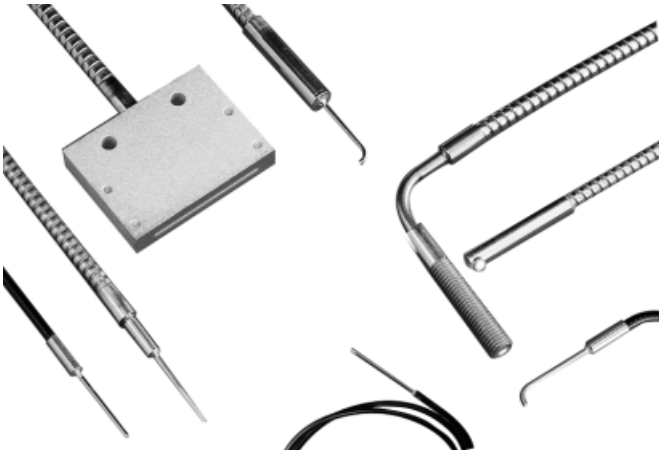
Glass Fiber Optics



- Banner glass fibers solve numerous challenging sensing requirements including the most hostile environments such as high temperatures up to 480°C (900°F), corrosive materials and extreme moisture
- Due to low mass of the fibers, glass fibers can withstand high levels of shock and vibration; they are also immune to extreme electrical noise
- Glass fibers are constructed of a combination of optical glass fiber, stainless steel, PVC, brass, silicone rubber, Teflon®, molded thermoplastics, and optical grade epoxy

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 (page 359). This sensor is approved for use inside hazardous areas when used with an appropriate intrinsic barrier. Also, see NAMUR sensor models Q45AD9F (page 416) and MIAD9F (page 148). Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.
3. In applications where glass fibers are being 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 (3'), take into account light signal reduction of 5 percent per foot of additional length.

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Model Numbering Scheme for Glass Fiber Optic Assemblies

ASSEMBLY STYLE designator
(one or two letters)

B = Bifurcated: emitter & receiver to one sensing point
DB = Double bifurcated: emitter & receiver to two sensing points
H = Hex-individual: emitter or receiver to six sensing points
HB = Hex-bifurcated: emitter & receiver to six sensing points
I = Individual: emitter or receiver to one sensing point
O = Octa-individual: emitter or receiver to eight sensing points
OB = Octa-bifurcated: emitter & receiver to eight sensing points
P = Penta-individual: emitter or receiver to five sensing points
PB = Penta-bifurcated: emitter & receiver to five sensing points
Q = Quad-individual: emitter or receiver to four sensing points
QB = Quad-bifurcated: emitter & receiver to four sensing points
T = Tri-individual: emitter or receiver to three sensing points
TB = Tri-bifurcated: emitter & receiver to three sensing points

SHEATHING MATERIAL designator

S = Stainless steel flexible conduit
P = PVC with galvanized monocoil reinforcing wire
L = Silicone rubber tubing (max. flexibility, min. fiber protection)
T = Teflon tubing (max. chemical resistance, min. flexibility)
HDP = High-density polyethylene (max. electrical isolation, min. flexibility)

FIBER BUNDLE DIAMETER designator
(in 1/16 of an inch)

.44 = 0.027" (0.7 mm)
.5 = 0.032" (0.8 mm)
.75 = 0.046" (1.2 mm)
1 = 0.062" (1.6 mm)
1.5 = 0.090" (2.3 mm)
2 = 0.125" (3.2 mm)
2.5 = 0.156" (4.0 mm), max bundle ø

I A T 2 3 S X X

MODIFICATIONS designator
(suffix may be any length)

"M600" suffix = Cable available in 600°F version
"M900" suffix = Cable available in 900°F version

SENSING END TIP STYLE designator
(one to five letters)

A = Angled tip (90°)
AC = Axial circular (ring-shaped) fiber termination
AM = Angled tip (90°); miniature probe (ø0.059")
AMM = Angled tip (90°); micro-miniature probe (ø0.043")
AR = Angled tip (90°); rectangular bundle termination (plastic insert)
AT = Angled (90°) & threaded (5/16 -24 x 1 1/2" long) brass tip
ATR = Angled (90°)& threaded tip; miniature rectangular bundle (plastic insert)
F = Ferruled (ø 3/16 x 1/2" long) tip; same as sensor end tip
FR = Ferruled tip; miniature rectangular bundle termination (plastic insert)
HA = Half-angled tip (45°)
HAR = Half-angled tip (45°); miniature rectangular bundle (plastic insert)
HAT = Half-angled (45°) & threaded (5/16 -24 x 1 1/2" long) brass tip
HATR = Half-angled and threaded tip; miniature rectangular bundle (plastic insert)
M = Miniature (ø0.059 x 1" long) tip
MAP = Miniature angled (90°) probe tip
MHAP = Miniature half-angled (45°) probe tip
MM = Micro-miniature (ø0.043 x 1" long) probe tip
MP = Miniature (ø0.059 x 1" long) probe, ø0.15 x 0.5" long ferrule
MT = Threaded (#8-32 x 0.5" long) brass end tip
MTAP = Threaded (#8-32 x 0.5" long) brass, miniature angled (90°) tip
MTHAP = Threaded (#8-32 x 0.5" long) brass, miniature half-angled (45°) tip
MTP = Threaded (#8-32) brass, miniature (ø0.059 x 1" long) probe
P = Probe (ø0.09 x 3" long) bendable tip
R = Rectangular bundle termination
RC = Radial circular light image around perimeter of tip
T = Threaded (5/16 -24 x 1 1/2" long), brass end tip
TA = Threaded (5/16 -24 x 1 1/2" long), angled (90°) end tip
TAR = Threaded (5/16 -24) angled (90°); miniature rectangular bundle (plastic insert)
THA = Threaded (5/16 -24 x 1 1/2" long), half-angled (45°) end tip
THAR = Threaded & half-angled (45°); miniature rectangular bundle (plastic insert)
TR = Threaded end tip; miniature rectangular bundle termination (plastic insert)

OVERALL LENGTH designator

Length of the complete fiber optic assembly in feet

SHORT FIBER OPTIC MODEL NUMBERING

The overall length dimensions of short fiber optic assemblies may be specified to the nearest inch. Use the numbers below to specify lengths that are not an even multiple of 12 inches

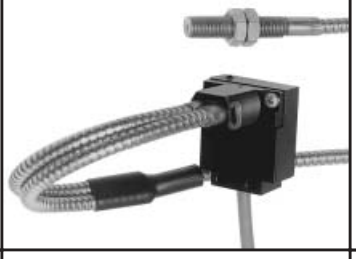
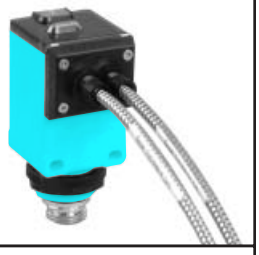
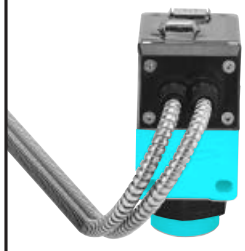
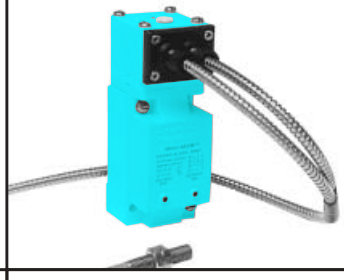
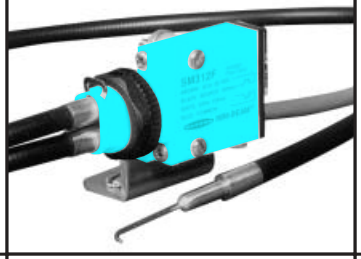
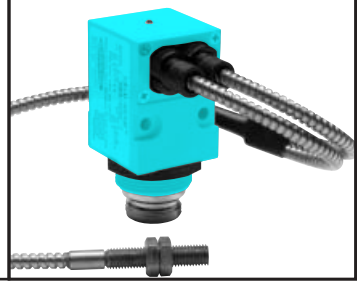
Overall Length		Model Number
1"	=	.1
2"	=	.2
3"	=	.3
4"	=	.33
5"	=	.4
6"	=	.5
7"	=	.6
8"	=	.7
9"	=	.8
10"	=	.83
11"	=	.9

e.g. to order model number IA23S in a 10" length, order "IA2.83S"

Note- If part number cannot be built here contact either Steven Engineering, or Banner Engineering Technical Support.

The following Banner fiber optic products use glass fibers for sensing applications.

Sensors for Glass Fiber Optics Quick Reference Guide

D12 Series Glass Fiber Optic Models (pp. 618, 622, 623 & 630)		**OMNI-BEAM** Glass Fiber Optic Models (pp. 430-433, & 447)	
ECONO-BEAM Glass Fiber Optic Models (p. 162)		**Q45 Series** Glass Fiber Optic Models (pp. 385 & 416)	
LR/PT400 with FOF-400 Glass Fiber Optic Fittings (p. 587)		**Q45X Bus Network Sensors** Glass Fiber Optic Models (p. 403)	
MAXI-BEAM Glass Fiber Optic Models (pp. 461 & 462)		**R55F** Glass Fiber Optic Models (p. 306)	
MINI-BEAM Glass Fiber Optic Models (pp. 120, 121, 131, 132, 143 & 148)		**SM512** Glass Fiber Optic Models (p. 278)	
MULTI-BEAM Glass Fiber Optic Models (pp. 485-488, 503 & 509)		**VALU-BEAM** Glass Fiber Optic Models (pp. 331, 342, 350, 358 & 359)	

Glass Fiber Optics Specifications

Construction	Combination of optical glass fiber, stainless steel or PVC, brass silicone rubber, Teflon®, molded thermoplastics, and optical grade epoxy. Optical fiber is F2 core, EN1 clad, except where noted. Flexible steel interlock sheathing is 302 stainless, except where noted.
Sensing Range	Refer to the excess gain curves for the fiber optic sensor to be used.
Bend Radius	Inside bend radius must be 0.5" (12 mm) or greater for PVC covered fiberoptic assemblies, and 1" (25 mm) or greater for stainless steel armored cable covered fibers.
Length	Standard length for assemblies is 24" (610 mm) or 36" (915 mm); see dimension diagrams Most models are available from the factory with shorter or longer cable lengths, up to 60' (18 m) max
Length Dimension Tolerance	Overall assembly length is ± 0.5" (12 mm) per 1' of length Bifurcation dimensions: ±0.5" (12 mm)
Implied Dimensional Tolerance	All glass fiber optic dimensions are in inches: 0.xxx = ±0.005 in; 0.xx = ±0.01; 0.x = ±0.1, unless specified
Operating Conditions	Fiber assemblies with stainless steel (SS) sheathing and metal end tips: -140° to +249°C (-220° to +480°F) Fiber assemblies with PVC sheathing and/or plastic end tips: -40° to +105°C (-40° to +220°F) Special order assemblies with SS sheathing and metal end tips and model suffix "M600": -140° to +315°C (-220° to +600°F) *sensing end tip only Special order assemblies with SS sheathing and metal end tips and model suffix "M900": -140° to +480°C (-220° to +900°F); note dimensional changes from STD models * sensing end tip only

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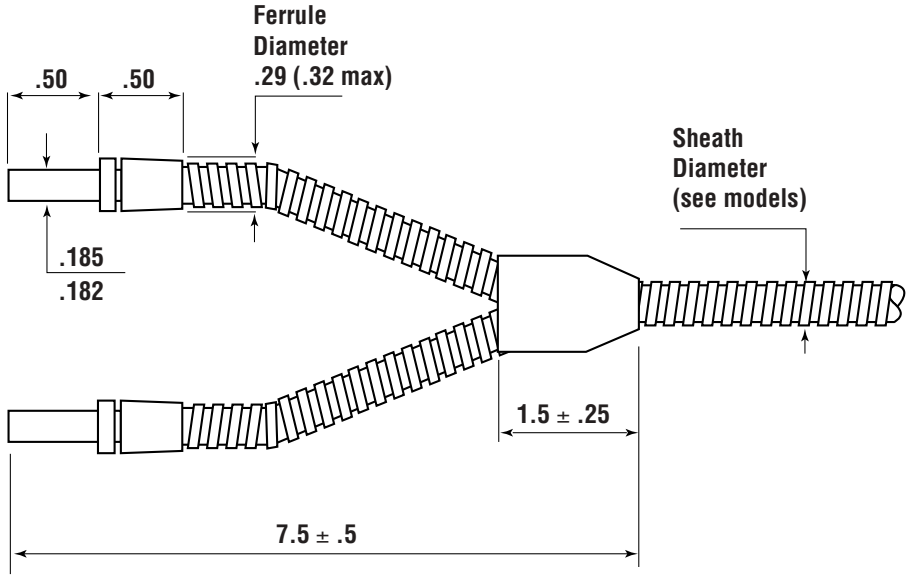
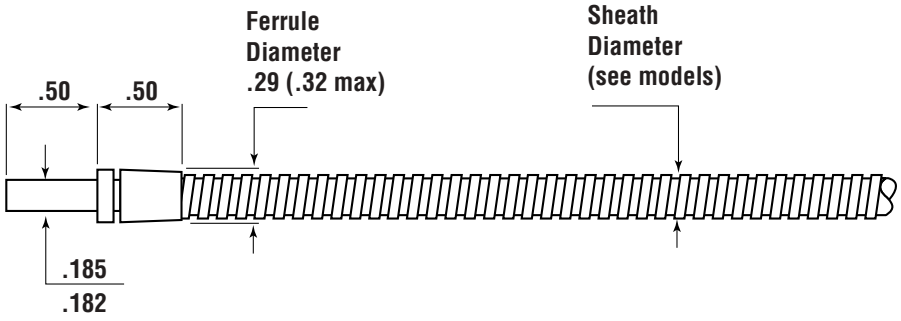
Glass Fiber Optic Construction

Bifurcated Fiber Construction

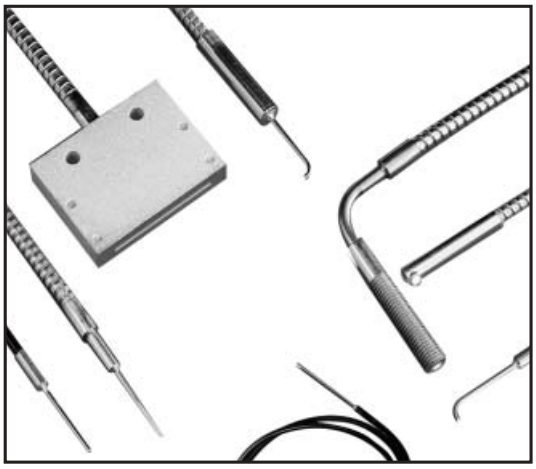


Individual Fiber Construction

NOTE: Two individual glass fibers are required per sensor for opposed mode sensing.

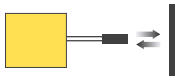


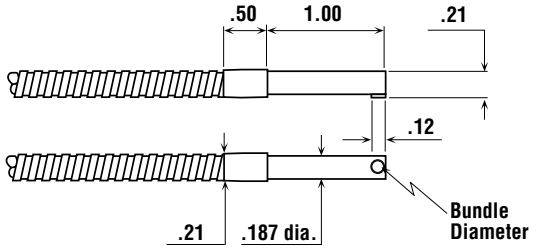
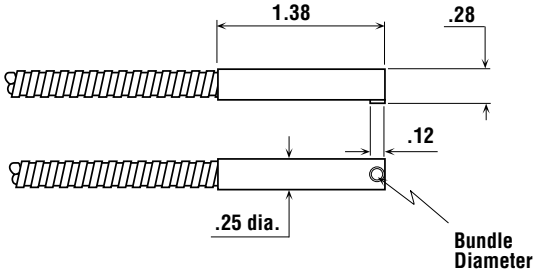
Standard Glass Fibers



Following is the listing of Banner standard, stocked glass fiber optic assemblies. Sensing end tips are common to both bifurcated ("B" model prefix) and individual ("I" model prefix) type assemblies. See page 681 for sensor end dimensions.

Contact your local sales engineer or factory applications expert for information on variations not listed, including: different final assembly lengths, additional bundle sizes, and alternate sheathing materials.



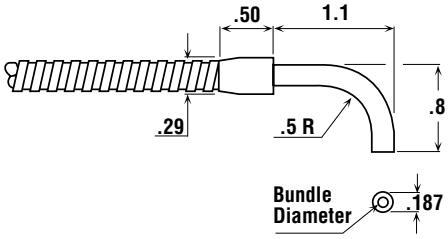
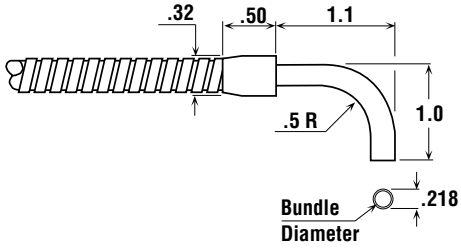
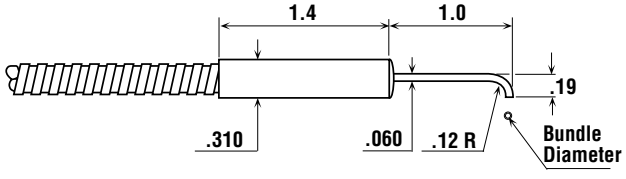
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BA1.53PMETA	Diffuse	36	0.090	PVC	.19	
BA.753PMETA			0.046	PVC	.19	
BA13PMETA			0.062	PVC	.19	
BA1.53SMETA*			0.090	SS	.21	
BA.753SMETA*			0.046	SS	.21	
BA13SMETA*			0.062	SS	.21	
IA1.53PMETA	Opposed	36	0.090	PVC	.19	
IA.753PMETA			0.046	PVC	.19	
IA13PMETA			0.062	PVC	.19	
IA1.53SMETA*			0.090	SS	.21	
IA.753SMETA*			0.046	SS	.21	
IA13SMETA*			0.062	SS	.21	
BA1.53PMTA	Diffuse	36	0.090	PVC	.19	
BA.753PMTA			0.046	PVC	.19	
BA13PMTA			0.062	PVC	.19	
BA1.53SMTA*			0.090	SS	.21	
BA.753SMTA*			0.046	SS	.21	
BA13SMTA*			0.062	SS	.21	
IA1.53PMTA	Opposed	36	0.090	PVC	.19	
IA.753PMTA			0.046	PVC	.19	
IA13PMTA			0.062	PVC	.19	
IA1.53SMTA*			0.090	SS	.21	
IA.753SMTA*			0.046	SS	.21	
IA13SMTA*			0.062	SS	.21	

* Available in 600°F version by adding suffix "M600" to model number

** Available in 900°F version by adding suffix "M900" to model number (some dimensions may change)

View Options Page

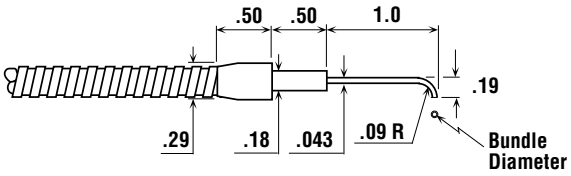
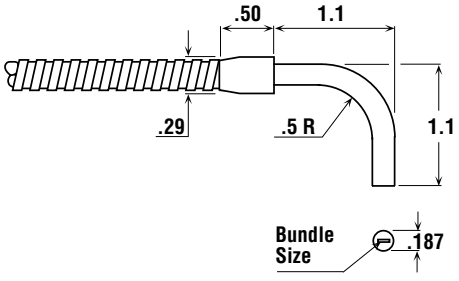
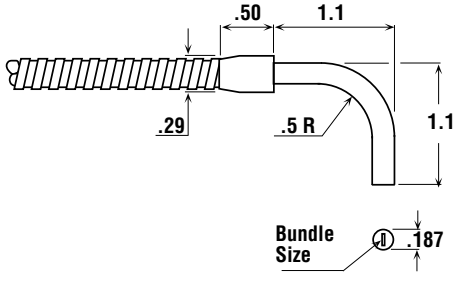
Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BA23S* ** **BA13P** **BA13S* **** **BA23P**	Diffuse	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
IA23S* ** **IA13P** **IA13S* **** **IA23P**	Opposed	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
BA2.53S* **BA2.53P**	Diffuse	36	0.156	SS PVC	.30	
IA2.53S* **IA2.53P**	Opposed	36	0.156	SS PVC	.30	
BAM.752S* **BAM.752P** **BAM.753S***	Diffuse	24 24 36	0.046	SS PVC SS	.25	
IAM.752S* **IAM.752P** **IAM.753S***	Opposed	24 24 36	0.046	SS PVC SS	.25	

* Available in 600°F version by adding suffix “M600” to model number

** Available in 900°F version by adding suffix “M900” to model number (some dimensions may change)

Standard Glass Fibers

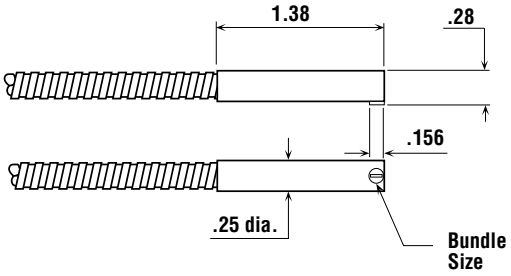
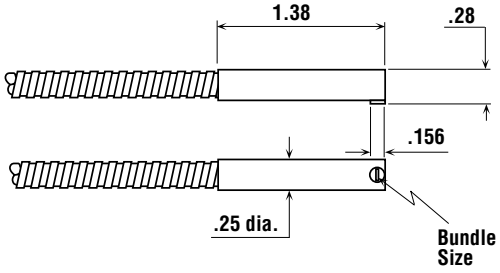
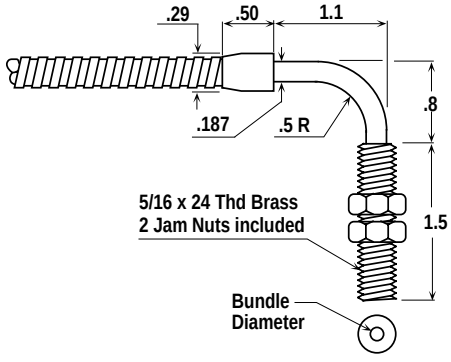
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BAMM.442S* **BAMM.442P**	Diffuse	24	0.027	SS PVC	.25	
IAMM.442S* **IAMM.442P**	Opposed	24	0.027	SS PVC	.25	
BAR.753S† **BAR.753P**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
IAR.753S† **IAR.753P**	Opposed	36	0.02 x 0.10	SS PVC	.25	
BAR.753SMRA* † **BAR.753PMRA**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
IAR.753SMRA† **IAR.753PMRA**	Opposed	36	0.02 x 0.10	SS PVC	.25	

* Available in 600°F version by adding suffix "M600" to model number

† M600 version uses aluminum instead of plastic insert

** Available in 900°F version by adding suffix "M900" to model number (some dimensions may change)

Standard Glass Fibers

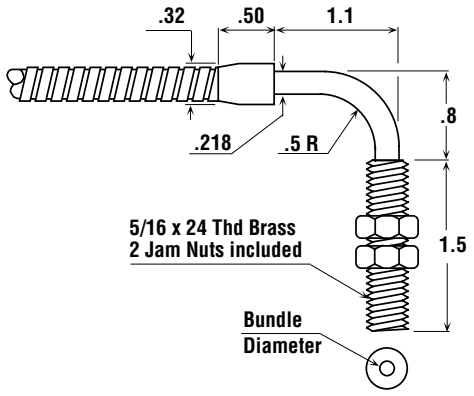
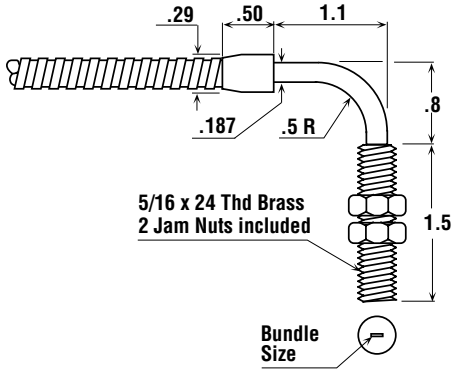
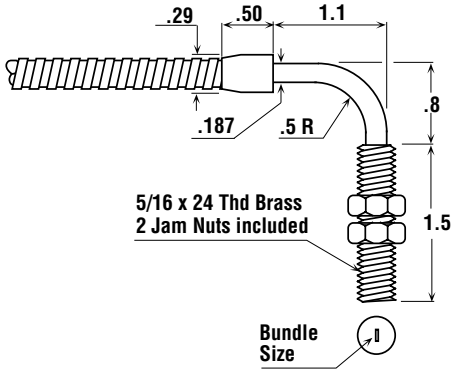
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BAR.753SMTA* † **BAR.752SMTA*** †	Diffuse	36 24	0.02 x 0.10	SS	.25	
IAR.753SMTA* † **IAR.752SMTA*** †	Opposed	36 24	0.02 x 0.10	SS	.21	
BAR.753SMTAMRA* † **BAR.752SMTAMRA*** †	Diffuse	36 24	0.02 x 0.10	SS	.21	
IAR.753SMTAMRA* † **IAR.752SMTAMRA*** †	Opposed	36 24	0.02 x 0.10	SS	.21	
BAT23S* ** **BAT13P** **BAT13S**** **BAT23P**	Diffuse	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
IAT23S* ** **IAT13P** **IAT13S*** ** **IAT23P**	Opposed	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	

* Available in 600°F version by adding suffix "M600" to model number

† M600 version uses aluminum instead of plastic insert

** Available in 900°F version by adding suffix "M900" to model number (some dimensions may change)

Standard Glass Fibers

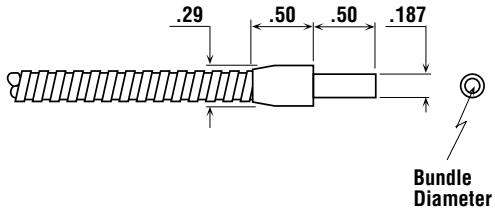
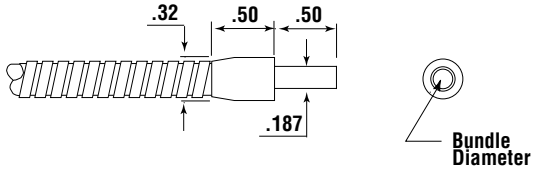
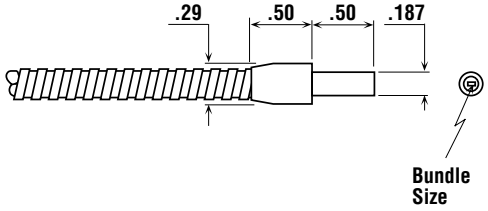
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BAT2.53S* ** **BAT2.53P**	Diffuse	36	0.156	SS PVC	.30	
IAT2.53S* ** **IAT2.53P**	Opposed	36	0.156	SS PVC	.30	
BATR.753S* † BATR.753P	Diffuse	36	0.02 x 0.10	SS PVC	.25	
IATR.753S* † IATR.753P	Opposed	36	0.02 x 0.10	SS PVC	.25	
BATR.753SMRA* † BATR.753PMRA	Diffuse	36	0.02 x 0.10	SS PVC	.25	
IATR.753SMRA* † IATR.753PMRA	Opposed	36	0.02 x 0.10	SS PVC	.25	

* Available in 600°F version by adding suffix "M600" to model number

** Available in 900°F version by adding suffix "M900" to model number

† M600 version uses aluminum instead of plastic insert

Standard Glass Fibers

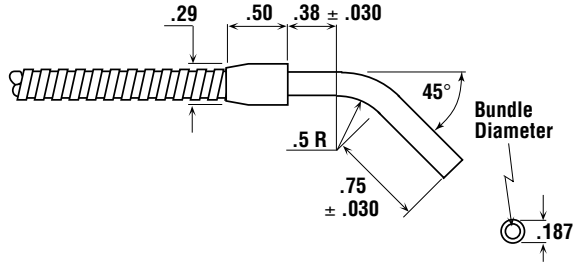
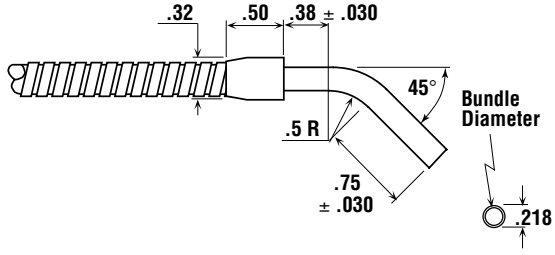
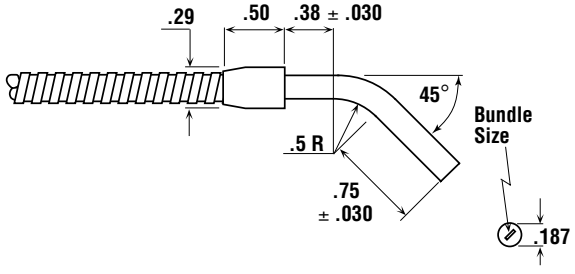
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BF23S* ** **BF13S*** **BF13P** **BF23P**	Diffuse	36	**0.125** **0.062** **0.062** **0.125**	**SS** **SS** **PVC** **PVC**	.25	
IF23S* ** **IF13S*** **IF13P** **IF23P**	Opposed	36	**0.125** **0.062** **0.062** **0.125**	**SS** **SS** **PVC** **PVC**	.25	
BF2.53S* **BF2.53P**	Diffuse	36	0.156	SS PVC	.30	
IF2.53S* **IF2.53P**	Opposed	36	0.156	SS PVC	.30	
BFR.753P **BFR.753S*** †	Diffuse	36	0.02 x 0.10 0.02 x 0.10	PVC SS	.25	
IFR.753P **IFR.753S*** †	Opposed	36	0.02 x 0.10 0.02 x 0.10	PVC SS	.25	

* Available in 600°F version by adding suffix "M600" to model number

** Available in 900°F version by adding suffix "M900" to model number

† M600 version uses aluminum instead of plastic insert

Standard Glass Fibers

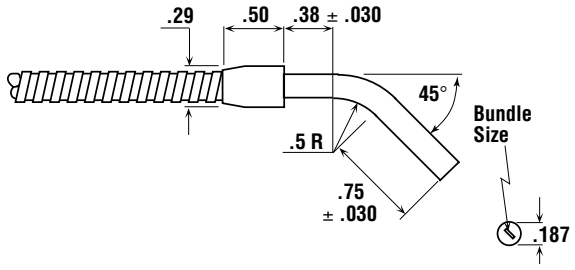
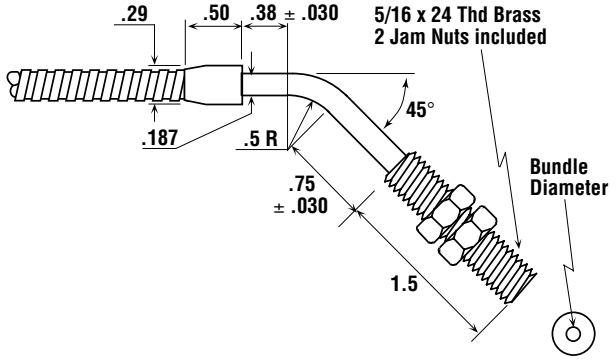
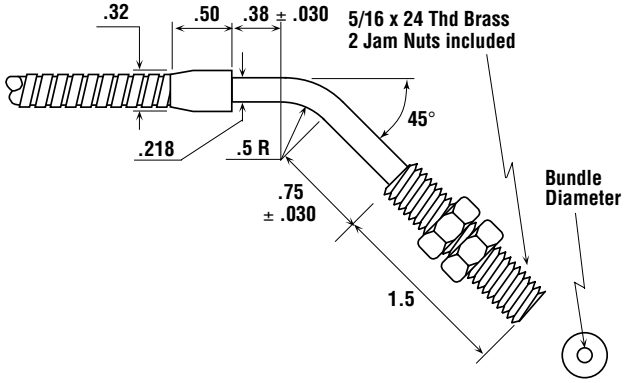
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BHA23S*	Diffuse	36	0.125	SS	.25	
BHA13P			0.062	PVC		
BHA13S*			0.062	SS		
BHA23P			0.125	PVC		
IHA23S*	Opposed	36	0.125	SS	.25	
IHA13P			0.062	PVC		
IHA13S*			0.062	SS		
IHA23P			0.125	PVC		
BHA2.53S*	Diffuse	36	0.156	SS	.30	
BHA2.53P				PVC		
IHA2.53S*	Diffuse	36	0.156	SS	.30	
IHA2.53P				PVC		
BHAR.753S* †	Diffuse	36	0.02 x 0.10	SS	.25	
BHAR.753P				PVC		
IHAR.753S* †	Diffuse	36	0.02 x 0.100.02 x 0.10	SS	.25	
IHAR.753P				PVC		

* Available in 600°F version by adding suffix "M600" to model number

** Available in 900°F version by adding suffix "M900" to model number

† M600 version uses aluminum instead of plastic insert

Standard Glass Fibers

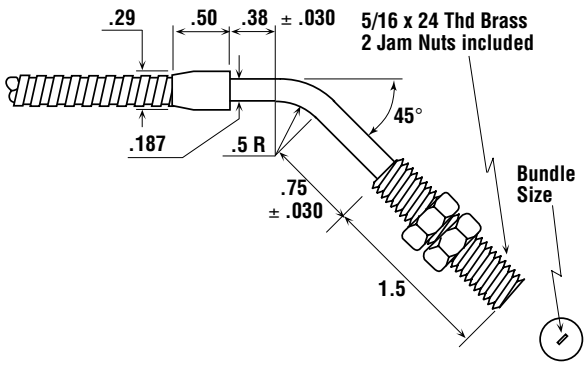
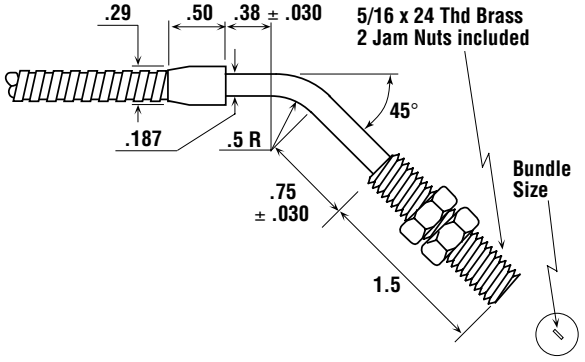
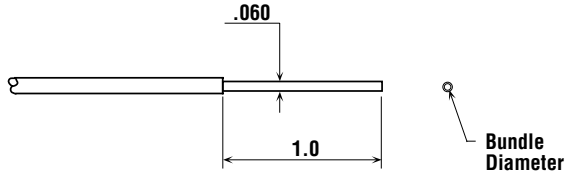
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BHAR.753SMRA* † **BHAR.753PMRA**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
IHAR.753SMRA* † **IHAR.753PMRA**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
BHAT23S* **BHAT13P** **BHAT13S*** **BHAT23P**	Diffuse	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
IHAT23S* **IHAT13P** **IHAT13S*** **IHAT23P**	Diffuse	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
BHAT2.53S **BHAT2.53P**	Diffuse	36	0.156	SS PVC	.30	
IHAT2.53S* **IHAT2.53P**	Diffuse	36	0.156	SS PVC	.30	

* Available in 600°F version by adding suffix "M600" to model number

** Available in 900°F version by adding suffix "M900" to model number

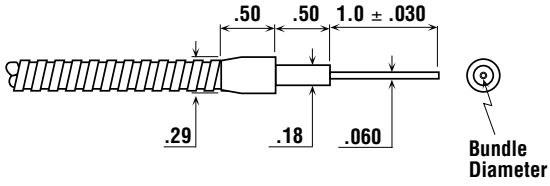
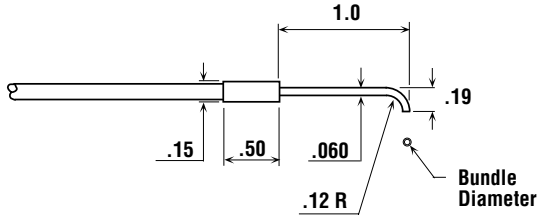
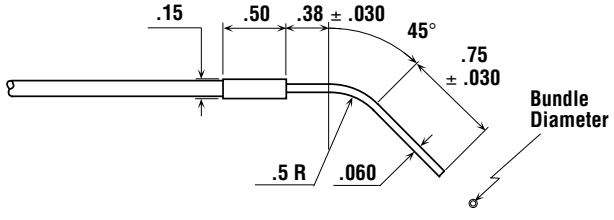
† M600 version uses aluminum instead of plastic insert

Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BHATR.753S*† **BHATR.753P**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
IHATR.753S*† **IHATR.753P**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
BHATR.753SMRA*† **BHATR.753PMRA**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
IHATR.753SMRA*† **IHATR.753PMRA**	Opposed	36	0.02 x 0.10	SS PVC	.25	
BM.752P **BM.753P**	Diffuse	24 36	0.046	PVC only	.09	
IM.752P **IM.753P**	Opposed	24 36	0.046	PVC only	.09	

* Available in 600°F version by adding suffix "M600" to model number
** Available in 900°F version by adding suffix "M900" to model number
† M600 version uses aluminum instead of plastic insert

Standard Glass Fibers

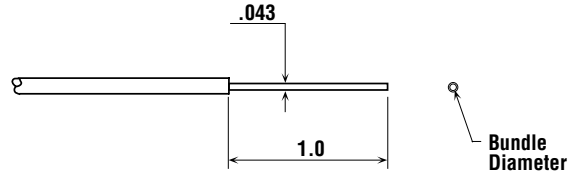
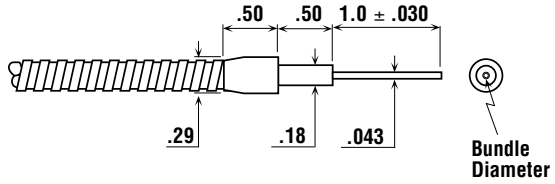
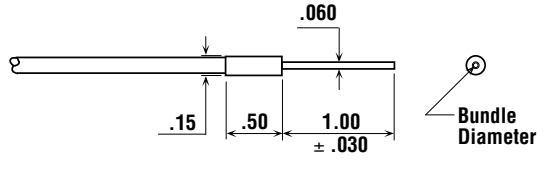
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BM.752S* **BM.753S***	Diffuse	24 36	0.046	SS	.25	
IM.752S* **IM.753S***	Opposed	24 36	0.046 0.027	SS	.25	
BMAP.753P **BMAP.442P**[1]	Diffuse	36 24	0.046 0.027	PVC	.12	
([1] Probe diameter for this model is 0.043")						
IMAP.753P **IMAP.442P**[1]	Opposed	36 24	0.046 0.027	PVC	.12	
([1] Probe diameter for this model is 0.043")						
BMHAP.753P **BMHAP.442P**	Diffuse	36 24	0.046 0.027	PVC	.12	
IMHAP.753P **IMHAP.442P**	Opposed	36 24	0.046 0.027	PVC	.12	

* Available in 600°F version by adding suffix "M600" to model number

** Available in 900°F version by adding suffix "M900" to model number

[1]Probe-style fibers may be modified for different probe lengths and angles

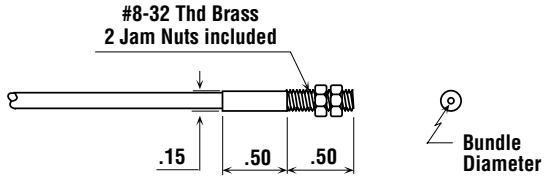
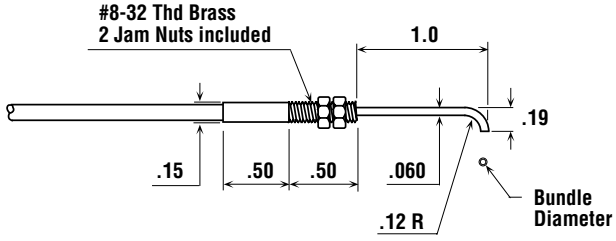
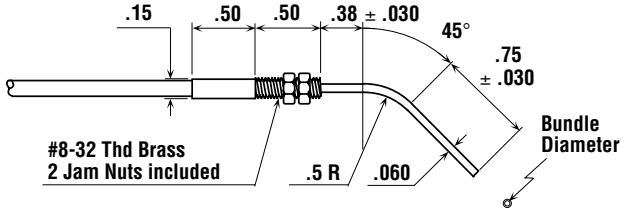
Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BMM.442P **BMM.443P**	Diffuse	24 36	0.027	PVC only	.09	
IMM.442P **IMM.443P**	Opposed	24 36	0.027	PVC	.09	
BMM.442S* **BMM.443S***	Diffuse	24 36	0.027	SS	.25	
IMM.442S* **IMM.443S***	Opposed	24 36	0.027	SS	.25	
BMP.753P **BMP.442P**	Diffuse	36 24	0.046 0.027	PVC	.12	
IMP.753P **IMP.442P**	Opposed	36 24	0.046 0.027	PVC	.12	

* Available in 600°F version by adding suffix “M600” to model number

** Available in 900°F version by adding suffix “M900” to model number

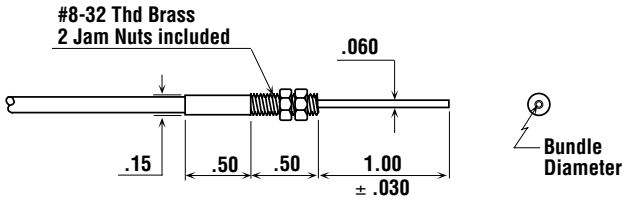
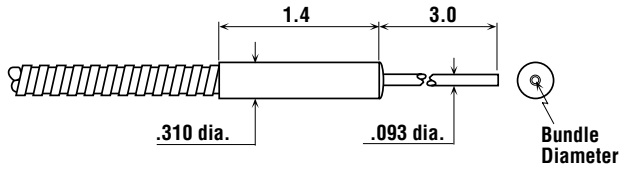
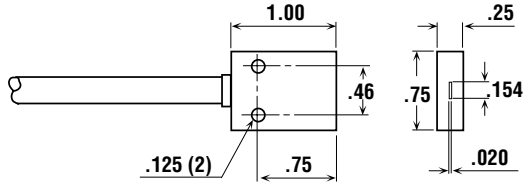
Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BMT.753P **BMT.442P**	Diffuse	36 24	0.046 0.027	PVC	.12	
IMT.753P **IMT.442P**	Opposed	36 24	0.046 0.027	PVC	.12	
BMTAP.753P **BMTAP.442P**[1] ([1]Probe diameter for this model is 0.043")	Diffuse	36 24	0.046 0.027	PVC	.12	
IMTAP.753P **IMTAP.442P**[1] ([1]Probe diameter for this model is 0.043")	Opposed	36 24	0.046 0.027	PVC	.12	
BMTHAP.753P **BMTHAP.442P**	Diffuse	36 24	0.046 0.027	PVC	.12	
IMTHAP.753P **IMTHAP.442P**	Opposed	36 24	0.046 0.027	PVC	.12	

* Available in 600°F version by adding suffix "M600" to model number
** Available in 900°F version by adding suffix "M900" to model number

[1]Probe-style fibers may be modified for different probe lengths and angles

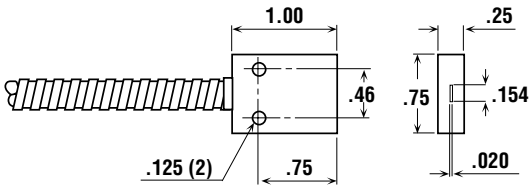
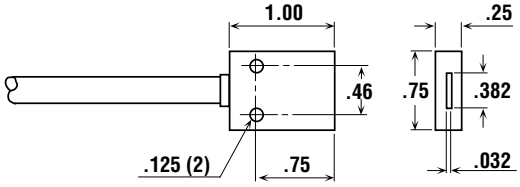
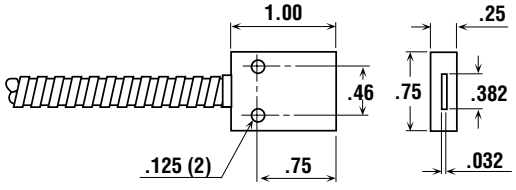
Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BMTP.753P **BMTP.442P**	Diffuse	36 24	0.046 0.027	PVC	.12	
IMTP.753P **IMTP.442P**	Opposed	36 24	0.046 0.027	PVC	.12	
BP13S* **BP12P** **BP12S*** **BP13P**	Diffuse	36 24 24 36	0.062	SS PVC SS PVC	.25	
Bendable probe sensing tip: R 6 mm (.24"), 12 mm (.47") min from either end						
IP13S* **IP12P** **IP12S*** **IP13P**	Opposed	36 24 24 36	0.062	SS PVC SS PVC	.25	
BR13P **BR12P**	Diffuse	36 24	0.020 x 0.154	PVC	.23	
IR13P **IR12P**	Opposed	36 24	0.020 x 0.154	PVC	.23	

* Available in 600°F version by adding suffix "M600" to model number (IR13S & IR23S)

** Available in 900°F version by adding suffix "M900" to model number

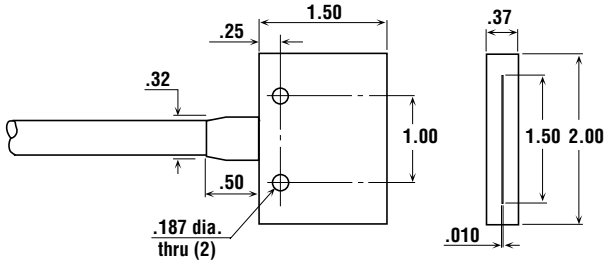
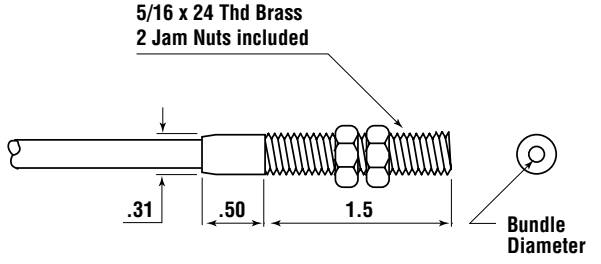
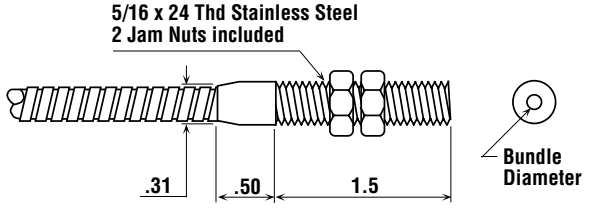
Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BR13S* BR12S*	Diffuse	36 24	0.020 x 0.154	SS	.25	
IR13S* IR12S*	Opposed	36 24	0.020 x 0.154	SS	.25	
BR23P BR26P	Diffuse	36 72	0.032 x 0.382	PVC	.23	
IR23P IR26P	Opposed	36 72	0.032 x 0.382	PVC	.23	
BR23S* BR26S*	Diffuse	36 72	0.032 x 0.382	PVC	.25	
IR23S* IR26S*	Opposed	36 72	0.032 x 0.382	PVC	.25	

* Available in 600°F version by adding suffix "M600" to model number (the plastic head on the BR13S and BR23S is replaced with an aluminum housing)

** Available in 900°F version by adding suffix "M900" to model number, brass threads are replaced with stainless steel with brass insert

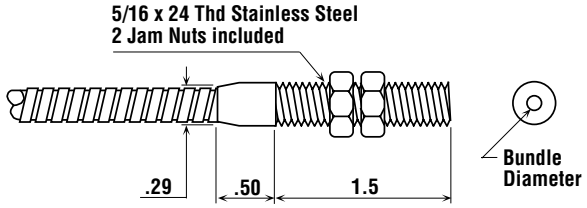
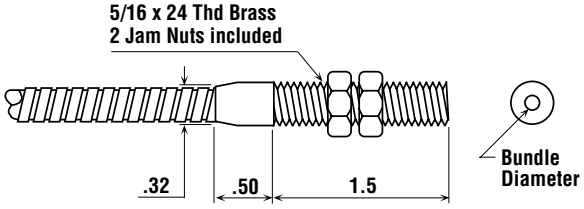
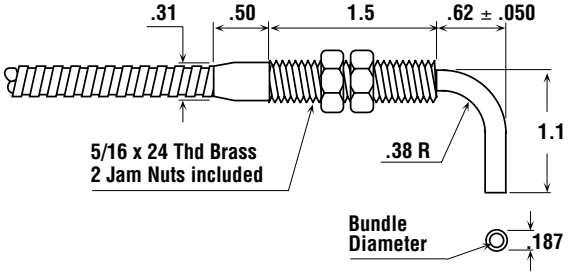
Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BR2.53P **BR2.56P** **BR2.53S*** **BR2.56S***	Diffuse	36 72 36 72	0.010 x 1.50	PVC PVC SS SS	.30	
IR2.53P **IR2.56P** **IR2.53S*** **IR2.56S***	Opposed	36 72 36 72	0.010 x 1.50	PVC PVC SS SS	.30	
BT13P **BT.752P** **BT13S*** **BT.752S*** **BT23S*** ** **BT23P** **BT26S*** **	Diffuse	36 24 36 24 36 36 72	0.062 0.046 0.062 0.046 0.125 0.125 0.125	PVC PVC SS SS SS PVC SS	.23 .23 .25 .25 .25 .25	
IT13P **IT.752P** **IT13S*** **IT.752S*** **IT23S*** ** **IT23P** **IT26S*** **	Opposed	36 24 36 24 36 36 72	0.046 0.046 0.062 0.046 0.125 0.125 0.125	PVC PVC SS SS SS PVC SS	.23 .23 .25 .25 .25 .25	
BT23SMSS* **BT23PMSS**	Diffuse	36	0.125	SS PVC	.25	
IT23SMSS* **IT23PMSS**	Opposed	36	0.125	SS PVC	.25	

* Available in 600°F version by adding suffix “M600” to model number

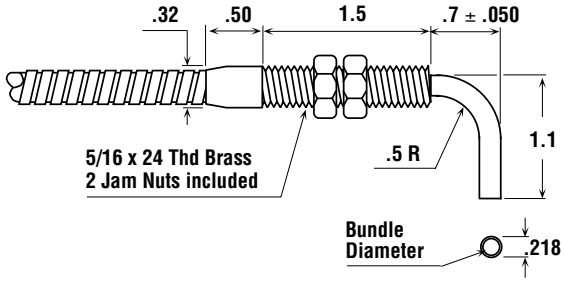
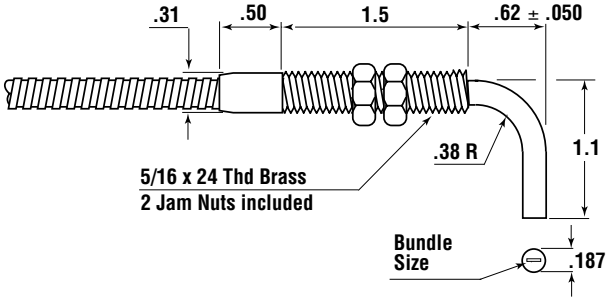
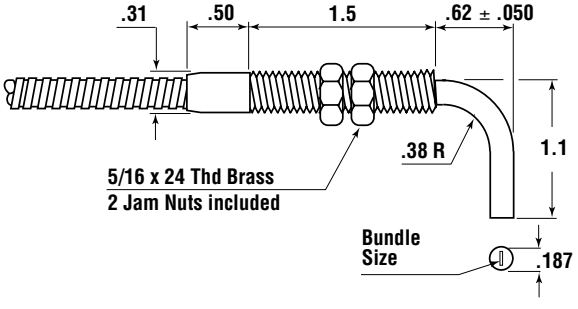
** Available in 900°F version by adding suffix “M900” to model number

Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BT23SM900 **BT26SM900** **BT210SM900**	Diffuse	36 72 120	0.125	SS	.25	
IT23SM900 **IT26SM900** **IT210SM900**	Opposed	36 72 120	0.125	SS	.25	
BT2.53S* **BT2.53P**	Diffuse	36	0.156	SS PVC	.30	
IT2.53S* **IT2.53P**	Opposed	36	0.156	SS PVC	.30	
BTA23S* ** **BTA13P** **BTA13S*** **BTA23P**	Diffuse	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
1.1" dimension changes with M900 (see p. 708)						
ITA23S* ** †† **ITA13P** **ITA13S*** **ITA23P**	Opposed	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	

* Available in 600°F version by adding suffix "M600" to model number
** Available in 900°F version by adding suffix "M900" to model number
† M600 version uses aluminum instead of plastic insert
†† M900 uses stainless steel threads

Standard Glass Fibers

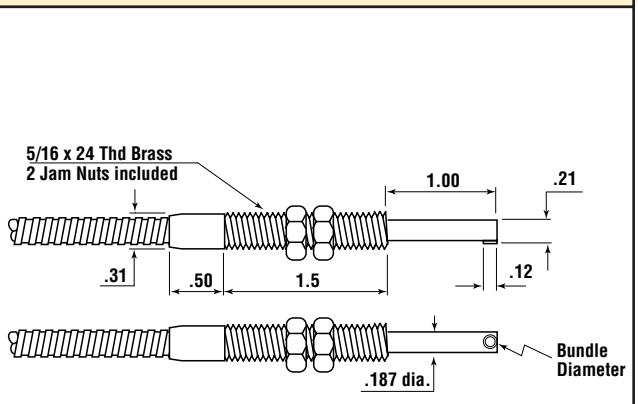
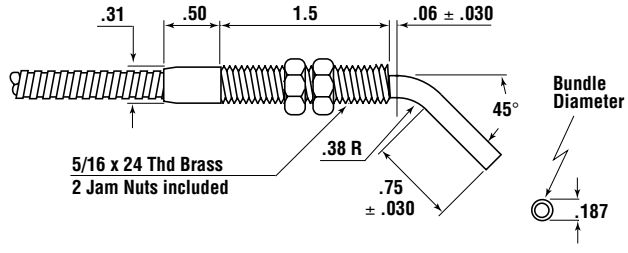
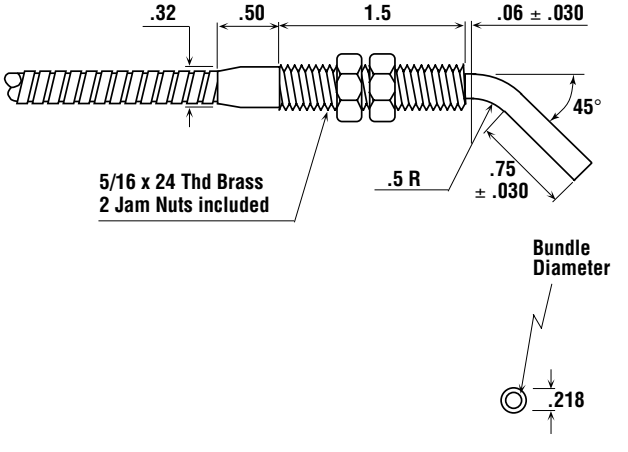
Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BTA2.53S* **BTA2.53P**	Diffuse	36	0.156	SS PVC	.30	
ITA2.53S* **ITA2.53P**	Opposed	36	0.156	SS PVC	.30	
BTAR.753S* † **BTAR.753P**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
ITAR.753S* † **ITAR.753P**	Opposed	36	0.02 x 0.10	SS PVC	.25	
BTAR.753SMRA* † **BTAR.753PMRA**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
ITAR.753SMRA* † **ITAR.753PMRA**	Opposed	36	0.02 x 0.10	SS PVC	.25	

* Available in 600°F version by adding suffix "M600" to model number

** Available in 900°F version by adding suffix "M900" to model number

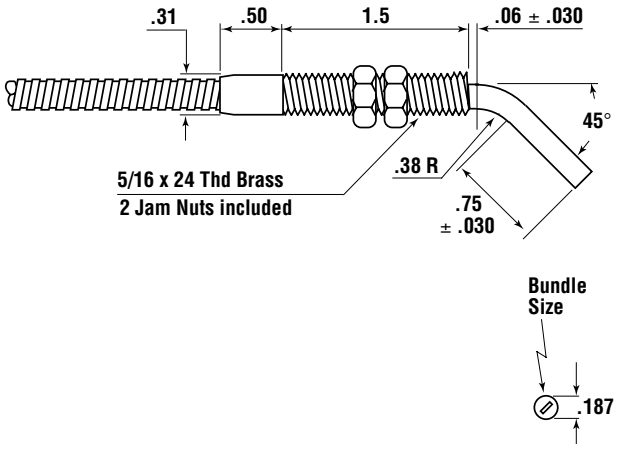
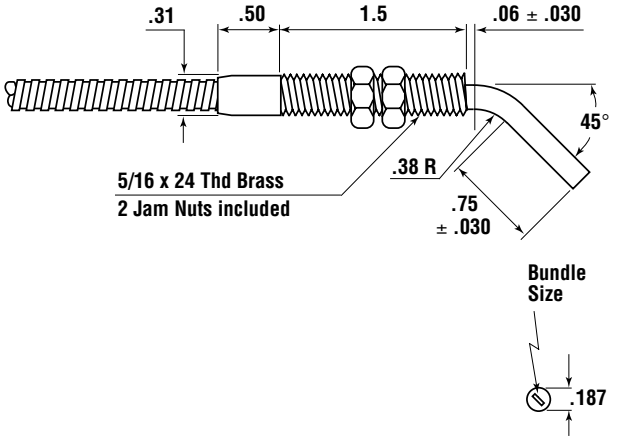
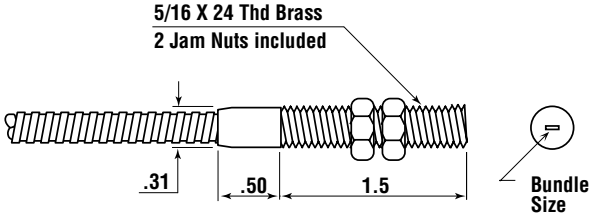
† M600 version uses aluminum instead of plastic insert

Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BTETA1.53S* BTETA.753S* BTETA13S*	Diffuse	36	0.090 0.046 0.062	SS	.25	
ITETA1.53S* ITETA.753S* ITETA13S*	Opposed	36	0.090 0.046 0.062	SS	.25	
BTHA23S* BTHA13P BTHA13S* BTHA23P	Diffuse	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
ITHA23S* ITHA13P ITHA13S* ITHA23P	Opposed	36	0.125 0.062 0.062 0.125	SS PVC SS PVC	.25	
BTHA2.53S* BTHA2.53P	Diffuse	36	0.156	SS PVC	.30	
ITHA2.53S* ITHA2.53P	Opposed	36	0.156	SS PVC	.30	

* Available in 600°F version by adding suffix "M600" to model number
** Available in 900°F version by adding suffix "M900" to model number

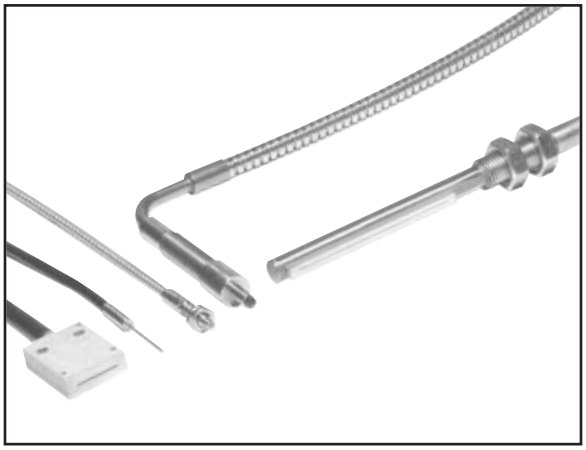
Standard Glass Fibers

Model	Sensing Mode	Final Assembly Lgth (in)	Bundle Size or Dia. (in)	Sheath Material	Sheath Dia. (in)	Sensing End Tip Dimensions (in)
BTHAR.753S* [†] **BTHAR.753P**	Diffuse	36	0.02 x 0.10	SS PVC	SS PVC	
ITHAR.753S* [†] **ITHAR.753P**	Opposed	36	0.02 x 0.10	SS PVC	SS PVC	
BTHAR.753SMRA* [†] **BTHAR.753PMRA**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
ITHAR.753SMRA* [†] **ITHAR.753PMRA**	Opposed	36	0.02 x 0.10	SS PVC	.25	
BTR.753S* [†] **BTR.753P**	Diffuse	36	0.02 x 0.10	SS PVC	.25	
ITR.753S* [†] **ITR.753P**	Opposed	36	0.02 x 0.10	SS PVC	.25	

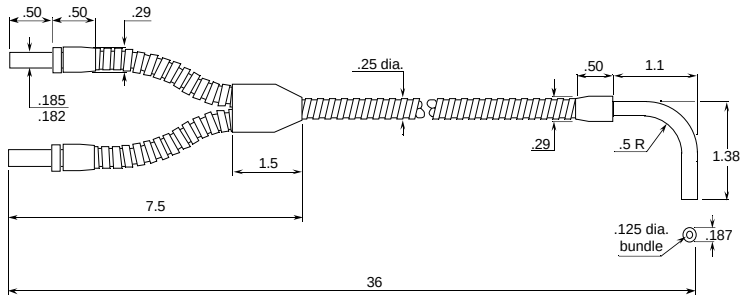
[1]Probe-style fibers may be modified for different probe lengths and angles

[†] M600 version uses aluminum instead of plastic insert

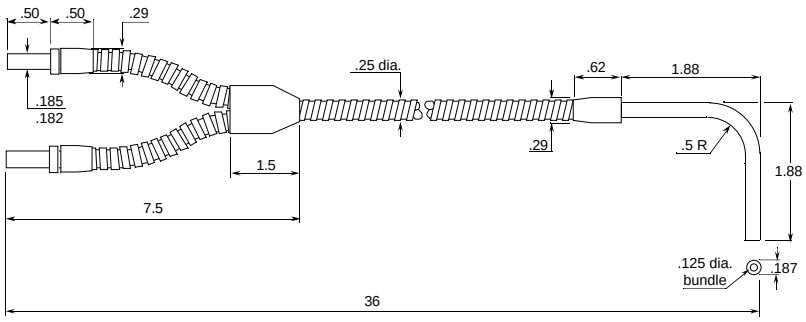
Custom Glass Fibers



Banner would like the opportunity to solve your most challenging sensing applications, using custom-designed glass fiber optics. Following are just a few examples of custom glass fiber optic assemblies which have been produced, to date. Contact your local sales engineer or our factory applications experts to discuss the details of your application requirements.

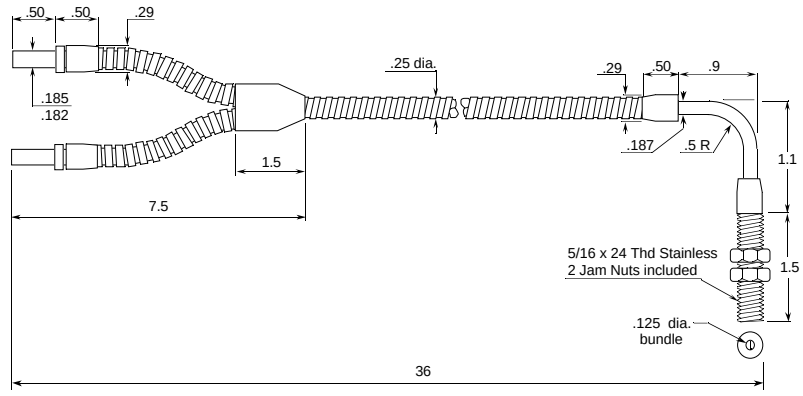
Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BA23SM1.38	36	0.125	SS	

This is a modified version of standard model BA23S. The length of the ferrule after the angle is extended from 0.8" to 1.38". This dimension can be made longer or can be made as short as 0.5". The smallest bend radius for the $^{3}/_{16}$" stainless steel tubing is $^{3}/_{8}$". The 1.1" dimension (before the angle) can also be modified.

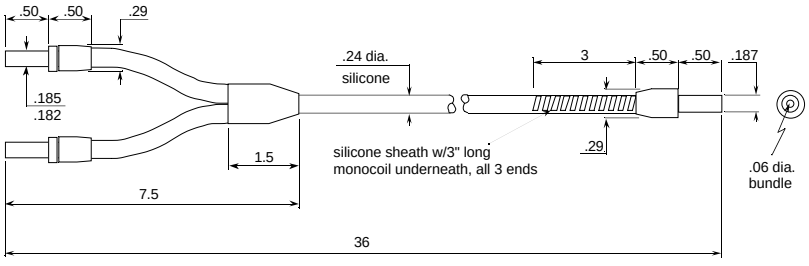
BA23SM1.9SQM900	36	0.125	SS	

This modification of the BA23S is for high temperature environments, up to 900° F. The angle end does not contain epoxy, which might break down at high temperatures. The high temperature construction of the scanning end requires 1.88" (or more) after the angle. The length of the tubing (before the angle, 1.88") can be made longer or modified to as short as 1.1". The shrink junction is made of PVC and should not be exposed to temperatures above 220°F.

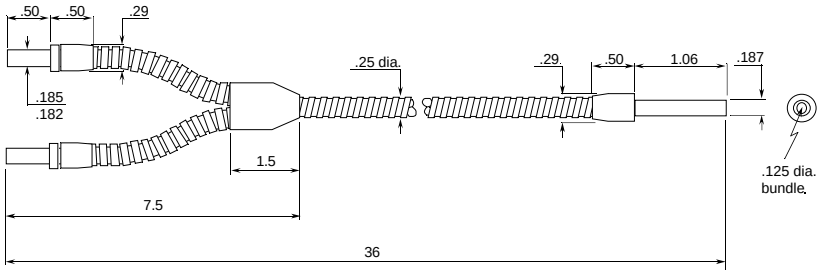
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BAT23SM900	36	0.125	SS	

The BAT23SM900 is the 900° F version of standard model BAT23S. The high temperature version requires a mechanical modification to eliminate the use of epoxy on the sensing end. The shrink junction is made of PVC tubing and should not be exposed to temperatures above 220° F. The material used for the threaded portion of the assembly is changed from brass to stainless steel, with brass insert.

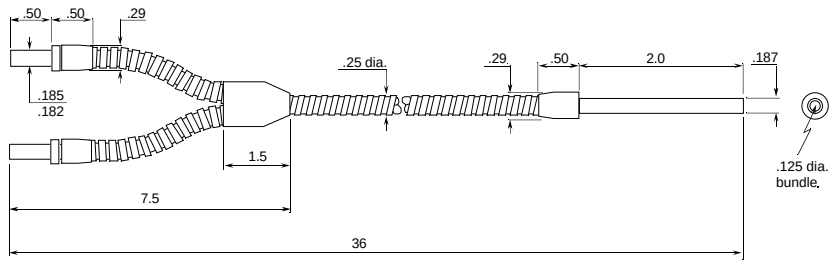
BF13LMSRE	36	0.125	Silicone	

Silicone rubber sheathing is used for this modification of standard model BF13S. The non-conductive rubber is very soft and flexible. A short length (3") of interlocking stainless steel is used inside the silicone sheathing on all three ends to protect the glass bundle. Silicone sheathing is used for its electrical insulating properties.

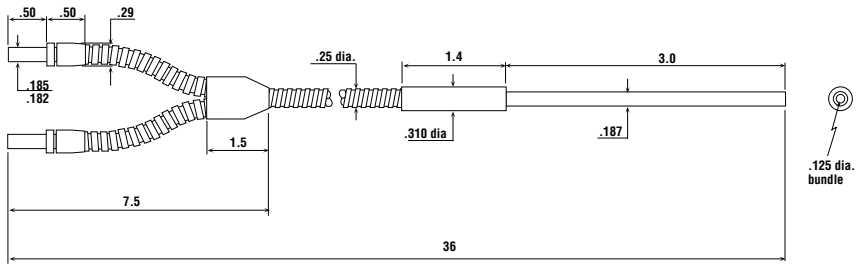
BF23SM1.06	36	0.125	SS	

This special assembly is an example of a modification to the sensing end ferrule of standard model BF23S. Here, the ferrule length is 1.06". A ferruled end tip can be ordered in nearly any length. The ferrule diameter can also be modified. This style of end tip is hard stainless steel, and is not bendable.

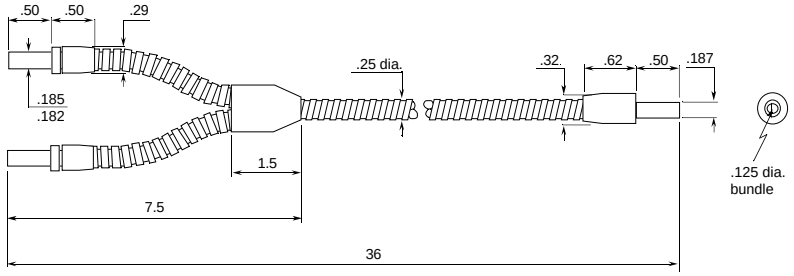
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BF23SM2	36	0.125	SS	

This modification of the ferruled end tip extends for a total length of two inches. A ferrule-style fiber is typically mounted through a 3/16" diameter hole, using a setscrew to secure it. By using a long ferruled tip, easy adjustment of sensing distance is possible by sliding the ferrule in and out through the mounting hole.

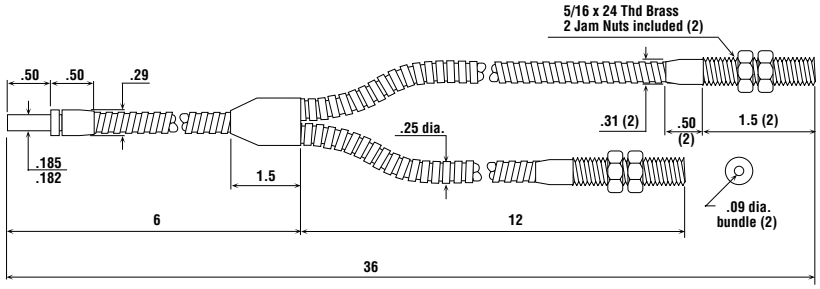
BF23SM3FMB	36	0.125	SS	

This BF23S with a three inch ferrule also has a mounting "bullet" found on probe style fibers. This allows use of the FMB-1 mounting bracket.

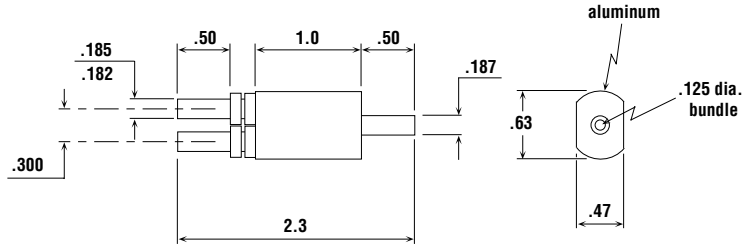
BF23SM900	36	0.125	SS	

This modification of standard model BF23S is for high temperature environments. The maximum allowable temperature for the standard fiber is 249° C (480° F). This modification allows the sensing end tip to survive in temperatures up to 900° F (480° C). The fiber bundle is randomly mixed at the sensing end tip. Specify a longer cable length if necessary.

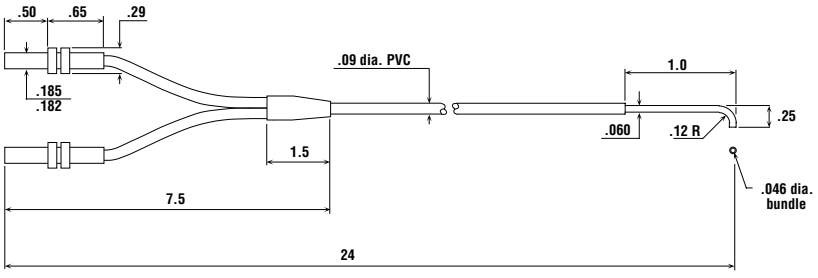
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BF23SMTTULB	36	0.090	SS	

Most bifurcated fiber assemblies are used in the diffuse (proximity) sensing mode, but this one is used (in pairs) in the opposed mode. The common end of one cable connects to an emitter, and the common end of the other cable, to a receiver. The two opposed beams created with the branched ends must both be broken in order to obtain an output from the sensor ("dark-AND" logic). Threaded ends are used to extend the opposed sensing range with addition of lenses L9 or L16F.

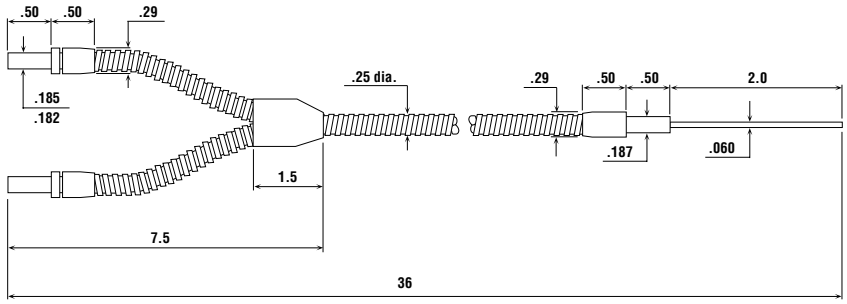
BF2M300	2.3	0.125	SS and Aluminum	

Most fiber optic assemblies use flexible sheathing to allow the sensing end to reach areas which are inaccessible to a larger self-contained photoelectric sensor. This assembly is a block which is used with MINI-BEAM fiber optic sensors. This fiber was designed for systems which require the sensor to be mounted on a movable arm. When a part is in place, the sensor moves to the inspection point. This type of assembly eliminates breakage caused by flexing of the sheathing of a standard fiber.

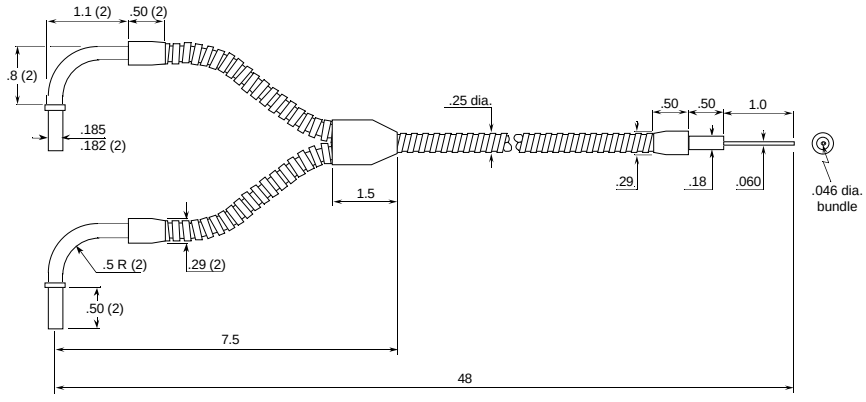
BM.752PMA.25	24	0.046	PVC	

This Bifurcated Miniature Probe with a Modified Angle is used in applications where space is limited. It can be built either as a bifurcated (shown) or an individual fiber (IM.752PMA.25). The PVC sheathing used on miniature probe style fibers does not have a monocoil reinforcing wire. Care should be taken not to exceed the 12 mm (0.5") minimum bend radius of this small sheathing.

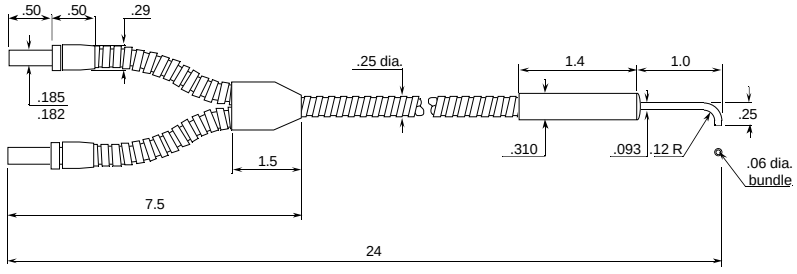
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BM.753SM2	36	0.046	SS	

Standard model BM.752S is modified to create this special assembly. The overall length is extended to 36" and the miniature sensing end is two inches long. Miniature ends are made of stainless steel and are not bendable. We can pre-bend the tubing before assembling the fiber in order to create a particular design. Multiple bends in the sensing end can also be made.

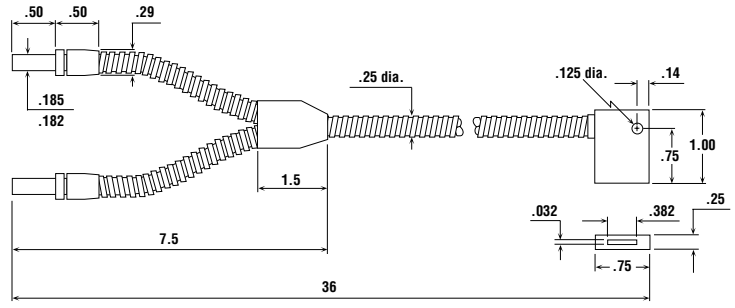
BM.754SMAMA	48	0.046	SS	

Fiberoptic assemblies may be designed to exactly fit a space-restricted area. This application required the fiber to exit the photoelectric sensor and turn a sharp right angle. The minimum bend radius of the sheathing of a standard fiber assembly would have been exceeded in this application. This modification can be made to virtually any standard fiberoptic assembly.

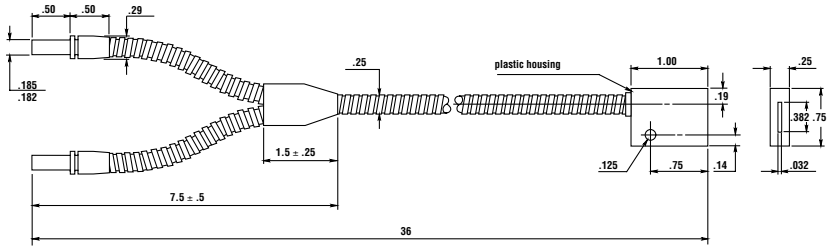
BP12SMA1X.25	24	0.060	SS	

This modification of standard model BP12S shows the minimum bend radius of the 0.09" diameter tubing used on standard probe fibers. The 1/4" distance after the angle is the minimum allowable for a true 90° angle. Standard probe length is three inches, with the middle two inches bendable. One half inch on each end of the probe is not bendable due to the optical epoxy used. The one inch probe on model BP12SMA1X.25 is not bendable.

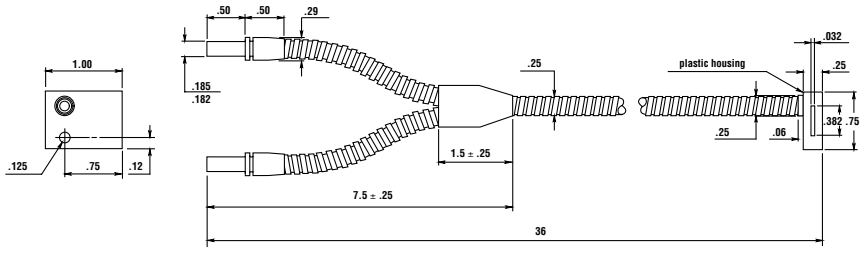
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BR23SMRA	36	0.125	SS	

Model BR23SMRA is a cable exit modification of standard model BR23S. This assembly was designed for a register mark sensing application where there was very limited space for the sensor. The fiber optic sensing end could not be close to the surface of the web. Therefore, a large rectangular fiber bundle was required. The fiber optic cable exits from the side of the plastic housing. Note that one of the two mounting holes is lost due to this modification.

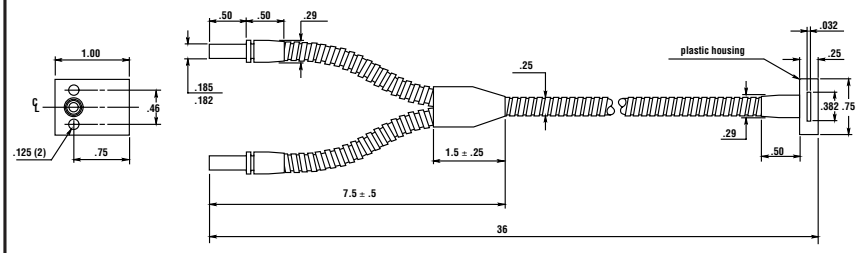
BR23SMCCE	36	0.125	SS	

Model BR23SMCCE is a cable exit modification to BR23S and has a Corner Cable Exit. This modification is also available on individual fiber optic assemblies, and fibers with a smaller rectangular bundle size. This model loses one of the two available mounting holes due to its modification.

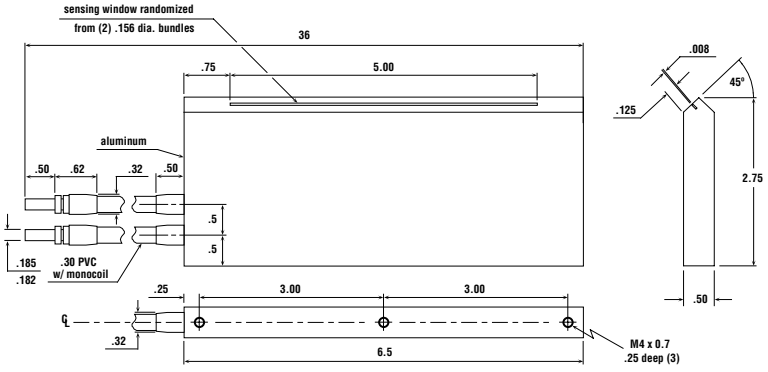
BR23SMCSE	36	0.125	SS	

Model BR23SMCSE is a cable exit modification to BR23S and has a Cable Side Exit. This modification is also available on individual fiber optic assemblies, and fibers with a smaller rectangular bundle size. This model loses one of the two available mounting holes due to its modification.

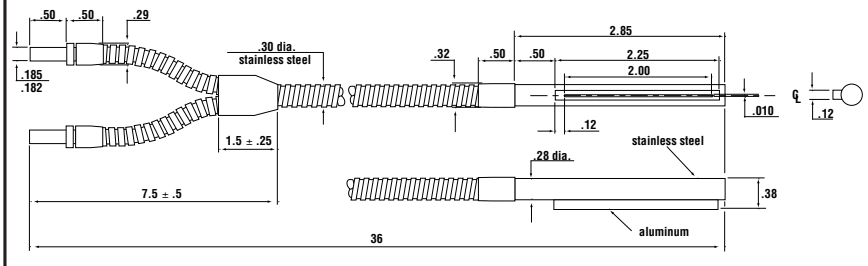
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BR23SMCSC	36	0.125	SS	

Model BR23SMCSC is a cable exit modification to BR23S and has a Cable Side Center. This modification is also available on individual fiber optic assemblies, and fibers with a smaller rectangular bundle size.

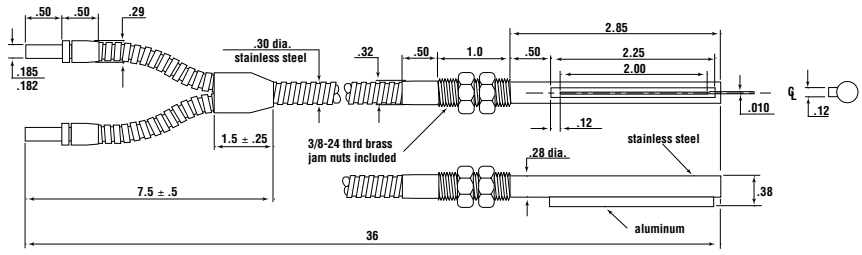
BR53PM5X.008	36	0.156 (2)	PVC	

This special rectangular fiber assembly uses the maximum bundle size (0.156" diameter) in each ferrule to obtain this large sensing area. The assembly requires the use of one photoelectric sensor to cover the five inch wide window. The fiber optic block is beveled on the end where the fiber slot is located. The object being detected in this application is folded paper which is placed on top of this fiber assembly. This configuration is used to allow the fibers to "look" at the object being sensed at a perpendicular angle.

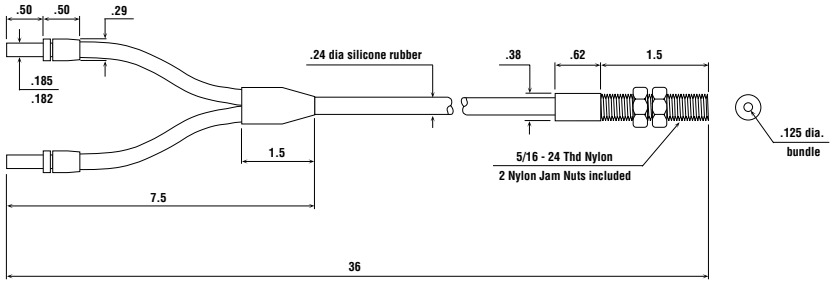
BRSE2.53S	36	0.156	SS	

The model BRSE2.53S Bifurcated Rectangular Side Exit assembly is used in applications where space is limited. This assembly can be built as a bifurcated fiber assembly (shown above) or as an individual fiber assembly (model IRSE2.53S).

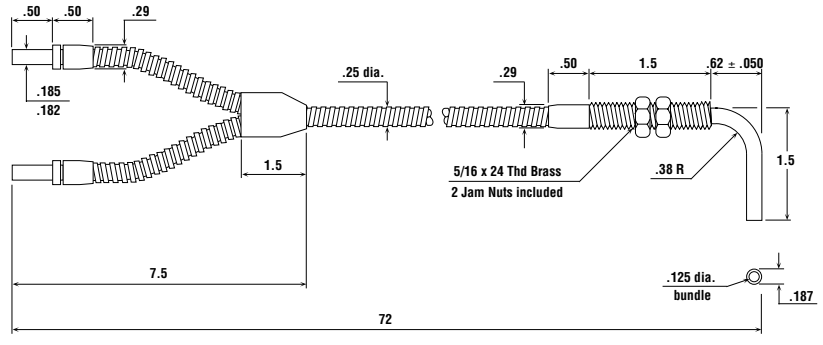
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
BTRSE2.53S	36	0.156	SS	

The model BTRSE2.53S is a threaded version of the the model BRSE2.53S (previous page).

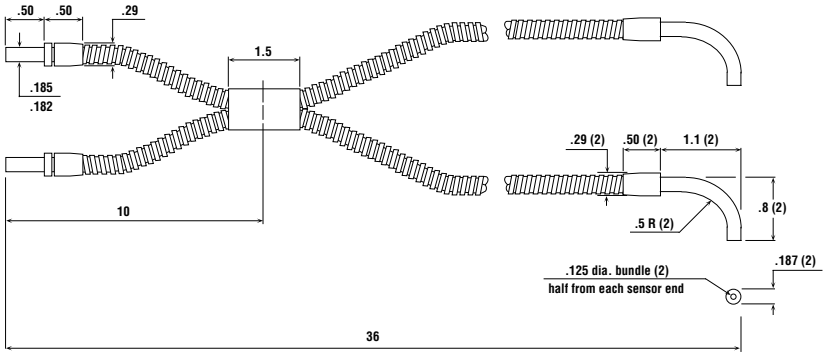
BT23LMNC	36	0.125	Silicone	

The BT23LMNC has basically the same configuration as a standard BT23P, with a few exceptions to conform to a particular application need. The BT23P has a steel reinforcing coil, which has been eliminated in the BT23LMNC, and the PVC sheath has been replaced with a sheath of silicone rubber. The threaded brass end tip has been replaced with a nylon tip. It is for use in a high-voltage area, where the fiber must be of a non-conductive construction. This option can be applied to most standard fiber bundles, for similar environments.

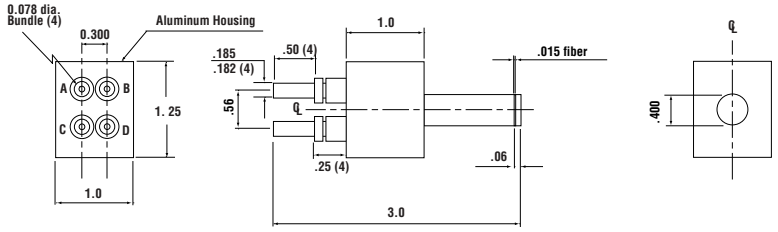
BTA26SM900	72	0.125	SS	

This modification of standard model BTA23S is used for high temperature applications. The maximum temperature limit of this special fiber assembly is 900° F (+480° C). The threaded portion of the fiber is changed from brass (on the standard model) to stainless steel (on this special). Stainless steel tubing has brass insert. The overall length has also been changed from 36 to 72".

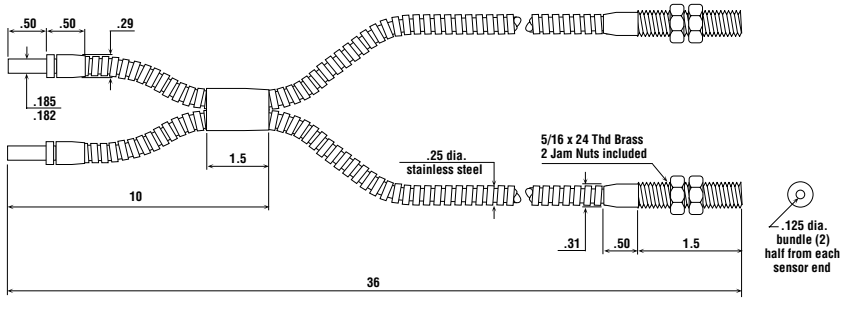
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
DBA23S	36	0.125	SS	

This Double Bifurcated Angle fiber assembly is used for sensing at two locations with one photoelectric sensor. Since the fiber is used in the diffuse mode of sensing, an object is detected if light is returned to either end of the fiber. When the photoelectric sensor is programmed for light operate, a "light-OR" logic function is established. In dark operate, a "dark-AND" logic function results.

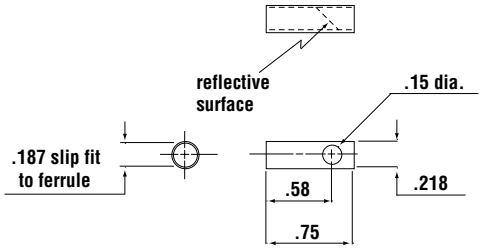
DBRC2.5M300	3	0.156	Aluminum	

This Double Bifurcated Radial Circle fiber assembly is used to inspect the inside of a cylinder wall to detect the absence of a black coating. The M300 suffix indicates that the assembly is designed for use with SM312 Series sensors. The circular bundle is split between two model SM312FV sensors, which (in this instance) provide a visible light source that yields a higher contrast ratio than would an infrared source in color sensing applications.

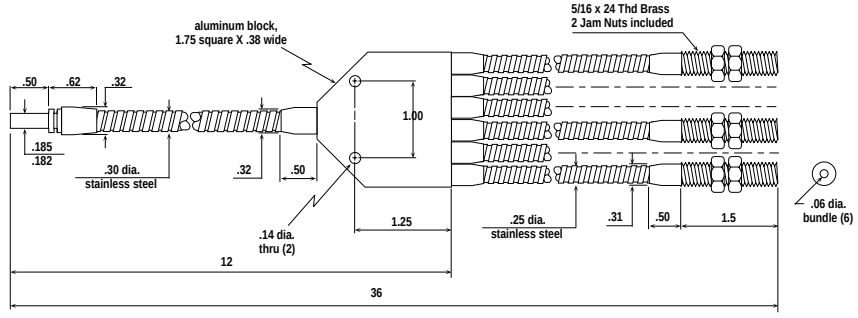
DBT23S	36	0.125	SS	

This Double Bifurcated Threaded fiber optic cable is a popular special assembly. Mounting the sensing ends is easy using the jam nuts. Each sensing end has a 1/8" diameter fiber bundle and performance equal to a single bifurcated assembly, like model BT23S. If the photoelectric sensor is programmed for light operate, a "light-OR" logic function results.

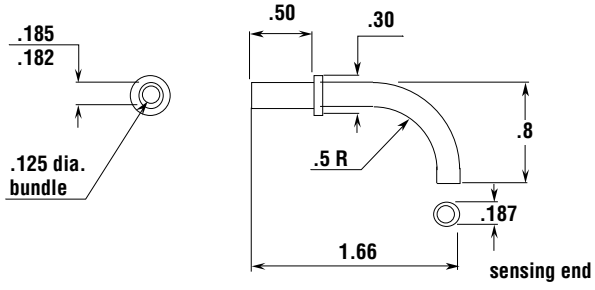
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
FARA	0.75	N/A	SS	

This special fiber attachment is typically used with model IF23S fibers to "bend" the light at a right angle to the length of the fiber ferrule. It is also used with model BF23SM2 when model BA1.53SMTA is too large in diameter to fit in the allocated space. The FARA slips over the ferrule and is held in place with an adhesive, (not supplied). The highly-polished reflective surface of the FARA is recessed in the stainless tube. Therefore, this assembly should not be used in a dirty environment. Excess gain is reduced 50% when using the model FARA.

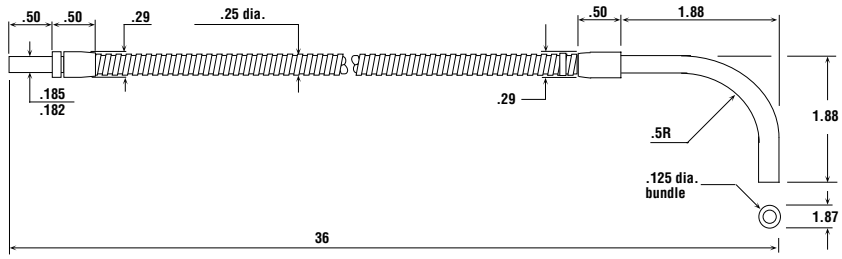
Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
HF2.53SMTT	36	0.062 (6)	SS	

The HF2.53SMTT is used in pairs (in the opposed mode) as a six-input “AND” gate, where all six beams must be broken before the sensor responds. The fiber bundle diameter at the photoelectric sensor end is the largest (0.156" diameter) available. At each of the sensing ends, the bundle diameter is 0.06". When determining the maximum sensing distance, use the excess gain curve for model IT13S. The number of legs on the fiber is not limited to six, and can be of different lengths. The end tip design may also be modified.

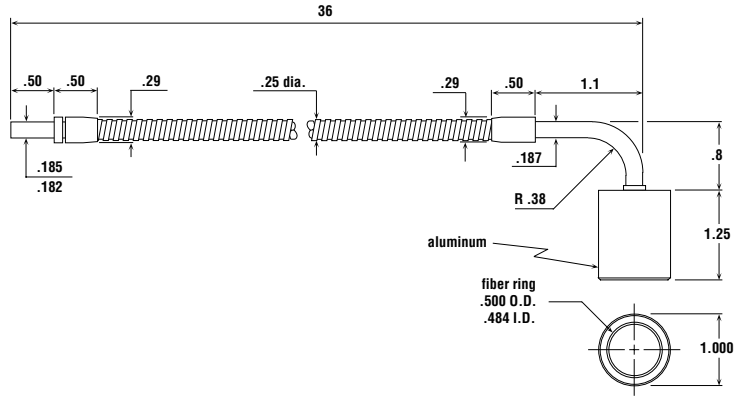
Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
IA2.15MSS	1.66	0.125	SS	

This special fiber assembly is the shortest possible modification to model IA23S. The entire ferrule is stainless steel and is not bendable. It is used in pairs with FOF-400 fiber optic fittings and LR400/PT400 sensors where space limitations prevent the use of right angle sensors. They may also be used with other sensors to provide various degrees of convergent-proximity mode sensing. The bundle diameter and overall length can be modified for your application.

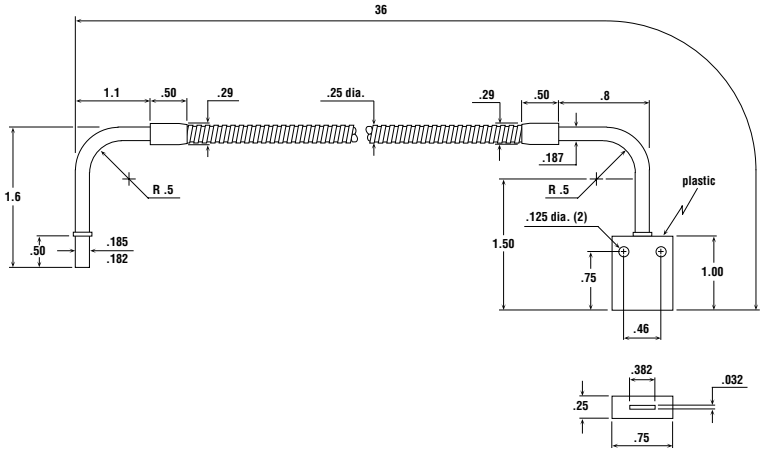
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
IA23SM1.9SQM900	36	0.125	SS	

This fiberoptic assembly is an individual fiber version of model BA23SM1.9SQM900. This assembly is modified for high temperature applications, up to 900° F (480°C). They are used in pairs in the opposed mode, and usually with high powered infrared sensors. A typical application is part presence detection in small kilns and ovens. One IA23SM1.9SQM900 may also be used with model SBAR1GHF to sense hot metal or hot glass.

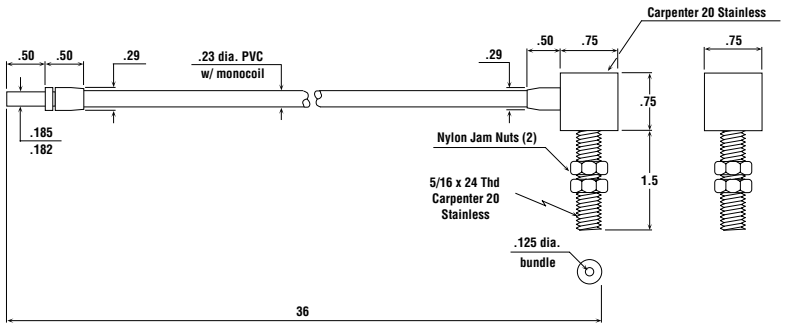
IAC23SM.500	36	0.125	SS	

This Individual Axial Circle fiber was designed for a special application to inspect the entire circumference of small opaque discs for chips and cracks. The disc is stopped momentarily between an opposed pair of fibers at the inspection station. The size of the fiber circle is slightly less than that of the disc. If no light passes to the receiver, the disc is accepted and advanced to the assembly area. This circular style of fiber can be made in a wide variety of diameters and line widths. The only restriction is the maximum bundle size per sensor ferrule (0.156" diameter).

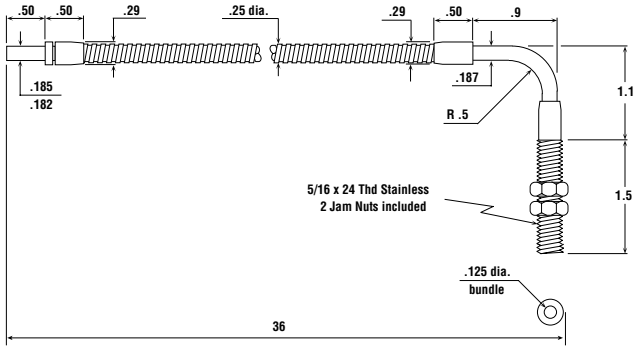
IAR23SMA	36	0.125	SS	

This modification of standard model IR23S has an angle at both ends. Both modifications were due to space limitations. The angle of the stainless steel tubing can be modified to suit a particular application. This type of modification can also be made to larger rectangular fibers like models IR2.53S and BR2.53S.

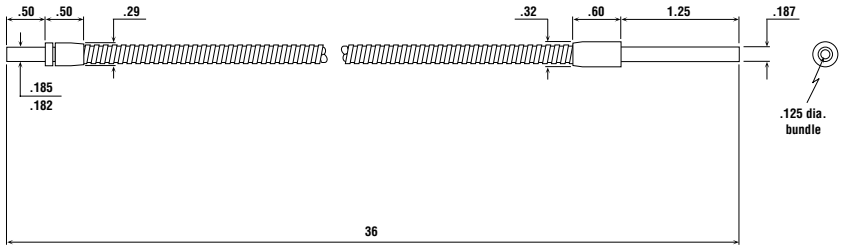
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
IAT23PMC20	36	0.125	PVC	

This special purpose fiber optic assembly is used in the manufacture of automobile batteries. It is subjected to continuous splash of electrolyte (acid). Carpenter 20 grade stainless steel is used for the threaded portion and for the right-angle block to withstand the acid environment. Modifications of the length, sheathing, and sensing end tip material are possible on this model.

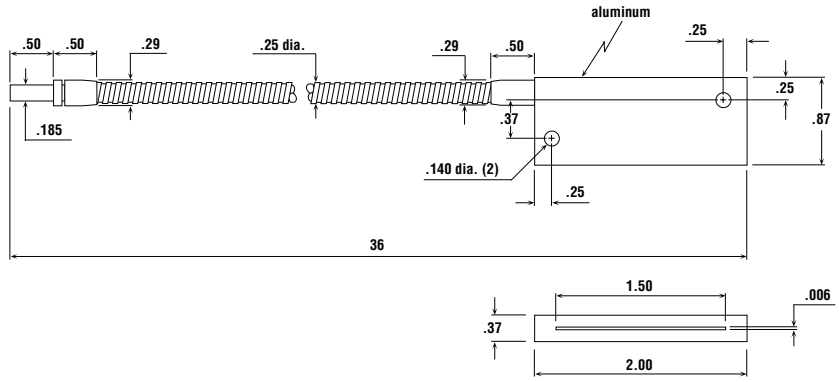
IAT23SM900	36	0.125	SS	

Model IAT23S is modified for high temperature operation to make this special fiber. Optical grade epoxy is eliminated at the sensing end of the fiber so that it can operate at up to 900° F (480° C). This change in manufacturing requires a slight dimensional change in the length of the angled portion of the sensing end. The material for the threaded portion is changed from brass to stainless steel, with brass insert.

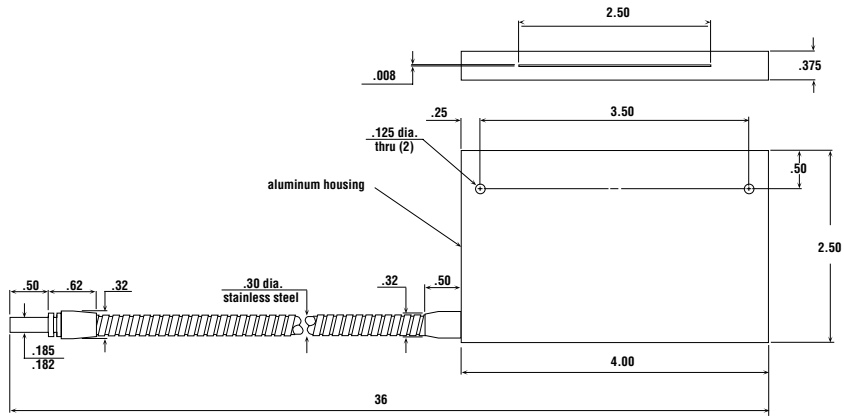
IF23SM900	36	0.125	SS	

This fiber optic assembly is a high temperature modification of standard model IF23S. Suffix "M900" stands for modified for 900° F (480° C). Dimensional differences include crimp collar diameter and ferrule length. These changes are necessary for manufacturing of the end tip without epoxy. Ferrule length can be extended like model BF23SM2.

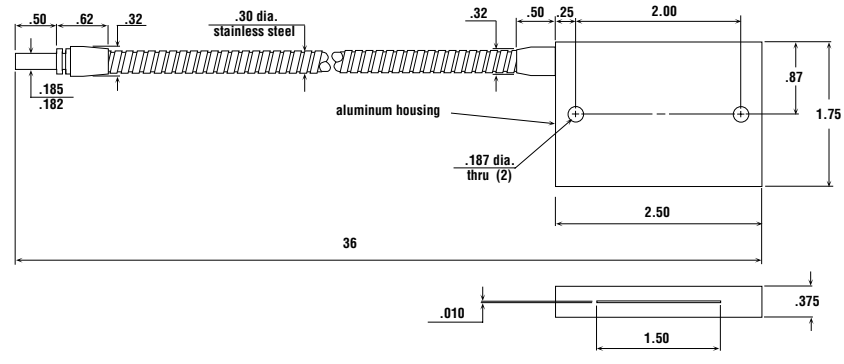
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
IR1.73SMSE.006	36	0.106	SS	

Model IR2.53S was too large to for an application requiring a long, thin rectangular fiber window. A machined housing was needed to fit the space allocated for the sensing end. The rectangular window is modified to only 0.006" wide, the smallest available. The mounting holes also had to be moved to allow the cable to exit from the side of the housing. The 1.5" length of the fiber window cannot be made longer in this housing style, but the window width can increase up to 0.013".

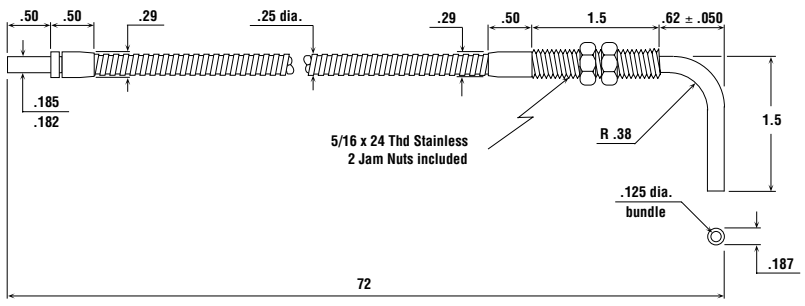
IR2.53SM2.5	36	0.156	SS	

Model IR2.53SM2.5 is used in applications where the required beam size is greater than 1.5" long. This model incorporates a different housing and cable exit than the standard IR2.53S. The 0.156" diameter fiber bundle on the photoelectric sensor end is the largest possible for efficient coupling of the light from the LED source into the fiber optic bundle. A typical application is counting small parts falling through the fiber window using sensor model OSBFAC. Also available is model IR2.53SM3. It has a fiber window 3.00 x .006".

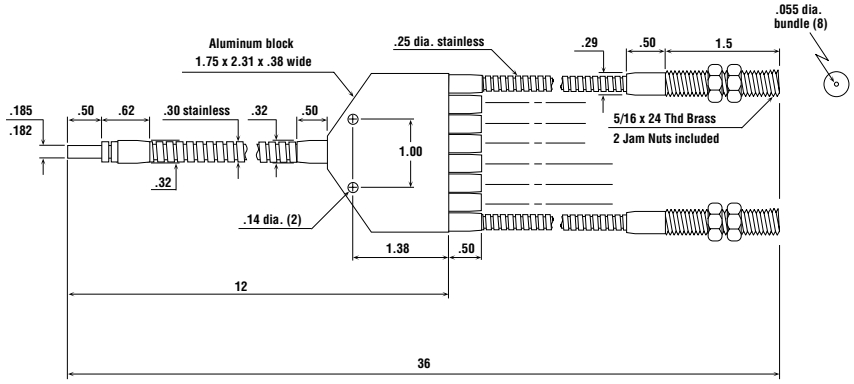
IR2.53SMRAMP	36	0.156	SS	

This customer-designed fiber is a modification of standard model IR2.53S. The cable exit and the mounting hole location are changed. This is one of many modifications possible to the large rectangular fiber optic assemblies.

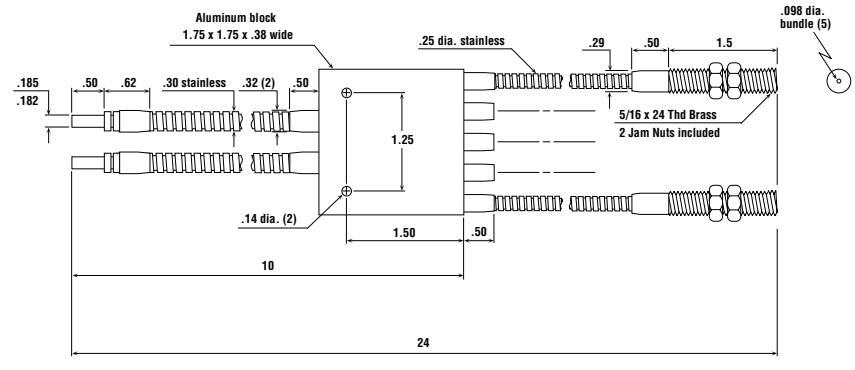
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
ITA26SM900	72	0.125	SS	

This assembly is a high temperature modification of standard fiber ITA23S. The length of the fiber is increased to 6' to allow the photoelectric control to reside outside of the high temperature environment. The end tip is constructed without the use of epoxy, allowing the fiber to operate in 900°F (+480°C) heat. Stainless steel is substituted for brass on the threaded end tip. This cable can be built in any length up to 60'.

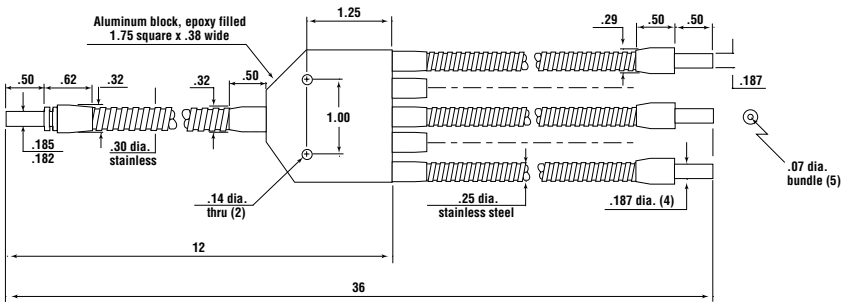
OF2.53SMTT	36	0.055 (8)	SS	

This Octa-Ferruled fiber Modified with Threaded Tips is used in pairs to set up an eight input “AND” gate, where all eight fiber beams must be broken to obtain an output (when the photoelectric sensor is used in the "dark operate" mode). This fiber is similar to model HF2.53SMTT, except it has eight ends instead of six. The maximum fiber bundle diameter (0.156") is used on the photoelectric sensor end, which creates 0.055" diameter bundles at all eight scanning ends.

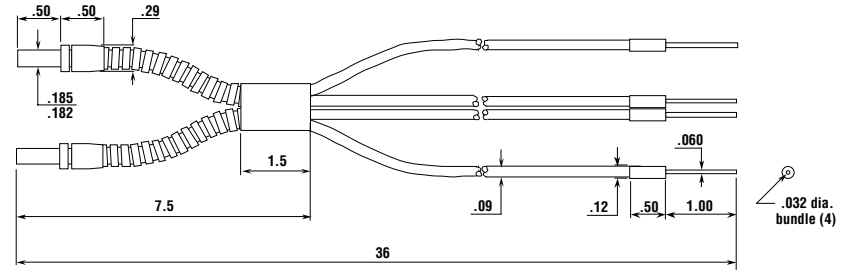
PBF2.52SMTT	24	0.098 (5)	SS	

This model is a Penta-Bifurcated Ferruled assembly that is Modified with Threaded Tip. It is used to set up a five input “OR” gate where if any one of the five sensing ends has light returned to it, an output occurs (when the photoelectric sensor is used in the "light operate" mode). The overall length of this assembly can be modified to suit your application. The ferruled ends which are used at the photoelectric sensor have the maximum allowable bundle size: 0.156" diameter. If more than five sensing ends are desired, the 0.098" diameter fiber bundles will be reduced in diameter.

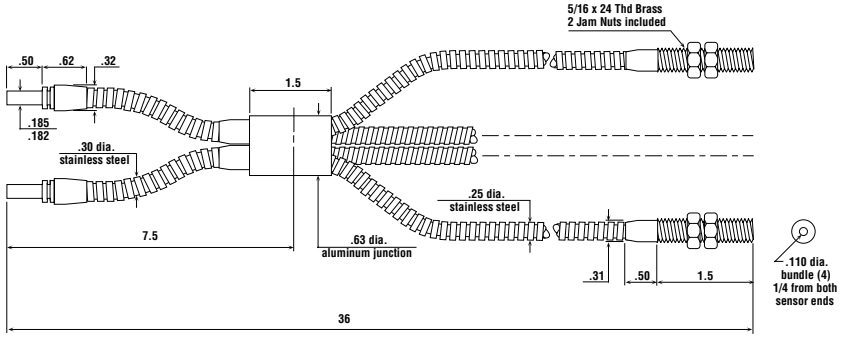
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
PF2.53S	36	0.070 (5)	SS	

This five-ferruled fiber is used in pairs to create 5 opposed beams using one photoelectric sensor. If the sensor is used in the light operate mode, a “light-or” logic function results. If “A” or “B” or “C”, etc. senses light, the output is energized. To determine the sensing range of the fiber, use the excess gain curve for model IT13S, located with the photoelectric sensor used for the application. The fiber optic cable uses the largest possible fiber optic bundle at the sensor end: 0.156" diameter.

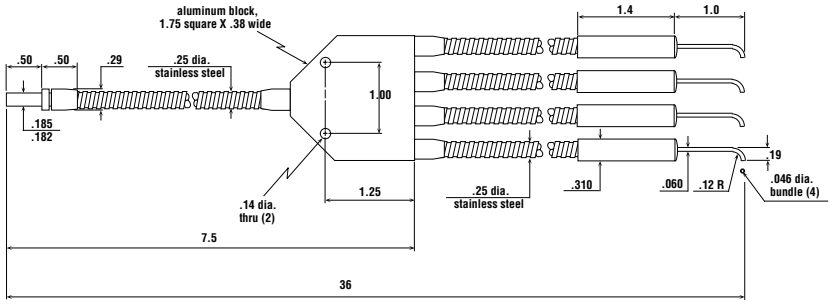
QBM.53P	36	0.032 (4)	SS/PVC	

This Quad-Bifurcated Miniature fiberoptic assembly with PVC sheathing allows a sensor to inspect four positions at one time. It was designed to detect when a hole is not centered in a metal washer. The four sensing ends are positioned 90° apart around the inside diameter of the washer. As the washer falls, guided through the inspection area, an interrogate (“gate”) signal tells the photoelectric sensor when to “look”. If the hole is off-center, one or more of the sensing ends will sense light reflected from the washer. The PVC sheathing on the sensing end legs of this assembly does not have a monocoil reinforcing wire.

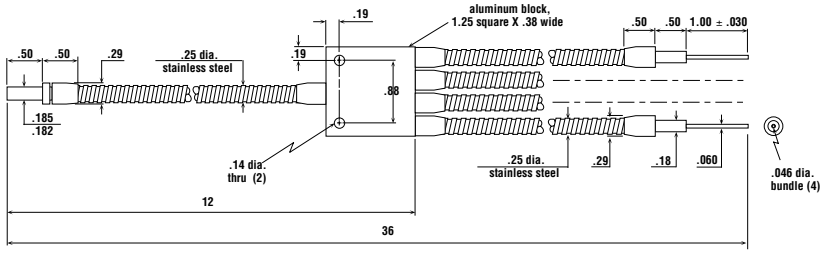
QBT23S	36	0.110 (4)	SS	

This fiber is similar to model DBT23S except it has four sensing ends. It is used in the diffuse sensing mode to set up a “light-OR” logic scheme. Both of the ferruled sensor ends contain the maximum bundle (0.156" diameter), and each sensing end has a fiber bundle diameter of 0.110". The fiber strands are fully randomized from each ferrule, so that each sensing end contains 1/4 of the bundle from each ferrule. An aluminum tube is used instead of a flat block at the bifurcation junction.

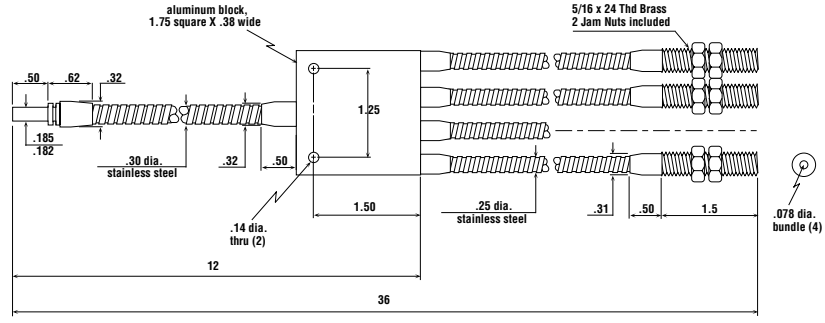
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
QF1.53SMAM	36	0.046	SS	

This fiber is an example of using multiple opposed miniature beams with one photoelectric sensor. Each sensing end has the same end tip as model IAM.752S for easy mounting via the "bullet" and the FMB-1 mounting bracket. This model is used in pairs, typically with a high powered infrared sensor. A pair of opposed 0.046" diameter fibers have 1/4 of the excess gain of a pair of 0.06" diameter fibers (e.g. IT13S); this corresponds to a range reduction of 50%.

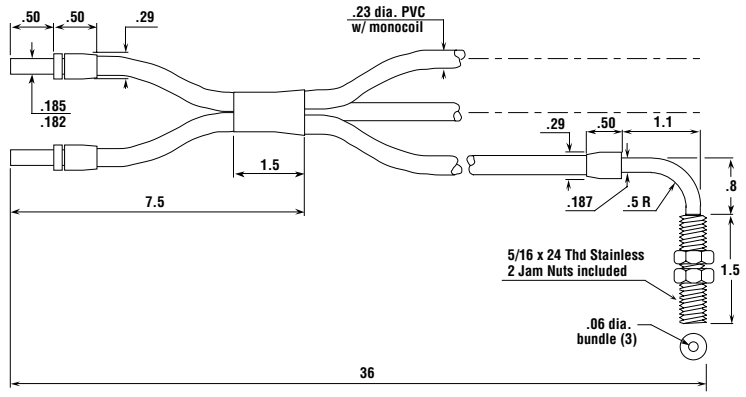
QF1.53SMM	36	0.046 (4)	SS	

This assembly is similar to model QF1.53SMAM, shown on the previous page. The sensing end tips on this model have a one" long straight probe, without a right angle. The miniature end tips are not bendable. A typical application for this style of fiber is to determine if all parts are in place. When using a sensor in the dark-operate mode, an output will occur only when all four beams are blocked ("dark-AND" logic).

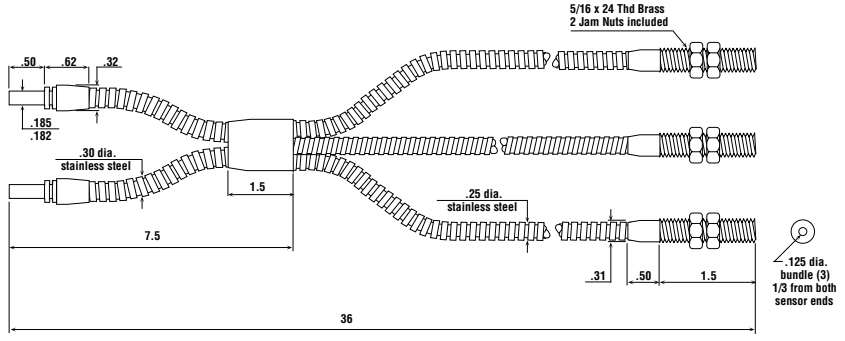
QF2.53SMTT	36	0.078 (4)	SS	

The QF2.53SMTT is a four-channel version of model HF2.53SMTT. It has slightly larger fiber bundles on the sensing ends, allowing more excess gain. It was designed for use on a rotary index table to insure that all four parts were in place before the table could advance. Using two fibers and one sensor set for dark operate, a programmable controller "looks" for a signal from the sensor when the parts should be in place. If the controller does not receive a signal, the controller stops the machine and sounds an alarm.

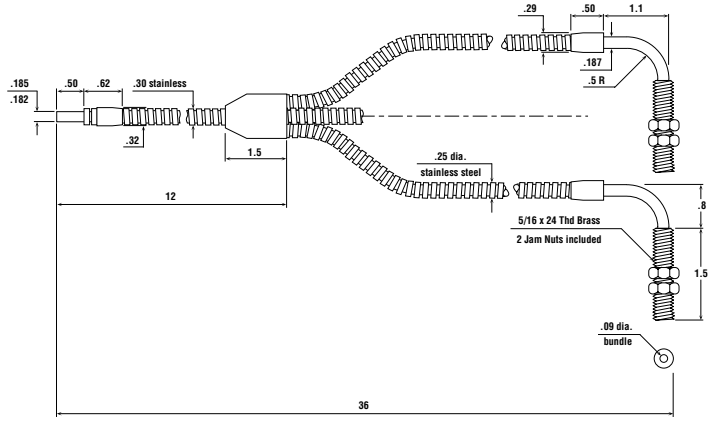
Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
TBAT13PMSS	36	0.060 (3)	SS	

This fiber is a Triple-Bifurcated Angle Threaded assembly with PVC sheathing and Modified Stainless Steel threads. It is designed for a machine requiring a three input "dark-AND" sensor. The machine punches out parts from a large sheet of plastic. The sensing ends are located just below the parts, in the die. At the end of a punch stroke, an interrogate ("gate") signal occurs to check the output from the photoelectric sensor. If any one of the three sensing ends sense a part (light operate) during the gate signal, the machine is shut down to avoid damage to the die.

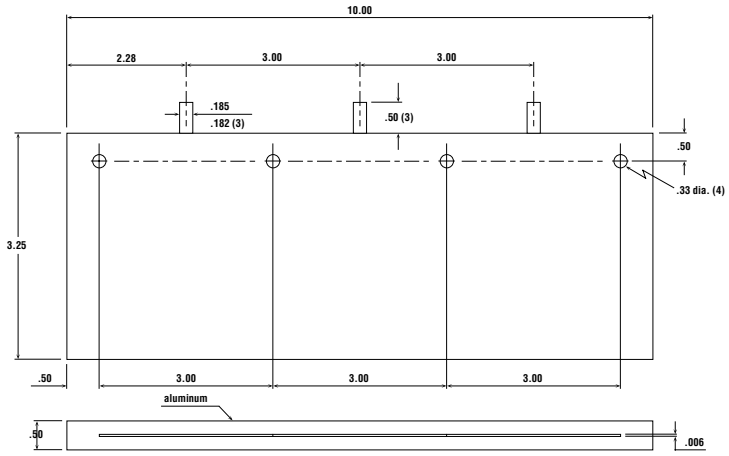
TBT23S	36	0.125 (3)	SS	

This Trifurcated-Bifurcated Threaded assembly is a three-legged version of the popular standard model BT23S. When determining the range of this fiber, use the excess gain curve for fiber model BT23S across from the photoelectric sensor you have chosen.

TF2.53SMAT	36	0.090 (3)	SS	

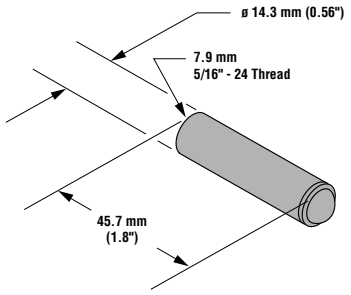
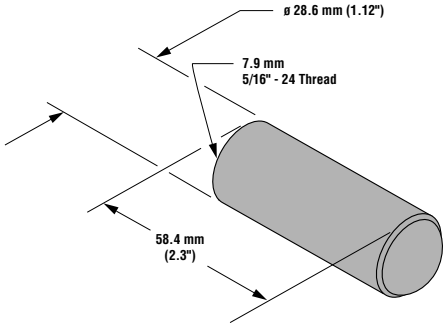
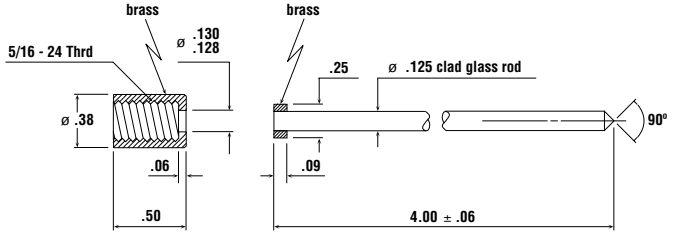
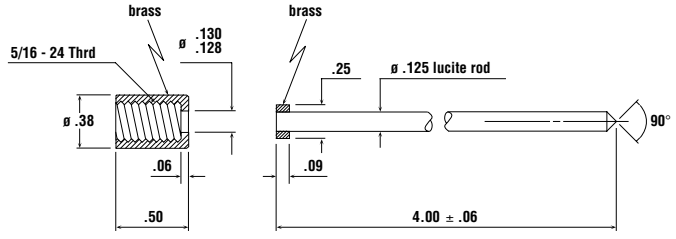
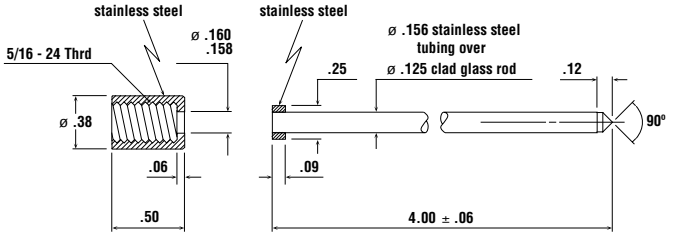
This assembly was designed as a Trifurcated-Ferruled version of model IAT23S. However, the bundle size on the sensing end tips is 0.09" in diameter. Opposed sensing range can be increased with the use of L9 or L16F lenses. The lenses should be used on all three ends of the two opposed fibers to achieve the maximum sensing range.

Custom Glass Fibers

Model	Length (in)	Bundle Diameter (in)	Sheath/ Construc-tion	Dimensions (in)
TIR2.5M9X.006	10	(3) 0.006 x 3.00	SS and Aluminum	

This Triple-Individual Rectangular assembly is used in the opposed mode (2 required) to cover an area nine inches wide. It may be used with high- powered sensor pair SM51EB6 and SM51RB6 equipped with FOF-500 fittings, for detecting small holes in opaque webs.

Glass Fiber Optic Accessories

Model	Description	
L10	• Glass lens with anodized red aluminum housing • Used with bifurcated threaded fibers primarily for register mark sensing • The L10 lens focuses the light to a point as small as 1/32" when used with a 0.06 in diameter fiber bundle • Should not be used with high-powered infrared sensors • Maximum temperature: 600°F (315°C) • Focal distance is 5 mm (±1 mm) (0.20" ±0.04")	
L16F **L16FAL** **L16FSS**	Delrin® housing; 220°F (105°C) max temp Anodized aluminum housing; 600°F (315°C) max temp Stainless steel housing; 900°F (480°C) max temp Used for long range opposed or retroreflective sensing	
TGR	• Tubular glass rod • Used for liquid level sensing • When used with bifurcated threaded fiber, the light is reflected back to the sensor when the probe is not in the liquid • Used where chemical and acid resistance is required	
TLR	• Tubular lucite rod • Used for liquid level sensing • It is less fragile than glass version (TGR) and is used in general purpose applications • Probe length modifications of both models are available by special order	
TGRMSSMCG-4	• Tubular glass rod, modified stainless steel, covered glass • Liquid level probe same as TGR, except inside stainless steel tubing and more durable than TGR • Epoxy used to bond the tubing to the rod is not acid or solvent resistant	

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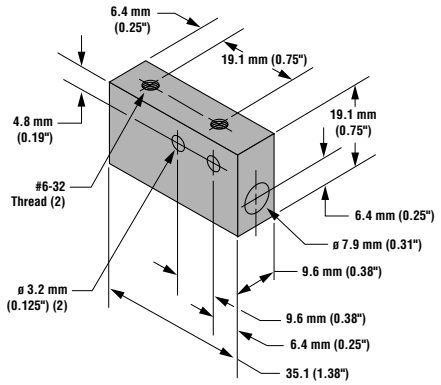
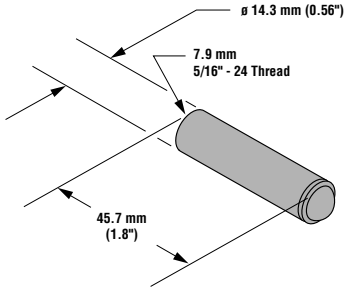
Glass Fiber Optics Accessories

Model	Description	
FMB-1	• Fiber mounting bracket • Can be used with many probe style fibers • The bracket eliminates the need to mount the fiber using its smaller and more fragile bendable probe • The fiber is held in place by two setscrews (wrench included)	
L9	• Glass lens with anodized blue aluminum housing • Used to extend the range of opposed mode fiber optics systems • Used also with a bifurcated fiber (BT13S) for short-range retroreflective sensing • The smaller fiber bundle (0.06" diameter) is desirable for retroreflective use • Maximum temperature: 600°F (315°C)	

Mounting Brackets

Model	Description	Dimensions
SMBF 	• Right angle bracket for glass fiber optics with $^{5}/_{16}$" - 24 threaded tip • 18-gauge stainless steel