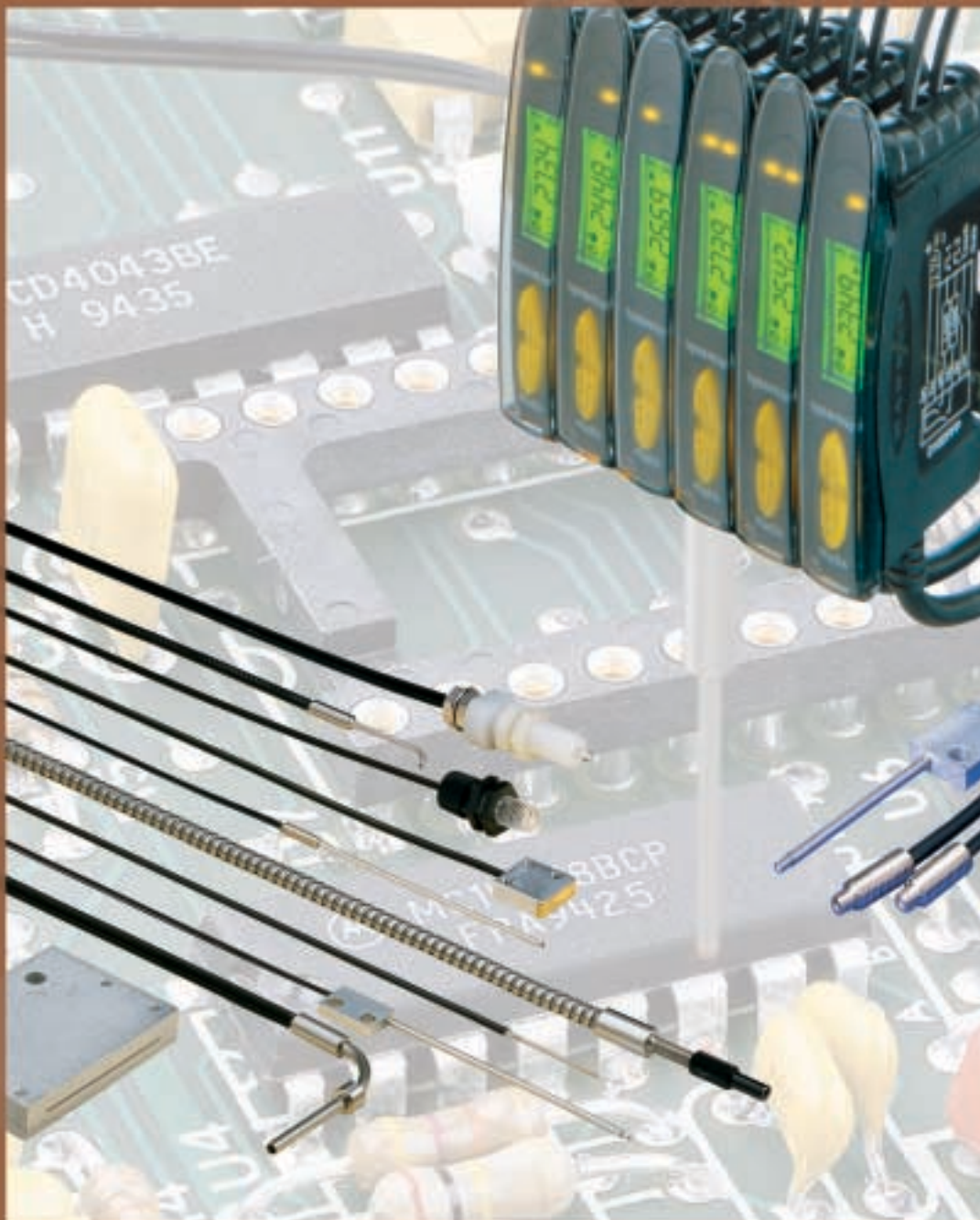


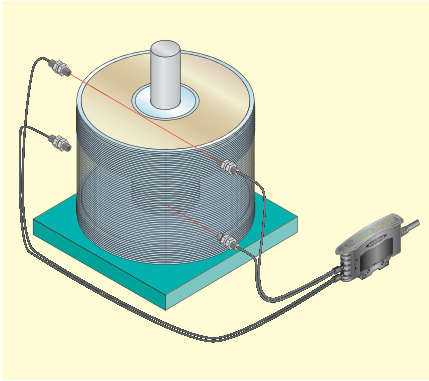


BANNER®
more sensors, more solutions

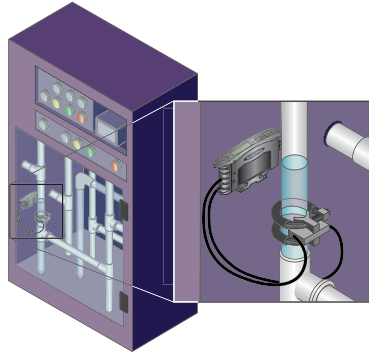
FIBRE-OPTIC SELECTION GUIDE

A Selection of Application Drawings

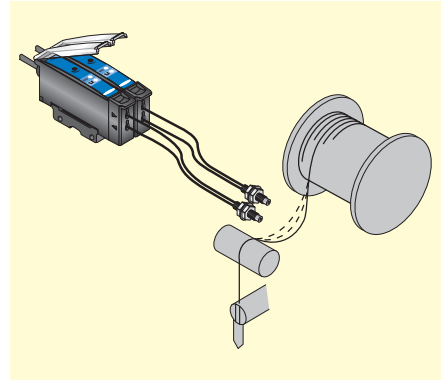
CD Stack Height
Sensor: D10DPFP, Fibre: PDIT26TM5



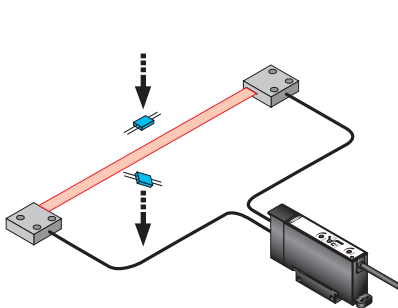
Non-contact Sensing of Liquid in Tubing
Sensor: D10DPFP, Fibre: PDI46U-LLD



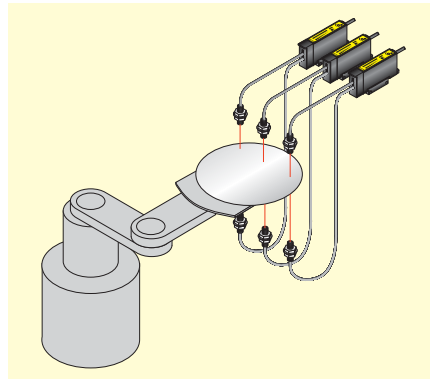
Bond Wire Loop Level Control
Sensor: D11SP6FP (2), Fibre: PBCT46U (2)



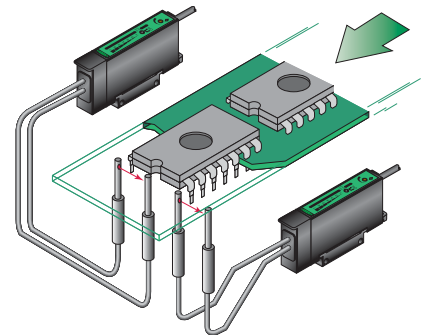
Small Parts Counting
Sensor: D12DAB6FP, Fibre: PIRS1X166U



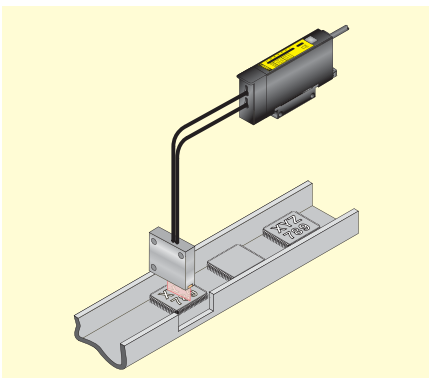
Wafer Centre Detection
Sensor: D12SP6FP, Fibre: PIT46UHT1



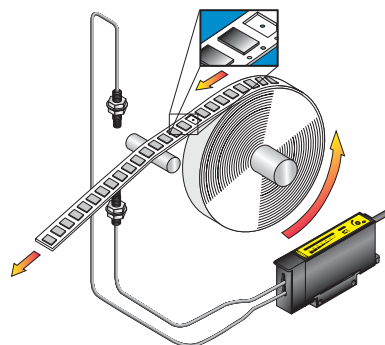
Integrated Circuit Lead Counting
Sensor: D12SP6FPY (2), Fibre: PIPS26U (2)



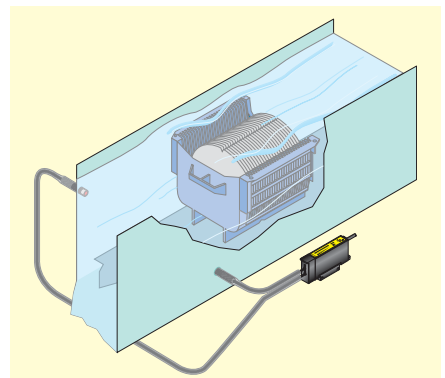
Wide Area Print Detection
Sensor: D12EP6FP, Fibre: PBR1X326U



Component Inspection in Web
Sensor: D12SP6FP, Fibre: PIT46U



Cassette Detection in Rinse Bath
Sensor: D12SP6FP, Fibre: PIE46UT



Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.

Products in this brochure do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energised or de-energised sensor output condition.

Plastic and Glass Fibres

An unrivalled selection of standard & custom designs.

The widest choice.

Banner fibre-optics allow you to “pipe” light into otherwise inaccessible or hostile environments. Banner has the broadest, most readily available line of fibres in the world. Choose from a huge selection of standard fibres in virtually all shapes and sizes. Custom fibres can also quickly and easily be designed for your unique applications, and built to your exact specifications. Choose from two general styles: individual fibres, used in pairs in the opposed sensing mode, and bifurcated fibres that emit and receive light signals in the same assembly (diffuse mode).

Plastic fibres.



Banner plastic fibres offer hundreds of affordable solutions. These inexpensive fibres can be easily cut to length during installation using the cutting device supplied with each fibre. They bend easily to fit precisely where required. They are also extremely flexible and coiled

versions are available for use in a variety of applications requiring articulated or reciprocating motion. Choose from diameters of 0,25; 0,5; 0,75; 1 or 1,5 mm. The larger the fibre diameter, the higher the excess gain attainable.

Glass fibres.

Banner glass fibres solve numerous challenging sensing requirements in the most hostile environments, including high temperatures up to 480° C, corrosive materials, and extreme moisture. Due to their low mass, these fibres can withstand high levels of shock and vibration. They are also inherently immune to extreme electrical noise.

Our unique vacuum feed-through assembly pro-



vides an easy way to access vacuum chambers. Banner glass fibres can be quickly custom-designed and built for your unique applications, including fibres to create a beam that precisely profiles the object you need to detect.

For a complete listing of Banner's extensive selection of glass and plastic fibre-optics, visit our web site: www.bannerengineering.com.

Plastic Fibre-optic Specifications

Sensing Range:

Refer to the range specifications shown on the fibre-optic drawing pages.

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 fibre shrinkage.

Repeated Bending/Flexing:

Life expectancy of plastic fibre-optic cable is in excess of one million cycles at bend radii of no less than the minimum specified 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 fibre-optic assemblies are recommended for any application requiring reciprocating fibre motion.

Operating Temperature:

-30 to +70° C unless otherwise specified.

Chemical Resistance:

The acrylic core of the monofilament optical fibre will be damaged by contact with acids, strong bases (alkalis) and solvents. The polyethylene jacket will protect the fibre from most chemical environments. However, materials may migrate through the jacket with long term exposure. Samples of fibre-optic material are available from Banner for testing.

Minimum Bend Radius:

8 mm for 0,25 mm diameter fibres;
12 mm for 0,5 mm diameter fibres;
25 mm for 1 mm diameter fibres;
38 mm for 1,5 mm diameter fibres.

Construction:

OPTICAL FIBRE: plastic monofilament

PROTECTIVE JACKET: black polyethylene, unless otherwise stated

THREADED END TIPS and HARDWARE: stainless steel (SS) or nickel-plated brass (NI Pltd BR)

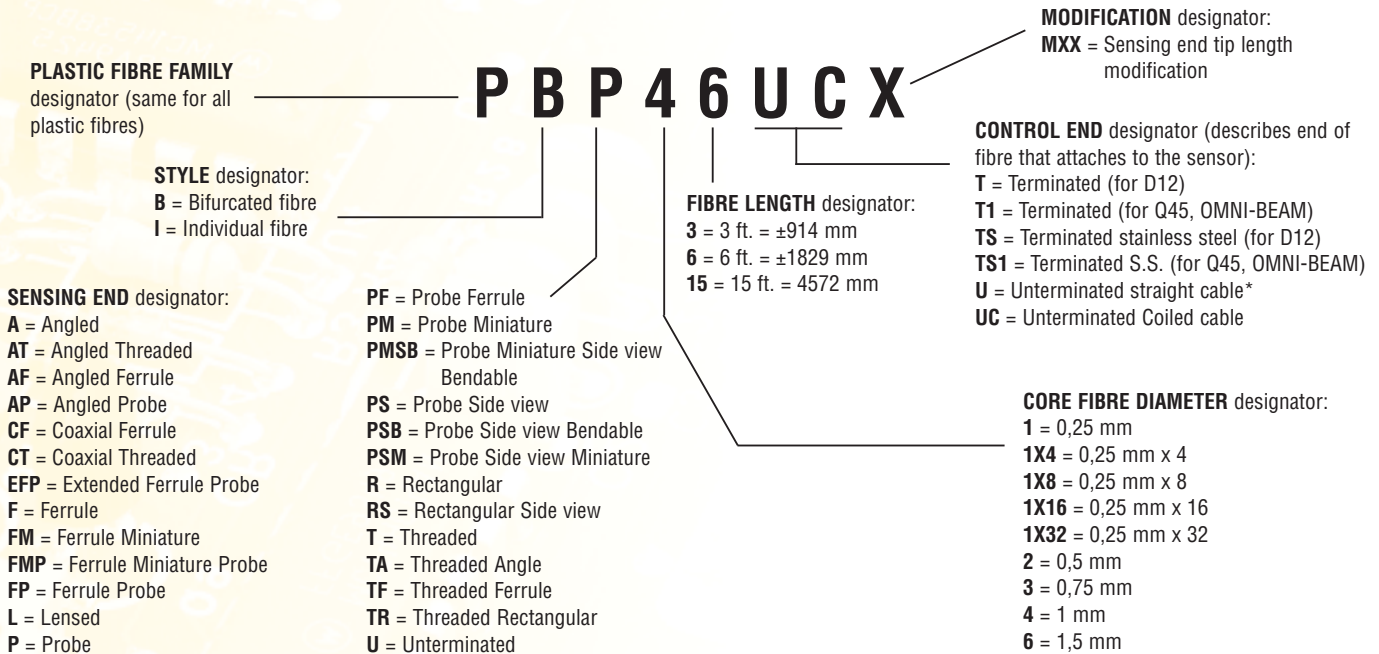
PROBE END TIPS: annealed (bendable) T304 stainless steel

ANGLED END TIPS: hardened T304 stainless steel

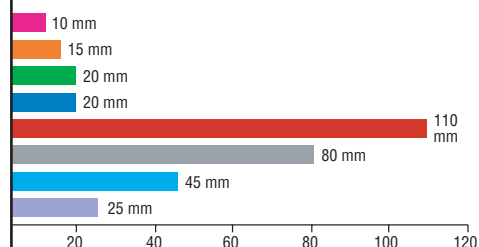
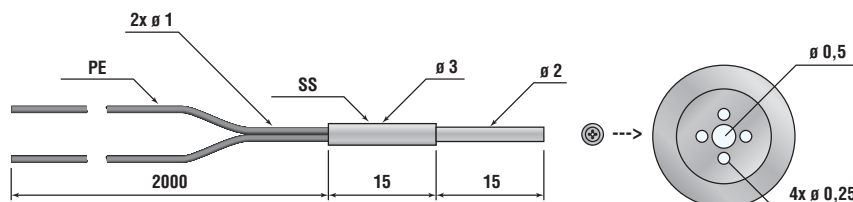
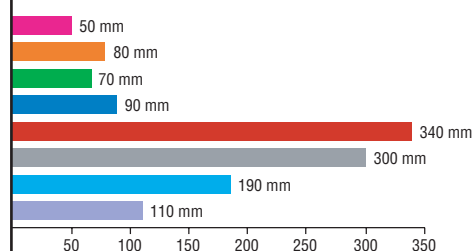
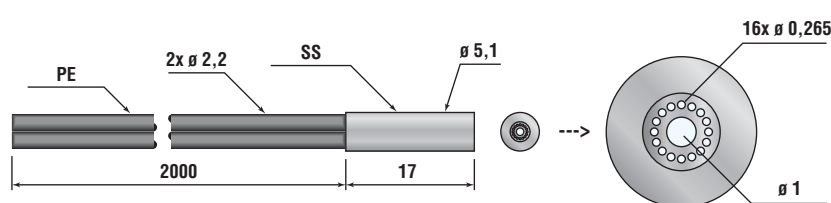
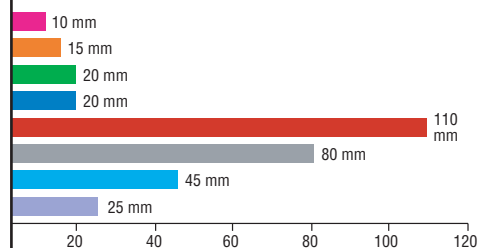
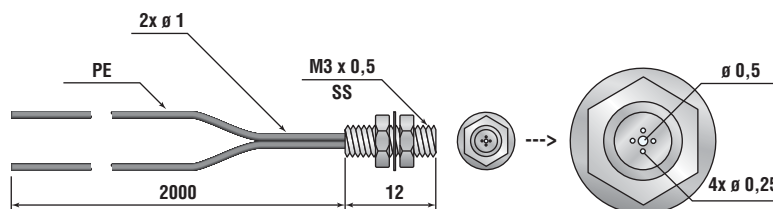
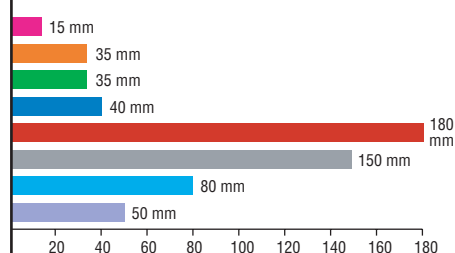
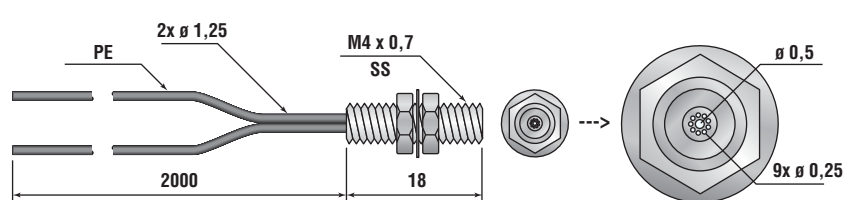
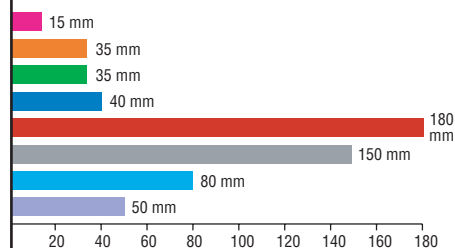
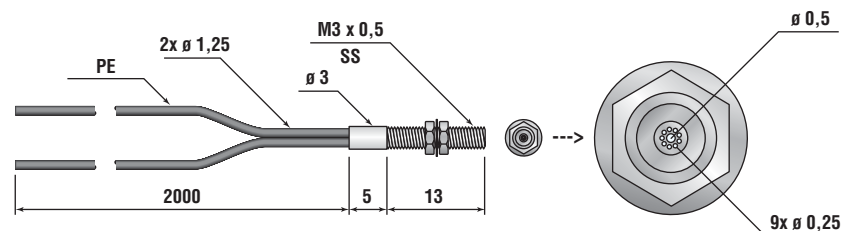
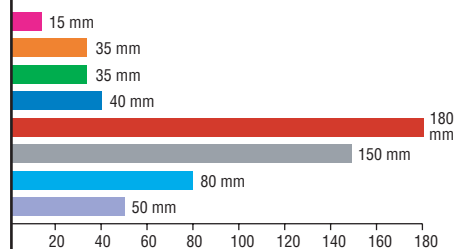
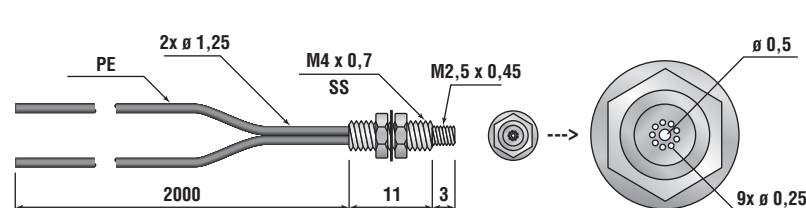
FERRULED END TIPS: T303 stainless steel

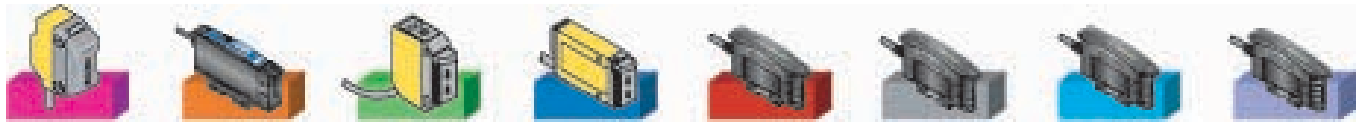
STAINLESS STEEL SHEATH: T302 stainless steel

Numbering scheme for Banner plastic fibres



* Plastic fibres having the letter "U" in the suffix of their model numbers have underminated control ends, and may be cut by the customer to the required length. Use cutters supplied with fibre-optic cable. Individual plastic fibres are sold in pairs. Fibres listed in this brochure are standard; modifications are available by special order.


QS18
D11(E)
Q23
SME312
D10SHP
D10HP
D10HS
D10SHS
Dimensions (in mm)
Range (in mm)
PBCF21X46U Bifurcated coaxial ferruled

PBCF46U Bifurcated coaxial ferruled

PBCT21X46U Bifurcated coaxial threaded

PBCT26U Bifurcated coaxial; may be used with L4C6 or L4C20 lens

PBCT26UM3 Bifurcated coaxial threaded; may be used with LZ3C8 lens

PBCT26UM4M2.5 Bifurcated coaxial threaded; may be used with L2 lens




QS18

D11(E)

Q23

SME312

D10SHP

D10HP

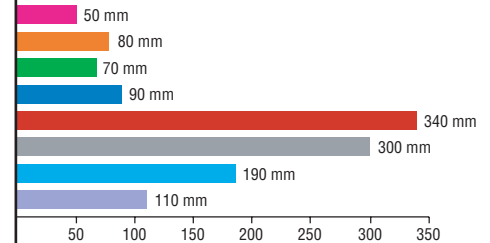
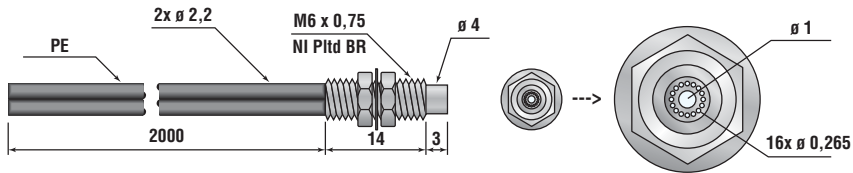
D10HS

D10SHS

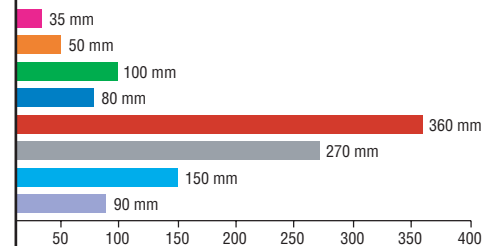
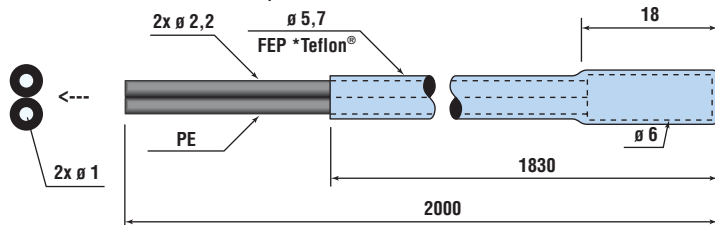
Dimensions (in mm)

Range (in mm)

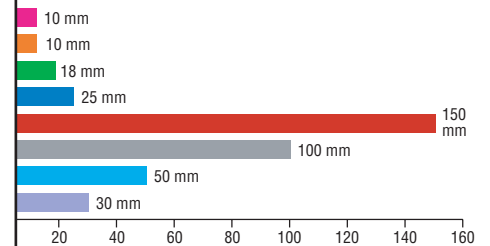
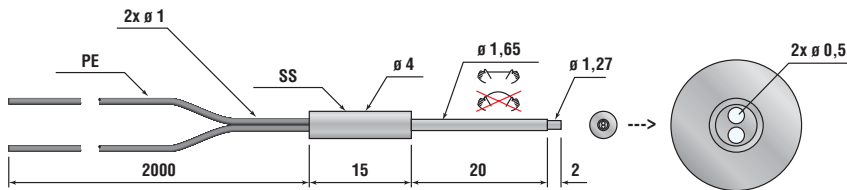
PBCT46U Bifurcated coaxial threaded



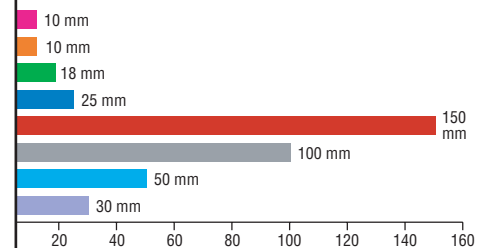
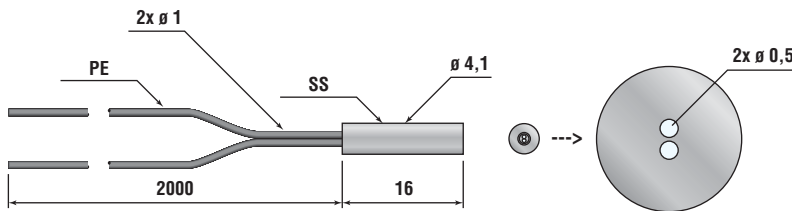
PBE46UTMNL Bifurcated encapsulated



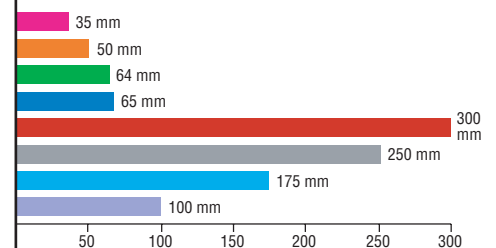
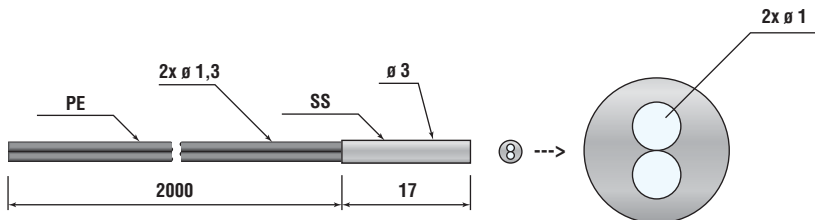
PBEFP26U Bifurcated extended ferruled



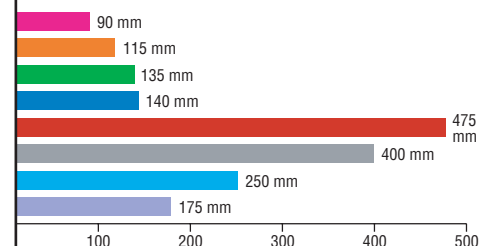
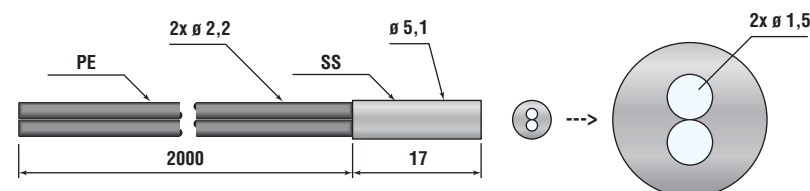
PBF26U Bifurcated ferruled



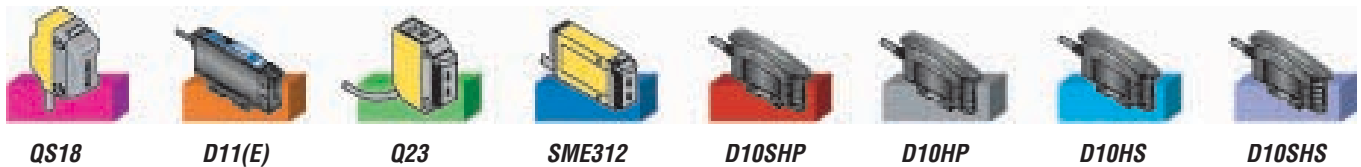
PBF46UM3MJ1.3 Bifurcated ferruled



PBF66U Bifurcated ferruled

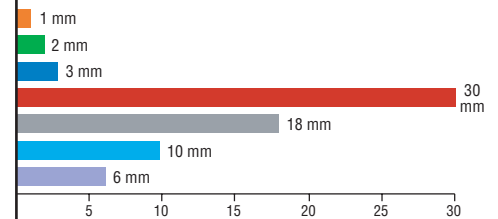
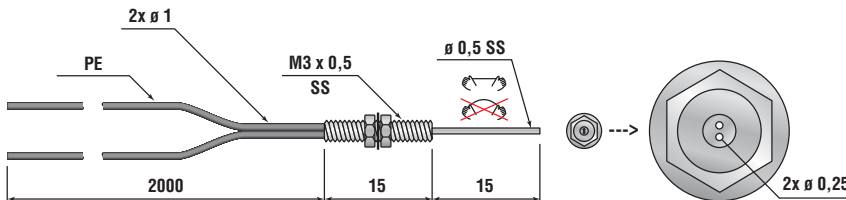
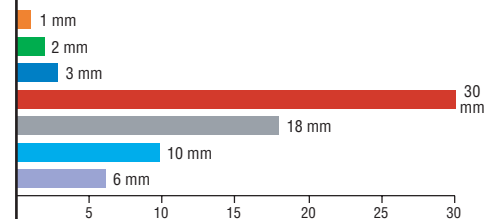
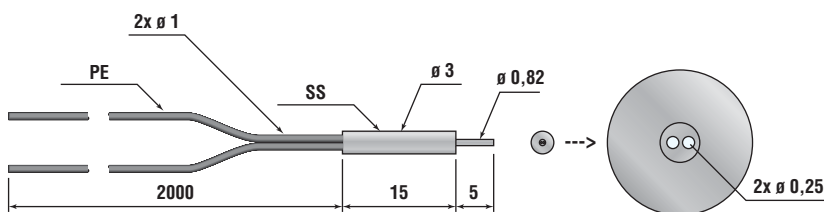
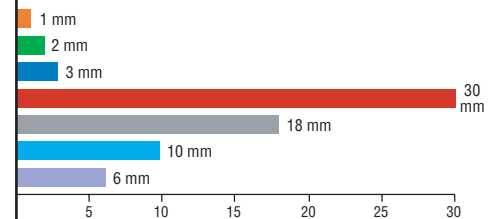
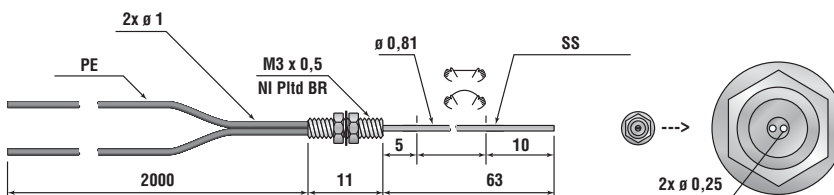
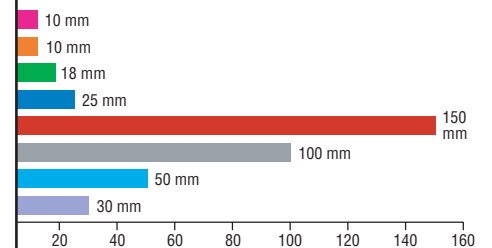
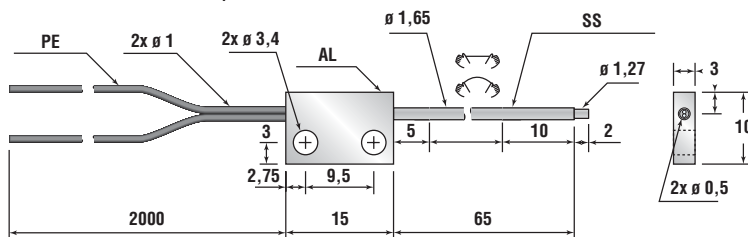
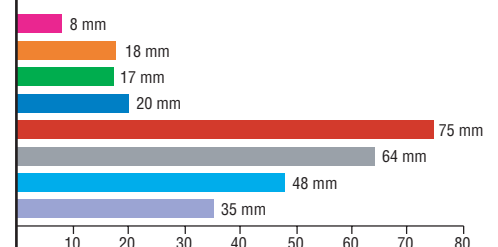
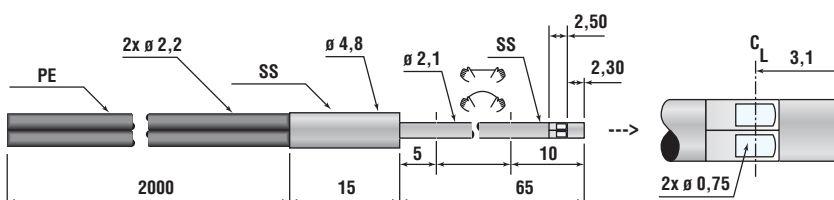
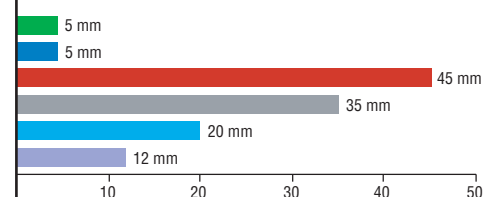
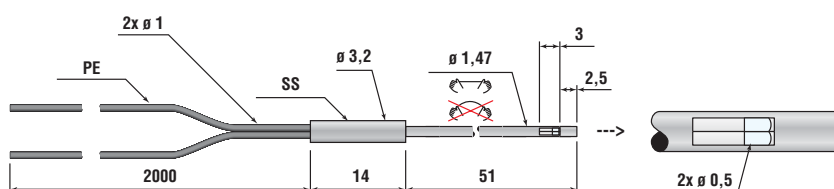


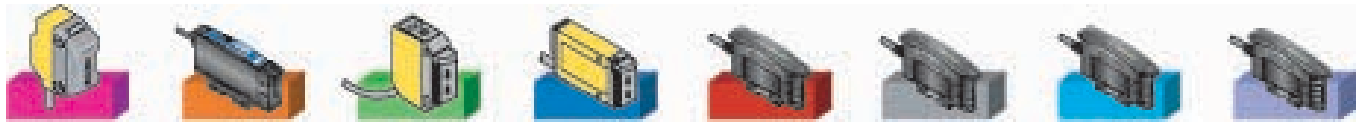
* Teflon® FEP is a registered trademark of Dupont Co.



Dimensions (in mm)

Range (in mm)

PBFM16U Bifurcated ferruled, miniature

PBFMP16UMP.2 Bifurcated ferruled miniature probe

PBP16U Bifurcated probe, bendable

PBPF26UMB Bifurcated probe, bendable

PBPMBS36U Bifurcated probe, miniature, side-view bendable

PBPS26U Bifurcated probe, side-view




QS18

D11(E)

Q23

SME312

D10SHP

D10HP

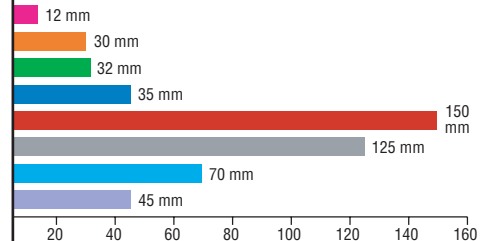
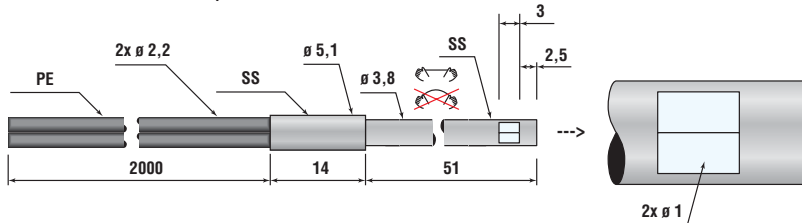
D10HS

D10SHS

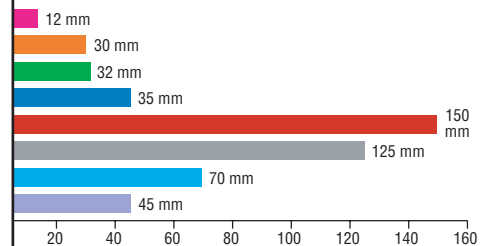
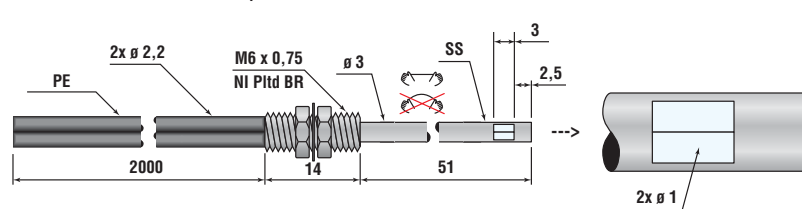
Dimensions (in mm)

Range (in mm)

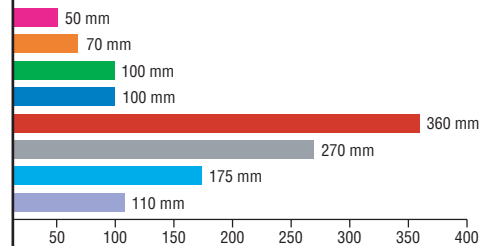
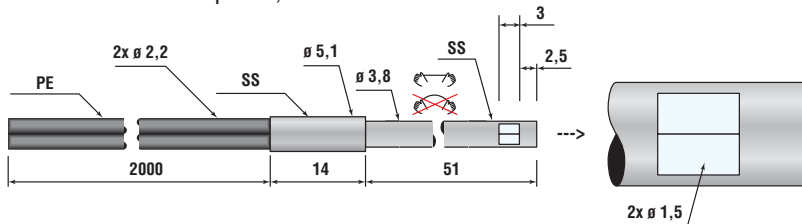
PBPS46U Bifurcated probe, side-view



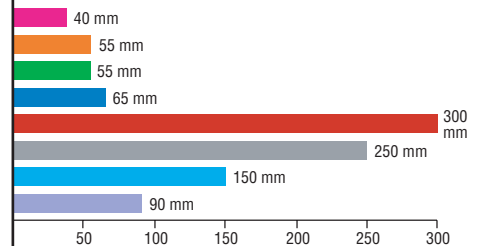
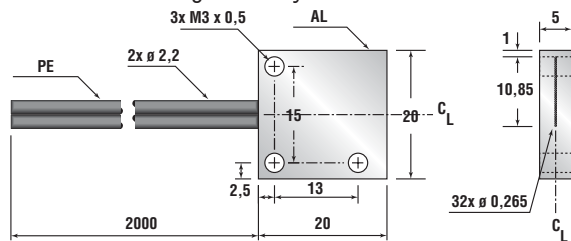
PBPS46UMT Bifurcated probe, side-view



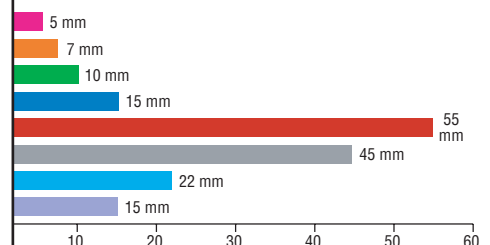
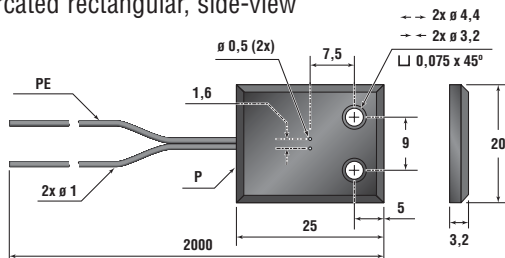
PBPS66U Bifurcated probe, side-view



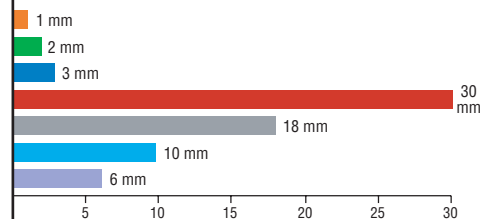
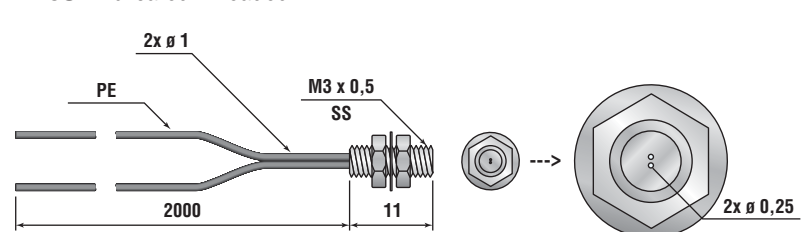
PBR1X326U Bifurcated rectangular array

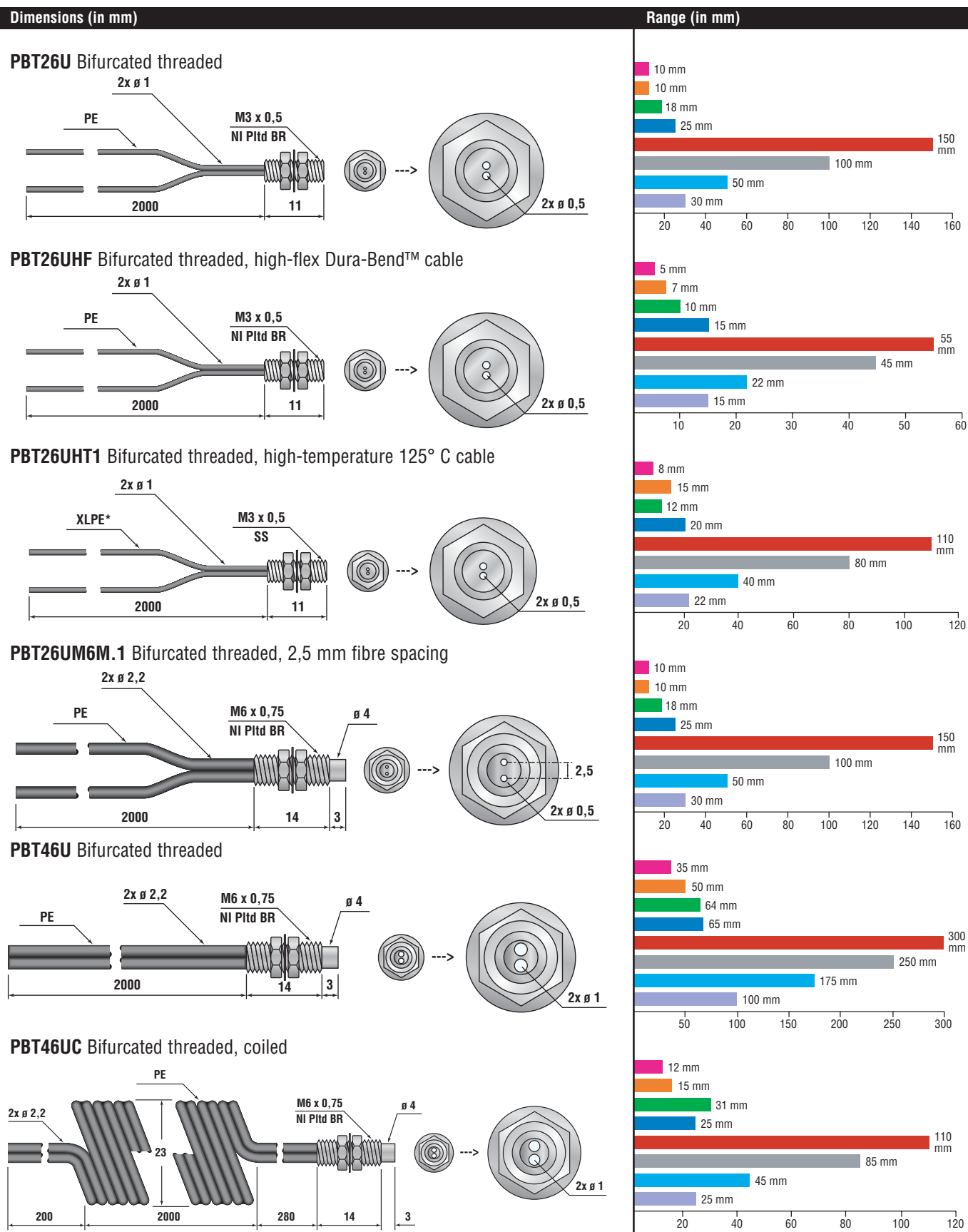


PBRS26U Bifurcated rectangular, side-view

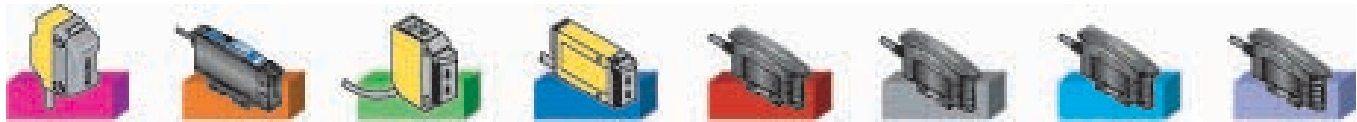


PBT16U Bifurcated threaded





* cross-linked polyethylene (XLPE)



QS18

D11(E)

Q23

SME312

D10SHP

D10HP

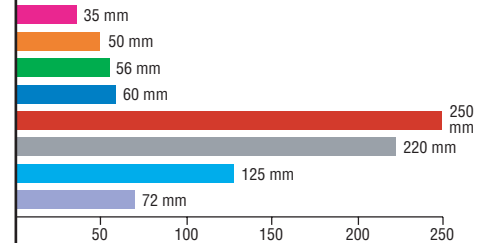
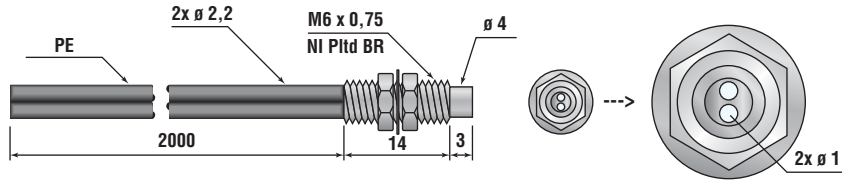
D10HS

D10SHS

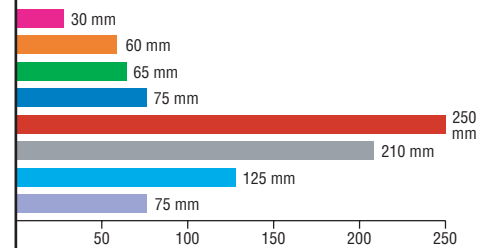
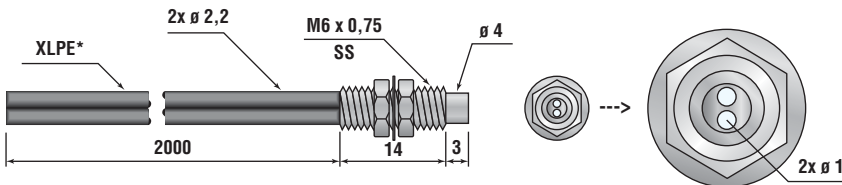
Dimensions (in mm)

Range (in mm)

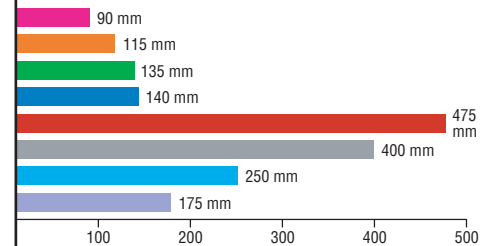
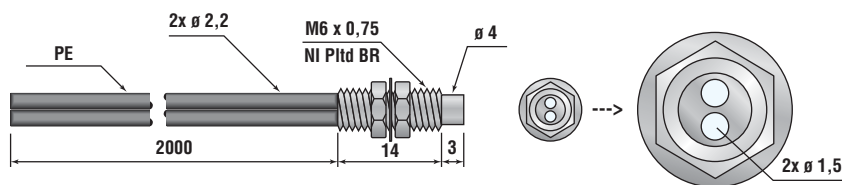
PBT46UHF Bifurcated threaded, high-flex Dura-Bend™ cable



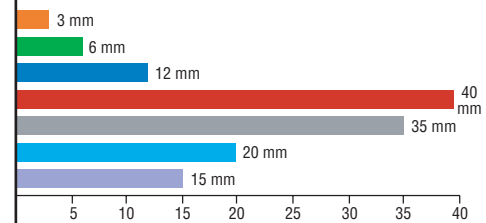
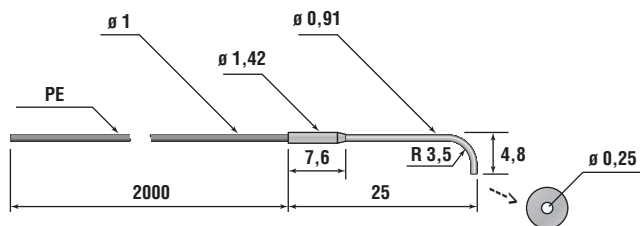
PBT46UHT1 Bifurcated threaded, high-temperature 125° C cable



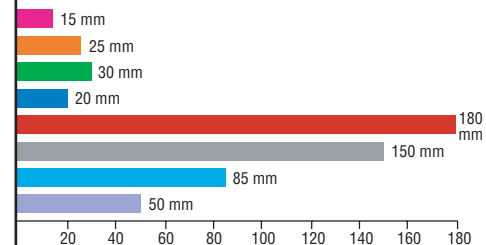
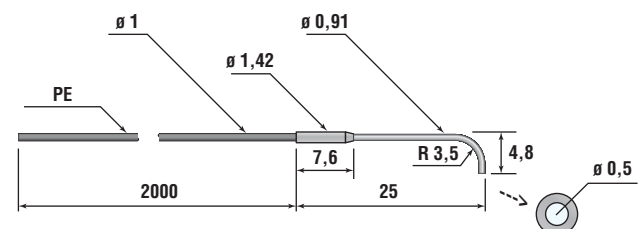
PBT66U Bifurcated threaded



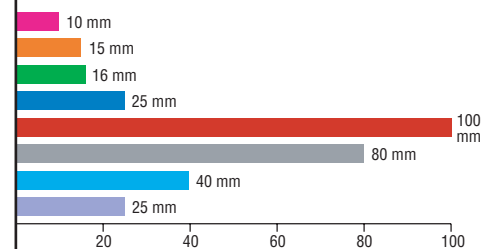
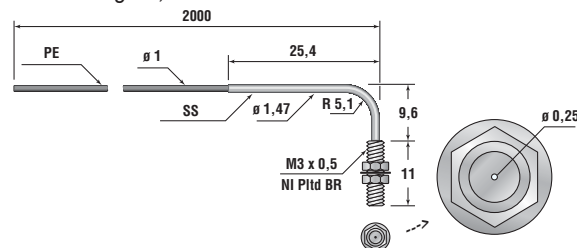
PIA16U Individual angled



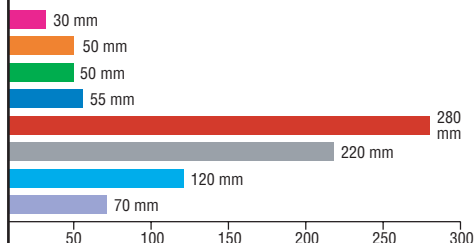
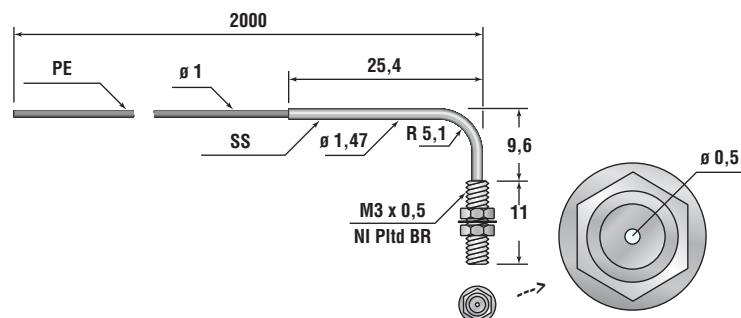
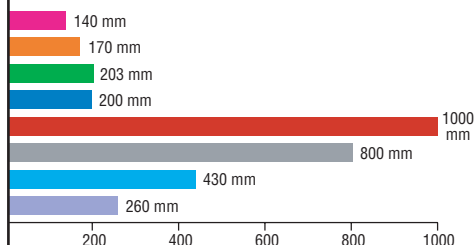
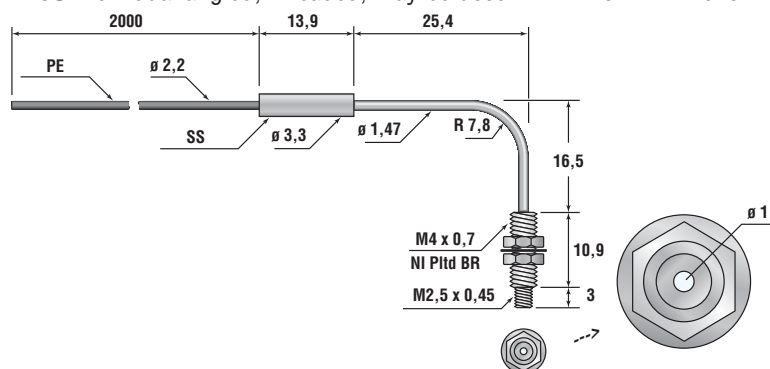
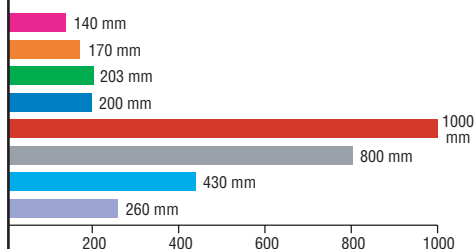
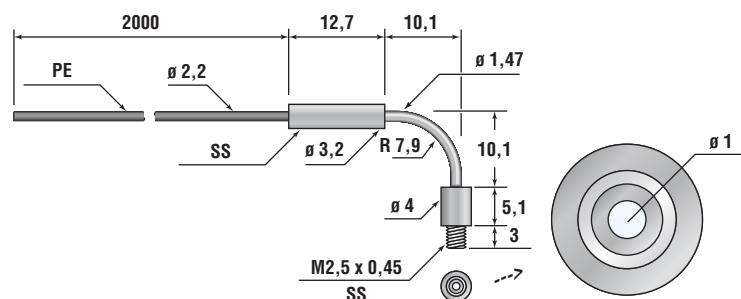
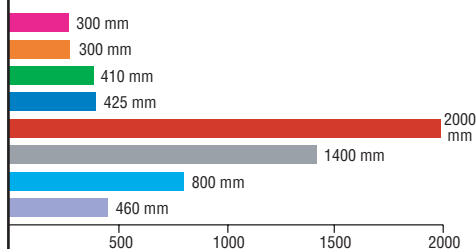
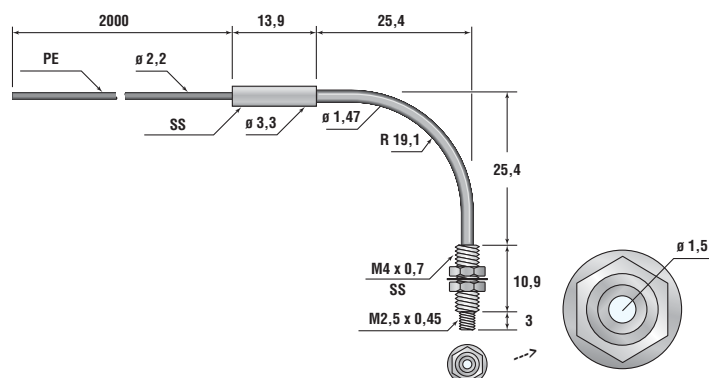
PIA26U Individual angled

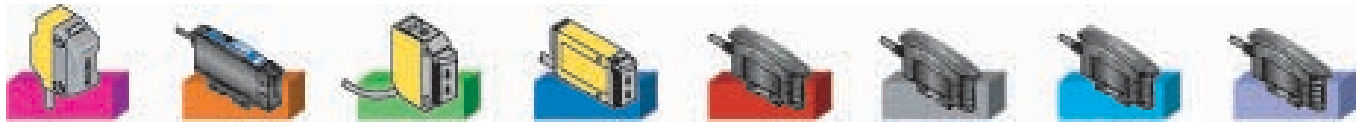


PIAT16U Individual angled, threaded



* cross-linked polyethylene (XLPE)


QS18
D11(E)
Q23
SME312
D10SHP
D10HP
D10HS
D10SHS
Dimensions (in mm)
Range (in mm)
PIAT26U Individual angled, threaded

PIAT46U Individual angled, threaded; may be used with L2 or L2RA lens

PIAT46UM.4X.4MT Individual angled, threaded; may be used with L2 / L2RA lens

PIAT66U Individual angled, threaded




QS18

D11(E)

Q23

SME312

D10SHP

D10HP

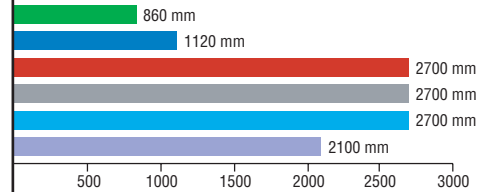
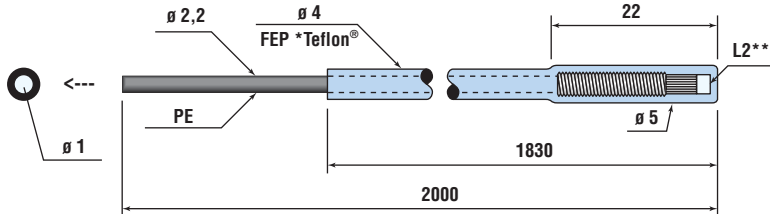
D10HS

D10SHS

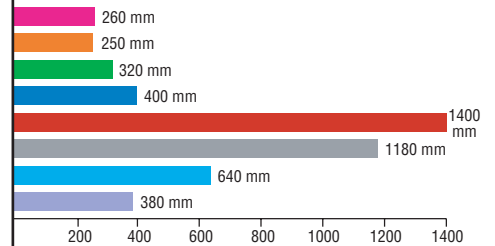
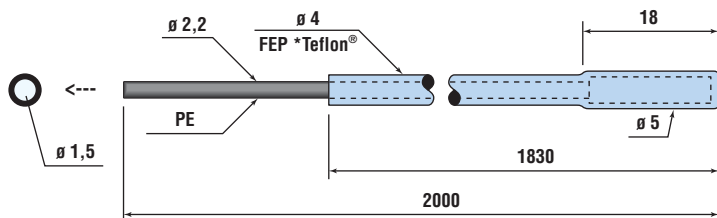
Dimensions (in mm)

Range (in mm)

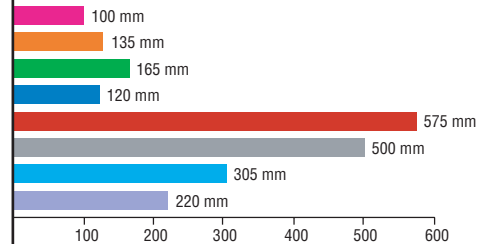
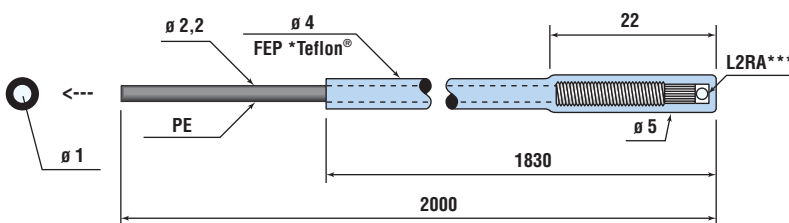
PIE46UT Individual encapsulated; L2 lens added internally



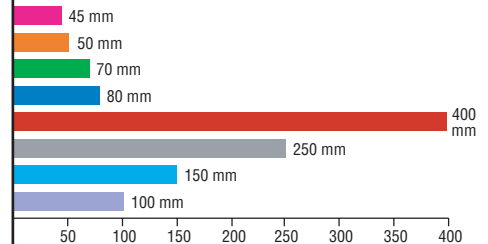
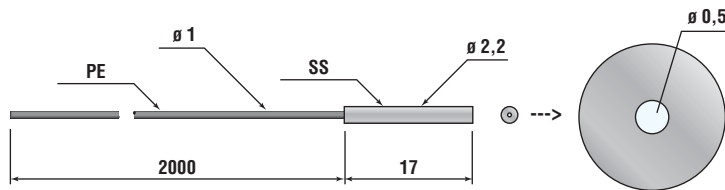
PIE66UTMNL Individual encapsulated



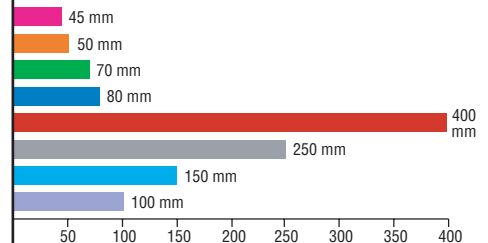
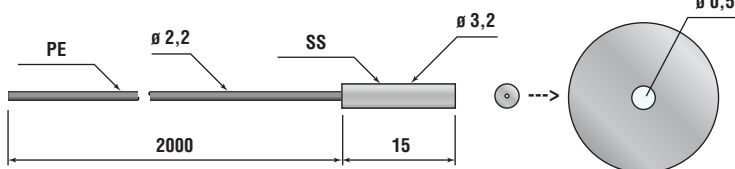
PIES46UT Individual encapsulated; L2RA side-view prism added internally



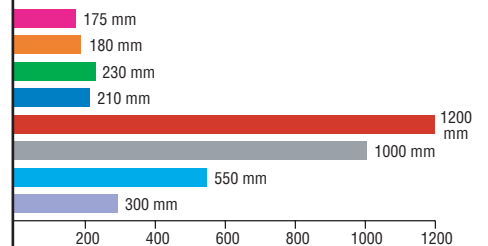
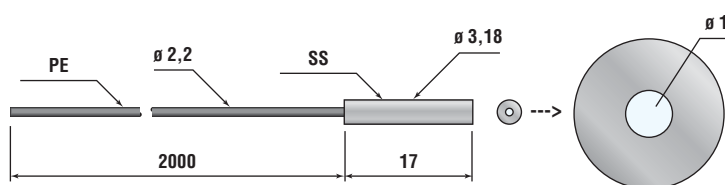
PIF26U Individual ferruled



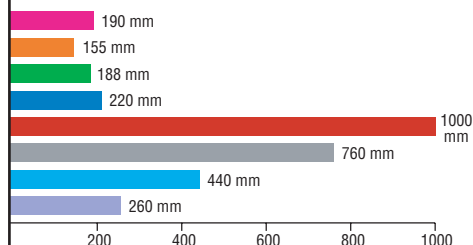
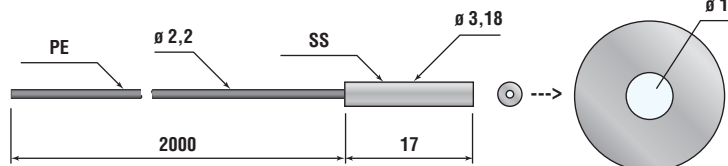
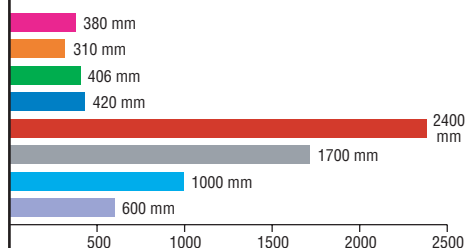
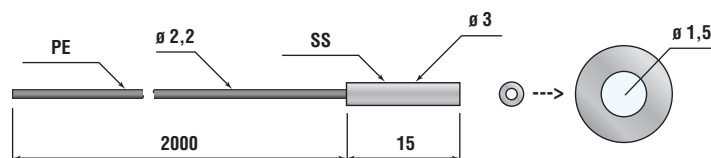
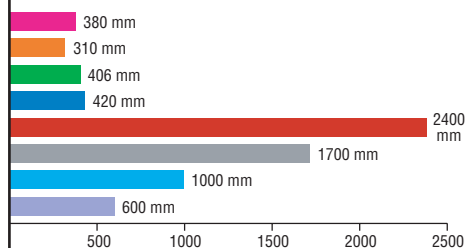
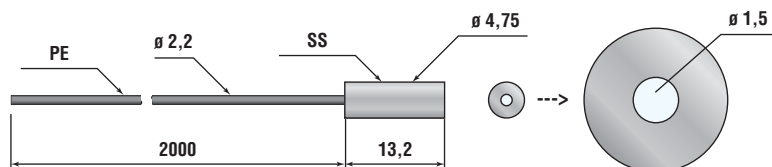
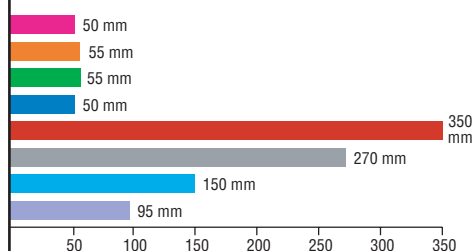
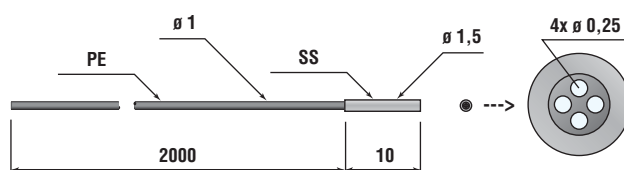
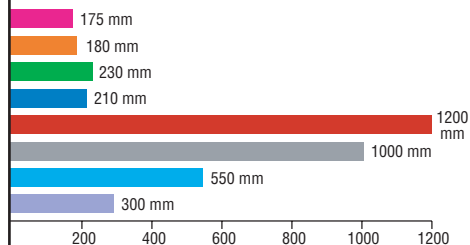
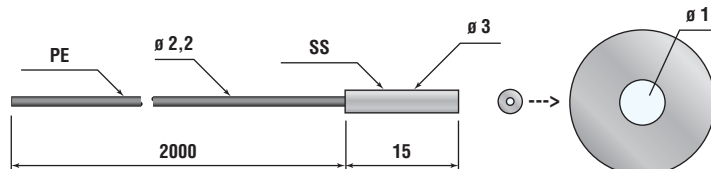
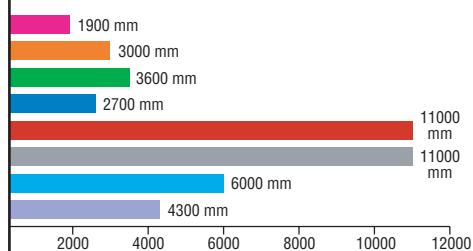
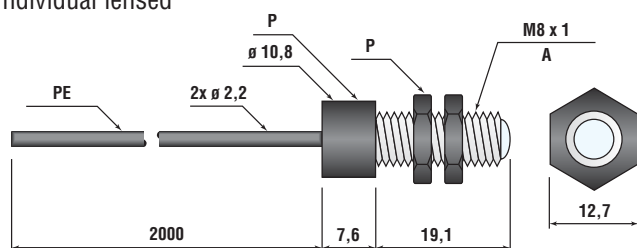
PIF26UMLS Individual ferruled, modified larger diameter (2,2 mm) jacket



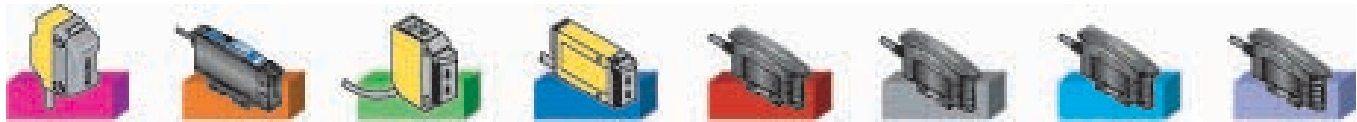
PIF46U Individual ferruled



* Teflon® FEP is a registered trademark of Dupont Co. ** L2 Lens *** L2RA Side-view prism


QS18
D11(E)
Q23
SME312
D10SHP
D10HP
D10HS
D10SHS
Dimensions (in mm)
Range (in mm)
PIF46UHF Individual ferruled, high-flex DuraBend™ cable

PIF66U Individual ferruled

PIF66UM.52M.19D Individual ferruled; use with VFT on ambient side of flange

PIFM1X46U Individual ferruled

PIFM46U Individual ferruled

PIL46U Individual lensed*


* Range chart includes model PIL415U (5 m cable) for extended range applications



QS18

D11(E)

Q23

SME312

D10SHP

D10HP

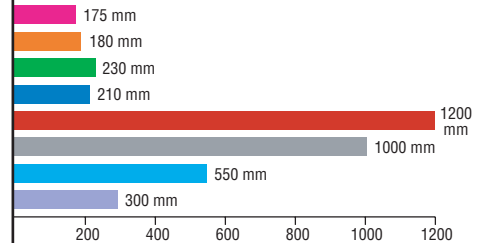
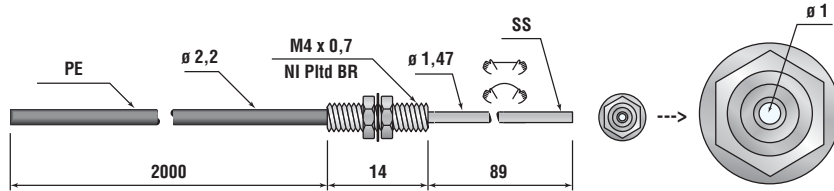
D10HS

D10SHS

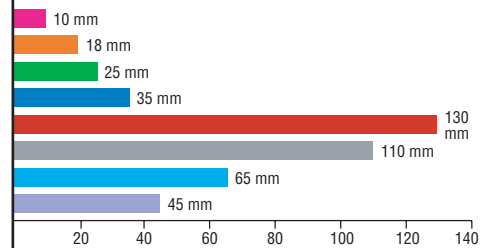
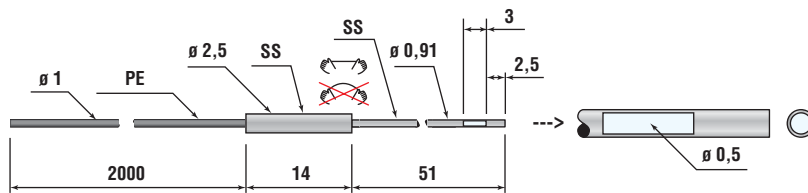
Dimensions (in mm)

Range (in mm)

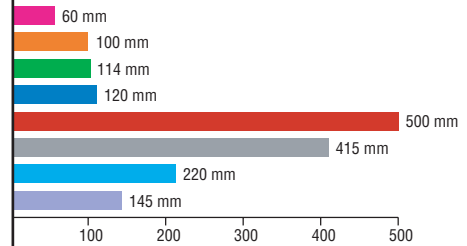
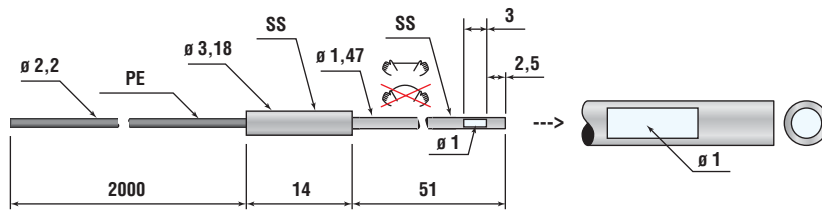
PIP46U Individual probe, bendable



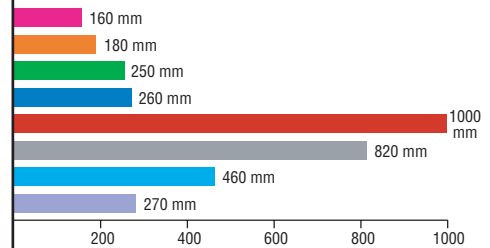
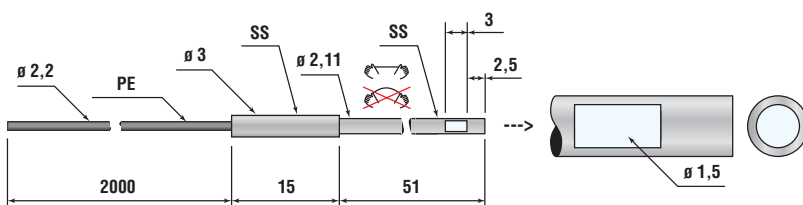
PIPS26U Individual probe, side-view



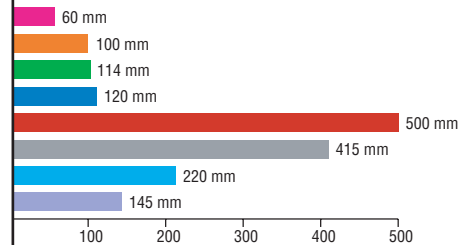
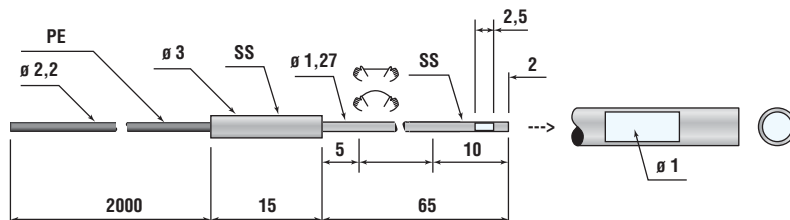
PIPS46U Individual probe, side-view



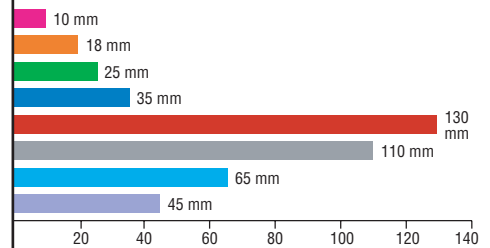
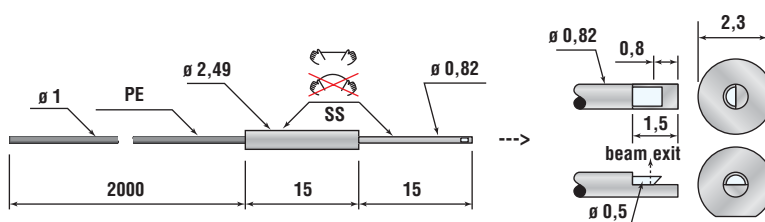
PIPS66U Individual probe, side-view

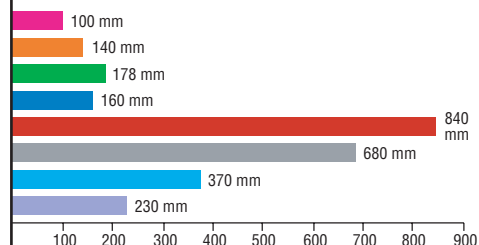
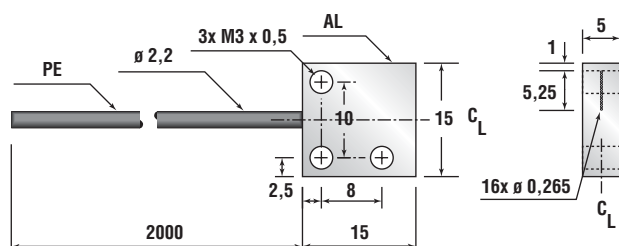
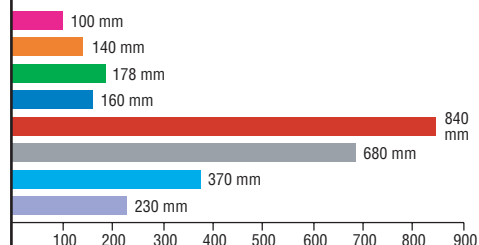
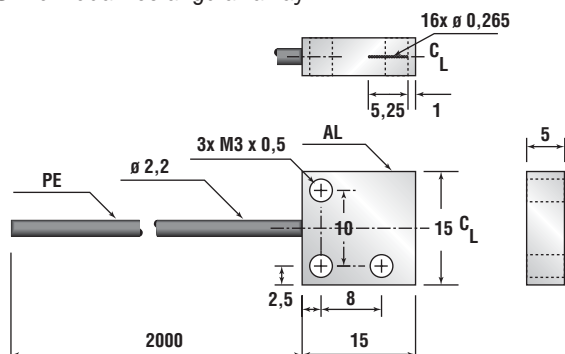
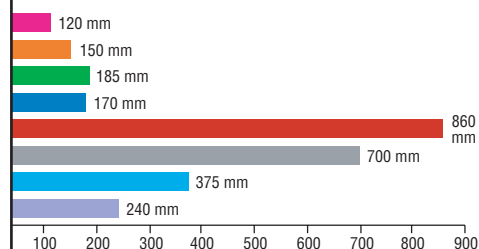
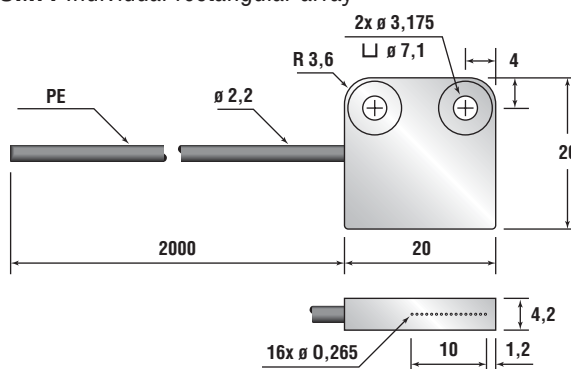
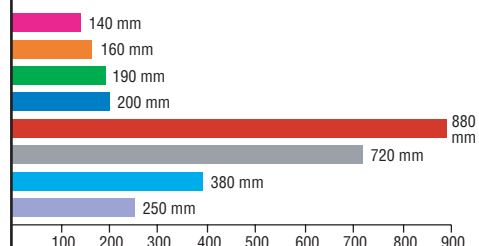
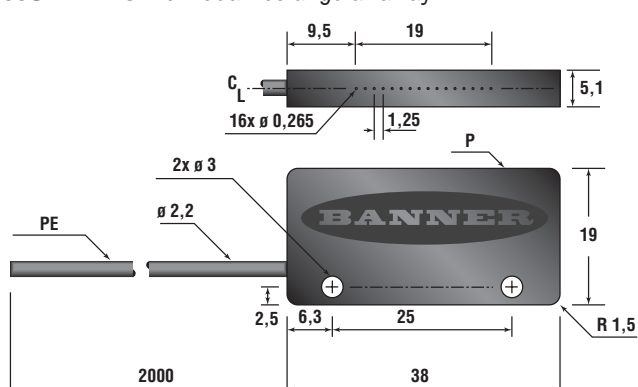


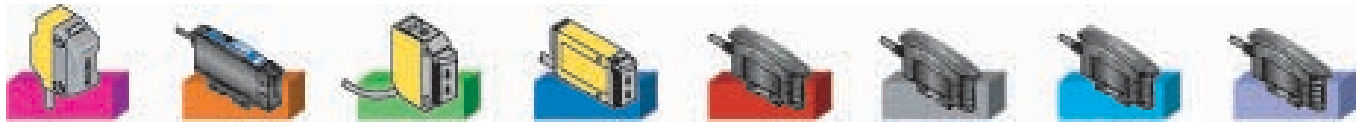
PIPSB46U Individual probe, side-view bendable



PIPSM26U Individual probe, side-view miniature




QS18
D11(E)
Q23
SME312
D10SHP
D10HP
D10HS
D10SHS
Dimensions (in mm)
Range (in mm)
PIR1X166U Individual rectangular array

PIRS1X166U Individual rectangular array

PIRS1X166UM.4 Individual rectangular array

PIRS1X166UMPM.75 Individual rectangular array




QS18

D11(E)

Q23

SME312

D10SHP

D10HP

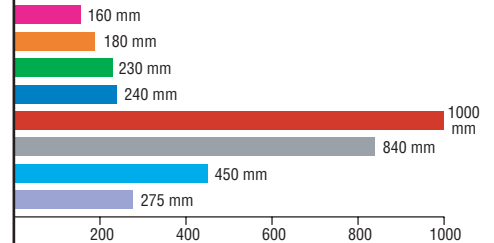
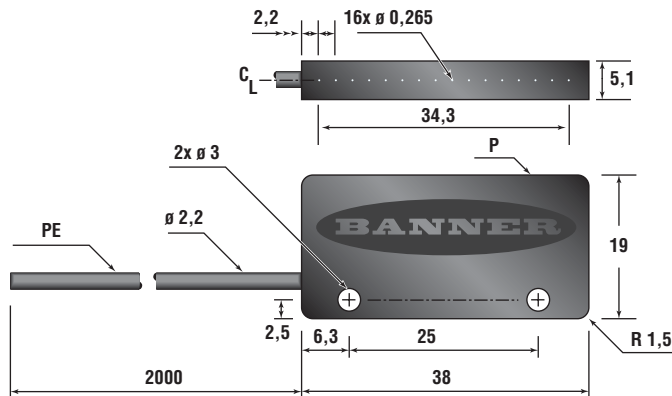
D10HS

D10SHS

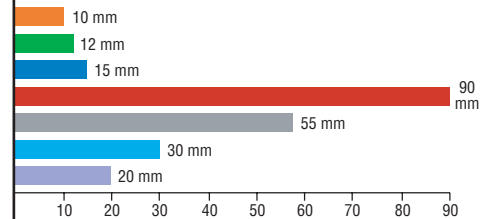
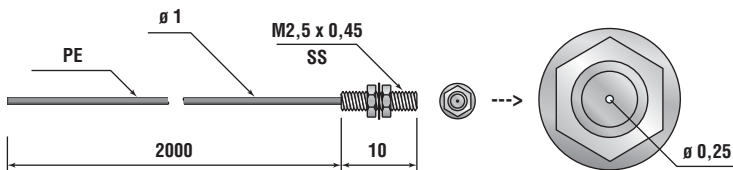
Dimensions (in mm)

Range (in mm)

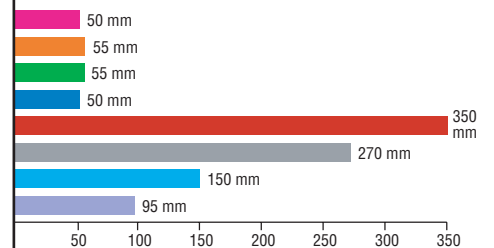
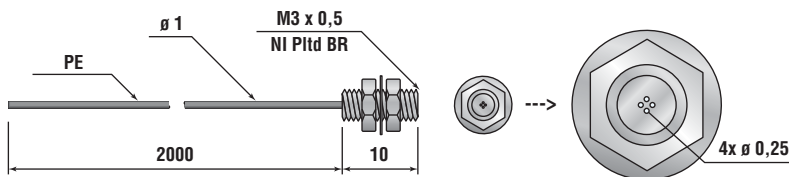
PIRS1X166UMPMAL Individual rectangular array



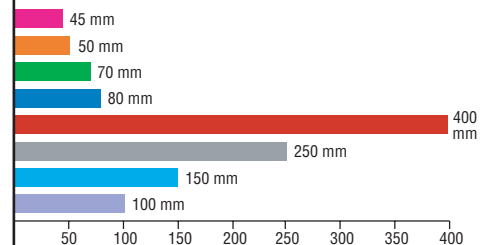
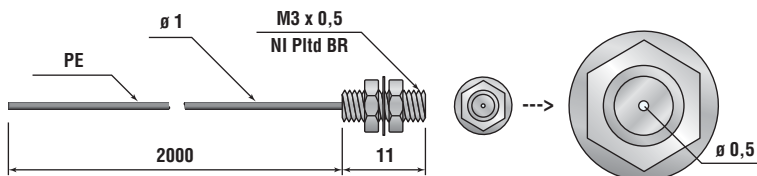
PIT16U Individual threaded



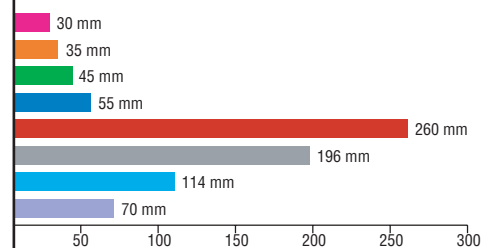
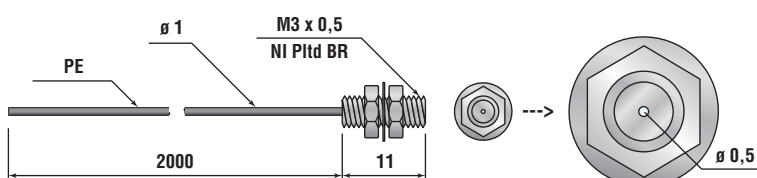
PIT1X46U Individual threaded



PIT26U Individual threaded



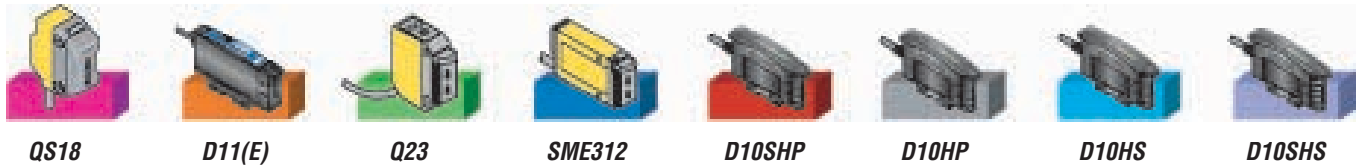
PIT26UHF Individual threaded, high-flex DuraBend™ cable





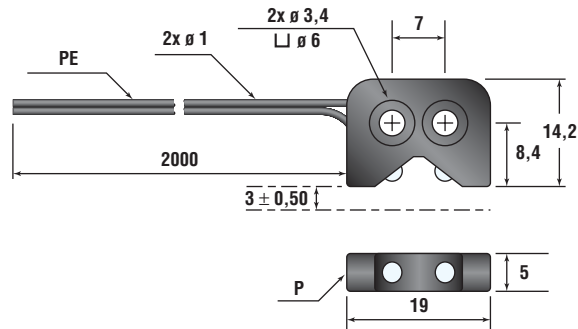
Dimensions (in mm)	Range (in mm)
PIT26UHT1 Individual threaded, high-temperature 125° C cable 	
PIT46U Individual threaded; may be used with L2 or L2RA lens 	
PIT46UC Individual threaded, coiled; may be used with L2 or L2RA lens 	
PIT46UHF Individual threaded, high-flex DuraBend™ cable; may be used with L2 or L2RA lens 	
PIT46UHT1 Individual threaded, high-temperature 125° C cable; may be used with L2 or L2RA lens 	
PIT66U Individual threaded; may be used with L2 or L2RA lens 	

* cross-linked polyethylene (XLPE)

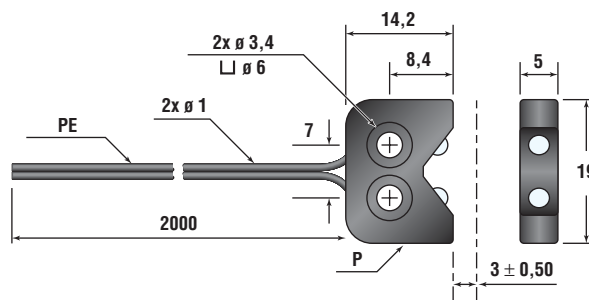


Dimensions (in mm)

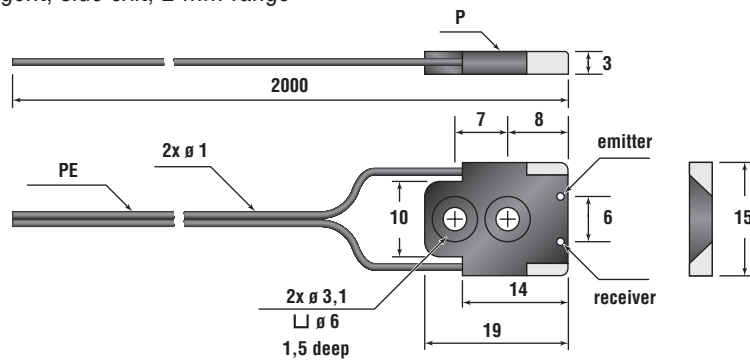
P12-C1 Mechanical convergent, 3 mm range



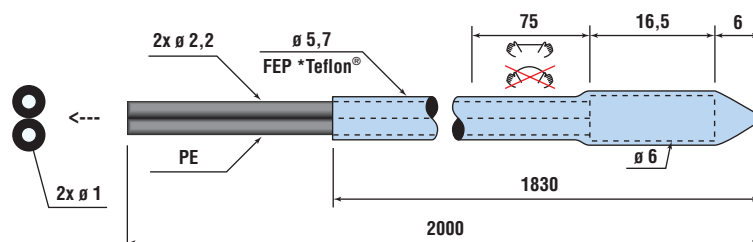
P22-C1 Mechanical convergent, 3 mm range



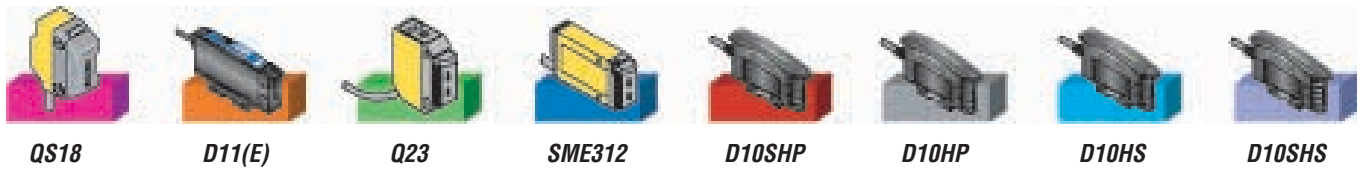
P32-C2 Mechanical convergent, side exit, 2 mm range



PBE46UTMLLP Bifurcated encapsulated liquid-level probe

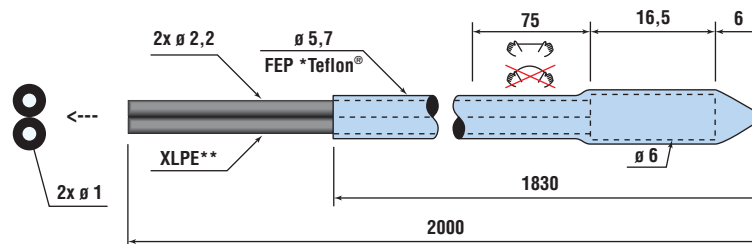


* Teflon® FEP is a registered trademark of Dupont Co.

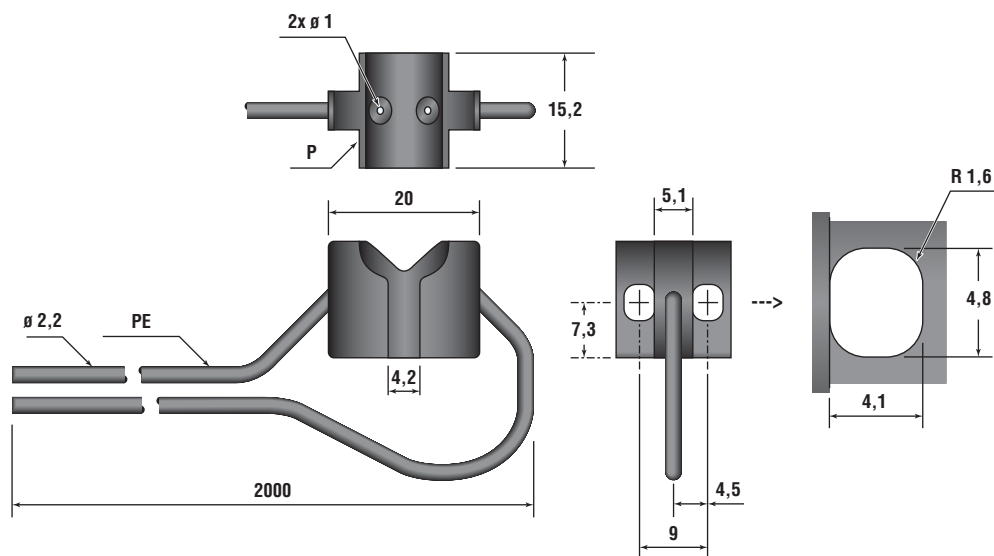


Dimensions (in mm)

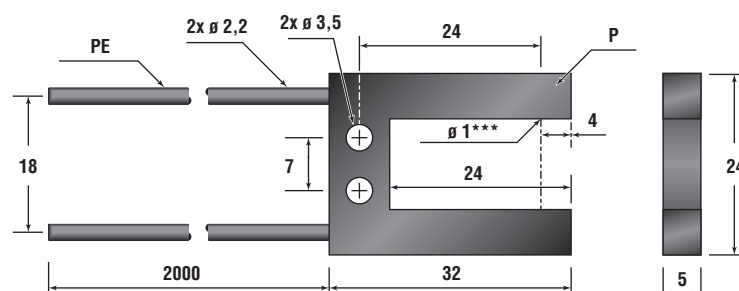
PBE46UTMLLPHT1 Bifurcated encapsulated liquid-level probe, high-temperature 125° C



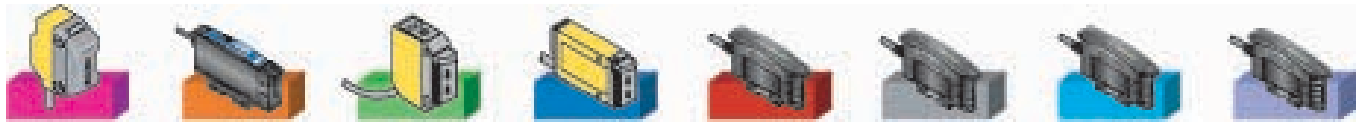
PDI46U-LLD Clamp-on type liquid-level detector; use with clear tube (2-25 mm diameter)



PDIS46UM12 "Slot sensor" fibre, 12 mm gap



* Teflon® FEP is a registered trademark of Dupont Co. ** cross-linked polyethylene (XLPE) *** sensing beam



QS18

D11(E)

Q23

SME312

D10SHP

D10HP

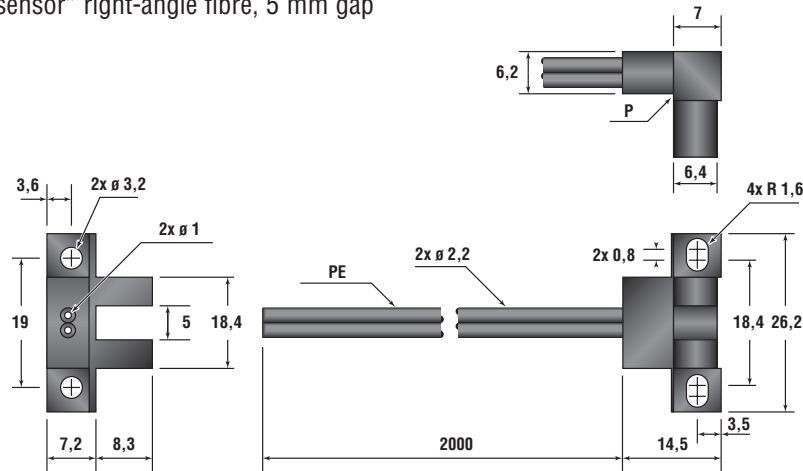
D10HS

D10SHS

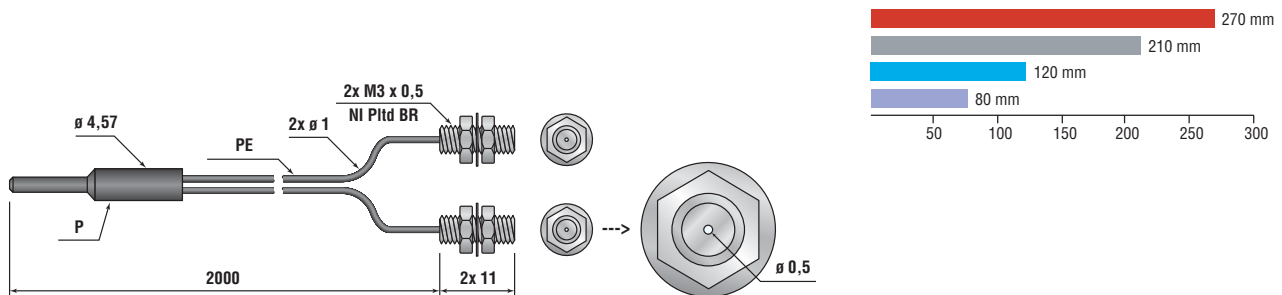
Dimensions (in mm)

Range (in mm)

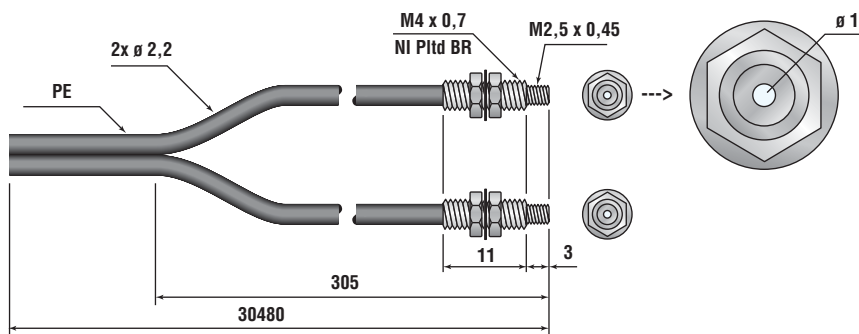
PDISM46UM5MA "Slot sensor" right-angle fibre, 5 mm gap



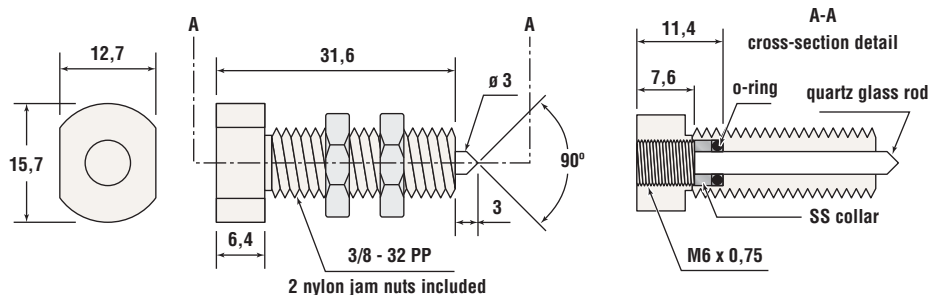
PDIT26T5 Dual individual threaded, D10 sensors ONLY

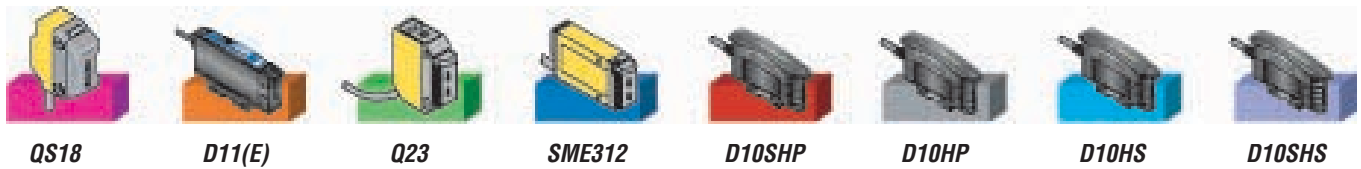


PDIT4100U Dual individual threaded, 30 m duplex plastic fibre cable



TGR3/8MPFMQ Quartz liquid-level probe, 3/8 inch threaded body; use with PBT46U or PBT26UM6M.1

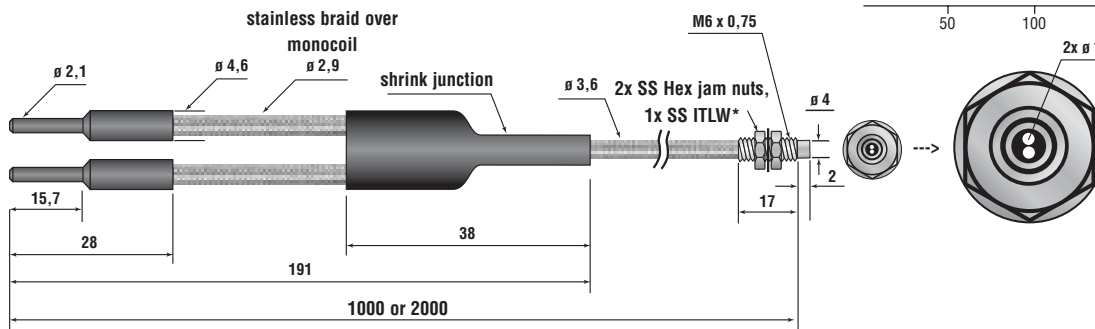
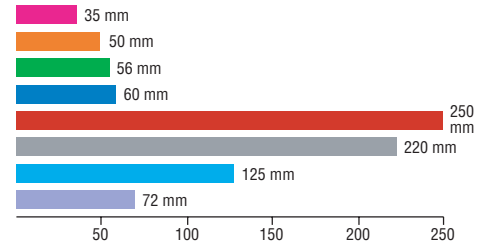


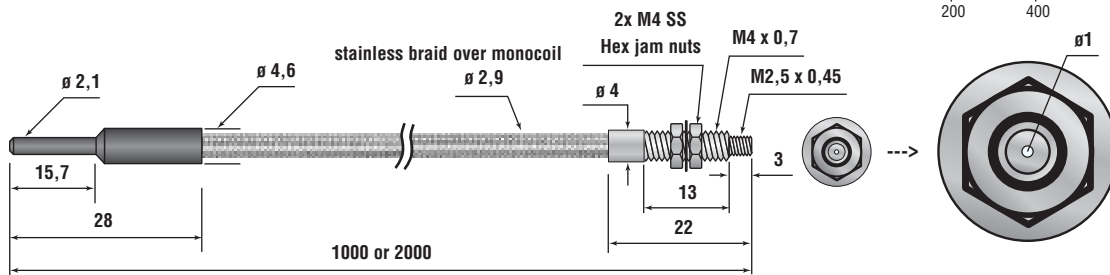
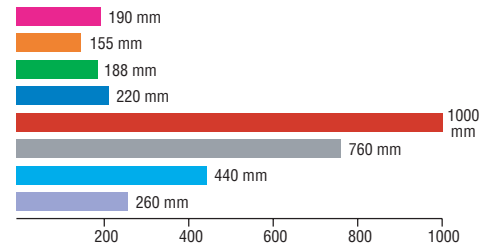


Dimensions (in mm)

Range (in mm)

PBT43TMB5 Heavy-duty bifurcated fibre (1 m length)

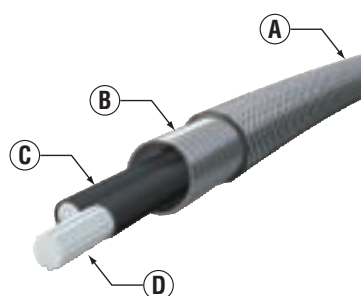
PBT46TMB5 Heavy-duty bifurcated fibre (2 m length)

PIT43TMB5 Heavy-duty individual fibre (1 m length)

PIT46TMB5 Heavy-duty individual fibre (2 m length)


STEELSKIN™ plastic fibres

STEELSKIN™ plastic fibres are built to withstand mechanical abuse, providing a flexible alternative to metal-sheathed glass fibres. STEELSKIN fibres resist kinking, cutting, and snagging, and are robust enough to hold up under conditions where normal plastic fibres may suffer breakage and possible failure.

- Multi-core plastic optical fibre technology
- Easily bent for comfortable embedding into machine profiles without performance loss
- Braided stainless steel “skin” provides aesthetic, low-profile installation



- A Braided stainless steel sheathing
- B Stainless steel monocoil reinforcing wire
- C Polyethylene jacket
- D Multi-core



* ITLW = Internal Tooth Lock Washer

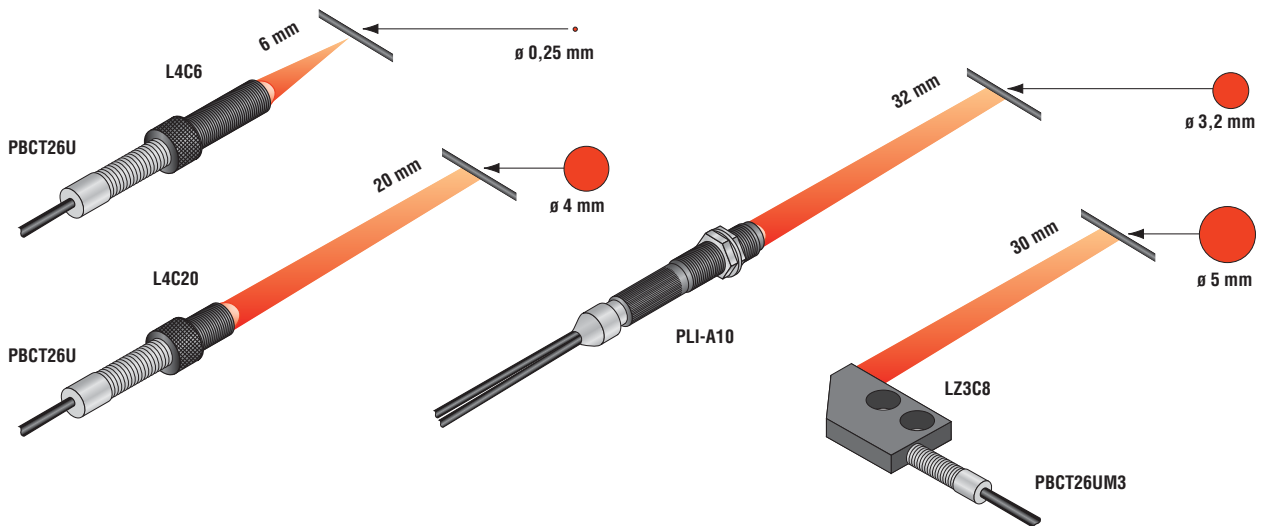
Convergent Spot Lens Attachments

Use with coaxial plastic fibre-optic assemblies with M4 threaded tips

Temperature: -40° to +70° C

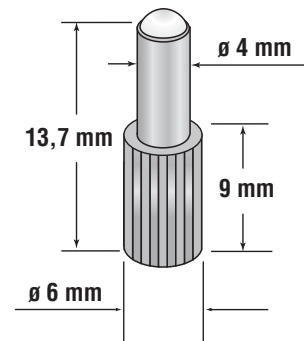
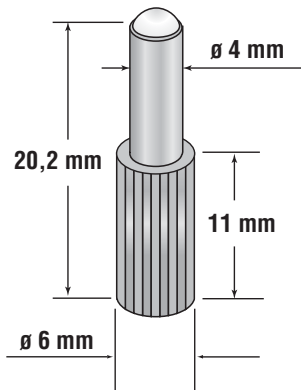
Housing: black anodised aluminum

Lens: acrylic (plastic) or glass



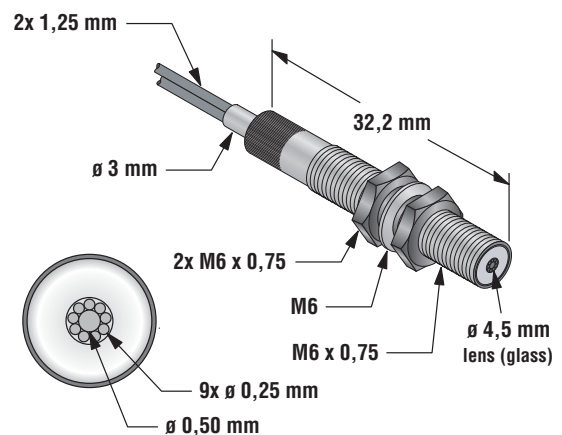
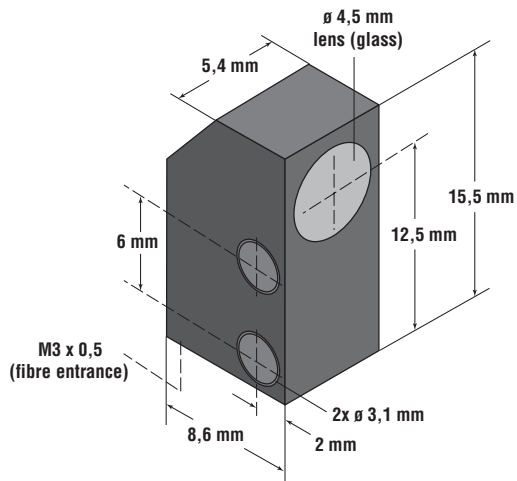
L4C6 Distance: 6 mm $\pm$ 1 mm

L4C20 Distance: 20 mm $\pm$ 1 mm



LZ3C8 Distance: 8 mm to 32 mm

PLI-A10 Distance: 8 mm to 30 mm
(with 2 m fibre attached)



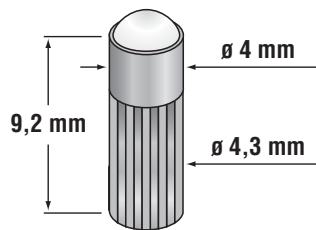
Range-extending Lens Attachments

L2

Temperature: -60° to +350° C

Housing: nickel plated brass

Lens: glass



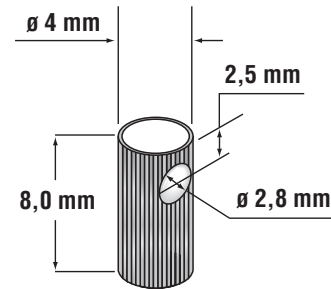
L2RA, 90° Right-Angle Attachment

Temperature: -60° to +300° C

Housing: nickel plated brass

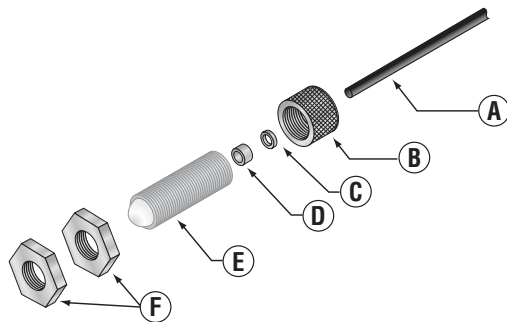
Prism: glass

(Use L2 and L2RA with M2.5 threaded fibre tips, such as PIT46U and PIT46UC)



L08FP, PIL46U & PIL415U

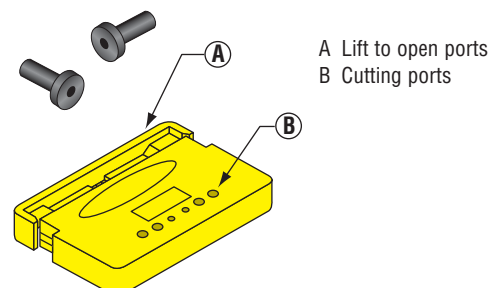
- The easily installed L08FP lens assembly may be used to extend the opposed-mode sensing range of 1 mm unterminated plastic fibre-optic models PIU430U or PIU460U.
- A pair of 2 m long 1 mm diameter individual fibres with factory-installed model L08FP lenses is available as plastic fibre-optic assembly model PIL46U. A 5 m version is also available, use model PIL415U.



- A Ø 1 mm plastic core diameter
- B Nut
- C Compression washer
- D Compression gasket
- E Lens, M8 x 1
- F Mounting nuts

Plastic Fibre Kits

These kits are used with the unterminated plastic fibre cables. The **PFK20** is for use with the 0,25 mm and 0,5 mm diameter cables. The **PFK40** is for the 1 mm and 1,5 mm diameter cables. Each kit contains 40 bushings and 10 cutter assemblies.

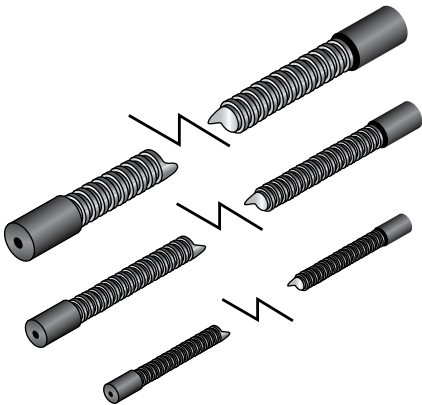


- A Lift to open ports
- B Cutting ports

Plastic Fibre Field-Installable Sheathing

PFS69S6T
PFS53S6T
PFS44S6T

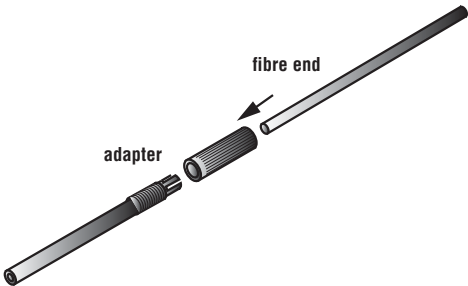
- Stainless steel sheathing with stainless steel end fittings (one end internally threaded to capture fibre end tips, other end non-threaded), is used in applications where protection is required for plastic fibre-optic cables.
- PFS69S6T may be used with bifurcated fibre assemblies having M6 x 0.75 threaded end tips (e.g., PBCT46U, PBP46U, PBT46UHT1, and PBT66U).
- PFS53S6T may be used with individual or bifurcated fibre assemblies having M4 x 0.7 threaded end tips (e.g., PBCT26U, PBPF26U, PIP46U, PIT46U, PIT46UHT1, and PIT66U).
- PFS44S6T may be used with individual fibre assemblies having M3 x 0.5 threaded end tips (e.g., PIP26U, PIT26U, PIT1X46U, and PITF26U).
- All models listed are 2 m in length.
- Other lengths are available by contacting Banner Applications Department.



Plastic Fibre Adapters

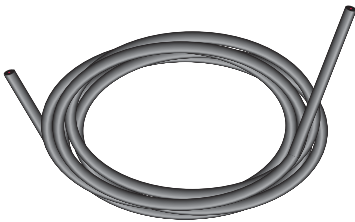
UPFA-1-100
UPFA-2-100

- Compression fitting adapters used with small-diameter unterminated plastic fibre cables.
- Use when interfacing small-diameter plastic fibres to QS18, Q23, R55F, D11, D12, D10, and MINI-BEAM plastic fibre sensor families.
- Use UPFA-1 to adapt plastic fibre-optic cables with outside jacket diameter of 1 mm, such as PITZ6U and PB16U.
- Use UPFA-2 to adapt plastic fibre-optic cables with outside jacket diameter of 1.25 mm or 1.3 mm, such as PBCT26U and PBF46UM3MJ1.3.
- Each kit contains 100 pairs of adapters. One pair will interface either one bifurcated fibre-optic cable or a pair of individual cables to a fibre-optic amplifier.



Unterminated Individual and Bifurcated Plastic Fibres

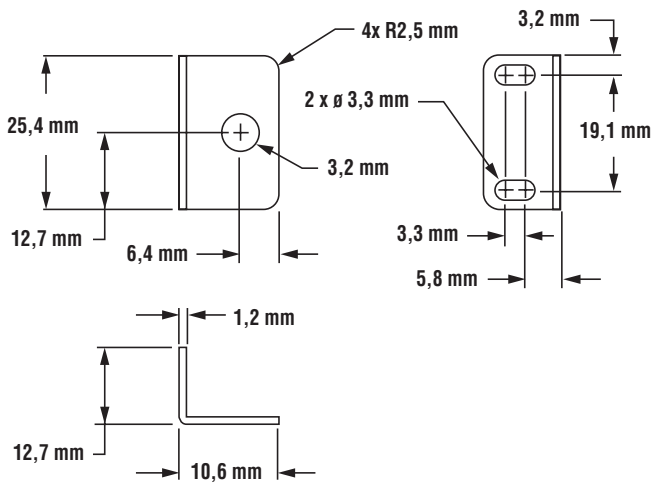
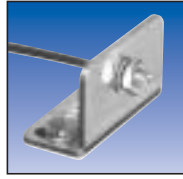
MODEL	CORE	LENGTH	TYPE
PIU230U	0,5 mm	9 m	Single
PIU260U	0,5 mm	18 m	Single
PIU430U	1 mm	9 m	Single
PIU460U	1 mm	18 m	Single
PIU630U	1,5 mm	9 m	Single
PIU660U	1,5 mm	18 m	Single
PBU430U	1 mm	9 m	Duplex
PBU460U	1 mm	18 m	Duplex



Fibre-optic Mounting Brackets

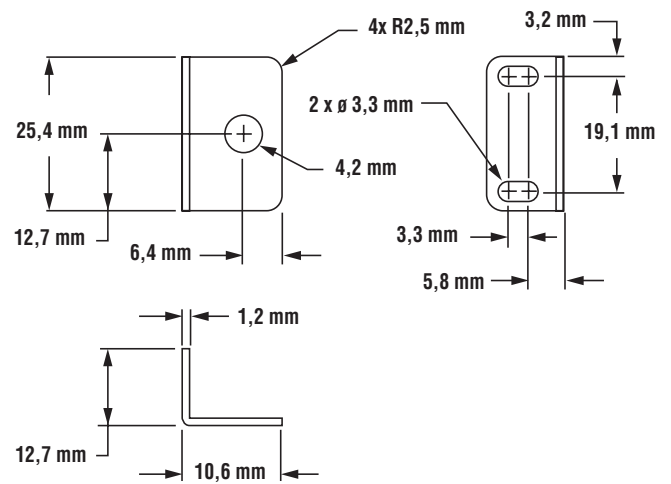
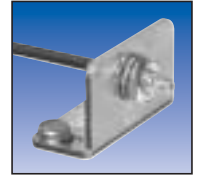
SMBFP3

- Right-angle bracket for plastic fibre-optics with 3 mm threaded tip
- Stainless steel (1,2 mm)



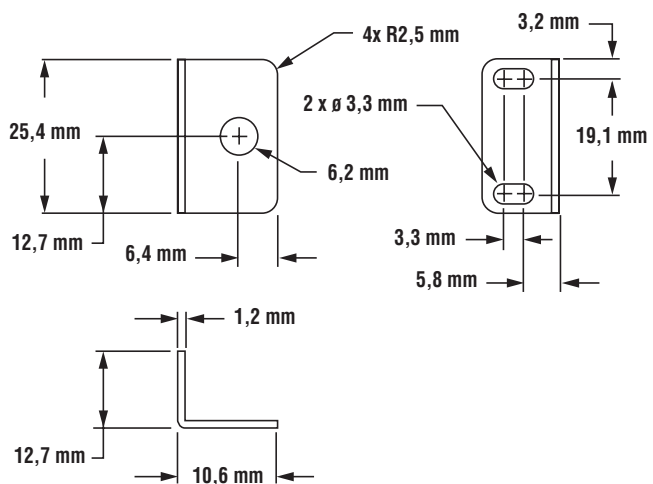
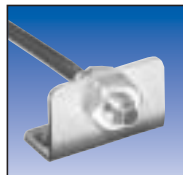
SMBFP4

- Right-angle bracket for plastic fibre-optics with 4 mm threaded tip
- Stainless steel (1,2 mm)



SMBFP6

- Right-angle bracket for plastic fibre-optics with 6 mm threaded tip
- Stainless steel (1,2 mm)



SMBFP4N

- Low-profile bracket for plastic fibre-optics with 4 mm threaded tip
- Stainless steel (1,2 mm)

