VS1 Series Sensors

VS1 features & benefits.

- Available with visible red or infrared sensing beam
- Choose models with 10 mm (0.4") or 20 mm (0.8") convergent point
- Dark- or light-operate models
- NPN (sinking) or PNP (sourcing) outputs
- Repeatability of 250 microseconds
- 10 to 30V dc operation
- IP67 and NEMA 6 environmental ratings

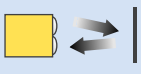
Convenient connections.

- Simple 3-wire hookup
- Choice of integral cable or pigtail quick-disconnect (QD) fitting

Miniature convergent-mode sensor.

The VS1 series convergent-mode sensor is a complete sensing system with a built-in amplifier that can switch loads up to 50 milliamps. The tiny device fits and functions in confined areas previously accessible only to remotely amplified or fiber optic sensors. The VS1 operates reliably inside machinery, including microelectronic conveying and inspection equipment, vibratory feeders and stamping machines. Versatile VS1 sensors can be used as high-quality, low-cost replacements for a variety of competitive miniature sensors.

VS1 Sensing Mode Options



Convergent

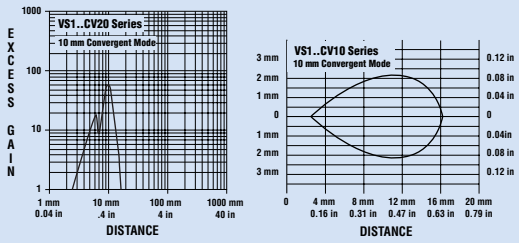
For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

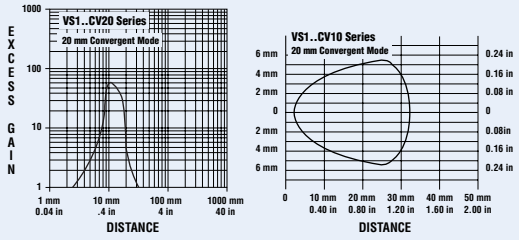
VS1 Series Convergent-Mode Sensors - Visible Red Beam Models

Visible red, 630 nm

Models	Range	Cable	Supply Voltage	Output Type
VS1AN5CV10 **VS1AN5CV10Q**	10 mm (0.4") ±5 mm	2 m (6.5') 3-wire 3-pin Pico QD pigtail	10 to 30V dc	NPN/LO
VS1RN5CV10 **VS1RN5CV10Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		NPN/DO
VS1AP5CV10 **VS1AP5CV10Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/LO
VS1RP5CV10 **VS1RP5CV10Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/DO
VS1AN5CV20 **VS1AN5CV20Q**	20 mm (0.8") ±10 mm	2 m (6.5') 3-wire 3-pin Pico QD pigtail	10 to 30V dc	NPN/LO
VS1RN5CV20 **VS1RN5CV20Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		NPN/DO
VS1AP5CV20 **VS1AP5CV20Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/LO
VS1RP5CV20 **VS1RP5CV20Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/DO

Diffuse mode performance based on 90% reflectance white test card



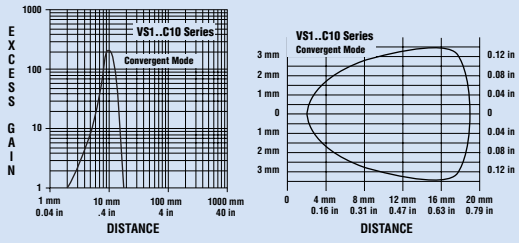


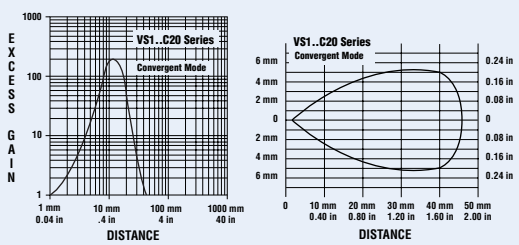
VS1 Series Convergent-Mode Sensors - Infrared Beam Models

Infrared, 865 nm

Models	Range	Cable	Supply Voltage	Output Type
VS1AN5C10 **VS1AN5C10Q**	10 mm (0.4") ±5 mm	2 m (6.5') 3-wire 3-pin Pico QD pigtail	10 to 30V dc	NPN/LO
VS1RN5C10 **VS1RN5C10Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		NPN/DO
VS1AP5C10 **VS1AP5C10Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/LO
VS1RP5C10 **VS1RP5C10Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/DO
VS1AN5C20 **VS1AN5C20Q**	20 mm (0.8") ±10 mm	2 m (6.5') 3-wire 3-pin Pico QD pigtail	10 to 30V dc	NPN/LO
VS1RN5C20 **VS1RN5C20Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		NPN/DO
VS1AP5C20 **VS1AP5C20Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/LO
VS1RP5C20 **VS1RP5C20Q**		2 m (6.5') 3-wire 3-pin Pico QD pigtail		PNP/DO

Diffuse mode performance based on 90% reflectance white test card



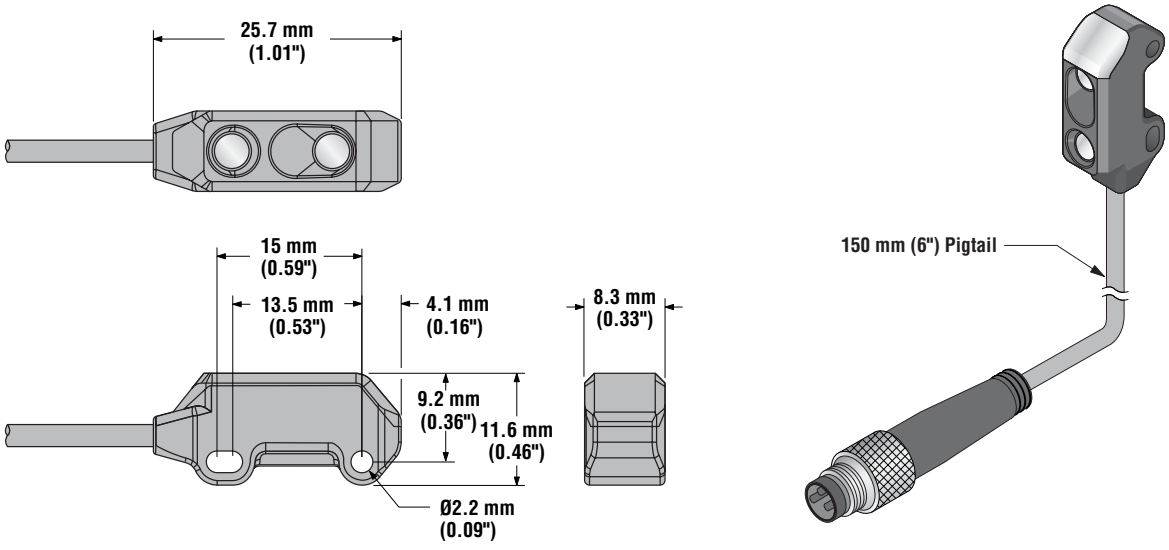


i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g. - **VS1AN5CV10 W/30**)
ii) A model with a QD connector requires an accessory mating cable. See Accessories section for more information.

VS1 Series Specifications

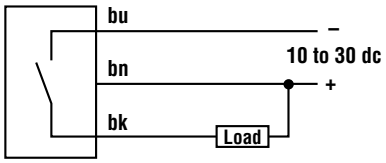
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	SPST solid-state switch Choose NPN (current sinking) or PNP (current sourcing) models Choose light operate (N.O.) or dark operate (N.C.) models
Output Rating	50 mA maximum **Off-state leakage current:** < 1 microamp at 24V dc **On-state saturation voltage:** < 0.25V at 10 mA dc; < 0.5V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs. Overload trip point ≥100 mA
Output Response Time	1 millisecond ON and OFF
Repeatability	250 microseconds
Indicators	Two LEDs: Green and Yellow **Green ON steady:** power to sensor is ON **Green flashing:** output overload **Yellow ON steady:** light is sensed **Yellow flashing:** marginal excess gain (1-1.5x) in light condition
Construction	Black ABS/polycarbonate housing with clear acrylic lens
Environmental Rating	IP67; NEMA 6
Connections	2 m (6.5') attached cable: three #28 ga stranded conductors with PE insulation; PVC outer cable jacket; or 3-pin Pico-style pigtail quick-disconnect fitting. QD cables are ordered separately.
Operating Conditions	**Temperature:** -20° to +55° C (-4° to +131° F) **Maximum Relative Humidity:** 80% at 50° C (non-condensing)
Application Notes	M2 stainless steel mounting hardware included. Optional mounting brackets are available.
Certifications	CE

VS1 Series Dimensions

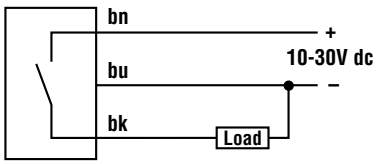


VS1 Series Hookup Diagrams

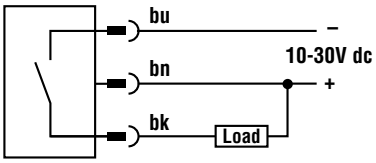
Sensors with NPN Outputs Cabled Hookup



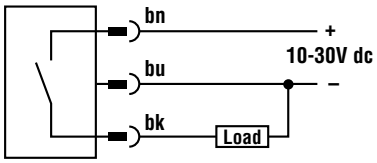
Sensors with PNP Outputs Cabled Hookup



Quick-Disconnect Hookup



Quick-Disconnect Hookup

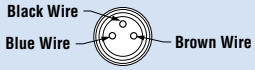


Quick-Disconnect (QD) Cables

Style	Models	Length	Used With
3-pin Pico-style Straight	**PKG3M-2** **PKG3M-9**	2 m (6.5') 9 m (30')	VS1 QD fitting

Pin-out

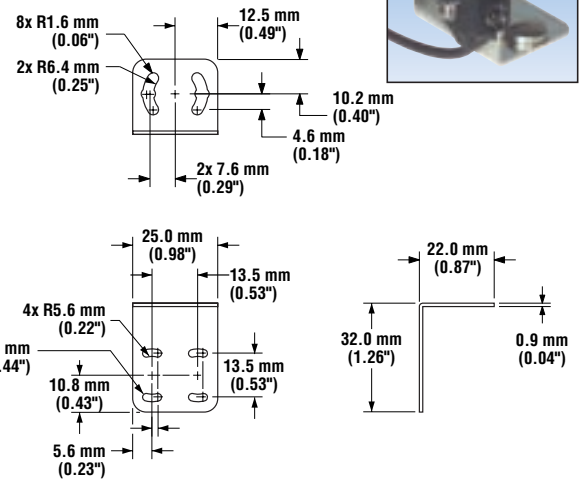
3-pin Pico-style (Cable Connector Shown)



Mounting Brackets

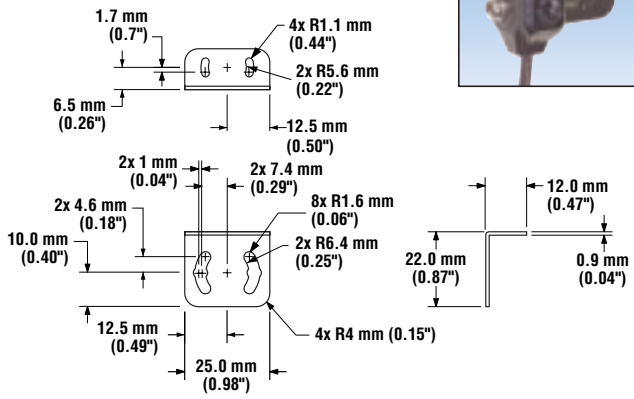
SMBVS1T

- Tall bracket
- Stainless steel



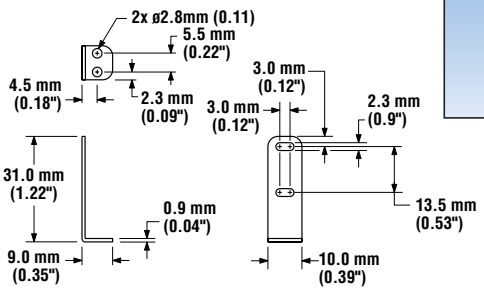
SMBVS1S

- Short compact bracket
- Stainless steel



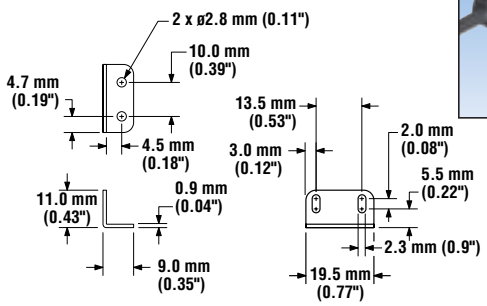
SMBVS1TC

- Tall compact bracket
- Stainless steel

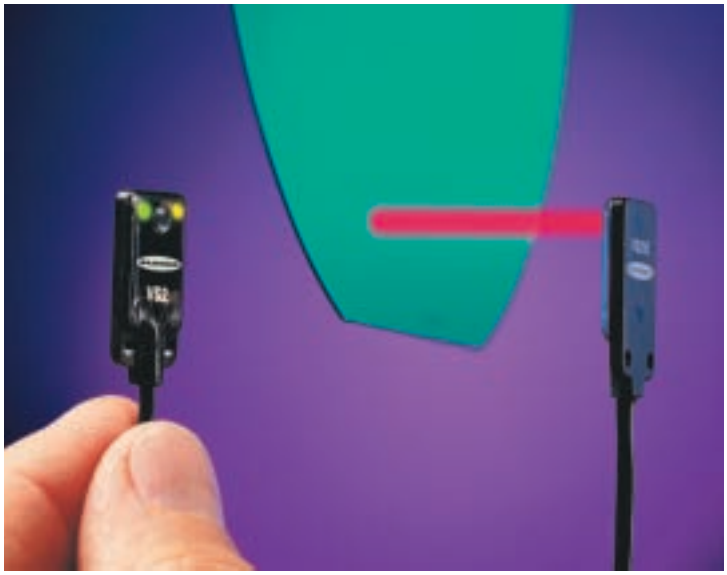


SMBVS1SC

- Short compact bracket
- Stainless steel



VS2 Series Sensors

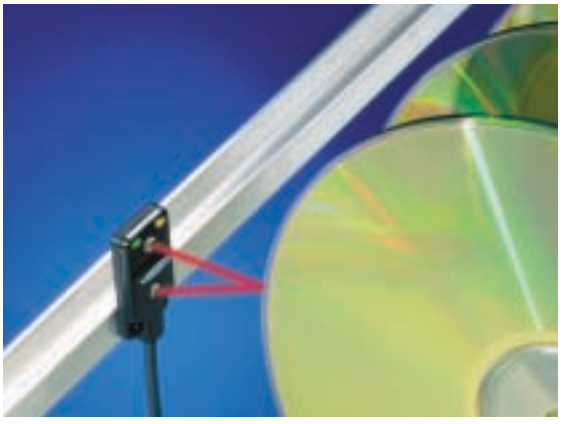


Ultra-miniature convergent-mode sensors feature powerful range.
VS2 series convergent-mode sensors are smaller than a postage stamp and slightly thicker than a credit card. The self-contained units can solve applications that previously required remote or fiber optic devices. They are ideal for sensing applications inside small machinery, microelectronic handling equipment, vibratory feeders, and punch presses.

VS2 sensors are also unaffected by varying target color, and are able to ignore reflective background objects that wreak havoc on standard sensing systems.

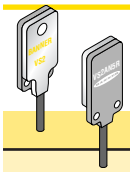
Advanced features.

- Visible red sensing beam
- Choose opposed- or convergent-mode sensing
- 15 mm, 30 mm or 600 mm sensing range
- 10 to 30V dc operation
- Dark- and light-operate models
- 160 microsecond repeatability
- 1 millisecond output response
- Green and yellow LED indicators
- Immune to RF and ambient light noise
- CE approved
- ABS housing rated IEC IP67 and NEMA 6
- -20° to +55° C (-4° to +131° F) operating temperature range
- Rugged design tolerates vibration, mechanical shock and washdown
- Integral cable or pigtail quick-disconnect fitting



VS2 Sensing Mode Options

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

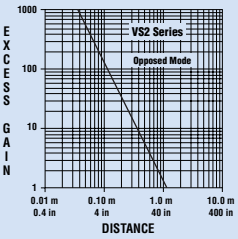


VS2 Series Opposed Mode Emitter (E) and Receiver (R) Models

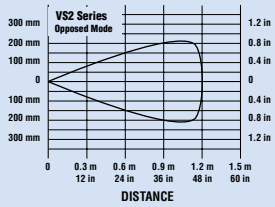
Visible red, 660 nm

Models*	Range	Cable	Supply Voltage	Output Type
VS2KAN5V Sensor Pair **VS25EV** Emitter **VS2AN5R** Receiver	Optimum up to 600 mm (24") 1.2 m (48") max.	2 m (6.5') 2 wires 3 wires 3-pin Pico QD pigtail	10 to 30V dc	NPN/LO
VS2KAN5VQ Sensor Pair **VS25EVQ** Emitter **VS2AN5RQ** Receiver				
VS2KRN5V Sensor Pair **VS25EV** Emitter **VS2RN5R** Receiver	Optimum up to 600 mm (24") 1.2 m (48") max.	2 m (6.5') 2 wires 3 wires 3-pin Pico QD pigtail	10 to 30V dc	NPN/DO
VS2KRN5VQ Sensor Pair **VS25EVQ** Emitter **VS2RN5RQ** Receiver				
VS2KAP5V Sensor Pair **VS25EV** Emitter **VS2AP5R** Receiver	Optimum up to 600 mm (24") 1.2 m (48") max.	2 m (6.5') 2 wires 3 wires 3-pin Pico QD pigtail	10 to 30V dc	PNP/LO
VS2KAP5VQ Sensor Pair **VS25EVQ** Emitter **VS2AP5RQ** Receiver				
VS2KRP5V Sensor Pair **VS25EV** Emitter **VS2RP5R** Receiver	Optimum up to 600 mm (24") 1.2 m (48") max.	2 m (6.5') 2 wires 3 wires 3-pin Pico QD pigtail	10 to 30V dc	PNP/DO
VS2KRP5VQ Sensor Pair **VS25EVQ** Emitter **VS2RP5RQ** Receiver				

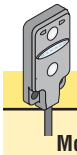
Diffuse mode performance based on 90% reflectance white test card



Beam Pattern
Effective Beam: 3 mm



*NOTE: Sensors may be purchased in pairs, or individually.

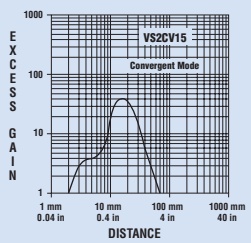


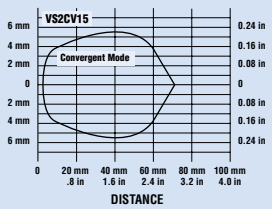
VS2 Series Convergent Models

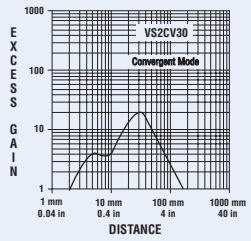
Visible red, 660 nm

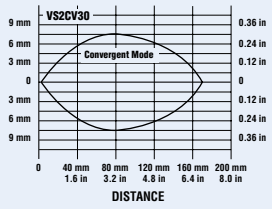
Models	Range	Cable	Supply Voltage	Output Type
VS2AN5CV15 **VS2AN5CV15Q**	15 mm (0.6") ±5 mm	2 m (6.5') 3-pin Pico QD	10 to 30V dc	NPN/LO
VS2RN5CV15 **VS2RN5CV15Q**		2 m (6.5') 3-pin Pico QD		NPN/DO
VS2AP5CV15 **VS2AP5CV15Q**		2 m (6.5') 3-pin Pico QD		PNP/LO
VS2RP5CV15 **VS2RP5CV15Q**		2 m (6.5') 3-pin Pico QD		PNP/DO
VS2AN5CV30 **VS2AN5CV30Q**	30 mm (1.2") ±10 mm	2 m (6.5') 3-pin Pico QD	10 to 30V dc	NPN/LO
VS2RN5CV30 **VS2RN5CV30Q**		2 m (6.5') 3-pin Pico QD		NPN/DO
VS2AP5CV30 **VS2AP5CV30Q**		2 m (6.5') 3-pin Pico QD		PNP/LO
VS2RP5CV30 **VS2RP5CV30Q**		2 m (6.5') 3-pin Pico QD		PNP/DO

Diffuse mode performance based on 90% reflectance white test card





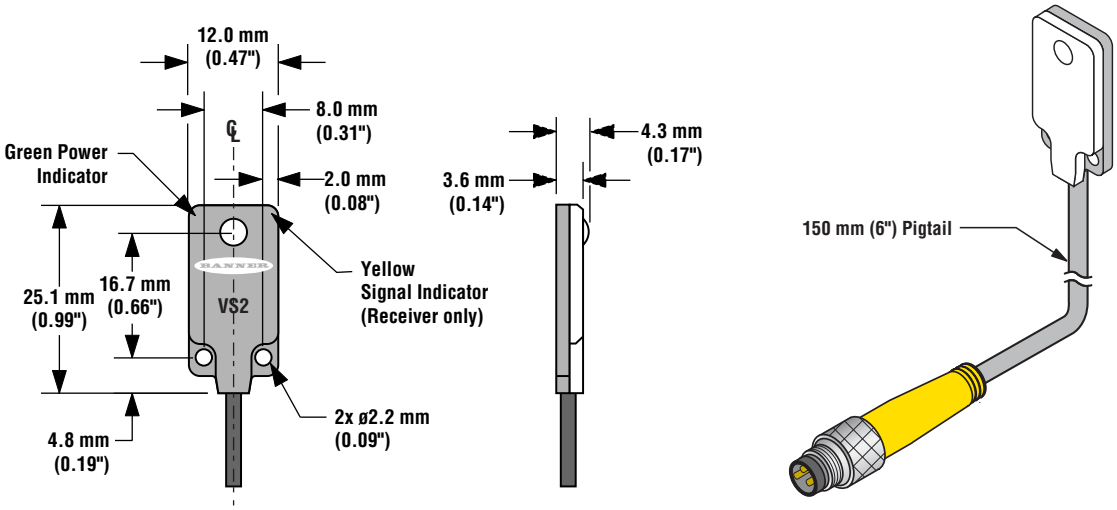




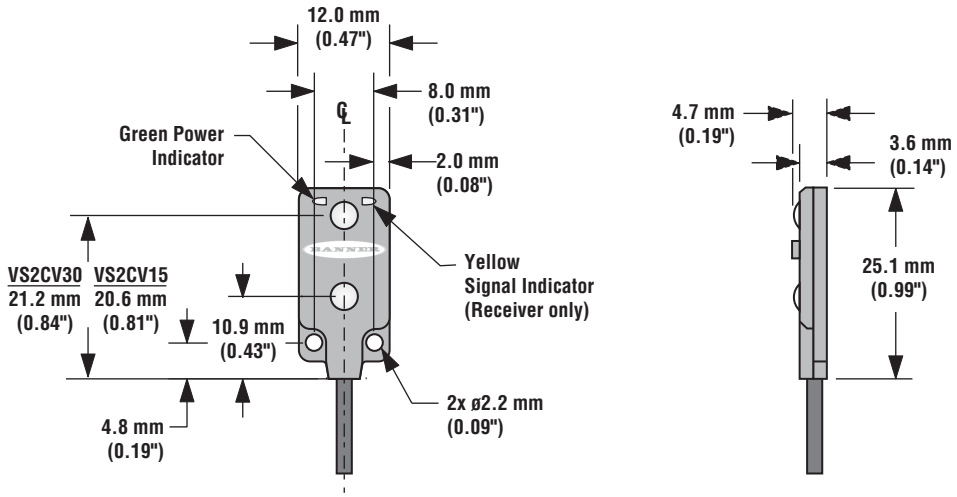
i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **VS2AN5CV15 W/30**).
ii) A model with a QD connector requires an accessory mating cable. See Accessories section for more information.

VS2 Series 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	SPST solid-state switch Choose NPN (current sinking) or PNP (current sourcing) models Choose light operate (N.O.) or dark operate (N.C.) models
Output Rating	50 mA maximum **Off-state leakage current:** < 1 microamp at 24V dc **On-state saturation voltage:** < 0.25V at 10 mA dc; < 0.5V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs **Opposed Mode:** Overload trip point ≥ 100 mA **Convergent:** Overload trip point ≥ 160 mA
Output Response Time	**Opposed Mode:** 1 millisecond ON and 0.5 millisecond OFF; **Convergent:** 1 millisecond ON and OFF NOTE: 100 millisecond (opposed mode) and 150 millisecond (convergent) delay maximum on power-up: output does not conduct during this time.
Repeatability	**Opposed Mode:** 100 microseconds **Convergent:** 160 microseconds
Indicators	Two LEDs: Green and Yellow **Green ON steady:** power to sensor is ON **Green flashing:** output overload **Yellow ON steady:** light is sensed **Yellow flashing:** marginal excess gain (1-1.5x) in light condition (opposed mode only)
Construction	**Opposed Mode:** Black ABS housing with clear MABS lens **Convergent:** Black ABS housing with acrylic lens
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m (6.5') attached cable: #28 ga stranded conductors with PE insulation; PVC outer cable jacket; or 3-pin Pico-style pigtail quick-disconnect fitting. QD cables are ordered separately.
Operating Conditions	**Temperature:** -20° to +55° C (-4° to +131° F) **Maximum Relative Humidity:** 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	**Vibration:** All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak **Shock:** All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Application Notes	M2 stainless steel mounting hardware included. Optional mounting brackets are available.
Certifications	CE

VS2 Series Opposed-Mode Sensor Dimensions

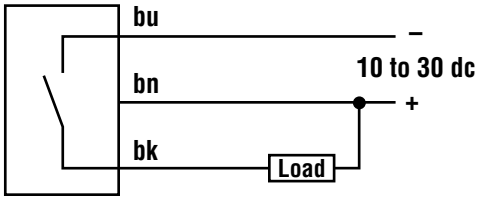


VS2 Series Convergent-Mode Sensor Dimensions

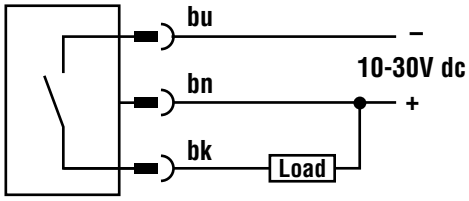


VS2 Series Hookup Diagrams

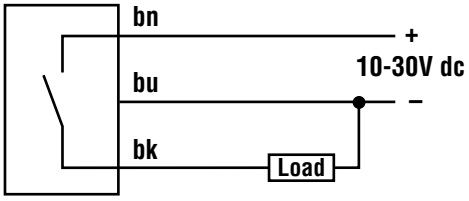
Sensors with NPN Outputs
Cabled Hookup



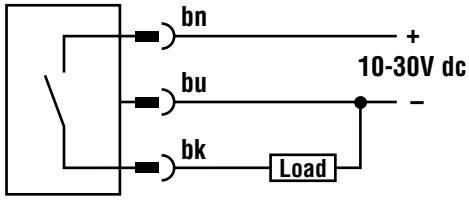
Quick-Disconnect Hookup



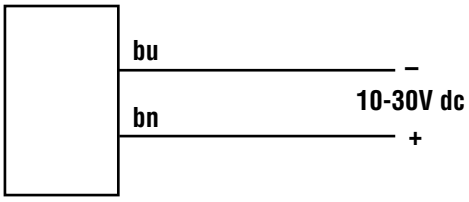
Sensors with PNP Outputs
Cabled Hookup



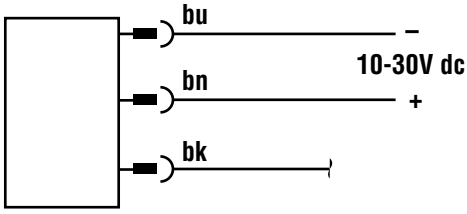
Quick-Disconnect Hookup



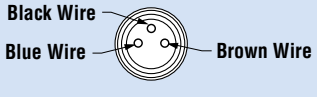
Emitters
Cabled Hookup



Quick-Disconnect Hookup

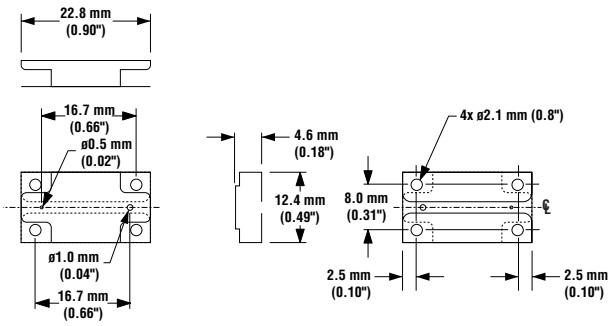


Quick-Disconnect (QD) Cables

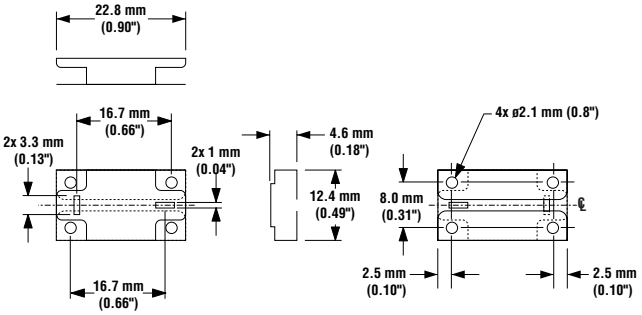
Style	Models	Length	Used With:	Connector	Pinout
3-pin Pico-style	**PKG3M-2** **PKG3M-9**	2 m (6.5') 9 m (30')	All VS2 Series sensors with QD fitting	Straight	

Apertures for Use on Opposed-Mode Models

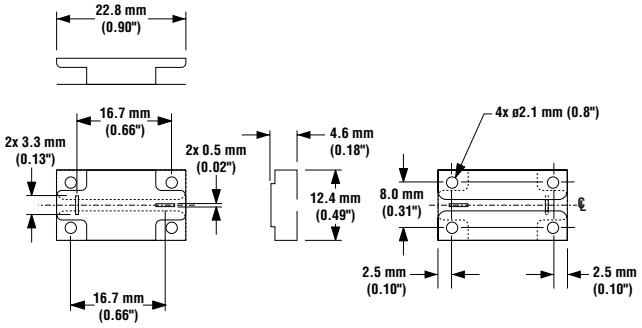
APVS2-0204
- 0.5 mm and 1.0 mm apertures
- 0.1 mm stainless steel
- Includes two apertures



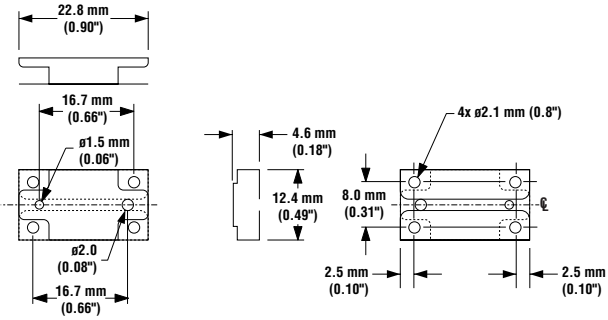
APVS2-04R
- 1 mm wide aperture - horizontal and vertical
- 0.1 mm stainless steel
- Includes two apertures



APVS2-02R
- 0.5 mm wide aperture - horizontal and vertical
- 0.1 mm stainless steel
- Includes two apertures

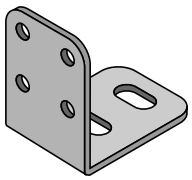


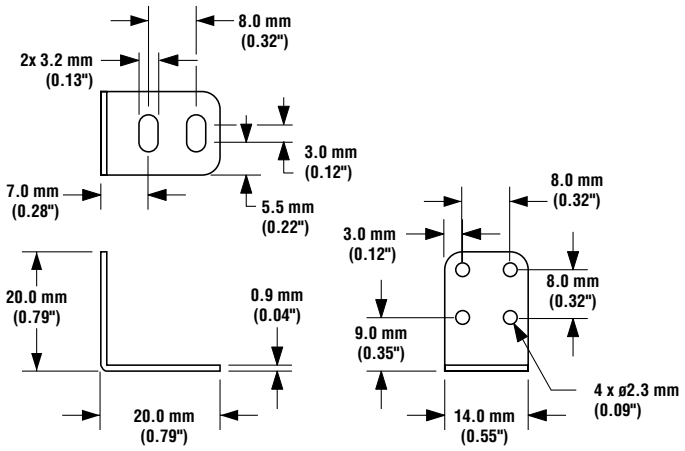
APVS2-0608
- 1.5 mm and 2.0 mm apertures
- 0.1 mm stainless steel
- Includes two apertures

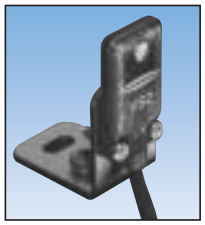


Mounting Brackets

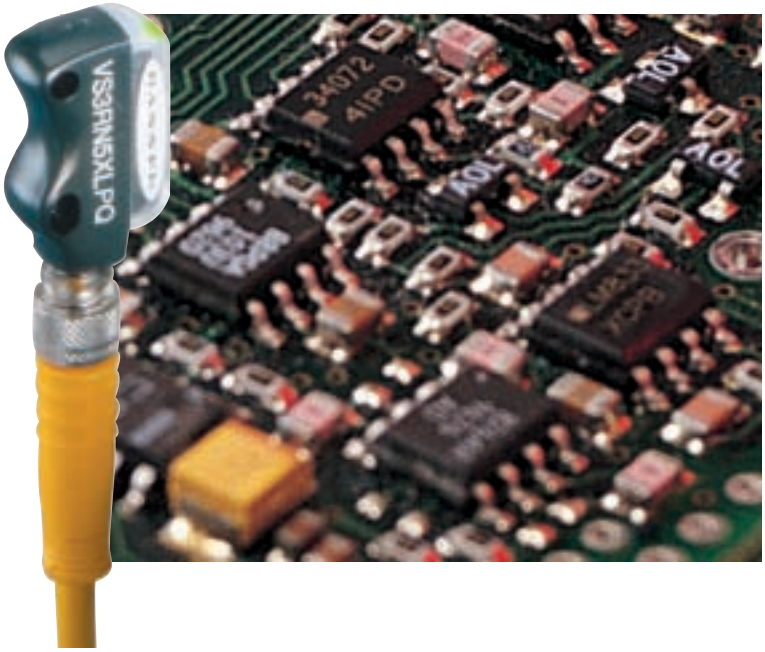
SMBVS2RA
- Right-angle bracket
- Stainless steel







VS3 Series Sensors



Advanced miniature sensors eliminate "blind" zone.
Bifurcated lens separation creates a "blind" response area near the lens of most retroreflective-mode photoelectrics. VS3 series retroreflective-mode sensors utilize coaxial optics to provide a complete sensing response area with no blind spots.

This unique design enables VS3 sensors to detect shiny objects accurately, even in close proximity to the sensing lens. The sensors' small size, precise sensing and exceptional range make them ideal replacements for remote and fiber optic devices in space-limited applications.

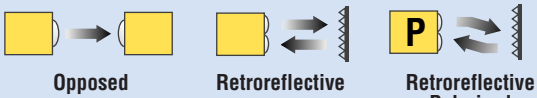
Extremely compact self-contained design.

- Visible red beam
- LED status/diagnostic indicators
- Opposed- or retroreflective-mode models
- CE approved, and rated IEC IP67 and NEMA 6
- Integral cable or pigtail quick-disconnect fitting
- Stainless steel mounting hardware included

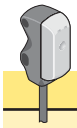
Miniature size offers powerful capability.

- Sensing range up to 1.2 m (48")
- Output response of 1 millisecond
- Repeatability of 160 microseconds
- 10 to 30V dc operation
- NPN (sinking) or PNP (sourcing) outputs
- 3-wire hookup; output load capacity to 50 mA
- Available in light operate (N.O.) and dark operate (N.C.) models

VS3 Sensing Mode Options



For complete listings of Banner's extensive product lines, go to www.bannerengineering.com



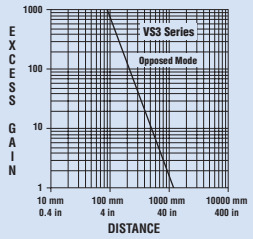
VS3 Series Opposed-Mode Emitter (E) and Receiver (R) Models

Visible red, 660 nm

Models*	Range	Cable	Supply Voltage	Output Type
VS3KAN5V Sensor Pair **VS35EV** Emitter **VS3AN5R** Receiver	1.2 m (48")	2 m (6.5') 2 wires 3 wires	10 to 30V dc	NPN/LO
VS3KAN5VQ Sensor Pair **VS35EVQ** Emitter **VS3AN5RQ** Receiver	1.2 m (48")	3-pin Pico QD	10 to 30V dc	NPN/LO
VS3KRN5V Sensor Pair **VS35EV** Emitter **VS3RN5R** Receiver	1.2 m (48")	2 m (6.5') 2 wires 3 wires	10 to 30V dc	NPN/DO
VS3KRN5VQ Sensor Pair **VS35EVQ** Emitter **VS3RN5RQ** Receiver	1.2 m (48")	3-pin Pico QD	10 to 30V dc	NPN/DO
VS3KAP5V Sensor Pair **VS35EV** Emitter **VS3AP5R** Receiver	1.2 m (48")	2 m (6.5') 2 wires 3 wires	10 to 30V dc	PNP/LO
VS3KAP5VQ Sensor Pair **VS35EVQ** Emitter **VS3AP5RQ** Receiver	1.2 m (48")	3-pin Pico QD	10 to 30V dc	PNP/LO
VS3KRP5V Sensor Pair **VS35EV** Emitter **VS3RP5R** Receiver	1.2 m (48")	2 m (6.5') 2 wires 3 wires	10 to 30V dc	PNP/DO
VS3KRP5VQ Sensor Pair **VS35EVQ** Emitter **VS3RP5RQ** Receiver	1.2 m (48")	3-pin Pico QD	10 to 30V dc	PNP/DO

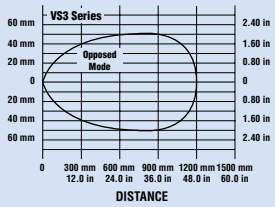
Excess Gain

Diffuse mode performance based on 90% reflectance white test card

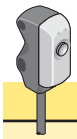


Beam Pattern

Effective Beam: 3 mm



*NOTE: Sensors may be purchased in pairs, or individually.



Coaxial optics eliminate "blind" area at close range.

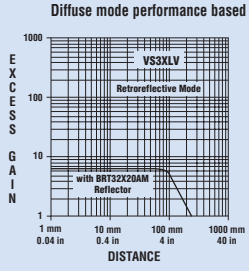
VS3 Series Retroreflective Models

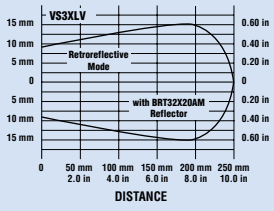
Visible red, 680 nm

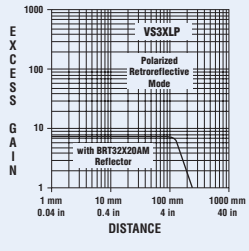
	Models	Range	Cable	Supply Voltage	Output Type
Non-Polarized	**VS3AN5XLV** **VS3AN5XLVQ**	250 mm (10") using BRT32X20AM retro target (supplied)	2 m (6.5') 3-pin Pico QD	10 to 30V dc	NPN/LO
	VS3RN5XLV **VS3RN5XLVQ**		2 m (6.5') 3-pin Pico QD		NPN/DO
	VS3AP5XLV **VS3AP5XLVQ**		2 m (6.5') 3-pin Pico QD		PNP/LO
	VS3RP5XLV **VS3RP5XLVQ**		2 m (6.5') 3-pin Pico QD		PNP/DO
Polarized	**VS3AN5XLP** **VS3AN5XLPQ**	250 mm (10") using BRT32X20AM retro target (supplied)	2 m (6.5') 3-pin Pico QD	10 to 30V dc	NPN/LO
	VS3RN5XLP **VS3RN5XLPQ**		2 m (6.5') 3-pin Pico QD		NPN/DO
	VS3AP5XLP **VS3AP5XLPQ**		2 m (6.5') 3-pin Pico QD		PNP/LO
	VS3RP5XLP **VS3RP5XLPQ**		2 m (6.5') 3-pin Pico QD		PNP/DO

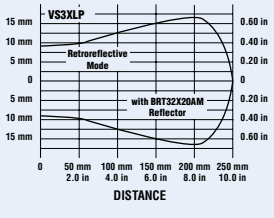
Excess Gain | **Beam Pattern**

Diffuse mode performance based on 90% reflectance white test card







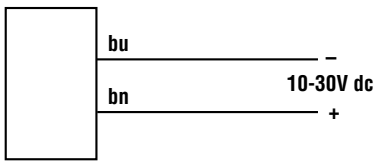


VS3 Series Specifications

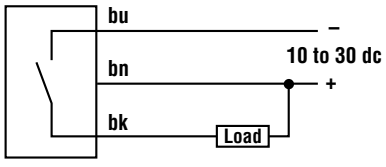
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 25 mA (exclusive of load)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	SPST solid-state switch Choose NPN (current sinking) or PNP (current sourcing) models Choose light operate (N.O.) or dark operate (N.C.) models
Output Rating	50 mA maximum **Off-state leakage current:** < 1 microamp at 24V dc **On-state saturation voltage:** < 0.25V at 10 mA dc; < 0.5V at 50 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs Overload trip point ≥ 100 mA
Output Response Time	**Opposed Mode:** 1 millisecond ON and 0.5 millisecond OFF; **Retroreflective:** 1 millisecond ON and OFF NOTE: 100 microsecond (opposed mode) and 150 millisecond (retroreflective) delay maximum on power-up: output does not conduct during this time.
Repeatability	**Opposed Mode:** 100 microseconds **Retroreflective:** 160 microseconds
Indicators	Two LEDs: Green and Yellow **Green ON steady:** power to sensor is ON **Green flashing:** output overload **Yellow ON steady:** light is sensed **Yellow flashing:** marginal excess gain (1-1.5x) in light condition (opposed mode only)
Construction	**Opposed and Non-polarized Retroreflective Models:** Black ABS housing with acrylic lens **Polarized Retroreflective Models:** Black ABS housing with glass lens and acrylic cover
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m (6.5') attached cable: #28 ga stranded conductors with PE insulation; PVC outer cable jacket; or 3-pin Pico-style threaded quick-disconnect fitting. QD cables are ordered separately.
Operating Conditions	**Temperature:** -20° to +55° C (-4° to +131° F) **Maximum Relative Humidity:** 80% at 50° C (non-condensing)
Vibration and Mechanical Shock	**Vibration:** All models meet IEC 60068-2-6, IEC 60947-5-2, UL491 Section 40, MIL-STD-202F Method 201A; 10 to 60 Hz, 0.5 mm peak to peak **Shock:** All models meet IEC 60068-2-27, IEC 60947-5-2; 30g peak acceleration, 11 millisecond pulse duration, half-sine wave pulse shape
Application Notes	M3 stainless steel mounting hardware included. Optional mounting brackets are available.
Certifications	CE

VS3 Series Hookup Diagrams

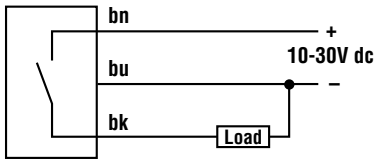
Emitters
Cabled Hookup



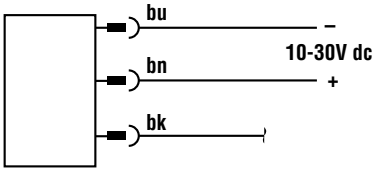
Sensors with NPN Outputs
Cabled Hookup



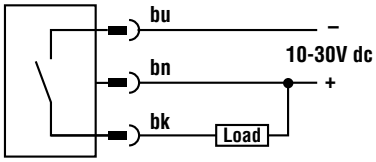
Sensors with PNP Outputs
Cabled Hookup



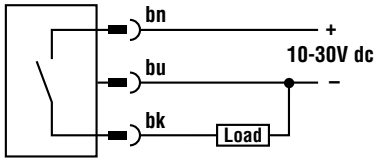
Quick-Disconnect Hookup



Quick-Disconnect Hookup



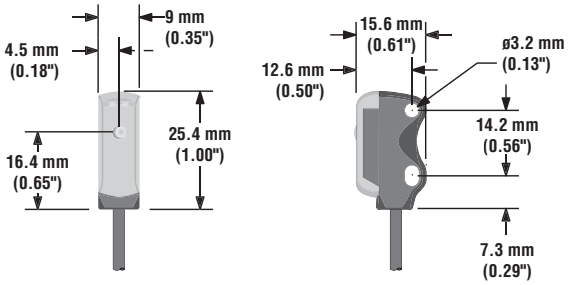
Quick-Disconnect Hookup



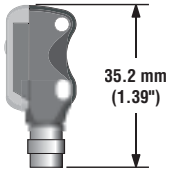
VS3 Series Sensor Dimensions

Opposed and Non-Polarized Retroreflective Modes (model suffix R, EV and XLV)

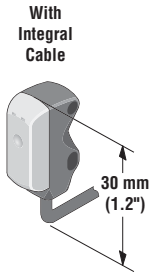
Cabled Models

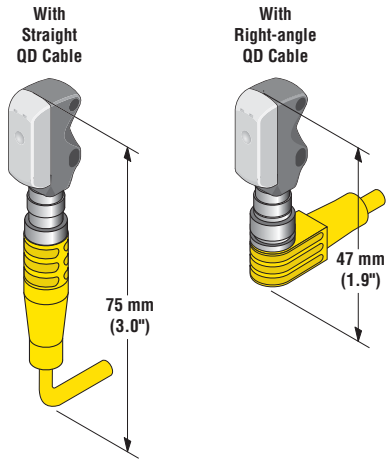


Quick-Disconnect Models

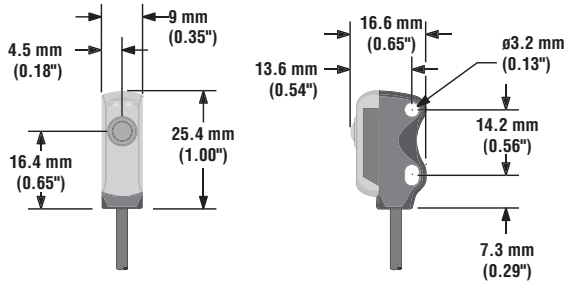


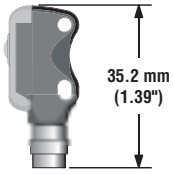
Cable Options





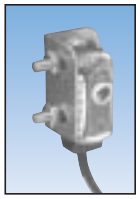
Polarized Retroreflective Modes (model suffix XLP)





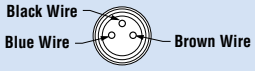
Mounting Brackets

SMBVS3S
- Right-angle bracket
- 300 series stainless steel



SMBVS3T
- Right-angle tall bracket
- 300 series stainless steel

Quick-Disconnect (QD) Cables

Style	Models	Length	Connector	Used With:	Pin-out
3-pin Pico-style	**PKG3M-2**	2 m (6.5')	Straight	VS3 with QD fitting	
	PKG3M-9	9 m (30')	Straight		
	PKW3M-2	2 m (6.5')	Right-angle		
	PKW3M-9	9 m (30')	Right-angle		

Q23 & QH23 Series Sensors

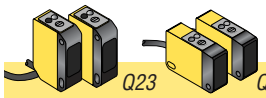
Miniature photoelectric sensors.
Versatile Q23 and QH23 series photoelectric sensors are available in both vertical and horizontal housing styles, to accommodate a variety of mounting requirements. The tiny, self-contained sensors, measuring just 34 x 12 x 23 mm (1.34" x 0.47" x 0.91"), provide powerful ranges, exceeding that of devices more than twice as large.

Sensor features.

- 8 m (26') opposed-mode sensing range
- 2 m (6.5') retroreflective-mode sensing range
- Convergent beam models provide 50 mm (2") focus length
- Short- and long-range diffuse and fiber optic models also available
- Visible red sensing beam simplifies setup and alignment
- Self-diagnostics and LED status indication
- 10 to 30V dc operation
- Versatile output configurations
- Sealed circuitry and rugged ABS housing
- Rated IP67 and NEMA 6
- Choice of integral cable or quick-disconnect fitting
- Mounting bracket and hardware included

Q23 & QH23 Sensing Mode Options

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

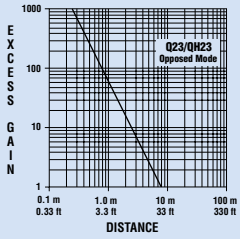


Q23 & QH23 Series Opposed-Mode Emitter (E) and Receiver (R) Models

Visible red, 680 nm

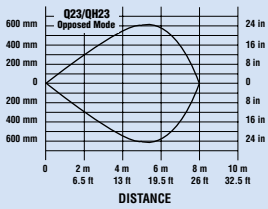
Models	Range	Cable	Supply Voltage	Output Type
Q236E **QH236E** **Q236EQ** **QH236EQ**	8 m (26')	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	N/A
Q23SN6R **QH23SN6R** **Q23SN6RQ** **QH23SN6RQ**	8 m (26')	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state NPN
Q23SP6R **QH23SP6R** **Q23SP6RQ** **QH23SP6RQ**	8 m (26')	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state PNP

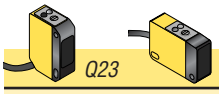
Excess Gain



Beam Pattern

Effective Beam: 5.3 mm



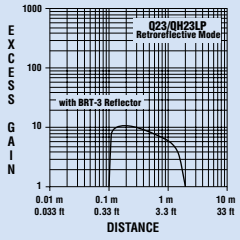


Q23 & QH23 Series Polarized Retroreflective Models

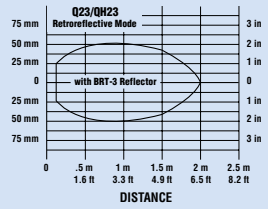
Visible red, 680 nm

Models	Range	Cable	Supply Voltage	Output Type
Q23SN6LP **QH23SN6LP** **Q23SN6LPQ** **QH23SN6LPQ**	100 mm to 2 m (4" to 80")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state NPN
Q23SP6LP **QH23SP6LP** **Q23SP6LPQ** **QH23SP6LPQ**	100 mm to 2 m (4" to 80")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state PNP

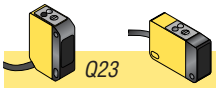
Excess Gain



Beam Pattern



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



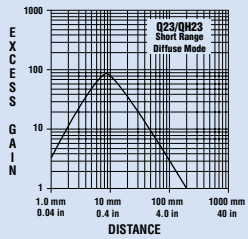
Q23 & QH23 Series Diffuse Models

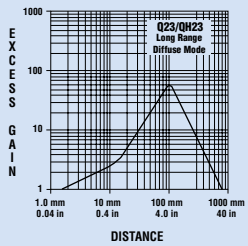
Visible red, 680 nm

	Models	Range	Cable	Supply Voltage	Output Type
SHORT RANGE	**Q23SN6D** **QH23SN6D** **Q23SN6DQ** **QH23SN6DQ**	**Optimum:** 2 to 50 mm (0.1" - 2")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state NPN
SHORT RANGE	**Q23SP6D** **QH23SP6D** **Q23SP6DQ** **QH23SP6DQ**	**Maximum:** 200 mm (8")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state PNP
LONG RANGE	**Q23SN6DL** **QH23SN6DL** **Q23SN6DLQ** **QH23SN6DLQ**	**Optimum:** 30 to 300 mm (1.2" to 12")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state NPN
LONG RANGE	**Q23SP6DL** **QH23SP6DL** **Q23SP6DLQ** **QH23SP6DLQ**	**Maximum:** 800 mm (32")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state PNP

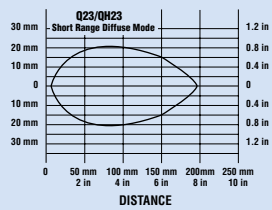
Excess Gain

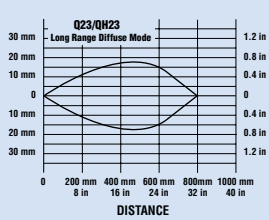
Diffuse mode performance based on 90% reflectance white test card





Beam Pattern



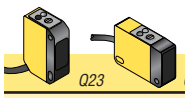


For All Q23 & QH23 Sensors:

i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **Q23SN6LP W/30**).

ii) All Q23 QD models have a 4-pin Pico-style connector on a 150 mm (6") cable pigtail.

iii) A model with a QD connector requires an accessory mating cable.



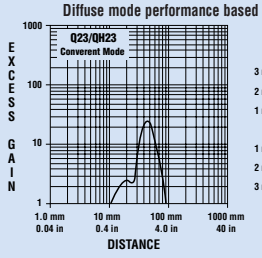
Q23 & QH23 Series Convergent Models

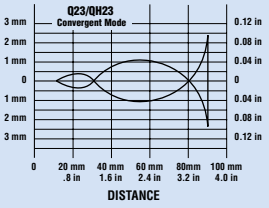
Visible red, 680 nm

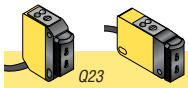
Models	Range	Cable	Supply Voltage	Output Type
Q23SN6CV50 QH23SN6CV50 Q23SN6CV50Q QH23SN6CV50Q	50 mm (2")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state NPN
Q23SP6CV50 QH23SP6CV50 Q23SP6CV50Q QH23SP6CV50Q	50 mm (2")	2 m (6.5') 2 m (6.5') 4-pin Pico QD pigtail 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state PNP

Excess Gain / Beam Pattern

Diffuse mode performance based on 90% reflectance white test card







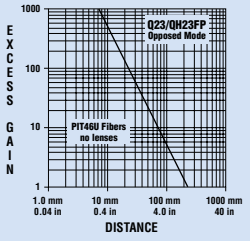
Q23 & QH23 Series Plastic Fiber Optic Models

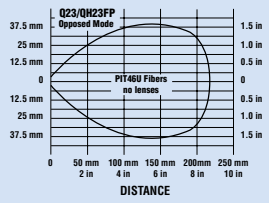
Visible red, 680 nm

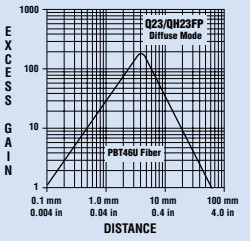
Models	Range	Cable	Supply Voltage	Output Type
STANDARD SPEED: 1 ms RESPONSE				
Q23SN6FP QH23SN6FP Q23SN6FPQ QH23SN6FPQ	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state NPN
Q23SP6FP QH23SP6FP Q23SP6FPQ QH23SP6FPQ	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state PNP
HIGH SPEED: 100 µS RESPONSE				
Q23SN6FPY QH23SN6FPY Q23SN6FPYQ QH23SN6FPYQ	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state NPN
Q23SP6FPY QH23SP6FPY Q23SP6FPYQ QH23SP6FPYQ	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	Complementary Solid-state PNP

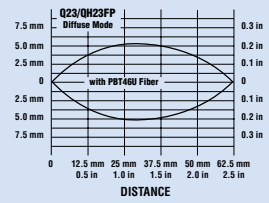
Excess Gain / Beam Pattern

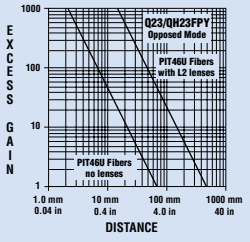
Diffuse mode performance based on 90% reflectance white test card

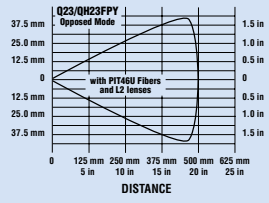


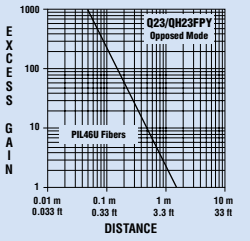


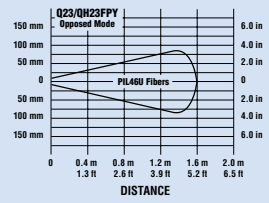












For Q23 & QH23 Plastic Fiber Sensing Mode:

i) The opposed range of Q23FP sensors using 1 mm (0.4") plastic fibers may be extended using optional lens pairs. A pair of model L2 lenses extends the opposed range to 2 m (6.5'). A pair of model L08FP lenses extends opposed range to 3 m (10').

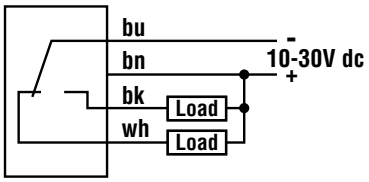
ii) Diffuse mode sensing with Q23FPY models is generally not recommended due to low excess gain. If in doubt about sensing performance, contact the factory Application Engineering Department or your local Banner sales engineer to discuss diffuse mode applications.

Q23 & QH23 Series Specifications

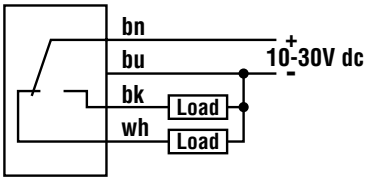
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 25 mA for diffuse, retro, and fiber optic models (exclusive of load) Opposed emitters and receivers draw 20 mA each
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid-state dc complementary outputs: **Q(H)23SN6xx models:** NPN sinking, N.O. (normally open) & N.C. (normally closed) complementary **Q(H)23SP6xx models:** PNP sourcing, N.O. & N.C. complementary **Light operate:** N.O. output conducts when the sensor sees its own modulated light source **Dark operate:** N.C. output conducts when the sensing beam is blocked The N.C. output may be used as an alarm output, depending upon hookup to the power supply (see hookup diagrams)
Output Rating	150 mA maximum each in standard hookup; when wired for alarm output, the total load may not exceed 150 mA **Off-state leakage current** less than 1 microamp at 30V dc **Output saturation voltage** less than 1 volt at 10mA dc; less than 1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up, transient voltages, and continuous overload or short-circuit of outputs
Output Response Time	1 millisecond ON and OFF (except for Q23FPY high-speed sensors which have 100 microsecond response time); no false pulse on power-up NOTE: 100 millisecond delay on power-up: outputs do not conduct during this time.
Repeatability	**All Opposed Modes:** 0.13 ms; **Retroreflective and Diffuse:** 0.25 ms; **FPY High-Speed Plastic Fiber Optic:** 25 microseconds. Response time and repeatability specifications are independent of signal strength.
Adjustments	Sensitivity control (single-turn, o-ring sealed potentiometer)
Indicators	Sensors except opposed mode emitters have two LEDs: **Green glowing steady:** dc Power ON **Green flashing:** output overload **Yellow glowing steady:** normally open output is conducting **Yellow flashing:** marginal excess gain (1 - 1.5x), light condition; flashing Yellow corresponds to ON state of alarm output Emitters have green Power ON indicator
Construction	Yellow and black ABS housing, with acrylic lenses, completely sealed. Stainless steel mounting bracket and M3 mounting hardware are supplied.
Environmental Rating	Meets NEMA standards 1, 2, 3, 3S, 4, 4X, 6, 12, and 13; IEC IP67. Housing materials rated UL 94 V-0
Connections	PVC-jacketed 4-conductor 2 m (6.5') or 9 m (30') cables, or 6" pigtail with 4-pin Pico-style quick-disconnect (QD) fitting are available. Mating QD cables are ordered separately; see Accessories page 38.
Operating Conditions	**Temperature:** -20° to +55° C (-5° to +131° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)
Application Note	To avoid damage to the sensor caused by static discharge (ESD), use the plastic screwdriver supplied with each sensor (included in the hardware packet) to adjust the Sensitivity control. Otherwise, use a screwdriver with an insulated handle.
Certifications	CE c UL us

Q23 & QH23 Series Hookup Diagrams

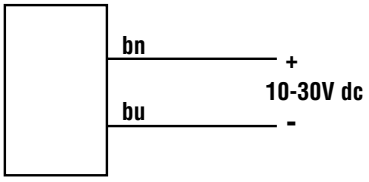
Sensors with NPN (Sinking) Outputs Standard Hookup



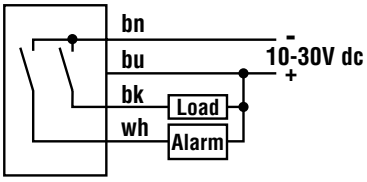
Sensors with PNP (Sourcing) Outputs Standard Hookup



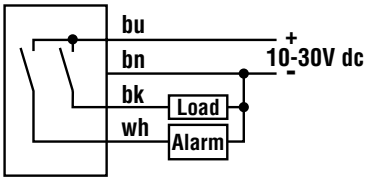
Emitters



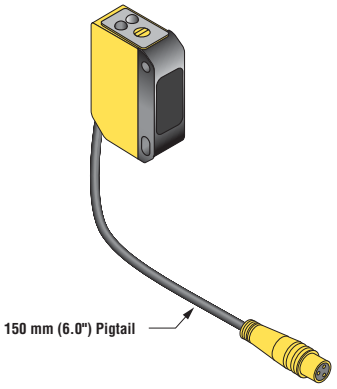
Alarm Hookup



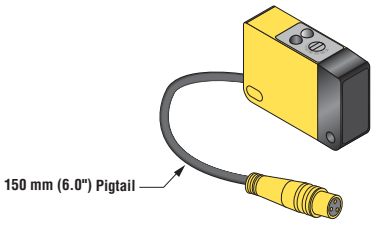
QH23 Pigtail Quick-Disconnect



Q23 Pigtail Quick-Disconnect



QH23 Pigtail Quick-Disconnect



Quick-Disconnect Cables (QD)

Style	Model	Length	Connector	For use with
4-pin Pico	**PKG4-2** **PKW4-2**	2 m (6.5') 2 m (6.5')	Straight Right-angle	All Q23 and QH23 sensors with pigtail QD

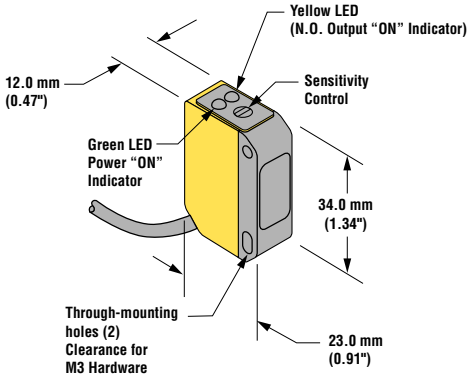
Quick-Disconnect (QD) Option

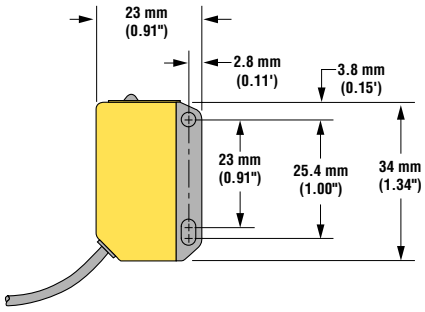
Q23 & QH23 sensors are sold either with a 2 m (6.5') or 9 m (30') attached PVC-covered cable or with a 4-pin Pico-style QD connector on a 150 mm (6") cable pigtail.

Q23 & QH23 QD sensors are identified by the letter "Q" in their model number suffix. Mating cables for QD sensors are model PKG4-2 (straight connector) or PKW4-2 (right-angled connector). Cables are supplied in a standard length of 2 m (6.5').

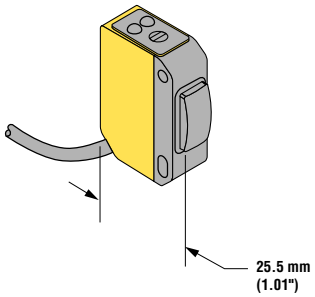
Q23 Series Dimensions

Q23 Sensor - Opposed, Diffuse and Retroreflective Modes (model suffix E, R, D, DL & LP)

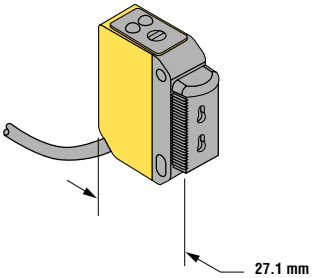




Q23 Sensor Convergent Mode (model suffix CV)

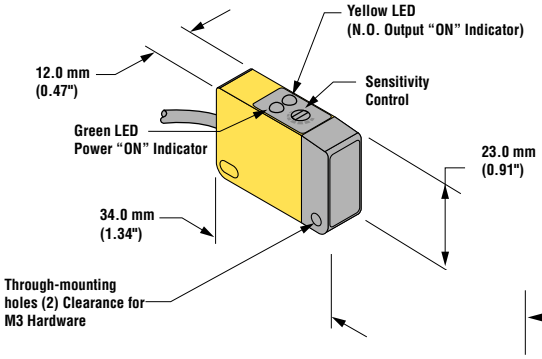


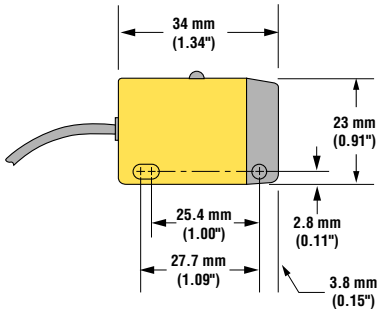
Q23 Sensor Plastic Fiber Optic (model suffix FP & FPY)



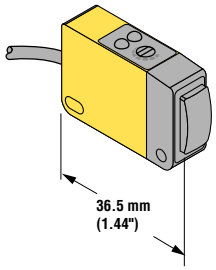
QH23 Series Dimensions

QH23 Sensor - Opposed, Diffuse and Retroreflective Modes (model suffix E, R, D, DL & LP)

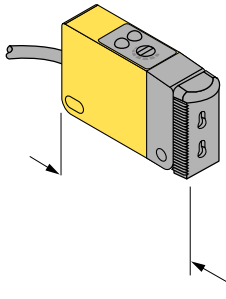




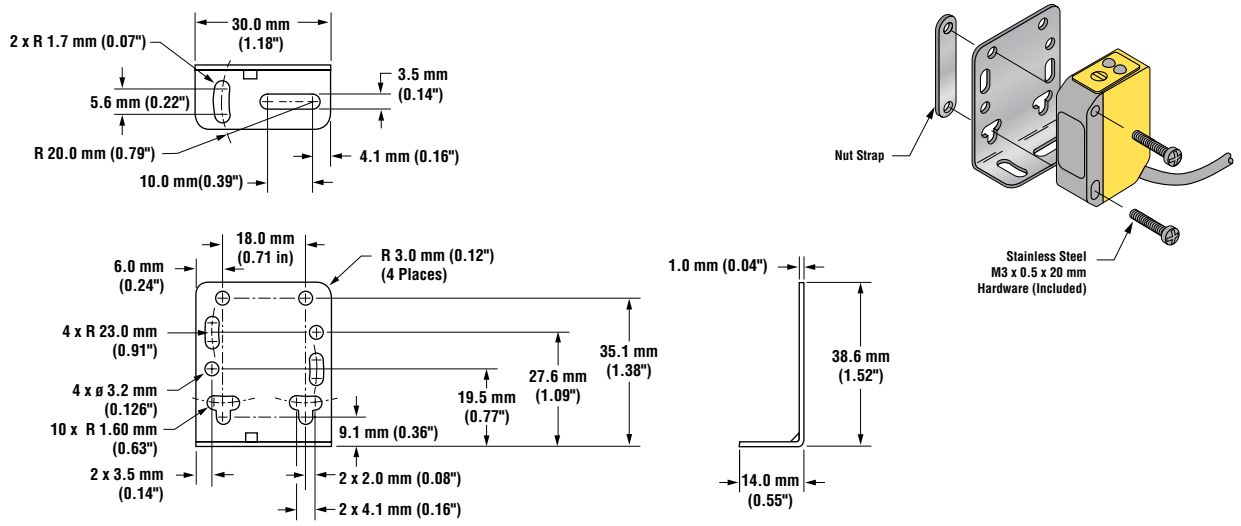
QH23 Sensor Convergent Mode (model suffix CV)



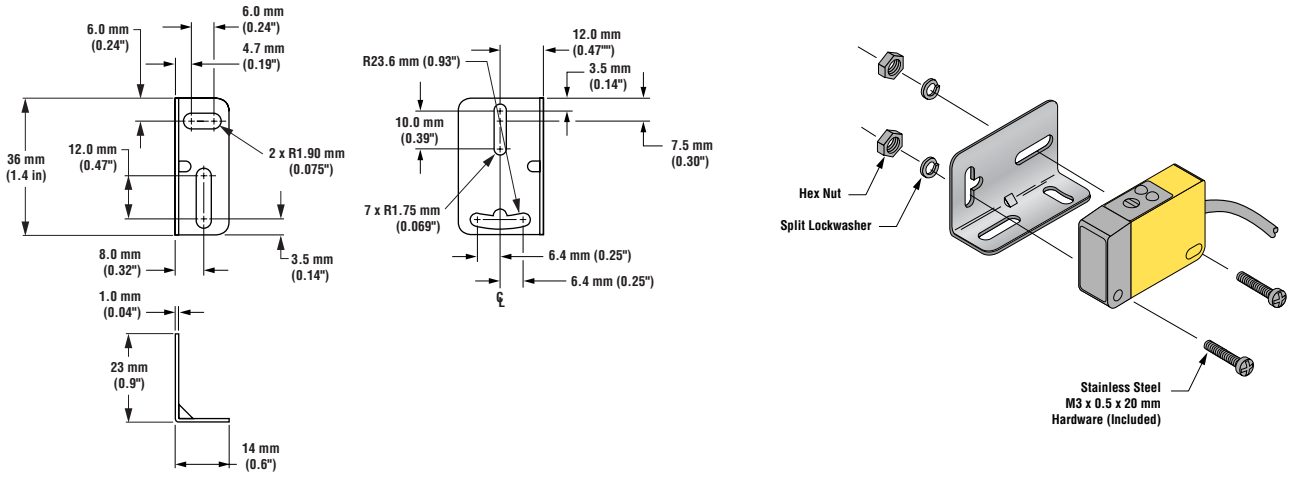
QH23 Sensor Plastic Fiber Optic (model suffix FP & FPY)



Q23 Series Mounting Bracket (included with sensor)



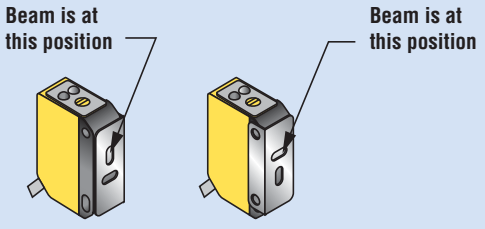
QH23 Series Mounting Bracket (included with sensor)



Apertures

Model	Aperture Shape	Aperture Size
AP19-00	Blank	Blank
AP23-04S	Slot	1.0 mm (0.04")
AP23-06S	Slot	1.5 mm (0.06")
AP23-10S	Slot	2.5 mm (0.10")
AP23-12S	Slot	3.0 mm (0.12")
AP23-0203	Round	ø 0.5 mm (0.02") & 0.8 mm (0.03")
AP23-0404	Round	ø 1.0 mm (0.04") & 1.0 mm (0.04")
AP23-0406	Round	ø 1.0 mm (0.04") & 1.5 mm (0.06")
AP23-1012	Round	ø 2.5 mm (0.10") & 3.0 mm (0.12")

Aperture Orientation

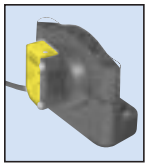


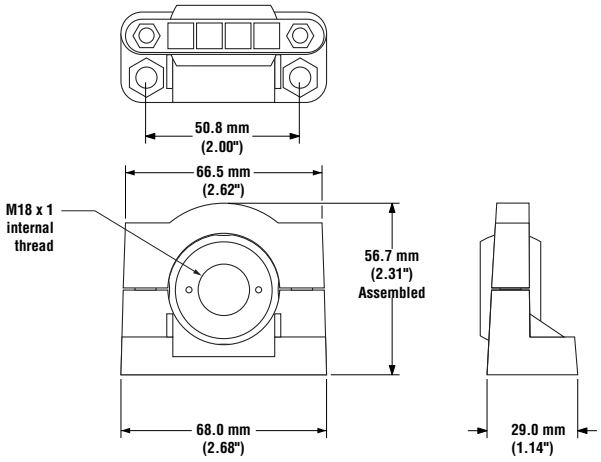
NOTE: Q23 opposed mode sensors may be fitted with apertures which narrow or shape the effective beam of the sensor to more closely match the size or profile of the object to be sensed. This will reduce the sensing range of the particular sensors. Q23 apertures use M3 hardware which is provided with the SMB23 mounting bracket and with all Q23 models. Slotted apertures have a vertical and horizontal slot of equal width. Round apertures have two circular holes.

Mounting Brackets

SMB3018SC

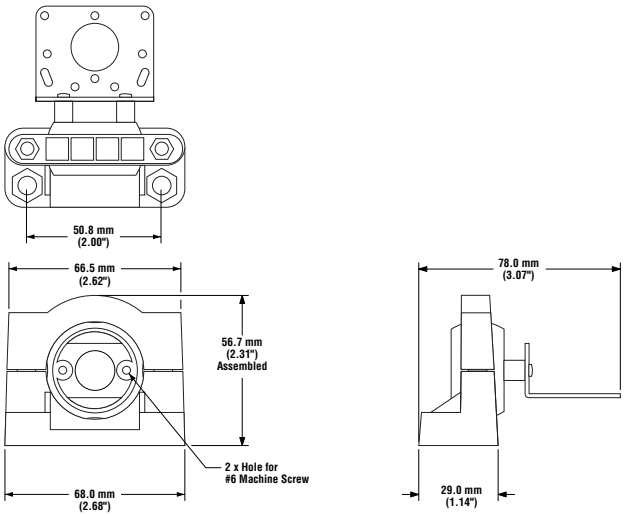
- For use with Q23 Series
- 18 mm swivel barrel or side-mount bracket
- Black reinforced thermoplastic polyester
- Includes stainless steel swivel locking hardware





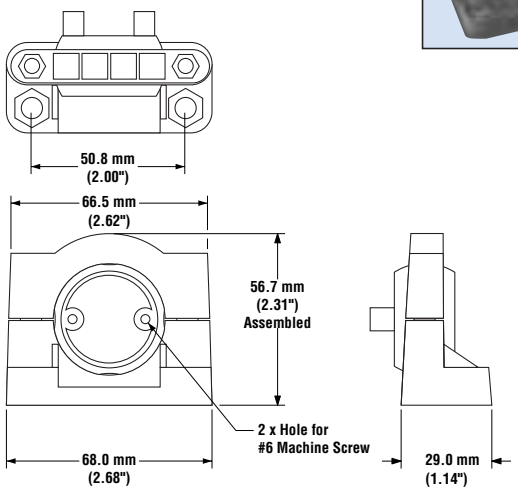
SMB30SK

- For use with Q23 or QH23 Series
- Flat-mount swivel bracket with extended range of motion
- Black reinforced thermoplastic polyester and 316 stainless steel
- Includes stainless steel swivel locking hardware



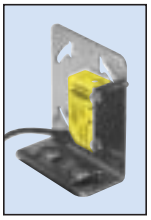
SMB30SUS

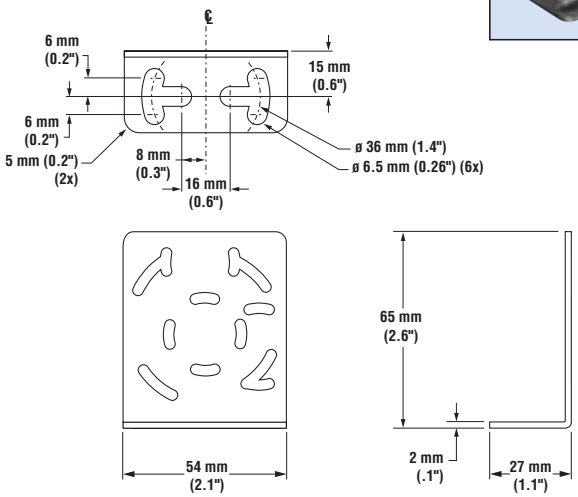
- For use with Q23 Series
- Side-mount swivel bracket – extended range of motion
- Black reinforced thermoplastic polyester
- Includes stainless steel swivel locking hardware



SMB46L

- For use with Q23 or QH23 Series
- "L" bracket
- 14-gauge 316 stainless steel





QS18AF & QS18FP Series Sensors

Design innovations.

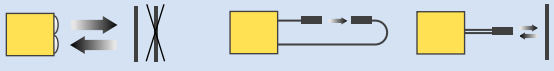
- Easily fits (or retrofits) any mounting
- Exceptional optical performance comparable to larger "MINI-style" or barrel sensors
- 10 to 30V dc operation
- Choose complementary (SPDT) NPN or PNP outputs
- LED status indicators are visible from 360°
- Rugged sealed housing and protected circuitry
- Fast (<1 millisecond) output response
- Excellent sensing repeatability
- Choose 2 m (6.5') integral cable, Pico-style QD pigtail, or integral Pico-style or Euro-style connectors, depending on model.

Universal performance & economy.

WORLD-BEAM™ QS18AF and QS18FP photoelectric sensors feature a universal mounting design that allows them to fit or retrofit virtually every mounting situation. The universal design allows them to replace hundreds of older designs using the existing mountings.

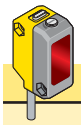
QS18AF models allow you to set a precise sensing cutoff point, eliminating background interference in small and/or difficult-to-reach locations.

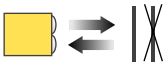
QS18AF & QS18FP Sensing Mode Options



Adjustable Field | Plastic Fiber Optic

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com



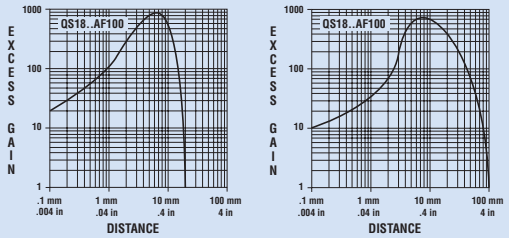


QS18AF Series Adjustable-Field Models

Visible red, 660 nm

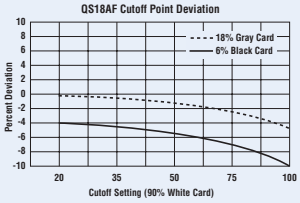
Models	Range	Cable	Supply Voltage	Output Type
QS18VN6AF100	1 mm (0.04") to cutoff point	2 m (6.5') 4-wire	10 to 30V dc	NPN
QS18VN6AF100Q	(cutoff point adjustable between 20-100 mm)	4-pin Pico QD pigtail	10 to 30V dc	NPN
QS18VP6AF100	1 mm (0.04") to cutoff point	2 m (6.5') 4-wire	10 to 30V dc	PNP
QS18VP6AF100Q	(cutoff point adjustable between 20-100 mm)	4-pin Pico QD pigtail	10 to 30V dc	PNP

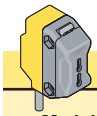
Diffuse mode performance based on 90% reflectance white test card



CUTOFF POINT DEVIATION

QS18AF Cutoff Point Deviation



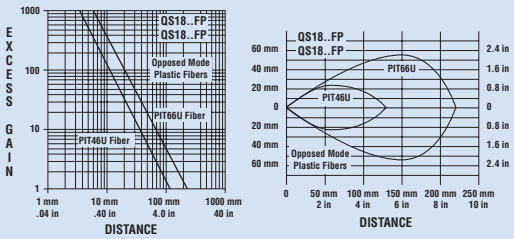


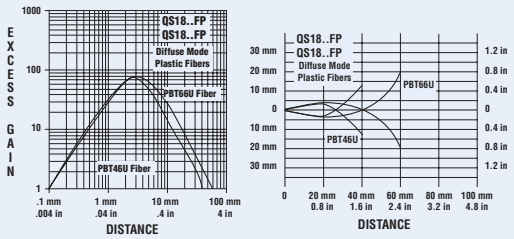
QS18FP Series Plastic Fiber Optic Models

Visible red, 660 nm

Models	Range	Cable	Supply Voltage	Output Type
QS18VN6FP	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-wire	10 to 30V dc	NPN
QS18VN6FPQ		4-pin Pico QD pigtail	10 to 30V dc	NPN
QS18VP6FP	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-wire	10 to 30V dc	PNP
QS18VP6FPQ		4-pin Pico QD pigtail	10 to 30V dc	PNP

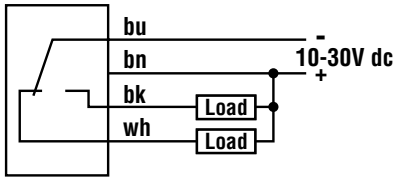
Diffuse mode performance based on 90% reflectance white test card



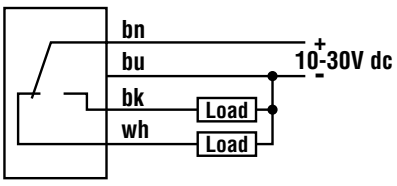


QS18AF & QS18FP Series Hookup Diagrams

QS18 Sensors with NPN (Sinking) Outputs



QS18 Sensors with PNP (Sourcing) Outputs

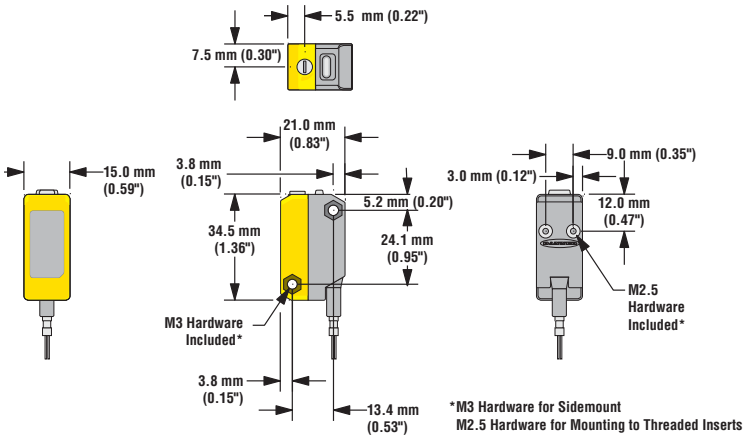


QS18AF & QS18FP Series Specifications

Supply Voltage	10 to 30V dc (10% maximum ripple) at less than 25 mA, exclusive of load; Protected against reverse polarity and transient voltages
Output Configuration	**Solid-state complementary (SPDT);** NPN or PNP (current sinking or sourcing), depending on model; **Rating:** 100 mA maximum each output at 25° C **Off-state leakage current:** less than 50 µA @ 30V dc **ON-state saturation voltage:** less than 1V @ 10 mA; less than 1.5V @ 100 mA Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response	**Adjustable-Field Mode:** 700 microseconds ON/OFF **Plastic Fiber Optic Mode:** 600 microseconds ON/OFF NOTE: 100 millisecond delay on power-up; outputs do not conduct during this time
Repeatability	**Adjustable-Field Mode:** 175 microseconds **Plastic Fiber Optic Mode:** 150 microseconds
Adjustments	**Adjustable-Field models:** multi-turn adjustment screw sets cutoff distance between 20 and 100 mm
Indicators	2 LED indicators: **Green steady:** Power ON **Green flashing:** Output overloaded **Red steady:** Light sensed **Red flashing:** Marginal excess gain
Construction	Polycarbonate/ABS alloy housing, rated IEC IP67; NEMA 6 3 mm mounting hardware included
Connections	2 m (6.5') 4-wire PVC cable, 9 m (30') PVC cable, or 4-pin integral Euro-style pigtail QD, or 4-pin Pico-style 150 mm (6") pigtail QD, depending on model
Operating Conditions	**Temperature for Adjustable-Field Mode:** 0° to +55° C (+32° to +131° F) **Temperature for Plastic Fiber Optic Mode:** -20° to +70° C (-4° to + 158° F) **Relative Humidity:** 90% @ 50° C (non-condensing)

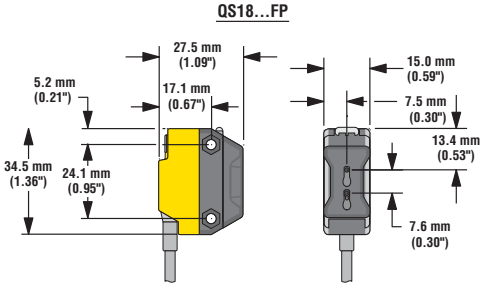
QS18AF & QS18FP Series Dimensions

Adjustable-Field Models
(model suffix AF)

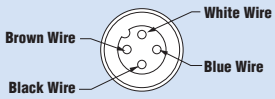
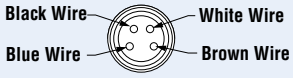
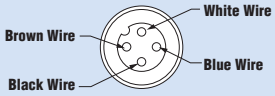


*M3 Hardware for Sidemount
M2.5 Hardware for Mounting to Threaded Inserts

Plastic Fiber Models
(model suffix FP)



QS18AF & QS18FP Modifications

Model Suffix	Modification	Description	Example of Model #	Used With:
Q5	4-pin Euro Pigtail QD	4-pin Euro-style pin-out 	**QS18VN6FPQ5**	All QS18 models
Q7	4-pin Pico Integral	4-pin Pico-style pin-out 	**QS18VN6FPQ7**	All QS18 models except AF100 models
Q8	4-pin Euro Integral	4-pin Euro-style pin-out 	**QS18VN6FPQ8**	All QS18 models except AF100 models

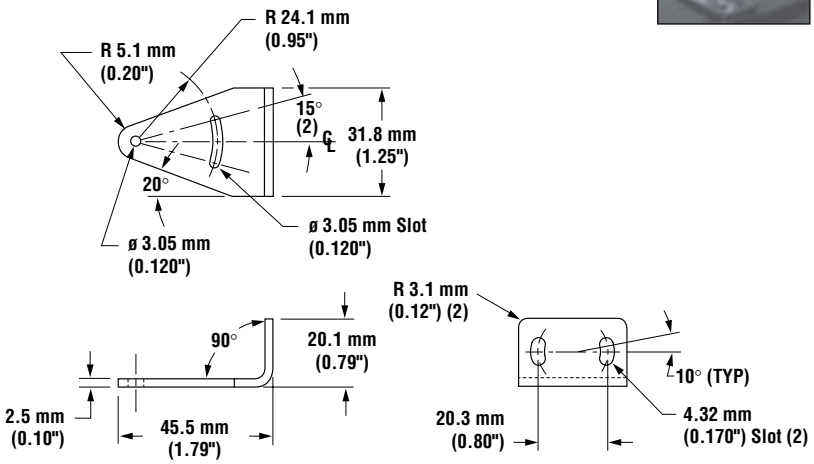
Quick-Disconnect (QD) Cables

Style	Models	Length	Connector	Used with:
4-pin Pico-style	**PKG4-2** **PKW4-2**	2 m (6.5') 2 m (6.5')	Straight Right-Angle	QS18 with Q suffix

Mounting Bracket

SMB312S

- Stainless steel 2-axis, side-mounting bracket
- Used with all QS18 models except for QS18 Adjustable Field

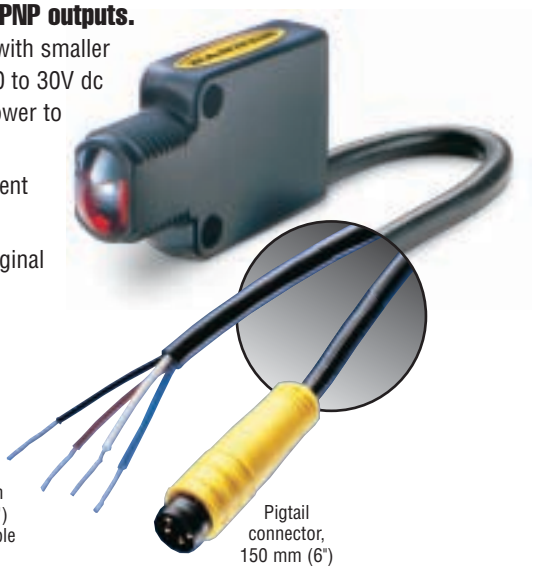


MINI-BEAM®2 Series Sensors

Switch 150 mA loads, NPN or PNP outputs.

Now you can switch larger loads with smaller sensors. Despite their tiny size, 10 to 30V dc MINI-BEAM2 sensors have the power to switch a 150 mA load.

- Available with NPN or PNP (current sinking or sourcing) outputs
- Only one-third the size of the original MINI BEAM sensor



2 m or 9 m (6.5' or 30') prewired cable

Pigtail connector, 150 mm (6")

Optional timing functions.

- Optional timing and logic functions available for MINI-BEAM2 sensors
- Include on-delay, off-delay, on- and off-delay, one-shot, delayed one-shot and more
- Available for opposed, retroreflective, diffuse, and convergent sensing modes

Prewired or pigtail connector wiring, 10 to 30V dc.

- Available with a 2 m or 9 m (6.5' or 30') prewired cable or a 150 mm (6") 4-pin Pico-style pigtail connector that offers "plug-and-play" convenience and interchangeability

Rugged sealed housing.

New MINI-BEAM2 sensors are just as rugged as their predecessors and will stand up to your tough applications.

- Housed in durable black polycarbonate/ABS alloy
- Operate in a wide range of temperatures—from -20° to +55° C (-4° to +131° F)
- Meet IEC IP67 and NEMA 6 environmental standards

Green Steady: Power ON

Amber Steady: Light sensed

Green Flashes five times to indicate maximum gain

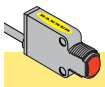
Single Green Flash: Click registered; gain reduced one increment

Green/Amber Alternating: Minimum gain achieved

Protected circuitry.

When you purchase the MINI-BEAM2, you won't lose your sensor investment due to electrical problems or installation error. Integral protective circuitry guards MINI-BEAM2 sensors against reverse polarity and transient voltages, short circuits and false pulse on power up.

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

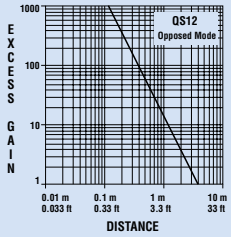


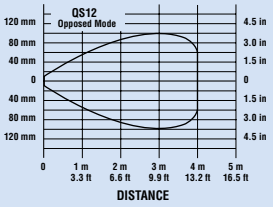
MINI-BEAM®2 Series Opposed-Mode Emitter (E) and Receiver (R) Models

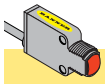
Visible red, 660 nm

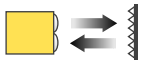
Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
QS126E **QS12VN6R**	4 m (13')	2 m (6.5')	10 to 30V dc	NPN (sinking)		
QS126EQ **QS12VN6RQ**	4 m (13')	4-pin Pico QD pigtail	10 to 30V dc	NPN (sinking)		
QS126E **QS12VP6R**	4 m (13')	2 m (6.5')	10 to 30V dc	PNP (sourcing)		
QS126EQ **QS12VP6RQ**	4 m (13')	4-pin Pico QD pigtail	10 to 30V dc	PNP (sourcing)		

Effective Beam: 5.3 mm





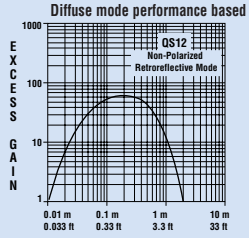


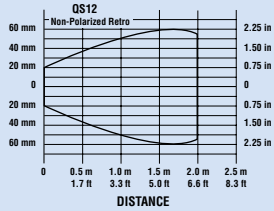


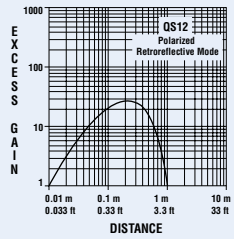
MINI-BEAM2 Series Retroreflective Models

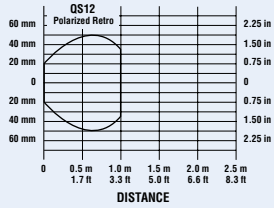
LV: Visible red, 660 nm LP: Visible red, 680 nm

	Models	Range**	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Retroreflective	**QS12VN6LV** **QS12VN6LVQ**	2 m (6.5')	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	NPN (sinking)	Diffuse mode performance based on 90% reflectance white test card	
Retroreflective	**QS12VP6LV** **QS12VP6LVQ**	2 m (6.5')	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	PNP (sourcing)		
Polarized Retroreflective	**QS12VN6LP** **QS12VN6LPQ**	2 m (6.5')	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	NPN (sinking)		
Polarized Retroreflective	**QS12VP6LP** **QS12VP6LPQ**	2 m (6.5')	2 m (6.5') 4-pin Pico QD pigtail	10 to 30V dc	PNP (sourcing)		







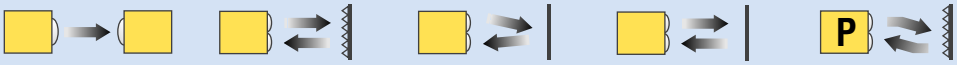


Note: Banner offers a wide variety of retroreflective targets. For a complete listing go to www.bannerengineering.com

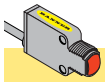
*9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **QS12VP6R W/30**). A model with a pigtail QD requires a mating cable.

**Range specifications for retroreflective sensors are largely dependent on target size and design. See Accessories section for more information on reflectors.

MINI-BEAM2 Sensing Mode Options

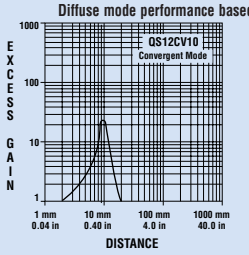
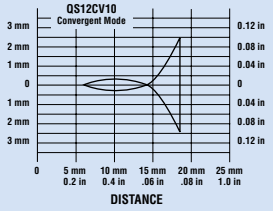
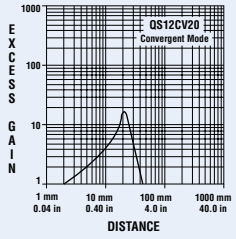
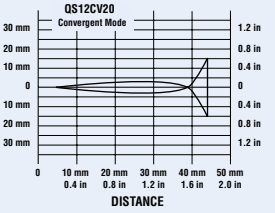


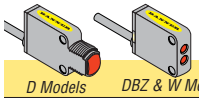
Opposed | Retroreflective | Convergent | Diffuse | Polarized Retroreflective



MINI-BEAM®2 Series Convergent Models

Visible red, 660 nm

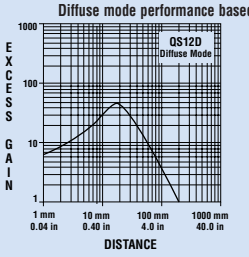
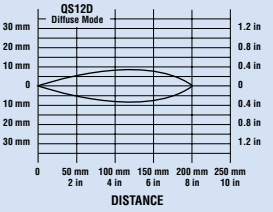
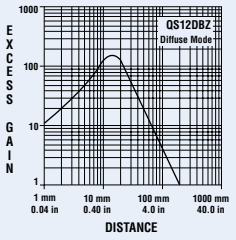
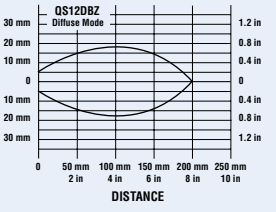
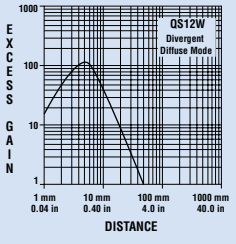
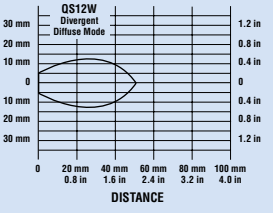
Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
QS12VN6CV10 **QS12VN6CV10Q**	10 mm (0.4") **Spot Size at Focus:**	2 m (6.5') 4-Pin Pico QD pigtail	10 to 30V dc	NPN (sinking)	Diffuse mode performance based on 90% reflectance white test card 	
QS12VP6CV10 **QS12VP6CV10Q**	1 mm (0.04")	2 m (6.5') 4-Pin Pico QD pigtail		PNP (sourcing)		
QS12VN6CV20 **QS12VN6CV20Q**	20 mm (0.8") **Spot Size at Focus:**	2 m (6.5') 4-Pin Pico QD pigtail	10 to 30V dc	NPN (sinking)		
QS12VP6CV20 **QS12VP6CV20Q**	1.75 mm (0.07")	2 m (6.5') 4-Pin Pico QD pigtail		PNP (sourcing)		



D Models *DBZ & W Models*

D, DBZ: Visible red, 680 nm
W: Visible red, 660 nm

MINI-BEAM2 Series Diffuse Models

	Models	Range	Cable*	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Diffuse	**QS12VN6D** **QS12VN6DQ**	200 mm (8")	2 m (6.5') 4-Pin Pico QD pigtail	10 to 30V dc	NPN (sinking)	Diffuse mode performance based on 90% reflectance white test card 	
	QS12VP6D **QS12VP6DQ**		2 m (6.5') 4-Pin Pico QD pigtail		PNP (sourcing)		
Diffuse (Flush-Front Profile)	**QS12VN6DBZ** **QS12VN6DBZQ**	200 mm (8")	2 m (6.5') 4-Pin Pico QD pigtail	10 to 30V dc	NPN (sinking)		
	QS12VP6DBZ **QS12VP6DBZQ**		2 m (6.5') 4-Pin Pico QD pigtail		PNP (sourcing)		
Divergent (Wide-Angle) Diffuse	**QS12VN6W** **QS12VN6WQ**	50 mm (2")	2 m (6.5') 4-Pin Pico QD pigtail	10 to 30V dc	NPN (sinking)		
	QS12VP6W **QS12VP6WQ**		2 m (6.5') 4-Pin Pico QD pigtail		PNP (sourcing)		

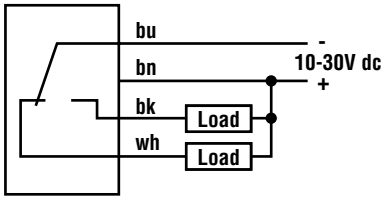
*9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **QS12VN6W W/30**). A model with a pigtail QD requires a mating cable.

MINI-BEAM®2 Series Specifications

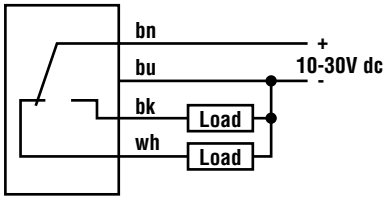
Supply Voltage	10 to 30V dc (10% maximum ripple) at less than 25 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Solid state complementary (SPDT): NPN or PNP (current sinking or sourcing) output models available
Output Rating	150 mA maximum each output at 25° C **OFF-state leakage current:** less than 10 µA @ 30V dc **ON-state saturation voltage:** less than 1V @ 10 mA; less than 2.0V @ 150 mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response	**Opposed Mode**: 8 milliseconds ON, 4 milliseconds OFF **All others:** 1.5 milliseconds NOTE: 500 millisecond delay on power-up, outputs do not conduct during this time
Repeatability	**Opposed Mode:** 1 millisecond **All others:** 175 microseconds
Adjustments	One rubber-sealed push-button **Hold:** Maximum gain **Click:** Reduce gain one increment
Indicators	2 LEDs, visible from back and sides of sensor: 1 green, 1 amber **Green steady:** Power ON **Amber steady:** Light sensed **Green flashing rapidly 5 times:** Maximum gain **Single green flash:** Click registered, gain reduced by one increment **Amber/Green alternating:** Minimum gain (can not reduce further)
Construction	Black polycarbonate/ABS alloy housing; totally encapsulated circuitry
Environmental Rating	IEC IP67; NEMA 6
Connections	2 m (6.5') 4-wire PVC cable, 9 m (30') PVC cable, or 4-pin Pico-style 150 mm (6") pigtail QD
Operating Conditions	**Temperature:** -20° to +55° C (-4° to +131° F) **Relative Humidity:** 90% @ 50° C (non-condensing)
Certifications	CE c UL us

MINI-BEAM®2 Series Hookup Diagrams

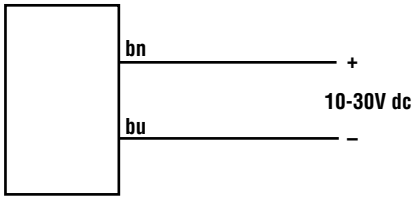
Sensors with
NPN (Sinking) Outputs



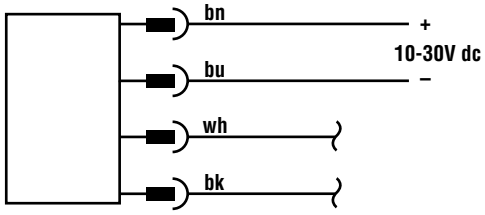
Sensors with
PNP (Sourcing) Outputs



DC Emitters with Attached Cable



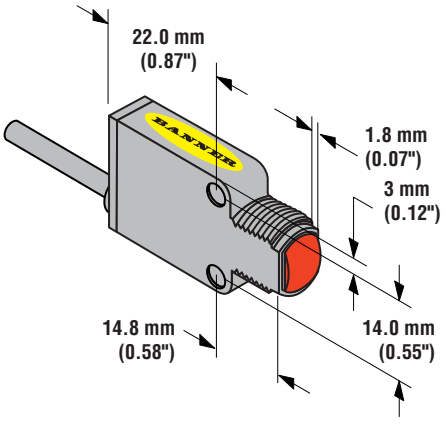
DC Emitters with Quick-Disconnect (QD)
(4 Pin Pico-Style)



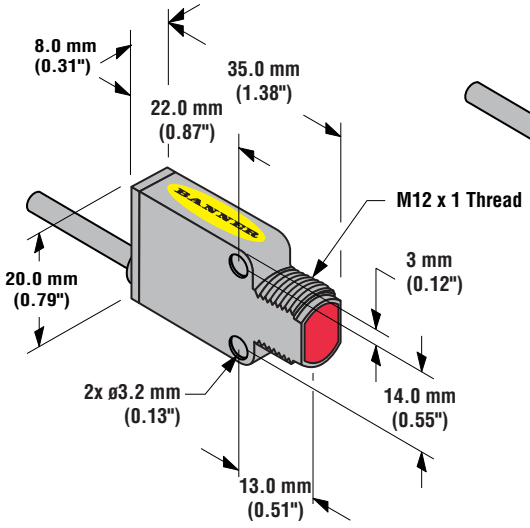
NOTE: Hookups are the same for either an integral or QD cable.

MINI-BEAM2 Series Dimensions

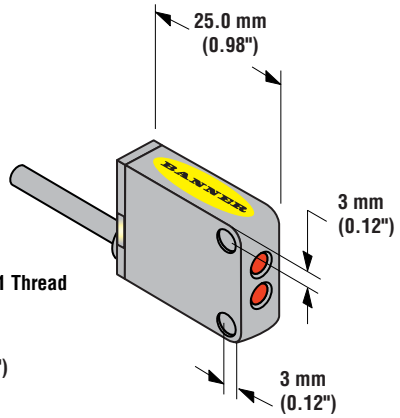
Opposed Emitter & Receiver
& Convergent-Mode Models



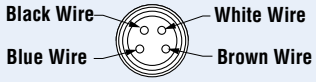
Diffuse, Retroreflective &
Polarized Retroreflective-Mode Models



Flush-Front Diffuse &
Wide-Angle Diffuse-Mode Models

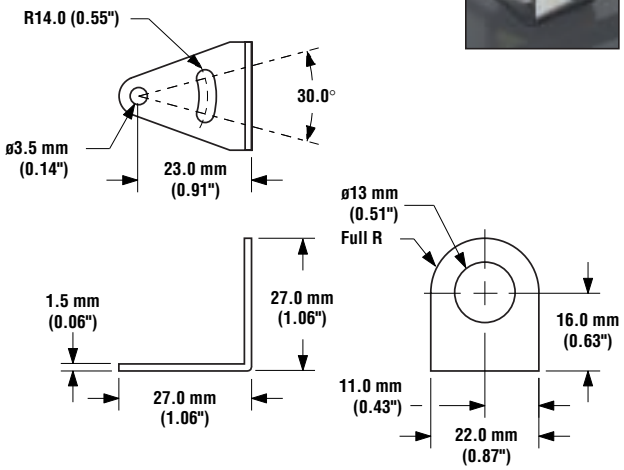


Quick-Disconnect Cables (QD)

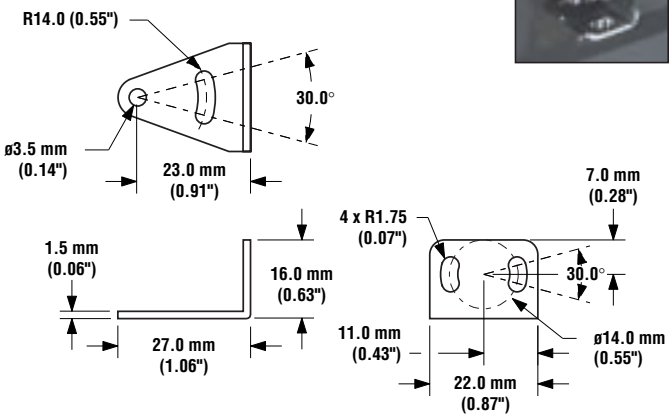
Style	Model	Length	Connector	Pin-out
4-pin Pico	**PKG4-2**	2 m (6.5')	Straight	

Mounting Brackets

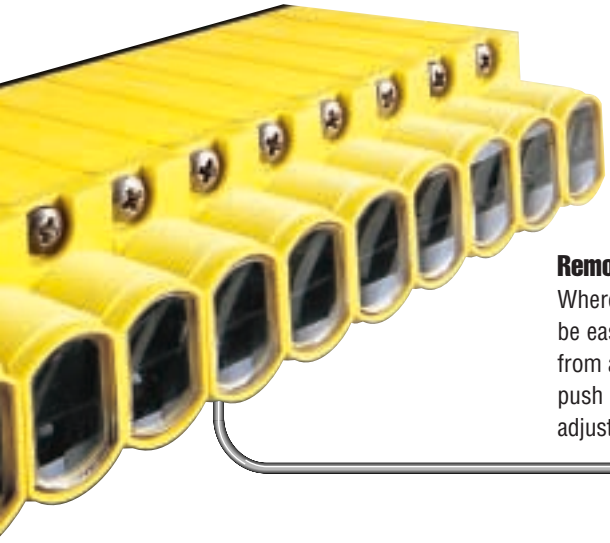
SMBQS12PD
- Right-angle bracket, 12 mm nose-mount
- 300 series stainless steel, 16 ga.



SMBQS12S
- Right-angle bracket, side-mount
- 300 series stainless steel, 16 ga.



MINI-BEAM® *Expert* Series Sensors



Remote programming for convenience and security.
Wherever they are mounted, one or more MINI-BEAM® *Expert* sensors can be easily wired to an external switch or PLC to enable remote programming from a convenient location. Remote programming capability allows the sealed push button to be locked out. This prevents unauthorized or inadvertent adjustments that can easily occur with conventional external switches.

Red, green or blue LED emitters.
MINI-BEAM *Expert* sensors, in plastic or glass fiber optic models and convergent-mode models, are available with a choice of red, green, white or blue LED light source. These emitter options enable you to optimize a sensor's sensitivity to specific colors, including low-contrast targets such as glass, or yellow ink on a white background.

***Expert* sensing features.**

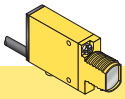
- Easy push-button programming automatically optimizes sensitivity
- 500 microsecond (0.5 millisecond) output response
- Bipolar NPN (sinking) / PNP (sourcing) outputs
- Simple output programming eliminates the need for Light/Dark Operate selection
- Green Stability indicator flashes when received signal level approaches the switching threshold, also indicates Power ON

Rugged and sealed.

- Glass-filled polyester housing
- Epoxy-encapsulated electronics
- Sealed programming button
- Rated IEC IP67 and NEMA 6

Prewired or quick-disconnect (QD) wiring, 10 to 30V dc.
The 10 to 30V dc sensors are available with an integral 2 m (6.5') or 9 m (30') cable, a 5-conductor PVC potted-in cable, or a 5-pin Euro-style quick-disconnect fitting. Keyed connectors prevent wiring errors.

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com



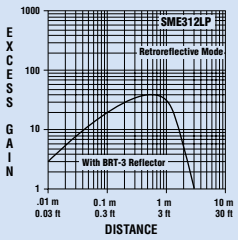
MINI-BEAM® *Expert* Series Polarized Retroreflective Models

Polarized, Visible red, 650 nm

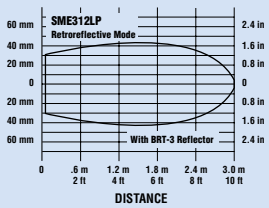
Models	Range	Cable	Supply Voltage	Output Type
SME312LP **SME312LPQD**	10 mm to 3 m (0.4" to 10')	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP

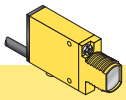
NOTE: Retroreflective range is specified using one model BRT-3 retroreflector (3" diameter). Actual sensing range may be more or less than specified, depending upon the efficiency and reflective area of the retroreflector(s) used. See Accessories section for more information.

Excess Gain



Beam Pattern





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

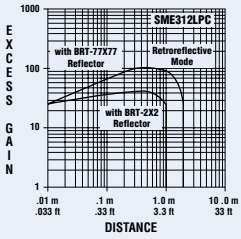
Visible red, 650 nm

Models	Range	Cable	Supply Voltage	Output Type
SME312LPC **SME312LPCQD**	1 m (3.3') with supplied reflector	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP

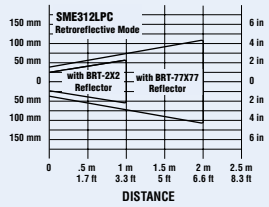
*NOTE: Sensing range will vary, according to the efficiency and reflective area of the retroreflector(s) used. For these low-contrast applications, the model BRT-2X2 (2" x 2") reflector is recommended, and one is bundled with each SME312LPC(QD) sensor.

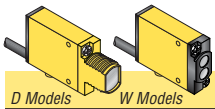
- For applications that involve high levels of vibration, the model BRT-36x40BM, with its micro-prism geometry, is recommended.
- For long-range applications, the BRT-77X77C reflector provides a range up to 2 m (6.5').
- SME312LPC(QD) are for use with corner cube type reflectors only; reflective tape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

Excess Gain



Beam Pattern





MINI-BEAM *Expert* Series Diffuse Models

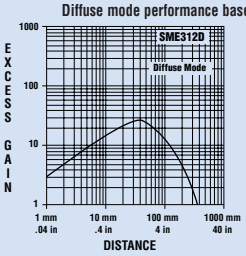
Infrared, 880 nm

	Models	Range	Cable	Supply Voltage	Output Type
Diffuse	**SME312D** **SME312DQD**	380 mm (15")	5-wire 2 m (6.5') 5-pin Euro-Style QD	10 to 30V dc	Bipolar NPN/PNP
Divergent Diffuse†	**SME312W** **SME312WQD**	130 mm (5")	5-wire 2 m (6.5') 5-pin Euro-Style QD	10 to 30V dc	Bipolar NPN/PNP

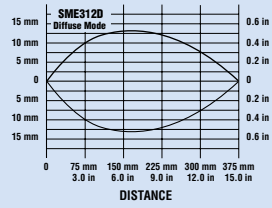
†Note: Divergent diffuse models recommended for sensing clear materials.

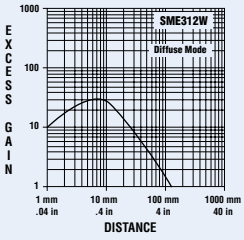
Diffuse mode performance based on 90% reflectance white test card

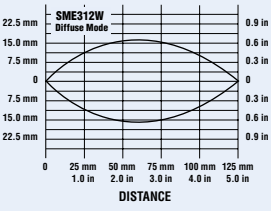
Excess Gain



Beam Pattern





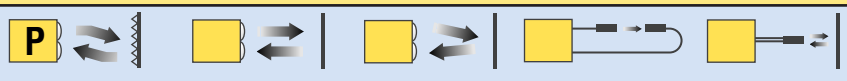


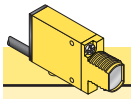
NOTES: i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SME312D W/30**).

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

iii) Add suffix "MHS" to any model number for 150 ms response speed and reduced gain (e.g., **SME312LPMHS**).

MINI-BEAM *Expert* Sensing Mode Options

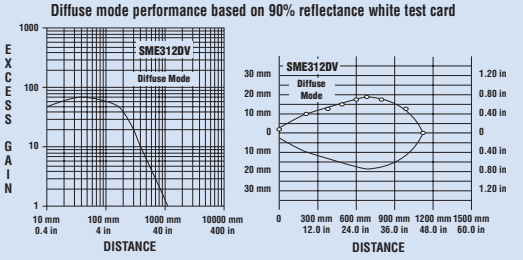




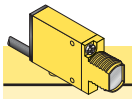
MINI-BEAM® *Expert* Series Diffuse Models (Continued)

Visible red, 650 nm

Models	Range	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
SME312DV **SME312DVQD**	1100 mm (43")	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	Diffuse mode performance based on 90% reflectance white test card	



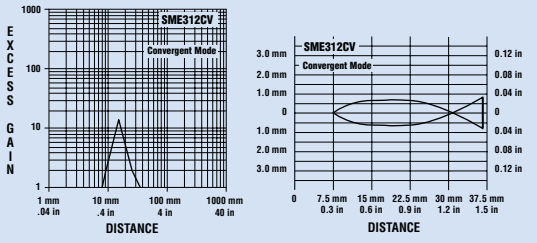
The SME312DV sensors are effective for sensing specular surfaces such as semiconductor wafers, disk drive media, glass and machined surfaces. The collimated optics of the SME312DV also permits the sensor to be mounted against clear container walls, view ports and other types of optical "feed-throughs."

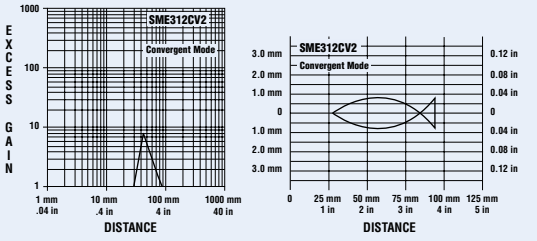


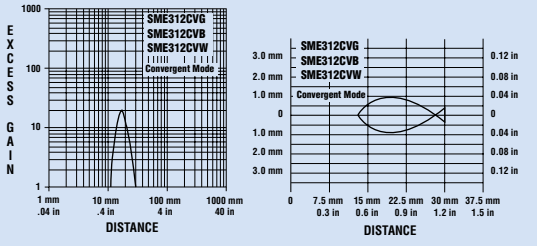
MINI-BEAM *Expert* Series Convergent Models

See sensing beam information below

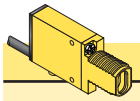
	Models	Focus	Cable	Supply Voltage	Output Type	Excess Gain	Beam Pattern
Visible Red 650 nm	**SME312CV** **SME312CVQD**	16 mm (0.65") **Spot Size at Focus:** 1.3 mm (0.05")	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	Diffuse mode performance based on 90% reflectance white test card	
Visible Red 650 nm	**SME312CV2** **SME312CV2QD**	43 mm (1.7") **Spot Size at Focus:** 3.0 mm (0.12")	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP		
Visible Green 525 nm	**SME312CVG** **SME312CVGQD**	16 mm (0.65") **Spot Size at Focus:** 1.0 mm (0.04")	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP		
Visible Blue 475 nm	**SME312CVB** **SME312CVBQD**	16 mm (0.65") **Spot Size at Focus:** 1.8 mm (0.07")	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP		
Visible White 450-650 nm	**SME312CVW** **SME312CVWQD**	16 mm (0.65") **Spot Size at Focus:** 1.8 mm (0.07")	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP		

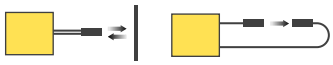






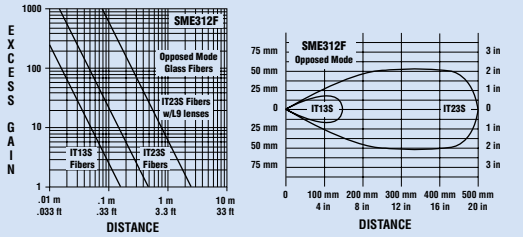
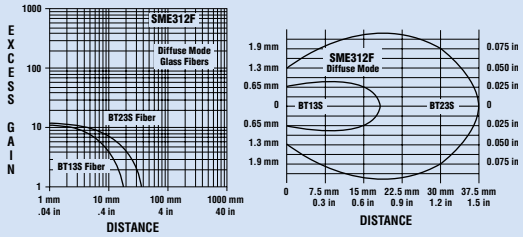
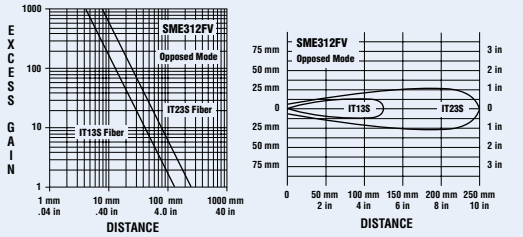
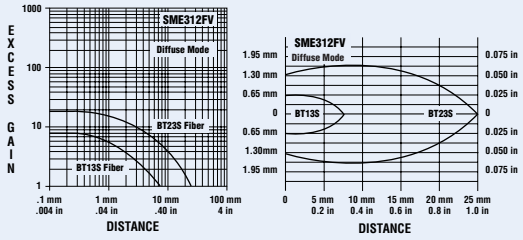
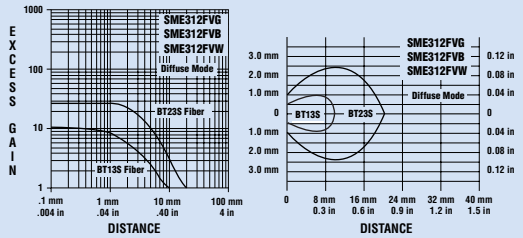
*NOTES: Green, blue, and white LED models are recommended for color mark sensing applications. Consult your local or factory sales engineer for model selection assistance.



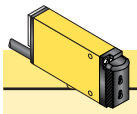


MINI-BEAM® *Expert* Series Glass Fiber Optic Models

See sensing beam information below

	Models	Range	Cable	Supply Voltage	Output Type	Diffuse mode performance based on 90% reflectance white test card Excess Gain / Beam Pattern
Infrared 880 nm	**SME312F** **SME312FQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	OPPOSED MODE – INDIVIDUAL FIBERS  DIFFUSE MODE – BIFURCATED FIBERS 
Visible Red 650 nm	**SME312FV** **SME312FVQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	OPPOSED MODE – INDIVIDUAL FIBERS  DIFFUSE MODE – BIFURCATED FIBERS 
Visible Green 525 nm	**SME312FVG** **SME312FVGQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 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') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	DIFFUSE MODE – BIFURCATED FIBERS 
Visible White 450-650 nm	**SME312FVW** **SME312FVWQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	

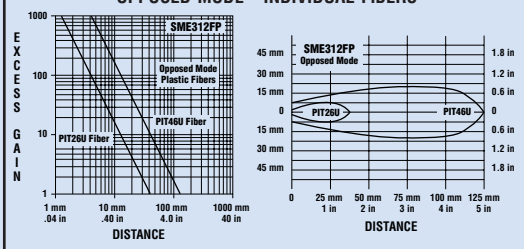
NOTES: i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **SME312F W/30**).
ii) A model with a QD connector requires a mating cable. See Accessories section for more information.
iii) Add suffix "MHS" to any model number for 150 ms response speed and reduced gain (e.g., **SME312FMHS**).

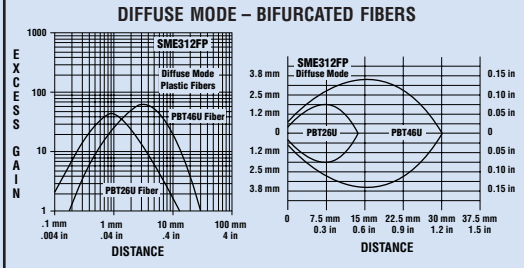


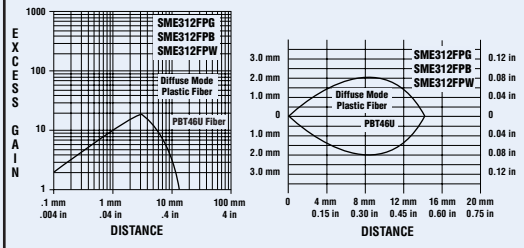
MINI-BEAM® *Expert* Series Plastic Fiber Optic Models

See sensing beam information below

	Models	Range	Cable	Supply Voltage	Output Type	Diffuse mode performance based on 90% reflectance white test card: Excess Gain / Beam Pattern
Visible Red 650 nm	**SME312FP** **SME312FPQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	OPPOSED MODE – INDIVIDUAL FIBERS; DIFFUSE MODE – BIFURCATED FIBERS
Visible Green 525 nm	**SME312FPG** **SME312FPGQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 30V dc	Bipolar NPN/PNP	DIFFUSE MODE – BIFURCATED FIBERS
Visible Blue 475 nm	**SME312FPB** **SME312FPBQD**	Range varies by sensing mode and fiber optics used	5-wire 2 m (6.5') 5-pin Euro-style QD	10 to 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') 5-pin Euro-style QD	10 to 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 Accessories section for more information.
iii) Add suffix "MHS" to any model number for 150 ms response speed and reduced gain (e.g., **SME312FPMHS**).

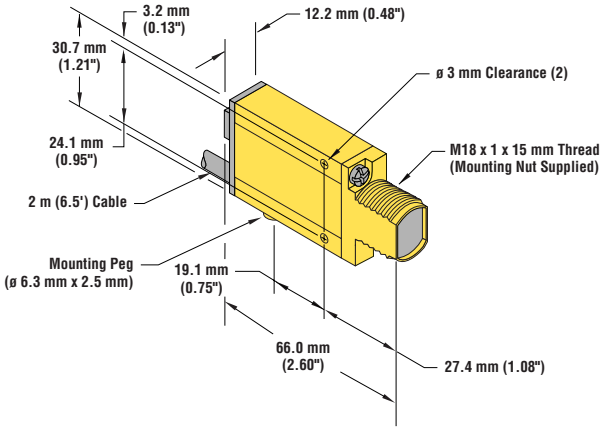
MINI-BEAM® *Expert* Series Specifications

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	150 mA maximum each output at 25° C, derated to 100 mA at 70° C (derate =1 mA per ° C) **Off-state leakage current:** less than 5 µA @ 30V dc **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 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, 3S, 4, 4X, 6, 12, and 13; IEC IP67
Connections	PVC-jacketed 5-conductor 2 m (6.5') or 9 m (30') unterminated cable, or 5-pin Euro-style quick-disconnect (QD) fitting are available. QD cables are ordered separately.
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

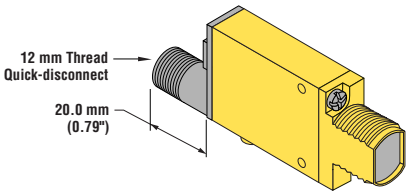
MINI-BEAM® *Expert* Series Dimensions

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

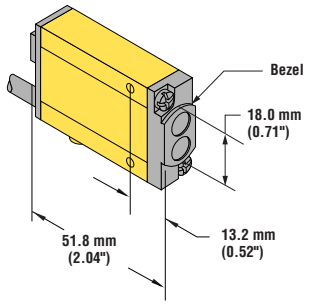
Cabled Models



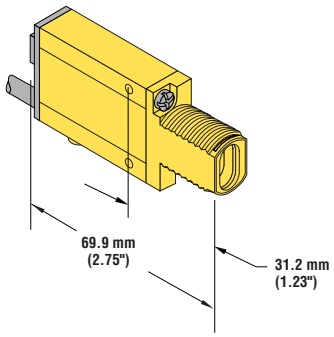
Quick-Disconnect Models



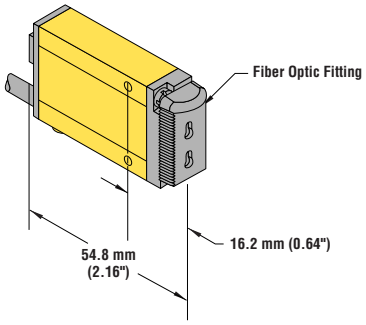
MINI-BEAM *Expert* Series Sensor
Divergent Diffuse Mode
(models with suffix W)



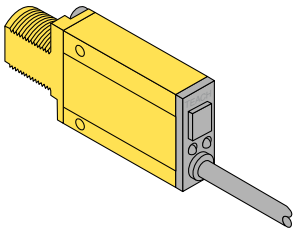
MINI-BEAM *Expert* Series Sensor
Glass Fiber Optic
(models with suffix F, FV, FVG, FVB and FVW)



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

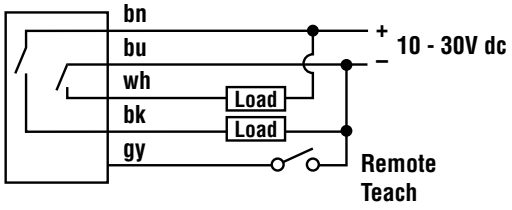


MINI-BEAM *Expert* Sensor - Rear View

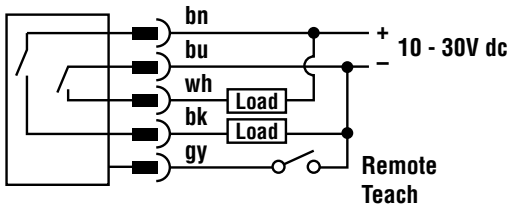


MINI-BEAM® *Expert* Series Hookup Diagrams

MINI-BEAM *Expert* Series Sensor
(Cabled models)



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



Quick-Disconnect (QD) Cables

Style	Models	Length	Connector	Used with:
5-pin Euro	**MQDC1-506**	2 m (6.5')	Straight	MINI-BEAM *Expert* Series with QD connector
	MQDC1-515	5 m (15')	Straight	
	MQDC1-530	9 m (30')	Straight	
	MQDC1-506RA	2 m (6.5')	Right-angle	
	MQDC1-515RA	5 m (15')	Right-angle	
	MQDC1-530RA	9 m (30')	Right-angle	

EZ-BEAM® T18 Series Sensors

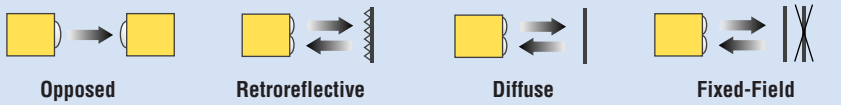
T18 cabled dc models shown

T18 Series Fixed-Field Sensors—ac or dc output.
Available with ac or dc outputs, EZ-BEAM® T18 series fixed-field sensors offer unprecedented installation flexibility. The innovative devices utilize reflected light signals from "Near" and "Far" receiver elements placed at different ranges to "see" objects. The sensor "sees" an object when the light signal from the Far receiver exceeds the light signal from the Near receiver, and ignores it when the light signal from the Near receiver is greater than that of the Far receiver.

- Patented† right-angle thermoplastic polyester housing with 18 mm threaded lens
- Advanced self-diagnostics with separate alarm output; dual LED status indicators
- Choice of integral cable or quick-disconnect connector (Euro-style or Micro-style, depending on model)
- 10 to 30V dc; choose SPDT (complementary) NPN or PNP outputs (150 mA max. ea.)
- 20 to 250V ac (3-wire hookup); SPST solid-state switch output, maximum load 300 mA

† U.S. design patent D361057

T18 Sensing Mode Options



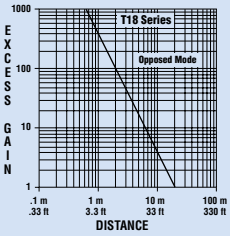
For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

T18 Series Opposed-Mode Emitter (E) and Receiver (R) Models

Infrared, 950 nm

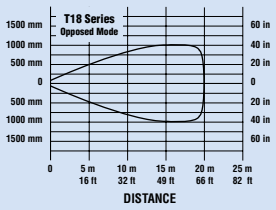
Models	Range	Cable	Supply Voltage	Output Type
T186E **T186EQ**	20 m (66')	2 m (6.5') 4-pin Euro QD	10 to 30V dc	—
T18SN6R **T18SN6RQ**	20 m (66')	2 m (6.5') 4-pin Euro QD	10 to 30V dc	NPN
T18SP6R **T18SP6RQ**	20 m (66')	2 m (6.5') 4-pin Euro QD	10 to 30V dc	PNP
T183E **T183EQ1**	20 m (66')	2 m (6.5') 4-pin Micro QD	20 to 250V ac	—
T18AW3R **T18AW3RQ1**	20 m (66')	2 m (6.5') 4-pin Micro QD	20 to 250V ac	LO
T18RW3R **T18RW3RQ1**	20 m (66')	2 m (6.5') 4-pin Micro QD	20 to 250V ac	DO

Excess Gain



Beam Pattern

Effective Beam: 13 mm

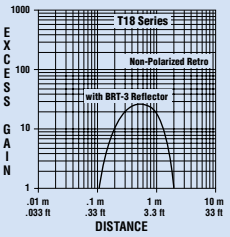


T18 Series Retroreflective Models

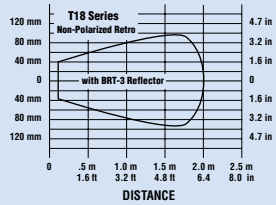
Non-Polarized *Polarized*

	Models*	Range	Cable	Supply Voltage	Output Type
NON-POLARIZED WITH GAIN CONTROL (INFRARED, 950 NM)	**T18SN6L** **T18SN6LQ**	2 m (79")	2 m (6.5') 4-pin Euro QD	10 to 30V dc	NPN
	T18SP6L **T18SP6LQ**		2 m (6.5') 4-pin Euro QD	10 to 30V dc	PNP
	T18AW3L **T18AW3LQ1**		2 m (6.5') 4-pin Micro QD	20 to 250V ac	LO
	T18RW3L **T18RW3LQ1**		2 m (6.5') 4-pin Micro QD	20 to 250V ac	DO
POLARIZED (VISIBLE RED, 680 NM)*	**T18SN6LP** **T18SN6LPQ**	2 m (79")	2 m (6.5') 4-pin Euro QD	10 to 30V dc	NPN
	T18SP6LP **T18SP6LPQ**		2 m (6.5') 4-pin Euro QD	10 to 30V dc	PNP
	T18AW3LP **T18AW3LPQ1**		2 m (6.5') 4-pin Micro QD	20 to 250V ac	LO
	T18RW3LP **T18RW3LPQ1**		2 m (6.5') 4-pin Euro QD	20 to 250V ac	DO

Excess Gain



Beam Pattern



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

*Use polarized models when shiny objects will be sensed.

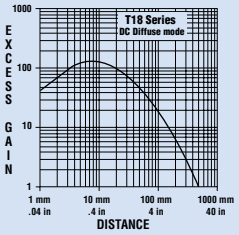
For EZ-BEAM® T18 Series Sensors:
i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **T18AW3L W/30**).
ii) A model with a QD connector requires an accessory mating cable. See Accessories section for more information.

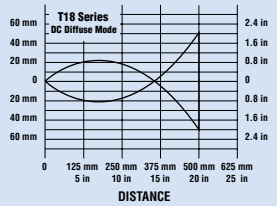
T18 Diffuse Models

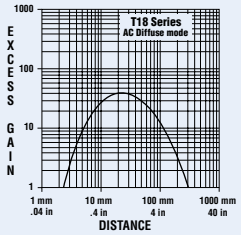
Infrared, 880 nm

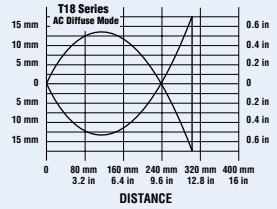
	Models	Range	Cable	Supply Voltage	Output Type
WITH GAIN CONTROL DC	T18SN6D T18SN6DQ	500 mm (20")	2 m (6.5') 4-pin Euro QD	10 to 30V dc	NPN
	T18SP6D T18SP6DQ		2 m (6.5') 4-pin Euro QD		PNP
WITH GAIN CONTROL AC	T18AW3D T18AW3DQ1	300 mm (12")	2 m (6.5') 4-pin Micro QD	20 to 250V ac	LO
	T18RW3D T18RW3DQ1		2 m (6.5') 4-pin Micro QD		DO

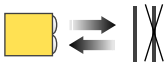
Diffuse mode performance based on 90% reflectance white test card









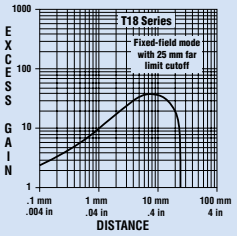


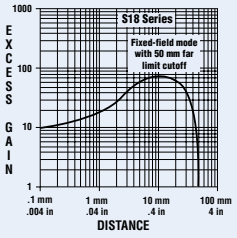
T18 Fixed-Field Models

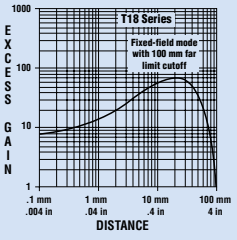
Infrared, 880 nm

	Models	Range	Cable	Supply Voltage	Output Type
WITH 25 MM FAR LIMIT CUTOFF	T18SN6FF25 T18SN6FF25Q	25 mm (1")	2 m (6.5') 4-pin Euro QD	10 to 30V dc	NPN
	T18SP6FF25 T18SP6FF25Q		2 m (6.5') 4-pin Euro QD	10 to 30V dc	PNP
	T18AW3FF25 T18AW3FF25Q1		2 m (6.5') 4-pin Micro QD	20 to 250V ac	LO
	T18RW3FF25 T18RW3FF25Q1		2 m (6.5') 4-pin Micro QD	20 to 250V ac	DO
WITH 50 MM FAR LIMIT CUTOFF	T18SN6FF50 T18SN6FF50Q	50 mm (2")	2 m (6.5') 4-pin Euro QD	10 to 30V dc	NPN
	T18SP6FF50 T18SP6FF50Q		2 m (6.5') 4-pin Euro QD	10 to 30V dc	PNP
	T18AW3FF50 T18AW3FF50Q1		2 m (6.5') 4-pin Micro QD	20 to 250V ac	LO
	T18RW3FF50 T18RW3FF50Q1		2 m (6.5') 4-pin Micro QD	20 to 250V ac	DO
WITH 100 MM FAR LIMIT CUTOFF	T18SN6FF100 T18SN6FF100Q	100 mm (4")	2 m (6.5') 4-pin Euro QD	10 to 30V dc	NPN
	T18SP6FF100 T18SP6FF100Q		2 m (6.5') 4-pin Euro QD	10 to 30V dc	PNP
	T18AW3FF100 T18AW3FF100Q1		2 m (6.5') 4-pin Micro QD	20 to 250V ac	LO
	T18RW3FF100 T18RW3FF100Q1		2 m (6.5') 4-pin Micro QD	20 to 250V ac	DO

Diffuse mode performance based on 90% reflectance white test card







T18 Series Specifications

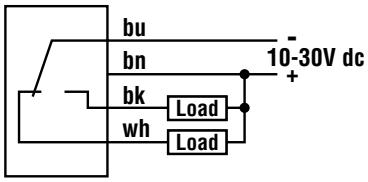
Supply Voltage and Current **Supply current (exclusive of load current)**	10 to 30V dc (10% maximum ripple) **Opposed Mode Emitters:** 25 mA **Opposed Mode Receivers:** 20 mA **Polarized Retro:** 30 mA **Non-Polarized Retro:** 25 mA **Fixed-Field:** 35 mA **Diffuse:** 25 mA
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	SPDT (complementary) solid-state dc switch; choose NPN (current sinking) or PNP (current sourcing) models. **Light operate:** N.O. output conducts when the sensor sees its own (or the emitter's) modulated light **Dark operate:** N.C. output conducts when the sensor sees dark. The N.C. (normally closed) output may be wired as a normally open marginal signal alarm output, depending upon hookup to the power supply (U.S. patent 5087838).
Output Rating	150 mA maximum (each) in standard hookup. When wired for alarm output, the total load may not exceed 150 mA. **Off-state leakage current:** <1 microamp at 30V dc **On-state saturation voltage:** <1V at 10 mA dc; <1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit of outputs
Output Response Time	**Opposed mode:** 3 milliseconds ON, 1.5 milliseconds OFF; **Polarized Retro, Non-Polarized Retro, Fixed-Field and Diffuse:** 3 milliseconds ON and OFF NOTE: 100 millisecond delay on power-up; outputs do not conduct during this time.
Repeatability	**Opposed mode:** 375 microseconds; **Polarized Retro, Non-Polarized Retro, Fixed-Field and Diffuse modes:** 750 microseconds; Repeatability and response are independent of signal strength
Adjustments	T18 series infrared non-polarized retro and diffuse mode models (only) have a single-turn rear-panel Sensitivity control for adjustment of system gain (turn clockwise to increase).
Indicators	Two LEDs: Green and Yellow **Green glowing steady:** power to sensor is ON **Green flashing:** output is overloaded (dc models only) **Yellow glowing steady:** normally open output is conducting **Yellow flashing:** excess gain marginal (1-1.5x) in light condition
Construction	Housings are thermoplastic polyester. Lenses are Lexan® or acrylic; T18 models come with one jam nut
Environmental Rating	Leakproof design rated NEMA 6P (IEC IP67)
Connections	2 m (6.5') or 9 m (30') attached cable, or 4-pin Euro-style or 4-pin Micro-style quick-disconnect fitting
Operating Conditions	**Temperature:** -40° to +70° C (-40° to 158° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)
Vibration and Mechanical Shock	All models meet Mil. Std. 202F requirements. Method 201A (Vibration; frequency 10 to 60 Hz, max., double amplitude 0.06" acceleration 10G). Method 213B conditions H&I (Shock: 75G with unit operating; 100G for non-operation)
Certifications	CE CSA® UL LISTED

Lexan® is a registered trademark of General Electric Co.

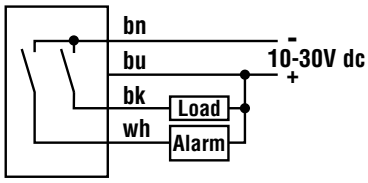
T18 Series DC Hookup Diagrams

DC Sensors with NPN (Sinking) Outputs

Standard Hookup

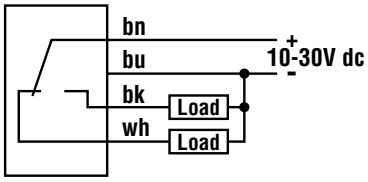


DC Alarm Hookup

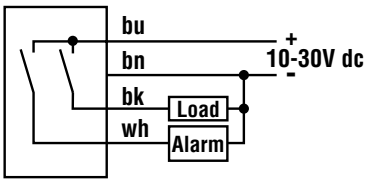


DC Sensors with PNP (Sourcing) Outputs

Standard Hookup

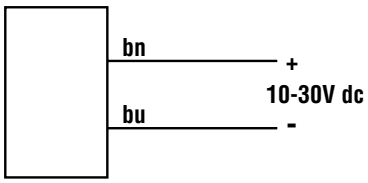


DC Alarm Hookup



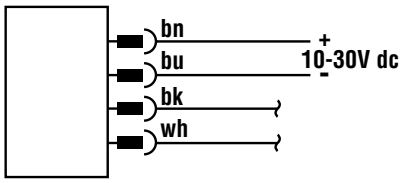
NOTE: Above hookups are the same for either integral cable or QD

DC Emitters with Attached Cable



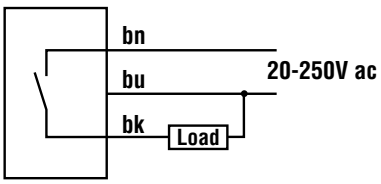
DC Emitters with Quick-Disconnect (QD)

Note: No connection to bk and wh wires of QD cable.

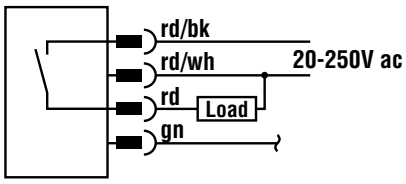


T18 Series AC Hookup Diagrams

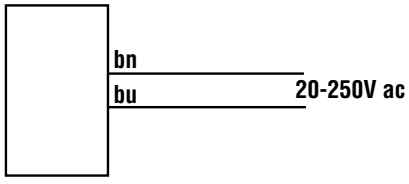
AC Sensors with Attached Cable



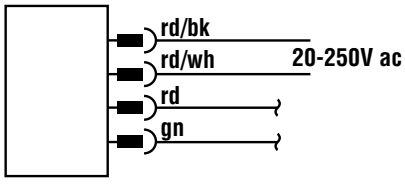
AC Sensors with QD Cable 4-pin Micro-style



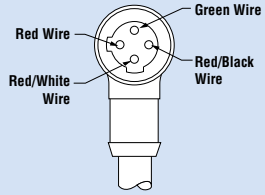
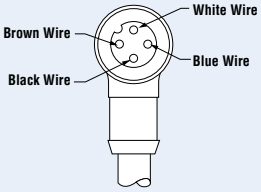
AC Emitter with Attached Cable



AC Emitter with QD Cable 4-pin Micro-style



T18 Series AC Hookups

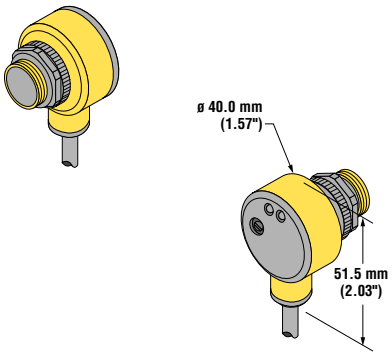
Style	Model	Length	Connector	Pin-Out
4-Pin Micro-Style	**MQAC-406**	2 m (6.5')	Straight	
	MQAC-415	5 m (15')	Straight	
	MQAC-430	9 m (30')	Straight	
	MQAC-406RA	2 m (6.5')	Right-Angle	
	MQAC-415RA	5 m (15')	Right-Angle	
	MQAC-430RA	9 m (30')	Right-Angle	
4-Pin Euro-Style	**MQDC-406**	2 m (6.5')	Straight	
	MQDC-415	5 m (15')	Straight	
	MQDC-430	9 m (30')	Straight	
	MQDC-406RA	2 m (6.5')	Right-Angle	
	MQDC-415RA	5 m (15')	Right-Angle	
	MQDC-430RA	9 m (30')	Right-Angle	

Quick-Disconnect (QD) Option

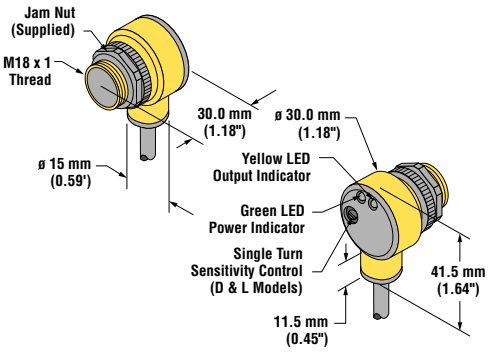
AC QD sensors are identified by the "Q1" in their model number suffix. Mating cables for EZ-BEAM® QD sensors are model MQAC-415 (straight connector) or MQAC-415RA (right-angled connector).

T18 Series Dimensions

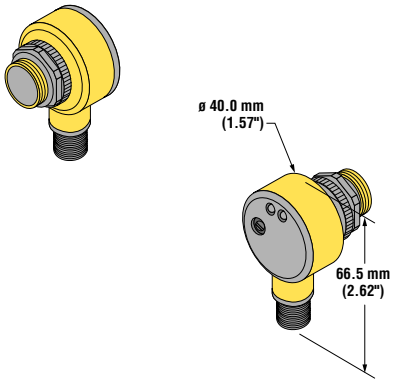
AC Sensor with Attached Cable



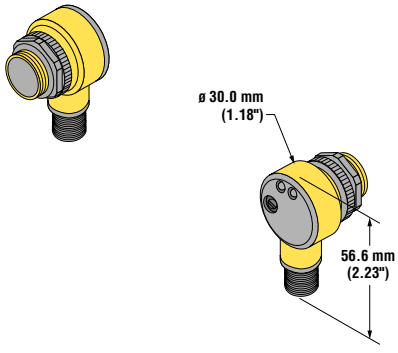
DC Sensor with Attached Cable



AC Sensor with Micro-Style QD



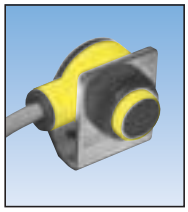
DC Sensor with Euro-Style QD

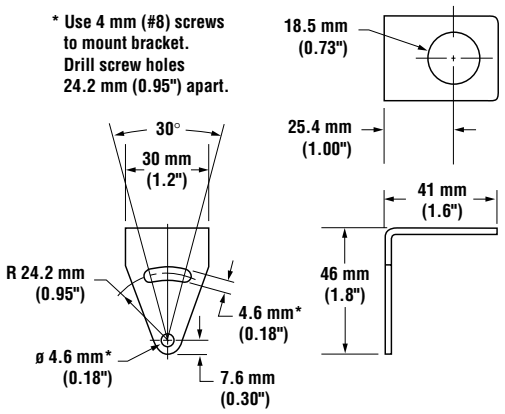


Mounting Brackets

SMB18A

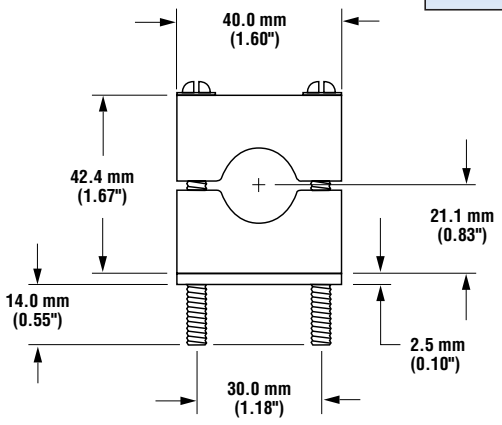
- Right-angle bracket with a curved mounting slot for versatility and orientation
- 11-gauge stainless steel





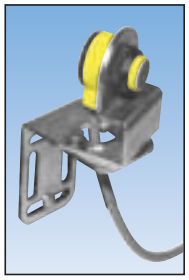
SMB18C

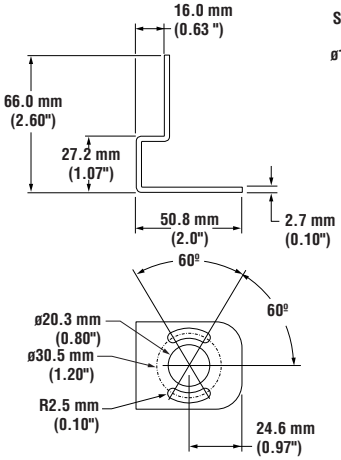
- 18 mm split clamp, black thermoplastic polyester
- Stainless steel mounting hardware included

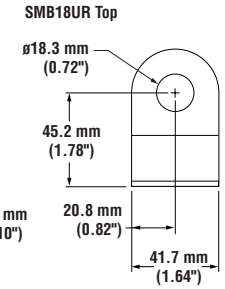


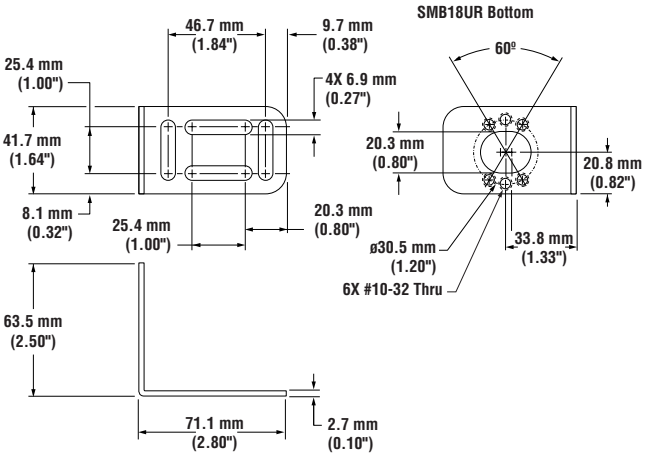
SMB18UR

- 2-piece universal swivel bracket for 18 mm sensors
- 300 series stainless steel





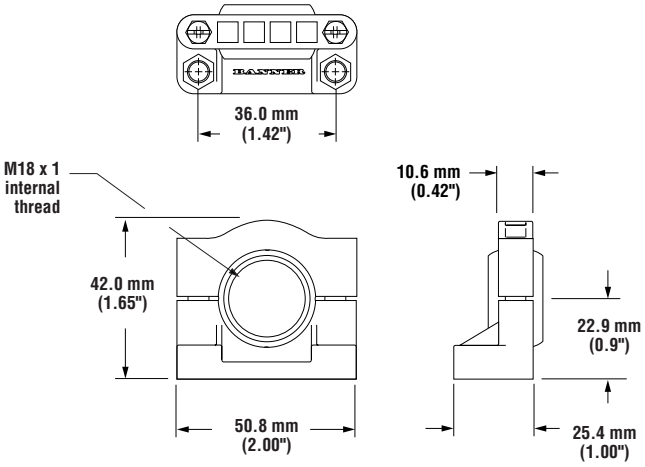




Mounting Brackets

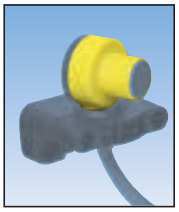
SMB18SF

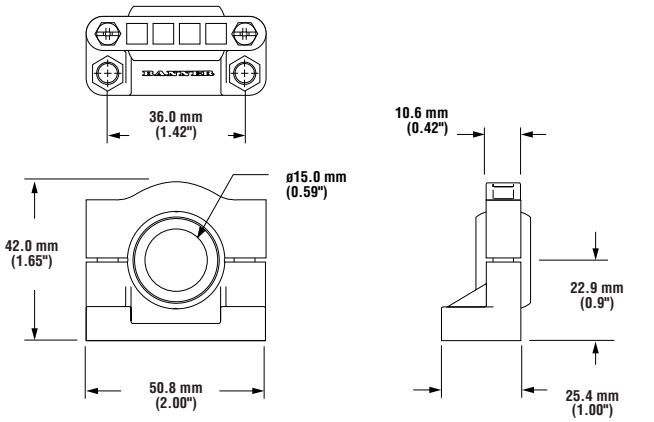
- 18 mm swivel bracket
- Black thermoplastic polyester



SMB1815SF

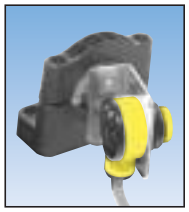
- Swivel with set screws for mounting of T18 by its cable hub
- Black reinforced thermoplastic polyester
- Includes stainless steel swivel locking hardware and 3/64" hex wrench

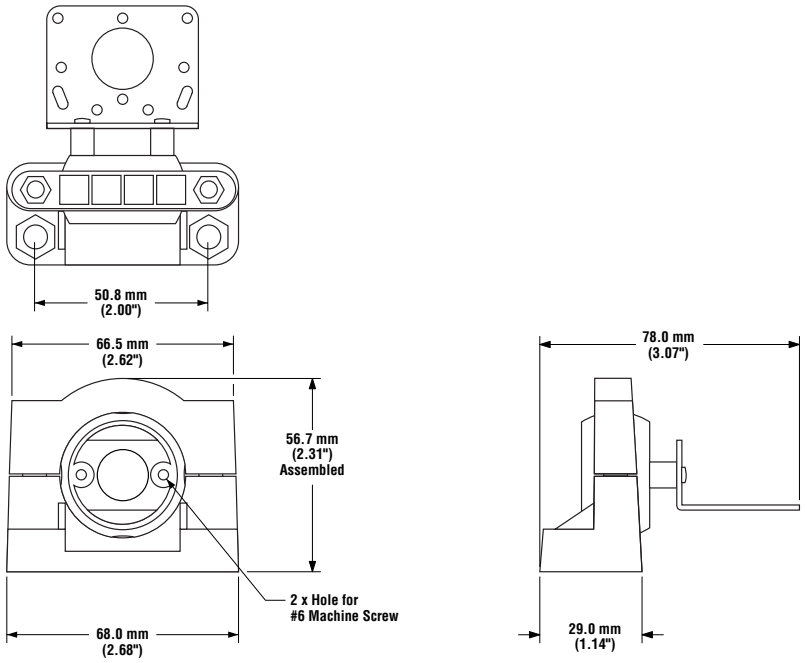




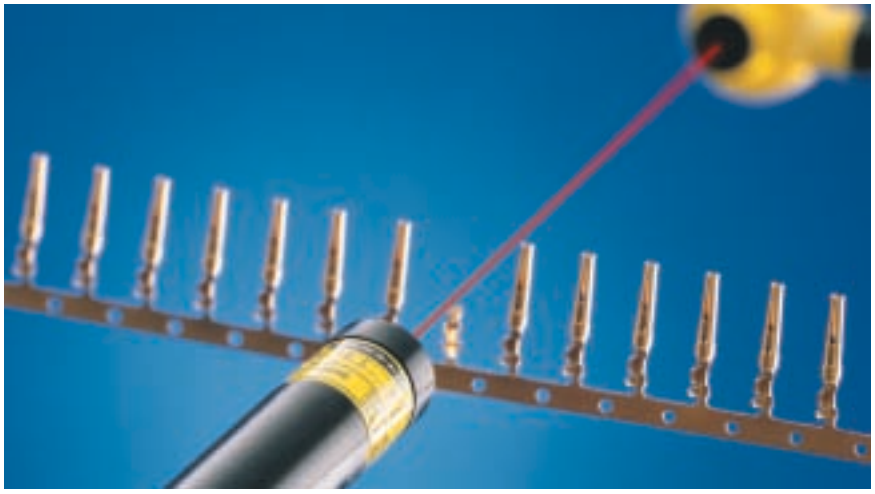
SMB30SK

- Flat-mount swivel bracket with extended range of motion
- Black reinforced thermoplastic polyester and 316 stainless steel





M12 Series Laser Emitters



Ultra-precise laser emitters.

Designed to solve the most exacting sensing applications, M12 Laser emitters feature a laser diode light source offering an increased sensing range and an easy-to-align visible red sensing beam. Combined with a modulated receiver, M12 emitters are ideal for sensing small objects and profiles in semiconductor manufacturing applications. They also provide excellent repeatability for position-sensing applications.

Compatible with a variety of Banner modulated photoelectric receivers, these emitters are easily integrated into new and existing applications. Green and yellow operating status LEDs indicate “Power Applied” and “Laser Enabled.”

Integral circuitry protects the emitters from being damaged by electrostatic discharge (ESD), transient voltages, and reverse polarity.

Innovative features & rugged construction.

- Collimated, apertured 2 mm diameter beam with <1 milliradian divergence
- Bore-sighted to within 2 milliradians and 0.25 mm of housing centerline
- Compatible with Banner MULTI-BEAM®, MAXI-BEAM®, VALU-BEAM®, and EZ-BEAM® and many other modulated receivers
- 10V to 30V dc operation
- Suitable for precision mount
- Smooth aluminum housing with black, hard-coat anodized finish
- Rated IP67 and NEMA 6P
- Operates reliably in temperatures from 0° C to 40° C (32° F to 104° F)
- Available with unterminated, 2 m (6.5') cable or 150 mm (6") pigtail, quick-disconnect (QD) cable
- 57 mm (2.25") long overall

M12 Series Models

	Models	Range	Cable**	Supply Voltage	Excess Gain	Effective Beam at Receiver	
						Opposed Distance	Beam Width
						at 25º C	
CLASS 1* (IEC)	M126E1LD	Range varies, depending on which receiver is used	2m (6.5') Unterminated	10 to 30V dc	See chart below	1.5 m (5') 3 m (10') 6 m (20') 15 m (50') 30 m (100')	3.5 mm (0.14") 5.5 mm (0.2") 8.5 mm (0.3") 18 mm (0.7") 32 mm (1.3")
	M126E1LDQ		150 mm (6") pigtail with 3-pin Pico-style QD connector				
CLASS 2*	M126E2LD	Range varies, depending on which receiver is used	2m (6.5') Unterminated	10 to 30V dc	See chart below	1.5 m (5') 3 m (10') 6 m (20') 15 m (50') 30 m (100')	3.5 mm (0.14") 5.5 mm (0.2") 8.5 mm (0.3") 18 mm (0.7") 32 mm (1.3")
	M126E2LDQ		150 mm (6") pigtail with 3-pin Pico-style QD connector				

*See M12 specifications for complete information regarding classification.

9 m (30') cables are available by adding suffix **"W/30" to the model number to the cabled version (e.g., **M126E1LD W/30**).

A model with a QD connector requires an accessory mating cable. See Accessories section for more information.

M12 Series Excess Gain

Receiver	Class 1* (IEC) Excess Gain at 15 m (50')	Class 2* Excess Gain at 15 m (50')	Receiver	Class 1* (IEC) Excess Gain at 15 m (50')	Class 2* Excess Gain at 15 m (50')
MULTI-BEAM®			**MINI-BEAM®**		
SBRX1	1,900	19,000	SM31R	250	2,500
SBR1	1,900	19,000	SM31RL	1,700	17,000
SBRXD1	1,900	19,000	SM31RMHS	180	1,800
SBRD1	1,900	19,000	SM31RLMHS	1,100	11,000
MAXI-BEAM®			**ECONO-BEAM®**		
RSBR	1,400	14,000	SE61R	60	600
RSBRSR	150	1,500	SE61RMHS	50	500
VALU-BEAM®			**Others**		
SMW95R	3,400	34,000	SM51RB	120	1,200
SMI91RQD	1,800	18,000	Q23SN6R	40	400
EZ-BEAM®			Q10AN6R	25	250
T18SN6R	750	7,500	Q45BB6R	900	9,000
T30SN6R	750	7,500			
S12SN6R	750	7,500			

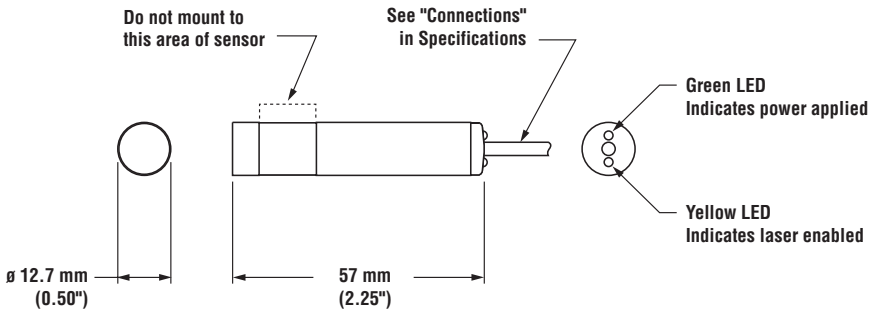
For information on compatibility of the M12 emitter with other Banner photoelectric receivers, contact the factory applications group at the address or numbers listed on the back cover.

*See M12 Specifications for complete information regarding classification.

M12 Series Specifications

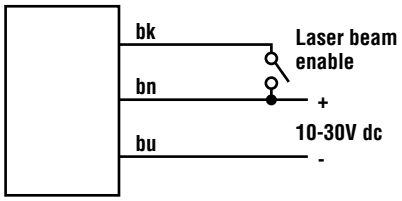
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 30 mA
Supply Protection Circuitry	Protected against electrostatic discharge (ESD) and transient voltages; protected against reverse polarity
Delay at Power-up	**M126E1 models:** less than 100 milliseconds **M126E2 models:** less than 30 milliseconds
Sensing Beam	670 nm visible red laser (temperature coefficient 0.2 nm/°C) **Pulse Width:** 7 µs **Rep Rate:** 30 µs **Peak Output Power:** **M126E1 models:** 0.36 milliwatts **M126E2 models:** 2.8 milliwatts
Beam Diameter at Aperture	Approximately 2 mm (0.08") diameter
Beam Divergence	±0.5 milliradians typical at 25° C; ±1.0 milliradian at operating temperature extremes
Beam Placement	Within 0.25 mm (0.01") and ±2 milliradians of mechanical centerline axis of housing
Laser Control	Apply +10 to 30V dc to black wire to enable beam; inhibit beam by applying 0V dc or by opening circuit; **Enable delay: M126E1 models:** less than 100 milliseconds **M126E2 models:** less than 30 milliseconds **Inhibit delay:** less than 1 millisecond
Indicators	Indicators are visible through rear cover. **Green:** indicates power applied **Yellow:** indicates laser enabled
Construction	12.7 mm (0.50") diameter smooth aluminum barrel; black hard-coat anodized finish, MIL-A-8625 Type III, Class II
Environmental Rating	NEMA 6; IEC IP67
Connections	PVC-jacketed 3-conductor 2 m (6.5') or 9 m (30') high-flex cable (unterminated); or 150 mm (6") pigtail with 3-wire Pico-style connector
Operating Conditions	**Temperature:** 0° to 40° C (32° to 104° F) **Maximum relative humidity:** 90% at 40° C (non-condensing)
Laser Classification	**M126E1 models:** Class 2 (CDRH), US Safety Standards 21 CFR 1040.10; Class 1 (IEC), European Standards EN 60825-1 and IEC 60825-1 **M126E2 models:** Class 2 (CDRH), US Safety Standards 21 CFR 1040.10; Class 2 (IEC), European Standards EN 60825-1 and IEC 60825-1
Certifications	CE

M12 Series Dimensions

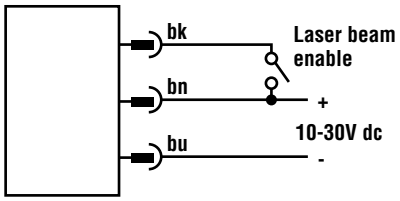


M12 Series Hookup Diagrams

M12 Laser Diode Emitter
Unterminated Cable



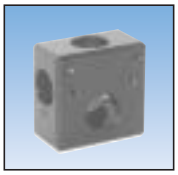
M12 Laser Diode Emitter
QD Version

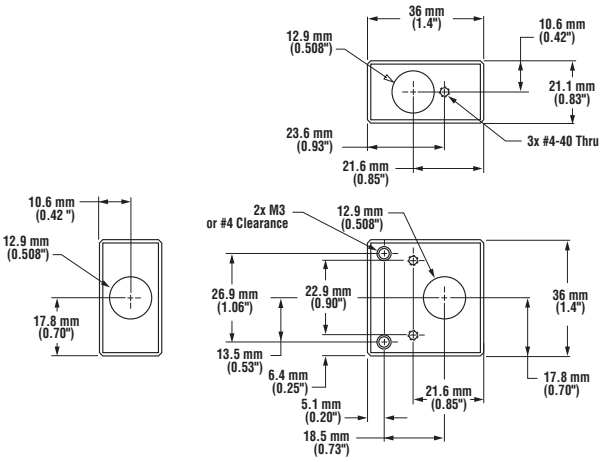


Mounting Brackets

SMB127 Mounting Block

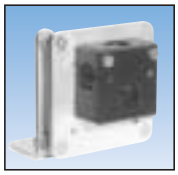
- Mounting block
- Comes with: 3/64" hex wrench and 4 set screws

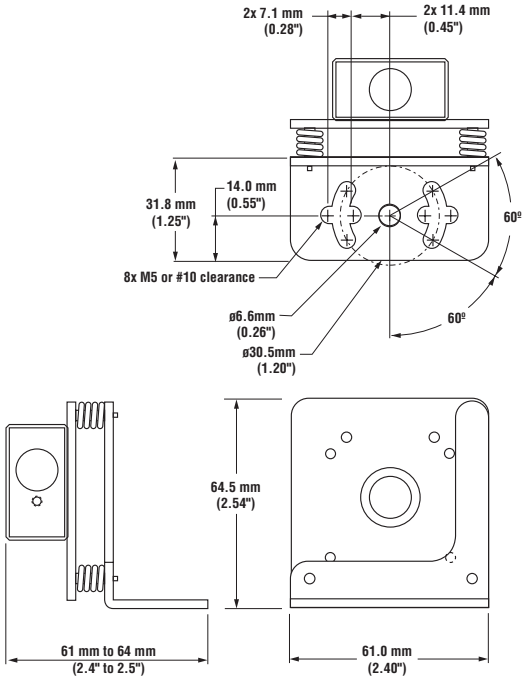




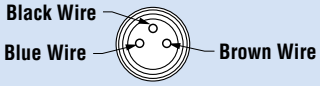
SMB46X3

- Assembly with mounting block and adjustable bracket
- Includes:
  - 2 mm hex key
  - 3/64" hex wrench and 4 set screws





Quick-Disconnect Cables (QD)

Style	Model	Length	Connector	Pin-out
3-pin Pico-style	**PKG3-2**	2 m (6.5')	Straight	

PICO-AMP MD14 Series Sensors

PICO-AMP remote sensors and amplifiers.

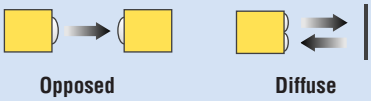
The PICO-AMP photoelectric sensing system consists of a small modulated amplifier and ultra-miniature remote sensors that fit into even the tightest locations. The PICO-AMP is an excellent choice for small-part sensing, precision machine control, semiconductor manufacturing, pharmaceutical packaging, and other sensing applications with space limitations. Sensors are approximately the size of a common thumbtack.

Amplifiers are designed to snap onto common 35 mm DIN rail, and can nest tightly together on 15 mm (0.6") centers. Amplifier features include light or dark operate selection, sensitivity adjustment, and a selectable output pulse stretcher. To prevent crosstalk in multiple-sensor applications, a four-position switch selects one of three modulation frequencies, or Auto Frequency mode. A green LED indicates power ON, and flashes to signal an output overload. A yellow LED indicates proper sensor alignment and flashes to signal marginal received light signal. The PICO-AMP system operates from 10 to 30V dc, and offers a bipolar output: both PNP (current sourcing) and NPN (current sinking).

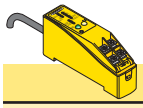
PICO-AMP amplifier and sensor features.

- Diffuse- or opposed-mode sensors are available
- Opposed-mode range is 300 mm (12")
- Diffuse-mode range is 50 mm (2")
- Switch-selectable modulation frequencies
- 3 fixed-frequency modulation settings
- Sensitivity adjustment
- Output OFF-delay feature
- Auto-Frequency setting prevents crosstalk
- Green and yellow status/diagnostic indicators
- Amplifier clips to 35 mm DIN rail for easy mounting
- Rugged polycarbonate/ABS alloy amplifier housing, with polycarbonate cover
- Amplifier meets UL94-V0 standards
- IEC IP50 and NEMA 1 environmental ratings
- Amplifiers and sensors sold separately
- Opposed-mode sensors sold in pairs

PICO-AMP MD14 Sensing Mode Options

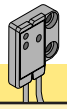


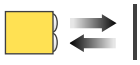
For complete listings of Banner's extensive product lines, go to www.bannerengineering.com



PICO-AMP MD14 Series Amplifier Module Models

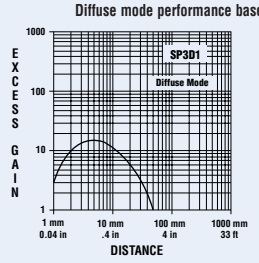
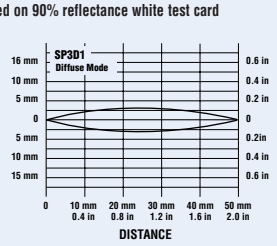
Models*	Supply Voltage	Response	Output Saturation	Off-State Leakage	Compatible Sensors	Output Type
MD14BB6 **MD14BB6Q**	10 to 30V dc	See Specifications	**PNP Output:** <1V at 10 mA <1.5V at 100 mA **NPN Output:** <0.2V at 10 mA <0.75V at 100 mA	<5 µA	SP3D1 SP3ER1 SP3ER2 SP8ER1 SP8ER2	Bipolar, NPN/PNP

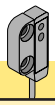




PICO-AMP MD14 Series Remote Diffuse-Mode Sensor Models

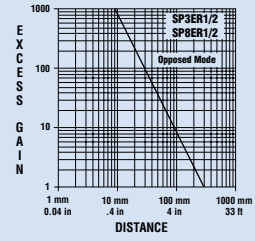
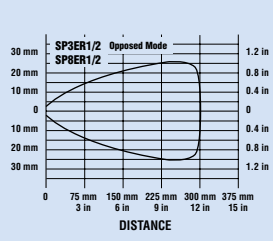
Infrared, 900 nm

Models	Range	Cable	Temperature	Excess Gain	Beam Pattern
SP3D1	50 mm (1.9")	2 m (6.5')	-20˚ to 70˚ C (-5˚ to +158˚ F)		



PICO-AMP MD14 Series Remote Sensors Opposed-Mode Sensor Models

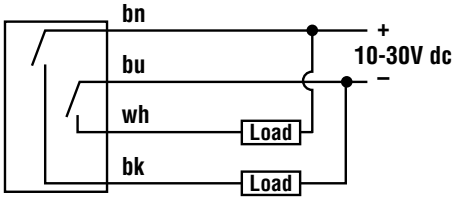
Infrared, 900 nm

Models*	Range	Cable	Temperature	Excess Gain	Beam Pattern
SP3ER1 **SP3ER2** **SP8ER1** **SP8ER2**	300 mm (12")	2 m (6.5')	-20˚ to 70˚ C (-5˚ to +158˚ F)		

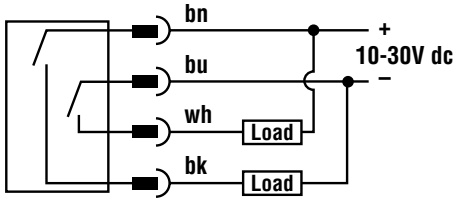
*NOTE: Opposed-mode sensors are shipped in connected pairs (one emitter and one receiver). The emitter includes a yellow LED which is ON whenever the receiver senses light from its emitter. The housing of the receiver will be the "mirror image" of its corresponding emitter.

PICO-AMP MD14 Series Amplifier Hookup Diagrams

With Attached Cable



With Quick-Disconnect



Quick-Disconnect (QD) Cables

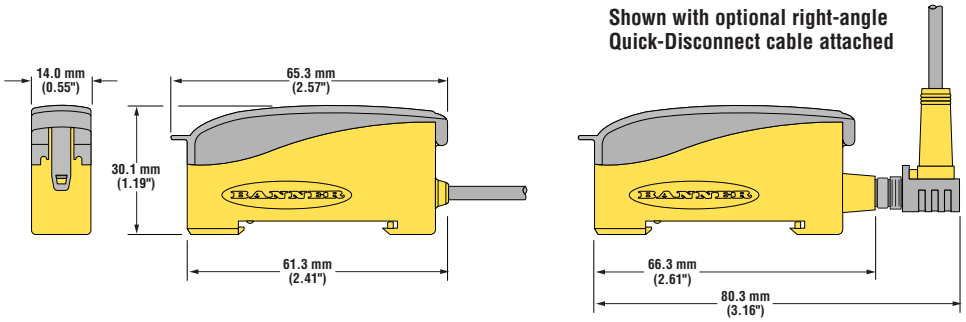
Style	Models	Length	Connector	For use with:
4-pin Pico-style	**PKG4-2** **PKW4-2**	2 m (6.5') 2 m (6.5')	Straight Right-Angle	PICO-AMP Amplifier Module

PICO-AMP MD14 Series Amplifier and Remote Sensor Specifications

Supply Compatibility	PICO-AMP amplifier models MD14BB6 and MD14BB6Q are compatible with the following remote sensors: SP3ER1, SP3ER2, SP8ER1, SP8ER2, SP3D1
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 55 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	100mA maximum, each output **Off-state Leakage Current:** less than 5µA **Output Saturation Voltage:** **PNP output** less than 1V @10mA; less than 1.5V @ 100mA **NPN output** less than 0.2V @ 10mA; less than 0.75V @ 100mA
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short-circuit of outputs
Output Response Time	**Frequency Selection** — **Response Time** Auto — 500 µs ON/ 350 µs OFF Freq 1 — 350 µs ON/ 250 µs OFF Freq 2 — 450 µs ON/ 300 µs OFF Freq 3 — 500 µs ON/ 350 µs OFF NOTE: 1) Auto mode defaults to Freq 1 at power-up 2) Response time will increase with adjacent sensor interference
Adjustments/Programming	Light/Dark Operate Select switch OFF-delay Select switch: 0 or 50 ms 4-position Frequency Select switch: Auto, Freq 1, Freq 2, Freq 3 12-turn slotted brass screw Gain (Sensitivity) adjustment potentiometer (clutched at both ends of travel)
Indicators	**Green ON Steady:** Power to amplifier is ON **Green Flashing:** Output is overloaded **Yellow ON Steady:** Light is sensed **Yellow Flashing:** Marginal excess gain (1 to 1.5x) in light condition
Construction	**Housing:** Yellow polycarbonate/ABS alloy, rated UL94 V-0 **Cover:** Gray-tinted polycarbonate **DIN spring clip:** Yellow Delrin® (acetal)
Environmental Rating	IP50, NEMA 1
Connections	**Sensor(s):** four M2.5 zinc-plated steel SEMS screws **Power and Outputs:** PVC-jacketed 4-conductor 2 m (6.5') or 9 m (30') attached cable, or 4-pin Pico-style quick-disconnect fitting QD cables are ordered separately (see Accessories)
Operating Conditions	**Temperature:** 0° to 55° C (32° to 131° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)
Application Notes	Always remove power to amplifier before connecting or disconnecting sensors
Certifications	CE

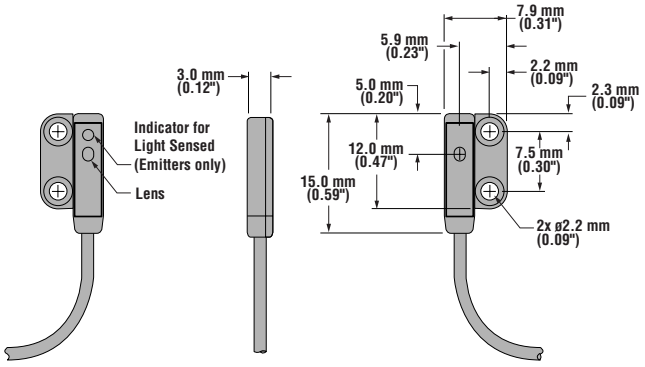
Delrin® is a registered trademark of Dupont Co.

PICO-AMP MD14 Series Amplifier Module Dimensions



PICO-AMP MD14 Series Remote Sensors Dimensions

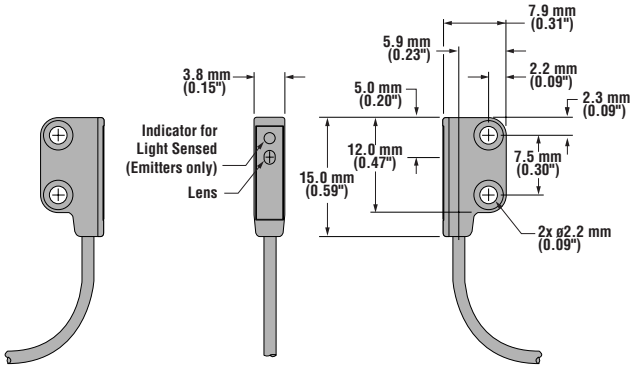
SP3ER Remote Sensors
Opposed Mode



SP3E1 Emitter
(or SP3R2 Receiver)

SP3R1 Receiver
(or SP3E2 Emitter)

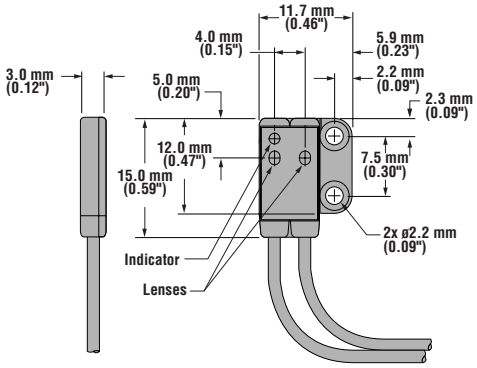
SP8ER Remote Sensors
Opposed Mode



SP8E1 Emitter
(or SP8R2 Receiver)

SP8R1 Receiver
(or SP8E2 Emitter)

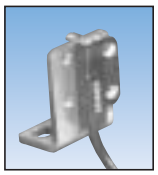
SP3D1 Remote Sensors
Diffuse Mode

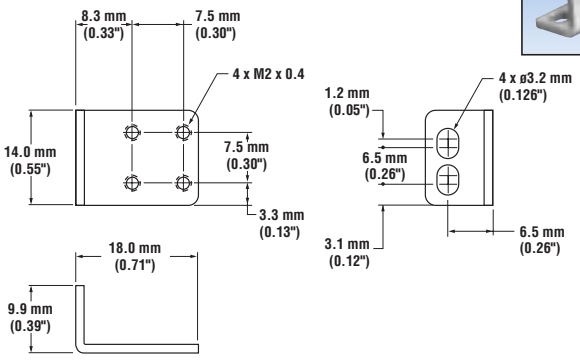


Mounting Brackets

SMBSP3

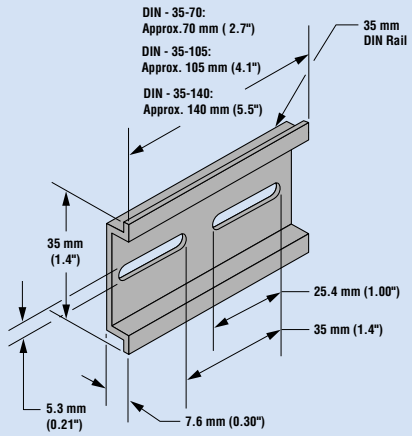
- 18-gauge stainless steel right-angle bracket for PICO-AMP SP3 and SP8 Series sensors





35 mm DIN Rail Track Accessories

Model	Description	Dimensions
DIN-35-70	70 mm track, accommodates up to 4 MD14 Amplifiers	
DIN-35-105	105 mm track, accommodates up to 6 MD14 Amplifiers	
DIN-35-140	140 mm track, accommodates up to 8 MD14 Amplifiers	



PicoDot® Series—Laser Sensors

PicoDot features.

- Convergent beam models come in 50 mm (2"), 100 mm (4"), and 200 mm (8") focal lengths
- Retroreflective-mode models feature a precise, narrow beam and polarized lens
- Visible red laser diode light source
- 200 microsecond sensing response
- 50 microsecond repeatability
- 10V to 30V dc operation
- Choice of NPN (sinking) or PNP (sourcing) complementary solid-state outputs
- Available with compact, lightweight housing, or environmentally sealed housing
- Precise .25 mm (0.01") spot at focal point

Ultra-precise laser sensors.

PicoDot laser sensors, available in convergent-beam and retroreflective-mode models, deliver high-precision sensing at ranges up to 39.6 m (130'). The Class 2 devices are ideal for exacting applications, including wafer handling, small-part sensing, and long-range sensing, in addition to high-speed presence detection and counting applications.

The self-contained sensors measure a mere 40.6 mm (1.60") high, by 12.7 mm (0.50") wide, by 45.6 mm (1.80") deep, and weigh less than an ounce, allowing easy installation into space-limited applications, such as robot arms and end efectors.

PicoDot Sensing Mode Options

Convergent

Polarized Retroreflective

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com

Choose PD49 models for environmentally sealed housing
Choose PD45 models for compact lightweight housing

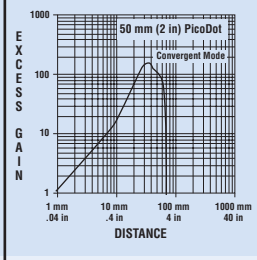
PicoDot® Series Convergent Laser Models

Visible red; Class 2 laser; 650 nm

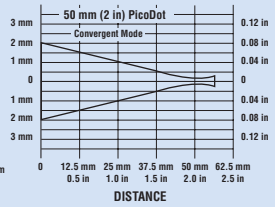
Models	Focus	Cable*	Supply Voltage	Output Type	Housing Rating
PD45VN6C50 **PD45VN6C50Q**	50 mm (2.0") **Spot Size at Focus:** 0.25 mm (0.01")	2 m (6.5') 5-pin Euro QD pigtail	10 to 30V dc	NPN	IP54, NEMA 3
PD49VN6C50 **PD49VN6C50Q**		2 m (6.5') 5-pin Euro QD pigtail		NPN	IP67, NEMA 6
PD45VP6C50 **PD45VP6C50Q**		2 m (6.5') 5-pin Euro QD pigtail		PNP	IP54, NEMA 3
PD49VP6C50 **PD49VP6C50Q**		2 m (6.5') 5-pin Euro QD pigtail		PNP	IP67, NEMA 6
PD45VN6C100 **PD45VN6C100Q**	102 mm (4.0") **Spot Size at Focus:** 0.25 mm (0.01")	2 m (6.5') 5-pin Euro QD pigtail	10 to 30V dc	NPN	IP54, NEMA 3
PD49VN6C100 **PD49VN6C100Q**		2 m (6.5') 5-pin Euro QD pigtail		NPN	IP67, NEMA 6
PD45VP6C100 **PD45VP6C100Q**		2 m (6.5') 5-pin Euro QD pigtail		PNP	IP54, NEMA 3
PD49VP6C100 **PD49VP6C100Q**		2 m (6.5') 5-pin Euro QD pigtail		PNP	IP67, NEMA 6
PD45VN6C200 **PD45VN6C200Q**	203 mm (8.0") **Spot Size at Focus:** 0.25 mm (0.01")	2 m (6.5') 5-pin Euro QD pigtail	10 to 30V dc	NPN	IP54, NEMA 3
PD49VN6C200 **PD49VN6C200Q**		2 m (6.5') 5-pin Euro QD pigtail		NPN	IP67, NEMA 6
PD45VP6C200 **PD45VP6C200Q**		2 m (6.5') 5-pin Euro QD pigtail		PNP	IP54, NEMA 3
PD49VP6C200 **PD49VP6C200Q**		2 m (6.5') 5-pin Euro QD pigtail		PNP	IP67, NEMA 6

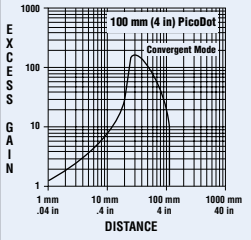
Excess Gain

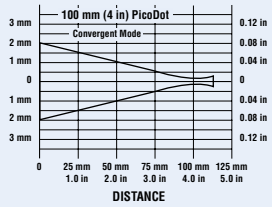
Performance based on 90% reflectance white test card

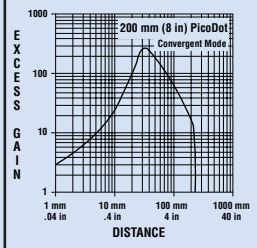


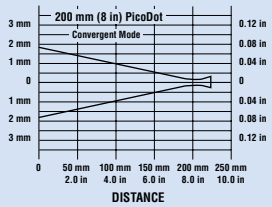
Beam Width









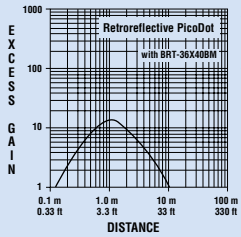


PicoDot Series Polarized Retroreflective Laser Models

Visible red; Class 2 laser; 670 nm

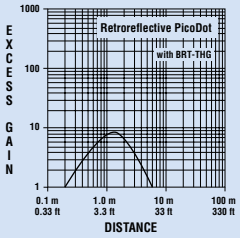
Models	Range**	Cable*	Supply Voltage	Output Type	Housing Rating
PD45VN6LLP **PD45VN6LLPQ**	0.2 m to 10.6 m (8" to 35')	2 m (6.5') 5-pin Euro QD pigtail	10 to 30V dc	NPN	IP54, NEMA 3
PD49VN6LLP **PD49VN6LLPQ**	0.2 m to 10.6 m (8" to 35')	2 m (6.5') 5-pin Euro QD pigtail	10 to 30V dc	NPN	IP67, NEMA 6
PD45VP6LLP **PD45VP6LLPQ**	0.2 m to 10.6 m (8" to 35')	2 m (6.5') 5-pin Euro QD pigtail	10 to 30V dc	PNP	IP54, NEMA 3
PD49VP6LLP **PD49VP6LLPQ**	0.2 m to 10.6 m (8" to 35')	2 m (6.5') 5-pin Euro QD pigtail	10 to 30V dc	PNP	IP67, NEMA 6

Excess Gain

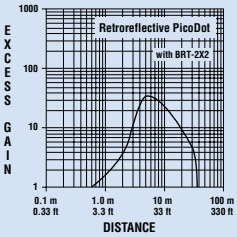


With BRT-36X40BM reflector included with sensor

With optional BRT-THG tape



With optional BRT-2X2 reflector



*9 m (30') cables available by adding suffix "**W/30**" to the model number of any cabled sensor. (e.g., **PD45VN6LLP W/30**). Models with a QD connector require an optional mating cable.
**Tested using a BRT-36x40BM retro target (included with each sensor). Actual range depends on the efficiency and size of the retroreflective target.

PicoDot® Series Specifications

Sensing Beam	Visible red Class 2 laser, 670 nm
Supply Voltage	10 to 30V dc (10% maximum ripple) at less than 20 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Output Configuration	SPDT (complementary) solid-state switch; choose NPN (current sinking) or PNP (current sourcing) models **Light operate:** Normally-open output conducts when the sensor sees its own modulated light **Dark operate:** Normally-closed output conducts when the sensor sees dark
Output Rating	150 mA maximum (each output) **Off-state leakage current:** <1 microamp at 30V dc; **On-state saturation voltage:** <0.3V at 10 mA dc; <0.8V at 150 mA dc
Output Protection	Protected against continuous overload or short-circuit of outputs; overload trip point ≥ 220 mA
Output Response Time	0.2 milliseconds ON and OFF
Repeatability	50 microseconds
Adjustments	12-turn slotted brass Gain (sensitivity) adjustment potentiometer (clutched at both ends of travel)
Extinguishing Wire	Gray wire held "low" for laser operation; "high" to turn laser off **Low** ≤1.0V dc **High** ≥+V-4.0V dc (<30V dc) or disconnect wire
Indicators	Two LEDs: Green and Yellow **Green glowing steady:** power to sensor is ON **Yellow glowing steady:** light is sensed; normally open output is conducting **Green blinking:** power overloaded **Yellow blinking:** marginal return signal
Construction	Housings are Cycolac® KJB heat-resistant ABS, UL94-VO rated; acrylic lens cover
Environmental Rating	**PD45 models:** NEMA 3; IEC IP54 **PD49 models:** NEMA 6; IEC IP67
Connections	2 m (6.5') or 9 m (30') attached cable, or 5-pin Euro-style 150 mm (6") pigtail quick-disconnect fitting; mating cables for QD models are ordered separately
Operating Conditions	**Temperature:** -10° to +45° C (+14° to 113° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)
Weight	**PD45 models:** Sensor only: 22g (0.8 oz); sensor plus 2 m cable 62g (2.2 oz) **PD49 models:** Sensor only: 28g (1 oz); sensor plus 2 m cable 68g (2.4 oz)
Application Notes	False pulse may occur <1 second after power-up
Certifications	CE

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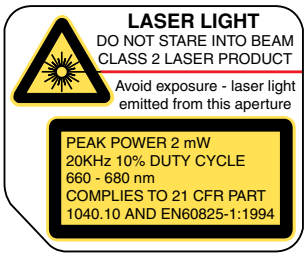
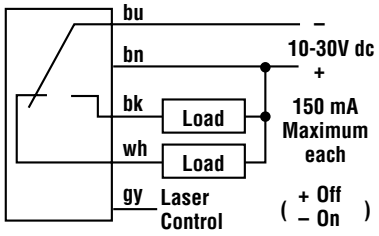
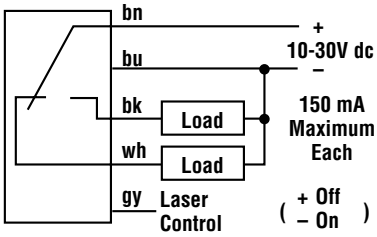


PicoDot® Series Hookup Diagrams

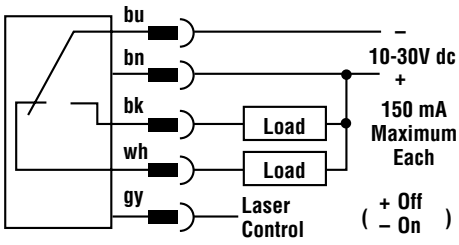
Sensors with NPN (Sinking) Outputs with Attached Cable



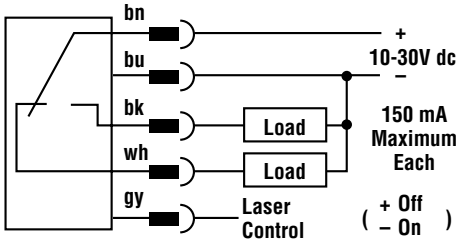
Sensors with PNP (Sourcing) Outputs with Attached Cable



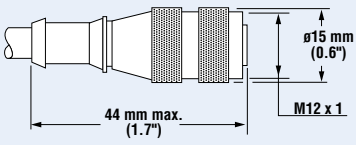
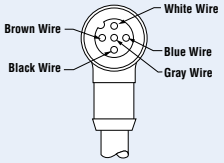
Sensors with NPN (Sinking) Outputs with Quick-Disconnect



Sensors with PNP (Sourcing) Outputs with Quick-Disconnect



Quick-Disconnect Cables (QD)

Style	Model	Length	Connector	Pin-out
5-pin Euro	**MQDC1-506** **MQDC1-515** **MQDC1-530**	2 m (6.5') 5 m (15') 9 m (30')		

Quick-Disconnect (QD) Option

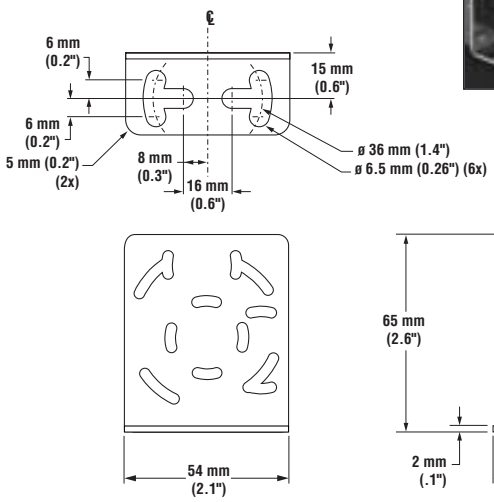
PicoDot sensors are sold with either a 2 m (6.5') attached PVC-covered cable, or with a 5-pin Euro-style pigtail QD cable fitting.

PicoDot QD sensors are identified by the letter "Q" in their model number suffix. Mating cables for QD PicoDot sensors are model MQDC1-5xx (straight connector) or MQDC1-5xxRA (right-angled connector).

Mounting Brackets

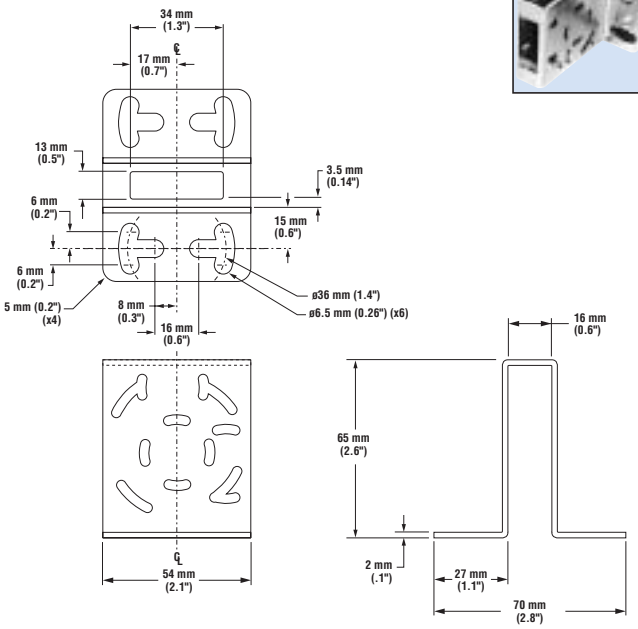
SMB46L

- "L" bracket
- 14-gauge 316 stainless steel



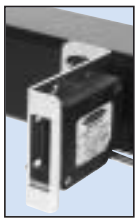
SMB46U

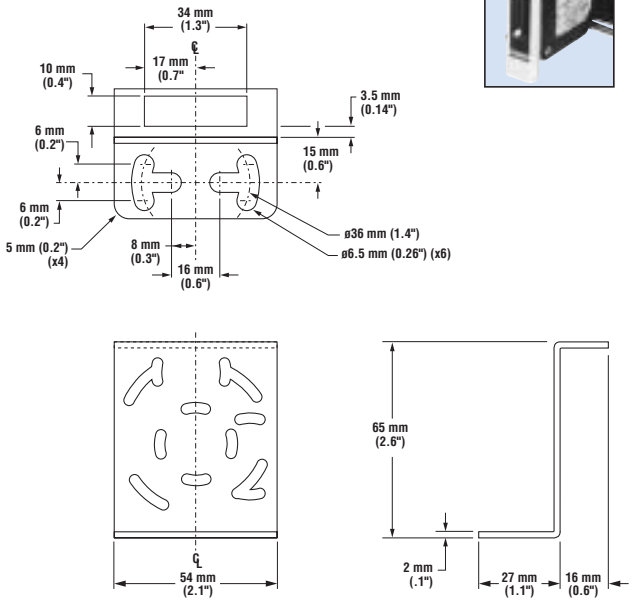
- "U" bracket
- 14-gauge 316 stainless steel



SMB46S

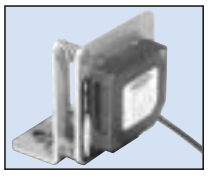
- "S" bracket
- 14-gauge 316 stainless steel

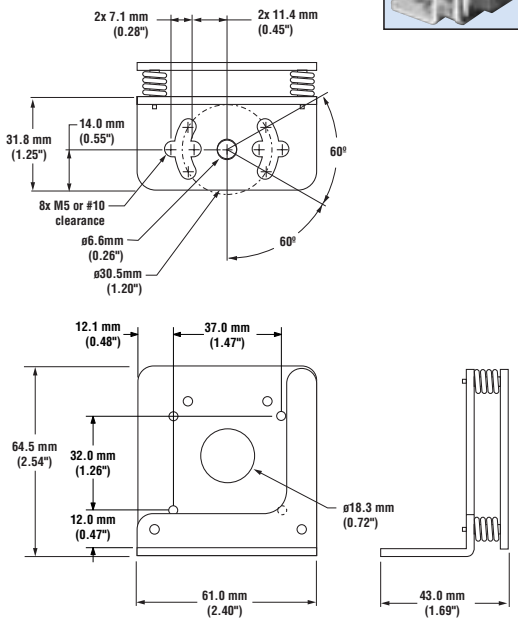




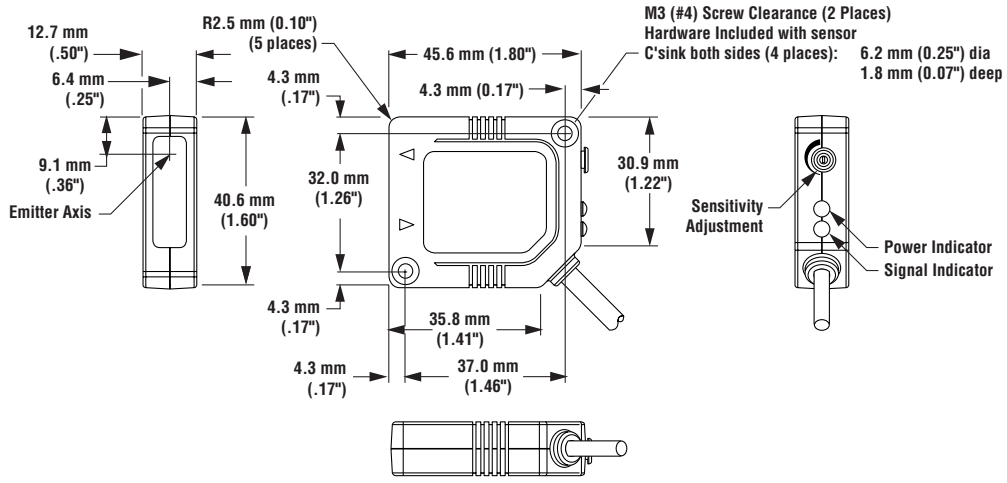
SMB46A

- Stainless steel adjustable bracket
- Comes with 2 mm short arm hex keys

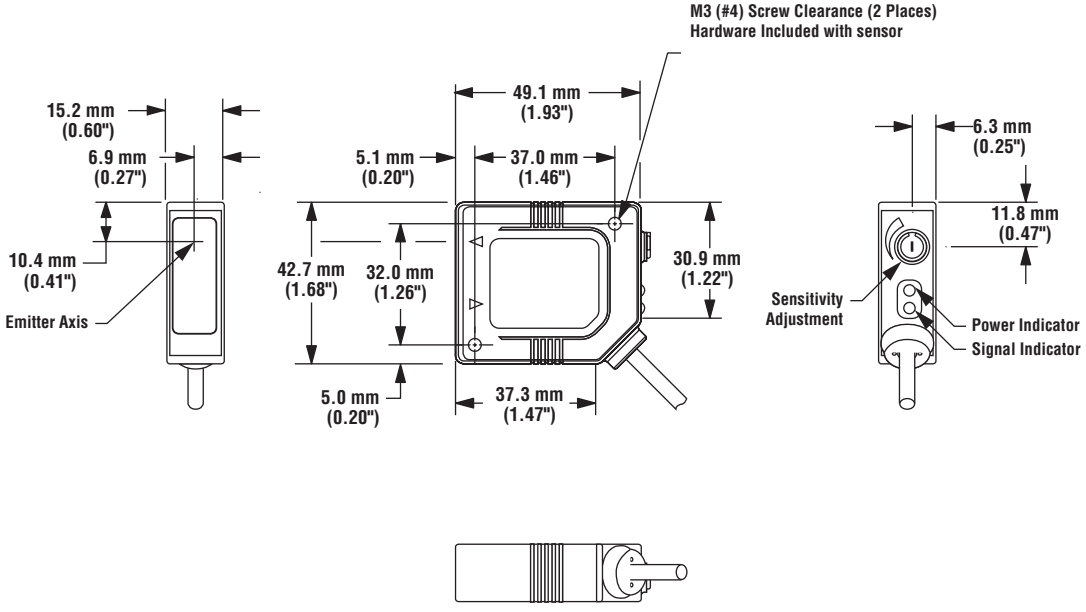




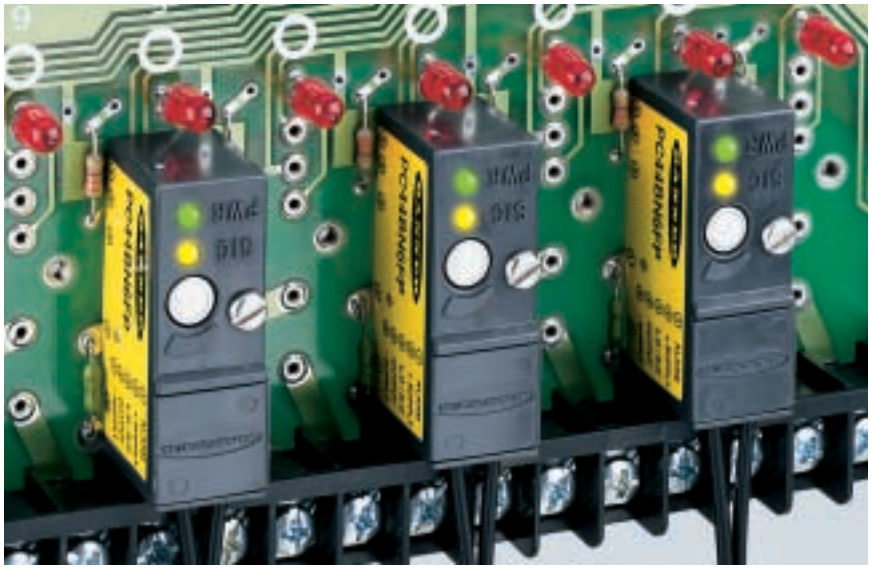
PicoDot® PD45 (IP54, NEMA 3) Dimensions



PicoDot PD49 (IP67, NEMA 6) Dimensions



PC44 Series Sensors



Three PC44 sensors plugged into I/O module

PC44: a powerful sensor for custom circuit boards.

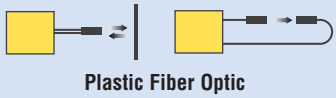
The PC44 is a high-quality photoelectric sensor that you can mount directly on your printed circuit boards. The tiny unit includes its own amplifier and requires only a 10-30V dc power source to operate.

Choose from complementary NPN (sinking) or PNP (sourcing) outputs, allowing one output to be wired as a low gain alarm.

Plug-in sensing controls for plastic fiber optics.

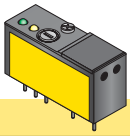
- Two models available: select NPN (current sinking) or PNP (current sourcing) outputs
- Both models have two outputs: Load and Alarm, rated for 100 mA maximum each
- Dual LEDs indicate Power ON, Output Overload, Alignment and Low Gain
- Alarm output conducts whenever excess gain in the light condition falls below 1.5x
- PC44 sensors may be soldered directly to a printed circuit board
- Optional socket pin kit available
- Easy fiber installation—simply push fibers into place and snap gripper door closed

PC44 Sensing Mode Options



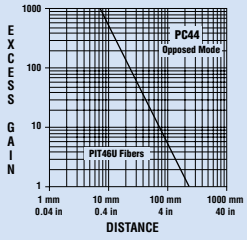
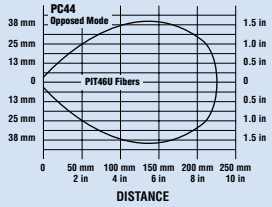
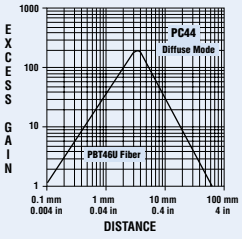
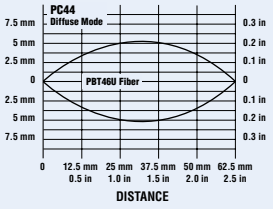
Plastic Fiber Optic

For complete listings of Banner's extensive product lines, go to www.bannerengineering.com



PC44 Series Plastic Fiber Optic

Visible red, 680 nm

Models	Range	Supply Voltage	Output Type	Excess Gain	Beam Pattern
PC44BN6FP	Range varies by sensing mode and fiber optics used	10 to 30V dc	NPN	Diffuse mode performance based on 90% reflectance white test card 	
PC44BP6FP	Range varies by sensing mode and fiber optics used	10 to 30V dc	PNP		

Printed Circuit Board Pin Socket Accessories

Model	Description
PCJ-25	Socket pin kit contains 25 socket pins (5 required per module) and 5 hold-down nuts (1 required per module)

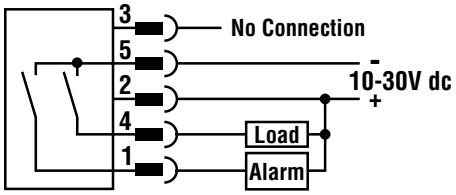
NOTE: PC44 modules may be soldered directly to a printed circuit board (wave solder or hand solder). A set of socket pins is available for PC board mounting. PC44 modules plug into standard I/O mounting racks.

PC44 Series Specifications

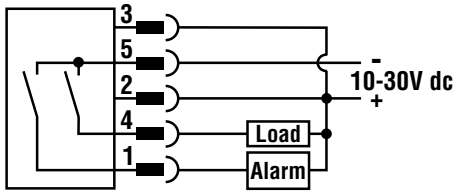
Supply Voltage and Current	10 to 30V dc at 25 mA maximum, exclusive of load, at module pins #2 (+V dc) and #5 (dc common); 10% maximum ripple
Supply Protection Circuitry	Protected against reverse polarity
Output Configuration	Solid-state dc output, selectable for light- or dark-operate: **PC44BN6FP:** NPN sinking load output plus NPN sinking alarm output **PC44BP6FP:** PNP sourcing load output plus PNP sourcing alarm output **Light operate mode:** Normally open load output conducts when the receiver sees the emitter's modulated visible red light **Dark operate mode:** Normally open load output conducts when the receiver does not see the emitter's modulated light
Module Output Rating	100 mA maximum each output **Off-state leakage** current is less than 1 microamp at 30V dc **On-state saturation** voltage is less than 1 volt at 10 mA dc and less than 1.5 volts at 100 mA dc When the alarm output is used, the total load may not exceed 100 mA
Output Protection Circuitry	Protected against false pulse on power-up and overload or short circuit of outputs
Output Response Time	1 millisecond ON and OFF; independent of signal strength; Repeatability: 0.25 milliseconds NOTE: False pulse protection circuit causes 100 millisecond delay on power-up.
Indicators	Two top-mounted LED indicators: **Green glowing steady:** dc Power ON **Green flashing:** output overloaded **Yellow glowing steady:** excess gain in light condition is >1.5x **Yellow flashing:** excess gain in light condition is marginal (<1.5x) **Flashing Yellow:** corresponds to a conducting (closed) alarm output
Construction	Polypropylene housing, gold-plated copper connecting pins, totally epoxy-encapsulated, sealed and plated steel mounting (hold-down) screw
Operating Conditions	**Temperature:** -20° to +50° C (-5° to +131° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)

PC44 DC Hookup Diagrams

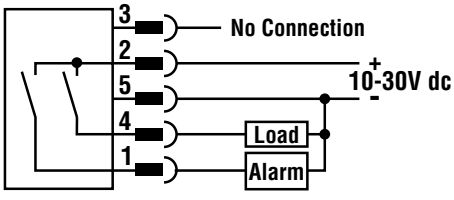
Model PC44BN6FP - NPN (Sinking) - Light Operate



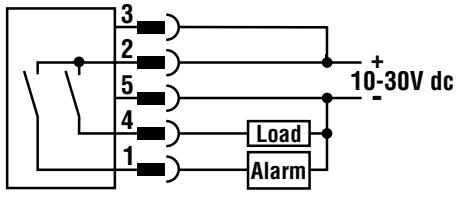
Model PC44BN6FP - NPN (Sinking) - Dark Operate



Model PC44BP6FP - PNP (Sourcing) - Light Operate

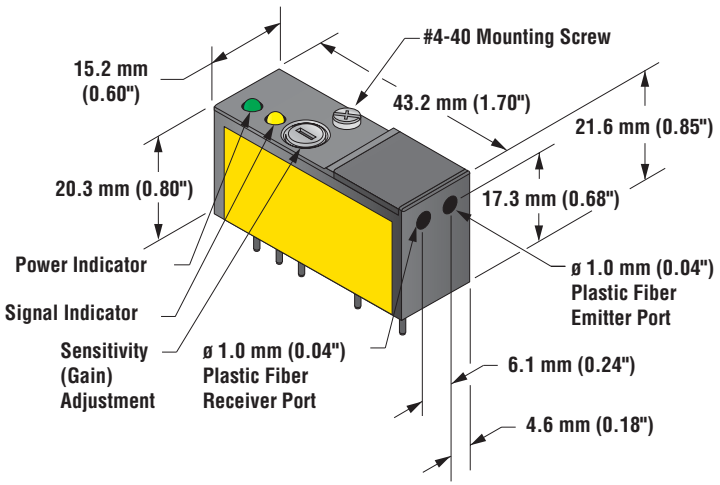


Model PC44BP6FP - PNP (Sourcing) - Dark Operate

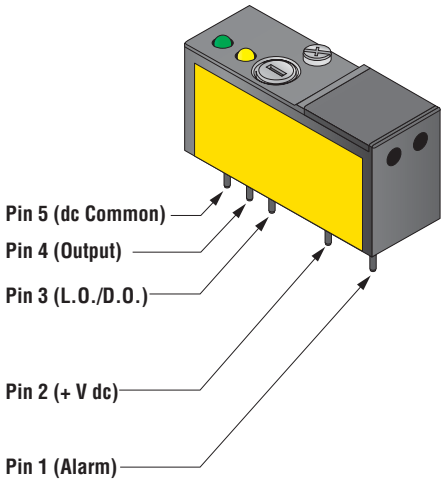


PC44 Series Dimensions

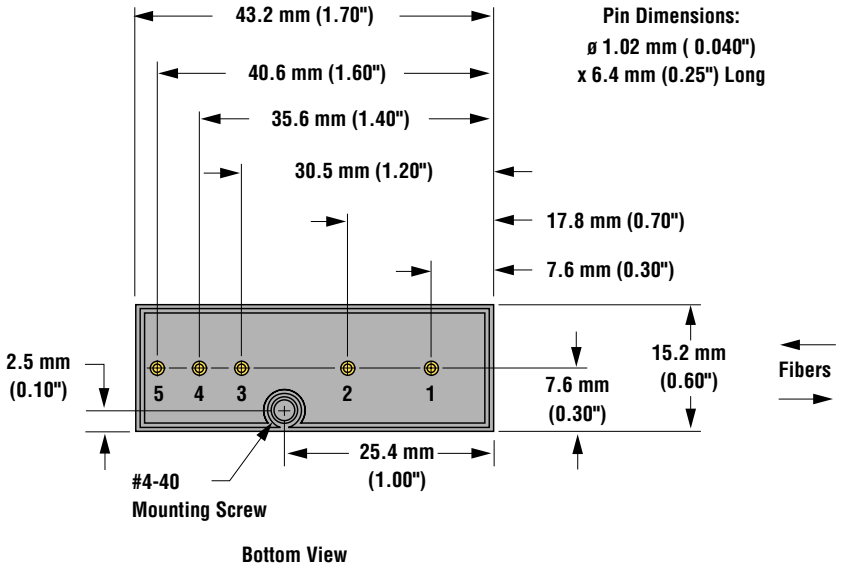
PC44 Series Modules Dimensions & Features



PC44 Series Modules Pin Identification



PC44 Series Modules Dimensions & Pin Locations



Bottom View

D10 *Expert* Series Sensors

Advanced fiber optic sensors for use with plastic fibers.

- Easy-to-set automatic *Expert*-style TEACH options* including static, dynamic, and single-point programming plus manual adjustment for fine-tuning
- 16-bit microcontroller and 12-bit analog-to-digital converter for high-performance, low-contrast sensing
- Easy-to-read 4-digit display for programming and signal strength readout, plus indicators for a continuous readout of operating status (user configurable)
- Four-mode power and speed selection with automatic cross-talk avoidance circuitry
- Selectable OFF-delay options
- Gate input wire can be used to selectively inhibit sensor outputs from switching
- Models available with visible red (680 nm) or visible green (525 nm) sensing beam
- Sleek, ultra-slim 10 mm housing, mounts to a standard 35 mm DIN rail

* U.S. Patent #5,808,296

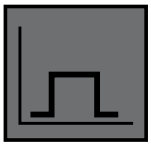
Protective cover.
A transparent dust cover allows you to see the display while it protects the sensor from dust and other contaminants. A captive hinge holds the cover open until it is manually closed.

LED diagnostics.
Indicator LEDs keep you constantly informed of the output status of the D10 sensors. A separate, domed LED for each channel lights yellow when the output is conducting.

Two independently configurable outputs in each sensor.
For the ultimate in versatility, the D10 *Expert* is available with two independent output channels, each with its own individually configurable setpoint. This allows you to solve multiple applications with a single sensor.

Two discrete outputs both can be either NPN (sinking) or PNP (sourcing), depending on model.

Analog and discrete output models have one discrete output (either NPN or PNP), plus a 4-20 mA current analog output or a 0-10V dc voltage analog output, depending on the model.

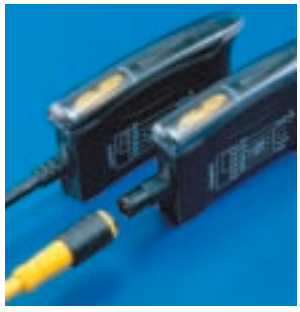


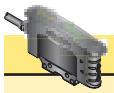
Discrete

Analog

Prewired or quick-disconnect wiring, 12 to 24V dc.*
The D10 has the wiring choices you need. Models are available with an integral, 2 m or 9 m (6' or 30') prewired cable or Pico-style quick-disconnect connection for plug-and-play convenience and interchangeability.

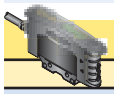
*15 to 24V dc for 0-10V dc analog models





D10 *Expert* Series Plastic Fiber Optic - Dual-Discrete Output Models

	Models	Cable	Supply Voltage	Output Type	Range Specifications*
VISIBLE RED 680 nm	D10DNFP D10DNFPQ	2 m (6.5') cable 6-pin Pico-style QD	12 to 24V dc	NPN (sinking)	Range varies by power level/speed selection and with fiber optics used.
	D10DPFP D10DPFPQ	2 m (6.5') cable 6-pin Pico-style QD		PNP (sourcing)	
VISIBLE GREEN 525 nm	D10DNFPG D10DNFPGQ	2 m (6.5') cable 6-pin Pico-style QD	12 to 24V dc	NPN (sinking)	Range varies by power level/speed selection and with fiber optics used.
	D10DPFPG D10DPFPGQ	2 m (6.5') cable 6-pin Pico-style QD		PNP (sourcing)	



D10 *Expert* Series Plastic Fiber Optic - Analog and Discrete Output Models

	Models	Cable	Supply Voltage	Discrete Output	Analog Output	Range Specifications*
VISIBLE RED 680 nm	D10INFP D10INFPQ	2 m (6.5') cable 6-pin Pico-style QD	12 to 24V dc	NPN (sinking)	4-20 mA	Range varies by power level/speed selection and with fiber optics used.
	D10IPFP D10IPFPQ	2 m (6.5') cable 6-pin Pico-style QD	12 to 24V dc	PNP (sourcing)	4-20 mA	
	D10UNFP D10UNFPQ	2 m (6.5') cable 6-pin Pico-style QD	15 to 24V dc	NPN (sinking)	0-10V	
	D10UPFP D10UPFPQ	2 m (6.5') cable 6-pin Pico-style QD	15 to 24V dc	PNP (sourcing)	0-10V	
VISIBLE GREEN 525 nm	D10INFPG D10INFPGQ	2 m (6.5') cable 6-pin Pico-style QD	12 to 24V dc	NPN (sinking)	4-20 mA	Range varies by power level/speed selection and with fiber optics setpoints.
	D10IPFPG D10IPFPGQ	2 m (6.5') cable 6-pin Pico-style QD	12 to 24V dc	PNP (sourcing)	4-20 mA	
	D10UNFPG D10UNFPGQ	2 m (6.5') cable 6-pin Pico-style QD	15 to 24V dc	NPN (sinking)	0-10V	
	D10UPFPG D10UPFPGQ	2 m (6.5') cable 6-pin Pico-style QD	15 to 24V dc	PNP (sourcing)	0-10V	

For D10 *Expert* Series:
i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **D10DNFP W/30**).
ii) A model with a QD connector requires an accessory mating cable. See Accessories section for more information.

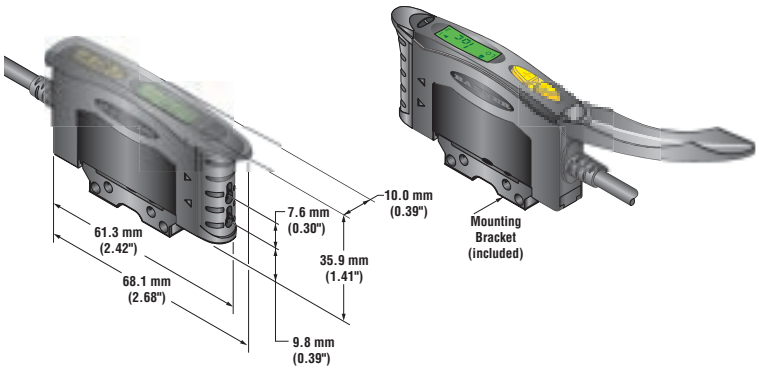
*See Fiber Optic Section, pages 108-135 for range information.

D10 *Expert* Sensing Mode Options

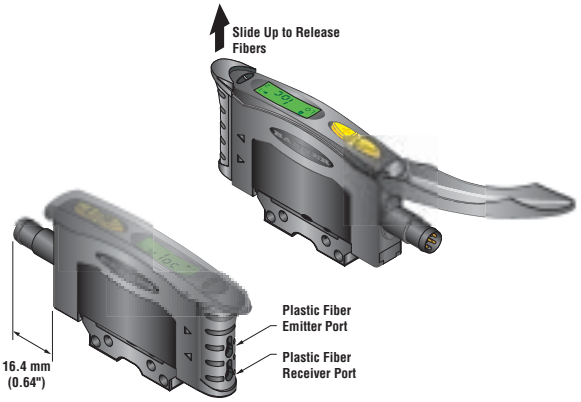
Plastic Fiber Optic

Dimensions

D10 Series with Cable Attached



D10 Series with Quick-Disconnect



D10 *Expert* Series Specifications

Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 108)
Supply Voltage and Current	**Dual-Discrete:** 12 to 24V dc (10% maximum ripple) at less than 65 mA, exclusive of load **4-20 mA Analog and Dual-Discrete Models:** 12 to 24V dc (10% maximum ripple) at less than 65 mA, exclusive of load **0-10V dc Analog Models:** 15 to 24V dc (10% maximum ripple) at less than 70 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	**Two independently configurable outputs, depending on model:** NPN w/analog (4-20 mA or 0-10V) or PNP w/analog (4-20 mA or 0-10V) **Dual Discrete Model:** 2 NPN or 2 PNP, depending on model
Output Rating	**Discrete Output:** 150 mA maximum load **OFF-state leakage current:** < 10 µA at 24V dc **ON-state saturation voltage:** NPN < 1.5V at 150 mA load PNP < 2.5V at 150 mA load **Analog Output:** 4-20 mA or 0-10V dc **Load:** 4-20 mA Models: 100Ω max. impedance 0-10V dc Models: 1 MΩ max. impedance
Output Protection Circuitry	Protected against false pulse on power-up and continuous short-circuit
Output Response Time	**Discrete Output:** Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds **Analog Output:** 1 millisecond NOTE: 150 millisecond delay on power-up; outputs do not conduct during this time
Adjustments	Push-button or remote programming of response time, OFF-delay, light-dark operate, and display
Indicators	Four-digit digital display plus LCD indicators for active channel, push-button lockout, OFF-delay and light/dark operate selection. LCD backlight (red for PROGRAM mode or green for RUN mode) indicates Power ON. Two amber output indicators.
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	NEMA 1, IEC IP50
Connections	PVC-jacketed 2 m or 9 m (6.5' or 30') 6-wire integral cable or integral 6-pin Pico-style quick-disconnect
Operating Temperature	**Temperature:** -20° to +55° C (-4° to +131° F) **Storage Temperature:** -20° to +80° C (-4° to +175° F) **Maximum relative humidity:** 90% @ 50° C (non-condensing)

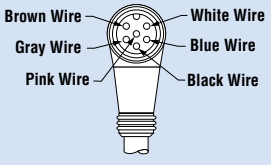
Number of Devices, Stacked	Ambient Temperature Rating	Load Specification
3	55° C	150 mA
7	50° C	50 mA
10	45° C	50 mA

Installation	35 mm DIN rail or included mounting bracket

The following is a selection of cables available for the D10 QD models.

Quick-Disconnect Cables

Style	Model	Length	Connector	Pin-out
6-pin Pico	**PKG6Z-2**	2 m (6.5')	Straight	**6-Pin Pico-Style Pin-out (Connector on Cable Shown)**
	PKG6Z-9	9 m (30')	Straight	
	PKW6Z-2	2 m (6.5')	Right-Angle	
	PKW6Z-9	9 m (30')	Right-Angle	



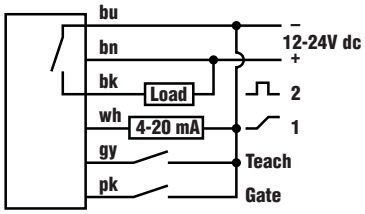
Modifications

Model Suffix	Modification	Description	Example of Model Number
W/30	9 m (30') Cable	All D10 sensors may be ordered with an integral 9 m (30') cable in place of the standard 2 m (6.5') cable	**D10DNFP W/30**

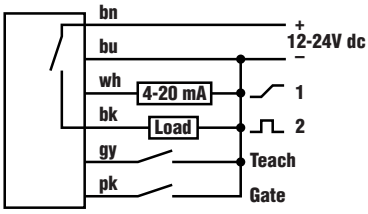
D10 *Expert* Series Hookup Diagrams

Analog and Discrete Outputs

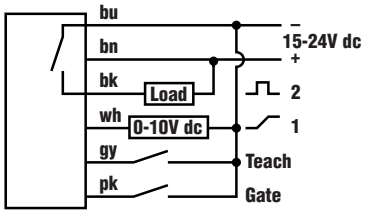
D10INFP(Q)



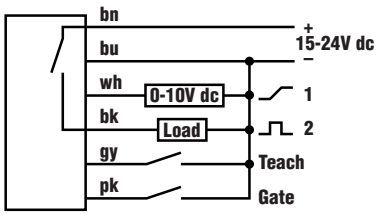
D10IPFP(Q)



D10UNFP(Q)

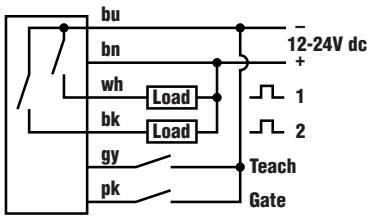


D10UPFP(Q)

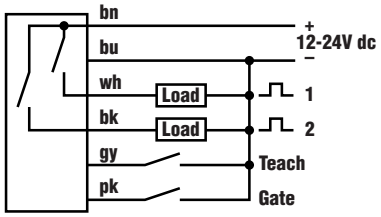


Dual-Discrete Outputs

D10DNFP(Q)



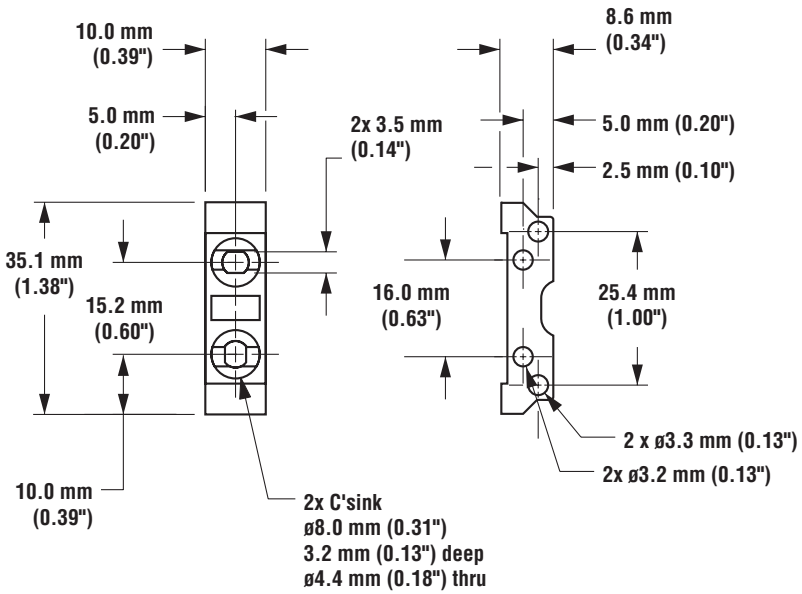
D10DPFP(Q)



NOTE: QD hookups are identical

For D10 *Expert* Series:
i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **D10INFP W/30**).
ii) A model with a QD connector requires an accessory mating cable. See Accessories section for more information.

Mounting Bracket (included with sensor)



D11 Series Sensors

D11 *Expert* Series–economical TEACH-mode fiber optic sensors.
With available red, green, blue and white LEDs, D11 fiber optic sensors provide powerful, compact, DIN-rail-mountable options for sensing and registration control. They are low-cost, high-power, plastic fiber optic sensors with fast 0.2 millisecond response time. D11 *Expert* models feature push-button programming to "teach" dark and light sensing conditions in low-contrast applications.

- Easy push-button TEACH-mode programming automatically adjusts sensitivity to optimal setting
- Designed for high performance, even in low-contrast sensing applications (sensitivity set to just above the "dark" condition)
- D11E Series sensors set the switching point midway between the "dark" and "light" conditions to ignore subtle changes, such as web flutter
- Fast, 200 microsecond (0.2 millisecond) output response; a 40 millisecond output pulse stretcher may be programmed, when needed
- Choose models with NPN (sinking) or PNP (sourcing) output
- Output may be programmed for either light or dark operate
- Sealed one-button programming† assures security of settings
- LED status indications for Power ON, output state, received signal strength, sensing contrast, and diagnostic trouble conditions
- Choose models with integral 2 m (6.5') cable or Pico-style quick-disconnect (QD) connector; 9 m (30') cables are also available

†U.S. Patent #5808296

D11 Series–self-contained fiber optic sensors:
D11 standard sensors feature a 15-turn sensitivity adjustment. LEDs indicate Power ON and Output ON, and flash to warn of problems including overloaded output and marginal excess gain. They feature overload, shorted load and low voltage protection, and automatically reset when the problem is cleared.

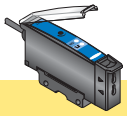
- Choice of NPN (sinking) or PNP (sourcing) complementary outputs—one normally open and one normally closed; 150 mA output load rating
- Normally closed output may be wired as a diagnostic alarm to alert personnel to marginal sensing conditions†
- 500 microsecond (0.5 millisecond) output response
- LED status indications for Power ON, Output Overload, Fiber Alignment, and Marginal Gain conditions†
- Choose models with integral 2 m (6.5') cable or Pico-style quick-disconnect (QD) connector; 9 m (30') cables are also available

†U.S. Patent #5087838

D11 Series Sensing Mode Options

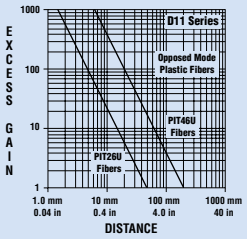
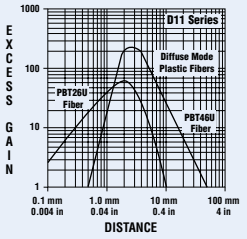
Plastic Fiber Optic

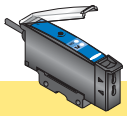
For complete listings of Banner's extensive product lines, go to www.bannerengineering.com



D11 Series Plastic Fiber Optic Models*

Visible red, 680 nm

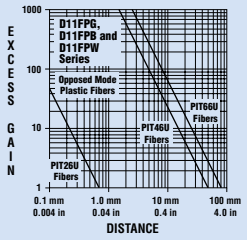
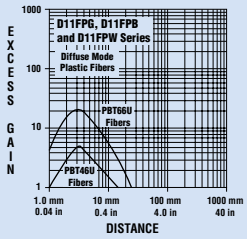
Models	Range	Cable	Supply Voltage	Output Type	Excess Gain
D11SN6FP **D11SN6FPQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking)	Diffuse mode performance based on 90% reflectance white test card 
D11SP6FP **D11SP6FPQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary PNP (sourcing)	



Models with green, blue, or white LED light source are recommended for color mark sensing.
Contact your local or factory sales engineer for model selection assistance.

D11 Series Plastic Fiber Optic Models*

See sensing beam information above

	Models	Range	Cable	Supply Voltage	Output Type	Excess Gain
VISIBLE GREEN 525 nm	**D11SN6FPG** **D11SN6FPGQ** **D11SP6FPG** **D11SP6FPGQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD 2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking) Complementary PNP (sourcing)	Diffuse mode performance based on 90% reflectance white test card 
VISIBLE BLUE 470 nm	**D11SN6FPB** **D11SN6FPBQ** **D11SP6FPB** **D11SP6FPBQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD 2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking) Complementary PNP (sourcing)	
VISIBLE WHITE 450-650 nm	**D11SN6FPW** **D11SN6FPWQ** **D11SP6FPW** **D11SP6FPWQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD 2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking) Complementary PNP (sourcing)	

***The above charts also reflect D11 *Expert* Series Plastic Fiber Optic Information. See Fiber Optic Section, pages 108-135 for range information.**
For D11 *Expert* Series model numbers, substitute the "S" with an "E or E2" (e.g., D11**S**N6FP refers to D11 Series model, D11**E**NSFP refers to D11 *Expert* Series model).

i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g. - **D11SN6FP W/30**)
ii) A model with a QD connector requires an accessory mating cable. See Accessories section for more information.
iii) 5V dc models are available. Contact factory for more information.

D11 Standard Series Specifications

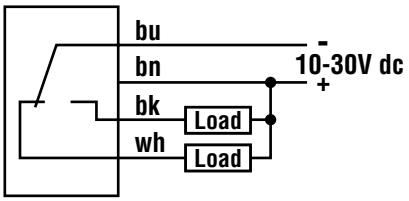
Supply Voltage and Current	10 to 30V dc at 25 mA (exclusive of load current)
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	Complementary: one normally open (N.O.) and the other normally closed (N.C.); N.C. output may be wired as diagnostic alarm output by reversing power supply connections† (see Hookups); outputs are NPN (sinking) or PNP (sourcing), depending on model † U.S. Patent #5087838 Diagnostic alarm output energizes whenever excess gain falls to between 1x and 1.5x in the light condition; this output corresponds to flashing yellow indicator LED
Output Rating	150 mA maximum (each output); the total load may not exceed 150 mA **Off-state leakage current:** <5 microamps at 30V dc **On-state saturation voltage** <1V at 10 mA dc; <1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up (false pulse protection circuit causes a 100 millisecond delay on power-up); short circuit protected
Output Response Time	500 microseconds ON and OFF
Repeatability	160 microseconds; response time and repeatability are independent of signal strength
Adjustments	Sensitivity control on top of housing (15-turn slotted brass screw, clutched at both ends of travel)
Indicators	Two LEDs: Green and Yellow **Green glowing steady:** power to sensor is ON **Green flashing:** output is overloaded **Yellow glowing steady:** normally open output is conducting **Yellow flashing:** marginal excess gain (1-1.5x) in light condition, alarm output ON
Construction	Black ABS housing with acrylic cover; stainless steel M3 x 0.5 hardware for use with ABS mounting bracket (supplied); requires PI or PB Series plastic fiber cable
Environmental Rating	IEC IP54; NEMA 2
Connections	2 m (6.5') or 9 m (30') attached cable, or 4-pin Pico-style quick-disconnect fitting; cables for QD models are purchased separately
Operating Conditions	**Temperature:** -20° to +55° C (-4° to +131° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE c UL us

D11 *Expert* Series Specifications

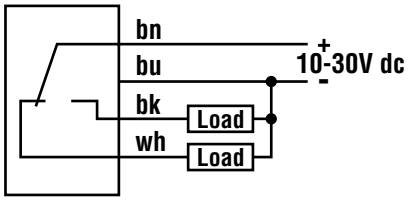
Supply Voltage and Current	10 to 30V dc (10% maximum ripple) at less than 45 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	One (SPST) NPN (sinking) or PNP (sourcing) open-collector transistor, depending on model; programmable for light or dark operate
Output Rating	150 mA maximum; **Off-state leakage current:** <5 microamps at 30V dc **On-state saturation voltage:** <1V at 10 mA dc; <1.5V at 150 mA dc
Output Protection Circuitry	Protected against false pulse on power-up and continuous overload or short circuit
Output Response Time	200 microseconds (0.2 milliseconds) “ON” and “OFF” (40 milliseconds “OFF” when pulse stretcher is programmed) NOTE: 100 millisecond delay on power-up: output is non-conducting during this time
Output Timing Functions	ON/OFF (no delay) or fixed 40 millisecond OFF-delay pulse stretcher; selected by push-button
Repeatability	65 microseconds
Adjustments	Push-button TEACH-mode sensitivity setting; remote teach input is provided
Indicators	Three LEDs: Green, Yellow and Red **Green LED:** lights for dc power “ON” and flashes when ready to register sensing condition during TEACH mode; 1 Hz when waiting to learn first sensing condition; 2 Hz when waiting to learn second sensing condition, 4 Hz when output is overloaded **Yellow LED:** lights for output “ON” (conducting) **Red LED:** is Banner's patented Alignment Indicating Device (AID™, U.S. patent #4356393) which lights whenever the sensor "sees" a light condition and superimposes a pulse rate which is proportional to the strength of the received light signal (the stronger the signal, the faster the pulse rate)
Construction	Black ABS housing with acrylic cover; stainless steel M3 x 0.5 hardware for use with ABS (Cycolac® KJB) mounting bracket (supplied); requires PI or PB Series plastic fiber cable
Environmental Rating	IEC IP54; NEMA 2
Connections	2 m (6.5') or 9 m (30') attached cable, or 4-pin Pico-style quick-disconnect fitting; cables for QD models are purchased separately
Operating Conditions	**Temperature:** -10° to +55° C (+14° to +131° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)
Certifications	CE c UL us

D11 Series Hookup Diagrams

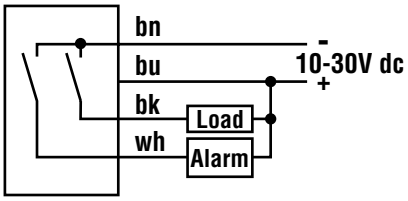
Sensors with NPN (Sinking) Outputs
Standard Hookup



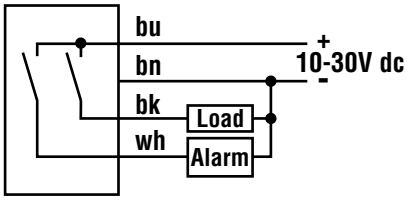
Sensors with PNP (Sourcing) Outputs
Standard Hookup



Alarm Hookup



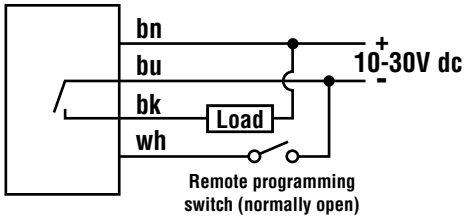
Alarm Hookup



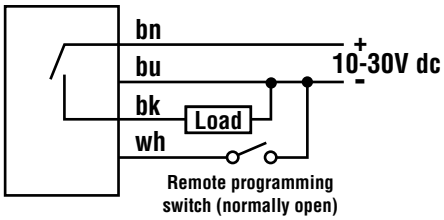
NOTE: Hookups are the same for either integral or QD cable

D11 *Expert* Series Hookup Diagrams

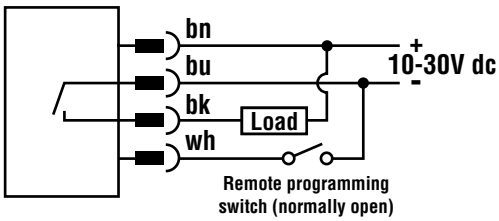
Sensors with NPN (Sinking) Outputs
with Attached Cable



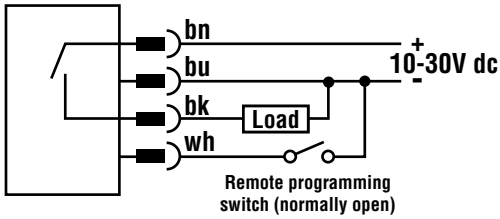
Sensors with PNP (Sourcing) Outputs
with Attached Cable



Sensors with NPN (Sinking) Outputs
with Quick-Disconnect



Sensors with PNP (Sourcing) Outputs
with Quick-Disconnect



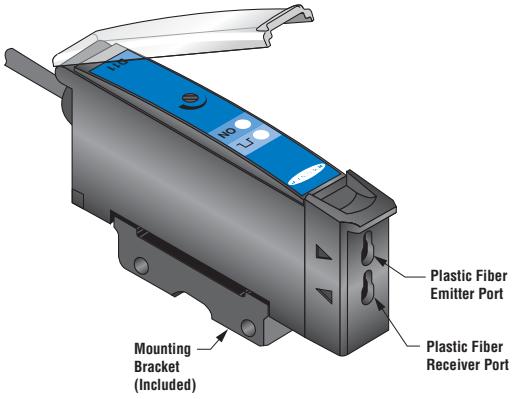
Quick-Disconnect (QD) Option

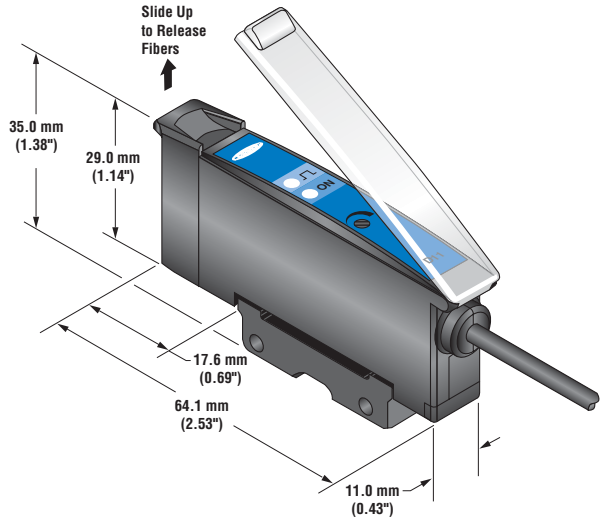
D11 *Expert* and standard series sensors are sold either with a 2 m (6.5') or 9 m (30') attached PVC-covered cable or with a 4-pin Pico-style QD cable fitting.

D11 *Expert* and standard series sensors are identified by the letter "Q" in their model number suffix. Mating cables for QD sensors are model PKG4-2 (straight connector) or PKW4-2 (right-angled connector). Cables are supplied in a standard length of 2 m (6.5').

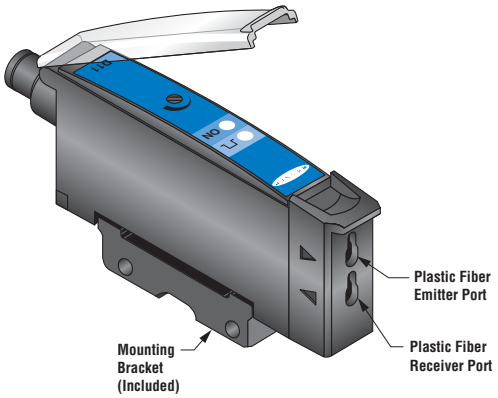
D11 Series Dimensions

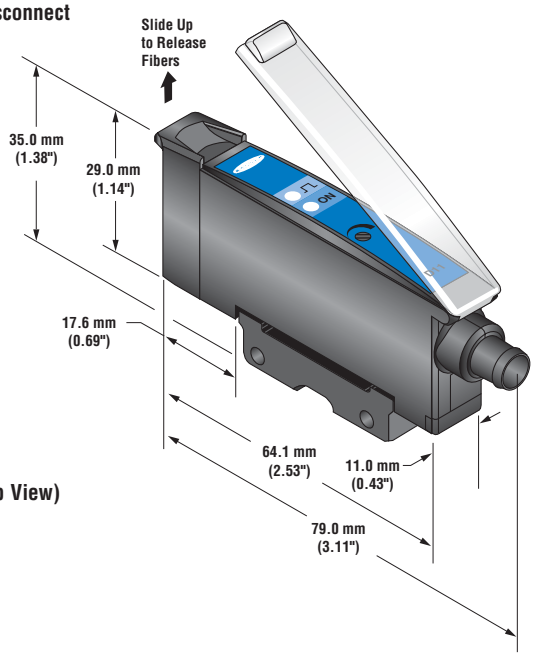
D11 Series with Cable Attached



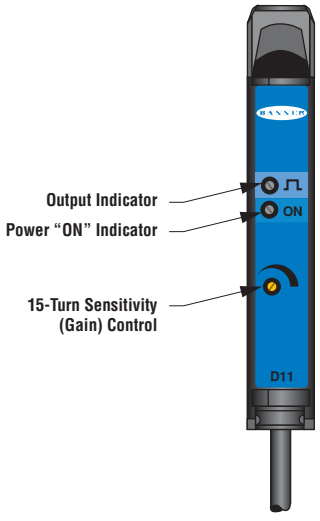


D11 Series with Quick-Disconnect



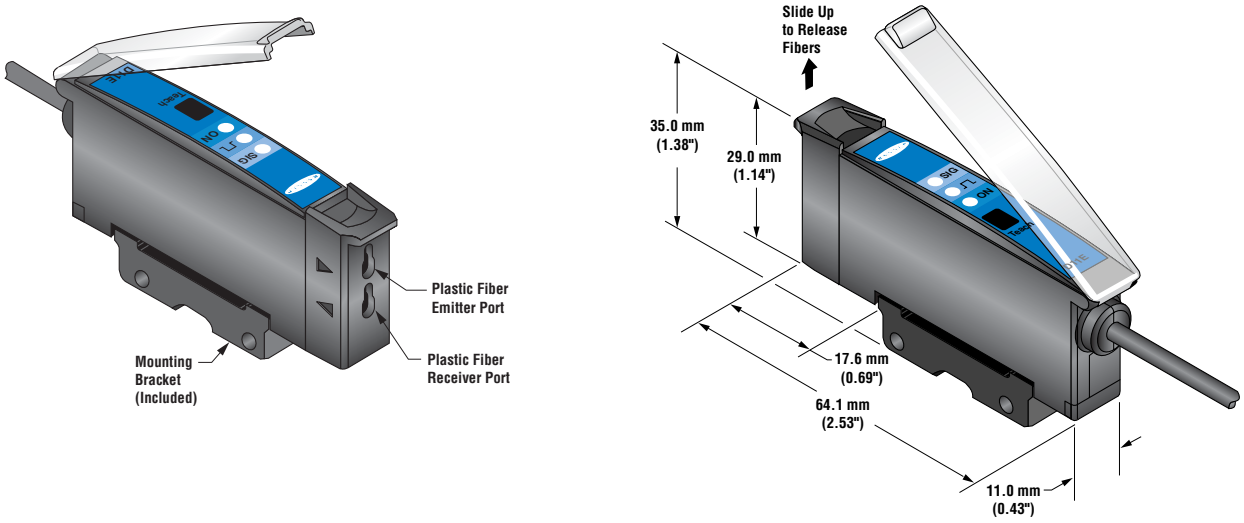


D11 Series Features (Top View)

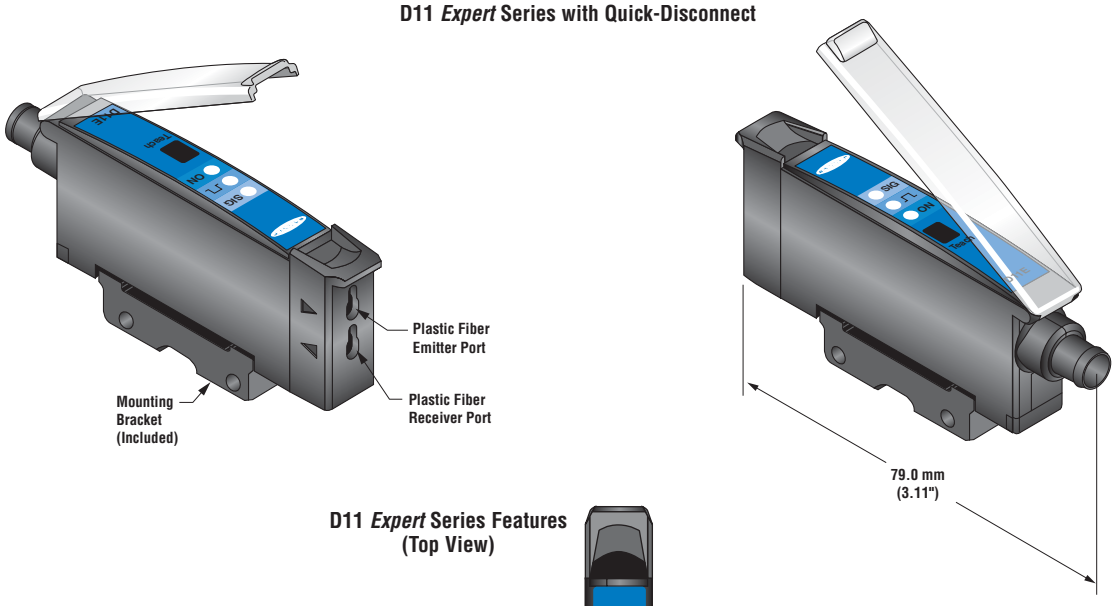


D11 *Expert* Series Dimensions

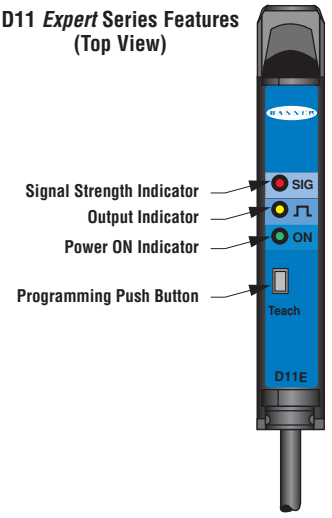
D11 *Expert* Series with Cable Attached



D11 *Expert* Series with Quick-Disconnect

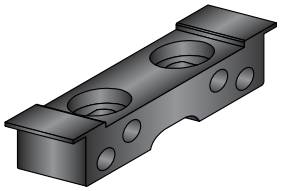


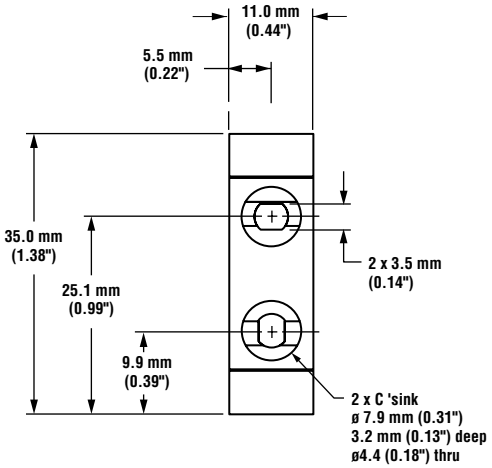
D11 *Expert* Series Features (Top View)

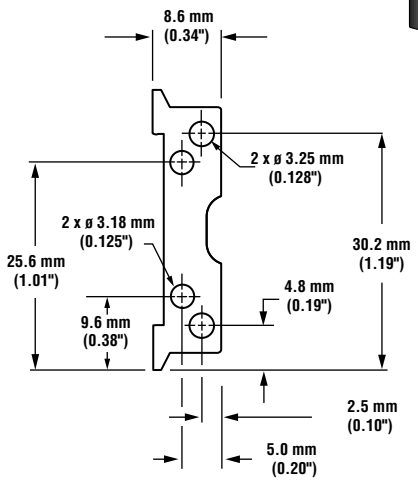


Mounting Bracket (included with sensor)

D11 & D11E Sensors mount directly to a standard 35 mm DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware

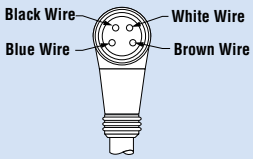






The following is a selection of cables available for the D11 QD models.

Quick-Disconnect Cables

Style	Model	Length	Connector	Pin-out
4-pin Pico-style	**PKG4-2** **PKW4-2**	2 m (6.5') 2 m (6.5')	Straight Right-Angle	

Modifications

Model Suffix	Modification	Description	Example of Model Number
W/30	9 m (30') Cable	All D11 and D11 *Expert* sensors may be ordered with an integral 9 m (30') cable in place of the standard 2 m (6.5') cable	**D11EN6FP W/30**

D12 Series Sensors

Standard, high-speed and high-power sensors.

- Models for use with either Banner glass or plastic fiber optic assemblies
- Standard models have fast 500 microsecond (0.5 millisecond) output response; high-speed models (model suffix “Y” or “Y1”) have selectable 500 or 50 microsecond response
- Choice of either NPN (sinking) or PNP (sourcing) complementary outputs; 150 mA output load rating
- Normally closed output of standard models may be wired as a diagnostic alarm output to alert personnel of marginal sensing conditions*
- 7-segment LED bargraph† (all models) indicates: received signal strength, output overload, and marginal signal strength (NOTE: bargraph is inoperative in the 50 microsecond mode of high speed models)
- Separate LED indicators for sensor power and output status
- “Y1” suffix high-speed models include a 20 millisecond output pulse stretcher
- Choose models with integral 2 m (6.5') cable or 150 mm (6") Pico-style pigtail quick-disconnect; 9 m (30') cables are also available

D12 *Expert* TEACH-mode fiber optic sensors.

- Easy TEACH-mode programming automatically adjusts sensitivity to optimal setting*
- D12E sensors are designed for low-contrast sensing applications (switching threshold set to just above the “dark” condition)
- D12E2 sensors set their switching threshold midway between “dark” and “light” conditions to ignore subtle changes, such as web flutter
- Models for either plastic or glass fiber optics; choose models with NPN (sinking) or PNP (sourcing) output

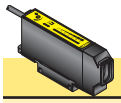
- Fast 200 microsecond sensing response; a 40 millisecond pulse stretcher may be programmed, when needed
- Output may be programmed for either light- or dark-operate
- Secure one-button programming is easy to use; one button sets both TEACH and sensor configuration settings
- Separate input for remote sensor programming by external switch, such as a switch or process controller
- 7-segment LED bargraph† indicates relative received signal strength and sensing contrast, programming status and diagnostic trouble warnings
- Dedicated alarm output for signaling marginal sensing conditions

AC-coupled sensors.

- Highly sensitive to very small signal change; fast response
- Automatic gain control circuit continually adjusts emitter output to maintain system gain
- Ideal for low-contrast applications such as web flaw, thread break and falling part detection
- Bipolar outputs: one NPN (sinking) and one PNP (sourcing)
- LED indicators for sensor power, output status and AGC lock condition
- Selectable light- or dark-operate; no false pulse on power-up
- Adjustable output pulse time
- Models for both plastic and glass fiber optics

*U.S. Patent #5808296
† U.S. Patent #4965548

For complete listings of Banner’s extensive product lines, go to www.bannerengineering.com



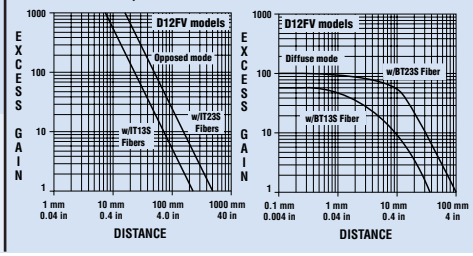
D12 Standard Series Glass Fiber Optic Models (500 µs Output Response)

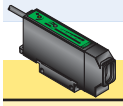
Visible red, 680 nm

Models	Range*	Cable	Supply Voltage	Output Type
D12SN6FV **D12SN6FVQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking)
D12SP6FV **D12SP6FVQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary PNP (sourcing)

Excess Gain

Diffuse mode performance based on 90% reflectance white test card



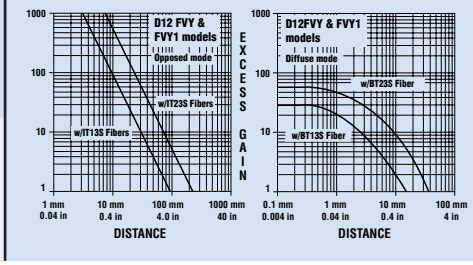


D12 High-Speed Series Glass Fiber Optic Models (50 µs or 500 µs Output Response)

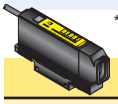
Models	Range	Cable	Supply Voltage	Output Type
D12SN6FVY **D12SN6FVYQ** **D12SN6FVY1*** **D12SN6FVY1Q***	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD 2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking)
D12SP6FVY **D12SP6FVYQ** **D12SP6FVY1*** **D12SP6FVY1Q***	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD 2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary PNP (sourcing)

Excess Gain

Diffuse mode performance based on 90% reflectance white test card



* Y1 models have 20 ms output pulse stretcher



D12 *Expert* Series Glass Fiber Optic Models

Models	Switching Threshold	Cable	Supply Voltage	Output Type
D12EN6FV **D12EP6FV**	Just above the "dark" condition	2 m (6.5') 2 m (6.5')	10 to 30V dc	NPN (sinking) PNP (sourcing)
D12E2N6FV **D12E2P6FV**	Midway between "dark" and "light" conditions	2 m (6.5') 2 m (6.5')	10 to 30V dc	NPN (sinking) PNP (sourcing)

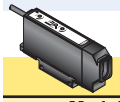
Maximum Range*

Diffuse mode performance based on 90% reflectance white test card

Range varies by sensing mode and fiber optics used:
IT23S fibers, opposed mode: 930 mm (36.6")*
IT13S fibers, opposed mode: 442 mm (17.4")

BT23S fiber, diffuse mode: 178 mm (7.0")
BT13S fiber, diffuse mode: 68 mm (2.7")

* Opposed-mode range may be extended using optional lenses (see accessories in the Glass Fiber Optic section).



D12 AC-Coupled Series Glass Fiber Optic Models (50 µs Output Response)

Models	Range	Cable	Supply Voltage	Output Type
D12DAB6FV **D12DAB6FVQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico Pigtail QD	10 to 30V dc	Bipolar NPN/PNP

Maximum Range

Diffuse mode performance based on 90% reflectance white test card

IT23S fibers, opposed mode: 200 mm (8")*
IT13S fibers, opposed mode: 75 mm (3")

BT23S fiber, diffuse mode: 60 mm (2.5")
BT13S fiber, diffuse mode: 25 mm (1")

* Opposed-mode range may be extended using optional lenses (see accessories in the glass fiber optic section).

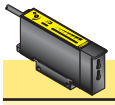
i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **D12SP6FV W/30**).
ii) Quick-disconnect models (suffix "Q") have a 150 mm (6") long pigtail cable with a Pico-style connector.
iii) A model with a QD connector requires an accessory mating cable. See page 107 for more information.

*See Fiber Optic Section, pages 108-135 for range information.

D12 *Expert* Sensing Mode Options

Glass and Plastic Fiber Optic

D12 Series Sensors

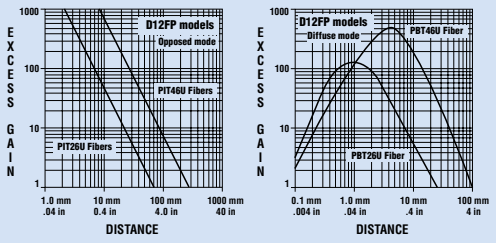


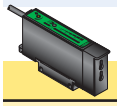
D12 Standard Series Plastic Fiber Optic Models (500 µs Output Response)

Models	Range*	Cable	Supply Voltage	Output Type
D12SN6FP **D12SN6FPQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking)
D12SP6FP **D12SP6FPQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary PNP (sourcing)

Excess Gain

Diffuse mode performance based on 90% reflectance white test card



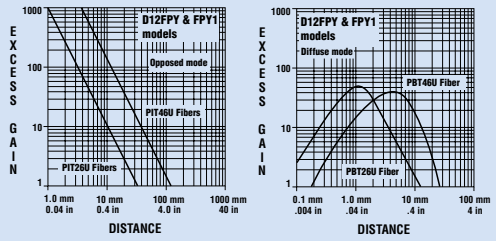


D12 High-Speed Series Plastic Fiber Optic Models (50 µs or 500 µs Output Response)

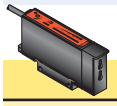
Models	Range	Cable	Supply Voltage	Output Type
D12SN6FPY **D12SN6FPYQ** **D12SN6FPY1*** **D12SN6FPY1Q***	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD 2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking)
D12SP6FPY **D12SP6FPYQ** **D12SP6FPY1*** **D12SP6FPY1Q***	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD 2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary PNP (sourcing)

Excess Gain

Diffuse mode performance based on 90% reflectance white test card



*Y1 models have 20 ms output pulse stretcher

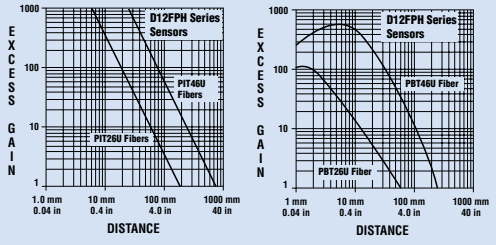


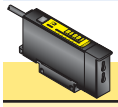
D12 High-Power Series Plastic Fiber Optic Models (500 µs Output Response)

Models	Range	Cable	Supply Voltage	Output Type
D12SN6FPH **D12SN6FPHQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary NPN (sinking)
D12SP6FPH **D12SP6FPHQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico QD	10 to 30V dc	Complementary PNP (sourcing)

Excess Gain

Diffuse mode performance based on 90% reflectance white test card





D12 *Expert* Series Plastic Fiber Optic Models

Models	Switching Threshold	Cable	Supply Voltage	Output Type
D12EN6FP **D12EP6FP**	Just above the "dark" condition	2 m (6.5')	10 to 30V dc	NPN (sinking) PNP (sourcing)
D12E2N6FP **D12E2P6FP**	Midway between "dark" and "light" conditions	2 m (6.5')	10 to 30V dc	NPN (sinking) PNP (sourcing)

Range*

Diffuse mode performance based on 90% reflectance white test card

Range varies by sensing mode and fiber optics used:
PIT46U fibers, opposed mode: 315 mm (12.4")*
PIT26U fibers, opposed mode: 84 mm (3.3")

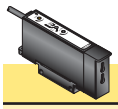
PBT46U fiber, diffuse mode: 95 mm (3.7")
PBT26U fiber, diffuse mode: 25 mm (1")

* Opposed-mode range may be extended using optional lenses (see accessories in the Plastic Fiber Optic section). See Fiber section for more range information.

i) 9 m (30') cables are available by adding suffix **"W/30"** to the model number of any cabled sensor (e.g., **D12SN6FPH W/30**).

ii) Quick-disconnect models (suffix "Q") have a 150 mm (6") long pigtail cable with a Pico-style connector.

*See Fiber Optic Section, pages 108-135 for range information.



D12 AC-Coupled Series Plastic Fiber Optic Models (50 µs Output Response)

Models	Range	Cable	Supply Voltage	Output Type	Maximum Range
D12DAB6FP **D12DAB6FPQ**	Range varies by sensing mode and fiber optics used	2 m (6.5') 4-pin Pico Pigtail QD	10 to 30V dc	Bipolar NPN/PNP	**Diffuse mode performance based on 90% reflectance white test card** PIT46U fibers, opposed mode: 76 mm (3")* PIT26U fibers, opposed mode: 13 mm (0.5") PBT46U fiber, diffuse mode: 25 mm (1") PBT26U fiber, diffuse mode: 5 mm (0.2") * Opposed-mode range may be extended using optional lenses (see accessories in the plastic fiber optic section).

D12 Standard, High-Speed, High-Power, *Expert* and AC-Coupled Series Specifications

Supply Voltage and Current	10 to 30V dc at 45 mA max. (exclusive of load); 10% maximum ripple
Supply Protection Circuitry	Protected against reverse polarity and transient voltages
Output Configuration	**Standard, High-Speed, High-Power Models:** Outputs are NPN (sinking) or PNP (sourcing), depending on model **Complementary:** one normally open (N.O.) and the other normally closed (N.C.); N.C.output may be wired as diagnostic alarm output by reversing power supply connections, except high speed "Y" and "Y1" suffix models (see hookups) ***Expert:*** **NPN** open collector (both outputs) or **PNP** open collector (both outputs), depending on model; **Load output:** N.O. and programmable light- or dark-operate; **Alarm output:** N.O. **AC-Coupled Models:** Bipolar: one NPN (current sinking) and one PNP (current sourcing) open-collector transistor
Output Rating	150 mA maximum each output **Off-state leakage current** less than 10 microamps at 30V dc **On-state saturation voltage** less than 1 volt at 10 mA dc and less than 1.5 volts at 150 mA dc **The total load may not exceed 150 mA**
Output Protection Circuitry	Protected against false pulse on power-up and short circuit of outputs
Output Response Time	**Standard and High-Power Models:** 500 microseconds on/off **High-Speed Models:** selectable 50 or 500 microseconds on/off ***Expert* Models:** 200 microseconds on/off (40 milliseconds OFF when OFF-delay selected) **AC-Coupled Models:** 50 microseconds on/off (NOTE: False pulse protection circuit causes a 0.1 second delay on power-up)
Output Operation Mode	***Expert* Models:** Light operate or dark operate: selected by push-button **AC-Coupled Models:** Light operate or dark operate: selected by switch
Output Timing Functions	**Standard, High-Speed, High-Power Models:** "Y1" models have fixed 20 ms pulse stretcher (off-delay) when 50 µs mode is used ***Expert* Models:** ON/OFF (no delay) or fixed 40 millisecond OFF-delay; selected by push-button **AC-Coupled Models:** Pulse output; adjustable from 1 to 70 milliseconds
Repeatability	**Standard, High-Speed, High-Power Models:** 130 microseconds; "Y" and "Y1" models have selectable 50 µs/500 µs response; repeatability in 50 µs mode is 15 µs ***Expert* Models:** 66 microseconds **AC-Coupled Models:** 15 microseconds ON
Adjustments	**Standard, High-Speed, High-Power and AC-Coupled Models:** Sensitivity control on top of sensor (15-turn slotted brass screw, clutched at both ends of adjustment); "Y" and "Y1" (high-speed models) also have a top-mounted Response Mode selector switch. ***Expert* Models:** Push-button TEACH-mode sensitivity setting; remote teaching input is also provided.

Specifications continued on next page.

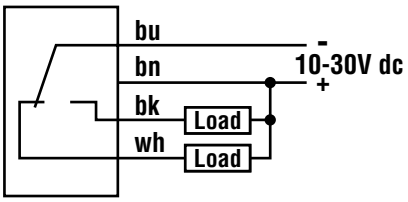
D12 Standard, High-Speed, High-Power, *Expert* and AC-Coupled Series Specifications, (Continued)

Indicators	**Standard, High-Speed, High-Power Models:** Two top-mounted LED indicators, one yellow and one green, and one 7-segment red LED moving dot bargraph. Note that the 7-segment bargraph and marginal excess gain indication (bargraph segment #7) are inoperative in the 50 µs response mode of "Y" and "Y1" models. **Green LED:** lights for DC Power ON **Yellow LED:** lights for Normally Open Output Conducting On all models in 500 µs response mode, the 7-segment moving dot red LED bargraph lights to indicate relative received light signal strength. On all models in 50 and 500 µs response mode, segment #1 flashes to indicate Output Overload. On all models in the 500 µs response mode, segment #7 flashes to indicate Marginal Excess Gain. On standard and high-power models, a flashing LED corresponds to the "ON" state of the alarm output (Alarm output not available on Y & Y1 models). ***Expert* Models:** **Green LED:** lights for DC power ON and flashes when ready for TEACH mode; 1 Hz when ready to learn first condition; 2 Hz for second condition **Yellow LED:** lights for load output ON (conducting) 7-segment moving dot red LED display indicates relative received light signal strength, output program settings, relative contrast level and alarms **AC-Coupled Models:** Three top-mounted LED indicators: **Green LED:** lights to indicate dc Power ON **Yellow LED:** lights for Output Conducting **Red LED:** lights whenever AGC system is locked onto the signal
Construction	Black ABS housing with acrylic cover, stainless steel M3 x 0.5 hardware for use with thermoplastic polyester mounting bracket (supplied); the plastic fiber clamping element is Delrin®
Environmental Rating	NEMA 4; IEC IP66
Connections	PVC-jacketed 2 m (6.5') or 9 m (30') cables or 150 mm 4-pin Pico-style quick-disconnect (QD) pigtail and *Expert* 5-pin Euro-style QD fittings are available. QD cables are ordered separately.
Operating Conditions	**Temperature:** -20° to +70° C (-5° to +158° F); **AC-Coupled Models:** -40° to +70° C (-40° to +158° F) **Maximum relative humidity:** 90% at 50° C (non-condensing)
Application Notes	D12 AC-coupled sensors should not be used in areas of known electrical "noise" or RF fields
Certification	**Standard, High-Speed, High-Power and *Expert* Models:** CE c UL us

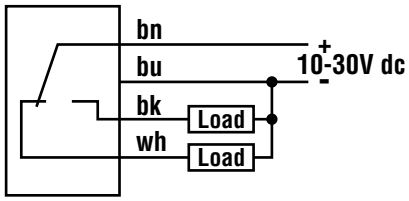
Delrin® is a registered trademark of Dupont

D12 Standard/High-Speed/High-Power Series Hookup Diagrams

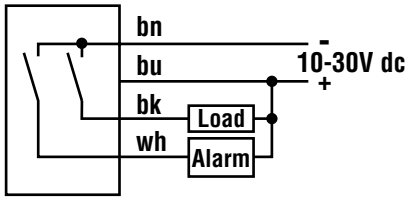
D12 Sensors with NPN (Sinking) Outputs
Standard Hookup



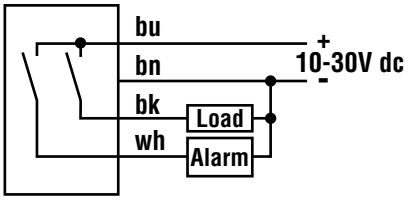
D12 Sensors with PNP (Sourcing) Outputs
Standard Hookup



Alarm Hookup*

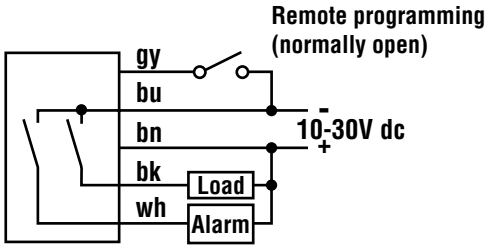


Alarm Hookup*

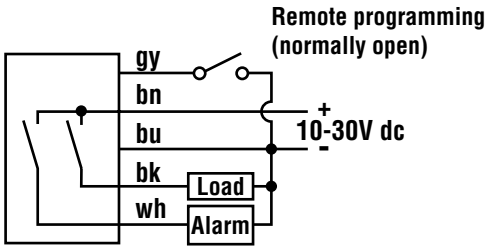


D12 *Expert* Series Hookup Diagrams

D12 *Expert* with NPN (Sinking) Outputs

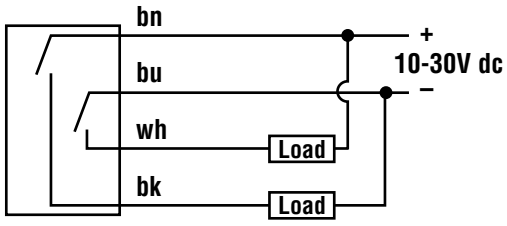


D12 *Expert* with PNP (Sourcing) Outputs

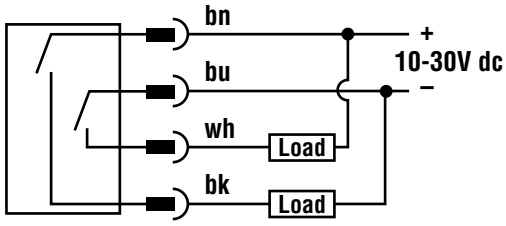


D12 AC-Coupled Series Hookup Diagrams

D12 AC-Coupled with Attached Cable



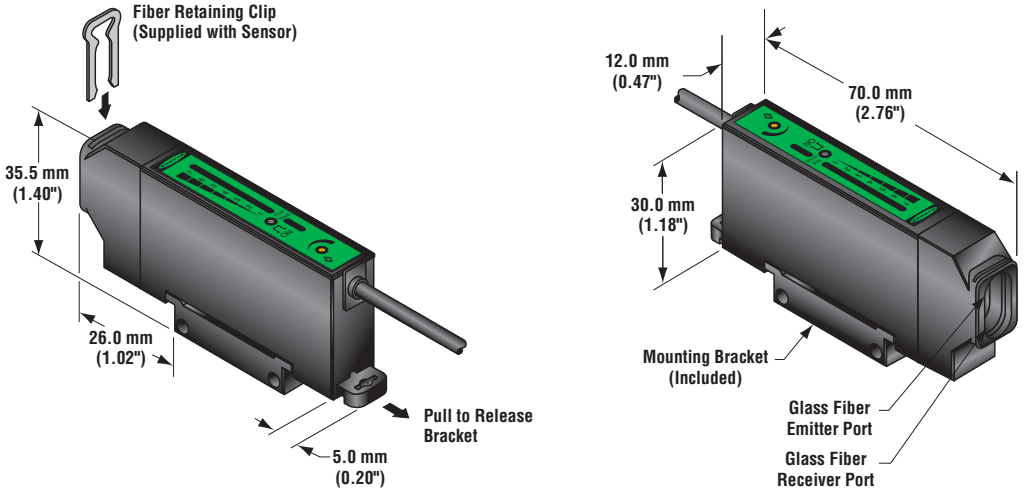
D12 AC-Coupled with Quick-Disconnect



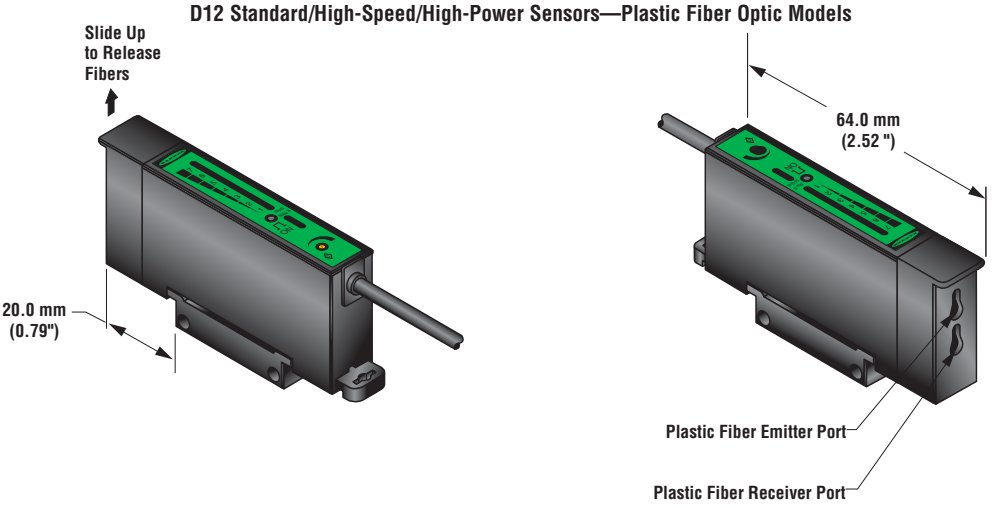
NOTE: Hookups are the same for either integral or quick-disconnect cable

D12 Standard/High-Speed/High-Power Series Dimensions

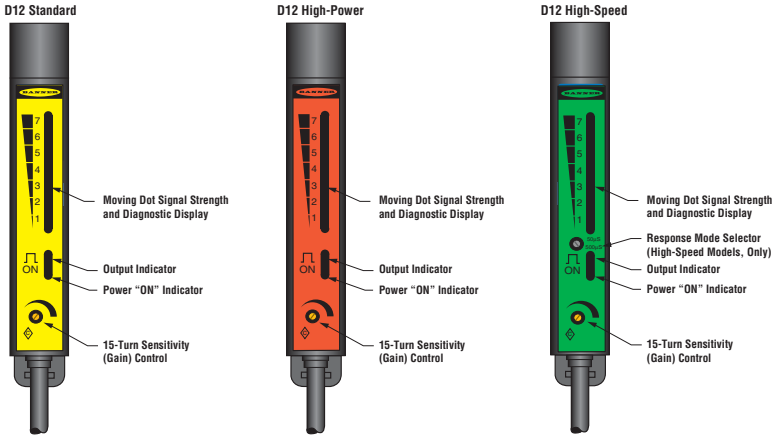
D12 Standard/High-Speed/High-Power Sensors—Glass Fiber Optic Models



D12 Standard/High-Speed/High-Power Sensors—Plastic Fiber Optic Models

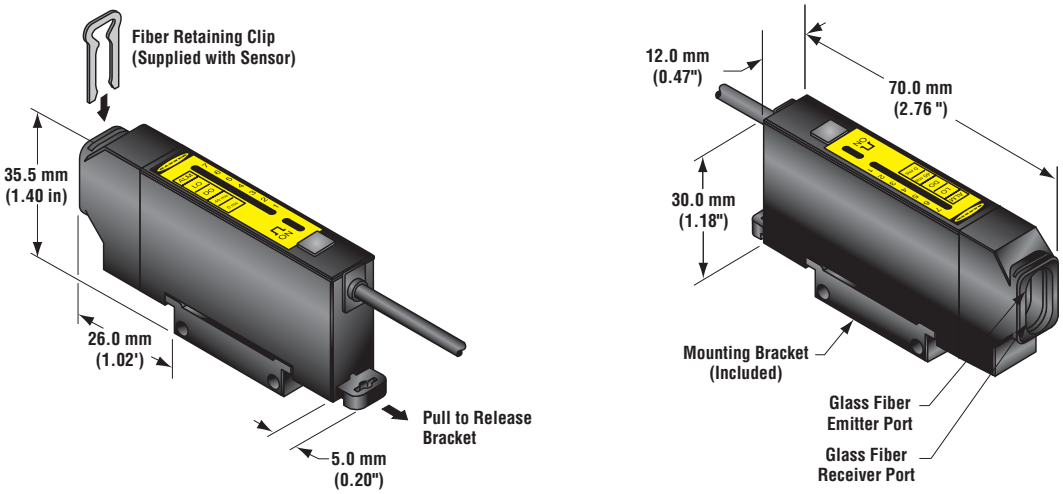


D12 Standard/High-Speed/High-Power Sensors Features (Top View)

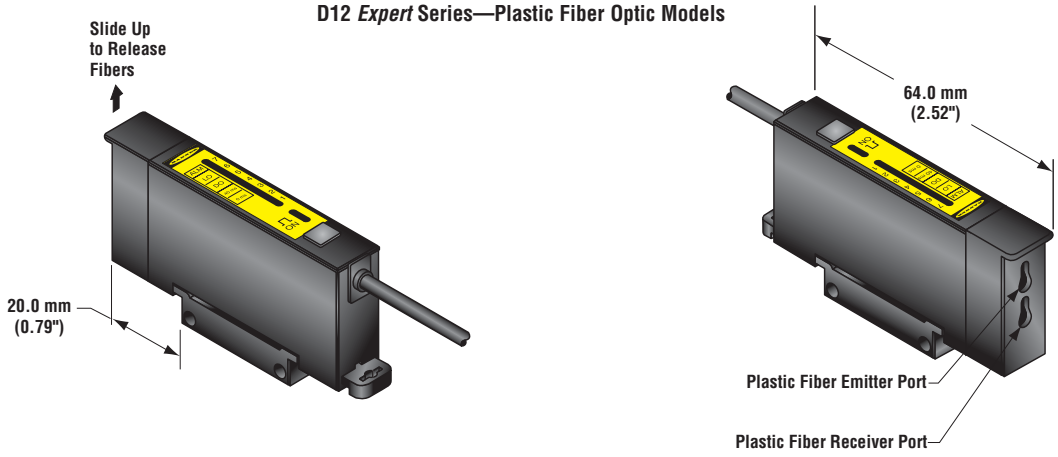


D12 *Expert* Series Dimensions

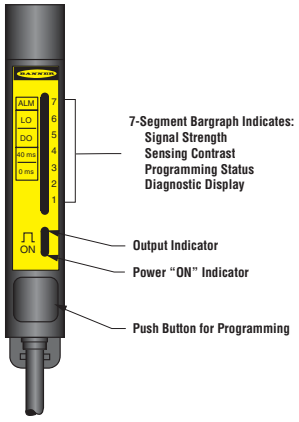
D12 *Expert* Series—Glass Fiber Optic Models



D12 *Expert* Series—Plastic Fiber Optic Models

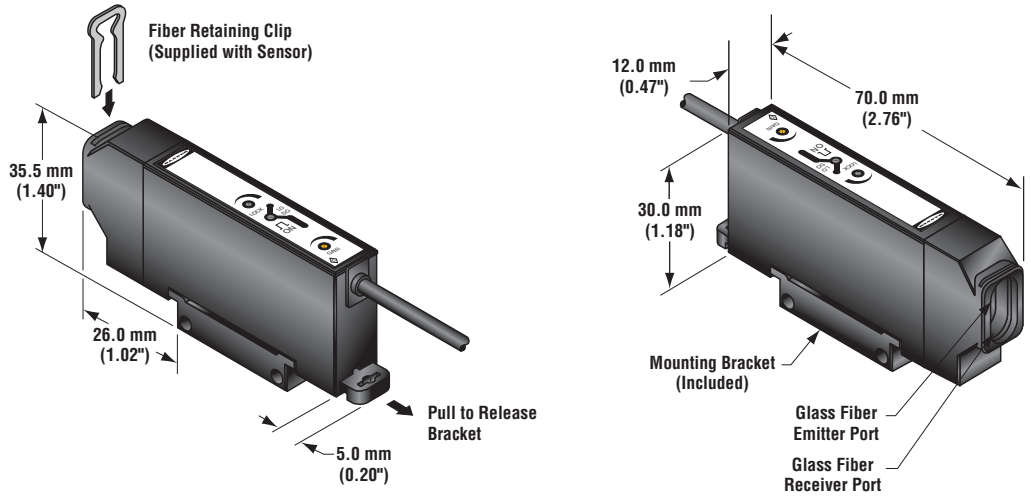


D12 *Expert* Series Features (Top View)

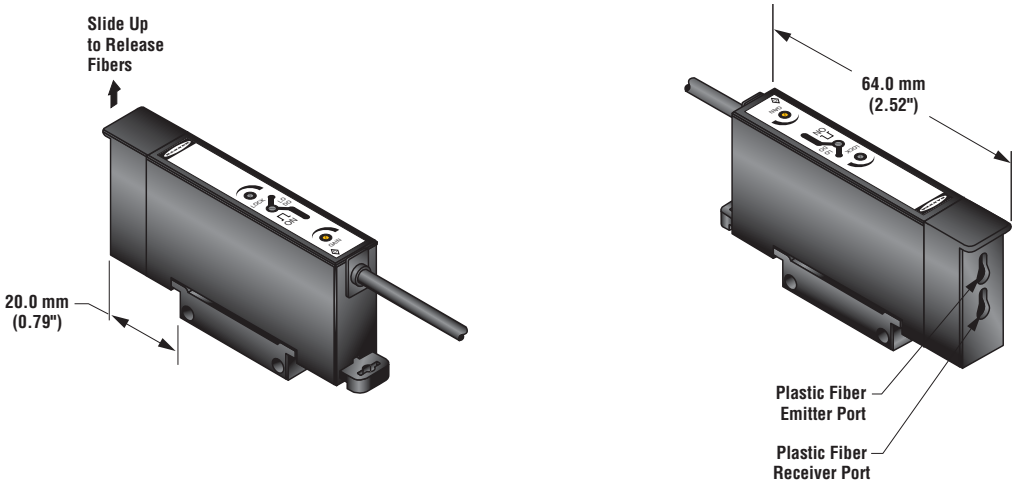


D12 AC-Coupled Series Dimensions

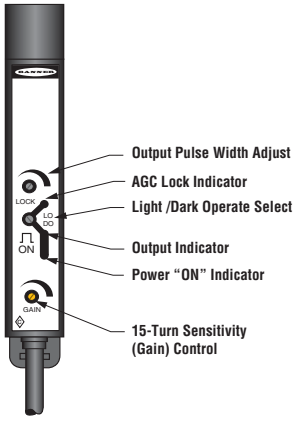
D12 AC-Coupled Series—Glass Fiber Optic Models



D12 AC-Coupled Series—Plastic Fiber Optic Models

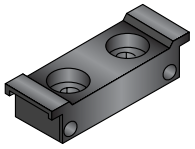


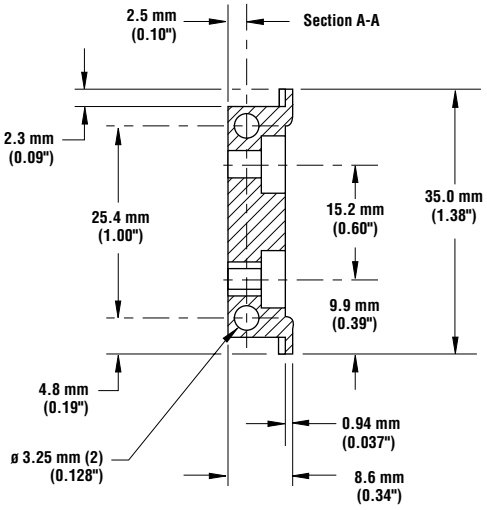
D12 AC-Coupled Series Features (Top View)

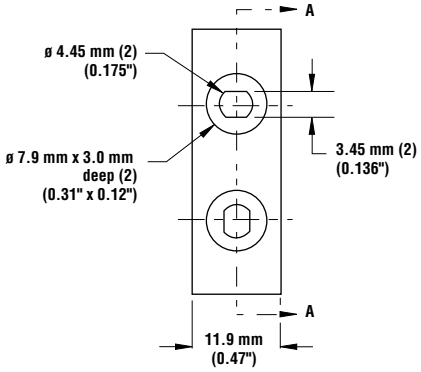


Mounting Bracket (included with sensor)

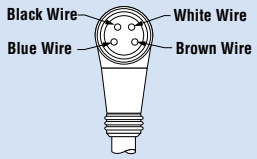
D12 Sensors mount directly to a standard DIN rail, or may be through-hole mounted using the supplied mounting bracket and M3 x 0.5 hardware





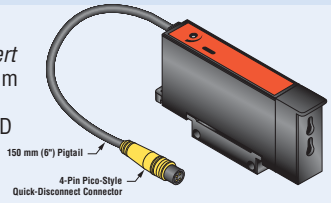


Quick-Disconnect Cables (QD)

Style	Model	Length	Connector	Pin-out
4-pin Pico-style	**PKG4-2**	2 m (6.5')	Straight	

For use with all D12 Sensors, except for D12 *Expert* Series.

Modifications

Model Suffix	Modification	Description	Example of Model Number
W/30	9 m (30') Cable	All D12 sensors may be ordered with an integral 9 m (30') cable in place of the standard 2 m (6.5') cable	**D12SN6FP W/30**
Q	150 mm 4-pin Pico-style Pigtail Quick-Disconnect NOTE: Not available for D12E *Expert* Series	All D12 sensors (except D12 *Expert* Series) may be built with a 150 mm (6") long integral cable which is terminated with the appropriate QD connector. See the Accessories section for more information. 	**D12SN6FPHQ**

Quick-Disconnect (QD) Option

D12 Standard/High-Speed/High-Power and AC-Coupled Sensors are sold either with a 2 m (6.5') or 9 m (30') attached PVC-covered cable or with a 150 mm (6") 4-pin Pico-style pigtail QD cable fitting.

D12 Standard/High-Speed/High-Power QD sensors are identified by the letter "Q" in their model number suffix. Mating cable for QD sensors is model PKG4-2 (straight connector). Cables are supplied in a standard length of 2 m (6.5').