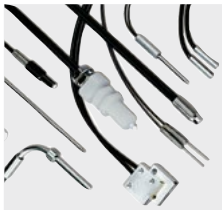
Fiber Optics

Fiber optic cables are ideal for harsh conditions including high vibration, extreme heat, noisy, wet, corrosive or explosive environments. Fiber optic sensors have thin profiles, allowing for close mounting of multiple units and mounting in confined areas. Sensors can be positioned precisely where needed with flexible fibers.

Series	Description	Output Response Time	Dimensions H x W x D	Housing Material	Power Supply
	**DF-G3** Long-range easy to read dual display fiber amplifier page 164	500 µs varies by model	33.0 x 72.0 x 10.0 mm	Thermoplastic	**NPN/PNP models:** 10 to 30 V dc **IO-Link models:** 18 to 30 V dc
	**DF-G2** High-speed easy to read dual display fiber amplifier page 166	10 µs (varies by model)	33.0 x 72.0 x 10.0 mm	Thermoplastic	**NPN/PNP models:** 10 to 30 V dc **IO-Link models:** 18 to 30 V dc
	**DF-G1** Easy to read dual display fiber amplifier page 168	**High Speed:** 200 µs **Long Range:** 2 ms **Extra Long Range:** 5 ms	33.0 x 72.0 x 10.0 mm	Thermoplastic	**NPN/PNP models:** 10 to 30 V dc **IO-Link models:** 18 to 30 V dc
	**D10** Advanced fiber optic amplifier page 172	varies by model	35.9 x 68.1 x 10.0 mm	Thermoplastic	12 to 24 V dc
	Plastic Fibers page 174				
	Glass Fibers page 192				

OTHER AVAILABLE MODELS

R55F see website

DF-G3 Series

Long-range Fiber Optic Amplifiers

- World-class long-range sensing capability, more than 3 m (10 ft) with opposed mode fibers
- Easy to read dual digital displays show both signal level and threshold simultaneously
- Cross-talk avoidance function allows seven inspections in dense sensing point applications
- Models with IO-Link enable a point-to-point communication link between a master device and a sensor, facilitating remote monitoring, teaching, and configuration
- Operator control of the sensitivity (hysteresis) provides additional detection sensitivity, or a stabilized output depending on the application details

IO-Link DF-G3

Sensing Beam Color	Range*	Connection	Output	Models
Visible Red, 635 nm	3,000 mm	2 m	Channel1: IO-Link, push/pull Channel 2: PNP only output, or input	DF-G3-KD-2M
Infrared, 850 nm**	6,000 mm	2 m	Channel1: IO-Link, push/pull Channel 2: PNP only output, or input	DF-G3IR-KD-2M

Single Output DF-G3

Sensing Beam Color	Range*	Connection	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	DF-G3-NS-2M	DF-G3-PS-2M
Infrared, 850 nm**	6,000 mm	2 m	DF-G3IR-NS-2M	DF-G3IR-PS-2M

Dual Output DF-G3

Sensing Beam Color	Range*	Connection	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	DF-G3-ND-2M	DF-G3-PD-2M
Infrared, 850 nm**	6,000 mm	2 m	DF-G3IR-ND-2M	DF-G3IR-PD-2M

Analog DF-G3

Sensing Beam Color	Range*	Connection	Supply Voltage	NPN Models	PNP Models
Visible Red	3,000 mm	2 m	Voltage: 12-30 V DC	DF-G3-NU-2M	DF-G3-PU-2M
			Current: 10-30 V DC	DF-G3-NI-2M	DF-G3-PI-2M
Infrared, 850 nm**	6,000 mm	2 m	Voltage: 12-30 V DC	DF-G3IR-NU-2M	DF-G3IR-PU-2M
			Current: 10-30 V DC	DF-G3IR-NI-2M	DF-G3IR-PI-2M

For more specifications see page 169

Connection Option: A model with a QD requires a mating cordset. (see page 169)

* Excess gain = 1, Long Range response speed, opposed mode sensing.
** IR models require T5 terminated glass fiber optic cables

DF-G3 Series

Water Detection Fiber Optic Amplifiers

- 1450 nm infrared wavelength to enhance contrast of clear liquids
- Reliable detection of presence or absence of water-based liquids
- Easy to read dual digital displays show both signal level and threshold simultaneously
- Cross-talk avoidance function allows seven inspections in dense sensing point applications
- Models with IO-Link enable a point-to-point communication link between a master device and a sensor, facilitating remote monitoring, teaching, and configuration
- Cordsets and brackets see page 169

Single Output DF-G3

Sensing Beam Color	Range*	Connection	NPN Models	PNP Models
Long Infrared, 1450 nm**	900 mm	2 m	DF-G3LIR-NS-2M	DF-G3LIR-PS-2M

Dual Output DF-G3

Sensing Beam Color	Range*	Connection	NPN Models	PNP Models
Long Infrared, 1450 nm**	900 mm	2 m	DF-G3LIR-ND-2M	DF-G3LIR-PD-2M

Analog DF-G3

Sensing Beam Color	Range*	Connection	Supply Voltage	NPN Models	PNP Models
Long Infrared, 1450 nm**	900 mm	2 m	Voltage: 12-30 V DC	DF-G3LIR-NU-2M	DF-G3LIR-PU-2M
			Current: 10-30 V DC	DF-G3LIR-NI-2M	DF-G3LIR-PI-2M

For more specifications see page 169

Connection Option: A model with a QD requires a mating cordset. (see page 169)

* Excess gain = 1, Long Range response speed, opposed mode sensing.
** IR models require T5 terminated glass fiber optic cables

DF-G2 Series

High-Speed *Expert*™ Fiber Optic Amplifiers

- The high speed DF-G2 fiber amplifiers now offer several LED colors to maximize contrast in challenging low-contrast applications
- Best in Class response time
- Programming via displays and switches/buttons or remote input teach wire
- *Expert* TEACH and SET methods ensure optimal gain and threshold for all applications, especially low contrast applications
- Cross talk avoidance algorithm allows two sensors to operate in close proximity for many applications

IO-Link DF-G2

Sensing Beam Color	Range	Connection	Output	Models
Visible Red, 635 nm	1,100 mm	2 m	Channel1: IO-Link, push/pull Channel 2: PNP only output, or input	**DF-G2-KD-2M**
Infrared, 850 nm*	2,100 mm	2 m	Channel1: IO-Link, push/pull Channel 2: PNP only output, or input	**DF-G2IR-KD-2M**

DF-G2

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Visible Red	Range varies by response speed and fiber optics used	2 m	**DF-G2-NS-2M**	**DF-G2-PS-2M**

DF-G2 Multiple color

Multiple LED color options available.

Multiple Color DF-G2

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Broad Spectrum White	50% of Visible Red Range	2 m	**DF-G2W-NS-2M**	**DF-G2W-PS-2M**
Visible Green	60% of Visible Red Range	2 m	**DF-G2G-NS-2M**	**DF-G2G-PS-2M**
Visible Blue	70% of Visible Red Range	2 m	**DF-G2B-NS-2M**	**DF-G2B-PS-2M**
Infrared*	190% of Visible Red Range	2 m	**DF-G2IR-NS-2M**	**DF-G2IR-PS-2M**

For more specifications see page 170.

Connection options: A model with a QD requires a mating cordset (see page 169).

For 9 m cable, change the suffix **2M** to **9M** in the 2 m model number (example, **DF-G2-NS-9M**).
For M8 pico pigtail, change the suffix **2M** to **Q3** in the 2 m model number (example, **DF-G2-NS-Q3**).
For M12 euro pigtail, change the suffix **2M** to **Q5** in the 2 m model number (example, **DF-G2-NS-Q5**).
* IR models require T5 terminated glass fiber optic cables

DF-G2 Series

Small Object Fiber Optic Amplifiers

- The DF-G2 Series uses Banner's unique firmware designed to achieve accurate, high speed, low contrast performance for small object detection applications
- Percent-based threshold selectable from 2% to 50% for sensitivity adjustment
- Automatic Gain Compensation (AGC) algorithm compensates for dust build-up on fiber optics to extend counting cycle and maintain count accuracy
- Intelligent Dynamic Event Stretcher (DES) minimizing chance for double-counting, even with non-uniform objects (i.e. gel caps, washers, etc.)

DF-G2

Sensing Beam Color	Range	Connection	NPN Models	PNP Models
Visible Red, 635 nm	Range varies by response speed and fiber optics used	2 m	**DF-G2-NC-2M**	**DF-G2-PC-2M**

Fiber Optic Arrays for DF-G2

Sensing Beam Color	Window Size	Fiber Exit	Minimum Object Size	Model
Visible Red, 635 nm	10 x 25 mm	Side Exit End Exit	1.5 mm	**PFCVA-10X25-S** **PFCVA-10X25-E**
Visible Red, 635 nm	25 x 25 mm	Side Exit End Exit	3 mm	**PFCVA-25X25-S** **PFCVA-25X25-E**
Visible Red, 635 nm	34 x 25 mm	Side Exit End Exit	4 mm	**PFCVA-34X25-S** **PFCVA-34X25-E**

DF-G2 and array fibers

Multiple array fiber models available.

For more specifications see page 170.

Connection options: A model with a QD requires a mating cordset (see page 169)

For 9 m cable, change the suffix **2M** to **9M** in the 2 m model number (example, **DF-G2-NC-9M**).

DF-G1 Series

Expert™ Dual-Display Fiber Optic Amplifiers

- The DF-G1 Series has a simple user interface to ensure easy sensor set-up and programming via displays and switches/buttons, remote input teach wire or IO-Link
- End user has full control over operating parameters, including Light/Dark Operate, output timing functions, gain level and response speed
- Cross talk avoidance algorithm allows multiple sensors to operate in close proximity
- Light receiver models detect light emission from a wide variety of sources

IO-LInk DF-G1

Sensing Beam Color	Range	Connection	Output	Models
Visible Red, 660 nm	Range varies by Speed Selection used and with fiber optics used. See fibers section on page 174 or reference website for range information.	2 m	Channel1: IO-Link, push/pul Channel 2: PNP only output, or input	**DF-G1-KS-2M**

DF-G1

Sensing Beam Color	Range	Connection	NPN Models	PNP Model
Visible Red, 660 nm	Range varies by Speed Selection used and with fiber optics used. See fibers section on page 174 or reference website for range information.	2 m	**DF-G1-NS-2M**	**DF-G1-PS-2M**

Light Receiver DF-G1

Sensing Beam Color	Range	Connection	NPN Models	PNP Model
Visible Red, 660 nm	Range varies by response speed used, gain setting, target light source intensity, ambient light level and with fiber optics used. See fibers section on page 174 or reference website for range information.	2 m	**DF-G1-NR-2M**	**DF-G1-PR-2M**

Connection options: A model with a QD requires a mating cordset

For 9 m cable, change the suffix **2M** to **9M** in the 2 m model number (example, **DF-G1-NS-9M**).
For M8 Pico pigtail change the suffix **2M** to **Q3** in the 2 m model number (example, **DF-G1-NS-Q3**).
For M12 Euro pigtail change the suffix **2M** to **Q5** in the 2 m model number (example, **DF-G1-NS-Q5**).

Euro QD
(for ..Q8 or ..Q5 models)
Straight connector models listed; for right-angle, add **RA** to the end of the model number (example, **MQDC-406RA)**

4-Pin
MQDC-406
2 m (6')
MQDC-415
5 m (15')
MQDC-430
9 m (30')

Pico QD
(for Q7 models)
Straight snap-on connector

Pico QD (for Q7 models)
Right-angle snap-on connector

4-Pin
PKG4-2
2 m (6')

PKW4Z-2
2 m (6')

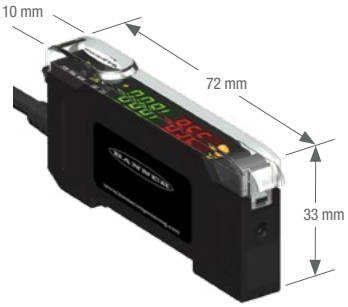
Additional cordset information is available
See page 758

DIN-35..

SA-DIN-BRACKET

Mounting Clamp

SA-DIN-CLAMP



Additional bracket information is available
See page 730

DF-G1 Specifications

Supply Voltage and Current	**NPN/PNP Models:** 10 to 30 V dc (10% max ripple) **IO-Link Models:** 18 to 30 V dc (10% max ripple) **Standard Mode:** 960 mW, Current consumption < 40 mA @ 24 V dc **ECO Display Mode:** 720 mW, Current consumption < 30 mA @ 24 V dc
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Output Configuration	**NPN/PNP Models:** 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model **IO-Link Models:** 1 push-pull and 1 PNP (complementary outputs)
Output Rating	100 mA max. load (derate 1 mA per °C above 30 °C) **OFF-state leakage current:** NPN/PNP: < 5 µA at 30 V dc IO-Link: < 50 µA at 30 V dc **ON-state saturation voltage:** NPN: < 1.5 V PNP: < 2 V IO-Link: < 2 V
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Output Response Time	**High Speed:** 200 us **Standard:** 500 us **Long Range:** 2 ms **Extra Long Range:** 5 ms **Light receiver models:** 50 ms, 150 ms
Delay at Power-up	500 milliseconds max.; outputs do not conduct during this time
Adjustments	3-way RUN/PRG/ADJ Mode Switch 2-way LO/DO Switch 3-way +/SET/- Rocker Button See datasheet for detailed information
Indicators	**Red 4-digit Display:** Signal Level **Green 4-digit Display:** Threshold **Yellow LED:** Output conducting (In Program Mode, Red and Green displays are used for programming menus)
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50, NEMA 1
Operating Conditions	**Temperature:** –10 to +55 °C **Storage:** –20 to +85 °C **Relative Humidity:** 90% @ 60 °C (non-condensing)
Certifications	CE c UL us LISTED 3TJJ IND. CONT. EQ. IO-Link®

DF-G2 Specifications

Supply Voltage and Current	10 to 30 V dc (10% max ripple)
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages **Standard display mode:** 960 mW, Current consumption less than 40 mA at 24 V dc **ECO display mode:** 720 mW, Current consumption less than 30 mA at 24 V dc
Output Configuration	**NPN/PNP Models:** 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model, plus 1 Health Mode output
Output Rating	100 mA max. load (derate 1 mA per °C above 30 °C) **OFF-state leakage current:** NPN/PNP: < 5 µA at 30 V dc **ON-state saturation voltage:** NPN: < 1.5 V PNP: < 2 V
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Sensing Beam	**DF-G2:** Visible red, 635 nm **DF-G2W:** Broad spectrum white, 450 to 650 nm **DF-G2B:** Visible blue, 470 nm **DF-G2G:** Visible green, 525 nm **DF-G2IR:** Infrared, 850 nm
Output Response Time	**Super High Speed:** 10 µs **High Speed:** 15 µs **Fast:** 50 µs **Standard:** 250 µs **Medium Range:** 500 µs **Long Range:** 1000 µs **Long Range with immunity to Energy Efficient Lights:** 2000 µs **Super High Speed:** 10 µs **High Speed:** 15 µs **Fast:** 50 µs **Standard:** 250 µs **Medium Range:** 500 µs **Long Range:** 1000 µs **DF-G2 Small Object Counter:** 25 µs 50 µs 150 µs 250 µs 500 µs
Repeatability	**Super High Speed:** 5 µs **High Speed:** 5 µs **Fast:** 12 µs **Standard:** 50 µs **Medium Range:** 80 µs **Long Range:** 165 µs **Long Range with immunity to Energy Efficient Lights:** 165 µs **DF-G2 Small Object Counter:** 12 µs 12 µs 30 µs 50 µs 80 µs
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50, NEMA 1
Operating Conditions	**Temperature:** –10 to +55 °C **Storage:** –20 to +85 °C **Relative Humidity:** 90% @ 60 °C (non-condensing)
Certifications	CE c UL us LISTED 3TJJ IND. CONT. EQ.

DF-G3 Specifications

Supply Voltage and Current	**NPN/PNP Models:** 10 to 30 V dc (10% max ripple) **Voltage output models:** 12 to 30 V dc (10% max ripple) **Standard Mode:** 960 mW, Current consumption < 40 mA @ 24 V dc **IO-Link Models:** 18 to 30 V dc (10% max ripple) **Current output models:** 10 to 30 V dc (10% max ripple) **ECO Display Mode:** 720 mW, Current consumption < 30 mA @ 24 V dc
Supply Protection Circuitry	Protected against reverse polarity, over voltage, and transient voltages
Sensing Beam	**DF-G3:** Visible red, 635 nm **DF-G3IR:** Infrared, 850 nm **DF-G3LIR:** Long Infrared, 1450 nm
Output Configuration	**NPN/PNP Models:** 1 current sourcing (PNP) or 1 current sinking (NPN) output, depending on model **IO-Link Models:** 1 push-pull and 1 PNP (complementary outputs) **Voltage output models:** 1 analog voltage output (user configurable as 1 V to 5 V or 0 V to 10 V) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output **Current output models:** 1 analog current output (4 mA to 20 mA) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output
Output Rating	100 mA max. load (derate 1 mA per °C above 30 °C) **OFF-state leakage current:** **NPN/PNP/current:** < 5 µA at 30 V dc **IO-Link:** < 50 µA at 30 V dc **ON-state saturation voltage:** **NPN:** < 1.5 V **PNP:** < 2 V **IO-Link:** < 2 V
Output Protection Circuitry	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Output Response Time	**High Speed:** 500 us **Fast:** 1000 us **Standard:** 2 ms **Long Range:** 8 ms **Extra Long Range:** 24 ms
Delay at Power-up	500 milliseconds max.; outputs do not conduct during this time
Indicators	**Red 4-digit Display:** Signal Level **Green 4-digit Display:** Threshold **Yellow LED:** Output conducting (In Program Mode, Red and Green displays are used for programming menus)
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50, NEMA 1
Operating Conditions	**Temperature:** –10 to +55 °C **Storage:** –20 to +85 °C **Relative Humidity:** 50% @ +50 °C (non-condensing)
Certifications	CE c UL us LISTED 3TJJ IND. CONT. EQ. IO-Link®

D10 Series

High-Speed *Expert*™ Fiber Optic Amplifiers

- Available with visible red or green beam
- Available in Light or Dark Operate
- Includes specially designed models for reliable detection of objects as small as 1.5 mm
- Features bussable models for side-by-side mounting and simplified wiring of up to 16 sensors
- Features thin 10 mm housing for standard 35 mm DIN-rail mounting

D10

Sensing Beam Color	Range	Connection	Output Type	Response Speed	Models
Visible Red	Range varies by Power Level/Speed Selection used and with fiber optics used. See fibers section on page 174 or reference datasheet for range information.	2 m	Bipolar NPN/PNP	500 ms	**D10AFP**
Visible Green		2 m		500 ms	**D10AFPG**
Visible Red		2 m		200 ms	**D10AFPY**
Visible Green		2 m		200 ms	**D10AFPGY**

Connection options: A model with a QD requires a mating cordset

For 4-pin Snap-on Pico QD cable, add suffix **Q** to the **2 m** model number (example, **D10AFPQ**).

	4-Pin	6-Pin
Pico QD (for Q7 models) Straight snap-on connector	**PKG4-2** 2 m (6')	**PKG6Z-2** 2 m (6')
Pico QD (for Q7 models) Right-angle snap-on connector	**PKW4Z-2** 2 m (6')	**PKW6Z-2** 2 m (6')

Additional cordset information is available
See page 758

DIN-35..

SMBR55F01

SMBR55FRA

Additional bracket information is available
See page 730

D10—Discrete Specifications

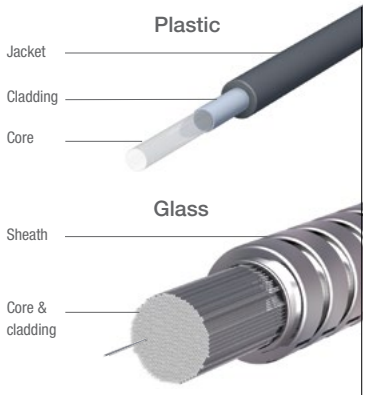
Required Fiber Optic Cable	Banner P-Series plastic fibers (See Plastic Fiber Optic section, page 174)
Supply Voltage & Current	10 to 30 V dc (10% max. ripple) @ less than 25 mA, exclusive of load
Supply Protection Circuitry	Protected against reverse polarity and transient voltage
Output Configuration	**Bipolar:** 1 current sourcing (PNP) and 1 current sinking (NPN)
Output Rating	100 mA per output with short circuit protection **OFF-state leakage current:** less than 10 µA sourcing; 200 µA sinking **ON-state saturation voltage:** **NPN:** 1.6 V @ 100 mA **PNP:** 2.0 V @ 100 mA
Output Protection Circuitry	Protected against output short-circuit and false pulse on power up
Delay at Power-up	Max. 100 milliseconds; outputs do not conduct during this time
Output Response Time	**Standard models (with crosstalk avoidance circuitry):** 500 microseconds **High-speed models:** 200 microseconds
Repeatability	**Standard models:** 95 microseconds **High-speed models:** 50 microseconds
Adjustments	12-turn Sensitivity potentiometer with relative position indicator; LO/DO Selection switch; 0 or 40 milliseconds OFF-delay switch NOTE: Use proper ESD techniques while making adjustments under cover
Indicators	**Two LEDs:** Green and Yellow **Green:** Power ON **Yellow:** Light Sensed Signal strength indicator See datasheet for detailed information
Construction	Black ABS/polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating	IEC IP50; NEMA 1
Operating Conditions	**Temperature:** –10 to +55 °C **Storage:** –20 to +85 °C **Relative humidity:** 90% @ 55 °C (non-condensing)
Certifications	CE cULus

Plastic Fiber Optics

Provide an economical alternative to glass fiber optics for piping photoelectric sensing light to and from confined areas with suitable environments

- Ideal for detecting small objects
- Withstand repeated flexing and bending
- Available in individual or bifurcated styles
- Available with core diameters of 0.25, 0.50, 0.75, 1.0 and 1.5 mm

Choosing Plastic or Glass



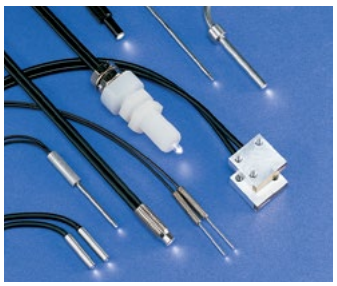
Fiber Construction

Core: Thin glass or plastic center of the fiber through which light travels

Cladding: Outer optical material surrounding the core that reflects light back into the core

Jacket/ Sheath: Protective layer to protect fiber from damage and moisture

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length in the field and cost less than glass fibers. Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.



Plastic fibers **page 174**

- Inexpensive and easily cut to length during installation
- Bend for a precise fit
- Available in high-flex models to withstand flexing
- Offered with special jackets that withstand corrosion, impact and abrasion
- Available for applications requiring articulated or reciprocating motion
- Available in diameters of 0.25, 0.5, 1.0 Or 1.5 mm
- Can be quickly custom designed and built for your unique applications

Glass fibers **page 192**

- Solve numerous challenging sensing requirements
- Ideal for hostile environments such as high temperatures to 480° C, corrosive materials and extreme moisture
- Withstand high levels of shock and vibration
- Inherently immune to extreme electrical noise
- Available with choice of sheathings: standard stainless-steel flexible conduit, PVC or other flexible tubing
- Can be quickly custom designed

Model Key

P	I	T	4	6	U	

PLASTIC FIBER FAMILY

Same for all plastic fibers

ASSEMBLY STYLE

I = Individual fiber*
DI = Dual Individual fiber*
B = Bifurcated fiber

SENSING END

A = 90° Angle
AT = 90° Angle/Thread
CF = Coaxial Ferrule
CT = Coaxial Thread
E = Encapsulated
EFP =Extended Ferrule Probe
F = Ferrule
FM = Ferrule Miniature
FMP = Ferrule Miniature Probe
L = Lensed
P = Probe
PF = Probe Ferrule
PMSB = Probe Miniature Side-view Bendable
PS = Probe Side-view
PSB = Probe Side-view Bendable
PSM = Probe Side-view Miniature
R = Rectangular
RS = Rectangular Side-view
T = Thread
TA = Thread/90° Angle
TP = Thread/Probe

MODIFICATIONS†

MFR = Flex relief
MSW = Slot width
MTA = Tight angle
MTL = Thread length
MAL = Array length
MPL = Probe length
MFL = Ferrule length

CONTROL END

U = Unterminated straight cable**
UC = Unterminated Coiled cable
UHF = Unterminated DURA-BEND™ multi-core cable
T5 = Terminated
TMB5 = SteelSkin™ braiding over monocoil reinforcement

FIBER LENGTH

3 = 1 m (1000 mm)
6 = 2 m (2000 mm)
15 = 5 m (5000 mm)
30 = 9 m (9,000 mm)
100 = 30 m (30,000 mm)

FIBER CORE DIAMETER

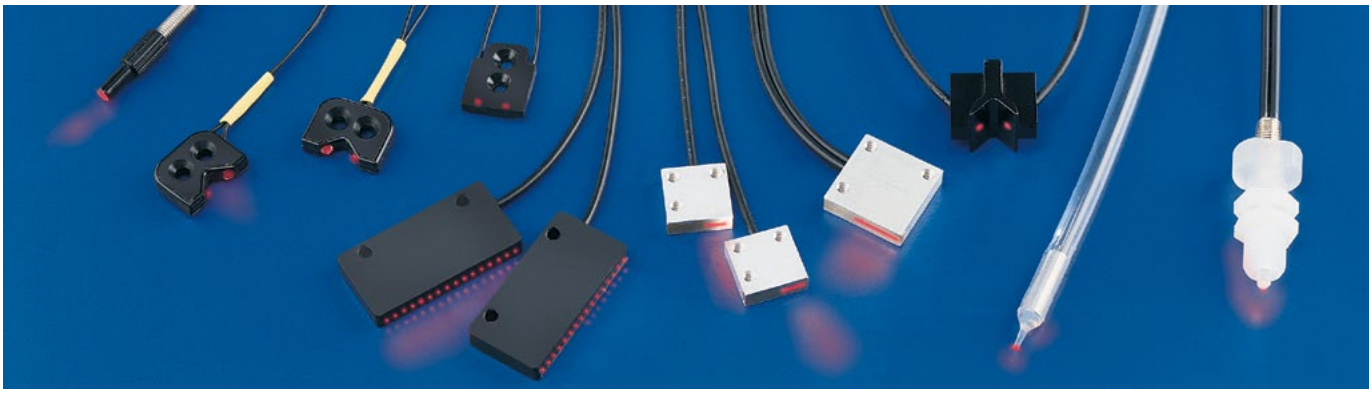
1 = 0.25 mm
2 = 0.50 mm
3 = 0.75 mm
4 = 1.00 mm
6 = 1.50 mm
1x4 = 4 x 0.25 mm
1x16 = 16 x 0.265 mm
1x32 = 32 x 0.265 mm

* All individual plastic fiber optics are sold and used in pairs. Bifurcated fibers are two-way fibers with a single sensing end that both emits and receives light and with dual-control sensor ends that attach separately to the sensor's LED and photodetector.

** Plastic fibers with "U" in the suffix of the model numbers have unterminated control ends; cut them to the required length using the supplied cutter.

† Not all modifications can be applied to all fiber assemblies. Please consult factory for verification of modifications.

Specialty fibers for specific sensing applications




DURA-BEND™ for extremely tight radius bends


Fluoropolymer encapsulated fibers


Focused beam fibers


Convergent beam fibers


Linear array fibers


Liquid level detection fibers

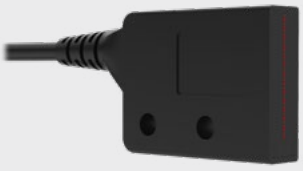

High temperature fibers


SteelSkin™ for impact and abrasion

Vantage Line Plastic Fibers

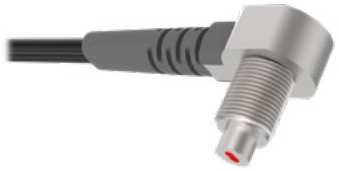
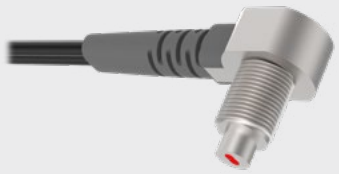
- OEM friendly packaging
- No fiber cutter included
- Opposed models come as a pair

Opposed Vantage Line Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	M6 threaded tip and integrated lens with flex relief 20 mm spot size at 100 mm	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1	2000† 2000 2000	**PITL23UM6-VL***
	M4 threaded tip and integrated lens with flex relief 30 mm spot size at 100 mm	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1	2000† 2000 1680	**PITL23UM4-VL***
	M4 & M2.6 threaded tip with flex relief	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1	2000† 1460 900	**PIT43U-VL***
	M4 threaded tip with flex relief	25 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1	1980 410 255	**PIT23UM4-VL***
	M3 threaded tip with flex relief	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1	2000† 1450 895	**PIT43UM3-VL***
	M3 threaded tip with flex relief	25 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1	2000† 440 270	**PIT23U-VL***
	M4 & M2.6 threaded tip with flex relief 90° angle/thread	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1	2000† 1250 770	**PIAT43UTA-VL***
	M4 & M2.6 threaded tip with flex relief 90° angle/thread	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1	2000† 1200 740	**PIAT43UHFTA-VL***
	Rectangular housing with front exit 14.5 mm array	60 mm	32 x 0.25 mm	–	DF-G3 DF-G2 DF-G1	2000† 1510 930	**PIR1X323T-VL***
	M4 & M2.6 threaded tip with stainless protective jacket	25 mm	1 mm	–	DF-G3 DF-G2 DF-G1	2000† 1700 1060	**PIT43TSL5-VL***
	M4 & M2.6 threaded tip with stainless protective jacket 90° angle/thread	25 mm	1 mm	–	DF-G3 DF-G2 DF-G1	2000† 1170 720	**PIAT43TSL5TA-VL***

* For two meter cable lengths replace ...**3**.. with **6** in the model number (example, **PIT46U-VL)**
† Max range determined by cable length 1 m = 2,000 mm

Diffuse Vantage Line Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	M6 threaded tip with flex relief	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1	2000† 455 280	**PBT43U-VL***
	M3 threaded tip with flex relief	25 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1	855 180 110	**PBT23U-VL***
	M4 & M2.6 thread non-bendable tip	25 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1	815 170 105	**PBT23UM4-VL***
	M6 threaded tip with flex relief 90° angle/thread	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1	2000† 390 240	**PBAT43UTA-VL***
	M6 threaded tip with flex relief 90° angle/thread	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1	2000† 365 225	**PBAT43UHFTA-VL***
	Rectangular housing with front exit 14.5 mm array	25 mm	32 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1	2000† 350 215	**PBR1X323U-VL***
	M6 threaded tip with stainless protective jacket	25 mm	1 mm	–	DF-G3 DF-G2 DF-G1	2000† 500 310	**PBT43TSL5-VL***
	M6 threaded tip with stainless protective jacket 90° angle/thread	25 mm	1 mm	–	DF-G3 DF-G2 DF-G1	2000† 435 270	**PBAT43TSL5TA-VL***

* For two meter cable lengths replace ...**3..** with **6** in the model number (example, **PBT46U-VL**)
† Max range determined by cable length 1 m = 2,000 mm (does not apply to diffuse models)

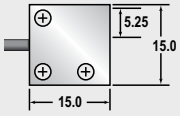
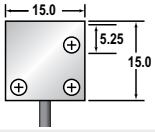
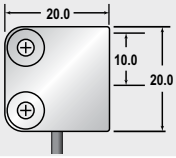
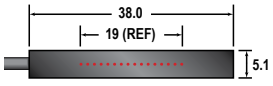
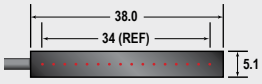
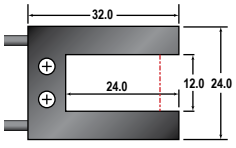
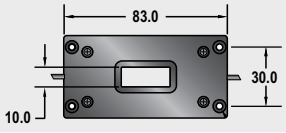
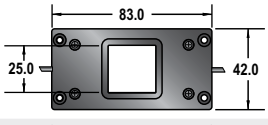
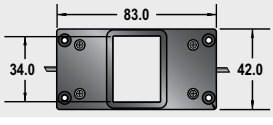
PFC-4
PF-C-4-100 (qty 100)

Array and Slot Fibers

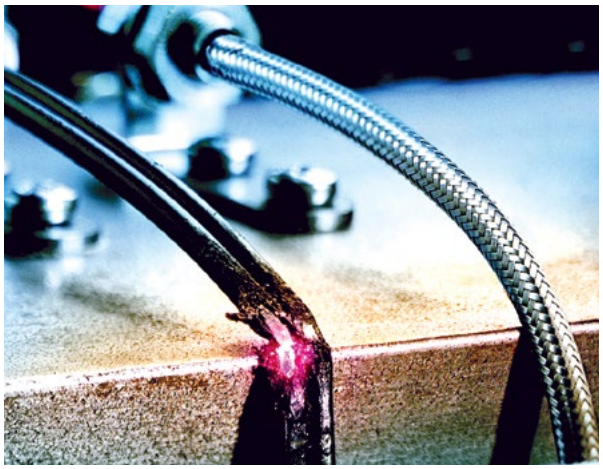
Array and Slot fibers are customizable for a simple setup and provide an optimal solution for small part counting applications. Array fibers are ideal for broad spectrum detection and slot fibers are pre-aligned and easy to install.

- Quick and easy setup and alignment
- Small part counting applications
- Multiple beams can be customized for different array lengths
- Wide area detection
- Ideal for tracking applications, profiling parts, edge guiding, finding the edge of objects
- Opposed models come as a pair

Opposed Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Ultra-compact head 5.25 mm straight exit Aluminium	5 mm	16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1040 640 260	PIR1X166U
	Ultra-compact head 5.25 mm side exit Aluminium	5 mm	16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1040 640 260	PIRS1X166U
	Compact head 10 mm side exit Aluminium	5 mm	16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1230 760 260	PIRS1X166UM.4
	19 mm side exit Plastic	5 mm	16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1245 770 270	PIRS1X166UMPM.75
	34 mm side exit Plastic	5 mm	16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1100 680 260	PIRS1X166UMPMAL
	Easy mount “fork” head Plastic	5 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	12 12 12 12	PDIS46UM12
	10 x 25 mm coverage Side (..-S) or end exit (..-E) Min. object detection of 1.5 mm	5 mm	16 x 0.25 mm	–	DF-G3 DF-G2 DF-G1 D10A	25 25 25 25	PFCVA-10X25-S PFCVA-10X25-E
	25 x 25 mm coverage Side (..-S) or end exit (..-E) Min. object detection of 3 mm	5 mm	16 x 0.25 mm	–	DF-G3 DF-G2 DF-G1 D10A	25 25 25 25	PFCVA-25X25-S PFCVA-25X25-E
	34 x 25 mm coverage Side (..-S) or end exit (..-E) Min. object detection of 4 mm	5 mm	16 x 0.25 mm	–	DF-G3 DF-G2 DF-G1 D10A	34 34 34 34	PFCVA-34X25-S PFCVA-34X25-E

† Max range determined by cable length 2 m = 4,000

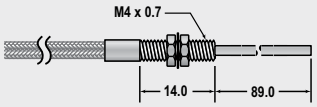
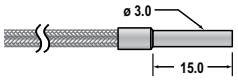
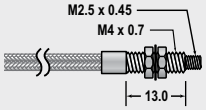


SteelSkin™ Fibers

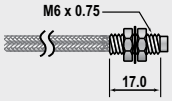
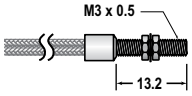
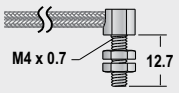
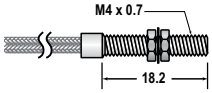
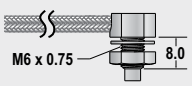
SteelSkin™ rugged fiber models resist kinking, cutting and snagging and have a low profile to easily embed in machines. Ideal for busy assembly stations, embedded in stations, part presence or places where equipment is constantly moved on and off a production line.

- Abrasion resistant while maintaining flexibility
- Bend to tighter radius and thinner than standard plastic fiber optics
- Superior resistance to wear, chemicals and other environmental conditions
- Assembly stations, part presence, busy assembly cells
- Opposed models come as a pair

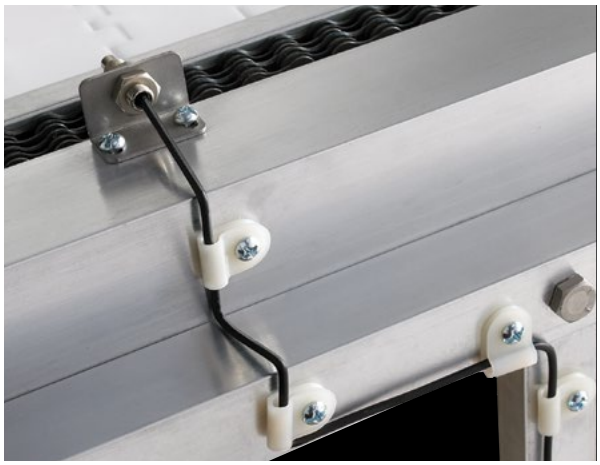
Opposed Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Probe Stainless Steel Braid over monocoil	12 mm	1 mm	–	DF-G3 DF-G2 DF-G1 D10A	2000† 1200 740 350	PITP43TMB5
	Ferrule Stainless Steel Braid over monocoil	12 mm	1 mm	–	DF-G3 DF-G2 DF-G1 D10A	2000† 1200 740 350	PIF43TMB5
	Thread Stainless Steel Braid over monocoil	12 mm	1 mm	–	DF-G3 DF-G2 DF-G1 D10A	2000† 1200 740 350	PIT43TMB5

Diffuse Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Thread Stainless Steel Braid over monocoil	12 mm	1 mm	–	DF-G3 DF-G2 DF-G1 D10A	1780 370 230 80	PBT43TMB5
	Coaxial Thread Stainless Steel Braid over monocoil	12 mm	1 x 0.5 & 9 x 0.25 mm	–	DF-G3 DF-G2 DF-G1 D10A	855 180 110 40	PBCT23TMB5
	Coaxial Threaded right angle Stainless Steel Braid over monocoil	12 mm	1 x 0.5 & 9 x 0.25 mm	–	DF-G3 DF-G2 DF-G1 D10A	620 130 80 30	PBCT23TMB5MTA
	Coaxial Thread Stainless Steel Braid over monocoil	12 mm	1 x 0.5 & 9 x 0.25 mm	–	DF-G3 DF-G2 DF-G1 D10A	855 180 110 40	PBCT23TMB5M4
	Threaded right angle Stainless Steel Braid over monocoil	12 mm	1 mm	–	DF-G3 DF-G2 DF-G1 D10A	1630 340 210 80	PBAT43TMB5MTA

† Max range determined by cable length 1 m = 2,000 (does not apply to diffuse models)

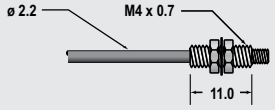
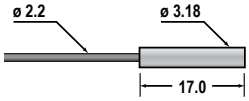
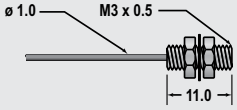
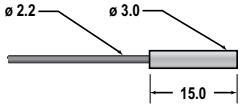
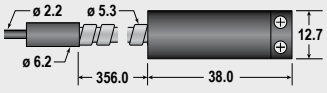
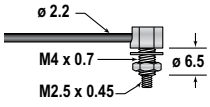


DURA-BEND™ Fibers

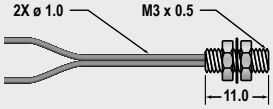
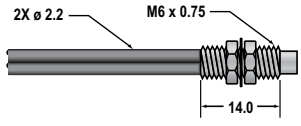
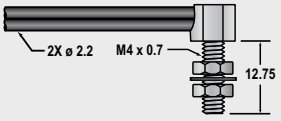
DURA-BEND™ fiber models provide improved flexibility for limited space setups and difficult-to-access locations. These fibers are best for use when fibers need to be integrated into a small fixture where a great deal of bending in tight spaces is needed.

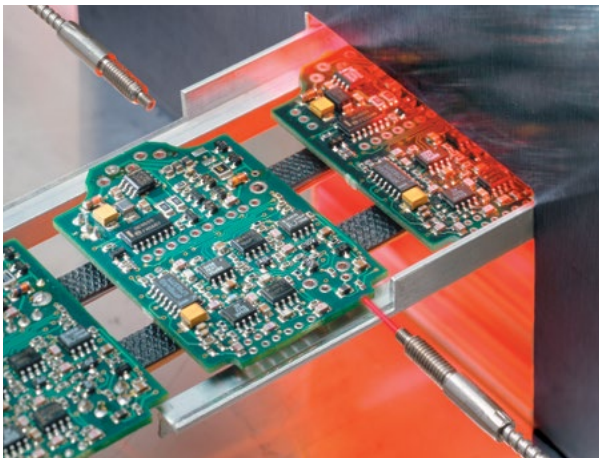
- Minimal transmission loss under extreme bend radius
- Maintains performance regardless of flexing
- Multicore assemblies available
- Can almost kink fiber without affecting performance
- Works well in constant flexing applications
- Opposed models come as a pair

Opposed Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	M4 x 0.7 and M2.5 x 0.45 Thread	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	3420 715 440 230	PIT46UHF
	Smooth ferrule	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	3420 715 440 230	PIF46UHF
	Thread	1 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	930 195 120 65	PIT26UHF
	Smooth ferrule	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	3420 710 440 230	PIFM46UHF
	Right angle Low profile	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	3110 650 400 200	PIA46UHFMBMPMS
	Right angle Threaded	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	3420 710 440 330	PIAT46UHFMTA

Diffuse Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Thread	1 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	310 65 40 18	PBT26UHF
	Thread	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1090 230 140 70	PBT46UHF
	Right Angle Threaded	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	930 195 120 70	PBAT46UHFMTA

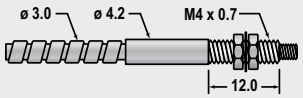
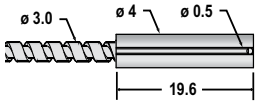
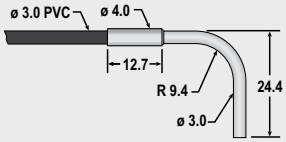
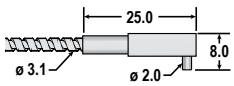
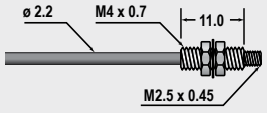


High Temp Fibers

High temp fiber optics are used in situations where the temperature is above a certain limit for most plastic fibers. These are usually used in thermal process applications and Banner offers the widest selection of plastic and glass fibers for high temperature situations.

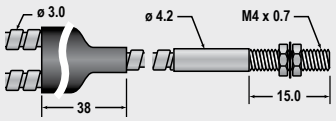
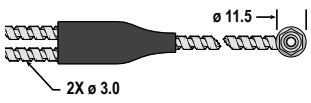
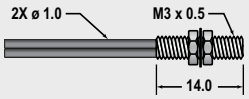
- For high temp applications above 100° C
- Thermal process applications
- For sensing near manufacturing ovens
- Manufacturing of solar panels, colored glass and ceramics
- Widest selection of plastic and glass fibers for high temp applications

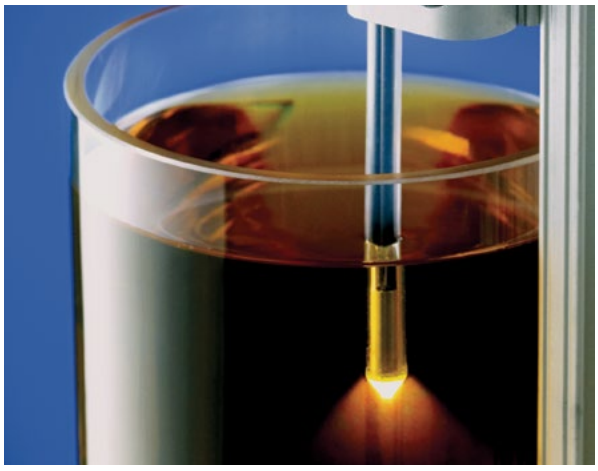
Opposed Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	M2.5 x 0.45 thread Stainless Steel Sheath End tip withstands 315° C	19 mm	1.2 mm	–	DF-G3 DF-G2 DF-G1 D10A	4000† 1260 775 325	IMT.756.6S-HT
	Smooth ferrule Side exit Stainless steel 250° C	19 mm	0.5 mm	–	DF-G3 DF-G2 DF-G1 D10A	1320 275 170 53	IA.31.7ST5ETA
	Smooth ferrule 90° angle Stainless steel tip End tip withstands 105° C	19 mm	1.3 mm	–	DF-G3 DF-G2 DF-G1 D10A	4000† 1310 810 310	IA.82.5PT5
	Smooth ferrule Side exit Stainless steel 480° C	19 mm	1.3 mm	–	DF-G3 DF-G2 DF-G1 D10A	4000† 1310 810 300	IA.83.3ST5ETA
	Thread End tip withstands 105° C	15 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 960 600 210	PIT46UHT1

† Max range determined by cable length 2 m = 4,000

Diffuse Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Miniature thread Stainless Steel Sheathing End tip withstands 315° C	19 mm	1.6 mm	–	DF-G3 DF-G2 DF-G1 D10A	390 80 50 15	BMT16.6S-HT
	Thread right angle Stainless Steel Sheathing End tip withstands 250° C	12 mm	1.6 mm	–	DF-G3 DF-G2 DF-G1 D10A	2100 440 270 NA	BAT16.6ST5MTA
	Thread End tip withstands 105° C	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	390 80 50 20	PBT26UHT2

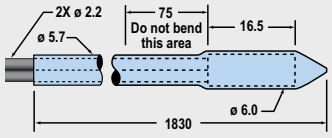
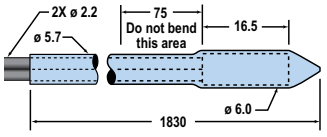
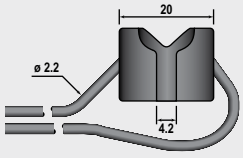


Specialty Fibers

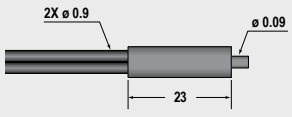
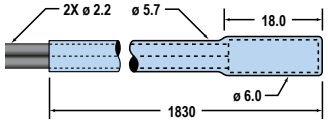
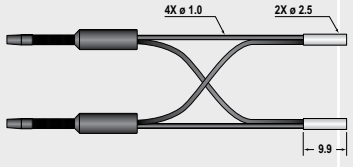
Specialty and custom fibers are designed for specific sensing applications. Many of the standard fibers can be customized and ready for use in days, not weeks. Banner excels in customization and will work with you to find the right solution.

- Chemical resistance
- Extreme environments
- Liquid level detection
- Customize bifurcations, material, lengths and other fiber features

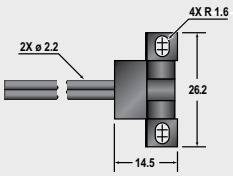
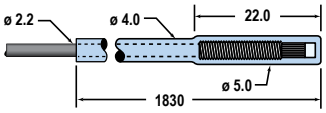
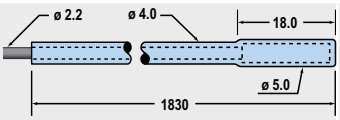
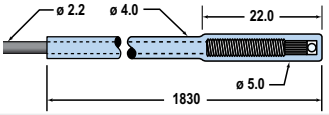
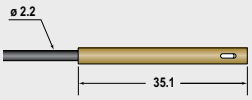
Liquid Level Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Fluoropolymer encapsulated Sensor switches when tip of fiber is immersed in liquid	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	NA	**PBE46UTMLLP**
	Fluoropolymer encapsulated Sensor switches when tip of fiber is immersed in liquid End tip withstands 105° C	15 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	NA	**PBE46UTMLLPHT1**
	Clear tube mount, 2 to 25 mm diameter	2 mm	1 mm	✂	Sensor switches when liquid meniscus reaches optical axis		**PDI46U-LLD**

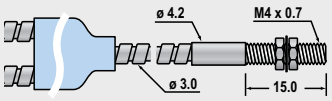
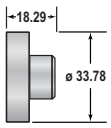
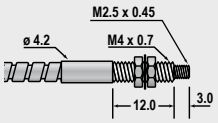
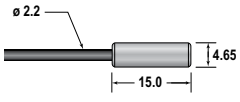
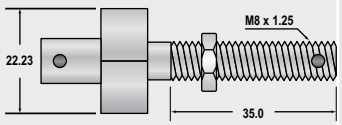
Diffuse Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Coaxial ferrule probe Non-metalic end tip	25 mm	1 x 1.0 & 16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 360 220 120	**PBCFP46UMLR**
	Fluoropolymer encapsulated tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 360 220 12	**PBE46UTMNL**
	Dual bifurcated Light “OR” or Dark “AND” logic	15 mm	0.5 mm	–	DF-G3 DF-G2 DF-G1 D10A	NA	**PDBF26T5**

Opposed Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Specialty slot sensor 90° angle; compact “fork” head	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	5 5 5 5	PDISM46UM5MA
	Sold as a pair Fluoropolymer encapsulated; lens	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 3080 1900 1600	PIE46UT
	Sold as a pair Fluoropolymer encapsulated; lens	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1540 950 300	PIE66UTMNL
	Sold as a pair Fluoropolymer encapsulated; Side-view prism	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	400 280	PIES46UT
	Sold as a pair Flat sides for easy alignment Brass housing	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1100 680 350	PIPS66UMSQMAP

Vacuum Applications

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Vacuum compatible No epoxy	19 mm	1.6 mm	–	Varies by feed through and amp used		BMT13SMVF
	Aluminum Vacuum feed through	–	–	–	DF-G3 DF-G2 DF-G1 D10A	NA	DVFT-2.ONWQ50
	Miniature thread No epoxy used For use on vacuum side Entire cable withstands 480 °C	19 mm	1.2 mm	–	Varies by feed through and amp used		IMT.753SMVF
	For use with Vacuum feed through on ambient side Opposed mode sold as a pair	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 2140 1320 350	PIF66UMVFA
	Stainless steel Vacuum feed through	–	–	–	DF-G3 DF-G2 DF-G1 D10A	NA	VFT-M8MVS

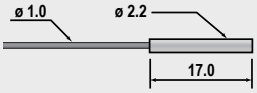
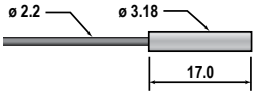
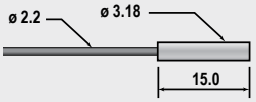
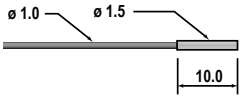
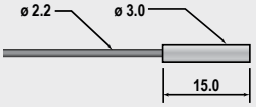
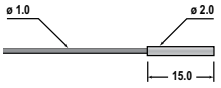
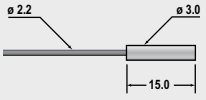
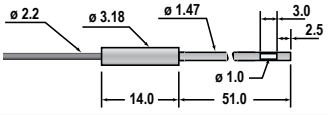
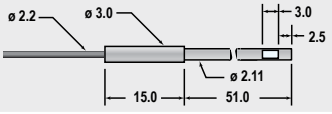
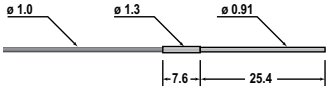
† Max range determined by cable length 2 m = 4,000

Standard Fibers

Standard fiber optics come in a variety of materials with standard fiber tips in various sizes. If a standard fiber does not meet your application requirements, modifications can be made to give you a customized solution.

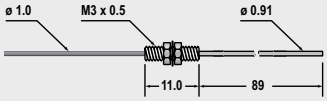
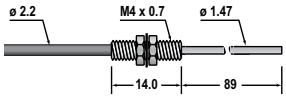
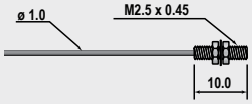
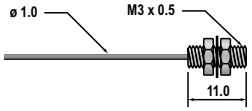
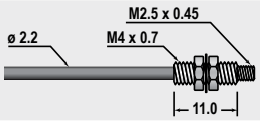
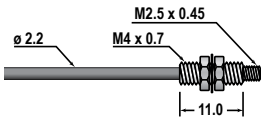
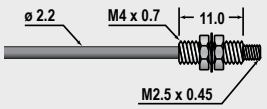
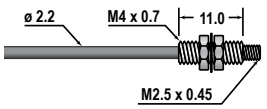
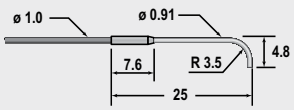
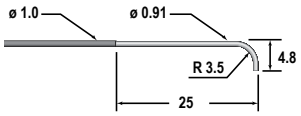
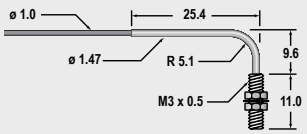
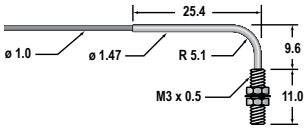
- Plastic individual fibers ideal for use in small, confined areas
- Available in side view/right angles
- Available in bifurcated models
- Opposed models come as a pair

Opposed Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Smooth ferrule Stainless steel tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 355 220 75	PIF26U
	Smooth ferrule Stainless steel tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1330 820 300	PIF46U
	Smooth ferrule Stainless steel tip	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 2140 1320 525	PIF66U
	Stainless steel tip Best for repetitive flexing (1,000s of cycles)	5 mm	4 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1940 405 250 70	PIFM1X46U
	Smooth ferrule Stainless steel tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1330 820 300	PIFM46U
	Smooth ferrule Stainless steel tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	505 105 65 20	PIF16U
	Smooth ferrule Stainless steel tip Thick jacket (ø 2.2 mm)	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 355 220 80	PIF26UMLS
	Smooth ferrule Stainless steel tip 90° angle sideview	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	2720 565 350 160	PIPS46U
	Smooth ferrule Stainless steel tip 90° angle sideview	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	2950 615 380 350	PIPS66U
	Probe Stainless steel tip	5 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	505 105 65 20	PIP16U

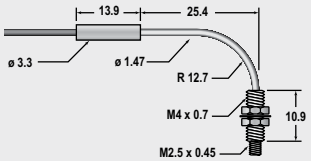
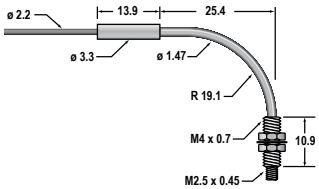
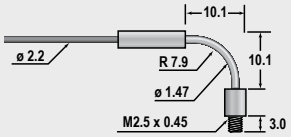
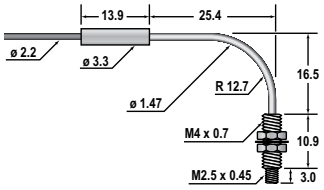
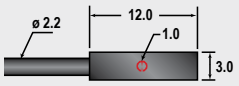
† Max range determined by cable length 2 m = 4,000

Opposed Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Probe Stainless steel tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1825 380 235 80	PIP26U
	Probe Stainless steel tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1230 760 265	PIP46U
	Stainless steel threaded tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	465 100 60 15	PIT16U
	Nickel plated brass threaded tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 220 75	PIT26U
	Nickel plated brass threaded tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1120 690 240	PIT415U
	Nickel plated brass threaded tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1330 820 300	PIT46U
	Nickel plated brass threaded tip	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 2140 1320 525	PIT66U
	Nickel plated brass threaded tip	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000 1815 1120 450	PIT615U
	Stainless steel 90° angle tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	230 50 30 15	PIA16U
	Stainless steel 90° angle tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	930 195 120 50	PIA26U
	Nickel plated brass threaded 90° angle tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	465 100 60 10	PIAT16U
	Nickel plated brass threaded 90° angle tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1555 325 200 50	PIAT26U

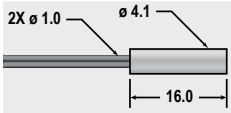
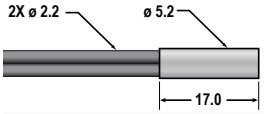
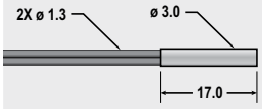
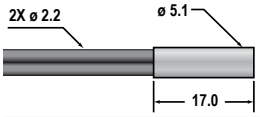
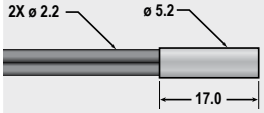
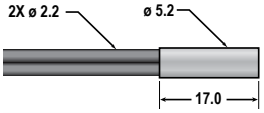
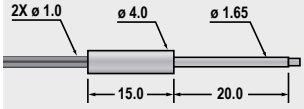
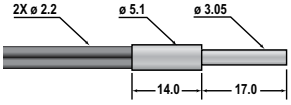
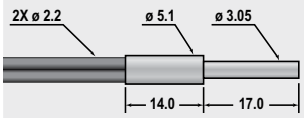
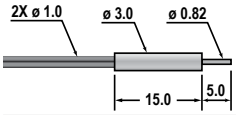
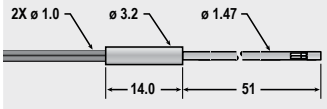
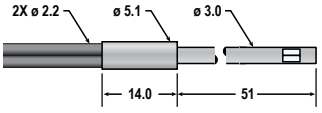
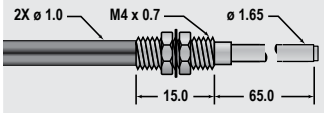
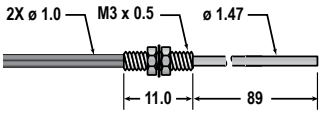
† Max range determined by cable length 2 m = 4,000

Opposed Fibers

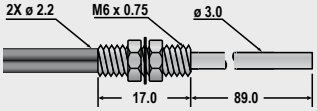
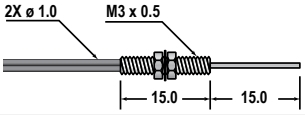
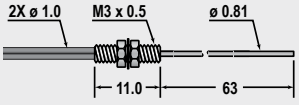
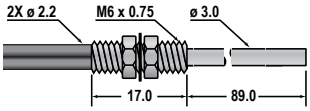
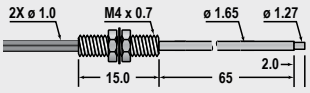
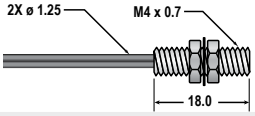
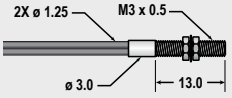
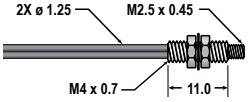
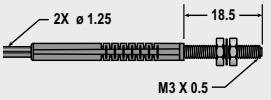
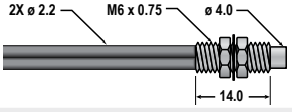
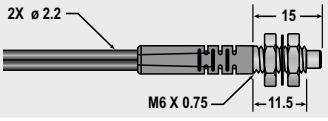
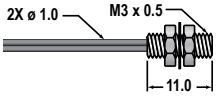
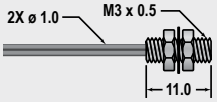
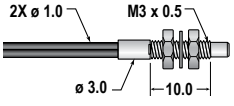
End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Stainless steel threaded 90° angle tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1360 840 275	PIAT46U
	Stainless steel threaded 90° angle tip	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 2075 1280 350	PIAT66U
	Stainless steel threaded 90° angle tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1360 840 275	PIAT46UM.4X.4MT
	Stainless steel threaded 90° angle tip	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 970 600 210	PIAT46UHF
	Delrin side exit	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	2000† 710 440 230	PIA46UHFMB8X12

† Max range determined by cable length 2 m = 4,000

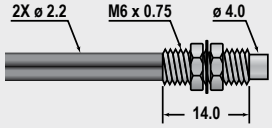
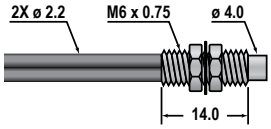
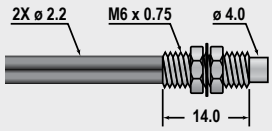
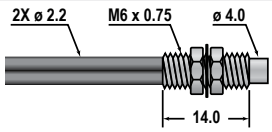
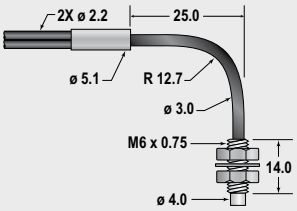
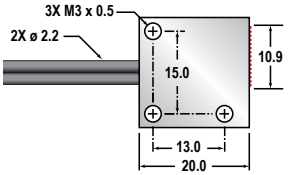
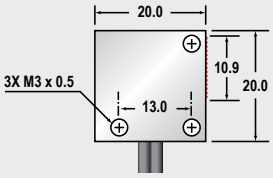
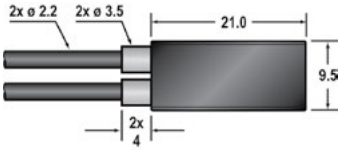
Diffuse Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Smooth ferrule Stainless steel tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	620 130 80 25	**PBF26U**
	Smooth ferrule Stainless steel tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 355 220 85	**PBF46U**
	Smooth ferrule Stainless steel tip Thin jacket (ø 1.3)	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 355 220 85	**PBF46UM3MJ1.3**
	Smooth ferrule Stainless steel tip	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	2410 500 310 170	**PBF66U**
	Smooth ferrule Stainless steel tip	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1445 300 186 65	**PBF46UHF**
	Smooth ferrule Stainless steel tip Coaxial	5 mm	1 x 1.0 and 16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	2140 445 275 96	**PBCF46U**
	Smooth ferrule Stainless steel tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	175 160 100 35	**PBEFP26U**
	Smooth ferrule Stainless steel tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1980 410 255 90	**PBFM46U**
	Smooth ferrule Stainless steel tip	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1440 300 185 65	**PBFM46UHF**
	Smooth ferrule Stainless steel tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 1120 690 240	**PBFMP16UMP.2**
	Smooth ferrule Stainless steel tip 90° angle sideview	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	230 50 30 15	**PBPS26U**
	Smooth ferrule Stainless steel tip 90° angle sideview	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	275 160 100 50	**PBPS46U**
	Probe ferrule Stainless steel tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	545 115 70 30	**PBPF215U**
	Probe ferrule Bendable stainless steel tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	620 130 80 25	**PBP26U**

Diffuse Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Probe ferrule Bendable stainless steel tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 355 220 85	PBP46U
	Probe ferrule Stainless steel tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	155 30 20 10	PBFM16U
	Probe ferrule Bendable stainless steel tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	115 25 15 5	PBP16U
	Probe ferrule Bendable stainless steel tip	2 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1475 310 190 65	PBP46UHF
	Probe ferrule Stainless steel tip	15 mm	0.5 mmv	✂	DF-G3 DF-G2 DF-G1 D10A	620 130 80 25	PBPF26U
	Coaxial Threaded Stainless steel tip	5 mm	1 x 0.5 & 9 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	700 145 90 40	PBCT26U
	Coaxial Threaded Stainless steel tip	5 mm	1 x 0.5 & 9 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	700 145 90 40	PBCT26UM3
	Coaxial Threaded Stainless steel tip	5 mm	1 x 0.5 & 9 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	700 145 90 40	PBCT26UM4M2.5
	Coaxial Threaded Stainless steel tip Overmolded flex relief	15 mm	1 x 0.5 10 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1555 325 200 110	PBCT26UMFR
	Coaxial Threaded Nickel plated Brass tip	5 mm	1 x 1.0 & 16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 355 220 120	PBCT46U
	Coaxial Threaded Stainless steel tip Overmolded flex relief	25 mm	1 x 1.0 16 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1555 325 200 110	PBCT46UMFR
	Threaded Stainless steel tip	5 mm	0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	80 15 10 5	PBT16U
	Threaded Nickel plated Brass tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	620 130 80 25	PBT26U
	Stainless steel tip	12 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	620 130 80 25	PBT26UMSSMFF

Diffuse Fibers

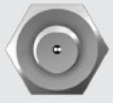
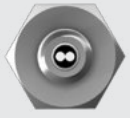
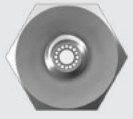
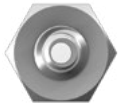
End Tip	Features	Minimum Bend Radius	Core Diameter	Free Cut	Typical Range (mm)		Models
	Threaded Nickel plated Brass tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1710 355 220 85	PBT46U
	Threaded Nickel plated Brass tip	40 mm	1.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	2400 500 310 170	PBT66U
	Threaded Nickel plated Brass tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1400 290 180 70	PBT415U
	Threaded Nickel plated Brass tip	15 mm	0.5 mm	✂	DF-G3 DF-G2 DF-G1 D10A	740 155 95 30	PBT26UM6M.1
	Stainless steel threaded 90° angle tip	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	930 195 120 70	PBAT46U
	10.9 mm front exit Aluminium	5 mm	32 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1555 325 200 65	PBR1X326U
	10.9 mm side exit Aluminium	5 mm	32 x 0.25 mm	✂	DF-G3 DF-G2 DF-G1 D10A	1555 325 200 65	PBRS1X326U
	Dual lens straight exit Aluminium	25 mm	1 mm	✂	DF-G3 DF-G2 DF-G1 D10A	4000† 950 590 210	PBL46U

† Max range determined by cable length 2 m = 4,000

Plastic Fiber Optics Specifications

Construction	**Optical Fiber:** Acrylic (PMMA) monofilament, except as noted **Protective Jacket:** Black polyethylene, except as noted **Threaded End Tips and Hardware:** Nickel-plated brass, except as noted **Probe End Tips:** Annealed (bendable) 304 stainless steel **Angled End tips:** Hardened 304 stainless steel **Ferrule End Tips:** 303 stainless steel
Sensing Range	Refer to the specific fiber optic/sensor combination
Implied Dimensional Tolerance	**All dimensions are in millimeters:** x = ±2.5 mm, x.x = ±0.25 mm and x.xx = ±0.12 mm, unless specified "L" = ±40 mm per meter
Minimum Bend Radius	8 mm for 0.25 mm diameter fibers 12 mm for 0.5 mm diameter fibers (except DURA-BEND™) 25 mm for 1.0 mm diameter fibers (except DURA-BEND™) 38 mm for 1.5 mm diameter fibers
Repeat Bending/Flexing	Life expectancy of plastic fiber optic cable is in excess of one million cycles at bend radii of no less than the minimum and a bend of 90° or less. Avoid stress at the point where the cable enters the sensor ("control end") and at the sensing end tip. Coiled plastic fiber optic assemblies are recommended for any application requiring reciprocating fiber motion.
Chemical Resistance	The acrylic core of the monofilament optical fiber will be damaged by contact with acids, strong bases (alkalis) and solvents. The polyethylene jacket will protect the fiber from most chemical environments. However, materials may migrate through the jacket with long term exposure. Samples of fiber optic material are available from Banner for testing and evaluation.
Temperature Extremes	Temperatures below –30 °C will cause embrittlement of the plastic materials but will not cause transmission loss. Temperatures above +70 °C will cause both transmission loss and fiber shrinkage.
Operating Temperature	–30 to +70 °C, unless otherwise specified

Fiber Core Diameter Comparison

 PIT16U	 PBT16U	N/A
 PIT26U	 PBT26U	 PBCT26U
 PIT46U	 PBT46U	 PBCT46U
 PIT66U	 PBT66U	N/A

⚠ Application Notes and Warnings ⚠

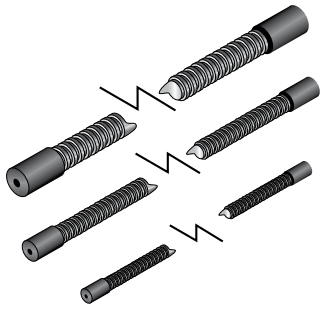
1. Plastic fiber assemblies with "U" in the suffix of the model numbers have unterminated control ends (the end that is coupled to the photoelectric sensor). The customer can cut these fiber optic assemblies to the required length using the supplied cutter. Use only the supplied cutter to ensure optimal light coupling efficiency.
2. Terminated plastic fiber assemblies are optically ground and polished and cannot be shortened, spliced or otherwise modified.
3. Do not subject the plastic fibers to sharp bends, pinching, high tensile loads or high levels of radiation.
4. When ordering fiber lengths in excess of 2 m, take into account light signal attenuation due to the additional length.
5. Due to their light transmission properties, plastic fiber optics are recommended for use only with visible light fiber optic sensors.
6. Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with NAMUR sensor model Q45AD9FP. Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.

Fiber Optic Accessories

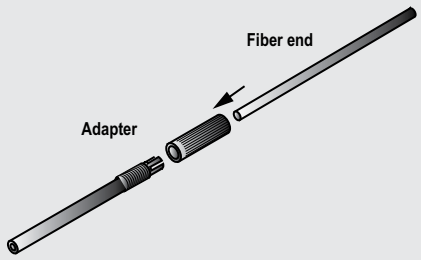
Fiber Cutters

Model Specific Features	General Features	Image	Model Number
Plastic fiber cutter	single cutter		PFC-4
	100 cutters		PFC-4-100
For use with 0.25 and 0.5 mm diameter cables.	• These kits are used with unterminated plastic fiber cables • Each kit contains 40 sensor adaptors and 10 cutter assemblies	NOTE: Adaptors used with Q45, OMNI-BEAM, ECONO-BEAM, MAXI-BEAM and VALU-BEAM sensors only.	PFK20
For use with 1 and 1.5 mm diameter cables.			PFK40

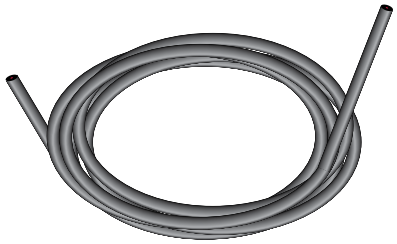
Plastic Fiber Field-Installable Sheathing

Model Specific Features	General Features	Image	Model Number
May be used with bifurcated fiber assemblies having M6 x 0.75 threaded end tips (e.g., PBCT46U, PBP46U, PBT46UHT1 and PBT66U).	• Stainless steel sheathing with stainless steel end fittings (one end internally threaded to capture fiber end tips, other end non-threaded) is used in applications where protection is required for plastic fiber optic cables • All models listed are 1.8 m in length • Other lengths are available by contacting Banner Applications Department		PFS69S6T
May be used with individual or bifurcated fiber assemblies having M4 x 0.7 threaded end tips (e.g., PBCT26U, PBPF26U, PIP46U, PIT46U and PIT66U).			PFS53S6T
May be used with individual fiber assemblies having M3 x 0.5 threaded end tips (e.g., PIP26U, PIT26U and PIT1X46U).			PFS44S6T

Plastic Fiber Adapters

Model Specific Features	General Features	Image	Model Number
Use to adapt plastic fiber optic cables with outside jacket diameter of 1.0 mm, such as PIT26U and PBP16U.	• Compression fitting adapters are used with small-diameter unterminated plastic fiber cables • Use when interfacing small-diameter plastic fibers to D10, D12, QM42, QS18, R55F, FI22 and MINI-BEAM plastic fiber sensor families • Each kit contains 100 pairs of adapters. One pair will interface either one bifurcated fiber optic cable or a pair of individual cables to a fiber optic amplifier		UPFA-1-100
Use to adapt plastic fiber optic cables with outside jacket diameter of 1.25 mm or 1.3 mm, such as PBCT26U and PBF46UM3MJ1.3.			UPFA-2-100

Unterminated Individual and Bifurcated Plastic Fibers

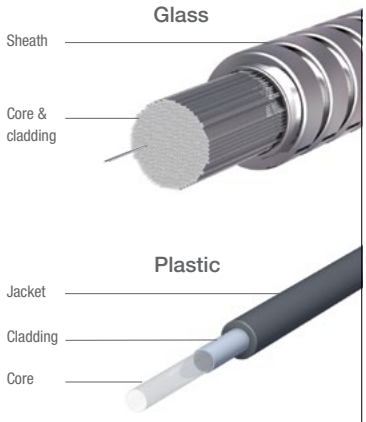
Core	Length	Type	Drawing	Model Number
0.5 mm	9 m	Single		PIU230U
	18 m			PIU260U
1.0 mm	9 m	Single		PIU430U
	18 m			PIU460U
1.5 mm	9 m	Single		PIU630U
	18 m			PIU660U
1.0 mm	9 m	Duplex		PBU430U
	18 m			PBU460U

Glass Fiber Optics

Solve numerous challenging sensing applications in the most hostile environments, including temperatures up to 480° C, corrosive materials and extreme moisture

- Withstand severe shock and vibration
- Ignore extreme electrical noise
- Constructed of a combination of optical glass fiber, stainless steel, PVC, brass, molded thermoplastics and optical-grade epoxy

Choosing Glass or Plastic



Fiber Construction

Core: Thin glass or plastic center of the fiber through which light travels

Cladding: Outer optical material surrounding the core that reflects light back into the core

Jacket/ Sheath: Protective layer to protect fiber from damage and moisture

Plastic fibers are for general purpose use. They tolerate severe flexing, can be cut to length in the field and cost less than glass fibers. Glass fibers are the best choice for challenging environments such as high temperatures, corrosive materials and moisture.

Glass fibers page 192

- Solve numerous challenging sensing requirements
- Ideal for hostile environments such as high temperatures to 480° C, corrosive materials and extreme moisture
- Withstand high levels of shock and vibration
- Inherently immune to extreme electrical noise
- Available with choice of sheathings: standard stainless-steel flexible conduit, PVC or other flexible tubing
- Can be quickly custom designed

Plastic fibers page 174

- Inexpensive and easily cut to length during installation
- Bend for a precise fit
- Available in high-flex models to withstand flexing
- Offered with special jackets that withstand corrosion, impact and abrasion
- Available for applications requiring articulated or reciprocating motion
- Available in diameters of 0.25, 0.5, 1.0 Or 1.5 mm
- Can be quickly custom designed and built for your unique applications

Model Key

I	AT	2	3	S	XX

ASSEMBLY STYLE

B = Bifurcated fiber
I = Individual fiber*

SENSING END TIP STYLE

A = 90° Angle
AM = Miniature 90° Angle
AT = 90° Angle/Thread
F = Ferrule
M = Miniature Tip
MP = Miniature Probe
MT = Miniature Thread
R = Rectangular Bundle Termination
T = Thread
TA = Thread/90° Angle
TETA = Thread and Extra Tight 90° Angle

* Individual glass fibers are packaged separately.

MODIFICATIONS

"**MXX**" = Sensing end tip modification
"**M600**" = Sensing end withstands 315° C
"**M900**" = Sensing end withstands 480° C

SHEATHING MATERIAL

S = Stainless steel flexible conduit
P = PVC with galvanized monocoil reinforcing wire

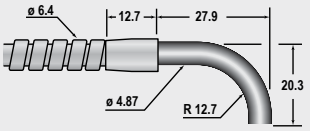
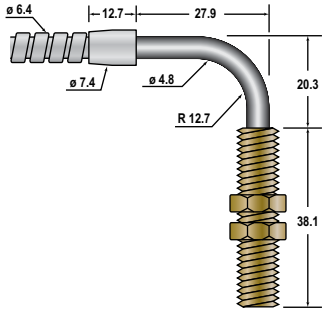
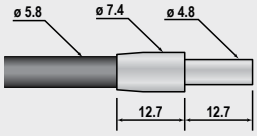
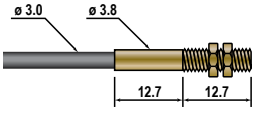
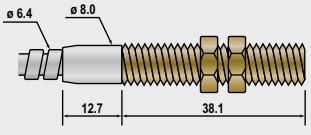
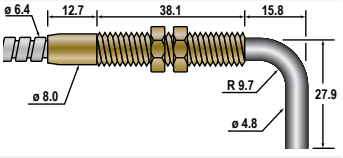
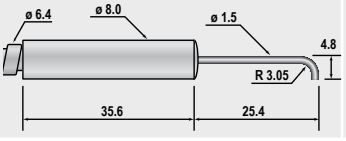
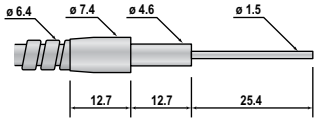
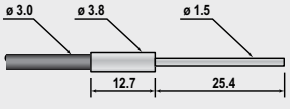
OVERALL LENGTH (in feet)

2 = 2 ft. = 610 mm ±38 mm
3 = 3 ft. = 914 mm ±38 mm

FIBER BUNDLE DIAMETER

.44 = 0.027 in = 0.69 mm
.5 = 0.032 in = 0.81 mm
.75 = 0.046 in = 1.17 mm
1 = 0.062 in = 1.57 mm
1.5 = 0.09 in = 2.29 mm
2 = 0.125 in = 3.18 mm
2.5 = 0.156 in = 3.96 mm

Opposed Glass Fibers

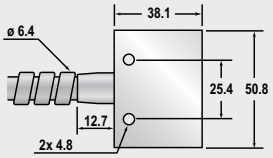
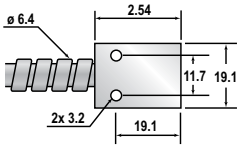
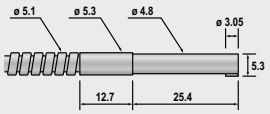
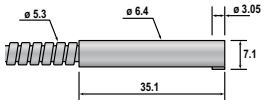
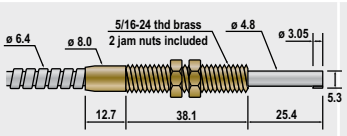
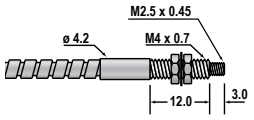
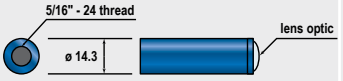
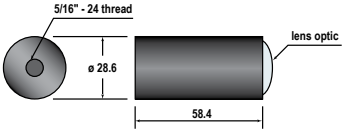
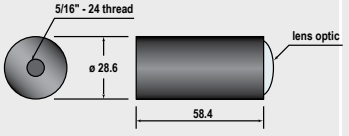
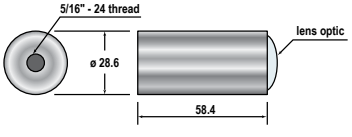
End Tip	Features	Minimum Bend Radius	Core Diameter	Temp	Typical Range (mm)		Models
	90° angle	19 mm	3.18 mm	M600 M900	QS18 R55F SME312 D12E D12	715 1050 250 975 550	**IA23S**
	90° angle/thread Lenses available	19 mm	3.18 mm	M600 M900	QS18 R55F SME312 D12E D12	900 1050 250 975 550	**IAT23S**
	Smooth ferrule	19 mm	3.18 mm	M600 M900	QS18 R55F SME312 D12E D12	990 1050 975 550	**IF23P**
	Miniature thread	9.5 mm	0.69 mm		QS18 R55F SME312 D12E D12	NA 75 25 102 70	**IMT.442P**
	Thread Lenses available	19 mm	3.18 mm	M600 M900	QS18 R55F SME312 D12E D12	900 1050 250 975 550	**IT23S**
	90° angle/thread	19 mm	3.18 mm	M600 M900	QS18 R55F SME312 D12E D12	1100 1050 250 925 550	**ITA23S**
	Miniature probe 90° angle	19 mm	1.17 mm	M600	QS18 R55F SME312 D12E D12	110 130 50 180 170	**IAM.752S**
	Miniature probe Non-bendable probe	19 mm	1.17 mm	M600	QS18 R55F SME312 D12E D12	NA 130 50 180 170	**IM.752S**
	Miniature probe	9.5 mm	1.17 mm		QS18 R55F SME312 D12E D12	NA 130 50 180 170	**IMP.753P**

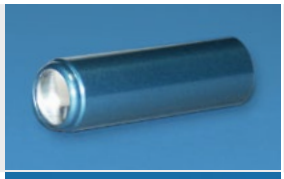
M600 Available 315 °C models. Add **M600** to end of model number (example, **IA23SM600**).

M900 Available 480 °C models. Add **M900** to end of model number (example, **IA23SM900**). Dimensions may vary for these models.

NA: Not recommended.

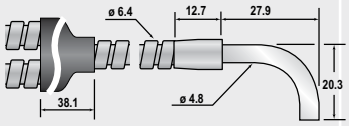
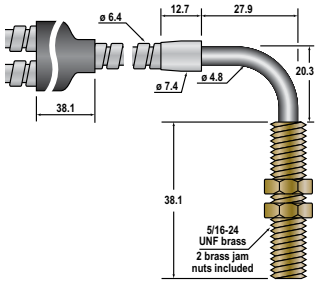
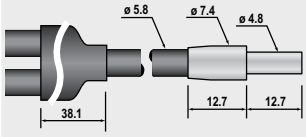
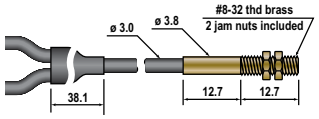
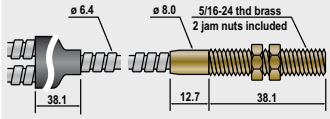
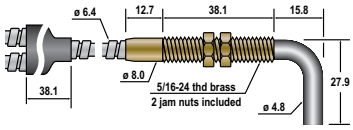
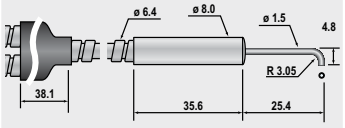
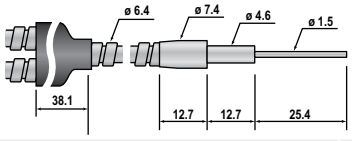
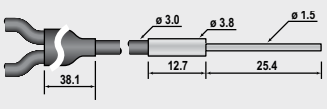
Opposed Glass Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Temp	Typical Range (mm)		Models
	Straight exit; 38 mm width	19 mm	3.7 mm	M600	QS18 R55F SME312 D12E D12	760 1175 350 975 580	IR2.53S
	Straight exit; 10 mm width	19 mm	3.2 mm	M600	QS18 R55F SME312 D12E D12	1045 1050 250 925 550	IR23S
	Side exit Stainless steel	19 mm	2.3 mm	M600	QS18 R55F SME312 D12E D12	250 600 180 500 450	IA1.53SMETA
	Side exit Stainless steel	19 mm	2.3 mm	M600	QS18 R55F SME312 D12E D12	340 600 180 500 450	IA1.53SMTA
	Side exit Stainless steel	19 mm	2.3 mm	M600	QS18 R55F SME312 D12E D12	390 600 180 500 450	ITETA1.53S
	For use in vacuum applications No epoxy	19 mm	1.3 mm		Contact factory for sensing range		IMT.753SMVF
	Glass lens withstands 315 °C Contact factory for range						L9
	Plastic housing withstands 105 °C Contact factory for range						L16F
	Aluminum housing withstands 315 °C Contact factory for range						L16FAL
	Stainless steel housing withstands 480 °C Contact factory for range						L16FSS



M600 Available 315 °C models. Add **M600** to end of model number (example, **BA23SM600**).

Diffuse Glass Fibers

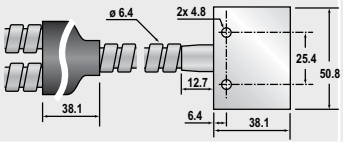
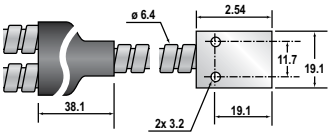
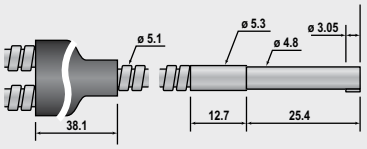
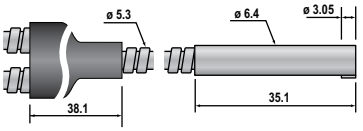
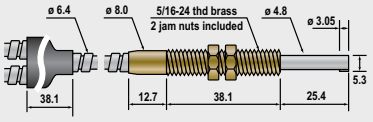
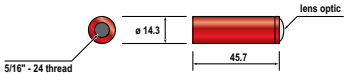
End Tip	Features	Minimum Bend Radius	Core Diameter	Temp	Typical Range (mm)		Models
	Stainless steel 90° angle	19 mm	3.2 mm	M600 M900	QS18 R55F SME312 D12E D12	80 110 25 180 150	**BA23S**
	Stainless Steel/Brass 90° angle	19 mm	3.2 mm	M600 M900	QS18 R55F SME312 D12E D12	90 110 25 180 150	**BAT23S**
	PVC sheath	19 mm	3.2 mm	_	QS18 R55F SME312 D12E D12	100 110 25 180 150	**BF23P**
	PVC over Moncoil Sheathing Brass	9.5 mm	0.7 mm	_	QS18 R55F SME312 D12E D12	NA NA 1 10 5	**BMT.442P**
	Stainless Steel/Brass	19 mm	3.2 mm	M600 M900	QS18 R55F SME312 D12E D12	100 110 25 180 150	**BT23S**
	Stainless steel/Brass 90° angle	19 mm	3.2 mm	M600 M900	QS18 R55F SME312 D12E D12	85 110 25 180 150	**BTA23S**
	Stainless Steel 90° angle	19 mm	1.2 mm	M600	QS18 R55F SME312 D12E D12	NA 11 3 42 25	**BAM.752S**
	Stainless Steel Probe	19 mm	1.2 mm	M600	QS18 R55F SME312 D12E D12	NA 11 3 42 25	**BM.752S**
	PVC over Moncoil Sheathing Probe	9.5 mm	1.2 mm	_	QS18 R55F SME312 D12E D12	NA 11 3 42 25	**BMP.753P**

M600 Available 315 °C models. Add **w** to end of model number (example, **BA23SM600**).

M900 Available 480° C models. Add **M900** to end of model number (example, **BA23SM900**). Dimensions may vary for these models.

NA: Not recommended.

Diffuse Glass Fibers

End Tip	Features	Minimum Bend Radius	Core Diameter	Temp	Typical Range (mm)		Models
	Straight exit; 38 mm width	19 mm	3.7 mm	M600	QS18 R55F SME312 D12E D12	75 120 30 180 155	BR2.53S
	Straight exit; 9.7 mm width	19 mm	3.2 mm	M600	QS18 R55F SME312 D12E D12	110 110 25 180 150	BR23S
	90° angle	19 mm	2.3 mm	M600	QS18 R55F SME312 D12E D12	45 65 20 135 125	BA1.53SMETA
	90° angle	19 mm	2.3 mm	M600	QS18 R55F SME312 D12E D12	50 60 20 135 125	BA1.53SMTA
	90° angle	19 mm	2.3 mm	M600	QS18 R55F SME312 D12E D12	30 60 20 135 125	BTETA1.53S
	Glass lens; withstands 315 °C Focuses light to .80 mm with ø 1.6 mm fiber				Contact factory for range information		L10

M600 Available 315 °C models. Add **M600** to end of model number (example, **BA23SM600**).

Glass Fiber Optics Specifications

Construction	Combination of optical glass fiber, stainless steel or PVC, brass, molded thermoplastics, and optical-grade epoxy. Optical fiber is F2 core, EN1 clad, approx. 50 µm diameter per strand. Flexible steel interlock sheathing is 302 stainless.
Sensing Range	Refer to the specific fiber optic to be used
Bend Radius	Inside bend radius must be 12 mm or greater for PVC covered fiber optic assemblies, and 25 mm or greater for stainless steel armored cable covered fibers
Length	Standard length for assemblies is 915 mm; see dimension diagrams Most models are available from the factory with shorter or longer cable lengths, up to 18 m max
Length Dimension Tolerance	**Overall assembly length:** ±12 mm per 300 mm of length **Shrink junction dimensions:** ±12 mm
Implied Dimensional Tolerances	**All dimensions are in millimeters:** x = ±2.5 mm, x.x = ±0.25 mm and x.xx = ±0.12 mm, unless specified.
Operating Conditions	Fiber assemblies with stainless-steel (SS) sheathing and metal end tips: -140° to +249° C Fiber assemblies with PVC sheathing and/or plastic end tips: -40° to +105° C Special order assemblies with SS sheathing and metal end tips and model suffix “M600”: -140° to +315° C* Special order assemblies with SS sheathing and metal end tips and model suffix “M900”: -140° to +480° C*; note dimensional changes from STD models * sensing end tip only

⚠ Application Notes and Warnings ⚠

1. The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced or otherwise modified.
2. Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with sensor model SMI912FQD. This sensor is approved for use inside hazardous areas when used with an appropriate intrinsic barrier. Also, see NAMUR sensor models Q45AD9F and MIAD9F. Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.
3. In applications where glass fibers are used to insulate the control from high voltage, specify silicone rubber, Teflon®, or high-density polyethylene sheathing with no reinforcing wire in the cable. It is the responsibility of the user to test each fiber optic assembly for insulation capacity.
4. Do not subject the fibers to sharp bends, pinching, repeated flexing or high levels of radiation.
5. When ordering fiber lengths in excess of 1 m, take into account light signal reduction of 5 percent per 300 mm of additional length.

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Additional Models Available

In addition to the configurations shown, Banner offers thousands of readily available alternative fiber models:

- Substitute PVC over monocoil sheathing for stainless steel
- Reduce or increase glass fiber optic bundle diameters
  Example: Change ø 3.18 mm bundle to ø 1.57 mm
- Substitute a rectangular-shaped fiber bundle (0.5 x 2.5 mm) for a circular bundle
- Change endtip material from brass to stainless steel
- Modify straight or angled probe tip dimensions
- Modify overall fiber length in intervals of 305 mm (standard lengths are 914 and 610 mm)