



**BANNER**<sup>®</sup>  
the photoelectric specialist

**D10 EXPERT™**  
Analog/Discrete  
Fiber Optic Sensor

## D10 Expert™: Redefining high-performance fiber optic sensing.

### Ultimate power & performance in low-contrast applications.

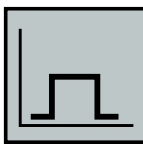
With its advanced 16-bit microprocessor and 12-bit A/D resolution, the new D10 Expert fiber optic sensor can solve the most difficult sensing applications, even when contrast is as low as 1% or less. Using its advanced “teachable” microprocessor, the sensor can learn the light and dark sensing conditions, compute the most accurate setting for recognizing the difference in received light signals, and self-program that setting.

### Two independently configurable outputs in each sensor.

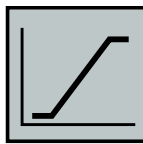
For the ultimate in versatility, the D10 Expert is available with two independent output channels, each with its own individually-configurable setpoint. This allows you to solve multiple applications with a single sensor.

*Two discrete outputs* both can be either NPN (sinking) or PNP (sourcing), depending on model.

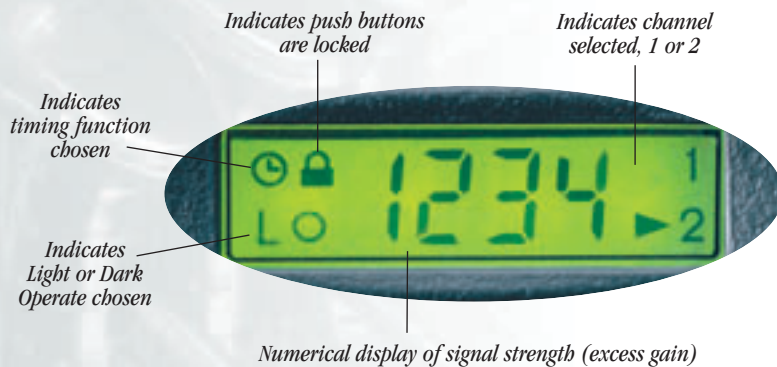
*Analog and discrete output* models have either an NPN (sinking) or PNP (sourcing) discrete output plus a 4-20 mA current analog output or a 0-10V dc voltage analog output, depending on the model (see model selection, page 8).



Discrete



Analog



Display instantly tells you if your application setup is PASS or FAILED. After setup, display changes from red to green.



### Advanced LCD digital display.

Use the most advanced diagnostics with Banner's all-new digital display of sensor configuration and performance. The display continuously shows whether the sensor is in setup or run mode, how it is configured and the strength of the sensing signal. This can save significant setup and diagnostics time.



## The most advanced setup & programming available.

### Three easy microprocessor-based programming options.

#### 1 Dynamic TEACH programs the sensor “on-the-fly.”

Dynamic TEACH enables the D10 to sample the sensing events, “learn” a series of conditions “on-the-fly,” and compute the optimum threshold between “light” and “dark” conditions; it then self-programs that setting and periodically updates it to compensate for any changes in sensing conditions during operation.

#### 2 Static TEACH computes each sensing condition individually.

In Static TEACH mode, you simply present the output “on” condition and push one button to “teach” or program that condition. Simply repeat the procedure for the “off” condition and the sensor computes the optimal setting.

#### 3 Single-Point Static TEACH sets a single ON condition.

Single-point Static TEACH programs the sensor to accept only a single ON condition. Discrete outputs do not conduct when any other condition is sensed; analog outputs are scaled so that the condition taught falls at the mid-point of the output range.

#### Manual adjustment allows fine-tuning to the exact desired threshold.

To fine-tune your application settings, you can manually override any pre-selected settings simply by pushing the “plus” or “minus” buttons. This ability to customize your settings gives you even greater flexibility and precision.

#### Unique scalable analog output.

Unlike conventional analog sensors, D10 *Expert* analog outputs are automatically scaled between your desired sensing setpoints. This unique feature speeds setup.

#### Select light-operate, dark-operate, channel display, and timing functions.

When in setup mode, the D10 *Expert* is easily programmed for outputs to operate in the “Light” or “Dark” condition. You can select which channel (one or two) you would like to view on the digital display, and select timing functions.



#### Remote programming.

For maximum convenience and easier access when programming hard-to-reach sensors, TEACH-mode programming can also be accomplished from a remote location using an external switch, a computer or a PLC. The push buttons may be locked remotely, providing added security by preventing tampering with the sensor adjustments.





## D10 Expert™: Rich in features that make manufacturing more efficient.



### Gate input allows parts to enter without triggering the outputs.

The D10 *Expert* gate input feature temporarily suspends the sensor's output operation, allowing parts to enter or exit the sensing area without falsely triggering the sensor outputs. This feature is useful for controlling the point that outputs are allowed to change state.

### Protective cover.

A transparent dust cover allows you to see the display while it protects the sensor from dust and other contaminants. A captive hinge holds the cover open until it is manually closed.

### LED diagnostics.

Indicator LEDs keep you constantly informed of the output status of the D10 sensors.

A separate, domed LED for each channel lights yellow when the output is conducting.

### Versatile fiber interface.

The D10 accommodates large core 0.75 mm, 1.0 mm and 1.5 mm (.03", .04", and .06") and small core 0.25 mm and 0.5 mm (.01" and .02") polyethylene jacketed plastic fibers. Banner's unique locking mechanism holds all sizes securely in place.



### Visible Red or Green sensing beams available.

Choose red or green emitter LED colors to optimize the D10's sensitivity to target colors and maximize performance.

### Immune to crosstalk & noise.

The D10 has built-in protocols to prevent noise and crosstalk interference. Multiple units can be mounted side-by-side or adjacent to other components without problems.

### Prewired or quick-disconnect wiring, 12 to 24V dc.\*

The D10 has the wiring choices you need.

Models are available with an integral, 2 m or 9 m (6' or 30')

prewired cable or Pico-style quick-disconnect connection for plug-and-play convenience and interchangeability.

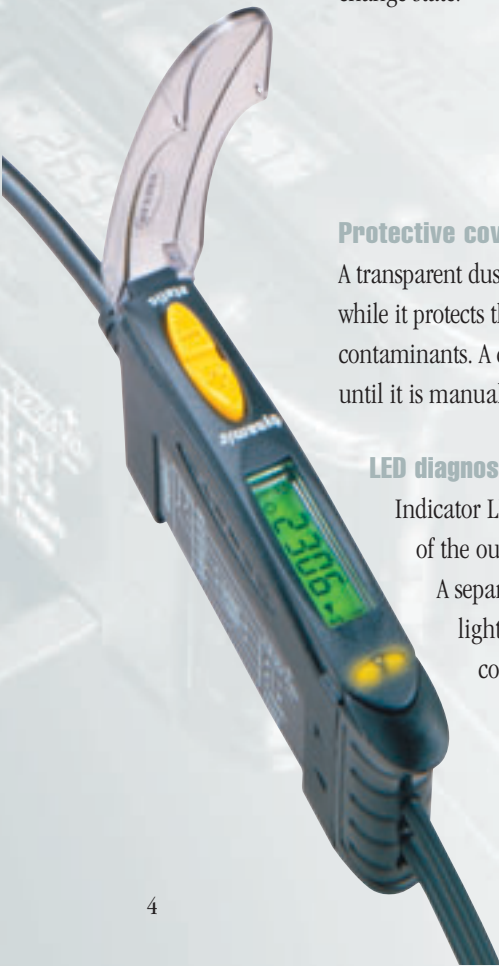


*\*15 to 24V dc for 0-10V dc analog models.*



### Protective circuitry.

The D10 is designed to withstand electrical problems or installation error. Integral protective circuitry guards the sensor against reverse polarity and transient voltages, short circuits, and false pulse on power up.





## Advanced fiber optics for all your application needs.



*DURA-BEND™ plastic fibers carry light through extremely tight radius bends.*

### The broadest line of general purpose fibers.

Banner has the widest selection and most readily available line of fibers in the world. Choose standard fibers in all shapes and sizes, or custom fibers that can be built to your exact specifications. Choose from individual fibers, used in pairs in the opposed sensing mode, and bifurcated fibers that emit and receive light signals in the same assembly.

Economical plastic fibers can be cut to length during installation. Their flexibility lets them bend where you want them. Coiled versions are available for use in applications requiring articulated or reciprocating motion. Standard fiber diameters include 0.25 mm, 0.5 mm, 0.75 mm, 1.0 mm and 1.5 mm (0.01", 0.02", 0.03", 0.04" and 0.06"). The larger the fiber diameter, the higher the excess gain. Special purpose models are described below.



### Application-specific fibers for special sensing functions.



#### Teflon®-encapsulated fibers.

Fiber optic assemblies are encapsulated in FEP Teflon® to withstand extremely harsh chemical environments. They withstand the severe acid baths used in semiconductor wafer manufacturing applications, and stand up to high temperatures, up to 125°C (257° F). Available for opposed or diffuse-mode sensing.

#### Linear array fibers.

These fibers provide a series of light beams to provide a rectangular array or ribbon of light. They are available in various lengths and can be custom-built to exact specifications. Typical applications include web guiding, parts profiling, and detection of vibrating targets.



#### Focused beam fibers.

Banner plastic fibers are available with a variety of lenses to precisely focus a beam on tiny objects or targets. They can form a spot as small as 0.25 mm (0.01") for your challenging applications.

#### Liquid level detection fibers.

Banner fibers work extremely well for liquid level detection through a sight glass or in direct contact applications. They are available in a variety of materials to withstand various liquids, including harsh and corrosive chemicals.



#### Convergent-beam fibers.

Bifurcated plastic fibers are positioned by an ultra-compact convergent sensing head to mechanically converge the emitted light at 3 mm (0.12") in front of the assembly. These fibers detect objects as small as 0.2 mm (0.008"), and accurately detect transparent targets without being affected by the background.

#### High-temperature fibers.

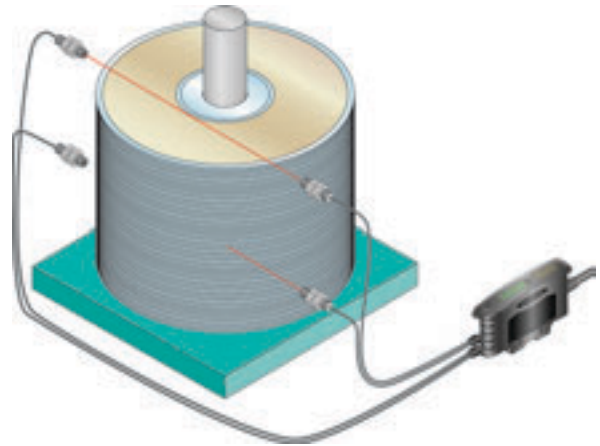
Banner glass fibers can withstand numerous challenging high-temperature applications up to 480°C (900°F). They are an excellent alternative in situations where other sensors can't survive, and can be used with range-extending and right-angle lens attachments.





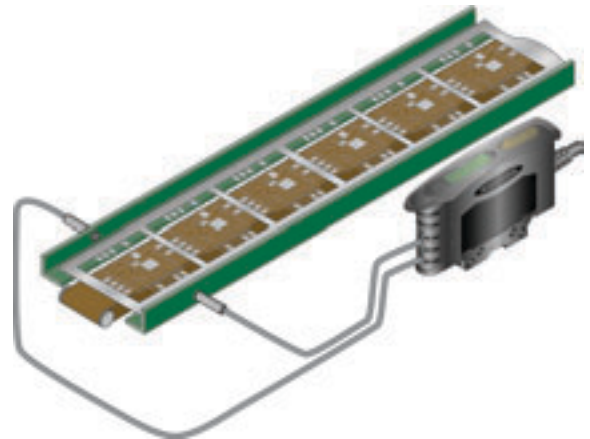
## CD STACK HEIGHT DETECTION

- Objective:** Detect the height of a CD stack at two levels.
- Sensor:** Model **D10DNFP**
- Fiber optic:** One pair of model **PDIT26TP5** two-channel individual fibers (the pair establishes two opposed mode beams)
- Operation:** A CD duplication process “burns” 25 CDs per cycle. The two discrete outputs of the D10 sensor are programmed to output for half-stack and full-stack conditions (i.e. - Output #1 energizes at 50% and Output #2 energizes at 100% light blockage). When a half stack (of 25 CDs) is sensed, the duplication machine is re-loaded and cycled. When a full stack of 50 CDs is sensed, the CDs are removed and packaged, and the process cycle restarts.



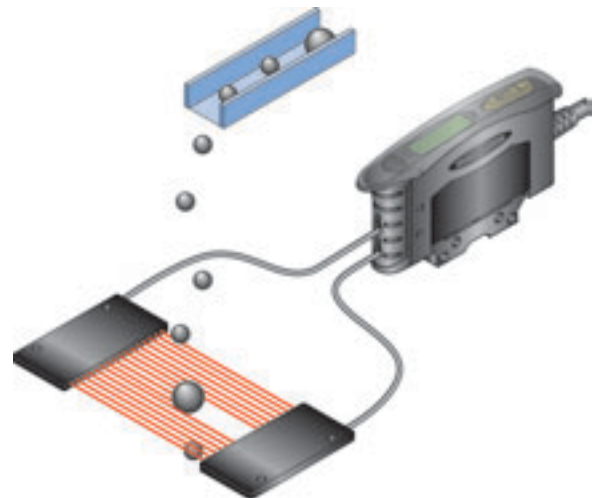
## LEAD FRAME PRESENCE DETECTION

- Objective:** To sense presence or absence of an IC lead frame.
- Sensor:** Model **D10DNFP**
- Fiber optic:** One pair of model **PIF26UMLS** individual plastic fiber optics
- Operation:** An integrated circuit lead frame moves in a U-shaped channel, and must be sensed using the opposed mode. Diffuse mode sensing is not possible, due to large differences in reflectivity of frame materials. The thickness of the lead frame material is 0.1 mm, and the diameter of the beam is 0.5 mm. The D10 sensor is able to differentiate this low contrast.



## PARTS COUNTING AND SIZE CHECKING

- Objective:** To count parts which exit a vibratory feeder, and to monitor for oversized parts.
- Sensor:** Model **D10DNFP** (with dual discrete outputs)
- Fiber optic:** One pair of model **PIRS1X166UMPMAL** 16-beam linear array individual plastic fiber optics
- Operation:** Ball bearings fall through the 16-beam light screen, created by the fiber optic pair. Bearings are counted using one of the D10 sensor outputs. The second D10 output is programmed to stop the feeder mechanism, if more than two beams are ever broken (indicating an oversized bearing).





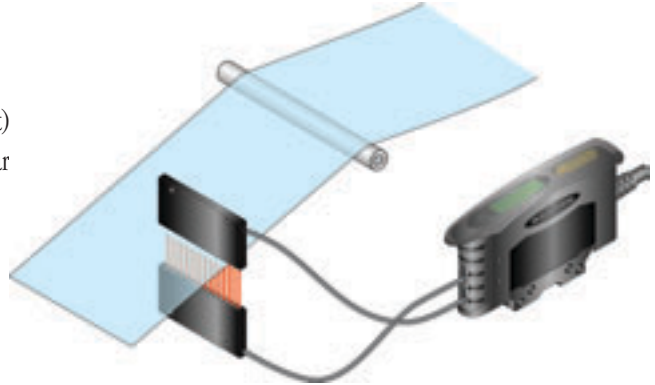
## ANALOG EDGEGUIDING AND WEB BREAK DETECTION

**Objective:** To provide an analog signal for edgewise of an opaque or semi-transparent web material, and to provide an alarm for a web break.

**Sensor:** Model **D10UNFP** (with one analog and one discrete output)

**Fiber optic:** One pair of model **PIRS1X166UMPMAL** 16-beam linear array individual plastic fiber optics

**Operation:** The analog output of the D10 sensor provides a voltage which is proportional to the number of beams broken in the linear array by the web material. This analog signal is used for edge position control. The discrete output of the D10 is programmed to energize an alarm if no beams are blocked (indicating a web break).



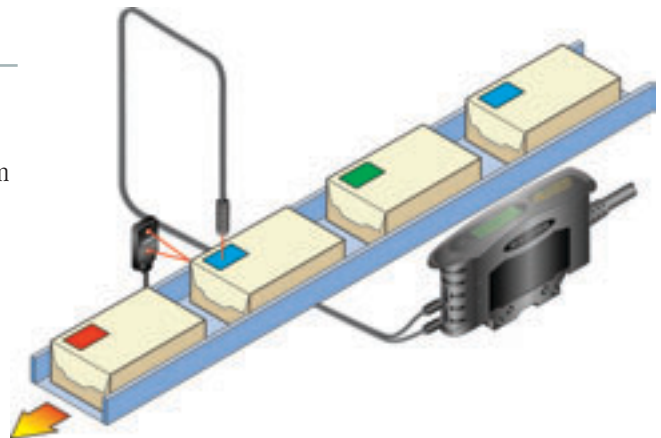
## COLOR SORTING

**Objective:** To sort cartons by color-coded labels.

**Sensors:** Color sensor: model **D10DNFP** (with dual discrete outputs)  
Interrogate sensor: model **VS2AN5CV30** convergent beam

**Fiber optic:** Bifurcated model **PBCT46U**

**Operation:** Three colored labels (red, blue & green) are used to sort cartons on a packaging line. The two outputs of the D10 are programmed as follows: red = both outputs ON, blue = both outputs OFF, and green = one output ON and the other OFF. The outputs of the D10 are interrogated using A VS2 Series convergent mode sensor.



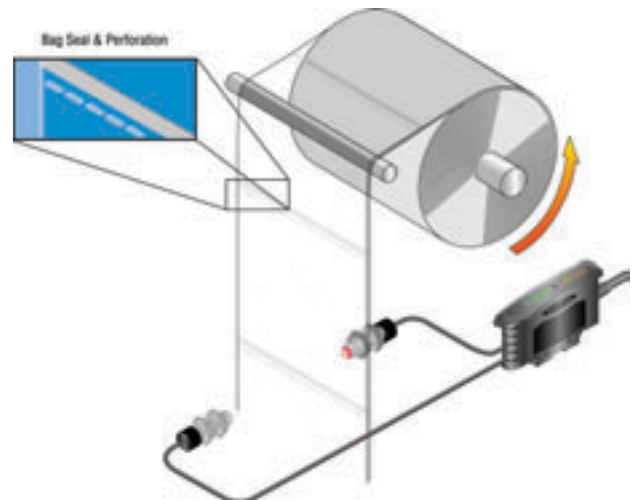
## POLY BAG SEAL DETECTION

**Objective:** To sense the seals in a continuous web of clear plastic bags.

**Sensor:** Model **D10DNFP**

**Fiber optic:** One pair of model **PIL46U** individual plastic fiber optics

**Operation:** Plastic bags are manufactured in a continuous web, with a seal and perforations between bags. To ensure the bag is properly separated from the web, a sensor is needed to send a signal to the separation mechanism. The bag seal acts as a registration mark. The low contrast capability of the D10 sensor, plus the light-averaging ability of the PIL46U fibers, work to reliably sense the bag seal.





# D10 Expert™: Fiber Optic Sensor Model Selection.

■ Red Beam   
 ■ Green Beam   
 ■ Models with pre-wired cable   
 ■ Models with Pico-style quick-disconnect

Model Number	Part Number	Maximum Range	Cable*	Supply Voltage	Output Type	Output Rating	Response
D10DNFP	62379	Dependent on fiber model, optional lenses and power level/speed selection.	2 m (6.5') Cable	12 to 24V dc	Two NPN	150 mA	Programmable 50 µs 200 µs 1 ms 2.5 ms
D10DNFPQ	62380		6-pin Pico-style QD				
D10DPFP	62382		2 m (6.5') Cable		Two PNP		
D10DPFPQ	62383		6-pin Pico-style QD				
D10DNFPG	64561		2 m (6.5') Cable		Two NPN		
D10DNFPGQ	64562		6-pin Pico-style QD				
D10DPFPG	64564		2 m (6.5') Cable		Two PNP		
D10DPFPGQ	64565		6-pin Pico-style QD				
D10INFP	62385		2 m (6.5') Cable	12 to 24V dc	NPN & Analog	150 mA & 4-20 mA	Programmable (Discrete) 50 µs 200 µs 1 ms 2.5 ms  Analog 1 ms
D10INFPQ	62386		6-pin Pico-style QD				
D10IPFP	62388		2 m (6.5') Cable	PNP & Analog			
D10IPFPQ	62389		6-pin Pico-style QD				
D10UNFP	63992		2 m (6.5') Cable	15 to 24V dc	NPN & Analog	150 mA & 0-10V	
D10UNFPQ	63993		6-pin Pico-style QD				
D10UPFP	63995		2 m (6.5') Cable	PNP & Analog			
D10UPFPQ	63996		6-pin Pico-style QD				
D10INFPG	64567	2 m (6.5') Cable	12 to 24V dc	NPN & Analog	150 mA & 4-20 mA		
D10INFPGQ	64568	6-pin Pico-style QD					
D10IPFPG	64570	2 m (6.5') Cable	PNP & Analog				
D10IPFPGQ	64571	6-pin Pico-style QD					
D10UNFPG	64573	2 m (6.5') Cable	15 to 24V dc	NPN & Analog	150 mA & 0-10V		
D10UNFPGQ	64574	6-pin Pico-style QD					
D10UPFPG	64576	2 m (6.5') Cable	PNP & Analog				
D10UPFPGQ	64577	6-pin Pico-style QD					

\* 9 m (30') cables are available by adding suffix "W/30" to the model number of any cabled sensor (e.g., D10DNFPW/30). A model with a QD connector requires a mating cable.

# D10 Expert™: Specifications & Dimensions.

## Specifications: D10 Expert®

**Required Fiber Optic Cable:** Banner P-Series plastic fibers.

**Sensing Beam:** Visible red, 680 nm, or Visible green, 525 nm, depending on model.

**Supply Voltage and Current:** 4-20 mA Analog and Discrete Models: 12-24V dc (10% maximum ripple) at less than 65 mA exclusive of load; 0-10V dc Analog Models: 15-24V dc (10% maximum ripple) at less than 70 mA exclusive of load.

**Supply Protection Circuitry:** Protected against reverse polarity and transient voltage.

**Output Configuration:** 2 independently configurable outputs, depending on model: NPN w/analog (4-20 mA or 0-10V) or PNP w/analog (4-20 mA or 0-10V). 2 NPN or 2 PNP.

### Output Rating:

Discrete Output: 150 mA, maximum load  
 OFF-state leakage current: < 10 µA at 24V dc  
 ON-state saturation voltage: NPN < 1.5V dc @ 150 mA  
 PNP < 2.5V dc @ 150 mA

Analog Output: 4-20 mA or 0-10V dc  
 Load: 4-20 mA Models: 100Ω maximum impedance  
 0-10V dc Models: 1 MΩ maximum impedance

**Output Protection Circuitry:** Protected against false pulse on power-up and continuous short-circuit.

### Output Response Time:

Discrete Output: Programmable, 50 microseconds, 200 microseconds, 1 millisecond, 2.5 milliseconds  
*Note: 150 millisecond delay on power-up; outputs do not conduct during this time.*

Analog Output: 1 millisecond  
*Note: 150 millisecond delay on power-up; outputs do not conduct during this time.*

**Adjustments:** Push-button or remote programming of response time, OFF-delay, light-dark operate, and display.

**Indicators:** Four-digit digital display plus LCD indicators for active channel, push-button lockout, OFF-delay and light/dark operate selection. LCD backlight (red for Program mode or green for RUN mode) indicates Power ON.

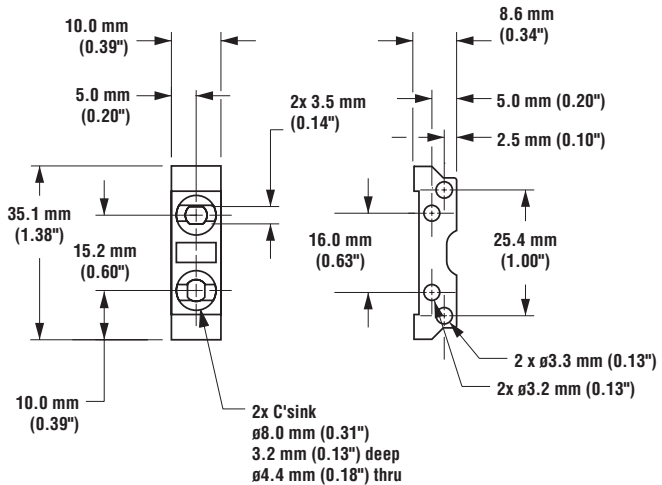
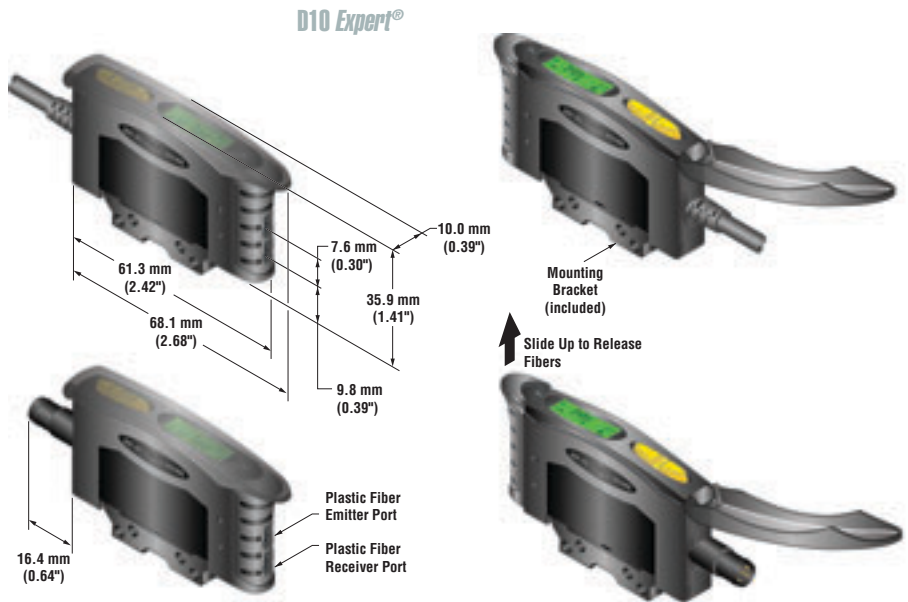
**Construction:** Black ABS/polycarbonate alloy housing, clear polycarbonate cover.

**Environmental Rating:** NEMA 1, IEC IP50.

**Connections:** PVC-jacketed 2 m or 9 m (6.5' or 30') 6-wire cable or integral 6-pin Pico-style quick-disconnect.

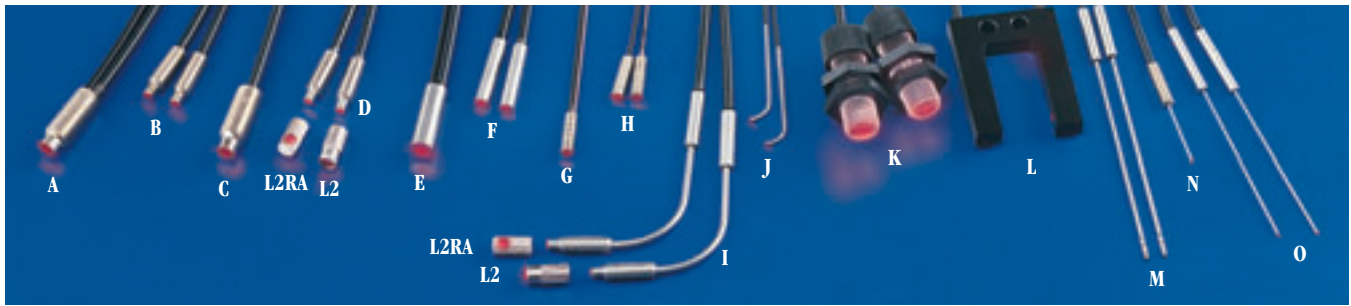
**Operating Conditions:** Temperature: -20° to +55°C (-4° to +131°F). Maximum Relative Humidity: 90% @ 50°C (non-condensing).

**Installation:** 35 mm DIN rail (mounting bracket included).



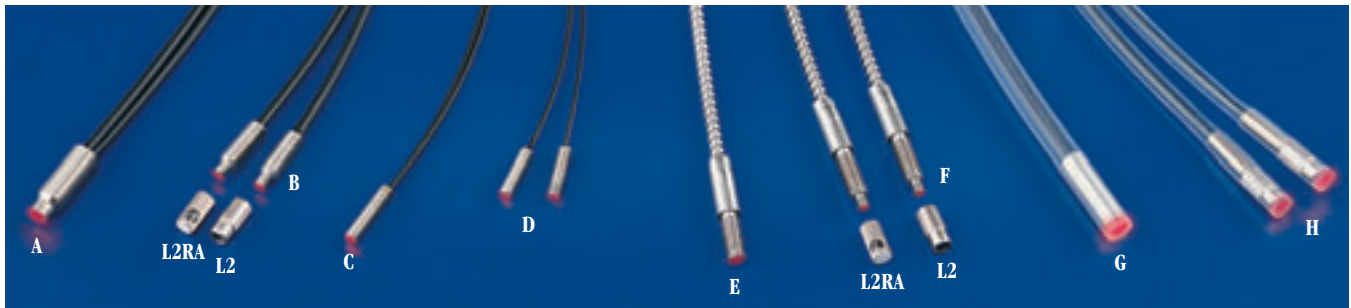


## The widest selection of general-purpose & harsh environment fibers.



### General-Purpose Fibers

Photo	Model Number	Type	Tip Configuration	Core $\phi$	Length	Notes
A	PBT66U	Bifurcated	M6 x 0.75 Thread	1.5 mm	2 m	
B	PIT66U	Individual	M4 x 0.7 Thread	1.5 mm	2 m	
C	PBT46U	Bifurcated	M6 x 0.75 Thread	1.0 mm	2 m	DURA-BEND™*
D	PIT46U	Individual	M4 x 0.7 Thread	1.0 mm	2 m	DURA-BEND™* L2/L2RA**
E	PBF46U	Bifurcated	$\phi$ 5.1 mm Ferrule	1.0 mm	2 m	DURA-BEND™*
F	PIF46U	Individual	$\phi$ 3.2 mm Ferrule	1.0 mm	2 m	DURA-BEND™*
G	PBT26U	Bifurcated	M3 x 0.5 Thread	0.5 mm	2 m	DURA-BEND™*
H	PIT26U	Individual	M3 x 0.5 Thread	0.5 mm	2 m	DURA-BEND™*
I	PIAT46U	Individual	M4 x 0.7 Thread & Angle	1.0 mm	2 m	DURA-BEND™* L2/L2RA**
J	PIA26U	Individual	$\phi$ 0.91 mm 90° Angled Probe	0.5 mm	2 m	DURA-BEND™*
K	PIL46U	Individual	M8 x 1 Plastic Lens	1.0 mm	2 m	DURA-BEND™*
L	PDIS46UM12	Dual Individual	Plastic "Slot Sensor" Housing, 12 mm	1.0 mm	2 m	DURA-BEND™*
M	PIPS26U	Individual	$\phi$ 0.91 mm Side-view Probe	0.5 mm	2 m	DURA-BEND™*
N	PBTP:53T	Bifurcated	M3 x 0.5 Thread & $\phi$ 0.5 mm Probe	0.125 mm	1 m	
O	PIP:53T	Individual	$\phi$ 2.4 mm Ferrule & $\phi$ 0.5 mm Probe	0.125 mm	1 m	



### Fibers for High Temperatures

Photo	Model Number	Type	Tip Configuration	Core $\phi$	Length	Max Operating Temp.	Notes
A	PBT46UHT1	Bifurcated	M6 x 0.75 Thread	1.0 mm	2 m	125°C (257°F)	
B	PIT46UHT1	Individual	M4 x 0.7 Thread	1.0 mm	2 m	125°C (257°F)	L2/L2RA**
C	PBT26UHT1	Bifurcated	M3 x 0.5 Thread	0.5 mm	2 m	125°C (257°F)	
D	PIT26UHT1	Individual	M3 x 0.5 Thread	0.5 mm	2 m	125°C (257°F)	
E	BMT16.6S-HT	Bifurcated	M4 x 0.7 Thread (Glass)	1.6 mm	2 m	315°C (600°F)	
F	IMT:756.6S-HT	Individual	M4 x 0.7 Thread (Glass)	1.3 mm	2 m	315°C (600°F)	L2/L2RA**

### Fibers for Harsh Chemicals

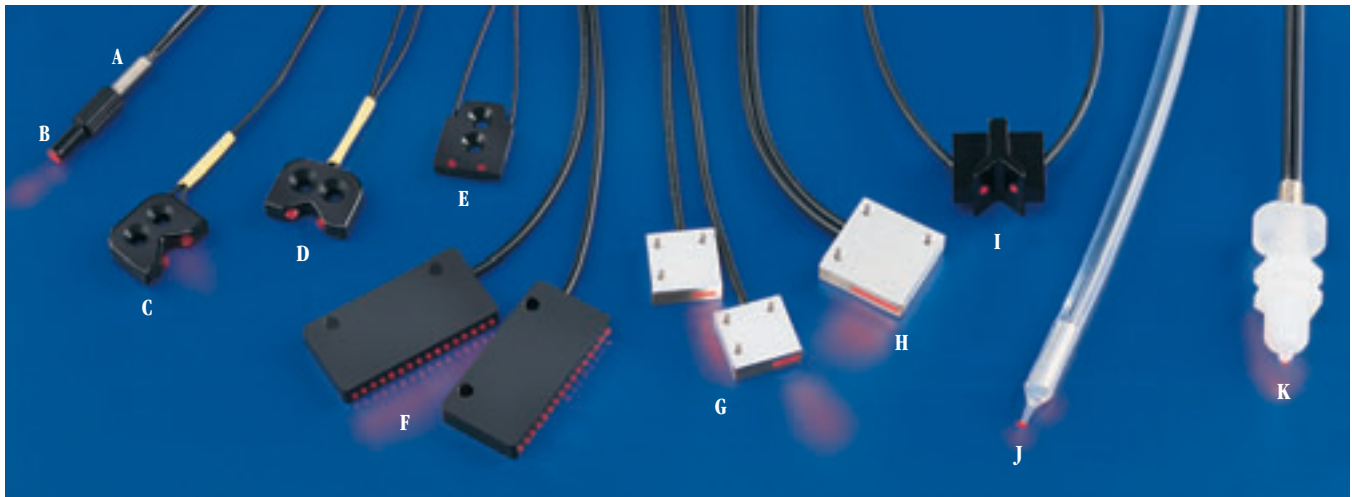
Photo	Model Number	Type	Tip Configuration	Core $\phi$	Length	Notes
G	PBE46UTMNL	Bifurcated	$\phi$ 6.0 mm Teflon-Encapsulated	1.0 mm	2 m	DURA-BEND™*
H	PIE46UT	Individual	$\phi$ 5.0 mm Teflon-Encapsulated, Lensed	1.0 mm	2 m	DURA-BEND™*

\*Can be manufactured with high-flex DURA-BEND™ fiber optic cable.

\*\*Compatible with range-extending and/or right-angle lens attachments.



## Specialty fibers meet your specific application requirements.



### Focused Beam Fibers

Photo	Model Number	Type	Tip Configuration	Core $\phi$	Length	Notes
A	PBCT26U	Bifurcated	Coaxial, M4x0.7 Thread	1x0.5 mm 9x0.25 mm	2 m	
B	L4C6	Lens	M4x0.7 Thread, Convergent, 0.25mm spot $\phi$	N/A	N/A	6 mm focal distance

### Convergent Background Suppression Fibers

Photo	Model Number	Type	Tip Configuration	Core $\phi$	Length	Notes
C	P12-C1	Convergent Beam	Plastic Head, Side Exit	0.5 mm	2 m	3 mm focal distance
D	P22-C1	Convergent Beam	Plastic Head, Straight Exit	0.5 mm	2 m	3 mm focal distance
E	P32-C2	Convergent Beam	Plastic Head, "Flat-Pack" Housing	0.5 mm	2 m	2 mm focal distance

### Linear Array Fibers

Photo	Model Number	Type	Tip Configuration	Core $\phi$	Length	Notes
F	PIRS1X166UMPAL	Individual	Plastic, Side Exit, 33 mm Linear Array Length	16 x 0.265 mm	2 m	
G	PIR1X166U	Individual	Aluminum, Straight Exit, 5 mm Linear Array Length	16 x 0.265 mm	2 m	
H	PBRS1X326U	Bifurcated	Aluminum, Side Exit, 11 mm Linear Array Length	32 x 0.265 mm	2 m	

### Liquid Level Detection Fibers

Photo	Model Number	Type	Tip Configuration	Core $\phi$	Length	Notes
I	PDI46U-LLD	Liquid Level	Clear Tube-Mountable Housing	1.0 mm	2 m	DURA-BEND™*
J	PBE46UTMLLP	Liquid Level	Teflon-Encapsulated Probe	1.0 mm	2 m	DURA-BEND™*
K	PBT46U & TGR3/8MPFMQ	Liquid Level	Polypropylene Housing & Quartz Probe	1.0 mm	2 m	DURA-BEND™*

\*Can be manufactured with high-flex DURA-BEND™ fiber optic cable.



## Banner: Industry's number one supplier of sensors & machine safety products.

When you buy your sensors and machine safety products from Banner, you gain the confidence of dealing with the largest, most knowledgeable and experienced sensor company. We have the broadest line of products and the most advanced manufacturing capabilities in the industry. We can handle any size order, large or small. We can deliver any of more than 15,000 products in just three days—most can ship within hours!

Just as important, we have the largest and most knowledgeable sales and support network, backed by the world's finest application engineers. With our global sales support network, we're close by wherever you're located, and we're ready to help you with your applications, plus give you excellent service support. When you add it up, you'll find the best value in Banner products.

Visit Banner On-Line at [bannerengineering.com](http://bannerengineering.com)



- Complete product information for:
  - Photoelectric sensors
  - Measurement and inspection sensors
  - Machine safety products
- Up-to-date "What's New" page.
- Complete descriptions for each product, with links to product data sheets and dimension drawings.
- Product catalogs, specifier's guides, and product brochures available for immediate download or email request.
- Documents available in multiple languages.



For more information or applications assistance:

Call **1.888.3.SENSOR**  
(1.888.373.6767)



### The Banner Photoelectric Sensors Catalog

The industry's most complete catalog; more than 700 pages of detailed product and technical information on more than 12,000 photoelectric sensors.



### Banner Measurement & Inspection Products Catalog

Advanced line of measurement and inspection products: including laser displacement sensors, ultrasonic gauging sensors, camera-based sensors, measuring light screens, and more.



### The Banner Machine Safety Products Catalog

A complete catalog of machine safety products including Banner's extensive line of safety light screens, safety interlock switches and E-stop safety modules.



## All Three Catalogs on One CD ROM

Get all three Banner catalogs on one easy-to-use CD ROM covering over 15,000 Banner photoelectric, measurement and inspection, and machine safety products. Includes selection charts, technical information and glossaries. International version includes information in eight languages. Call, write or email for your copy today!



## Worldwide Representation.

- |                  |             |              |                |                  |
|------------------|-------------|--------------|----------------|------------------|
| • Australia      | • Denmark   | • Indonesia  | • Netherlands  | • Slovakia       |
| • Argentina      | • Egypt     | • Ireland    | • New Zealand  | • Spain          |
| • Austria        | • Estonia   | • Israel     | • Norway       | • Sweden         |
| • Belgium        | • Finland   | • Italy      | • Pakistan     | • Switzerland    |
| • Brazil         | • France    | • Japan      | • Peru         | • Taiwan         |
| • Canada         | • Germany   | • Korea      | • Philippines  | • Thailand       |
| • Chile          | • Greece    | • Latvia     | • Poland       | • Turkey         |
| • China          | • Hong Kong | • Lithuania  | • Portugal     | • United Kingdom |
| • Colombia       | • Hungary   | • Luxembourg | • South Africa | • Uruguay        |
| • Costa Rica     | • Iceland   | • Malaysia   | • Russia/CIS   | • Venezuela      |
| • Czech Republic | • India     | • Mexico     | • Singapore    |                  |



Banner Engineering Corp., P.O. Box 9414, Minneapolis, MN 55440 U.S.A.  
Phone 763.544.3164 Fax 763.544.3213 [bannerengineering.com](http://bannerengineering.com) Email: [sensors@bannerengineering.com](mailto:sensors@bannerengineering.com)