Plastic Fibers

Datasheet

Plastic fiber optics usually have a large, monofilament core that comes in a single strand. Advances in LED technology have improved the performance and range of plastic fiber optic sensing systems to the point that they are nearly equivalent to glass fibers. Plastic fibers are a versatile, cost-effective choice for many fiber optic sensing applications.

- 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 for difficult-to-access locations, without the decreased performance to which excessively bent standard plastic fibers optics are prone
- Unterminated models can be cut to length in the field

Opposed mode 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 Fiber Models

Diffuse Retlecove Mode—Bifurcated Models					
Model	Length (m)	Bundle Diameter (mm)	Range	Description	
PBCT46U	2	1 mm and 16 x 0.25 mm	DF-G1: 220 mm (8.7 in) D10D: 345 mm (13.6 in) D10B: 145 mm (5.7 in) D10A: 120 mm (4.7 in)	Coaxial fiber with an M6 threaded tip; unterminated straight cable	
PBT26U	2	0.5	DF-G1: 80 mm (3.1 in) D10D: 150 mm (5.9 in) D10B: 38 mm (1.5 in) D10A: 25 mm (1 in)	Bifurcated fiber with an M3 threaded tip; unterminated straight cable	
PBT26U-VL	2	0.5	DF-G1: 65 mm (2.6 in) DF-G2: 105 mm (4.1 in) DF-G3: 503 mm (19.8 in)	Vantage Line; bifurcated fiber with an M3 threaded tip; unterminated straight cable with flex relief	

Diffuse Reflective Mode—Bifurcated Models					
Model	Length (m)	Bundle Diameter (mm)	Range	Description	
PBT415U	5	1	DF-G1: 180 mm (7.1 in) D10D: 250 mm (9.8 in) D10B: 85 mm (3.3 in) D10A: 72 mm (2.8 in)	Bifurcated fiber with an M6 threaded tip; unterminated straight cable	
PBT46U	2	1	DF-G1: 220 mm (8.7 in) D10D: 300 mm (11.8 in) D10B: 100 mm (3.9 in) D10A: 85 mm (3.3 in)	Bifurcated fiber with an M6 threaded tip; unterminated straight cable	
PBT46U-VL	2	1	DF-G1: 186 mm (7.3 in) DF-G2: 301 mm (11.8 in) DF-G3: 1443 mm (56.8 in)	Vantage Line; bifurcated fiber with an M3 threaded tip; unterminated straight cable with flex relief	
PBT66U	2	1.5	DF-G1: 310 mm (12.2 in) D10D: 475 mm (18.7 in) D10B: 200 mm (7.9 in) D10A: 170 mm (6.7 in)	Bifurcated fiber with an M6 threaded tip; unterminated straight cable	

Opposed Mode—Individual Fiber Models					
Model	Length (m)	Bundle Diameter (mm)	Range	Description	
PDIS46UM12	2	1	DF-G1: 12 mm (0.5 in) D10D: 12 mm (0.5 in) D10B: 12 mm (0.5 in) D10A: 12 mm (0.5 in)	Slot sensing head to; unterminated straight cable	
PIAT46U	2	1	DF-G1: 840 mm (33.1 in) D10D: 1200 mm (47.2 in) D10B: 320 mm (12.6 in) D10A: 275 mm (10.8 in)	M2.5 and M4 threaded tip with an angled probe; unterminated straight cable	
PIAT46UHFMTA	2	1	DF-G1: 440 mm (17.3 in) D10D: 1000 mm (39.4 in) D10B: 330 mm (13 in) D10A: 230 mm (9.1 in)	M2.5 and M4 threaded tip to right angle; unterminated straight DuraBend cable	
PIPS49TMB5MFF	2.7	1		Probe with sideview exit; SteelSkin sheathing with TMB5 Termination	
PIRS1X166UMPMAL	2	16 x 0.25 mm	DF-G1: 680 mm (26.8 in) D10D: 1000 mm (39.4 in) D10B: 300 mm (11.8 in) D10A: 260 mm (10.2 in)	Rectangular body with 33.5mm long sideview array; unterminated straight cable	

Opposed Mode—Individual Fiber Models					
Model	Length (m)	Bundle Diameter (mm)	Range	Description	
PIT26U	2	0.5	DF-G1: 220 mm (8.7 in) D10D: 400 mm (15.7 in) D10B: 95 mm (3.7 in) D10A: 75 mm (3 in)	M3 threaded tip; unterminated straight cable	
PIT46U	2	1	DF-G1: 820 mm (32.3 in) D10D: 1200 mm (47.2 in) D10B: 320 mm (12.6 in) D10A: 300 mm (11.8 in)	M2.5 and M4 threaded tip; unterminated straight cable	
PIT46UHF	2	1	DF-G1: 400 mm (15.7 in) D10D: 1000 mm (39.4 in) D10B: 330 mm (13 in) D10A: 230 mm (9.1 in)	M2.5 and M4 threaded tip; unterminated straight cable	
PIT46U-VL	2	1	DF-G1: 558 mm (22 in) DF-G2: 904 mm (35.6 in) DF-G3: 4335 mm (170.7 in)	M2.6 and M4 threaded tip; flex relief; unterminated straight cable; Vantage Line	
PIT66U	2	1.5	DF-G1: 1320 mm (52 in) D10D: 2400 mm (94.5 in) D10B: 600 mm (23.6 in) D10A: 525 mm (20.7 in)	M2.5 and M4 threaded tip; unterminated straight cable	

Cut the Plastic Fiber

An unterminated plastic fiber is designed to be cut by the customer to the length required for the application. To facilitate cutting, a Banner model PFC-4 cutting device is supplied with this fiber.

1. Locate the non-terminated end, and determine the length of fiber required for the application.
2. Lift the top of the cutter to open the cutting ports.
3. Insert the non-terminated end through one of the four large cutting ports on the PFC-4 cutter so that the excess fiber protrudes from the back of the cutter.
4. Double-check the fiber length, and close the cutter until the fiber is cut.
5. Gently wipe the cut ends of the fiber with a clean, dry cloth to remove any contamination.

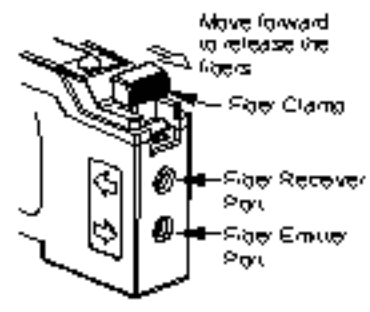
Note: Do not use solvents or abrasives on any exposed optical fiber. Do not use a cutting port more than once. The blade may tend to dull after one cut.

Installation Instructions

Installing the Fibers in a DF-Gx Sensor

Follow these steps to install glass or plastic fibers.

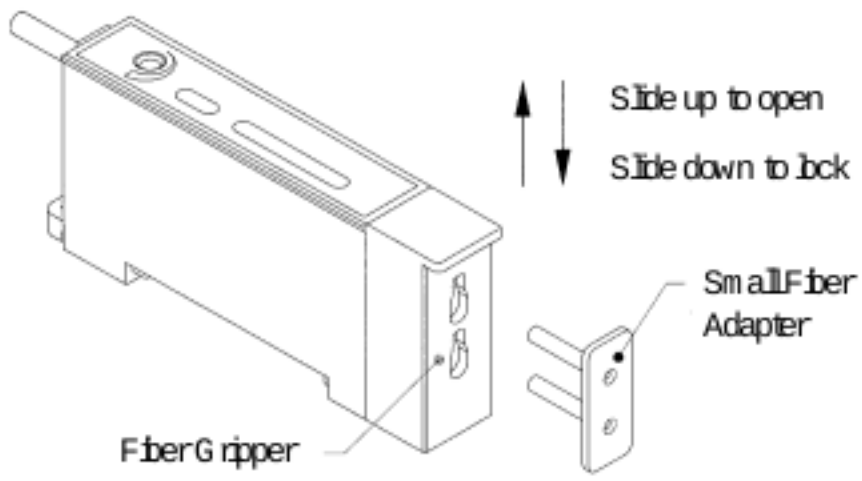
1. Open the dust cover.
2. Move the fiber clamp forward to unlock it.
3. Insert the fiber(s) into the fiber port(s) until they stop.
4. Move the fiber clamp backward to lock the fiber(s).
5. Close the dust cover.



Note: For optimum performance of IR models, if applicable, glass fibers must be used.

Installing Plastic Fibers in a D11 or D12 Sensor

Follow these steps to install plastic fibers.



1. Cut the fiber ends according to the instructions included with the fibers.
2. Slide the fiber gripper up (open).
3. If you are using 0.254 mm (0.01 in) or 0.508 mm (0.02 inch) diameter fibers Insert the adaptor into the ports as far as it will go.
4. For all fiber diameters: Insert the prepared plastic fiber sensor ends gently into the ports as far as they will go.
5. Slide the fiber gripper back down to lock it.

Installing Plastic Fibers on a MINI-BEAM

Follow these instructions to install plastic fibers into your sensor. MINI-BEAMS may have either a fiber gripper or a clamp screw. MINI-BEAM and ECONO-BEAM sensors for use with plastic fiber optic assemblies include sensors with the letters FP in their model number.

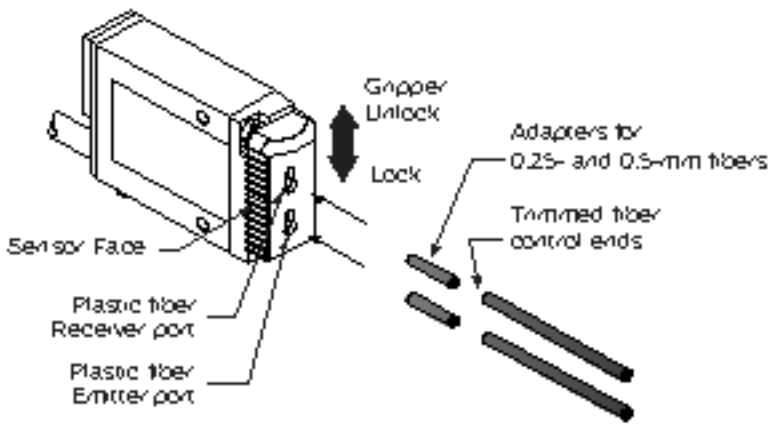


Figure 1. MINI-BEAM with fiber grippers

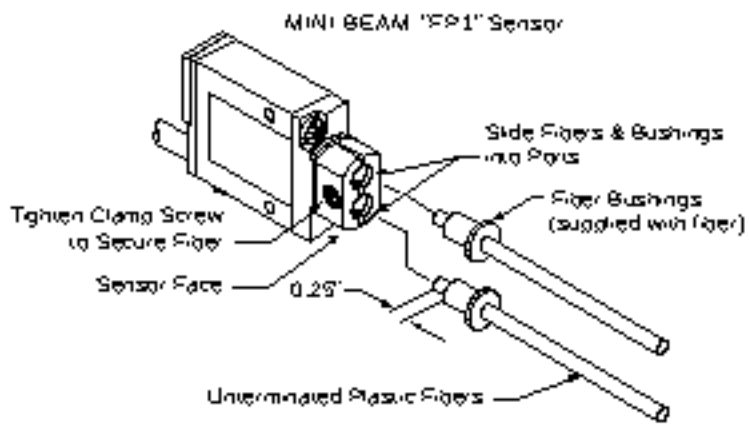
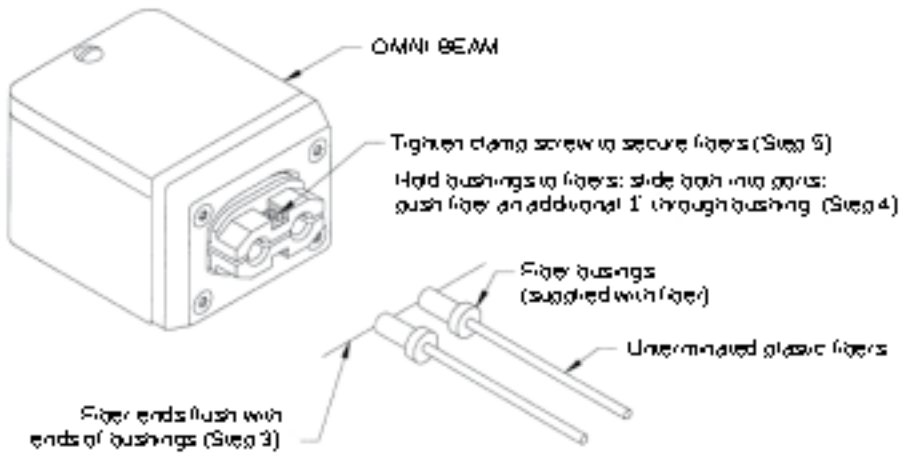


Figure 2. MINI-BEAM with clamp screws

1. Prepare the sensor ends of the fibers (see Cut the Plastic Fiber on p. 3).
2. Prepare the sensor for the fibers.
   - For models with a fiber gripper: Unlock the fiber gripper as shown in the figure and apply the appropriate fiber adaptors to the fiber, if needed.
   - For models with a clamp screw: Loosen the clamp screw on the sensor face.
3. Insert the plastic fibers.
   - For models with a fiber gripper: Gently insert the prepared fiber ends into the ports as far as they will go.
   - For models with a clamp screw: Align the fiber ends flush with the ends of the bushings as shown. Hold the bushings to the fibers and slide both into the sensor ports. Push the fiber an additional 1 inch through the bushing.
4. Lock in the fibers.
   - For models with a fiber gripper: Slide the fiber gripper back to lock, as shown in the figure.
   - For models with a clamp screw: Tighten the clamp screw to secure the fibers.

Installing the Plastic Fibers on a MAXI-BEAM, VALU-BEAM, or Q45 Sensor

MAXI-BEAM, VALU-BEAM, and Q45 Series sensors for use with plastic fiber optic assemblies include sensors with the letters FP in their model number suffix.



1. Prepare the sensor ends of the fibers (see Cut the Plastic Fiber on p. 3).
2. Loosen the clamp screw on the sensor face.
3. Align the fiber ends flush with the ends of the bushings as shown.
4. Hold the bushings to the fibers and slide both into the sensor ports. Push the fiber an additional 1 inch through the bushing.
5. Tighten the clamp screw to secure the fibers.

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Sensing Range

Refer to the specific fiber optic/sensor combination

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

See www.bannerengineering.com
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.

Operating Temperature

–30 °C to +70 °C (–22 °F to +158 °F) unless otherwise specified

Temperature Extremes

Temperatures below –30 °C cause the plastic to become brittle, but will not cause transmission loss.
Temperatures above +70 °C cause both transmission loss and fiber shrinkage.

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

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

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. Teflon coated fibers are also available.

Application Notes and Warnings

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.

Terminated plastic fiber assemblies are optically ground and polished and cannot be shortened, spliced, or otherwise modified.

Do not subject the plastic fibers to sharp bends, pinching, high tensile loads, or high levels of radiation.

When ordering fiber lengths in excess of 2 m, take into account light signal attenuation because of the additional length.

Because of their light transmission properties, plastic fiber optics are recommended for use only with visible light fiber optic sensors.

Use caution when applying fiber optics in hazardous locations. Although fiber optic assemblies are, by themselves, intrinsically safe, the sensor and associated electronics must be LOCATED IN A SAFE ENVIRONMENT. Alternatively, fiber optics may be used with NAMUR sensor model Q45AD9FP. Fiber optics do not necessarily provide a hermetic seal between a hazardous environment and the safe environment.

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