

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 Category 4-rated safety system for personnel and equipment protection
- 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 (see below)
- 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
- Rated for Class 1/Division 1 & 2, Groups A, B, C, D; Zone 0, Group IIC and Zone 22



CONTROLLERS

GRIDS & POINTS

INTERLOCKS

E-STOP BUTTONS

Grid systems

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

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Point systems

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

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Interlock systems

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

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E-Stop buttons

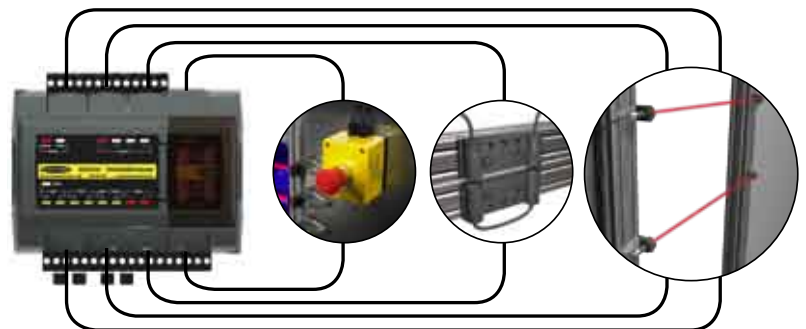
- Push-to-stop, twist-to-release optical E-Stop button
- Models with fiber connection on same or opposite side of enclosure

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Controllers

- 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



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 to 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 control reliability requirements and meets Safety Category 4 per EN 954-1 and IEC 61496-1 Type 4 requirements.



PICO-GUARD™ Controller

- Bi-color LED indicators for easy status monitoring
- Four optical channels
- Removable terminal blocks
- Quick-disconnect fiber optic interface
- Three options for fiber optic cables
- DIN rail or panel/wall mounting
- Two Universal Safety Stop Input (USSI), one trip and latch with reset input or muting device inputs



PICO-GUARD™ Controller Models, 24V dc

| Model | Inputs | Safety Outputs | Output Rating | Aux. Outputs | Muting | Output Response Time | Data Sheet |
|--------------|--|----------------|---------------|--|--------|--------------------------|----------------------|
| SFCDT-4A1 | 4 Optical Channels & | 2 PNP OSSD | 0.5 amps | 3 PNP (Aux., Fault, Weak) | - | 13 ms (optical channels) | 69761, 69763 |
| SFCDT-4A1C | 2 NC USSI (dual) x2 | | | 7 PNP (Aux., Fault, Weak & Ch 1-4) | - | 7 ms (USSIs) | |
| SFCDT-4A1CM1 | 4 Optical Channels, Mute Inputs, Mute Enable | | | 7 PNP (Aux./Mute lamp, Fault, Weak & Ch 1-4) | Yes | 13 ms (optical channels) | 122801, 69761, 69763 |

NOTE: A complete system requires a controller and optical elements, such as Interlocking Switches (see page 64), Grids and Points (see page 62), or E-Stop buttons (see page 66).



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.
- 12 mm Point has impact-resistant polycarbonate plastic construction.
- 30 mm Point has robust stainless steel housing with tempered glass lens window.
- Environmental rating is IP65 for Grids and IP67 for Points.
- Grids and Points meet Type 4 per IEC 61496-2 and Safety Category 4 per EN 954-1 applications 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.

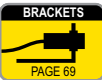


CONTROLLERS

GRIDS & POINTS

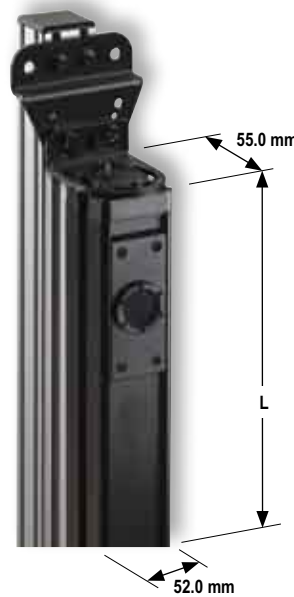
INTERLOCKS

E-STOP BUTTONS



PICO-GUARD™ Grid Systems

- Two-, three- or four-beam models
- PVC-coated integral cable with polished fibers
- IEC IP65 rated
- Robust black anodized housing with field replaceable window
- MEK-resistant housing for paint booth applications
- Optional MEK-resistant conduit and cable gland (see page 69)
- Interchangeable as emitter or receiver with PICO-GUARD™ controller



PICO-GUARD Grid



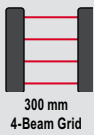
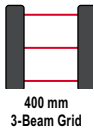
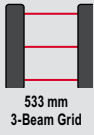
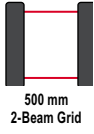

Full View



Black Anodized Aluminum

PICO-GUARD™ Grid Systems

- CONTROLLERS
- GRIDS & POINTS
- INTERLOCKS
- E-STOP BUTTONS

| Model* | Beam Spacing | Protected Height | Housing Length (L) | Fiber Description** | Fiber Length | Maximum Range*** | Data Sheet |
|--------------|--|------------------|--------------------|--|--------------|------------------|---------------|
| SFG4-300C8 |  300 mm 4-Beam Grid | 900 mm | 1084 mm | Integral Polished-End, PVC Coated Fibers 7 mm diameter | 2.4 m | 31.1 m | 69762 & 69763 |
| SFG4-300C15 | | | | | 4.5 m | 27.1 m | |
| SFG4-300C25 | | | | | 7.5 m | 22.6 m | |
| SFG4-300C50 | | | | | 15 m | 14.9 m | |
| SFG4-300C100 | | | | | 30 m | 7.0 m | |
| SFG3-400C8 |  400 mm 3-Beam Grid | 800 mm | 984 mm | | 2.4 m | 31.1 m | |
| SFG3-400C15 | | | | | 4.5 m | 27.1 m | |
| SFG3-400C25 | | | | | 7.5 m | 22.6 m | |
| SFG3-400C50 | | | | | 15 m | 14.9 m | |
| SFG3-400C100 | | | | | 30 m | 7.0 m | |
| SFG3-533C8 |  533 mm 3-Beam Grid | 1066 mm | 1251 mm | | 2.4 m | 31.1 m | |
| SFG3-533C15 | | | | | 4.5 m | 27.1 m | |
| SFG3-533C25 | | | | | 7.5 m | 22.6 m | |
| SFG3-533C50 | | | | | 15 m | 14.9 m | |
| SFG3-533C100 | | | | | 30 m | 7.0 m | |
| SFG2-500C8 |  500 mm 2-Beam Grid | 500 mm | 684 mm | | 2.4 m | 31.1 m | |
| SFG2-500C15 | | | | | 4.5 m | 27.1 m | |
| SFG2-500C25 | | | | | 7.5 m | 22.6 m | |
| SFG2-500C50 | | | | | 15 m | 14.9 m | |
| SFG2-500C100 | | | | | 30 m | 7.0 m | |
| SFG2-584C8 |  584 mm 2-Beam Grid | 584 mm | 768 mm | 2.4 m | 31.1 m | | |
| SFG2-584C15 | | | | 4.5 m | 27.1 m | | |
| SFG2-584C25 | | | | 7.5 m | 22.6 m | | |
| SFG2-584C50 | | | | 15 m | 14.9 m | | |
| SFG2-584C100 | | | | 30 m | 7.0 m | | |

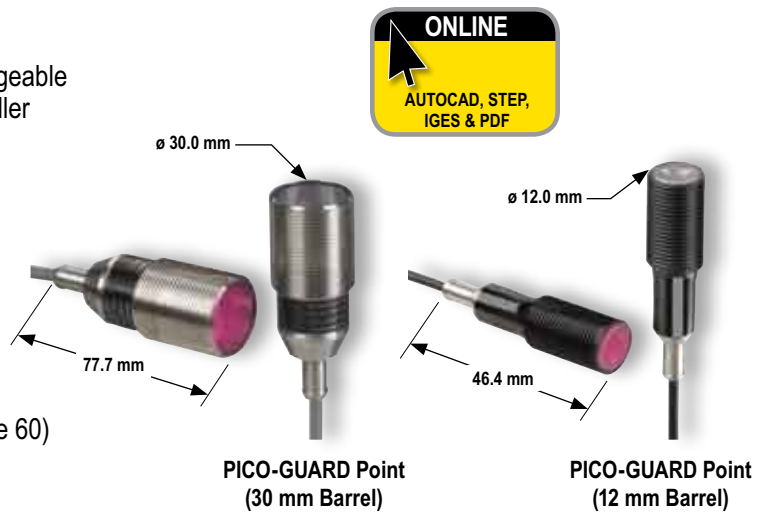
* Order any two Grid optical elements with the same housing length.

** MEK-resistant conduit is available to protect fiber (see page 69).

*** 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 71 for detailed range information.

PICO-GUARD™ Point Systems

- 12 or 30 mm threaded barrel fiber optic interchangeable as emitter or receiver with PICO-GUARD™ controller
- Multiple Points create customized grid system
- Polished-end integral fiber
- Moisture and dirt resistant
- 304 stainless steel (30 mm) or impact-resistant polycarbonate (12 mm) housing
- Type 4 effective aperture angle (EAA)
- IEC IP67 rated
- A complete system requires a controller (see page 60)



PICO-GUARD™ Point Systems

| Model* | Housing Material | Orientation/Type | Fiber Description | Fiber Length | Maximum Range** | Data Sheet |
|-------------|---------------------|--|---|--------------|-----------------|----------------|
| SFP30SXP8 | 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 | 111390 & 69763 |
| SFP30SXP15 | | | | 4.5 m | 24.4 m | |
| SFP30SXP25 | | | | 7.5 m | 21.9 m | |
| SFP30SXP50 | | | | 15 m | 14.0 m | |
| SFP30SXP100 | | | | 30 m | 8.5 m | |
| SFP30SXT8 | | | Integral Polished-End, PTFE Coated Fibers 2.2 mm Diameter | 2.4 m | 28.7 m | |
| SFP30SXT15 | | | | 4.5 m | 24.4 m | |
| SFP30SXT25 | | | | 7.5 m | 21.9 m | |
| SFP30SXT50 | | | | 15 m | 14.0 m | |
| SFP30SXT100 | | | | 30 m | 8.5 m | |
| SFP30SS8 | | | Integral Polished-End, Polyethylene Coated Fibers 2.2 mm Diameter | 2.4 m | 28.7 m | |
| SFP30SS15 | | | | 4.5 m | 24.4 m | |
| SFP30SS25 | | | | 7.5 m | 21.9 m | |
| SFP30SS50 | | | | 15 m | 14.0 m | |
| SFP30SS100 | 30 m | 8.5 m | | | | |
| SFP12PXP8 | 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 | 111389 & 69763 |
| SFP12PXP15 | | | | 4.5 m | 4.8 m | |
| SFP12PXP25 | | | | 7.5 m | 3.4 m | |
| SFP12PXP50 | | | | 15 m | 1.5 m | |
| SFP12PXT8 | | | Integral Polished-End, PTFE Coated Fibers 2.2 mm Diameter | 2.4 m | 6.4 m | |
| SFP12PXT15 | | | | 4.5 m | 4.8 m | |
| SFP12PXT25 | | | | 7.5 m | 3.4 m | |
| SFP12PXT50 | | | | 15 m | 1.5 m | |
| SFP12PS8 | | | Integral Polished-End, Polyethylene Coated Fibers 2.2 mm Diameter | 2.4 m | 6.4 m | |
| SFP12PS15 | | | | 4.5 m | 4.8 m | |
| SFP12PS25 | | | | 7.5 m | 3.4 m | |
| SFP12PS50 | | | | 15 m | 1.5 m | |

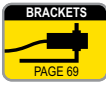
* Order any two Point optical elements with the same beam diameter.

** 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 71 for detailed range information.

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.
- Fibers connect and disconnect quickly.
- Switches meet Safety Category 4 requirements with one switch pair per guard (per ISO 13849-1).
- 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.



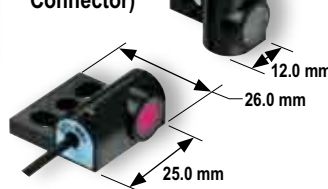
PICO-GUARD™ Fiber Optic Interlock Switches

- Six housing styles
- Easy-to-install housings
- Quick-release connectors or integral fibers, depending on model
- A complete system requires a controller (see page 60)

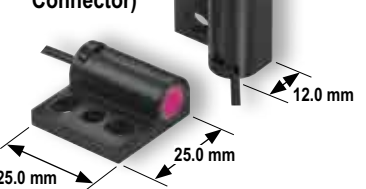
SFI-M12 Models
(Integral Fibers)



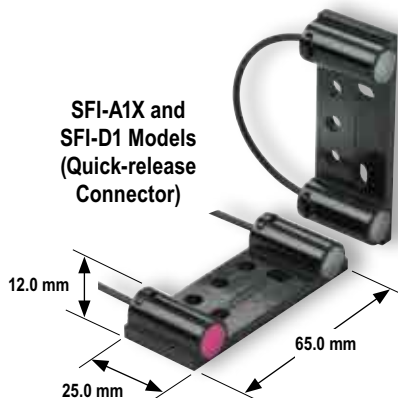
SFI-R1 Models
(Quick-release Connector)



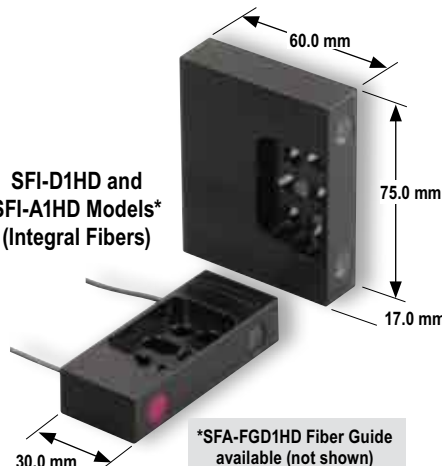
SFI-S1 Models
(Quick-release Connector)



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

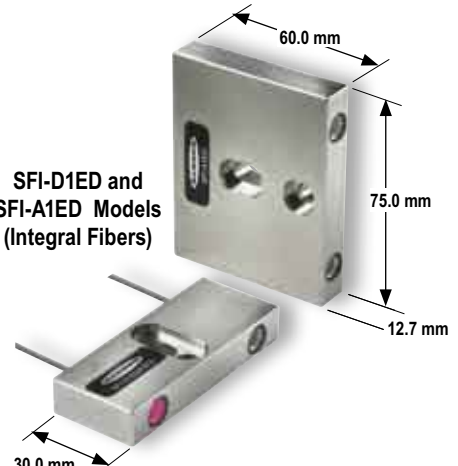


SFI-D1HD and
SFI-A1HD Models*
(Integral Fibers)



*SFA-FGD1HD Fiber Guide available (not shown)

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



PICO-GUARD™ Fiber Optic Interlock Switches

| Models | Housing Material | Orientation/Type | Fiber Length* | Separation and Max. Switching Distance | Data** Sheet | |
|----------------|---------------------|--|---|--|--|--------|
| SFI-S1R | Plastic | Straight, Right Mounting |  | Bulk or Precut | 1 mm = ± 10 mm 25 mm = ± 11 mm 50 mm = ± 12 mm | 109909 |
| SFI-S1L | | Straight, Left Mounting | | | | |
| SFI-R1R | Plastic | Right-angle, Right Mounting |  | Bulk or Precut | 1 mm = ± 11 mm 25 mm = ± 21 mm 50 mm = ± 33 mm | 109907 |
| SFI-R1L | | Right-angle, Left Mounting | | | | |
| SFI-D1 | Plastic | Dual, Center Mounting |  | Bulk or Precut | 1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm | 109908 |
| SFI-A1 | | Actuator, Polyethylene Jacket, Center Mounting | | | | |
| SFI-A1XP | | Actuator, Polyethylene Jacket, PVC Sheath, Center Mounting | | | | |
| SFI-A1XT | | Actuator, Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting | | | | |
| SFI-M12SS06UXT | 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 | 117201 |
| SFI-M12SS15UXT | | | | 4.5 m | | |
| SFI-M12SS30UXT | | | | 9.0 m | | |
| SFI-D1EDPXT6 | 316 Stainless Steel | Straight, Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting |  | 1.8 m | 1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm | 120125 |
| SFI-D1EDPXT15 | | | | 4.5 m | | |
| SFI-D1EDPXT30 | | | | 9.0 m | | |
| SFI-D1EDPXT50 | | | | 15.3 m | | |
| SFI-A1ED | | Actuator, Center Mounting | — | | | |
| SFI-D1HDPS6† | Zinc | Straight, Polyethylene Jacket, Center Mounting |  | 1.8 m | 1 mm = ± 7 mm 25 mm = ± 8 mm 50 mm = ± 9 mm | 121307 |
| SFI-D1HDPS15† | | | | 4.5 m | | |
| SFI-D1HDPS30† | | | | 9.0 m | | |
| SFI-D1HDPS50† | | | | 15.3 m | | |
| SFI-D1HDPXT6† | | Straight, Polyethylene Jacket, Fluoropolymer Sheath, Center Mounting | | 1.8 m | | |
| SFI-D1HDPXT15† | | | | 4.5 m | | |
| SFI-D1HDPXT30† | | | | 9.0 m | | |
| SFI-D1HDPXT50† | | 15.3 m | | | | |
| SFI-A1HD | | Actuator, Center Mounting | — | | | |

* Fibers available in bulk to be cut to length or precut lengths with polished ends. Order fibers separately (see page 68). Integral fiber lengths are listed.

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

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

CONTROLLERS

GRIDS & POINTS

INTERLOCKS

E-STOP BUTTONS

Emergency Stop Push Buttons

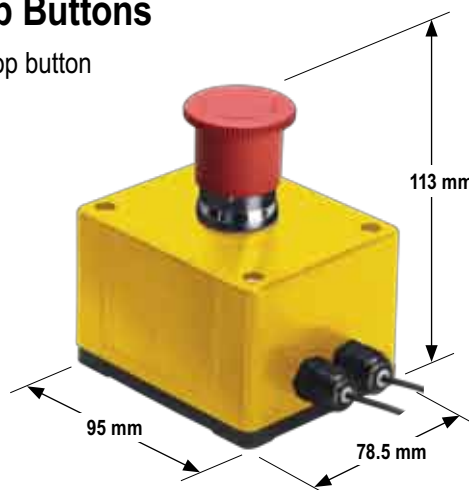
PICO-GUARD™ Fiber Optic

- 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 Safety Category 4 applications (per ISO 13849-1) 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



PICO-GUARD™ Optical E-Stop Buttons

- Push-to-stop, twist-to-release optical E-Stop button
- IP65-rated housing
- Fiber connection ports (same side or opposite sides, depending on model)



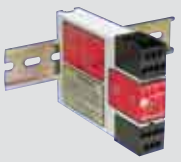



Emergency Stop Push Button with Enclosure



| Models | Housing Description | Data Sheet |
|--------------|---|----------------|
| SFS-EMB-01E1 | One-sided fiber connection | 129342 & 69763 |
| SFS-EMB-01E2 | Two-sided fiber connection (opposite sides) | |


Accessories PICO-GUARD™

PICO-GUARD™ Interfacing Products

| Models | | Description | Product Information | Data Sheet |
|-----------------------------------|---|---------------------------------------|---------------------|------------|
| Interface Modules |  | IM-T-9A (3 NO) | Page 107 | 62822 |
| | | IM-T-11A (2 NO/1 NC) | | |
| Muting Modules |  | MM-TA-12B | Page 94 | 63517 |
| | | MMD-TA-12B | | 116390 |
| | | MMD-TA-11B | | |
| Interface Modules and Controllers |  | SC22-3-S... | Page 76 | 133487 |
| | | SC22-3-C... | | |
| | | SC22-3E-S... | | |
| | | SC22-3E-C... | | |
| Contactors |  | Mechanically Linked Contactors | Page 191 | 111881 |
| | | 11-BG00-31-D-024 | | |
| | | BF1801L-024 | | |
| | | Aux. Contacts | | |
| | | 11-BGX10-40 | | |
| | | 11-G484-30 | | |
| | | Suppressors | | |
| | | 11-BGX77-048 | | |
| 11-G318-48 | | | | |

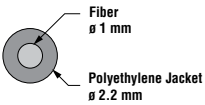
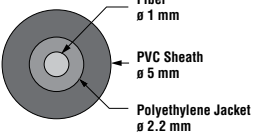
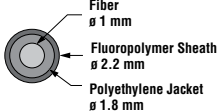
NC = Normally closed, NO = Normally open

PICO-GUARD™ Remote Display

| Models | Description | Data Sheet |
|---|-------------|------------|
|  | SFA-RD | 109374 |

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 | |

CONTROLLERS




GRIDS & POINTS

INTERLOCKS

E-STOP BUTTONS

PICO-GUARD™ Plastic Fiber Optic Accessories

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








| Model | | Description | Data Sheet | |
|--------------|---|-------------|--|--------|
| Attenuator |  | SFA-FA | <ul style="list-style-type: none"> 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 | 109910 |
| |  | SFA-FS | | |
| Fiber Cutter |  | PFC-2-25 | <ul style="list-style-type: none"> Used with Banner 2.2 mm OD diameter unterminated fiber optic cable (1 mm core) Contains 25 fiber cutters | — |
| | | | | |









PICO-GUARD™ Cable Glands and Conduits

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

| Model | Description | |
|---------------|-------------|--|
| SFA-FCC-008 | 2.4 m | Conduit <ul style="list-style-type: none"> Made of flexible MEK-resistant polyamide Protects fiber Snaps into emitter/receiver Easily cuts to length |
| SFA-FCC-015 | 4.5 m | |
| SFA-FCC-025 | 7.5 m | |
| SFA-FCC-050 | 15 m | |
| SFA-FCC-100 | 30 m | |
| SFA-FCC-CGM20 | M20 Threads | Cable Gland <ul style="list-style-type: none"> Use with MEK-resistant conduit (above) Made of MEK resistant polyamide Attaches conduit to emitter/receiver and PICO-GUARD controller |

PICO-GUARD™ Brackets

| Controller | Grids | | | | 12 mm–Points | |
|--|--|--|--|--|---|--|
|  pg. 166 |  pg. 166 |  pg. 167 |  pg. 168 |  pg. 168 |  pg. 172 |  pg. 172 |
| DIN-35... | EZA-MBK-1 | EZA-MBK-2 | EZA-MBK-3 | EZA-MBK-9 | SMB12MM | SMB1812SF |

| 30 mm–Points | | | | | Interlock Switches | | |
|--|--|--|--|--|---|--|--|
|  pg. 173 |  pg. 173 |  pg. 173 |  pg. 173 |  pg. 174 |  pg. 171 |  pg. 172 |  pg. 172 |
| SMB30A | SMB30MM | SMB30SC | SMBAMS30P | SMBAMS30RA | SFA-IMB1 | SFA-IMB2 | SMB12MM |

PICO-GUARD® Replacement Parts

| Model | Description |
|-----------|--|
| EZA-LAT-1 | Replacement adapter hardware for Grid. |
| MGA-KS0-1 | SPST key reset switch, no wires (includes key) |
| 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 | Replacement adapter hardware for SPF12 |
| SFA-LAT-30 | Replacement adapter hardware for SPF30 |
| SFA-W-1 | Replacement window for Grid |
| STP-3 | Specified test piece, 45 mm dia. for Grid |

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 initiate 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 models: | Aux., weak, fault, Ch 1-4 |
| Muting models: | Aux./Mute temp, fault, Ch 1-4 (-4A1C 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 67. |




PICO-GUARD™ Controller Specifications (cont'd)


| | |
|---------------------------------|--|
| 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 | <p>All models:</p> <p>System Status (bi-color Red/Green): overall status of the PICO-GUARD system</p> <p>System Reset (bi-color Yellow/Red): status of the input; indicates system reset needed</p> <p>Channel (4 bi-color Red/Green): each shows the status of one optical channel</p> <p>EDM (bi-color Red/Green): status of the EDM input channels</p> <p>OSSD (bi-color Red/Green): status of the OSSD outputs</p> <p>Config (bi-color Red/Green): status of the system configuration</p> <p>Non-Muting models:</p> <p>USS1 (2 bi-color Red/Green): status of the USS1 input channels (a-b and c-d)</p> <p>USS1 1 Reset (bi-color Yellow/Red): status of USS1 1 reset input; indicates USS1 1 reset needed</p> <p>EDM (bi-color Red/Green): status of the EDM input channels</p> <p>OSSD (bi-color Red/Green): status of the OSSD outputs</p> <p>Config (bi-color Red/Green): status of the system configuration</p> <p>Muting Models:</p> <p>Muting (4 bi-color Red/Green): status of the muting input</p> <p>Mute Enable (bi-color Yellow/Red): status of the EDM enable</p> |
| Enclosure Rating | P20 |
| 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 | <div style="display: flex; align-items: center;"> <div> <p>Important Notice:</p> <p>European Community Machinery Directive 2006/42/EC</p> <p>The PICO-GUARD Controllers comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-GUARD Controllers 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.</p> </div> </div> |
| Wiring Diagrams | WD023, WD024, WD025, WD026, WD027, WD028 (pp. 232-263) |


PICO-GUARD™ Grid & Point Systems Specifications

| Operating Range | <p>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-2 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.</p> <p>12 mm Point Operating Range:</p> <p>Minimum operating range: 150 mm</p> <p>Maximum operating range: see table*</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th></th> <th>SFP12..8</th> <th>SFP12..15</th> <th>SFP12..25</th> <th>SFP12..50</th> </tr> </thead> <tbody> <tr> <td>SFP12..8</td> <td>6.4 m</td> <td>5.5 m</td> <td>4.6 m</td> <td>3 m</td> </tr> <tr> <td>SFP12..15</td> <td>5.5 m</td> <td>4.8 m</td> <td>4 m</td> <td>2.7 m</td> </tr> <tr> <td>SFP12..25</td> <td>4.6 m</td> <td>4 m</td> <td>3.4 m</td> <td>2.1 m</td> </tr> <tr> <td>SFP12..50</td> <td>3 m</td> <td>2.7 m</td> <td>2.1 m</td> <td>1.5 m</td> </tr> </tbody> </table> <p>30 mm Point Operating Range:</p> <p>Minimum operating range: 800 mm</p> <p>Maximum operating range: see table*</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th></th> <th>SFP30..8</th> <th>SFP30..15</th> <th>SFP30..25</th> <th>SFP30..50</th> <th>SFP30..100</th> </tr> </thead> <tbody> <tr> <td>SFP30..8</td> <td>28.7 m</td> <td>25.9 m</td> <td>23.2 m</td> <td>20.1 m</td> <td>13.7 m</td> </tr> <tr> <td>SFP30..15</td> <td>25.9 m</td> <td>24.4 m</td> <td>22.9 m</td> <td>19.5 m</td> <td>12.8 m</td> </tr> <tr> <td>SFP30..25</td> <td>23.2 m</td> <td>22.9 m</td> <td>21.9 m</td> <td>17.1 m</td> <td>12.2 m</td> </tr> <tr> <td>SFP30..50</td> <td>20.1 m</td> <td>19.5 m</td> <td>17.1 m</td> <td>14.0 m</td> <td>11.0 m</td> </tr> <tr> <td>SFP30..100</td> <td>13.7 m</td> <td>12.8 m</td> <td>12.2 m</td> <td>11.0 m</td> <td>8.5 m</td> </tr> </tbody> </table> <p>Grids Operating Range:</p> <p>Minimum operating range: 800 mm</p> <p>Maximum operating range: see table*</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th></th> <th>SFG..8</th> <th>SFG..15</th> <th>SFG..25</th> <th>SFG..50</th> <th>SFG..100</th> </tr> </thead> <tbody> <tr> <td>SFG..8</td> <td>31.1 m</td> <td>29.0 m</td> <td>26.5 m</td> <td>21.6 m</td> <td>14.9 m</td> </tr> <tr> <td>SFG..15</td> <td>29.0 m</td> <td>27.1 m</td> <td>24.7 m</td> <td>20.1 m</td> <td>14.0 m</td> </tr> <tr> <td>SFG..25</td> <td>26.5 m</td> <td>24.7 m</td> <td>22.6 m</td> <td>18.3 m</td> <td>12.8 m</td> </tr> <tr> <td>SFG..50</td> <td>21.6 m</td> <td>20.1 m</td> <td>18.3 m</td> <td>14.9 m</td> <td>10.4 m</td> </tr> <tr> <td>SFG..100</td> <td>14.9 m</td> <td>14.0 m</td> <td>12.8 m</td> <td>10.4 m</td> <td>7.0 m</td> </tr> </tbody> </table> <p>* In applications using SSM or MSM series corner mirrors, range is reduced by approximately 8 percent for each mirror used.</p> | | 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 | | 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 | | 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 |
|------------------------|--|-----------|-----------|-----------|------------|-----------|----------|-------|-------|-------|-----|-----------|-------|-------|-----|-------|-----------|-------|-----|-------|-------|-----------|-----|-------|-------|-------|--|----------|-----------|-----------|-----------|------------|----------|--------|--------|--------|--------|--------|-----------|--------|--------|--------|--------|--------|-----------|--------|--------|--------|--------|--------|-----------|--------|--------|--------|--------|--------|------------|--------|--------|--------|--------|-------|--|--------|---------|---------|---------|----------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|--------|----------|--------|--------|--------|--------|-------|
| | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |



| PICO-GUARD™ Grid & Point Systems Specifications (cont'd) | |
|--|--|
| 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 |  <p>Important Notice: European Community Machinery Directive 2006/42/EC The PICO-GUARD Grid and Points comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-GUARD Grid and Points 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.</p> |

| 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 |  <p>Important Notice: European Community Machinery Directive 2006/42/EC The PICO-GUARD Safety Interlock Switches comply with Machine Directive 98/37/EC. After December 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-GUARD Safety Interlock Switches 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.</p> |

| PICO-GUARD™ E-Stop Button Specifications | |
|--|--|
| Mounting | Holes (x4) for M5 screws (mounting hardware not included) |
| Construction | Enclosure and Base: Polycarbonate Button: Polyimide Button Base: Aluminum/Zinc alloy |
| Operating Conditions | Temperature: 0° to +70° C Relative humidity: 95% (non-condensing) |
| Environmental Rating | IP65 |
| Certifications |  <p>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 29, 2009, when Machine Directive 2006/42/EC will be in force, the PICO-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.</p> |