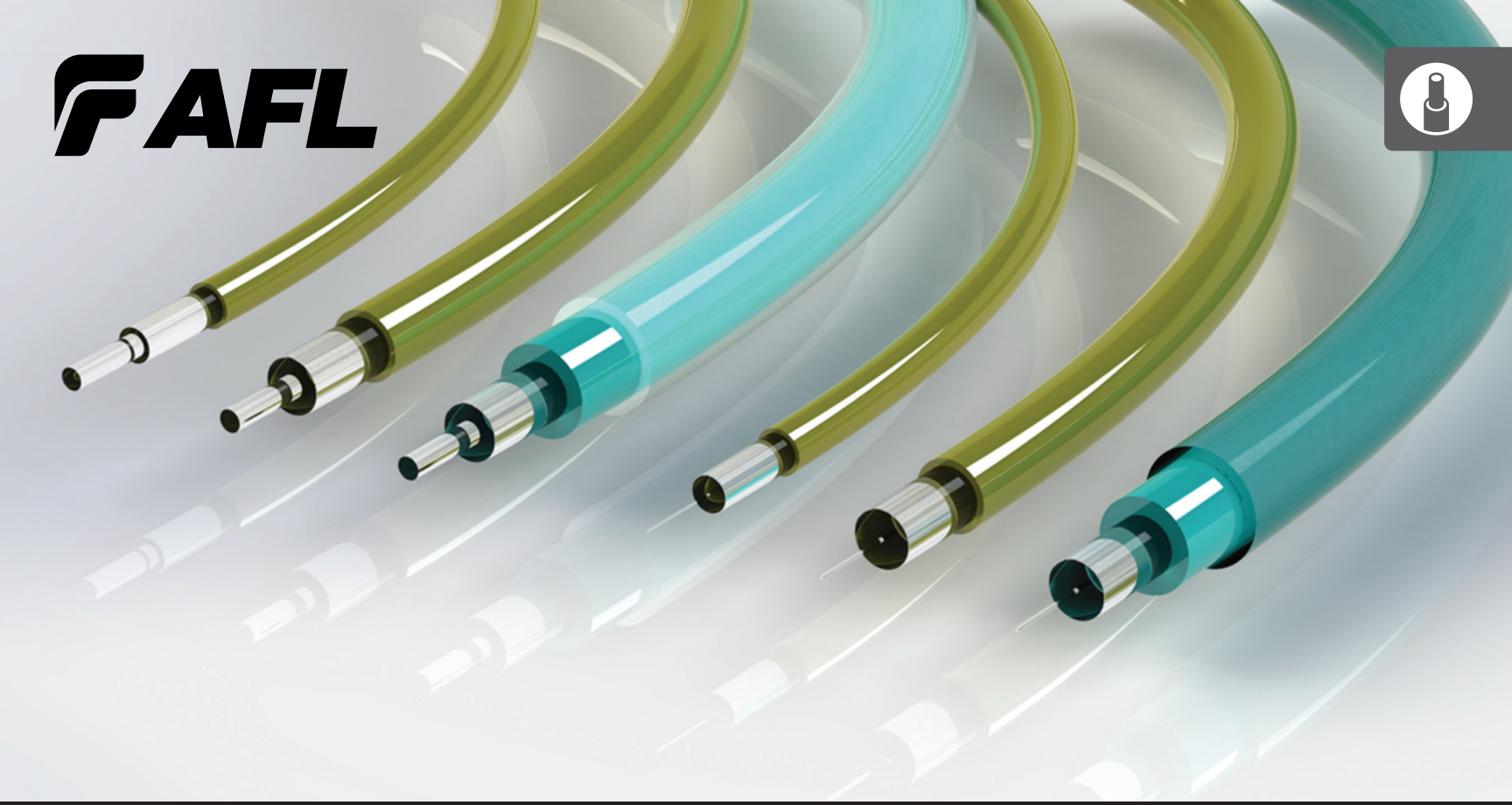


MEDICAL FIBER OPTICS

Fibers | Components | Cables | Assemblies | Equipment

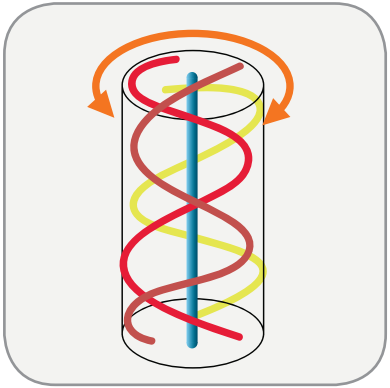
Medical Capabilities

- GMP and Traceability
- Glass and Waveguide
- Coatings and Buffers
- Components Splicing and Processing
- Medical Cables
- Proximal and Distal Assembly
- Test and Inspection

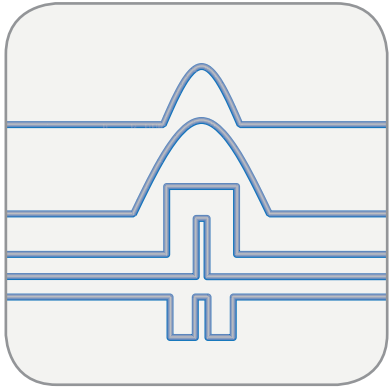
Medical Optical Waveguides

Precision and custom waveguides to deliver low and high power optical signals

- Polarization control for interferometric requirements
- Synthetic fused silica for 200nm to 2100nm transmission windows
- Step or graded refractive index profiles to achieve desired beam characteristics
- Photosensitive designs for cost effective fiber Bragg gratings
- Multi-core Fibers for shape sensing



Multi-core Fibers

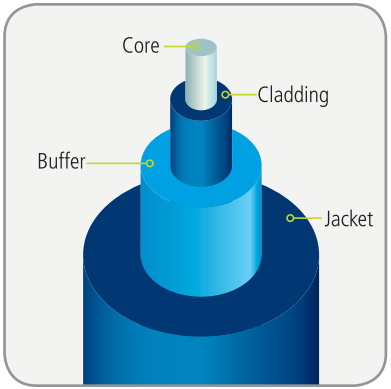


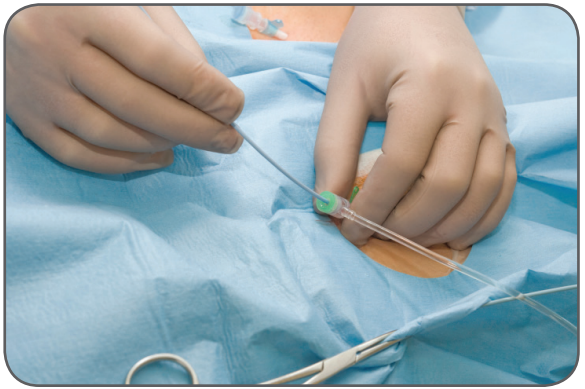
Waveguide Index Profile

Medical Coatings and Buffers

Coatings and buffers to achieve handling, mechanical and delivery needs

- Carbon coatings for enhanced reliability through autoclave sterilization
- Thin polyimide coatings provide geometric advantages
- Acrylate coating for improved handling
- Silicone/PFA coatings to provide lubricity during introduction
- Metal coatings for visualization



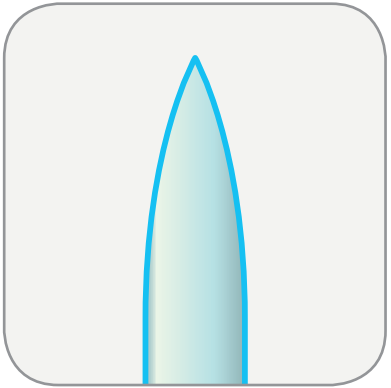


Specialty Fiber Optic Components and Services

Glass processing and attachment of beam shaping or sensing components

- Adiabatic Tapers for light confinement
- Endcap and GRIN lens attachment for beam conditioning and shaping
- Fiber Combiners for brightness conversion
- Lensing techniques for beam shaping and sensing
- Mode field adapter for lower loss joining of dissimilar waveguides
- Multi-core fiber fanouts for precision access to input/output

Multi-core Fan-in/Fan-out



Tapered Axicon

Ball Lens

Medical Optical Cabling

Biocompatible Cabling and Jacketing

Provides additional mechanical protection and space/size reductions

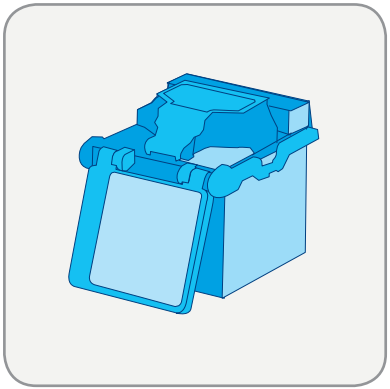
- Polyurethane for flexibility
- PVC for cost effectiveness
- Kevlar for strength and connector attachment
- Other medical grade jacketing

4F - 900 µm Micro Cable

Multi-Fiber Instrument Cable

Fusion Splicing and Test Equipment

- Fiber stripping and cleaving tools for high-speed/cost-effective assembly
- Automatic Preparation Machines
- Fiber splicing tools for joining and attachment of fibers and optical components
- Field and Specialty Fusion Splicing Systems
- Optical testing tools to rapidly measure the as-built performance
- OTDR's, Loss Test Sets, Inspection and Cleaning
- Multi-fiber connectors via MPO and other designs are available



Optical Processing

Test Equipment

Medical Fiber Selector

Single-Mode Optical Fibers for Medical Sensing

AFL's single-mode fibers offer designers control of the electromagnetic wave function of light for use in a wide variety of precision sensor platforms. Medical device suppliers into the FFR (fractional flow reserve), OCT (optical coherence tomography), or other sensing applications can rely on quality, volume, and value from AFL's single-mode optical fibers.

FIBER TYPE	SINGLE-MODE (VISIBLE WAVELENGTHS)				SINGLE-MODE (NEAR INFRA-RED)				SINGLE-MODE (INFRA-RED)			
Core (Mode) Diameter (µm)	4				6				9.3			
Clad Diameter (µm)	125		80		125		80		125		80	
Numerical Aperture	0.11	0.15	0.11	0.15	0.11	0.15	0.11	0.15	0.11	0.15	0.11	0.15
Cutoff Wavelength (nm)	550	700	550	700	800	900	800	900	1260	1350	1260	1350
Operating Wavelength (nm)	600	820	600	820	850	950	850	950	1310	1550	1310	1550
Clad Non-Circularity	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%
Core/Clad Offset (µm)	<0.5	<0.5	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0
Proof Test (Kpsi)	200	200	200	200	200	200	200	200	200	200	200	200
Hermetic Carbon Available	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coating Options Available												
Coating Diameter Polyimide (µm)	155	155	105	105	155	155	105	105	155	155	105	105
Coating Diameter Acrylate (µm)	250	250	160	160	250	250	160	160	250	250	160	160
Coating Diameter Silicone/PFA (µm)	250	250	250	250	250	250	250	250	250	250	250	250

Medical Fiber Selector

Multimode Optical Fibers for Medical Sensing

AFL's multimode fibers offer more geometric tolerance in terms of light sources, detectors, and other components within the sensor system design. Medical device suppliers into the FFR (fractional flow reserve), OCT (optical coherence tomography), or other sensing applications can rely on quality, volume, and value from AFL's multimode optical fibers.

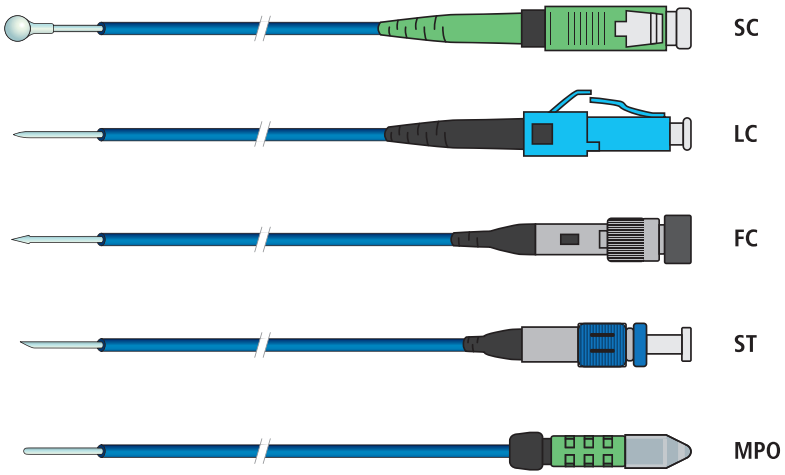
FIBER TYPE	MULTIMODE				MULTIMODE				MULTIMODE			
Core Diameter (µm)	50				60				100			
Index Profile	Graded or Step				Graded or Step				Graded or Step			
Clad Diameter (µm)	125		80		125		80		125		110	
Numerical Aperture	0.1 - 0.29		0.1 - 0.29		0.1 -0.29		0.1 -0.29		0.1 -0.29		0.1 -0.29	
Operating Wavelength (nm)	200 - 2100		200 - 2100		200 - 2100		200 - 2100		200 - 2100		200 - 2100	
Clad Non-Circularity	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%	<2%
Core/Clad Offset (µm)	<0.5	<0.5	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0	<0.5	<0.5	<1.0	<1.0
Proof Test (Kpsi)	200	200	200	200	200	200	200	200	200	200	200	200
Hermetic Carbon Available	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coating Options Available												
Coating Diameter Polyimide (µm)	155	155	105	105	155	155	105	105	155	155	105	105
Coating Diameter Acrylate (µm)	250	250	160	160	250	250	160	160	250	250	160	160
Coating Diameter Silicone/PFA (µm)	250	250	250	250	250	250	250	250	250	250	250	250

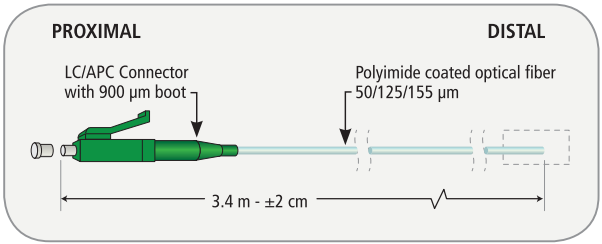
Sensing Fiber Optic Assemblies

Medical Assembly Guide

From the optical waveguide, through the coatings, cabling, and assembly, medical designers can be confident in a repeatable product. Standard and customer assembly testing Is available to ensure optical and mechanical requirements are met. Medical device suppliers into the FFR (fractional flow reserve), OCT (optical coherence tomography), or other tactile sensing applications can rely on quality, volume, and value from AFL.

Medical Assemblies Optical Connectors

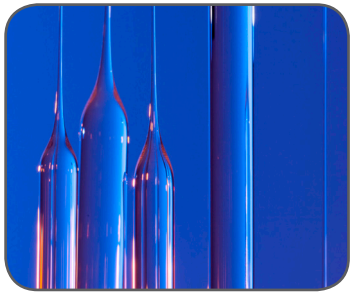


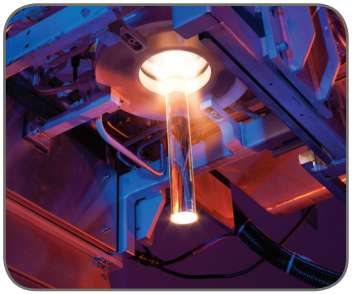


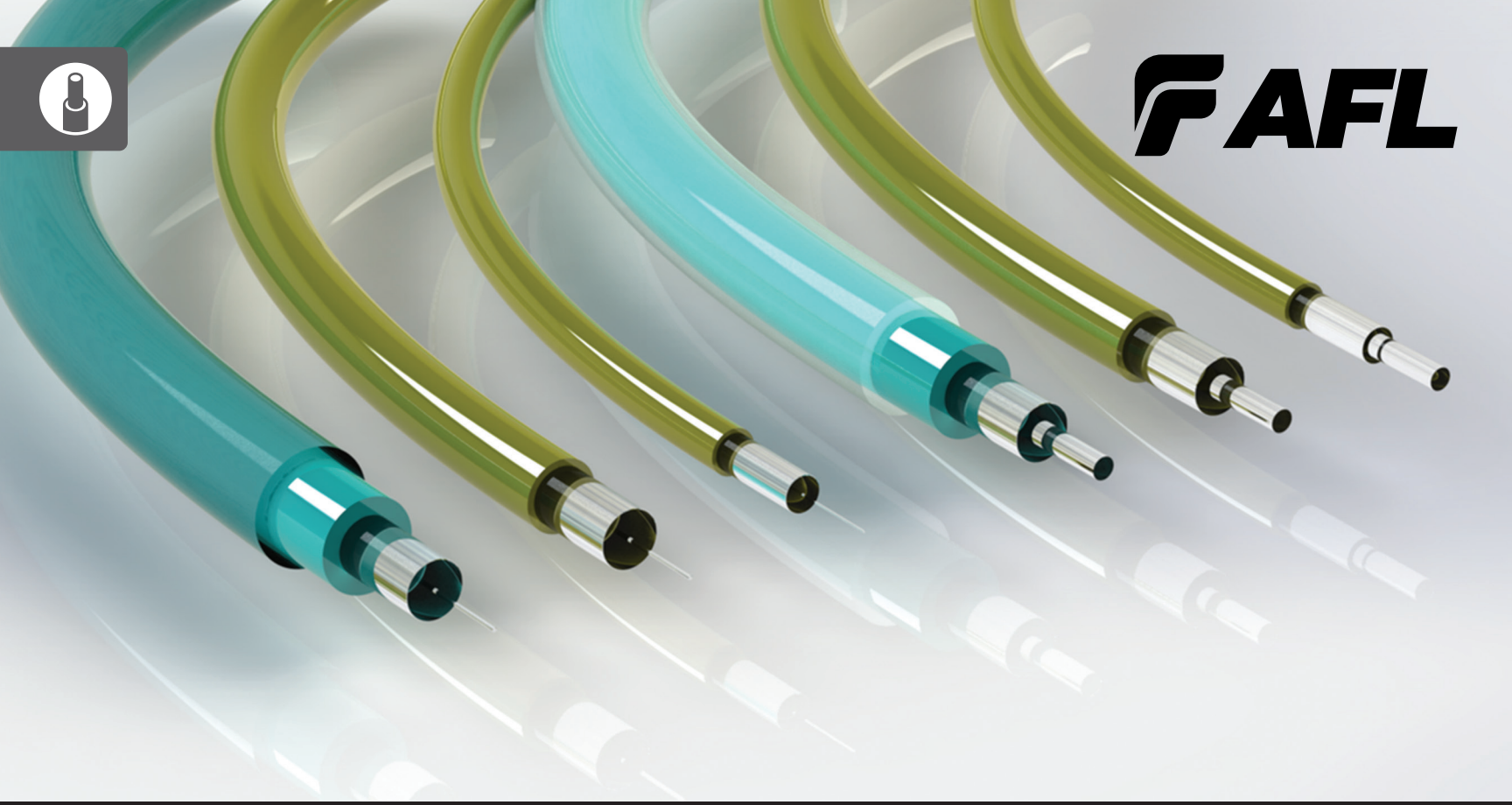
Founded in 1984, AFL is a global leader providing fiber optic products, equipment, and engineering services to the communications, medical, energy, and OEM markets. AFL offers a diverse mix of cable and fiber, assemblies, components, equipment and services to the medical industry.

As minimal-invasive surgery expands, so does the need for advanced fiber optic sensors. As a leader in the fiber optic industry, AFL is positioned to meet these growing needs.

AFL brings years of experience in developing solutions for customers, fostering a creative culture to drive and deploy innovative technologies that will improve communications and sensing for years to come.







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www.AFLglobal.com or 800-235-3423

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MEDICAL FIBER OPTICS

Fibers | Components | Cables | Equipment