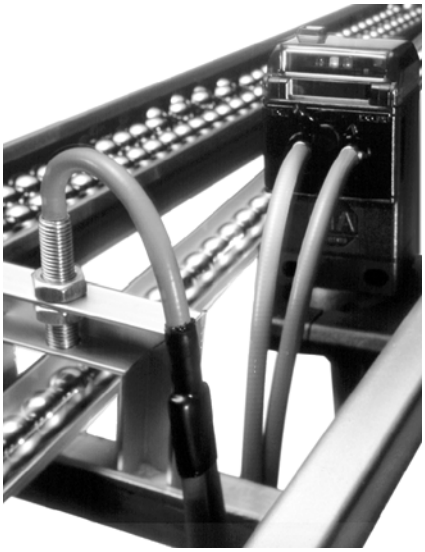
# Glass Fiber Optic Cables

## Introduction



### Application Recommendations

1. Many glass fiber optic cables are available with different glass fiber bundle diameters.

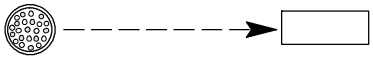
   Larger diameter bundles contain more fibers to carry light between the sensor and application. These cables will generally offer **longer sensing ranges**.

   Smaller diameter bundles provide greater resolution and the ability to detect smaller targets.
2. Glass fiber optic cables can be applied in high shock and vibration applications, but secure the cables to prevent excess flexing. Do not use glass cables in applications where they are constantly flexing. ***They will break***. Plastic fiber optic cables provide better performance in these applications.
3. Avoid sharp bends. The individual glass fibers in the cable can be broken. Don't exceed the following bend tolerances with PVC sheathed cables:

**Minimum Cable Bend Radius**

| Bundle Diameter [mm (in.)] | Minimum Bend Radius [mm (in.)] |
|---|---|
| 0.68 (0.027) | 12.7 (0.50) |
| 1.16 (0.046) | 12.7 (0.50) |
| 1.6 (0.063) | 15.8 (0.625) |
| 2.28 (0.090) | 15.8 (0.625) |
| 3.17 (0.125) | 19.0 (0.75) |
| 3.96 (0.156) | 25.4 (1.0) |
| 4.57 (0.180) | 31.7 (1.25) |

4. Glass fiber optic cables cannot be cut, spliced or repaired.
5. Glass fiber optic cables tip cannot be bent. Only special plastic fiber optic cable sensing end tips can be bent as specified in the Selection Guide. When using bendable end tips, bend should not be attempted closer than 19 mm (0.75 in.) to the sensing end of the cable.
6. Some applications call for glass fiber optic cables to be used to isolate the sensor from **high voltage**. Custom cables with special nonconductive components must be ordered for these applications.
7. X-RAY or GAMMA radiation will cause glass fibers to eventually become opaque. Custom cables constructed with special optical quartz fibers must be ordered for use in areas with **high radiation**.
8. Use Transmitted Beam sensing in **submerged applications** when possible. Spiral-wound stainless steel sheathing is generally not suitable for wet applications. Fiber optic cables with PVC sheathing should be used for these applications.
9. A glass fiber optic sensor with a **bifurcated** cable can provide **retroreflective** or **diffuse sensing** depending upon the distance to the target and the sensitivity adjustment on the sensor. If the sensor and cable are to be used for retroreflective sensing, the sensitivity of the sensor must be adjusted low enough to avoid unwanted diffuse response from the targets to be sensed.
10. Glass fiber optic cables have a wide **field of view**, typically 82°. A smaller field of view can be achieved by attaching an Extended Range Lens Assembly to the sensing end of the fiber. These lens assemblies will also increase the available sensing distance. Refer to the Accessories section for more information.
11. Most glass fiber optic cables have round sensing tips with the glass fibers arranged in a circular configuration. Other cables such as 43GT-FIS40SL offer sensing tips with a **rectangular shaped opening** for the glass fibers, referred to as "slotted" cables (see illustration below).



Control Interface End Tip — Sensing End Tip

Use these equivalent diameters to determine the approximate performance of slotted cables.

| Slot Dimensions [mm (in.)] | Round Sensing Tip Equivalent Diameter [mm (in.)] |
|---|---|
| 2.5 x 0.5 (0.1 x 0.02) | 1.2 (0.046) |
| 0.5 x 2.5 (0.02 x 0.1) | 1.2 (0.046) |
| 5.1 x 0.25 (2.0 x 0.01) | 1.2 (0.046) |
| 9.7 x 0.8 (0.382 x 0.032) | 3.1 (0.125) |

Formula:
Approximate diameter = $1.128 \times \sqrt{\text{Length x Width}}$

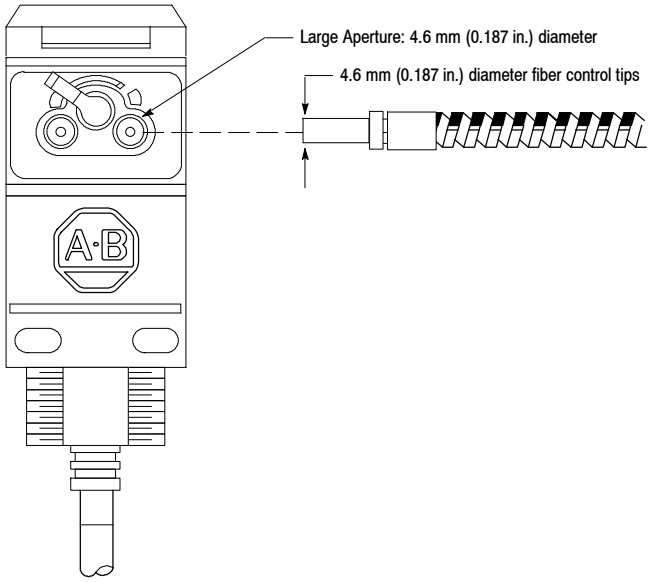
**ATTENTION**

Fiber optic cables are not recommended for explosion-proof applications in hazardous environments. The fiber optic cable can provide a path for explosive fumes to travel from the hazardous area to the safe area.

## Glass Fiber Optic Cables for use with Large Aperture Sensors

The fiber optic cables on pages 1-236…1-250 are for use with the large aperture sensors shown below.

**42GxF-900x**




## Large Aperture Sensors:

*42SRF-60xx*
*42SRF-65xx*

*42GTGF-100x0*
*42GTGF-103x0*

*42xRx-5x00FO*

*42GxF-900x*

*42EF-G1xxA*

*42KL-G1xxx*

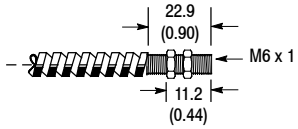
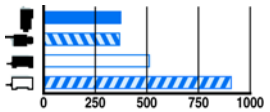
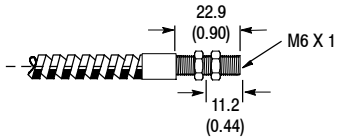
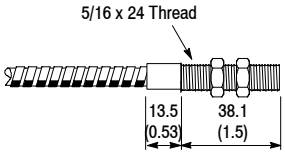
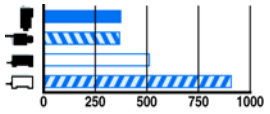
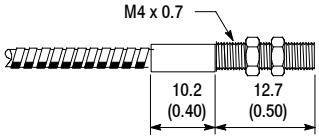
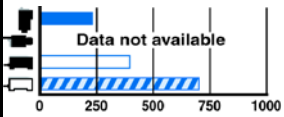
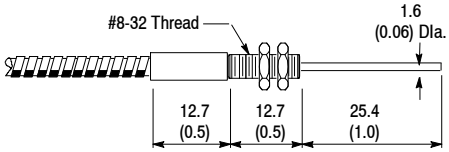
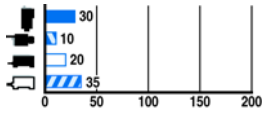
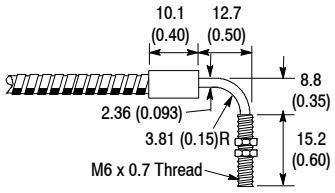
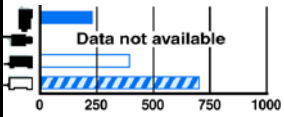
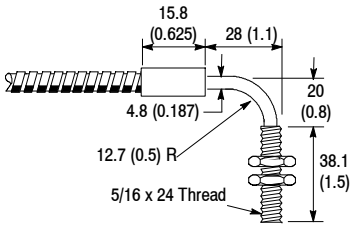
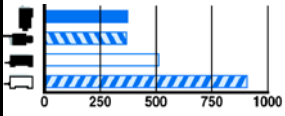
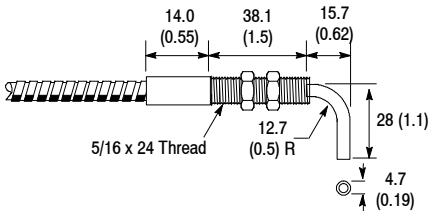
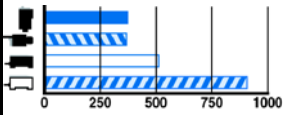
Note: Nominal Sensing Distance

- Due to the variation between fiber optic cables, sensing distance can vary widely
- The sensing distance of bifurcated cables is measured with white paper (90% reflectivity). Other surfaces may be less reflective and therefore would have shorter sensing distances.
- The published numbers are based on extensive testing and are conservative
- The sensing distance of transmitted beam cables is measured from tip to tip
- Application considerations that effect distance
  - Sensor selected
  - Reflectivity of target
  - Environment
  - Accessories such as range extending lenses
  - Length of the cable
- Consult with product support for additional information.

**All dimensions indicated are typical. The fiber optic cables on pages 1-236…1-250 are for use with large aperture sensors as seen on the following pages:**

# 43GT Glass Fiber Optic Cables

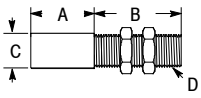
## Threaded Transmitted Beam for Small Aperture Sensors [2.2 mm (0.09 in.)]

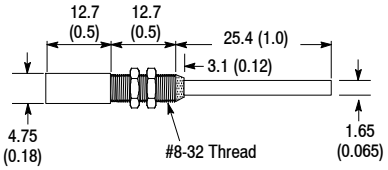
| Dimensions—[mm (in.)] | Sensing Tip Material | Fiber Bundle Diameter [mm (in.)] | Sheathing Material | Sensing Distance [mm] | Cat. No. |
|---|---|---|---|---|---|
|  | Brass | 1.6 (0.062) | Stainless Steel |  | 43GT-TAB15SS |
| | | | PVC | | 43GT-TAB15MS |
|  | Stainless Steel | 1.6 (0.062) | Stainless Steel | | 43GT-TAS15SS |
| | | | PVC | | 43GT-TAS15MS |
|  | Stainless Steel | 1.6 (0.062) | Stainless Steel |  | 43GT-TBS15SS |
| | | | PVC | | 43GT-TBS15MS |
|  | Stainless Steel | 1.2 (0.046) | Stainless Steel |  | 43GT-XAS10SS |
| | | | PVC | | 43GT-XAS10MS |
|  | Stainless Steel | 0.7 (0.027) | Stainless Steel |  | 43GT-MRS00SS |
| | | | PVC | | 43GT-MRS00MS |
|  | Stainless Steel | 1.2 (0.046) | Stainless Steel |  | 43GT-TIS10SS |
| | | | PVC | | 43GT-TIS10MS |
|  | Stainless Steel | 1.6 (0.062) | Stainless Steel |  | 43GT-TMS15SS |
| | | | PVC | | 43GT-TMS15MS |
|  | Stainless Steel | 1.6 (0.062) | Stainless Steel |  | 43GT-TQS15SS |
| | | | PVC | | 43GT-TQS15MS |

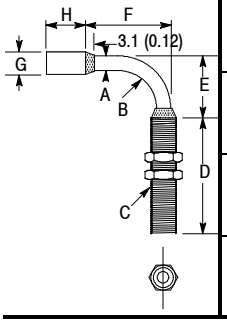
**Note**: Two transmitted beam fiber cables required for each sensor.
Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

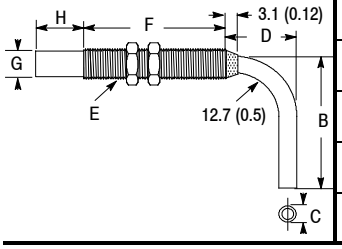
# Glass Fiber Optic Cable Tips

**Use with Configurators on page 1-258 and 1-259.**

| Approximate Dimensions [mm (in.)] | Code | [mm (in.)] | Approximate Dimensions [mm (in.)] | | | |
|---|---|---|---|---|---|---|
| | | | A | B | C | D |
|  | TA | 2.29 (0.09) | 10.16 (0.40) | 11.18 (0.44) | 5.84 (0.23) | M6 x 1 class 6g |
| | TB | 3.2 (0.125) | 13.46 (0.53) | 38.1 (1.5) | 7.92 (0.312) | 5/16 x 24 UNF |
| | TF | 3.2 (0.125) | 13.46 (0.53) | 12.7 (0.5) | 4.45 (0.175) | #8-32 |
| | TG | 1.2 (0.046) | 13.46 (0.53) | 38.1 (1.5) | 9.53 (0.375) | 3/8 x 24 UNF |
| | TV | 4.0 (0.156) | 13.46 (0.53) | 139.7 (5.5) | 7.92 (0.312) | 5/16 x 24 UNF |
| | TY | 3.2 (0.125) | 13.46 (0.53) | 101.6 (4.0) | 7.62 (0.3) | 5/16 x 24 UNF |
| | XA | 1.2 (0.046) | 10.16 (0.40) | 12.7 (0.5) | 4.75 (0.187) | M4 x 0.7 |
| | XB | 1.2 (0.046) | 10.16 (0.40) | 12.7 (0.5) | 4.75 (0.187) | M6 x 0.75 |
| | XD | 3.2 (0.125) | 13.46 (0.53) | 15.24 (0.6) | 7.92 (0.312) | 5/16 x 24 UNF |

| Approximate Dimensions [mm (in.)] | Code | Standard Bundle [mm (in.)] |
|---|---|---|
|  | MR | 1.2 (0.046) |

| Approximate Dimensions [mm (in.)] | Code | Standard Bundle [mm (in.)] | Approximate Dimensions [mm (in.)] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | A | B | C | D | E | F | G | H |
|  | TM | 3.2 (0.125) | 4.75 (0.187) | 12.7 (0.5) | 5/16 x 24 | 38.1 (1.5) | 20.3 (0.8) | 27.9 (1.1) | 7.49 (0.295) | 15.8 (0.625) |
| | TO | 4.0 (0.156) | 5.54 (0.218) | 12.7 (0.5) | 5/16 x 24 | 38.1 (1.5) | 20.3 (0.8) | 27.9 (1.1) | 7.49 (0.295) | 15.8 (0.625) |
| | TC | 1.2 (0.046) | 2.36 (0.093) | 6.35 (0.25) | 8 - 32 | 12.7 (0.5) | 9.65 (0.38) | 15.2 (0.6) | 4.45 (0.175) | 15.8 (0.625) |
| | TI | 1.2 (0.046) | 2.36 (0.093) | 3.81 (0.15) | M6 x 0.75 | 15.2 (0.6) | 8.89 (0.35) | 12.7 (0.5) | 4.75 (0.187) | 10.1 (0.40) |

| Approximate Dimensions [mm (in.)] | Code | Standard Bundle [mm (in.)] | Approximate Dimensions [mm (in.)] | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | B | C | D | E | F | G | H |
|  | TQ | 3.2 (0.125) | 27.9 (1.1) | 4.75 (0.187) | 15.75 (0.62) | 5/16 x 24 | 38.1 (1.5) | 7.92 (0.312) | 13.97 (0.55) |
| | TR | 3.98 (0.156) | 27.9 (1.1) | 5.54 (0.218) | 18.29 (0.72) | 5/16 x 24 | 38.1 (1.5) | 7.92 (0.312) | 13.97 (0.55) |
| | TW | 3.2 (0.125) | 40.6 (1.6) | 4.75 (0.187) | 15.75 (0.62) | 5/16 x 24 | 38.1 (1.5) | 7.92 (0.312) | 13.97 (0.55) |
| | TX | 3.2 (0.125) | 20.6 (0.81) | 4.75 (0.187) | 26.9 (1.06) | 5/16 x 24 | 38.1 (1.5) | 7.92 (0.312) | 13.97 (0.55) |
| | TD | 1.2 (0.046) | 12.7 (0.5) | 2.36 (0.093) | 8.89 (0.35) | M4 x 0.7 | 12.7 (0.5) | 4.75 (0.187) | 10.16 (0.40) |

# Glass Fiber Optic Cables

## Additional Cables for Small Aperture Sensors [2.2 mm (0.09 in.) OD Sensor End Tip]

### Custom Fiber Optic Cables

Rockwell Automation/Allen-Bradley can provide custom glass fiber optic cables to meet nearly any application requirement.

Typical cable modifications include:

- Custom lengths up to 15.2 m (50 ft)
- Custom temperature ratings up to 482°C (900°F)
- Custom configurations including multiple sensing tips
- Custom sensing end tips—nearly any modification is possible

For more information contact your local Rockwell Automation sales office or Allen-Bradley distributor.

### To Build a Custom Fiber Optic for Small Aperture Sensor:

**43 G — S**

**Fiber Optic Cable**

**Fiber Material**
G = Glass

**Sensing Mode**
R = Reflective (Bifurcated)
T = Transmitted Beam (Individual)

**Sensing End Tip Style (see pages 1-260…1-267)**
Threaded
- Axial
- Angled
- Side view

Ferruled
- Axial
- Angled
- Side view

Block
- Axial
- Side view

**Sensing End Tip and Nut Material**
A = Aluminum (block tips only)
B = Brass
C = Combination Brass/Stainless Steel
S = Stainless Steel

**Fiber Bundles**
See page 1-268 for dimensions.

**Overall Length (in.)**
**Standard lengths are 36 inches** and do not require these spaces to be filled in. If a special length is required, complete the above with the number of total inches, i.e. 024 for a two foot cable.

Lengths typically ordered:

| | | |
|---|---|---|
| 24 inches | = | 024 |
| 48 inches | = | 048 |
| 60 inches | = | 060 |
| 72 inches | = | 072 |
| 96 inches | = | 096 |
| 108 inches | = | 108 |
| 120 inches | = | 120 |

Any length over 120 inches, please contact factory.

**Fits small aperture (2.2 mm/ 0.09 in. OD) sensors which include:**
- 42KL-L2xxx
- 42GxF-910
- 42GTGF-101x0
- 42SMF71xx
- 42SRF-61xx w/61-6374 adaptor
- 42SRF-63xx w/61-6374 adaptor
- 42xRx-5x00FO w/61-6374 adaptor
- 45FVL-xxxx-xx
- 45FSL-xxxx-xx

**Sheathing**
E = Stainless Steel Flexible Conduit 600°F
F = Stainless Steel Flexible Conduit 900°F
M = PVC 200°F
S = Stainless Steel Flexible Conduit 500°F