PICO-GUARD™
Fiber Optic Safety Systems

PICO-GUARD™ optical safety systems provide a control-reliable, non-contact and low-cost optical alternative to traditional machine safeguarding methods.

- Compact, economical and easy installation: reduces need for expensive electrical wiring
- System includes controller, flexible optical fiber, optional protective sheathing and interchangeable optical elements for a variety of safeguarding applications
- Optical elements never wear out and are easy to align
- Category 4 interlocking with one switch per guard, even with multiple switches per optical channel
- Rated for use in explosive environments: ATEX, FM and CSA certifications; Class 1/Division 1 & 2, Groups A, B, C, D; Zone 0, Group IIC and Zone 22
- Exceeds OSHA/ANSI Control Reliability requirements and is certified to cULus NIPF and CE certified to Type 4 and Category 4.

Controllers page 508

- Four optical channels on all models
- DIN rail or panel/wall mounting
- Models with Universal Safety Stop Input (USSI), auxiliary outputs and muting function
- Quick-disconnect fiber optic interface and removable terminal blocks
- Selectable trip or latch output, external device monitoring and auto/manual power-up

Grid & Point System page 511

Grids

- Two-, three- or four-beam systems
- Protected heights of 500 to 1066 mm
- Five lengths of fiber cable

Points

- 12 or 30 mm threaded barrel housings
- Use multiple points for a customized grid system
- Three integral fiber types in five lengths

Interlock Systems page 515

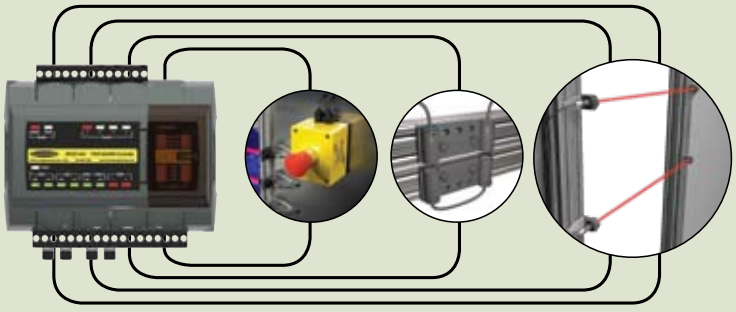
- Non-contact optical safety switches
- Six housing styles
- Integral fibers or quick-release fiber connectors

E-Stop Buttons page 518

- Push-to-stop, twist-to-release optical E-Stop button
- Models with fiber connection on same or opposite side of enclosure

Four optical channels for monitoring multiple points with one controller

- Interlock up to sixteen guards or gates
- Create one four-beam grid or two individual two-beam grids for perimeter and access guarding
- Combine grids, points, interlocks and E-Stop buttons for multiple application requirements



Compact fiber optic technology for explosive environments

- Paint booths
- Gaseous fill areas (example, cigarette lighters)
- Cosmetic and perfume manufacturing
- Pharmaceutical manufacturing
- Battery manufacturing
- Semiconductor processing
- Film and web processing
- Chemical processing
- Explosives manufacturing

CONTROLLERS

PICO-GUARD™ Fiber Optic

- Four optical channels protect personnel from hazardous equipment and to protect critical tooling or processes.
- Controller signals the machine control circuit to stop when the system detects a loss in light signal or receives a safety stop request from its Universal Safety Stop Interface (USSI) input.
- Each channel can control several optical elements in the same fiber loop.
- Each channel can monitor a separate part of a machine, such as doors, points of entry and E-stops.
- USSI connects multiple PICO-GUARD™ Controllers and other safety devices in a single safety circuit, when required.
- Controllers are available with optical channel auxiliary outputs and muting.
- Controllers interface with PICO-GUARD Grids, Points, Interlock Switches and Optical E-Stop Buttons to solve numerous applications.
- Diverse-redundant and self-checking design exceeds OSHA/ANSI Control Reliability requirements and meets Category 4 per ISO 13849-1(EN 954-1) and IEC 61496-1 Type 4 requirements.

ACCESSORIES page 519

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PICO-GUARD™ Controller Models, 24V dc

Inputs	Safety Outputs	Output Rating	Aux. Outputs	Muting	Output Response Time	Models
4 Optical Channels & 2 NC USSI (dual)	2 PNP OSSD	0.5 amps	3 PNP (Aux., Fault, Weak)	—	13 ms (optical channels) 7 ms (USSIs)	**SFCDT-4A1**
			7 PNP (Aux., Fault, Weak & Ch 1-4)	—		**SFCDT-4A1C**
4 Optical Channels, Mute Inputs, Mute Enable			7 PNP (Aux./Mute lamp, Fault, Weak & Ch 1-4)	Yes	13 ms (optical channels)	**SFCDT-4A1CM1**

NOTE: A complete system requires a controller and optical elements, such as Interlocking Switches (see page 515), Grids and Points (see page 511), or E-Stop buttons (see page 518).

PICO-GUARD™ Controller Specifications

System Power Requirements	24V dc ±15%, 10% max. ripple; 250 mA max., exclusive of output loads. External supply must be in accordance with IEC 61558.
Short Circuit Protection	All inputs and outputs are protected from short circuits to +24V dc or dc common.
Response Time	**Optical Channel:** 13 milliseconds max. (Time between the opening of an optical switch and the OSSD safety outputs turning off.) **USSI Inputs:** 7 milliseconds max. (Time between actuation of the safety stop input device and the OSSD safety outputs turning off.)
External Device Monitoring (EDM) Input	Two inputs for external device monitoring (EDM). Each input monitors the status of a normally closed, forced-guided monitor contact of an external safety device or MPCE. The EDM inputs must be high (10 to 30V dc) when the external device or MPCE is OFF, and must be low (less than 3V dc) when the external device or MPCE is ON. External devices or MPCEs must meet certain timing requirements, depending on the configuration setting.
System Reset Input	The Reset input must be high (10 to 30V dc) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the system from a manual power-up, optical channel latch or system lockout condition.
USSI 1 Reset Input (Not available on SFCDT-4A1CM)	The Reset input must be high (10 to 30V dc) for 0.25 to 2 seconds and then low (less than 3V dc) to reset the system from a USSI 1 latch condition.
USSI 1 Input (Not available on SFCDT-4A1CM1)	Dual-channel, redundant inputs for monitoring output contacts or "handshake" compatible safety solid-state outputs of other safety stop devices. OFF (stop) signals cause the PICO-GUARD OSSDs to latch OFF (Latch condition).
USSI 2 Input (Not available on SFCDT-4A1CM1)	Dual-channel, redundant inputs for monitoring output contacts or "handshake" compatible safety solid-state outputs of other safety stop devices. OFF (stop) signals cause the PICO-GUARD OSSDs to turn OFF (Trip condition).
Muting Device Inputs (SFCDT-4A1CM1)	The muting devices work in pairs (MS1 and MS2, MS3 and MS4) and required to be "closed" within 3 seconds of each other (simultaneity requirement) to intiate a mute (assuming all other conditions are meet). Muting device outputs must be hard contacts (electrical), capable of switching 15 to 30V dc at 10 to 50 mA.
Mute Enable Input (SFCDT-4A1CM1)	When Mute Enable is selected (functional), this input must have +24V dc applied in order to start a mute; opening this input after mute has begun has no effect.
Safety Outputs	Two redundant solid-state 24V dc, 0.5A max. sourcing OSSD (Output Signal Switching Device) safety outputs. (Use optional interface modules for ac or larger dc loads.) Capable of the Banner "Safety Handshake". **ON-state voltage:** ≥ Vin-1.5V dc **OFF-state voltage:** 1.2V dc max. **Max. load resistance:** 1,000 Ω **Max. load capacitance:** 0.1 µF **OSSD test pulse width:** 100 to 300 microseconds **OSSD test pulse period:** 6 milliseconds
Non-Safety Outputs	Solid state 24V dc (≥ Vin – 1.5V dc), 0.25A max. sourcing (PNP) non-safety outputs **Non-muting:** Aux., weak, fault, Ch 1-4 **Muting:** Aux./Mute temp, fault, Ch 1-4 (-4A1CM1 models only)
Remote Status Interface	Isolated RS-232 non-safety output (4800 Baud rate) for setup or monitoring the system status. Connections provided for a Remote Display unit. See Interfacing Products on page 501.
Controls and Adjustments	Redundant switches for Auto/Manual power-up, Trip/Latch output operation and 1- or 2-channel EDM operation. Redundant switches for ON/OFF of each optical channel. (NOTE: At least one optical channel must be ON.)
Ambient Light Immunity	> 10,000 lux at 5° angle of incidence
Strobe Light Immunity	Totally immune to one Federal Signal Corp. "Fireball" model FB2PST strobe
Emitter Element	Visible red LED, 660 nm at peak emission
Status Indicators	**All models:** **System Status (bi-color Red/Green):** overall status of the PICO-GUARD system **System Reset (bi-color Yellow/Red):** status of the input; indicates system reset needed **Channel (4 bi-color Red/Green):** each shows the status of one optical channel **EDM (bi-color Red/Green):** status of the EDM input channels **OSSD (bi-color Red/Green):** status of the OSSD outputs **Config (bi-color Red/Green):** status of the system configuration **Non-Muting models:** **USSI (2 bi-color Red/Green):** status of the USSI input channels (a-b and c-d) **USSI 1 Reset (bi-color Yellow/Red):** status of USSI 1 reset input; indicates USSI 1 reset needed **EDM (bi-color Red/Green):** status of the EDM input channels **OSSD (bi-color Red/Green):** status of the OSSD outputs **Config (bi-color Red/Green):** status of the system configuration **Muting Models:** **Muting (4 bi-color Red/Green):** status of the muting input **Mute Enable (bi-color) Yellow/Red):** status of the EDM enable

More on next page

PICO-GUARD™ Controller Specifications (cont'd)

Enclosure Rating	IEC IP20
Operating Conditions	**Temperature:** 0° to +50° C **Relative humidity:** 95% maximum (non-condensing)
Design Standards	Designed to comply with Type 4 per IEC 61496-1; Type 4 per UL 61496-1; Category 4 per EN 954-1
Certifications	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The PICO-GUARD Controllers comply with Machine Directive 98/37/EC and are certified to EN954-1(1996). After December 31, 2011, these safety devices can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.
Wiring Diagrams	WD023, WD024, WD025, WD026, WD027, WD028 (pp. 788-791)

GRIDS & POINTS
PICO-GUARD™ Fiber Optic

- Grid and Point optical elements are for use with PICO-GUARD™ Controllers and fiber optic cables in personnel safety and equipment-protection applications.
- Choices include compact 12 or 30 mm non-contact fiber optic Point elements, or Grid systems for perimeter and access guarding.
- Each fiber optic channel uses one Emitter/Receiver pair (up to 4 pairs per controller).
- Each Point or Grid element can function as emitter or receiver, depending on installation.
- Grid system features rugged anodized aluminum construction, with two, three or four beams and beam spacing from 300 to 584 mm.
- Grid housings are MEK resistant for paint booth applications; optional MEK-resistant conduit and cable glands are available.
- 12 mm Point has impact-resistant polycarbonate plastic construction.
- 30 mm Point has robust stainless steel housing with tempered glass lens window.
- Multiple points can be used to create a customized grid system.
- Environmental rating is IP65 for Grids and IP67 for Points.
- Grids and Points meet Type 4 per IEC 61496-2 and Category 4 per ISO 13849-1 (EN 954-1) requirements when used with a PICO-GUARD controller.
- Grid and Points are ATEX, FM and CSA approved for use in explosive environments when used with a PICO-GUARD controller.

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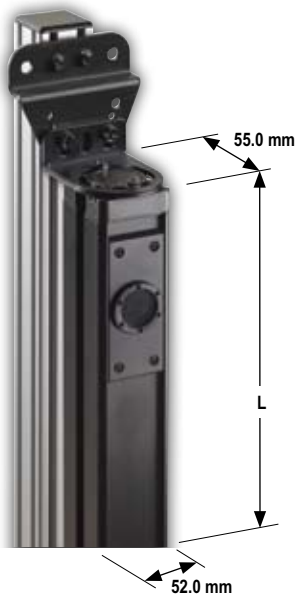

PICO-GUARD Grid

Full View

Black Anodized Aluminum

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PICO-GUARD Point (30 mm Barrel)

PICO-GUARD Point (12 mm Barrel)

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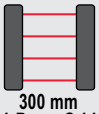
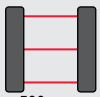
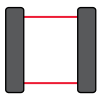
PICO-GUARD™ Grid Systems

Beam Spacing	Protected Height	Housing Length (L)	Fiber Description**	Fiber Length	Maximum Range***	Models*
 300 mm 4-Beam Grid	900 mm	1084 mm	Integral Polished-End, PVC Coated Fibers 7 mm diameter	2.4 m	31.1 m	SFG4-300C8
				4.5 m	27.1 m	SFG4-300C15
				7.5 m	22.6 m	SFG4-300C25
				15 m	14.9 m	SFG4-300C50
				30 m	7.0 m	SFG4-300C100
 400 mm 3-Beam Grid	800 mm	984 mm		2.4 m	31.1 m	SFG3-400C8
				4.5 m	27.1 m	SFG3-400C15
				7.5 m	22.6 m	SFG3-400C25
				15 m	14.9 m	SFG3-400C50
				30 m	7.0 m	SFG3-400C100
 533 mm 3-Beam Grid	1066 mm	1251 mm		2.4 m	31.1 m	SFG3-533C8
				4.5 m	27.1 m	SFG3-533C15
				7.5 m	22.6 m	SFG3-533C25
				15 m	14.9 m	SFG3-533C50
				30 m	7.0 m	SFG3-533C100
 500 mm 2-Beam Grid	500 mm	684 mm		2.4 m	31.1 m	SFG2-500C8
				4.5 m	27.1 m	SFG2-500C15
				7.5 m	22.6 m	SFG2-500C25
				15 m	14.9 m	SFG2-500C50
				30 m	7.0 m	SFG2-500C100
 584 mm 2-Beam Grid	584 mm	768 mm		2.4 m	31.1 m	SFG2-584C8
				4.5 m	27.1 m	SFG2-584C15
				7.5 m	22.6 m	SFG2-584C25
				15 m	14.9 m	SFG2-584C50
				30 m	7.0 m	SFG2-584C100

* Order any two Grid optical elements with the same housing length. A complete system requires a controller (see page 508).
** MEK-resistant conduit is available to protect fiber (see page 521).
*** Maximum range is based on using an emitter and receiver with the same length fiber. Using an emitter and receiver with different length fibers may decrease or increase range. Using corner mirrors reduces range. See specifications on page 514 for detailed range information.

PICO-GUARD™ Point Systems

Housing Material	Orientation/Type		Fiber Description	Fiber Length	Maximum Range**	Models*
304 Stainless Steel	Straight 30 mm Barrel Mounting (25 mm beam diameter)		Integral Polished-End, PVC Coated Fibers 5 mm Diameter	2.4 m	28.7 m	**SFP30SXP8**
				4.5 m	24.4 m	**SFP30SXP15**
				7.5 m	21.9 m	**SFP30SXP25**
				15 m	14.0 m	**SFP30SXP50**
				30 m	8.5 m	**SFP30SXP100**
			Integral Polished-End, PTFE Coated Fibers 2.2 mm Diameter	2.4 m	28.7 m	**SFP30SXT8**
				4.5 m	24.4 m	**SFP30SXT15**
				7.5 m	21.9 m	**SFP30SXT25**
				15 m	14.0 m	**SFP30SXT50**
				30 m	8.5 m	**SFP30SXT100**
			Integral Polished-End, Polyethylene Coated Fibers 2.2 mm Diameter	2.4 m	28.7 m	**SFP30SS8**
				4.5 m	24.4 m	**SFP30SS15**
				7.5 m	21.9 m	**SFP30SS25**
				15 m	14.0 m	**SFP30SS50**
				30 m	8.5 m	**SFP30SS100**
Plastic	Straight 12 mm Barrel Mounting (9 mm beam diameter)		Integral Polished-End, PVC Coated Fibers 5 mm Diameter	2.4 m	6.4 m	**SFP12PXP8**
				4.5 m	4.8 m	**SFP12PXP15**
				7.5 m	3.4 m	**SFP12PXP25**
				15 m	1.5 m	**SFP12PXP50**
			Integral Polished-End, PTFE Coated Fibers 2.2 mm Diameter	2.4 m	6.4 m	**SFP12PXT8**
				4.5 m	4.8 m	**SFP12PXT15**
				7.5 m	3.4 m	**SFP12PXT25**
				15 m	1.5 m	**SFP12PXT50**
			Integral Polished-End, Polyethylene Coated Fibers 2.2 mm Diameter	2.4 m	6.4 m	**SFP12PS8**
				4.5 m	4.8 m	**SFP12PS15**
				7.5 m	3.4 m	**SFP12PS25**
				15 m	1.5 m	**SFP12PS50**

* Order any two Point optical elements with the same beam diameter. A complete system requires a controller (see page 508).

** Maximum range is based on using an emitter and receiver with the same length fiber. Using an emitter and receiver with different length fibers may decrease or increase range. Using corner mirrors reduces range. See specifications on page 514 for detailed range information.

PICO-GUARD™ Grid & Point Systems Specifications

Operating Range

Range information is based on use of the integral polished fibers. The use of SFA-FS Fiber Splice reduces range by 20%. Do not cut polished fiber ends unless absolutely necessary (if the end is damaged or contaminated, or must be cut to length). Use only the Model PFC-3 Fiber Cutter to cut fibers, when necessary. If a polished end is cut, the excess gain is reduced, the advantage of polishing is lost, and the operating range is reduced.

12 mm Point Operating Range:
Minimum operating range: 150 mm
Maximum operating range: see table*

	SFP12..8	SFP12..15	SFP12..25	SFP12..50
SFP12..8	6.4 m	5.5 m	4.6 m	3 m
SFP12..15	5.5 m	4.8 m	4 m	2.7 m
SFP12..25	4.6 m	4 m	3.4 m	2.1 m
SFP12..50	3 m	2.7 m	2.1 m	1.5 m

30 mm Point Operating Range:
Minimum operating range: 800 mm
Maximum operating range: see table*

	SFP30..8	SFP30..15	SFP30..25	SFP30..50	SFP30..100
SFP30..8	28.7 m	25.9 m	23.2 m	20.1 m	13.7 m
SFP30..15	25.9 m	24.4 m	22.9 m	19.5 m	12.8 m
SFP30..25	23.2 m	22.9 m	21.9 m	17.1 m	12.2 m
SFP30..50	20.1 m	19.5 m	17.1 m	14.0 m	11.0 m
SFP30..100	13.7 m	12.8 m	12.2 m	11.0 m	8.5 m

Grids Operating Range:
Minimum operating range: 800 mm
Maximum operating range: see table*

	SFG..8	SFG..15	SFG..25	SFG..50	SFG..100
SFG..8	31.1 m	29.0 m	26.5 m	21.6 m	14.9 m
SFG..15	29.0 m	27.1 m	24.7 m	20.1 m	14.0 m
SFG..25	26.5 m	24.7 m	22.6 m	18.3 m	12.8 m
SFG..50	21.6 m	20.1 m	18.3 m	14.9 m	10.4 m
SFG..100	14.9 m	14.0 m	12.8 m	10.4 m	7.0 m

* In applications using SSM or MSM series corner mirrors, range is reduced by approximately 8 percent for each mirror used.

Beam Diameter

12 mm Point: 9 mm
30 mm Point: 25 mm
Grids: 25 mm

Effective Aperture Angle (EAA)

Type 4 per IEC 61496-2; ±2.5° @ 3 m when used with SFCDT-..

Environmental Rating

Points: IP67
Grids: IP65

Operating Conditions

Temperature: 0° to +70° C **Relative humidity:** 95% (non-condensing)

Construction

12 mm Point: black polycarbonate plastic housing; polyethylene, PVC or PTFE coated fibers
30 mm Point: 304 stainless steel housing, glass window; polyethylene, PVC or PTFE coated fibers
Grids: black anodized aluminum housing and label; tempered glass window; zinc end caps; PVC coated fibers

Certifications

Important Notice:
European Community Machinery Directive 2006/42/EC
The PICO-GUARD Grid and Points comply with Machine Directive 98/37/EC and are certified to EN954-1(1996). After December 31, 2011, these safety devices can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

INTERLOCK SWITCHES
PICO-GUARD™ Fiber Optic

- Interlock switches interface with PICO-GUARD™ fiber optic controllers.
- Compact, non-contact and easy to install, the switches interlock doors, guards, gates and covers.
- Fiber optic interlock switches eliminate the need to run electrical wires to a hazardous area.
- Housings are easy to install and include integral fibers or quick-release connectors for easy connection or disconnection of fibers.
- Switches meet Category 4 requirements with one switch pair per guard per ISO 13849-1 (EN 954-1) when used with PICO-GUARD controller.
- Impact-resistant polycarbonate plastic, extreme-duty chemically resistant stainless steel or heavy-duty impact-resistant zinc die-cast models are available.
- Switches have an environmental rating of IP67 and are ATEX, FM and CSA approved for use in explosive environments when used with a PICO-GUARD controller.
- Attenuator is available for reducing excess gain in short-run applications.
- Splices are available for easily connecting two fiber sections.

Photoelectrics Sensors
Fiber Optic Sensors
Special Purpose Sensors
Measurement & Inspection Sensors
Vision
Wireless
Lighting & Indicators
Safety Light Screens
Safety Laser Scanners
Fiber Optic Safety Systems
Safety Controllers & Modules
Safety Two-Hand Control Modules
Safety Interlock Switches
Emergency Stop & Stop Control

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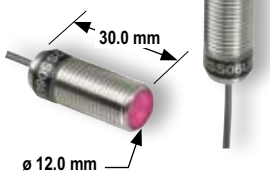
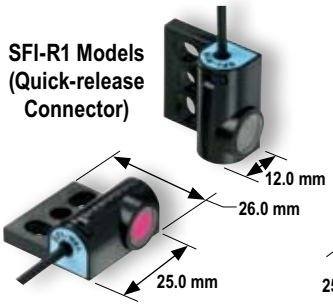
FIBER OPTIC
CONTROLLERS
GRID & POINTS
INTERLOCKS
E-STOP BUTTONS

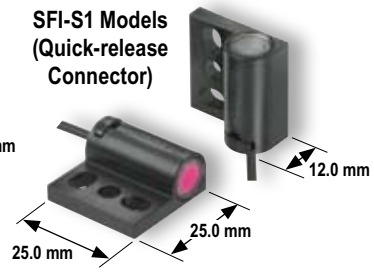
SFI-M12 Models (Integral Fibers)



SFI-R1 Models (Quick-release Connector)



SFI-S1 Models (Quick-release Connector)



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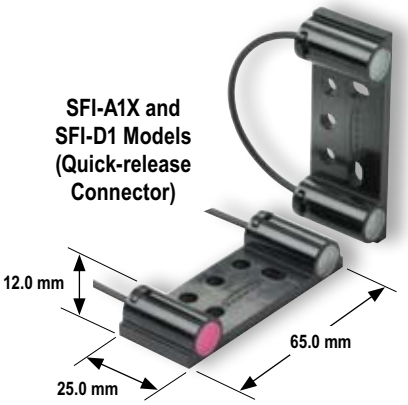
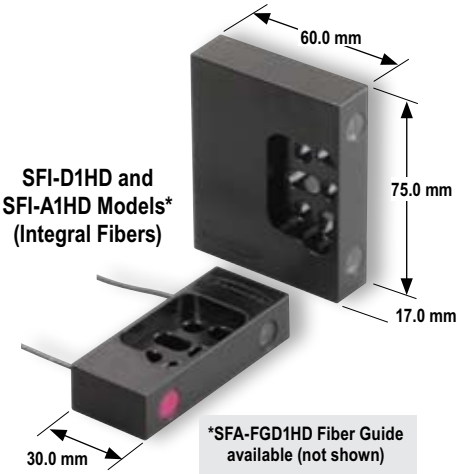
SFI-A1X and SFI-D1 Models (Quick-release Connector)

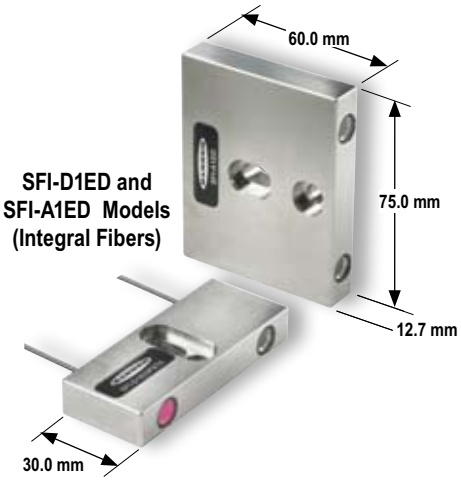


SFI-D1HD and SFI-A1HD Models* (Integral Fibers)



*SFA-FGD1HD Fiber Guide available (not shown)

SFI-D1ED and SFI-A1ED Models (Integral Fibers)



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PICO-GUARD™ Fiber Optic Interlock Switches

Housing Material	Optical Element Orientation/Type		Fiber Length**	Separation and Max. Switching Distance	Models*
Plastic	Straight, Right Mounting		Bulk or Precut	1 mm = ± 10 mm 25 mm = ± 11 mm 50 mm = ± 12 mm	**SFI-S1R**
	Straight, Left Mounting				**SFI-S1L**
Plastic	Right-angle, Right Mounting		Bulk or Precut	1 mm = ± 11 mm 25 mm = ± 21 mm 50 mm = ± 33 mm	**SFI-R1R**
	Right-angle, Left Mounting				**SFI-R1L**
Plastic	Dual(Active), Center Mounting		Bulk or Precut	1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm	**SFI-D1**
	Actuator(Passive), Polyethylene Jacket, Center Mounting				**SFI-A1**
	Actuator(Passive), Polyethylene Jacket, PVC Sheath, Center Mounting				**SFI-A1XP**
	Actuator(Passive), Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting				**SFI-A1XT**
316 Stainless Steel	Straight, Polyethylene Jacket, Fluoropolymer Sheath, 12 mm Barrel Mounting		1.8 m	1 mm = ± 10 mm 25 mm = ± 11 mm 50 mm = ± 12 mm	**SFI-M12SS06UXT**
			4.5 m		**SFI-M12SS15UXT**
			9.0 m		**SFI-M12SS30UXT**
316 Stainless Steel	Dual(Active), Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting		1.8 m	1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm	**SFI-D1EDPXT6**
			4.5 m		**SFI-D1EDPXT15**
			9.0 m		**SFI-D1EDPXT30**
			15.3 m		**SFI-D1EDPXT50**
	Actuator(Passive), Center Mounting		–		**SFI-A1ED**
Zinc	Dual(Active), Polyethylene Jacket, Center Mounting		1.8 m	1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm	**SFI-D1HDPS6†**
			4.5 m		**SFI-D1HDPS15†**
			9.0 m		**SFI-D1HDPS30†**
			15.3 m		**SFI-D1HDPS50†**
	Dual(Active), Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting		1.8 m		**SFI-D1HDPXT6†**
			4.5 m		**SFI-D1HDPXT15†**
			9.0 m		**SFI-D1HDPXT30†**
			15.3 m		**SFI-D1HDPXT50†**
	Actuator(Passive), Center Mounting		—		**SFI-A1HD**

* A complete system requires a controller (see page 508).

** Fibers available in bulk to be cut to length or precut lengths with polished ends. Order fibers separately (see page 520). Integral fiber lengths are listed.

† Optional fiber guide available (**SFA-FGD1HD**). See data sheet p/n 123560.

Note: Also see the Application and Design Guide p/n 69763.

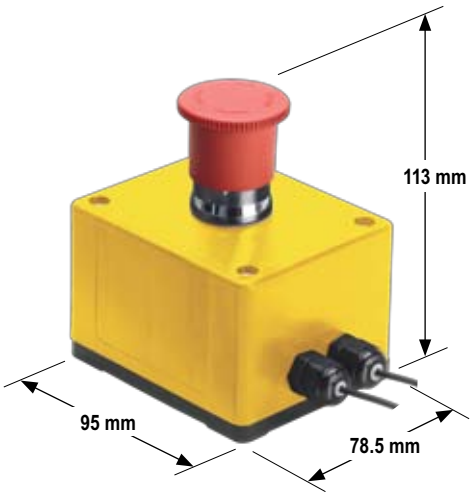
PICO-GUARD™ Fiber Optic Interlock Switches Specifications

Operating Distance	1-50 mm max.
Mounting	**SFI-S.., SFI-R..., SFI-D1, SFI-A1 and SFI-AIX.. models:** Holes for M4 (#10) screws (not included) **SFI-D1E..., SFI-AIED, SFI-D1H... and SFI-A1H... models:** Holes for M6 screws (not included) **SFI-M12... models:** Two M12 x 1.25 nuts (provided)
Construction	**SFI-S.., SFI-R..., SFI-D1, SFI-A1 and SFI-AIX.. models:** Polycarbonate plastic housing and window; acrylic lens **SFI-M12, SFI-D1E.. and SFI-AIED models:** 316 stainless steel housing, glass window, PTFE-sheathed plastic fiber **SFI-D1H... and SFI-A1H... models:** Cast zinc housing, glass window, PTFE-sheathed or PE plastic fiber
Operating Conditions	**Temperature:** 0° to +70° C **Relative humidity:** 95%
Environmental Rating	IP67
Certifications	**Important Notice:** **European Community Machinery Directive 2006/42/EC** The PICO-GUARD Safety Interlock Switches comply with Machine Directive 98/37/EC. and are certified to EN954-1(1996). After December 31, 2011, these safety devices can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

Emergency Stop Push Buttons
PICO-GUARD™ Fiber Optic

- Features bright red push-to-stop, twist-to-release, direct opening button with yellow background (per ANSI NFPA 79 and IEC 60204-1)
- Provides choice of models with fiber connections on same side or opposite sides of enclosure
- Delivers easy connection for 2 mm OD (1 mm core) plastic fibers
- Accommodates up to 3 E-Stops in a series on a single channel (all PICO-GUARD™ controllers have four channels)
- Constructed of impact-resistant polycarbonate resin—rated IP65
- Can be used with SFI interlocking switches in same optical loop
- Offers easy mounting and installation
- Meets Category 4 requirements per ISO 13849-1 (EN 954-1) applications when used with a PICO-GUARD controller
- Up to 125 m of fiber (polished) with one E-Stop button
- Certified to EN ISO 13850 and EN 60947-5-5 Emergency Stop button requirements
- Certified to ATEX, FM and CSA standards for use in potentially explosive environments

ACCESSORIES page 520



Emergency Stop Push Button with Enclosure

ONLINE
AUTOCAD, STEP, IGES & PDF

PICO-GUARD™ Optical E-Stop Buttons

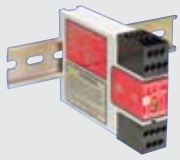
Housing Description	Models*
One-sided fiber connection	**SFS-EBM-01E1**
Two-sided fiber connection (opposite sides)	**SFS-EBM-01E2**

* A complete system requires a controller (see page 508).

PICO-GUARD™ E-Stop Button Specifications

Mounting	Holes (x4) for M5 screws (mounting hardware not included)	
Construction	**Enclosure and Base:** Polycarbonate **Button:** Polymide **Button Base:** Aluminum/Zinc alloy	
Operating Conditions	**Temperature:** 0° to +70° C	**Relative humidity:** 95% (non-condensing)
Environmental Rating	IP65	
Certifications		**Important Notice:** **European Community Machinery Directive 2006/42/EC** The PICO-GUARD Optical E-Stop Buttons comply with Machine Directive 98/37/EC. After December 31, 2011, when Machine Directive 2006/42/EC will be in force, thePICO-GUARD Optical E-Stop Buttons can only be installed as a replacement component within the European Union (EU). For more information, please see www.bannerengineering.com/144763 or call 1-888-373-6767.

PICO-GUARD™ Interfacing Products

		Description	Models	Product Information
Interface Modules		• Interface modules provide two or three normally open force-guided relay outputs rated at 6 A (-9A) or 7A (-11A). • PICO-GUARD monitors these interface modules when they are connected to the PICO-GUARD External Device Monitoring (EDM) inputs. • Convenient plug-in terminal blocks on a 22.5 mm DIN-rail mountable housing are included.	**IM-T-9A** (3 NO) **IM-T-11A** (2 NO/1 NC)	Page 552
Muting Modules		• The Muting Module can be used with PICO-GUARD systems and can temporarily inhibit a Grid or Point so materials can safely pass through the beams without stopping the machinery. • The module uses redundant microcontroller-based logic.	**MMD-TA-12B** **MMD-TA-11B**	Page 544
Interface Modules and Controllers		• One controller provides configurable monitoring of multiple safety devices. • 22 input terminals can monitor both contact-based and PNP solid-state input devices. • 3 pairs of independent solid-state safety outputs can be used with selectable one- or two-channel external device monitoring. • Ten configurable non-safety status outputs track inputs, outputs, lockout, I/O status and other functions. • All SC22-3 modules use 24V dc. • 10/100 Base TX Ethernet communication option using EtherNet/IP and Modbus TCP protocols (SC22-3E models).	**SC22-3-S...** **SC22-3-C...** **SC22-3E-S...** **SC22-3E-C...**	Page 526
Contactors		• Pairs of contactors create safety stop circuits with two normally open contacts in series. • PICO-GUARD can monitor the circuit because of the contacts' force-guided mechanically linked design. • Contactors add 10 or 18 amp current carrying capability to any safety system. • Auxiliary contacts add 3 or 4 normally open contacts. • Suppressors extend the life of an actuating device that uses a contactor. • Modular design simplifies assembly and installation.	**Mechanically Linked Contactors** **11-BG00-31-D-024** **BF1801L-024** **Aux. Contacts** **11-BGX10-40** **11-G484-30** **Suppressors** **11-BGX77-048** **11-G318-48**	Page 742

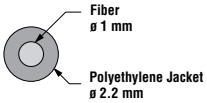
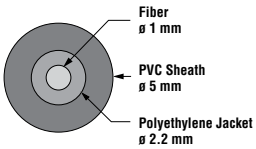
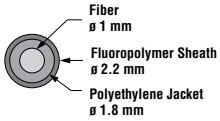
NC = Normally closed, NO = Normally open

PICO-GUARD™ Remote Display

Models		Description
	**SFA-RD**	• The display provides the same ongoing operating status feedback as the PICO-GUARD controller. • Rated IP67; NEMA 6, it can be conveniently mounted outside enclosure. • Convenient DIN-rail mountable housing; flat-mount and right-angle brackets are included.

PICO-GUARD™ Plastic Fiber Optics

Plastic optical fiber for use with Banner PICO-GUARD optical elements is available in bulk form (to be cut to length in the field) or precut lengths with polished ends for maximum excess gain.

Length		Standard Polyethylene Jacket	PVC Sheath	Fluoropolymer Sheath
Dimensions				
Bulk	9 m	PIU430U	PIU430UXP	PIU430UXT
	18 m	PIU460U	PIU460UXP	PIU460UXT
	30.5 m	PIU4100U	PIU4100UXP	PIU4100UXT
	61 m	PIU4200U	PIU4200UXP	PIU4200UXT
	100.5 m	PIU4330U	PIU4330UXP	PIU4330UXT
	152.5 m	PIU4500U	PIU4500UXP	PIU4500UXT
	488 m	PIU41600U	PIU41600UXP	PIU41600UXT
Cut Lengths with Polished Ends	0.3 m	PWS43P	PWXP43P	PWXT43P
	0.5 m	PWS45P	PWXP45P	PWXT45P
	0.7 m	PWS47P	PWXP47P	PWXT47P
	1 m	PWS410P	PWXP410P	PWXT410P
	1.5 m	PWS415P	PWXP415P	PWXT415P
	2 m	PWS420P	PWXP420P	PWXT420P
	2.5 m	PWS425P	PWXP425P	PWXT425P
	3 m	PWS430P	PWXP430P	PWXT430P
	3.5 m	PWS435P	PWXP435P	PWXT435P
	4 m	PWS440P	PWXP440P	PWXT440P
	4.5 m	PWS445P	PWXP445P	PWXT445P
	5 m	PWS450P	PWXP450P	PWXT450P
	6 m	PWS460P	PWXP460P	PWXT460P
	7 m	PWS470P	PWXP470P	PWXT470P
	8 m	PWS480P	PWXP480P	PWXT480P
	9 m	PWS490P	PWXP490P	PWXT490P
	10 m	PWS4100P	PWXP4100P	PWXT4100P
	11 m	PWS4110P	PWXP4110P	PWXT4110P
	12 m	PWS4120P	PWXP4120P	PWXT4120P
	13 m	PWS4130P	PWXP4130P	PWXT4130P
	14 m	PWS4140P	PWXP4140P	PWXT4140P
	15 m	PWS4150P	PWXP4150P	PWXT4150P
	20 m	PWS4200P	PWXP4200P	PWXT4200P
	25 m	PWS4250P	PWXP4250P	PWXT4250P
	30 m	PWS4300P	PWXP4300P	PWXT4300P

PICO-GUARD™ Plastic Fiber Optic Accessories

Fiber optic devices used with PICO-GUARD™ optical elements improve performance and simplify installation.

Model		Description	Models
Attenuator		• Reduces excess gain in short-run applications • Uses Banner 2.2 mm OD plastic fiber optic cable (1 mm core) • Made of impact-resistant polycarbonate plastic, rated IP67	SFA-FA
Splice		• Provides easy connection of two fiber sections • Simplifies connecting and disconnecting fibers • Uses Banner 2.2 mm OD plastic fiber optic cable (1 mm core) • Made of impact-resistant polycarbonate plastic, rated IP67	SFA-FS
Fiber Cutter		• Used with Banner 2.2 mm OD diameter unterminated fiber optic cable (1 mm core) • Contains 25 fiber cutters	PFC-3-25
Polishing Kit		• Can achieve 95% performance of factory polished fibers (see data sheet p/n 128868 for information)	SFA-FFP

PICO-GUARD™ Cable Glands and Conduits

Conduit and gland used with PICO-GUARD™ Grids provide MEK-resistant protection.

Description			Model
2.4 m	Conduit	• Made of flexible MEK-resistant polyamide • Protects fiber • Snaps into emitter/receiver • Easily cuts to length	SFA-FCC-008
4.5 m			SFA-FCC-015
7.5 m			SFA-FCC-025
15 m			SFA-FCC-050
30 m			SFA-FCC-100
M20 Threads	Cable Gland	• Use with MEK-resistant conduit (above) • Made of MEK-resistant polyamide • Attaches conduit to emitter/receiver and PICO-GUARD controller	SFA-FCC-CGM20

PICO-GUARD™ Replacement Parts

Model	Description
EZA-LAT-1	LAT replacement adapter hardware for Grid.
MGA-KS0-1	Panel-mount keyed normally open reset switch
SFA-CMH	PICO-GUARD controller mounting hardware
SFA-CTB1	PICO-GUARD controller 4-position terminal block
SFA-CTB2	PICO-GUARD controller 9-position terminal block
SFA-CTB3	PICO-GUARD controller 18-position terminal block

Model	Description
SFA-CTB4	PICO-GUARD controller 5-position terminal block
SFA-IAG	Interlock alignment guide
SFA-LAT-12	LAT replacement adapter hardware for SPF12
SFA-LAT-30	LAT replacement adapter hardware for SPF30
SFA-W-1	Replacement window for Grid
STP-3	Specified test piece, 45 mm dia. for Grid

PICO-GUARD™ Brackets

Controller	Grids		12 mm–Points		30 mm–Points		Interlock Switches
							
pg. 628	pg. 628	pg. 629	pg. 636	pg. 636	pg. 639	pg. 641	pg. 635
DIN-35...	EZA-MBK-1	EZA-MBK-2	SMB12MM	SMB1812SF	SMB30A	SMB30SC	SFA-IMB2

Additional brackets and information available. See page 620.