

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:

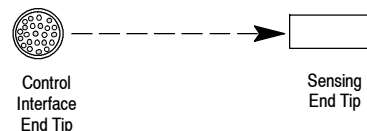
Minimum Cable Bend Radius

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).



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 = $1.128 \times \sqrt{\text{Length} \times \text{Width}}$

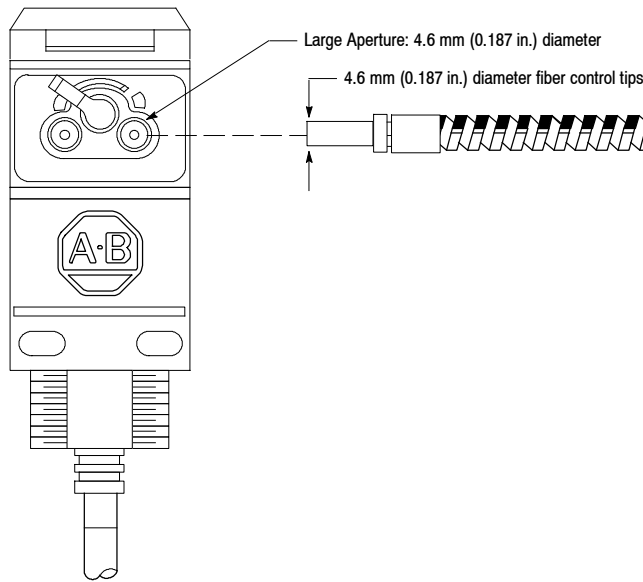
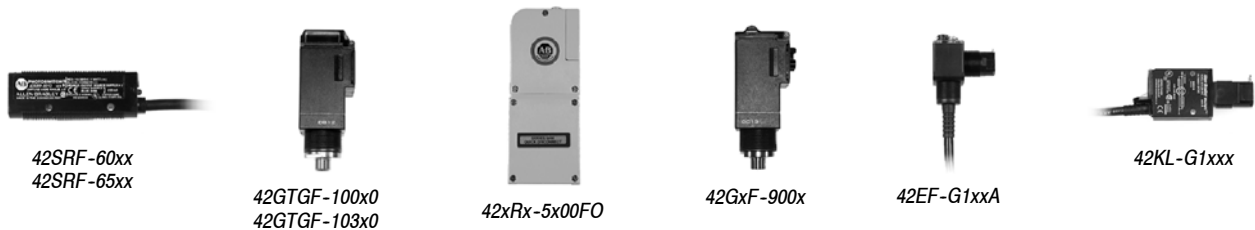
ATTENTION



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**Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]****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:****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:

43GR Glass Fiber Optic Cables**Ferrule Bifurcated Cables for Large Aperture Sensors [4.6 mm (0.187 in.)]**

Approximate Dimensions [mm (in.)]	Sensing Tip Material	Fiber Bundle Diameter [mm (in.)]	Sheathing Material	Sensing Distance [mm]	Cat. No.
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-FAS25SL
			PVC		43GR-FAS25ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-FBS25SL
			PVC		43GR-FBS25ML
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MAS00SL
			PVC		43GR-MAS00ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MDS10SL
			PVC		43GR-MDS10ML
	Stainless Steel	1.6 (0.062)	Stainless Steel		43GR-MHS15SL
			PVC		43GR-MHS15ML
	Stainless Steel	0.7 (0.027)	Stainless Steel		43GR-MVS00SL
			PVC		43GR-MVS00ML
	Stainless Steel	3.2 (0.125)	Stainless Steel		43GR-FIS25SL
			PVC		43GR-FIS25ML
	Stainless Steel	4.0 (0.156)	Stainless Steel		43GR-FJS30SL
			PVC		43GR-FJS30ML
	Stainless Steel	1.2 (0.046)	Stainless Steel		43GR-MOS10SL
			PVC		43GR-MOS10ML

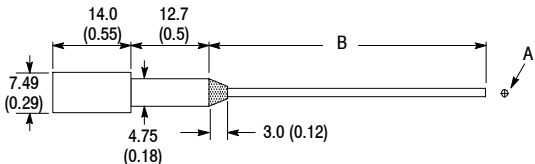
Note: Standard length for glass fiber optic cables is 0.91 m (36 in.) tip to tip.

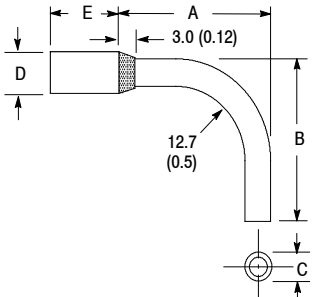
PHOTOSWITCH® Photoelectric Sensors
Fiber Optic Cable Cross Reference

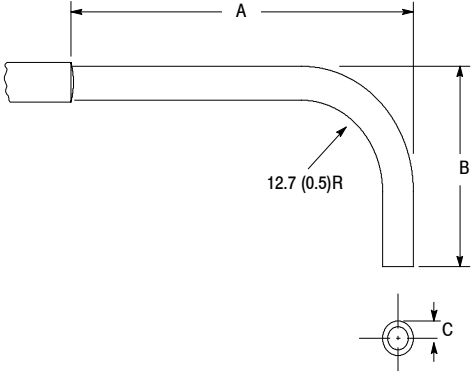
Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.	Cat. No.
99-1000-1	43GR-TAS20ML	99-461-1	43GT-MMS10ML	99-721-1	43GT-MIS15ML
99-1003-1	43GR-XDB25SL	99-477-1	43GT-TFS00ML	99-722-1	43GT-TMS25ML
99-108	43PT-PLS52FS	99-479-1	43GT-MUS10ML	99-723-1	43GT-TMS15MS
99-109	43PT-PLS52GS	99-487-1	43GT-MRS10ML	99-751-1	43GR-XAS10SS
99-110	43PR-PJS53ZS	99-490-1	43GT-MHS15SL	99-752-1	43GR-TIS10SS
99-116-1	43GT-MIS15SL	99-491-1	43GT-MHS15ML	99-753-1	43GR-FTS10SS
99-161-1	43GR-TAB20SS	99-494-1	43GT-BCA73SL	99-755-1	43GR-TDS10SS
99-181-1	43GT-TWC25SL	99-495-1	43GT-BCA73ML	99-794-1	43GR-BRA79SL
99-184-1	43GT-2FAS20SL	99-500-1	43GT-TBS25SL	99-800	43PR-NDS59FS
99-201-1	43GR-FOS20ML	99-50-1	43GT-FAS25SL	99-801	43PR-NDS57ZS
99-206-1	43GR-FPS20SL	99-501-1	43GT-TBS25ML	99-802	43PR-NAS57ZM
99-214-1	43GR-FJS30SL	99-502-1	43GT-TBB30SL	99-803	43PR-NAS60FM
99-222-1	43GR-TMC25SL	99-504-1	43GT-TQC25SL	99-804	43PR-NKS57ZS
99-224-1	43GR-TMC15SL	99-505-1	43GT-TQC25ML	99-805	43PR-NKS61FS
99-238-1	43GR-FGS25SL	99-508-1	43GT-TRC30SL	99-806	43PR-NFS53FM
99-275-1	43GR-TFS10ML	99-51-1	43GT-FAS25ML	99-808Z	43PR-NGS53ZM
99-279-1	43GR-MUS10ML	99-52-1	43GT-TBB25SL	99-809Z	43PR-NGS55ZM
99-283-1	43GR-MS10ML	99-530-1	43GT-TTC20SL	99-810	43PR-PES53FS
99-290-1	43GR-MHS15SL	99-53-1	43GT-TBB25ML	99-811	43PR-PFS53FS
99-291-1	43GR-MHS15ML	99-54-1	43GT-FIS25SL	99-814	43PR-CBS53ZM
99-294-1	43GR-BCA73SL	99-55-1	43GT-FIS25ML	99-816	43PR-AAS53ZM
99-300-1	43GR-TBS25SL	99-56-1	43GT-BAA72SL	99-818	43PR-VBS53ZM
99-30-1	43GR-FAS25SL	99-57-1	43GT-BAA72ML	99-819	43PT-NAS58FS
99-301-1	43GR-TBS25ML	99-58-1	43GT-MKS00SL	99-820	43PT-NBS56FM
99-302-1	43GR-TBB30SL	99-59-1	43GT-MKS00ML	99-821	43PT-NBS54FM
99-304-1	43GR-TQC25SL	99-614-1	43GR-MQS15SL	99-822	43PT-NBS52FM
99-308-1	43GR-TRC30SL	99-623-1	43GR-2FAS25SL	99-823	43PT-PAS52FS
99-31-1	43GR-FAS25ML	99-626-1	43GT-6TBB15SL	99-825	43PT-PCS52FM
99-315-1	43GR-TKC25ML	99-643-1	43GR-4TBB22SL	99-827	43PT-CBS56FS
99-32-1	43GR-TBB25SL	99-68-1	43GR-MVS00ML	99-828	43PT-SAS56FS
99-330-1	43GR-TTS20SL	99-69-1	43GT-TMC25SL	99-833	43PR-SCS57ZS
99-33-1	43GR-TBB25ML	99-700-1	43GR-TBS20MS	99-838	43PR-SBS57ZS
99-34-1	43GR-FIS25SL	99-701-1	43GR-TBS15ML	99-85-1	43GR-TGB33SL
99-350-1	43GR-FRS40SL	99-702-1	43GR-TAS20MS	99-90	43PT-NJS56FS
99-35-1	43GR-FIS25ML	99-704-1	43GR-TAS20SS	99-900	43PR-RAS57ZS
99-36-1	43GR-BAA72SL	99-705-1	43GR-TMS25ML	99-91	43PT-NJS56GS
99-37-1	43GR-BAA72ML	99-706-1	43GR-TMS20MS	99-92	43PT-PKS56FS
99-39-1	43GR-MKS00ML	99-708-1	43GR-TQS20MS	99-93	43PT-PKS56GS
99-400-1	43GT-FOS20SL	99-710-1	43GT-TBS15MS	99-94	43PR-NES57ZS
99-408-1	43GT-FPS10SL	99-714-1	43GT-TAS15SS	99-95	43PR-NES57VS
99-424-1	43GT-TMC15SL	99-714-1	43GT-TAS15SS	99-951-1	43GT-XAS10SS
99-426-1	43GT-TOC30SL	99-715-1	43GT-TFS10ML	99-952-1	43GT-TIS10SS
99-436-1	43GT-FAS30SL	99-716-1	43GT-TOS30ML	99-953-1	43GT-FTS10SS
99-453-1	43GT-TJC30ML	99-717-1	43GT-TQS25ML	99-955-1	43GT-TDS10SS
99-458-1	43GT-MBS10SL	99-718-1	43GT-TQS15MS	99-96	43PR-PIS57ZS
99-46-1	43GR-TXC25SL	99-720-1	43GT-TRS30ML	99-97	43PR-PIS57VS

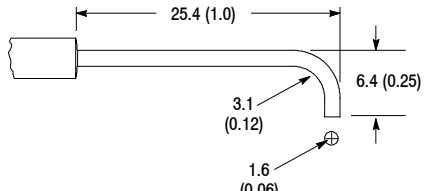
Glass Fiber Optic Cable Tips

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

Approximate Dimensions [mm (in.)]	Code	[mm (in.)]	Dimensions [mm (in.)]	
			A	B
	MB	1.2 (0.046)	1.65 (0.065)	25.4 (1.0)
	MF	1.2 (0.046)	1.65 (0.065)	50.8 (2.0)
	MV	0.70 (0.027)	1.09 (0.043)	12.7 (0.5)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]				
			A	B	C	D	E
	FI	3.2 (0.125)	27.9 (1.1)	20.3 (0.8)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FJ	4.0 (0.156)	27.9 (1.1)	25.4 (1.0)	5.54 (0.218)	7.49 (0.295)	15.8 (0.625)
	FK	3.2 (0.125)	27.9 (1.1)	27.9 (1.1)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FL	3.2 (0.125)	27.9 (1.1)	35.0 (1.38)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FM	3.2 (0.125)	47.7 (1.88)	47.7 (1.88)	4.75 (0.187)	7.49 (0.295)	15.8 (0.625)
	FT	2.2 (0.09)	12.7 (0.5)	10.16 (0.40)	2.36 (0.093)	4.75 (0.187)	10.4 (0.4)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]	Dimensions [mm (in.)]		
			A	B	C
	FS	3.2 (0.125)	27.9 (1.1)	20.3 (0.8)	4.75 (0.187)

Approximate Dimensions [mm (in.)]	Code	Standard Bundle [mm (in.)]
	ML	1.2 (0.046)

Glass Fiber Optic Cables

Additional Cables for Large Aperture Sensors [4.6 mm (0.187 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 a Large Aperture Sensor:

43

Fiber Optic Cable

Fiber Material
 G = Glass
 Q = Quartz

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.

L

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 product support.

Fits large aperture (4.6 mm/ 0.187 in. OD) sensors which include:
 42EF-G1xxA
 42EF-KL-G1xxx
 42GxF-900x
 42GTGF-100x0
 42GTGF-103x0
 42SRF-60xx
 42SRF-65xx
 42xRx-5x00FO

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

PVC 
 Stainless Steel Flexible Conduit 