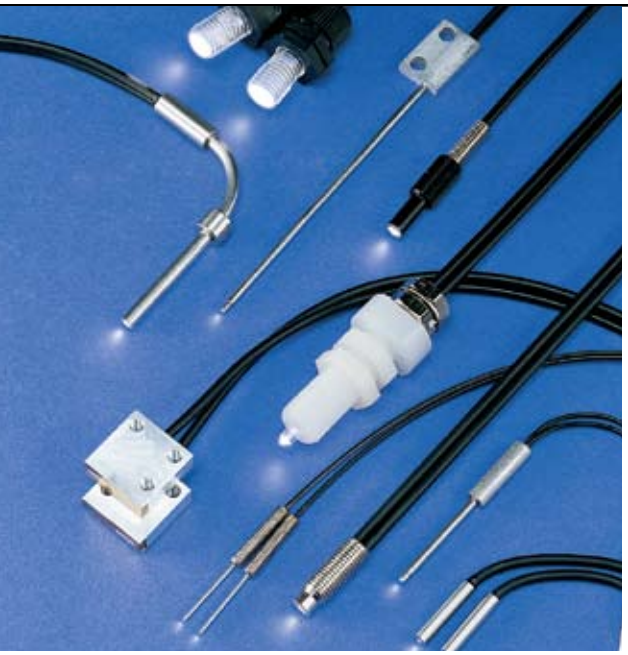


Plastic Fiber Optics

- 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 optional DURA-BEND™ fibers for improved flexibility in difficult-to-access locations, without the decreased performance to which excessively bent standard plastic fibers optics are prone
- Available with core diameters of 0.25, 0.50, 0.75, 1.0 and 1.5 mm

Plastic Fiber Optic Model Key

P	B	P	4	6	U	C	X

PLASTIC FIBER FAMILY designator

Same for all plastic fibers

ASSEMBLY STYLE designator

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

SENSING END designator

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

FIBER CORE DIAMETER designator

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

FIBER LENGTH designator

3 = 1 m (1000 mm)
6 = 2 m (2000 mm)
100 = 30 m (30480 mm)

CONTROL END designator

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

MODIFICATIONS designator†

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

* 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.

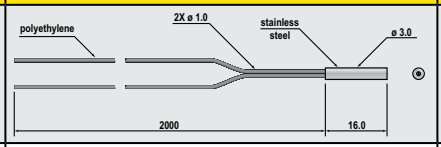
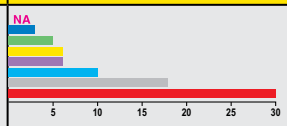
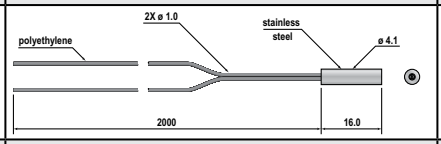
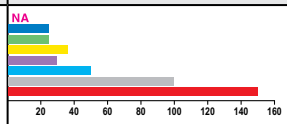
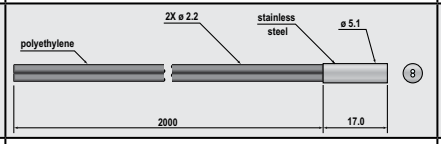
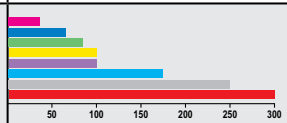
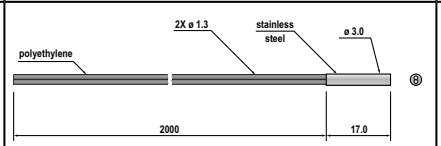
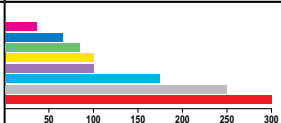
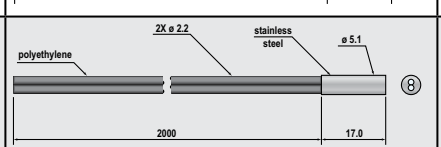
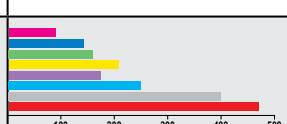
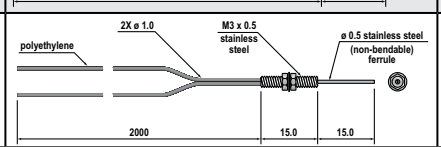
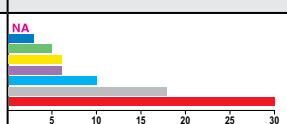
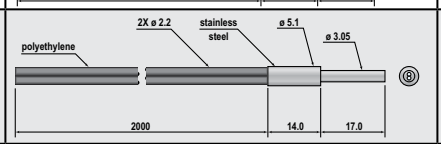
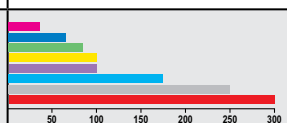
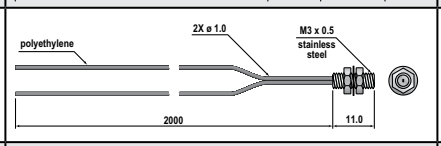
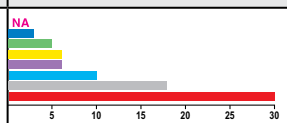
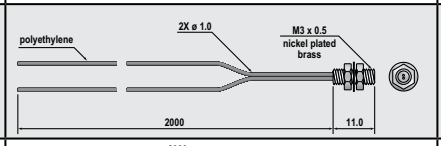
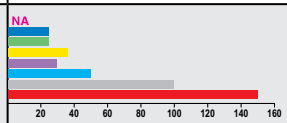
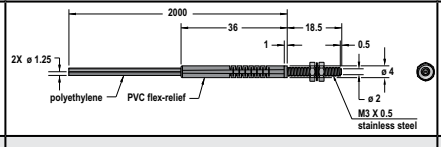
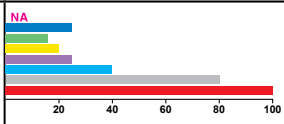
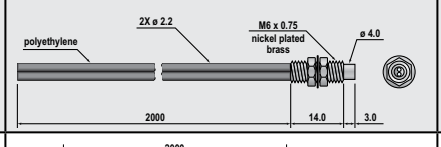
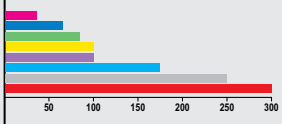
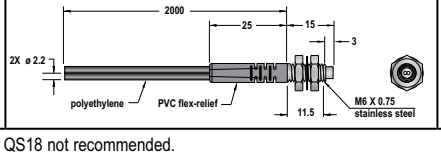
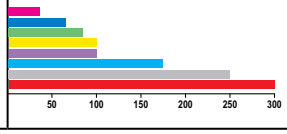
† Not all modifications can be applied to all fiber assemblies. Please consult factory for verification of modifications.

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

⚠ 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 (page 200). Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.

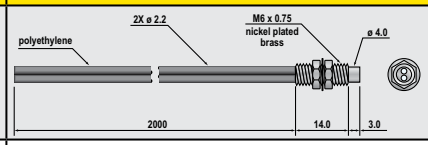
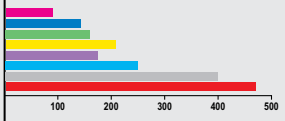
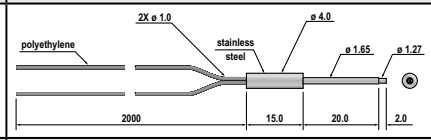
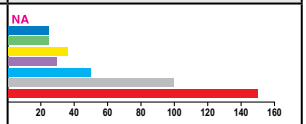
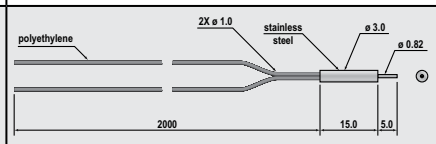
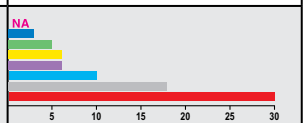
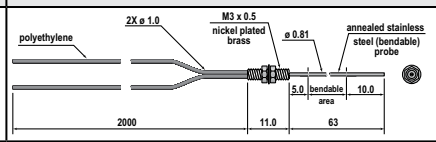
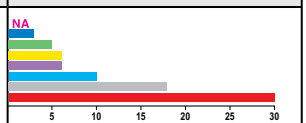
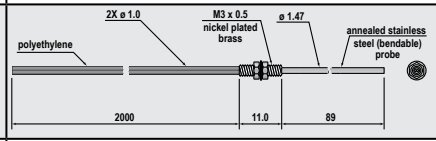
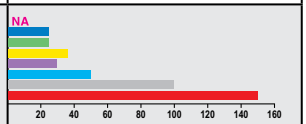
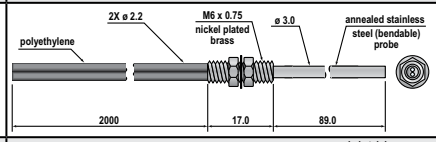
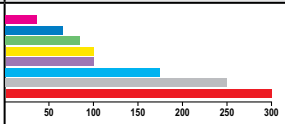
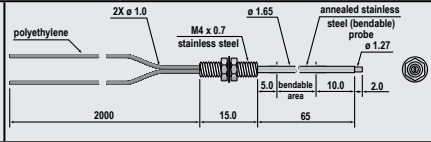
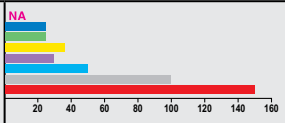
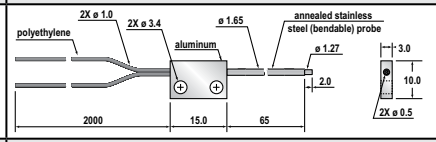
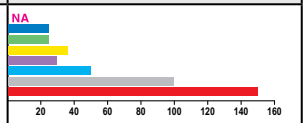
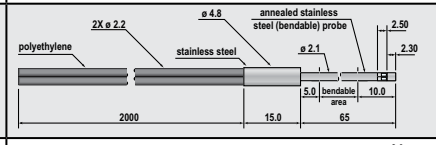
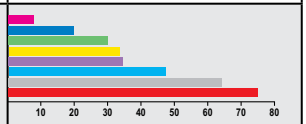
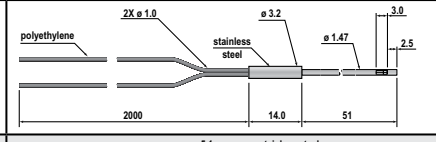
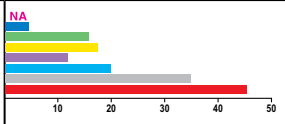
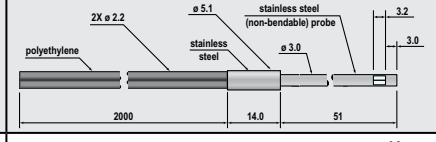
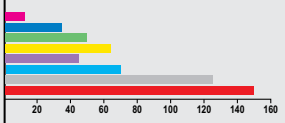
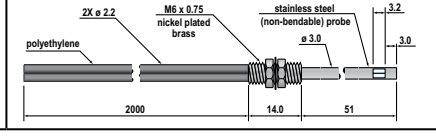
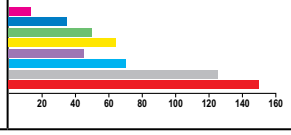
Model Number		Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Diffuse / Standard	PBF16U		0.25	8	• Smooth ferrule	✓	
	PBF26U		0.5	12	• Smooth ferrule	✓	
	PBF46U		1.0	25	• Smooth ferrule	✓	
	PBF46UM3MJ1.3		1.0	25	• Smooth ferrule; thin jacket (ø 1.3)	✓	
	PBF66U		1.5	38	• Smooth ferrule; long range	✓	
	PBFM16U		0.25	8	• Non-bendable miniature tip	✓	
	PBFM46U		1.0	25	• Smooth ferrule	✓	
	PBT16U		0.25	8	• Thread	✓	
	PBT26U		0.5	12	• Thread	✓	
	PBT26UMFR		0.5	12	• Thread • Overmolded flex relief	✓	
	PBT46U		1.0	25	• Thread	✓	
	PBT46UMFR		1.0	25	• Thread • Overmolded flex relief	✓	

More on next page

NA: WORLD-BEAM QS18 not recommended.

* Fibers can be free cut using fiber cutter (see page 259).

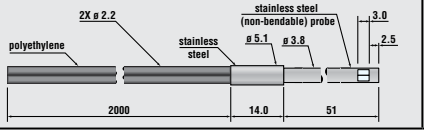
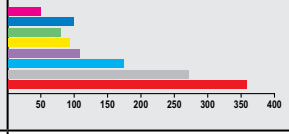
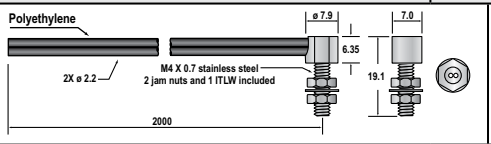
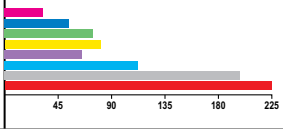
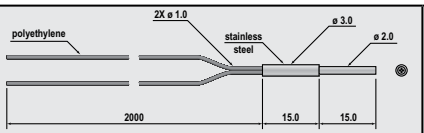
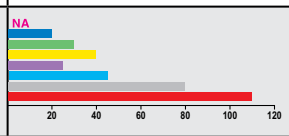
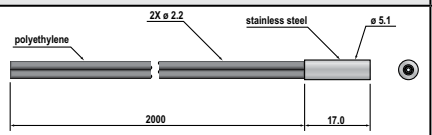
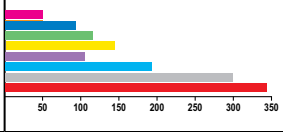
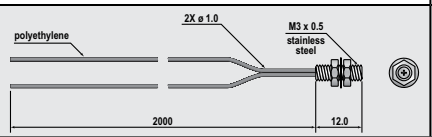
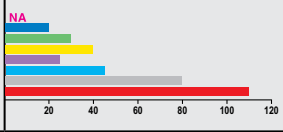
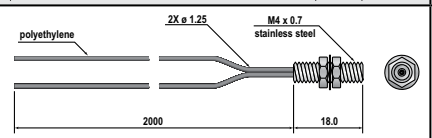
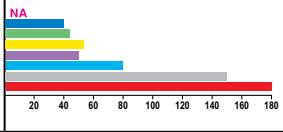
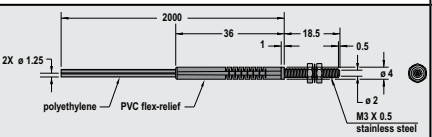
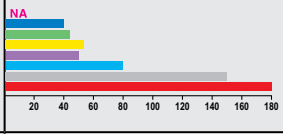
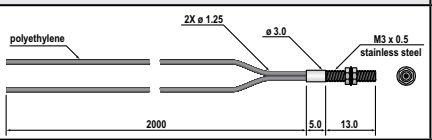
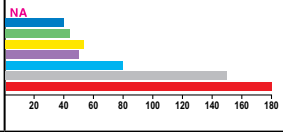
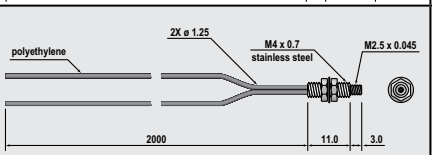
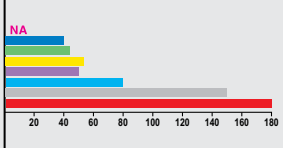
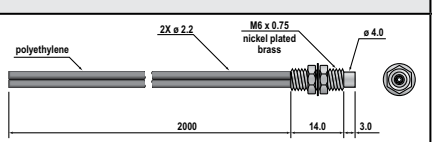
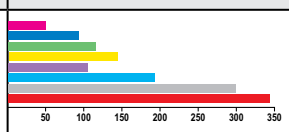
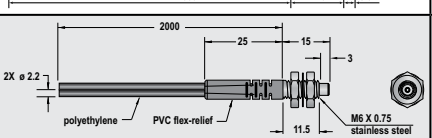
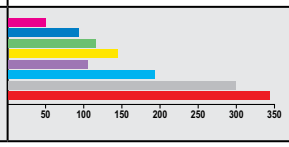
SENSORS

Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Diffuse	Standard	PBT66U		1.5	38	• Thread; long range	✓	
	Probe	PBEFP26U		0.5	12	• Smooth ferrule; non-bendable tip	✓	
		PBFMP16UMP2		0.25	8	• Smooth ferrule; non-bendable tip	✓	
		PBP16U		0.25	8	• Thread; bendable tip	✓	
		PBP26U		0.5	12	• Thread; bendable tip	✓	
		PBP46U		1.0	25	• Thread; bendable tip	✓	
		PBPF26U		0.5	12	• Thread; bendable tip	✓	
		PBPF26UMB		0.5	12	• Flat mounting block; bendable tip	✓	
	Side-View	PBPMSB36U		0.75	20	• Smooth ferrule; bendable tip	✓	
		PBPS26U		0.5	12	• Smooth ferrule; bendable tip	✓	
		PBPS46U		1.0	25	• Smooth ferrule; bendable tip	✓	
		PBPS46UMT		1.0	25	• Thread; non-bendable tip	✓	

More on next page

NA: WORLD-BEAM QS18 not recommended.

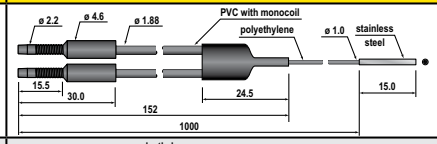
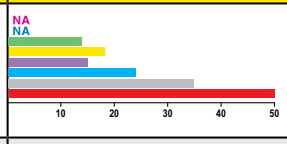
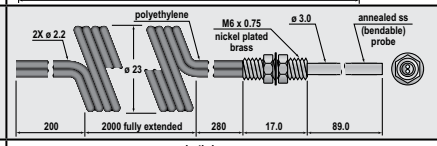
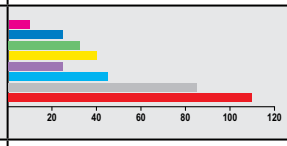
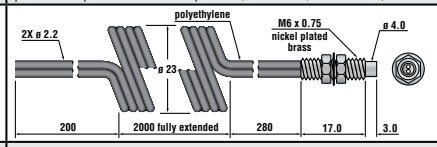
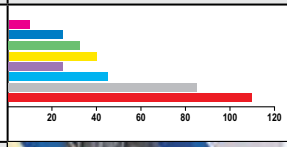
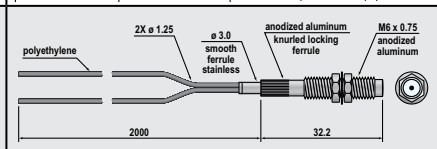
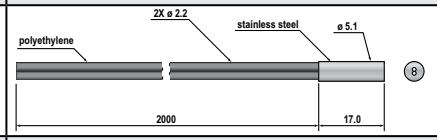
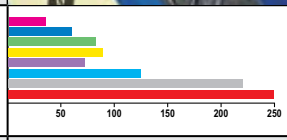
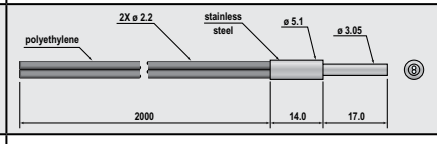
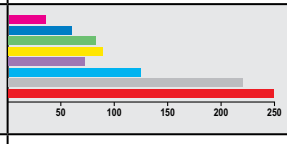
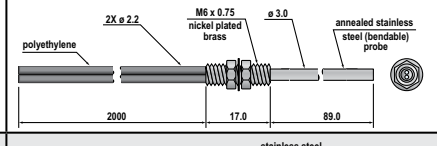
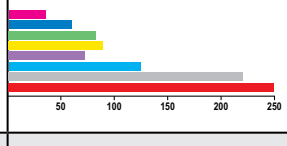
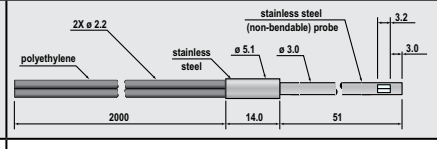
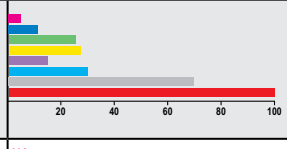
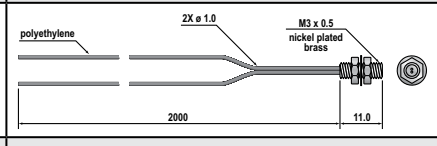
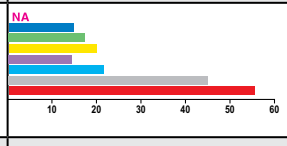
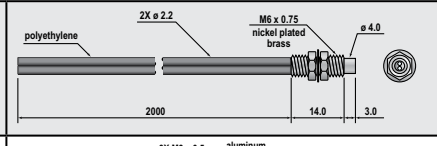
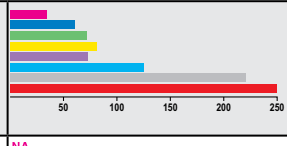
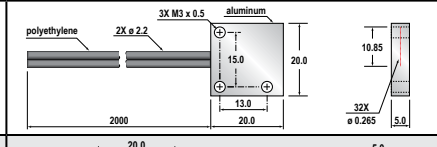
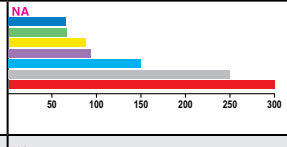
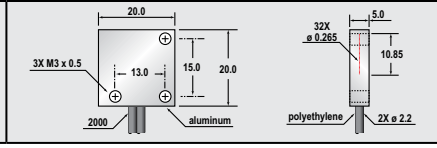
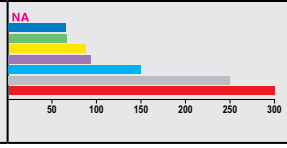
* Fibers can be free cut using fiber cutter (see page 259).

Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Diffuse	Side-View	PBPS66U		1.5	38	• Smooth ferrule; non-bendable tip	✓	
	Right-Angle	PBAT46UHFMTA		1.0	2	• Right Angle, threaded, stainless steel	✓	
	Coaxial	PBCF21X46U		0.5 4X 0.25	12	• Miniature probe tip	✓	
		PBCF46U		1.0 16X 0.265	25	• Smooth ferrule	✓	
		PBCT21X46U		0.5 4X 0.25	12	• Miniature thread	✓	
		PBCT26U		0.5 9X 0.25	12	• Thread	✓	
		PBCT26UMFR		0.5 10X 0.25	12	• Thread • Overmolded flex relief	✓	
		PBCT26UM3		0.5 9X 0.25	12	• Miniature thread	✓	
		PBCT26UM4M2.5		0.5 9X 0.25	12	• Thread	✓	
		PBCT46U		1.0 16X 0.265	25	• Thread	✓	
		PBCT46UMFR		1.0 16X 0.265	25	• Thread • Overmolded flex relief	✓	

More on next page

NA: WORLD-BEAM QS18 not recommended. Indicates lens available for model. See page 251 for details.

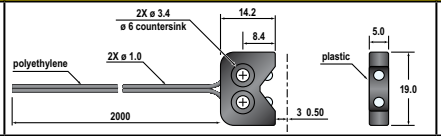
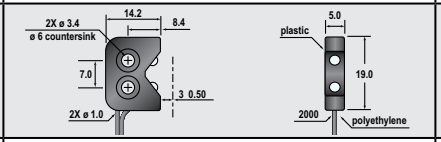
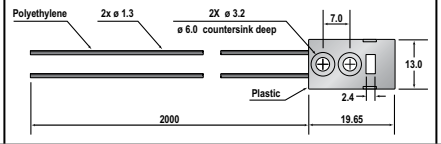
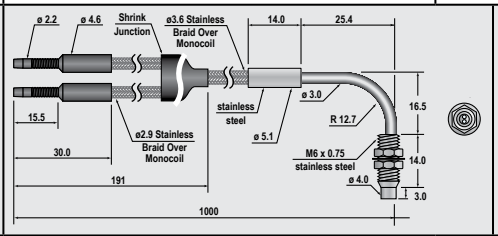
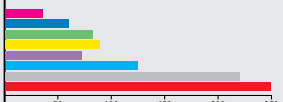
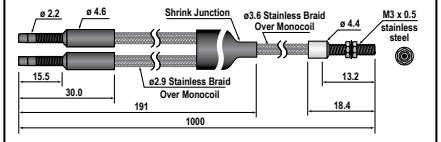
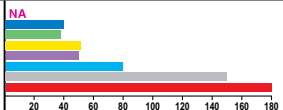
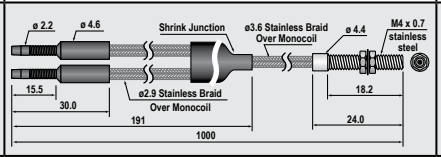
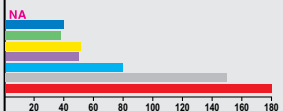
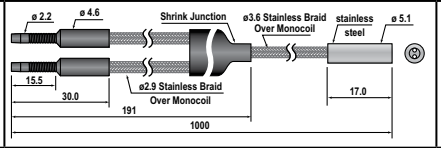
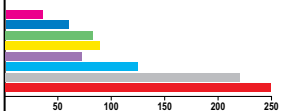
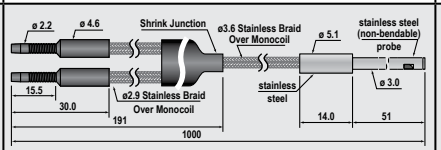
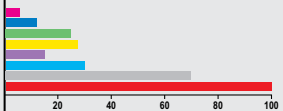
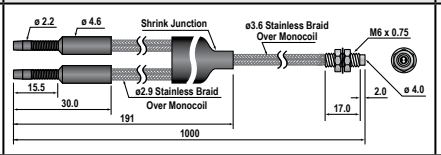
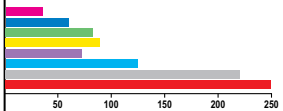
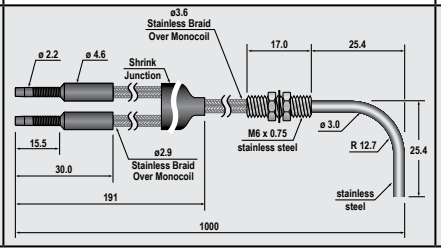
* Fibers can be free cut using fiber cutter (see page 259).

Model Number		Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Diffuse — High-Flex	PBFM1X43T5		4X 0.25	8	• Best for repetitive flexing (1,000s of cycles)		
	PBP46UC		1.0	25	• For applications involving reciprocating motion	✓	
	PBT46UC		1.0	25	• For applications involving reciprocating motion	✓	
Convergent Beam Spot	PLI-A10		0.5 9X 0.25	12	• Anodized AL tip; ø 0.5-3.2 mm beam spot • Glass lens	✓	
DURA-BEND™	PBF46UHF		1.0	1	• Smooth ferrule	✓	
	PBFM46UHF		1.0	1	• Smooth ferrule	✓	
	PBP46UHF		1.0	1	• Thread; bendable tip	✓	
	PBPS46UHF		1.0	1	• Smooth ferrule; non-bendable tip	✓	
	PBT26UHF		0.5	1	• Thread	✓	
	PBT46UHF		1.0	1	• Thread	✓	
Area Sensing (Array)	PBR1X326U		32X 0.265	25	• Rectangular tip	✓	
	PBRS1X326U		32X 0.265	25	• Rectangular tip; side sensing	✓	

More on next page

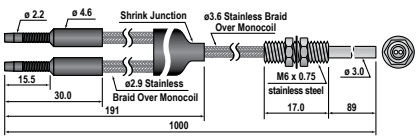
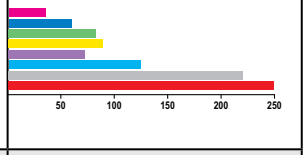
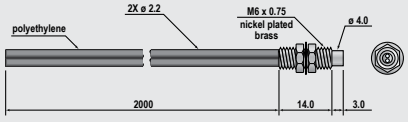
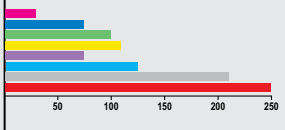
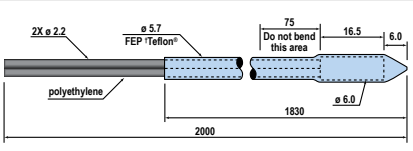
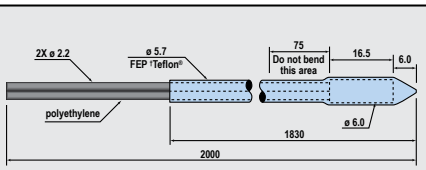
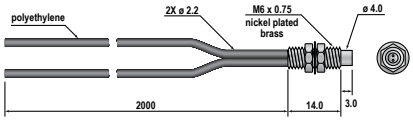
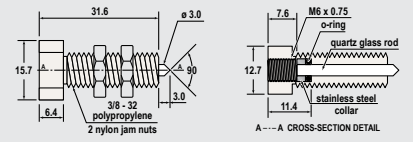
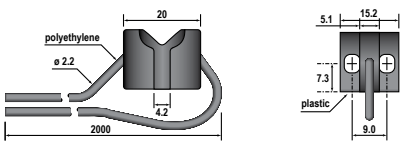
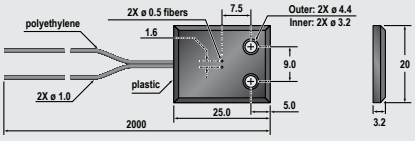
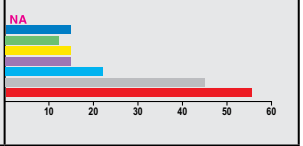
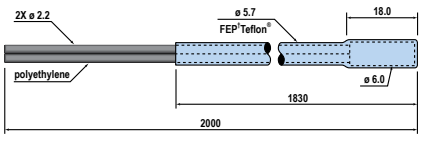
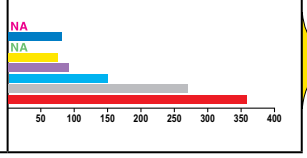
NA: WORLD-BEAM QS18 not recommended. **NA:** MINI-BEAM *Expert* not recommended.

* Fibers can be free cut using fiber cutter (see page 259).

Model Number		Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Diffuse / Mechanical Convergent	P22-C1		0.5	12	• Straight exit with lenses; 3 mm range; DURA-BEND fiber	✓	
	P12-C1		0.5	12	• Side exit with lenses; 3 mm range; DURA-BEND fiber	✓	
	P32-C6		1.0	25	• Flat mount; 6 mm range; lensed convergent optics	✓	
Diffuse / SteelSkin™	PBAT43TMB5		1.0	12	• 90° angle/thread		
	PBCT23TMB5		0.5 9X 0.25	12	• Miniature thread		
	PBCT23TMB5M4		0.5 9X 0.25	12	• Thread		
	PBF43TMB5		1.0	12	• Smooth ferrule		
	PBPS43TMB5		1.0	12	• Smooth ferrule; non-bendable tip		
	PBT43TMB5		1.0	12	• Thread		
	PBTA43TMB5		1.0	12	• Thread/90° angle		

More on next page

NA: WORLD-BEAM QS18 not recommended. Indicates lens available for model. See page 251 for details. * Fibers can be free cut using fiber cutter (see page 259).

Model Number		Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Diffuse / Liquid Level	SteelSkin™ PBTP43TMB5		1.0	12	• Thread; bendable tip		
Diffuse / Liquid Level	High-Temp PBT46UHT1		1.0	25	• Thread; withstands 105° C	✓	
Diffuse / Liquid Level	PBE46UTMLLP		1.0	25	• Fluoropolymer encapsulated • Sensor switches when tip of fiber is immersed in liquid	✓	
Diffuse / Liquid Level	PBE46UTMLLPHT1		1.0	25	• Fluoropolymer encapsulated; withstands 105° C • Sensor switches when tip of fiber is immersed in liquid	✓	
Diffuse / Liquid Level	PBT26UM6M.1		0.5	12	• Quartz probe; polypropylene housing • Sensor switches when tip of quartz is immersed in liquid	✓	
Diffuse / Liquid Level	TGR3/8MPFMQ		0.5	12			
Diffuse / Liquid Level	PDI46U-LLD		1.0	1	• Clear tube mount; DURA-BEND fiber • Sensor switches when liquid meniscus reaches optical axis	✓	
Diffuse / Flat Pack	PBRS26U		0.5	12	• 3.2 mm thickness; DURA-BEND fiber	✓	
Diffuse / Chemical Resistant	PBE46UTMNL		1.0	25	• Fluoropolymer encapsulated tip	✓	

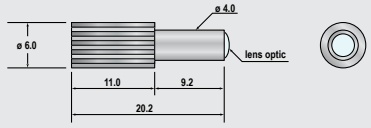
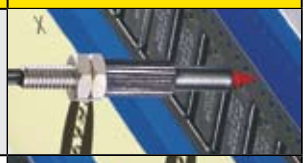
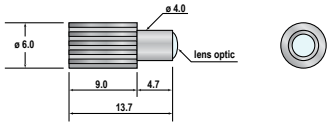
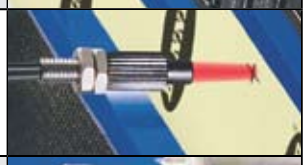
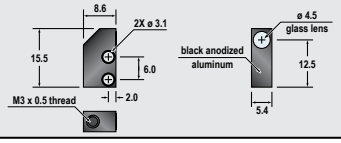
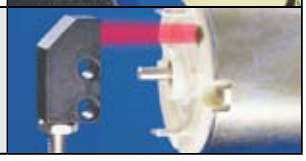
More on next page

NA: WORLD-BEAM QS18 not recommended.

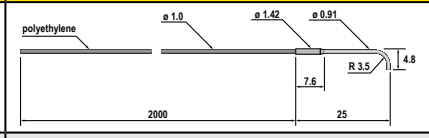
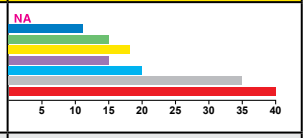
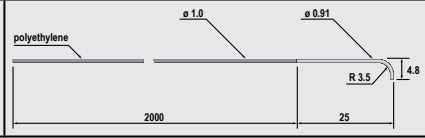
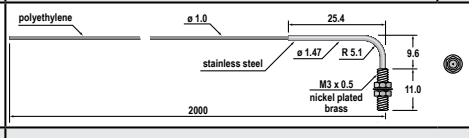
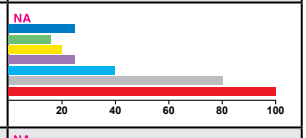
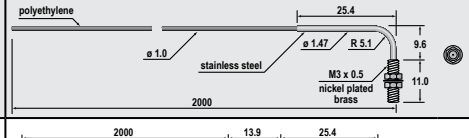
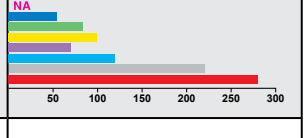
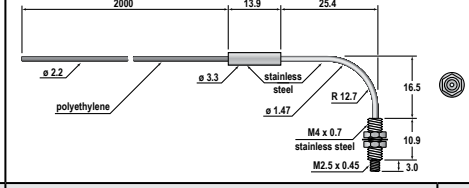
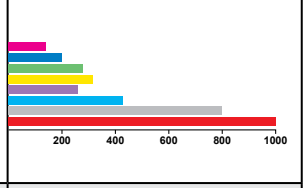
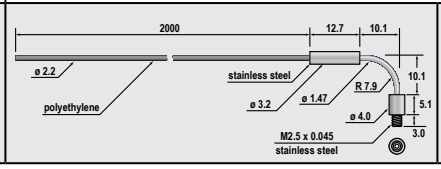
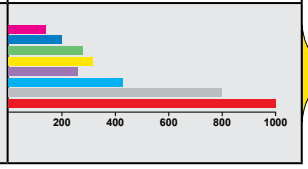
NA: D10–Discrete not recommended.

* Fibers can be free cut using fiber cutter (see page 259).

Diffuse — Convergent Spot Lens

Model Number	Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
L4C6		ref. model PBCT26U	ref. model PBCT26U	• Anodized AL housing; ø 0.25 mm beam spot @ 6 mm • Fixed focus		
L4C20		ref. model PBCT26U	ref. model PBCT26U	• Anodized AL housing; ø 4 mm beam spot @ 20 mm • Fixed focus		
LZ3C8		ref. model PBT26UM3	ref. model PBCT26UM3	• Anodized AL housing; ø 0.5 - 3.2 mm adj. beam spot • Adjustable focus		

Opposed — Standard

Model Number	Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
PIA16U		0.25	8	• 90° angle	✓	
PIA26U		0.5	12	• 90° angle	✓	
PIAT16U		0.25	8	• 90° angle/thread	✓	
PIAT26U		0.5	12	• 90° angle/thread	✓	
PIAT46U		1.0	25	• 90° angle/thread	✓	
PIAT46UM.4X.4MT		10.	25	• 90° angle/thread	✓	

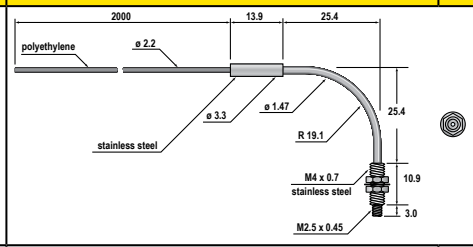
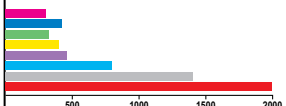
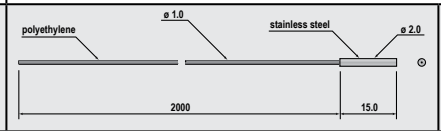
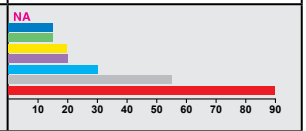
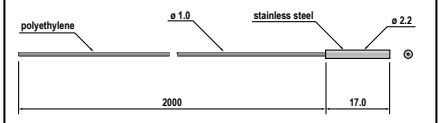
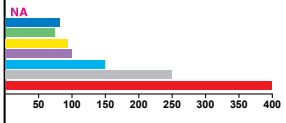
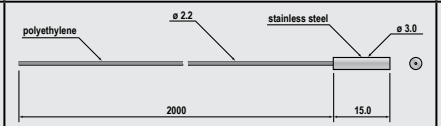
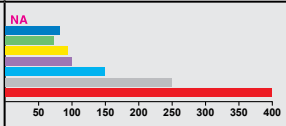
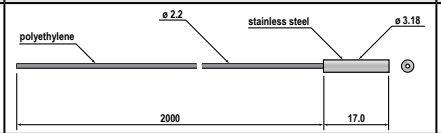
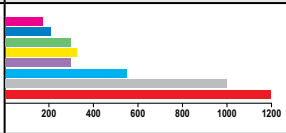
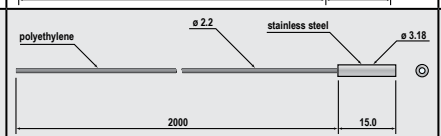
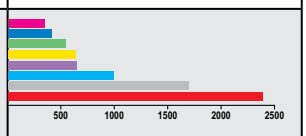
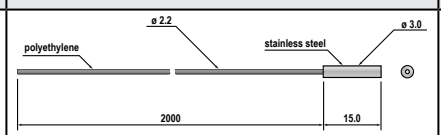
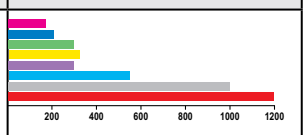
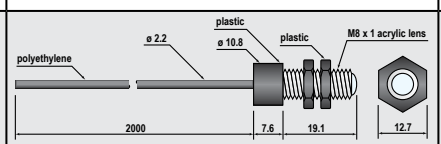
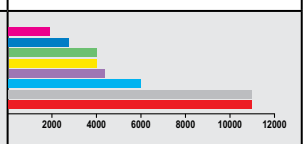
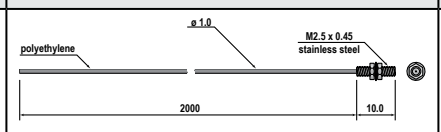
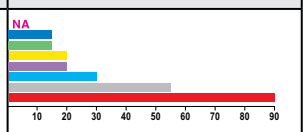
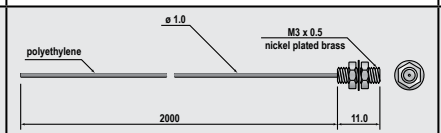
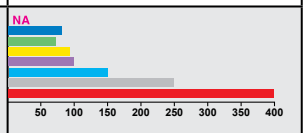
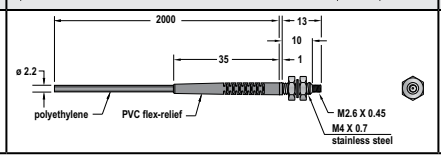
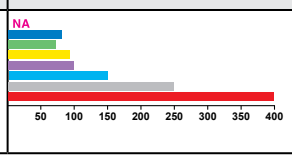
More on next page

NA: WORLD-BEAM QS18 not recommended.

Indicates lens available for model. See page 257 for details.

* Fibers can be free cut using fiber cutter (see page 259).

SENSORS

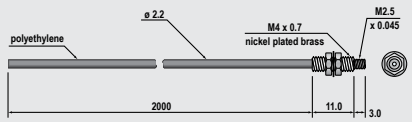
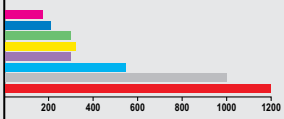
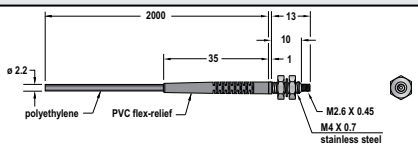
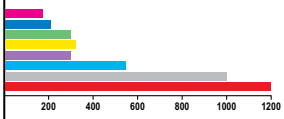
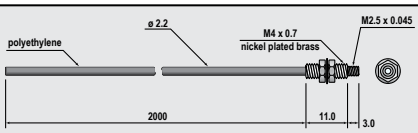
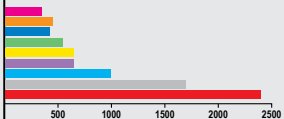
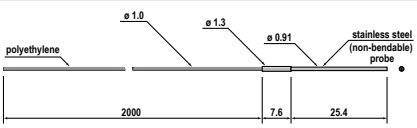
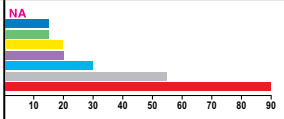
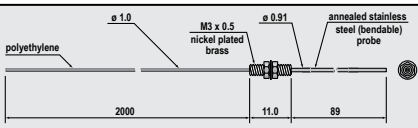
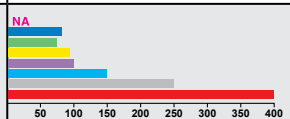
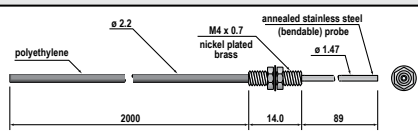
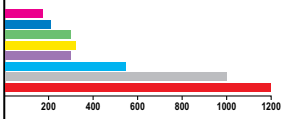
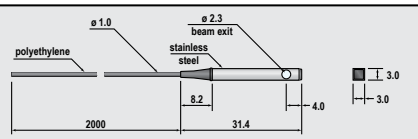
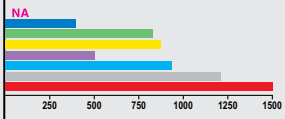
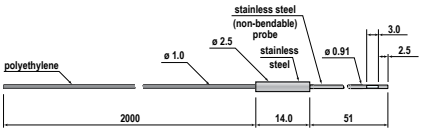
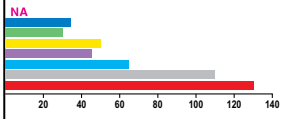
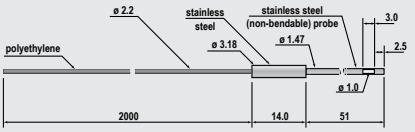
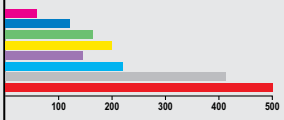
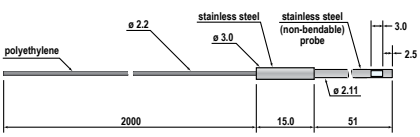
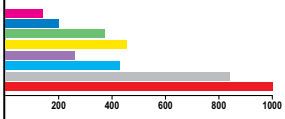
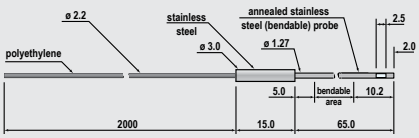
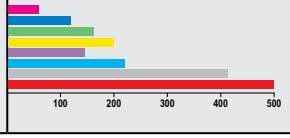
Model Number	Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Opposed / Standard / PIAT66U		1.5	38	• 90° angle/thread; long range	✓	
PIF16U		0.25	8	• Smooth ferrule	✓	
PIF26U		0.5	12	• Smooth ferrule	✓	
PIF26UMLS		0.5	12	• Smooth ferrule; thick jacket (ø 2.2 mm)	✓	
PIF46U		1.0	25	• Smooth ferrule	✓	
PIF66U		1.5	38	• Smooth ferrule; long range	✓	
PIFM46U		1.0	25	• Smooth ferrule; miniature tip	✓	
PIL46U		1.0	25	• Plastic lens; ultra-long range • Lens available separately, see page 257.	✓	
PIT16U		0.25	8	• Thread	✓	
PIT26U		0.5	12	• Thread	✓	
PIT26UMFR		0.5	12	• Thread • Overmolded flex relief	✓	

More on next page

NA: WORLD-BEAM QS18 not recommended.

Indicates lens available for model. See page 257 for details.

* Fibers can be free cut using fiber cutter (see page 259).

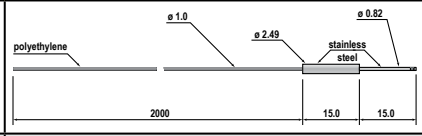
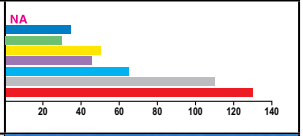
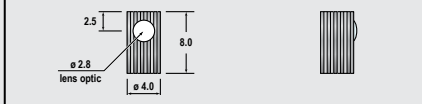
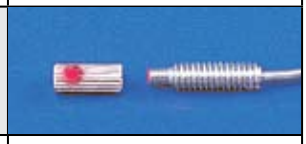
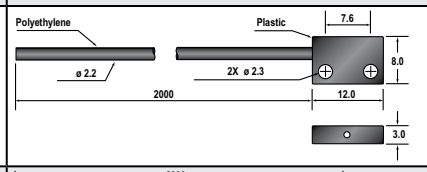
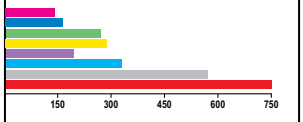
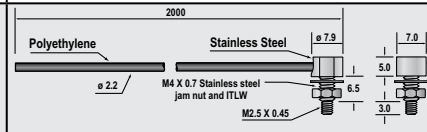
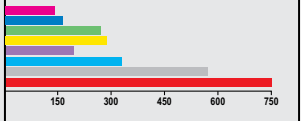
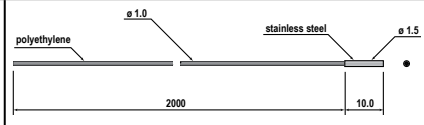
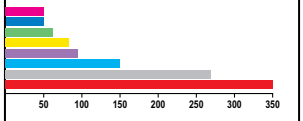
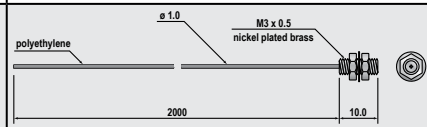
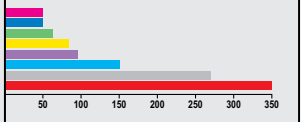
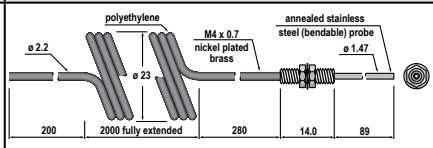
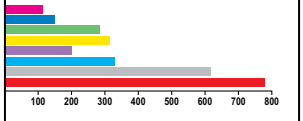
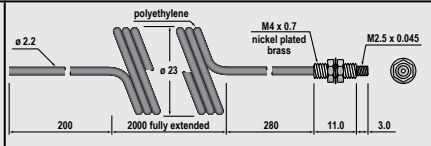
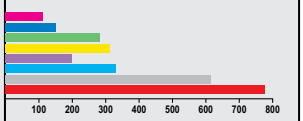
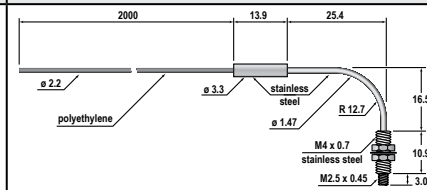
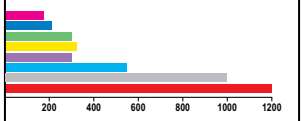
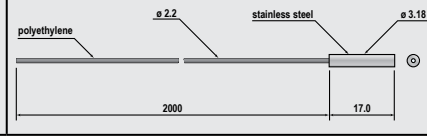
Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Opposed	Standard	PIT46U		1.0	25	• Thread	✓	
		PIT46UMFR		1.0	25	• Thread • Overmolded flex relief	✓	
		PIT66U		1.5	38	• Thread; long range	✓	
	Probe	PIP16U		0.25	8	• Smooth ferrule; non-bendable tip	✓	
		PIP26U		0.5	12	• Thread; bendable tip	✓	
		PIP46U		1.0	25	• Thread; bendable tip	✓	
	Side-View	PLIS-1		0.5	12	• Low beam divergence angle of 2° • Ideal for wafer mapping	✓	
		PIPS26U		0.5	12	• Smooth ferrule; non-bendable tip	✓	
		PIPS46U		1.0	25	• Smooth ferrule; non-bendable tip	✓	
		PIPS66U		1.5	38	• Smooth ferrule; non-bendable tip	✓	
		PIPSB46U		1.0	25	• Smooth ferrule; bendable tip	✓	

More on next page

NA: WORLD-BEAM QS18 not recommended.

* Fibers can be free cut using fiber cutter (see page 259).

SENSORS

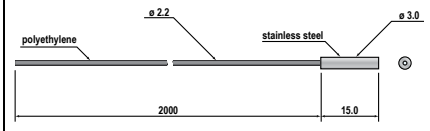
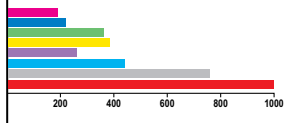
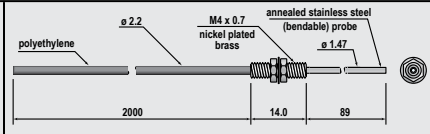
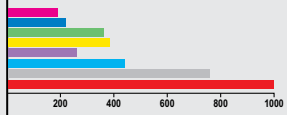
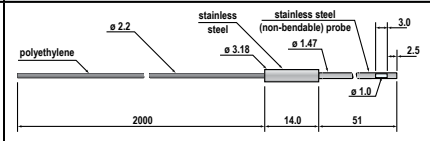
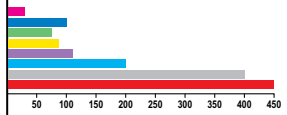
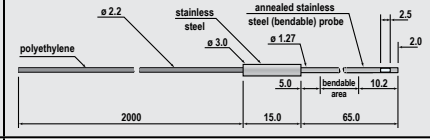
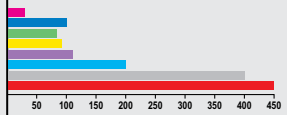
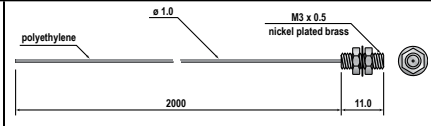
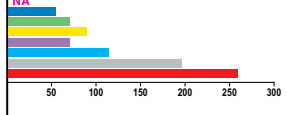
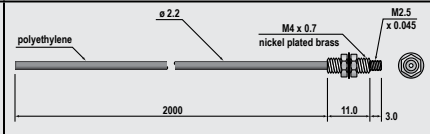
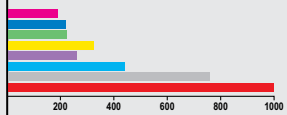
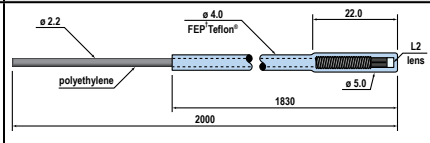
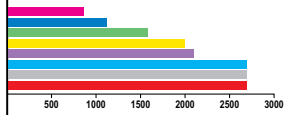
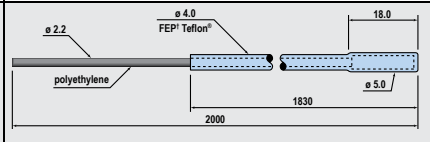
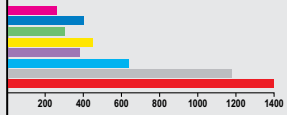
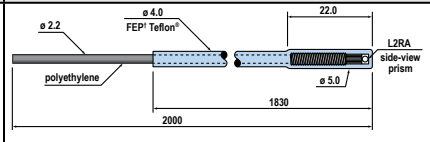
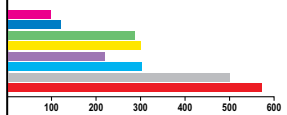
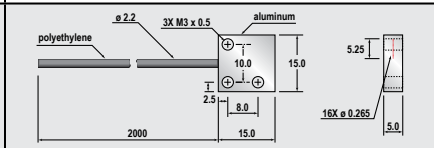
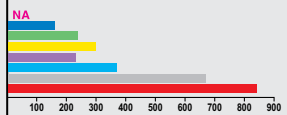
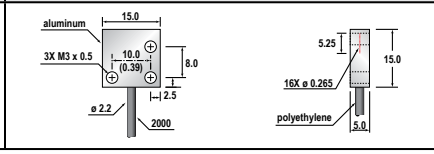
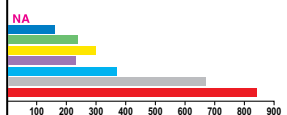
Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Opposed	Side-View	PIPSM26U		0.5	12	• Miniature smooth ferrule; non-bendable tip		
		L2RA		ref. model PIT46U	ref. model PIT46U	• Compact glass prism • M2.5 thread	✓	
	Right-Angle	PIA46UHFMB8X12		1.0	2	• Right angle; side exit; Delrin	✓	
		PIAT46UHFMTA		1.0	2	• Right angle; threaded, stainless steel	✓	
	High-Flex	PIFM1X46U		4X 0.25	8	• Best for repetitive flexing (1,000s of cycles)	✓	
		PIT1X46U		4X 0.25	8	• Best for repetitive flexing (1,000s of cycles)	✓	
		PIP46UC		1.0	25	• For applications involving reciprocating motion	✓	
		PIT46UC		1.0	25	• For applications involving reciprocating motion	✓	
	DURA-BEND™	PIAT46UHF		1.0	1	• 90° angle/thread	✓	
		PIF46UHF		1.0	1	• Smooth ferrule	✓	

More on next page

NA: WORLD-BEAM QS18 not recommended.

Indicates lens available for model. See page 257 for details.

* Fibers can be free cut using fiber cutter (see page 259).

	Model Number	Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Opposed / DURA-BEND™	PIFM46UHF		1.0	1	• Smooth ferrule; miniature tip	✓	
	PIP46UHF		1.0	1	• Thread; bendable tip	✓	
	PIPS46UHF		1.0	1	• Smooth ferrule; non-bendable tip	✓	
	PIPSB46UHF		1.0	1	• Smooth ferrule; bendable tip	✓	
	PIT26UHF		0.5	1	• Thread	✓	
	PIT46UHF		1.0	1	• Thread	✓	
Chemical Resistant	PIE46UT		1.0	25	• Fluoropolymer encapsulated; lens	✓	
	PIE66UTMNL		1.5	38	• Fluoropolymer encapsulated; lens	✓	
	PIES46UT		1.0	25	• Fluoropolymer encapsulated; side-view prism	✓	
Area Sensing (Array)	PIR1X166U		16X 0.265	25	• Ultra-compact head; straight exit; 5.25 mm width	✓	
	PIRS1X166U		16X 0.265	25	• Ultra-compact head; side exit; 5.25 mm width	✓	

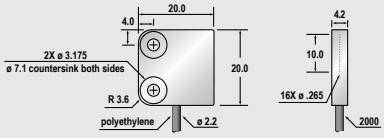
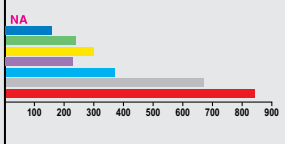
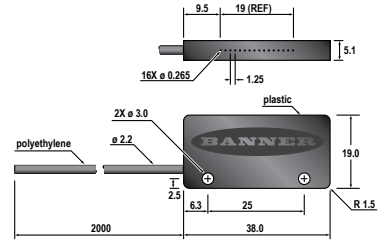
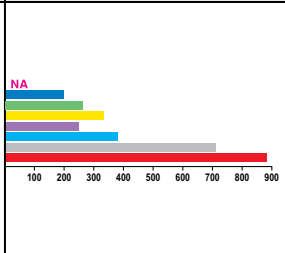
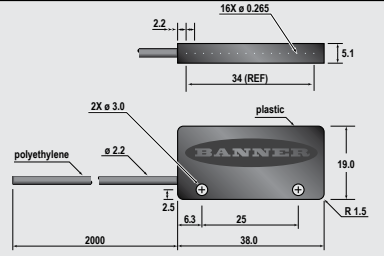
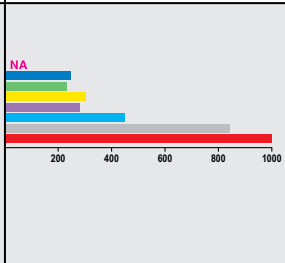
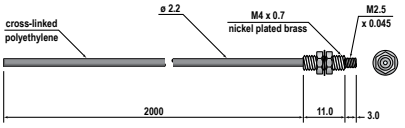
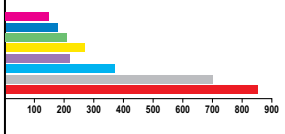
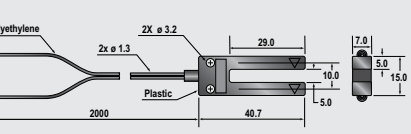
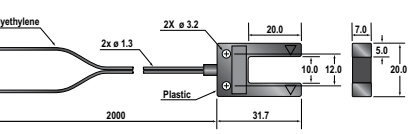
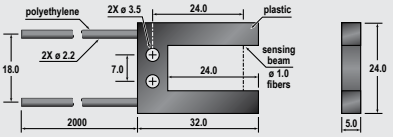
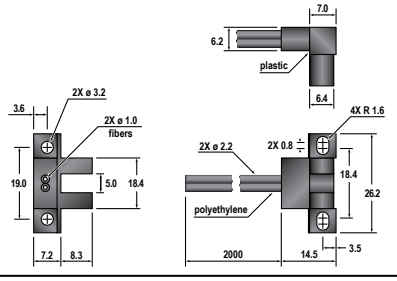
More on next page

NA: WORLD-BEAM QS18 not recommended.

Indicates lens available for model. See page 257 for details.

* Fibers can be free cut using fiber cutter (see page 259).

SENSORS

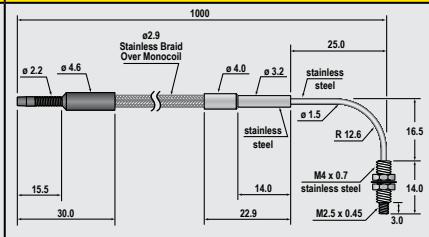
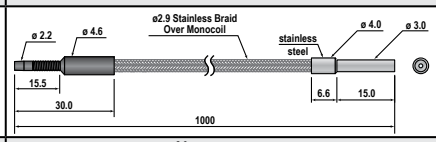
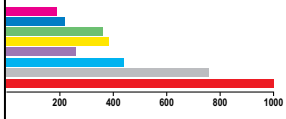
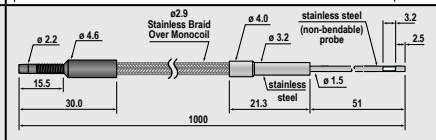
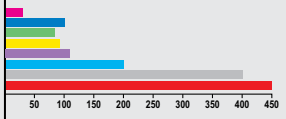
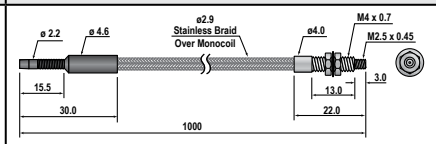
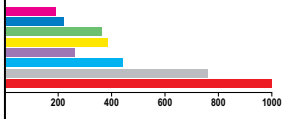
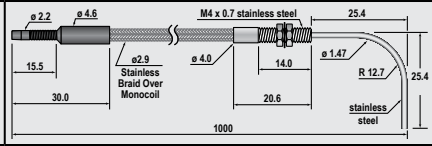
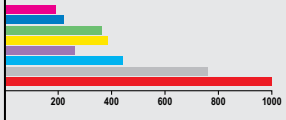
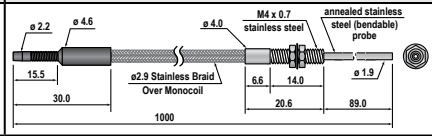
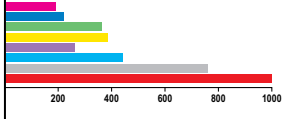
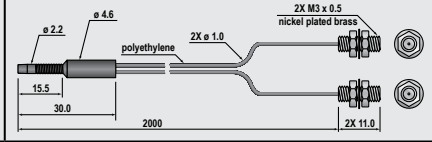
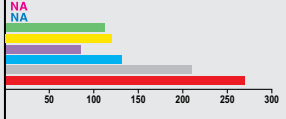
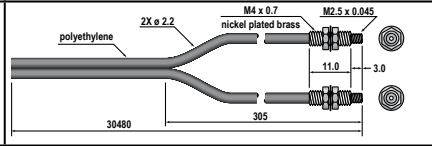
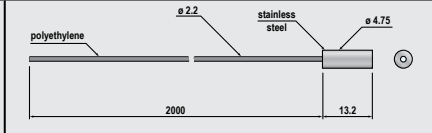
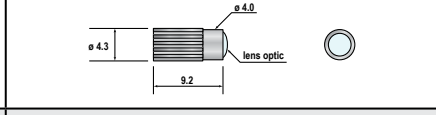
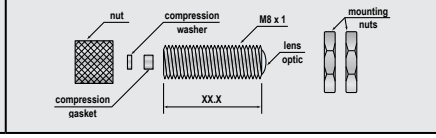
Model Number		Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Opposed — Area Sensing (Array)	PIRS1X166UM.4		16X 0.265	25	• Compact head; side exit; 10 mm width	✓	
	PIRS1X166UMPM.75		16X 0.265	25	• Side exit; 19 mm width	✓	
	PIRS1X166UMPMAL		16X 0.265	25	• Side exit; 34 mm width	✓	
Opposed — High-Temp	PIT46UHT1		1.0	25	• Thread; withstands 105° C	✓	
Opposed — Slot	PDIS16UM5		0.25	10	Easy mount “fork” head; 5 mm gap	✓	
	PDIS16UM10		0.25	10	Easy mount “fork” head; 10 mm gap	✓	
	PDIS46UM12		1.0	25	• Easy mount “fork” head; DURA-BEND fiber	✓	
	PDISM46UM5MA		1.0	25	• 90° angle; compact “fork” head; DURA-BEND fiber	✓	

More on next page

NA: WORLD-BEAM QS18 not recommended.

Indicates lens available for model. See page 257 for details.

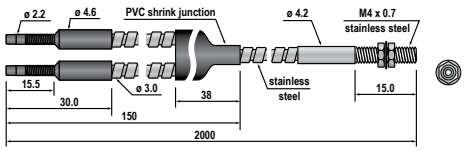
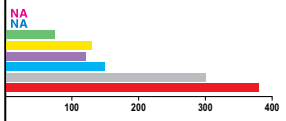
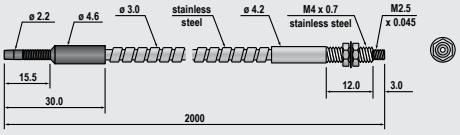
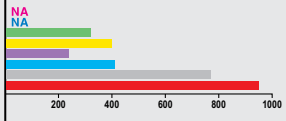
* Fibers can be free cut using fiber cutter (see page 259).

Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Opposed	STEELSKIN™	PIAT43TMB5		1.0	12	• 90° angle/thread		
		PIF43TMB5		1.0	12	• Smooth ferrule		
		PIPS43TMB5		1.0	12	• Smooth ferrule; non-bendable tip		
		PIT43TMB5		1.0	12	• Thread		
		PITA43TMB5		1.0	12	• Thread/90° angle		
		PITP43TMB5		1.0	12	• Thread; bendable tip		
	Dual Individual	PDIT26T5		0.5	12	• Accomplish 2 inspections using only one sensor		
		PDIT4100U		1.0	25	• 30 m duplex fiber cable	✓	Contact factory for sensing range.
	Vacuum	PIF66UM.52M.19D		1.5	38	• For use with VFT-M8MVS (ambient side) See page 265.	✓	Contact factory for sensing range.
	Extended Range Lens	L2		ref. model PIT46U	ref. model PIT46U	• Range-extending lens • M2.5 thread		
		LO8FP		ref. model PIL46U	ref. model PIL46U	• Ultra-long range-extending lens; use with raw plastic fiber		

More on next page

NA: WORLD-BEAM QS18 not recommended. **NA:** MINI-BEAM *Expert* not recommended. Indicates lens available for model. See page 257 for details.

* Fibers can be free cut using fiber cutter (see page 259).

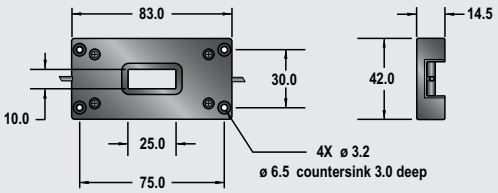
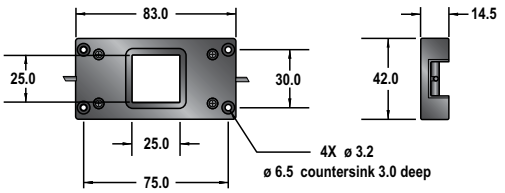
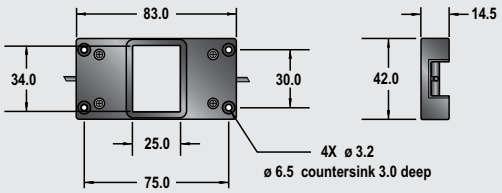
Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Free Cut*	Typical Range (mm)
Diffuse	High-Temp	BMT16.6S-HT		1.57	19	• High performance glass fiber optics for use with Banner D10 plastic fiber sensors • Miniature thread; end tip withstands 315° C		
Opposed	High-Temp	IMT.756.6S-HT†		1.27	19	• High performance glass fiber optics for use with Banner D10 plastic fiber sensors • Miniature thread; end tip withstands 315° C		

NA: WORLD-BEAM QS18 not recommended. NA: MINI-BEAM *Expert* not recommended. Indicates lens available for model. See page 257 for details.

* Fibers can be free cut using fiber cutter (see page 259).

† Fibers are sold separately, must order two fibers to form a pair.

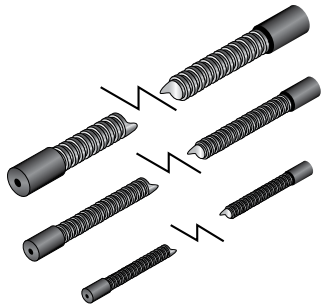
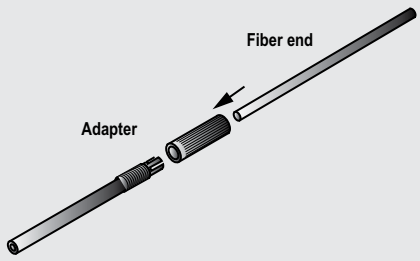
D10 *Expert*™ Small Object Counter Fiber Optic Arrays

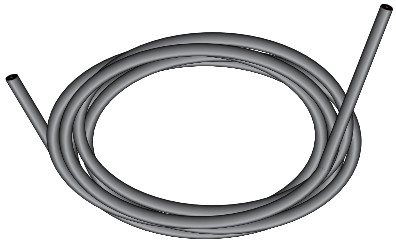
Model Number*	Fiber Exit	Drawing & Dimensions (mm)	Detection Window	Minimum Object Detection†	Used With
PFCVA-10X25-S	Side Exit		10 x 25 mm	1.5 mm	• D10DNCFP... • D10DPCFP... (see page 229)
PFCVA-10X25-E	End Exit				
PFCVA-25X25-S	Side Exit		25 x 25 mm	3 mm	
PFCVA-25X25-E	End Exit				
PFCVA-34X25-S	Side Exit		34 x 25 mm	4 mm	
PFCVA-34X25-E	End Exit				

* Custom fiber arrays and mounting configurations are possible. Contact factory with your small object counting application.

† With 2% Threshold Offset Percentage

Fiber Optic Accessories

Model Number		Model Specific Features	General Features	Drawings
Fiber Cutters	PFK20	• For use with 0.25 and 0.5 mm diameter cables.	• These kits are used with unterminated plastic fiber cables. • Each kit contains 40 bushings and 10 cutter assemblies (cutters can be purchased separately in packages of 25 - reference model PFC-2-25).	 NOTE: Bushings used with Q45, OMNI-BEAM, ECONO-BEAM, MAXI-BEAM and VALU-BEAM sensors only.
	PFK40	• For use with 1 and 1.5 mm diameter cables.		
Plastic Fiber Field-Installable Sheathing	PFS69S6T	• 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.	
	PFS53S6T	• 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).		
	PFS44S6T	• May be used with individual fiber assemblies having M3 x 0.5 threaded end tips (e.g., PIP26U, PIT26U and PIT1X46U).		
Plastic Fiber Adapters	UPFA-1-100	• 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, D11, 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-2-100	• 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.		

Model Number		Core	Length	Type	Drawing
Unterminated Individual and Bifurcated Plastic Fibers	PIU230U	0.5 mm	9 m	Single	
	PIU260U		18 m		
	PIU430U	1.0 mm	9 m	Single	
	PIU460U		18 m		
	PIU630U	1.5 mm	9 m	Single	
	PIU660U		18 m		
	PBU430U	1.0 mm	9 m	Duplex	
	PBU460U		18 m		

SENSORS

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

Glass Fiber Optic Model Key

I	A T	2	3	S	X X

ASSEMBLY STYLE designator

B = Bifurcated fiber
I = Individual fiber*

SENSING END TIP STYLE designator

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

MODIFICATIONS designator

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

SHEATHING MATERIAL designator

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

OVERALL LENGTH designator (in feet)

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

FIBER BUNDLE DIAMETER designator

.44 = 0.7 mm
.5 = 0.8 mm
.75 = 1.2 mm
1 = 1.6 mm
1.5 = 2.3 mm
2 = 3.2 mm
2.5 = 4.0 mm

* Individual glass fibers are packaged separately.

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

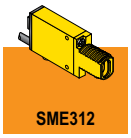
⚠ Application Notes and Warnings ⚠

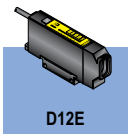
1. The ends of glass fiber optic assemblies are optically ground and polished. Care taken in this manufacturing process accounts for the light coupling efficiency of the fiber optic assembly. As a result, glass fiber assemblies cannot be shortened, spliced or otherwise modified.
2. Use caution when applying 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 (page 357). This sensor is approved for use inside hazardous areas when used with an appropriate intrinsic barrier. Also, see NAMUR sensor models Q45AD9F (page 200) and MIAD9F (page 117). Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.
3. In applications where glass fibers 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.

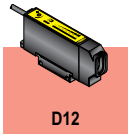
Teflon® is a registered trademark of Dupont™.

SENSORS


R55F


SME312


D12E

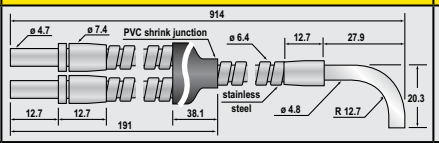
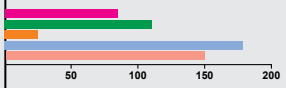
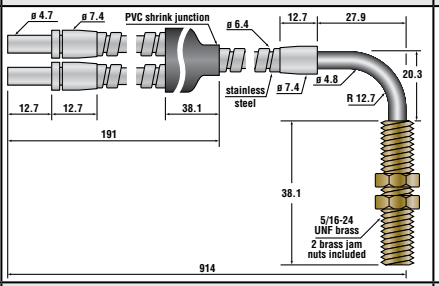
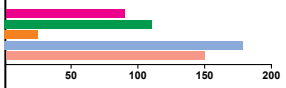
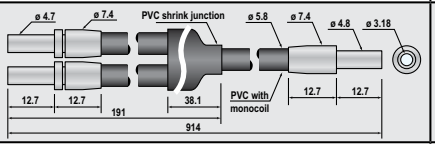
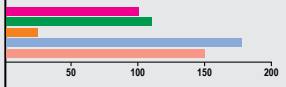
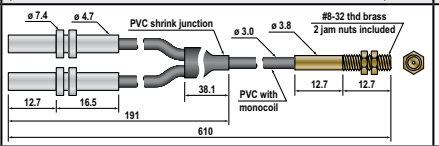
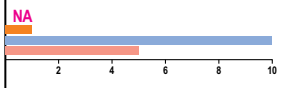
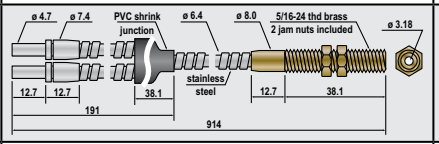
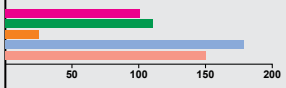
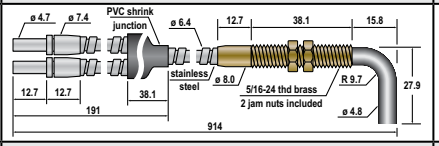
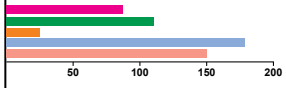
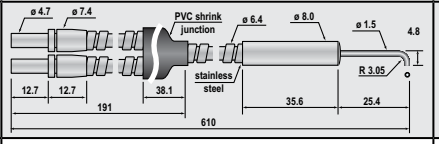
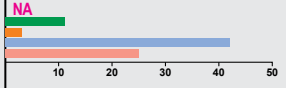
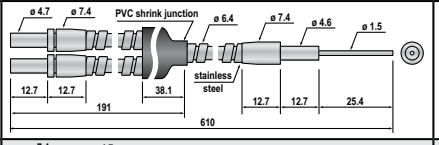
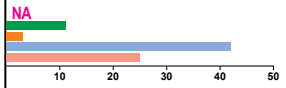
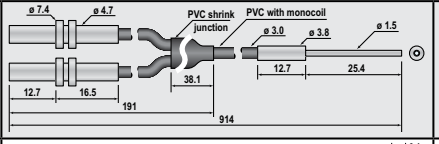
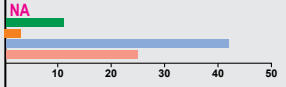
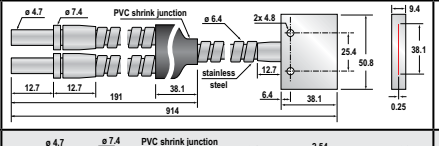
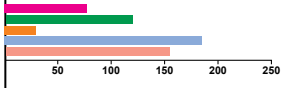
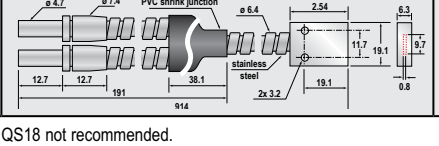
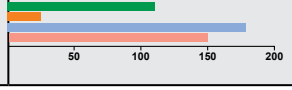

D12


QS18

Indicates lenses available for model. See page 263 for details.

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

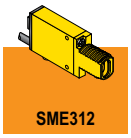
M900 Available 480° C models. Add **M900** to end of model number (example, **BA23SM900**). Dimensions may vary for these models.

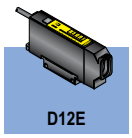
Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Typical Range (mm)
Diffuse	Standard	BA23S		3.18	19	• 90° angle M600 M900	
		BAT23S		3.18	19	• 90° angle/thread M600 M900	
		BF23P		3.18	19	• Smooth ferrule	
		BMT.442P		0.69	9.5	• Miniature thread	
		BT23S		3.18	19	• Thread M600 M900	
		BTA23S		3.18	19	• Thread/90° angle M600 M900	
	Miniature Probe	BAM.752S		1.17	19	• ø 1.5 mm non-bendable probe; 90° angle M600	
		BM.752S		1.17	19	• ø 1.5 mm non-bendable probe M600	
		BMP.753P		1.17	9.5	• ø 1.5 mm non-bendable probe	
	Area Sensing (Array)	BR2.53S		3.96	19	• Straight exit; 38 mm width M600	
		BR23S		3.18	19	• Straight exit; 10 mm width M600	

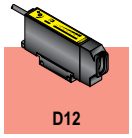
More on next page

NA: WORLD-BEAM QS18 not recommended.


R55F

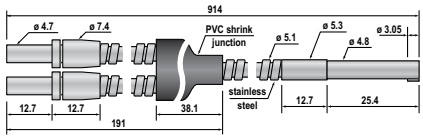
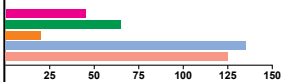
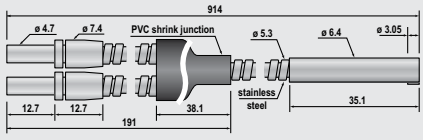
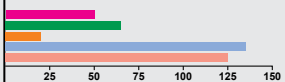
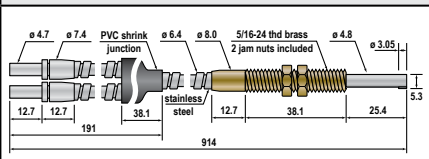
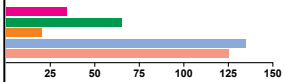
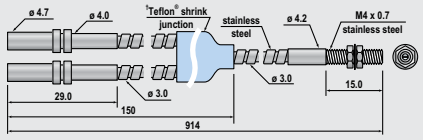
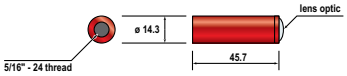

SME312


D12E


D12


QS18

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

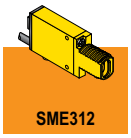
Model Number			Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Typical Range (mm)
Diffuse	Side-View	BA1.53SMETA		2.29	19	• Ultra-compact head M600	
		BA1.53SMTA		2.29	19	• Compact head M600	
		BTETA1.53S		2.29	19	• Ultra-compact head; thread M600	
	Vacuum	BMT13SMVF		1.57	19	• Miniature thread; entire cable withstands 480° C	Contact factory for sensing range.
	Convergent Beam Spot	L10		ref. glass fiber key or call factory	ref. glass fiber key or call factory	• Glass lens; withstands 315° C • Focuses light to .80 mm with ø 1.6 mm fiber	

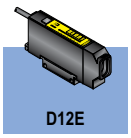
Glass Fiber Optics—Additional Models Available

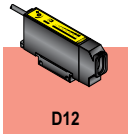
In addition to the configurations shown, Banner offers thousands of readily available alternative fiber models:

- 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).


R55F


SME312


D12E

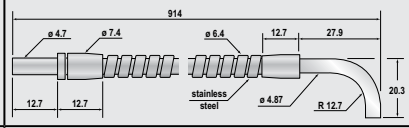
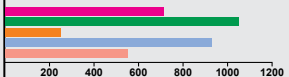
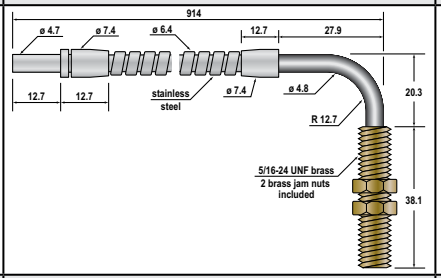
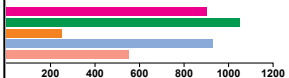
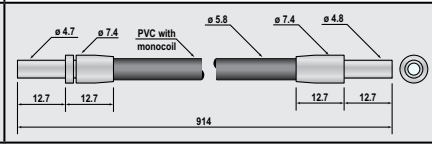
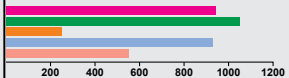
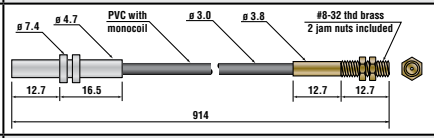
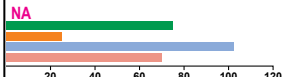
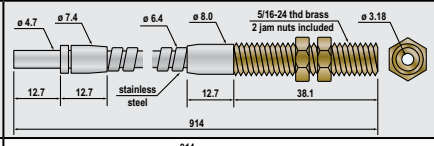
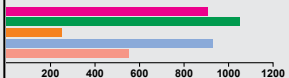
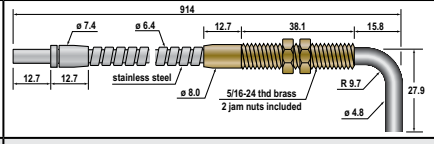
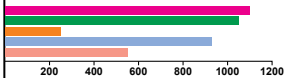
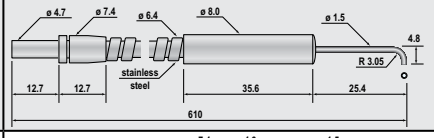
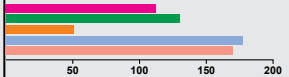
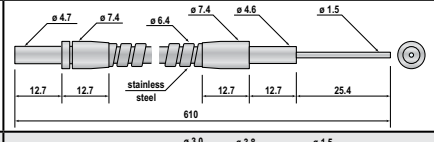
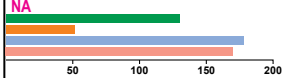
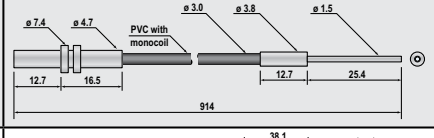
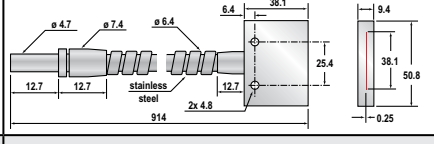
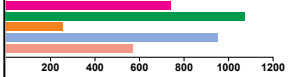
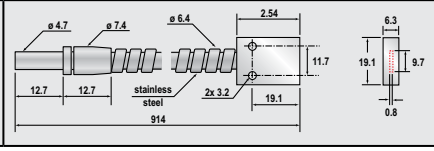
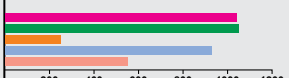

D12


QS18

Indicates lenses available for model. See page 261 for details.

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

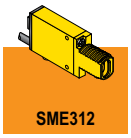
M900 Available 480° C models. Add **M900** to end of model number (example, **BA23SM900**). Dimensions may vary for these models.

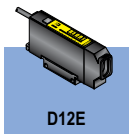
Model Number		Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Typical Range (mm)
Opposed — Standard	IA23S		3.18	19	• 90° angle	
	IAT23S		3.18	19	• 90° angle/thread	
	IF23P		3.18	19	• Smooth ferrule	
	IMT.442P		0.69	9.5	• Miniature thread	
	IT23S		3.18	19	• Thread	
	ITA23S		3.18	19	• Thread/90° angle	
Miniature Probe	IAM.752S		1.17	19	• ø 1.5 mm non-bendable probe; 90° angle	
	IM.752S		1.17	19	• ø 1.5 mm non-bendable probe	
	IMP.753P		1.17	9.5	• ø 1.5 mm non-bendable probe	
Area Sensing (Array)	IR2.53S		3.69	19	• Straight exit; 38 mm width	
	IR23S		3.18	19	• Straight exit; 10 mm width	

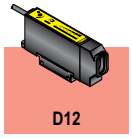
More on next page

NA: WORLD-BEAM QS18 not recommended.


R55F

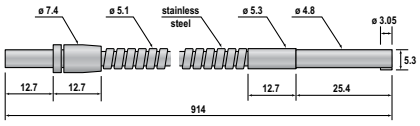
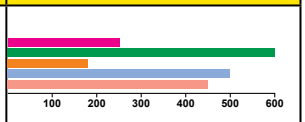
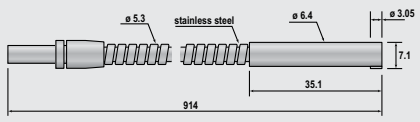
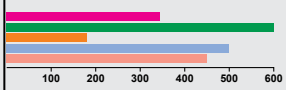
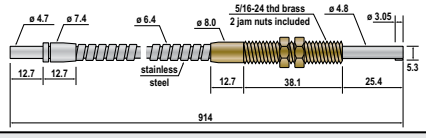
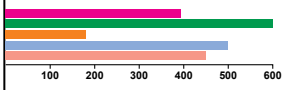
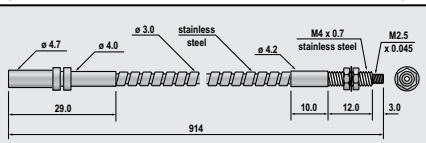
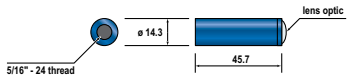
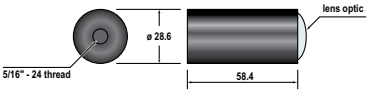
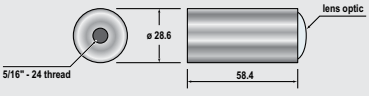
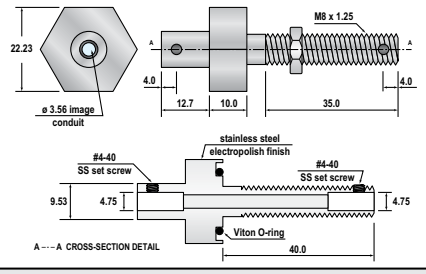
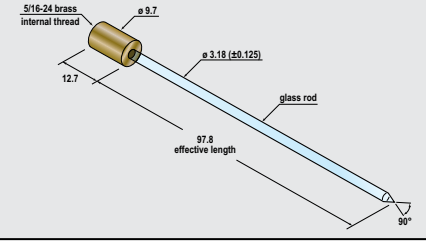

SME312


D12E


D12


QS18

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

Model Number		Drawing & Dimensions (mm)	Core Dia. (mm)	Min. Bend Radius (mm)	Features	Typical Range (mm)
Opposed — Side-View	IA1.53SMETA		2.29	19	• Ultra-compact head M600	
Opposed — Side-View	IA1.53SMTA		2.29	19	• Compact head M600	
Opposed — Side-View	ITETA1.53S		2.29	19	• Ultra-compact head; thread M600	
Opposed — Vacuum	IMT.753SMVF		1.27	19	• Miniature thread; entire cable withstands 480° C	Contact factory for sensing range.
Opposed — Extended Range Lens	L9		ref. model IT23S	ref. model IT23S	• Glass lens; withstands 315° C	
Opposed — Extended Range Lens	L16F		ref. model IT23S	ref. model IT23S	• Plastic housing; withstands 105° C	
Opposed — Extended Range Lens	L16FAL		ref. model IT23S	ref. model IT23S	• Aluminum housing; withstands 315° C	
Opposed — Extended Range Lens	L16FSS		ref. model IT23S	19	• Stainless steel housing withstands 480° C	
Opposed — Vacuum Feed Through	VFT-M8MVS		3.56	—	• Seals to 1 x 10^{-9} torr; withstands 120° C	
Opposed — Liquid Level	TGR		3.18	—	• Use with BT23S • Sensor switches when tip of glass rod is immersed in liquid