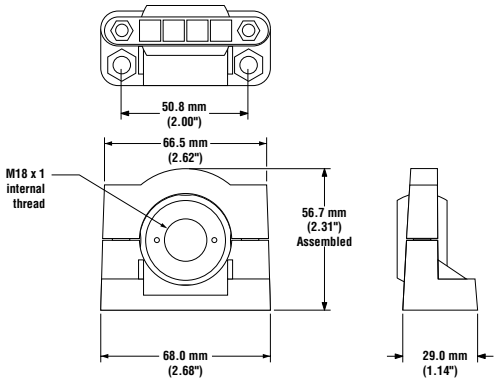
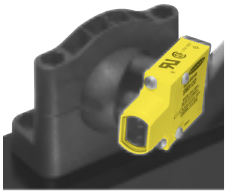
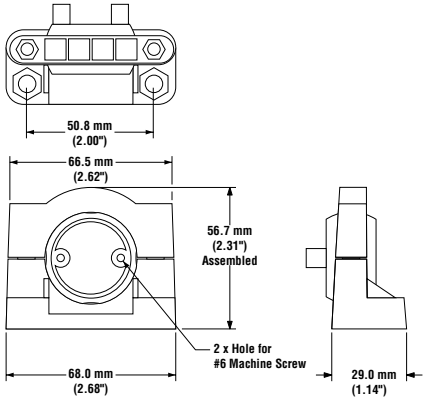
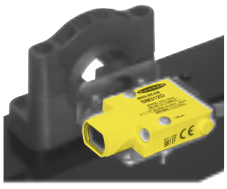
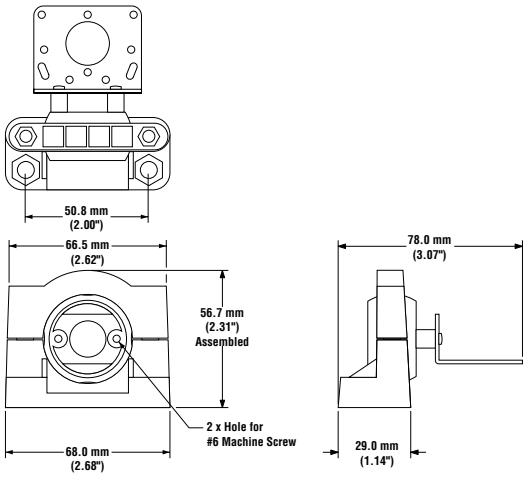
The following cables are available for extending the length of existing sensor cable. These are 30 m (100 ft) lengths of MINI-BEAM cable. This cable may be spliced to existing cable. Connectors, if used, must be customer-supplied.

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

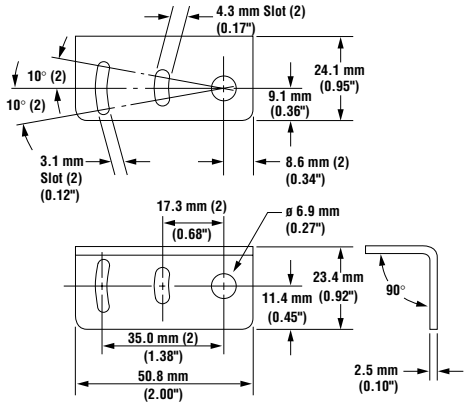
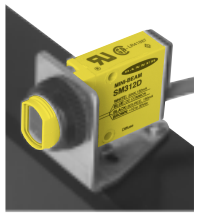
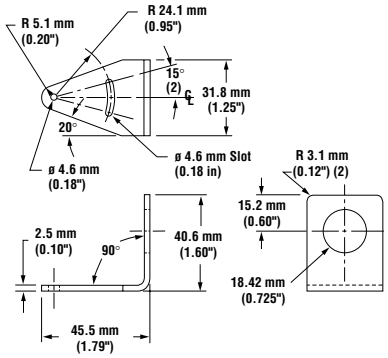
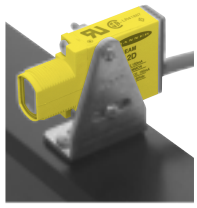
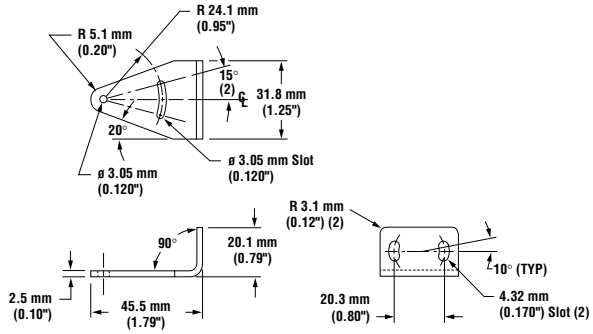
Mounting Brackets

Model	Description	Dimensions
SMB18C 	• 18 mm split clamp bracket • Black thermoplastic polyester • Includes stainless steel mounting hardware	
SMB18SF 	• 18 mm swivel bracket • Black thermoplastic polyester • Includes stainless steel swivel locking hardware	
SMB18UR 	• 2-part universal rotating bracket • Stainless steel	

Mounting Brackets

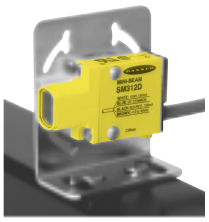
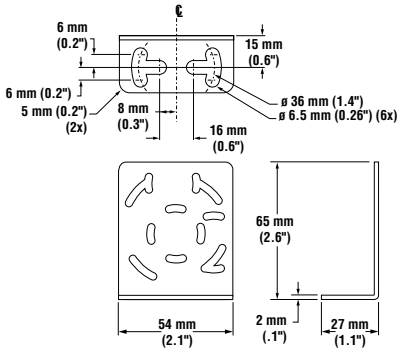
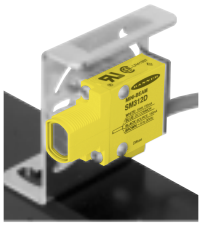
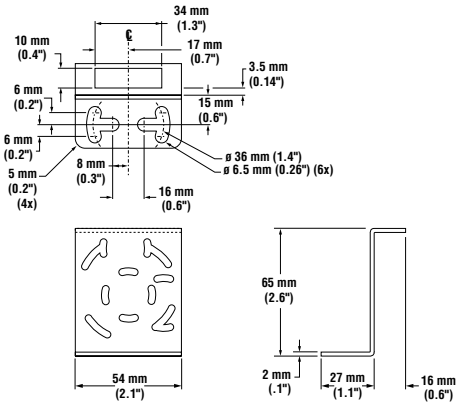
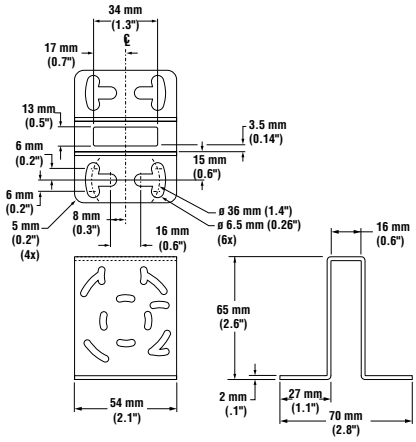
Model	Description	Dimensions
SMB3018SC 	• 18 mm swivel barrel or side mount bracket • Black reinforced thermoplastic polyester • Includes stainless steel swivel locking hardware	
SMB3018SUS 	• Side mount swivel bracket – extended range of motion • Black thermoplastic polyester	
SMB30SK 	• Flat-mount swivel bracket with extended range of motion • Black reinforced thermoplastic polyester and 316 stainless steel • Includes stainless steel swivel locking hardware	

Mounting Brackets

Model	Description	Dimensions
SMB312B 	• Stainless steel 2-axis, bottom mounting bracket • Includes mounting foot	
SMB312PD 	• Stainless steel 18 mm barrel mounting bracket	
SMB312S 	• Stainless steel 2-axis, side mounting bracket	

MINI-BEAM Accessories

Mounting Brackets

Model	Description	Dimensions
SMB46L 	• "L" bracket • 14-gauge 316 stainless steel	
SMB46S 	• "S" bracket • 14-gauge 316 stainless steel	
SMB46U 	• "U" bracket • 14-gauge 316 stainless steel	

Retroreflective Targets

Banner offers a wide selection of high-quality retroreflective targets. See Accessories section for complete information.