Fiber Optic Assemblies

Technical Data

REFERENCE SUMMARY

Product Category:
Assembly

Trade Name:
Fiber Optic Assemblies

DESCRIPTION

Fiberguide has been supporting the Original Equipment Manufacturer (OEM) in taking their concepts and ideas to market since 1977. Our staff of engineers, technical sales professionals and experienced production team unites in developing that product specific to your individual application. We design and engineer assemblies using not only our own pure silica core/silica clad, silica core/plastic clad fibers, but borosilicate glass fiber, ESKA™ plastic optical fiber, fluoride fiber, chalcogenide fiber, erbium-doped fiber and polarization maintaining fiber as well. Available with numerical apertures (N.A.'s) from 0.12 (full acceptance angle 14°) to 0.66 (full acceptance angle 82°), with the widest range of custom and standard endfittings/connectors and outer jackets to tailor a product to your technical and economic requisites.

The definition of a fiber optic assembly is "A length of fiber optic cable that has been terminated with a connector, pigtail or other component." This could be a single fiber cable terminated with industry standard connectors on both ends and jacketed in flexible sheathing, to a multi-fiber design consisting of multiple inputs and/or outputs, each with different cross-section areas and geometries, each requiring a custom machined endfitting and a heavy duty outer jacket to protect the assembly from being crushed.

TYPICAL EXAMPLES

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Fiberguide Industries, Inc., 1 Bay Street, Stirling, NJ 07980
Phone: 908-647-6601 Fax: 908-647-8464 info@fiberguide.com www.fiberguide.com

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DESIGN FEATURES

- Temperatures from -269°C to +750°C. (Using gold coated fibers.)
- Vacuum compatible tested to 10-9 Torr.
- Chemical resistant: acids, bases, and organic solvents.
- Radiation resistant: gamma, e-beam, fast neutrons, and x-ray resistant.
- Operating wavelengths from 180nm to 2400nm.
- Overall lengths up to 100 meters.
- Active area geometries include circular, arc, segmented, rectangle, concentric, square, linear, hexagonal, or whatever the application calls for.
- Bifurcated, trifurcated to complex multiple leg assemblies.
- Cross-section, or aperture, of each end may be of a different geometry, i.e. line-to-spot, spot-to-spot, concentric-to-(2) spots, or whatever the application calls for.
- Different size and/or different fibers (e.g. silica/silica and borosilicate) may be combined into the same assembly.
- Fiber arrangement may be random, uniformly distributed, scrambled, coherently aligned, mapped for specific input/output distribution, precision spaced.
- Wide assortment of end terminations and furcation joints.

End Terminations

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Furcation Joints

SHEATHING/JACKET MATERIALS

To Achieve	Tight Bend Radius	Non Conductive	Chemical Resistance	Non Magnetic	Vacuum Compatible	Liquid Tight
Breakout Tubing	B	A	A	A	F	A
Silverflex (Fiberglass)	A	A	B	A	A	F
Polyimide Tubing	C	A	A	A	A	A
PVC (polyvinyl chloride) Monocoil	B	*	A	F	F	A
PVC Tubing	B	A	A	A	F	A
Stainless Steel Monocoil	C	F	A	B	A	F
Stainless Steel Braided Hose	C	F	A	B	A	A
Tygon Tubing	A	A	B	A	F	A

A = Best **F = Worst**
*** = Inside coil is conductive, outside PVC jacket is not.**

To Protect Against	Bending	Crushing	Cutting	Kinking	Pulling	High Heat
Breakout Tubing	B	C	C	B	A	C
Silverflex (Fiberglass)	F	F	F	B	F	A
Polyimide Tubing	F	F	F	F	D	A
PVC (polyvinyl chloride) Monocoil	C	B	B	A	C	C
PVC Tubing	D	D	D	C	C	C
Stainless Steel Monocoil	A	A	A	A	C	A
Stainless Steel Braided Hose	A	A	A	A	A	A
Tygon Tubing	F	D	F	C	C	C

A = Best **F = Worst**
These are rough "guidelines" only. Subject to change without notice. Consult engineering for specific needs or questions.

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SHEATHING/JACKET MATERIALS

Material: PVC jacket, inner polypropylene tube with kevlar strands.

Temperature Rating: -20°C through 80°C.

Used For: Non-conductive, chemical resistant, non-magnetic, liquid tight and low cost.

NOT Used For: Environments that consist of crushing, cutting, vacuum requirements and high heat requirements.

Material: Fiberglass, (Dyed or natural, saturated or unsaturated).

Temperature Rating: up to 625°C.

Used For: Tight bend radius, non-conductive, chemical resistant, non-magnetic, vacuum compatible, high temperature, low cost.

NOT Used For: Environments that consist of crushing, cutting, liquid tight requirements, aerospace environment and pulling.

Material: Polyimide.

Temperature Rating: -250°C through 480°C.

Used For: Non-conductive, chemical resistant, non-magnetic, liquid tight and low cost.

NOT Used For: Environments that consist of bending, crushing, cutting, kinking and pulling.

Material: PVC tubing, steel coils.

Temperature Rating: -30°C through 100°C.

Used For: Moderate bend radius, chemical resistant, liquid tight, resistant to kinking, cutting and crushing with moderate cost.

NOT Used For: Environments that consist of vacuum, non-magnetic, high temperature requirements.

Material: PVC tubing, brass or stainless steel interlocked coils.

Temperature Rating: -30°C through 100°C.

Used For: Moderate bend radius, chemical resistant, liquid tight, resistant to kinking, cutting and crushing with moderate cost.

NOT Used For: Environments that consist of vacuum non-magnetic, high temperature requirements.

Material: PVC.

Temperature Rating: -20°C through 100°C.

Used For: Tight bend radius, non-conductive, chemical resistant, non-magnetic, liquid tight, low cost.

NOT Used For: Environments that consist of bending, crushing, cutting, vacuum, high temperature requirements.

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SHEATHING/JACKET MATERIALS

Material: Stainless steel.

Temperature Rating:
-160°C through 800°C.

Used For: Chemical resistant, non-magnetic, vacuum compatible, resistant to tight bending, crushing, cutting, kinking, high temperature.

NOT Used For: Environments that consist of tight bending, liquid tight, non-conductive requirements.

Material: Stainless steel.

Temperature Rating: up to 525°C.

Used For: Chemical resistant, liquid tight, vacuum compatible, resistant to tight bending, crushing, cutting, kinking, high temperature.

NOT Used For: Environments that consist of tight bending, non-conductive requirements.

Material: Tygon.

Temperature Rating:
-45°C through 70°C.

Used For: Tight bend radius, non-conductive, chemical resistant, non-magnetic, liquid tight and low cost.

NOT Used For: Environments that consist of crushing, cutting, vacuum and high temperature.

TYPICAL APPLICATIONS

Scientific
- Remote spectroscopy
- Photoinitiated chemistry
- Particle detection
- Fluorescence excitation
- Microscope illumination
- Chemical analysis
- Colorimetry
- Raman scattering, thompson scattering, optical pyrometry, and streak cameras

Industrial
- Remote illumination
- Reflective sensors
- Quality control
- Inspection systems
- Smoke detection
- Scanning, counting, monitoring, inspecting
- High power laser delivery
- Laser welding, soldering

Medical
- Laser delivery
- Medical diagnostics
- Photodynamic therapy
- Endoscopy
- Flow Cytometry
- Genomics
- Proteomics

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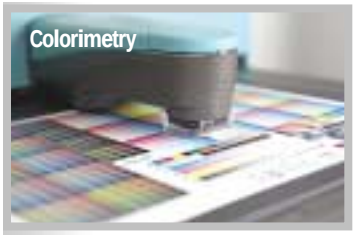
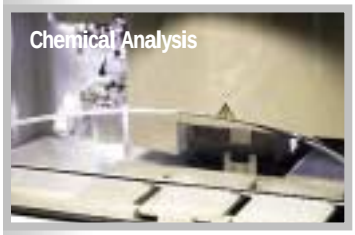
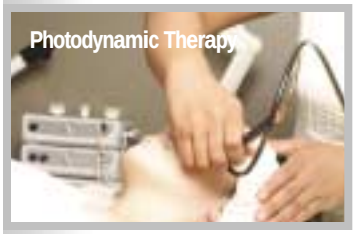
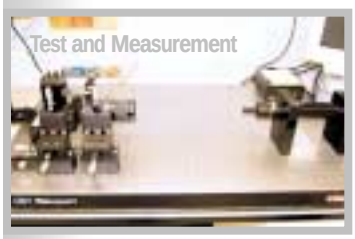
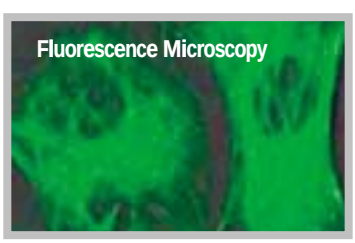
TYPICAL APPLICATIONS











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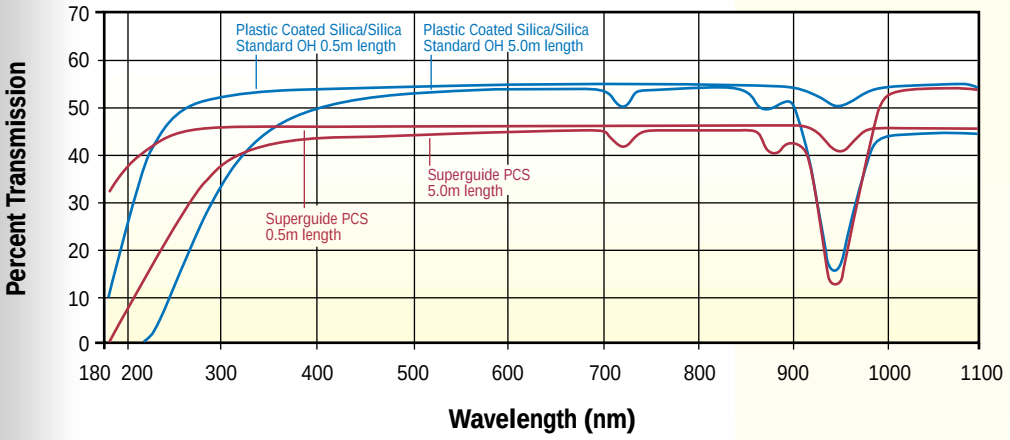
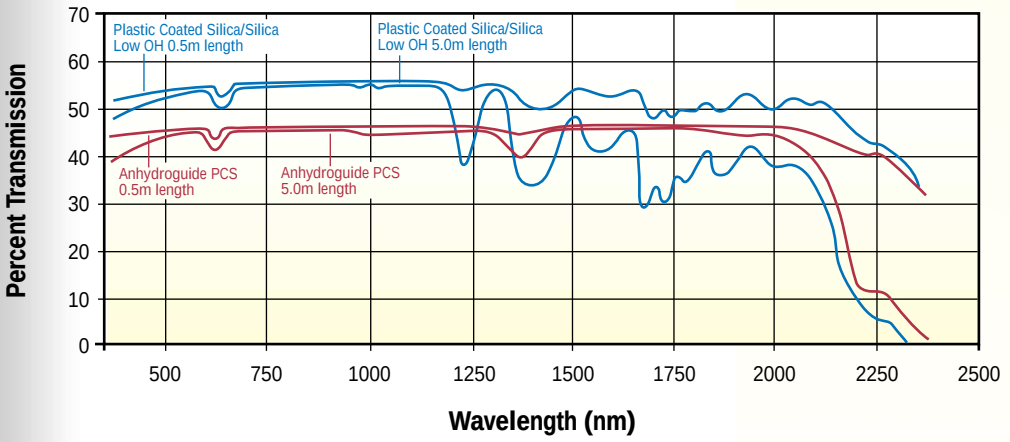
SPECTRAL ATTENUATION (Typical)

Bundle Transmission UV-VIS



Bundle Transmission VIS-IR



Note: Percent transmission is expressed as a function of wavelength, overall length and packing fraction (maximum number of fibers which can fit into a given area). Total loss shown includes input/output Fresnel loss, packing fraction loss and intrinsic attenuation.

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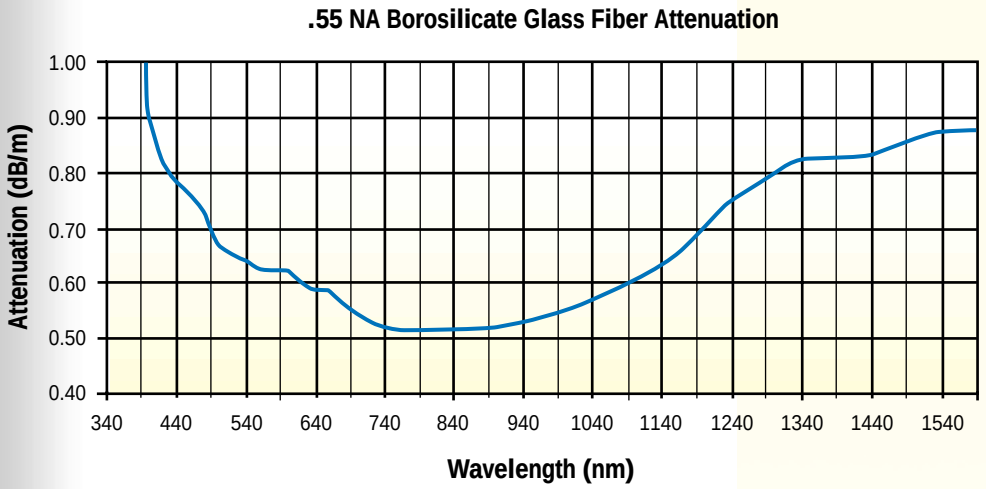
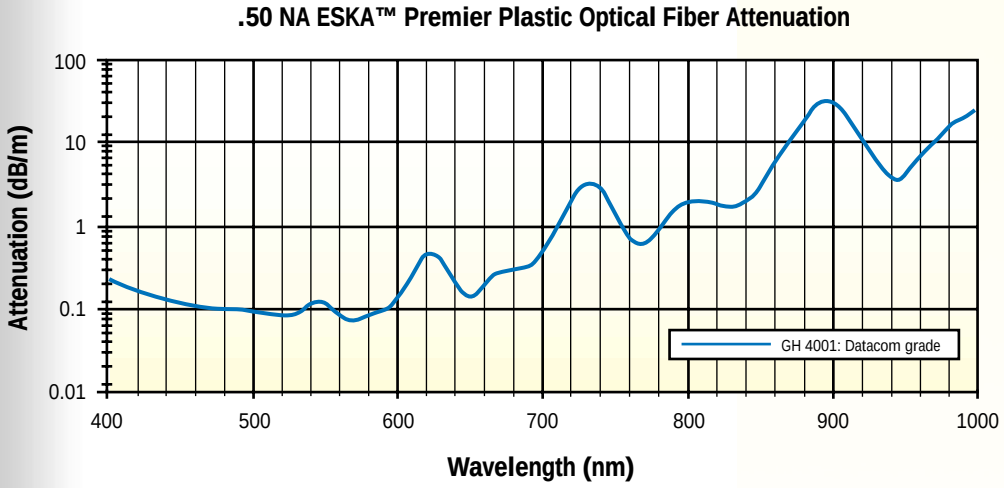
SPECTRAL ATTENUATION (Typical)





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FLUORIDE FIBER

An optical fiber operating in the mid-infrared wavelength range is fabricated using ZrF4-based fluoride glass.

CHALCOGENIDE FIBER

These multimode step index fibers have a chalcogenide core and chalcogenide cladding of lower refractive index, transmitting light from 1µm - 6µm. Are flexible and do not suffer from serious degradation by moisture ingress as with certain other types of fiber designed for similar wavelengths. Chalcogenide fibers do not have the tensile strength of silica fibers, however, they are quite easy to handle if given a suitable jacket for protection.

ERBIUM-DOPED FIBER

Erbium is a metallic rare earth element that is used to amplify light signals sent along fiber optic cable. If this chemical element is doped in a glass fiber and light is pumped through it, the result is an Erbium-Doped Fiber Amplifier (EDFA). These amplifiers provide a large gain, which occurs when the fiber is “pumped” by additional light input at a wavelength shorter than 1.55_m, e.g. a wavelength of 980nm. Also, large output power is obtained, and near quantum-limited noise performance in the 1.55_m spectrum. EDFAs enable the user transmitting an optical signals over very long distances without the need for electronic signal regeneration.

POLARIZATION MAINTAINING (PM) FIBER

An optical fiber in which the polarization planes of light waves launched into the fiber are maintained during propagation with little or no cross-coupling of optical power between the polarization modes. PMF is used for pigtails, integrated optics and Gyros/sensors.

TYPICAL FIBER SPECIFICATIONS

Fiber Type	N.A.	Acceptance Angle	Temperature Range
Plastic Clad Silica Anhydroguide series (Low OH) and Superguide series (Standard OH)	0.37	46° full angle	-30°C to +150°C*
Plastic Clad Silica/Silica Anhydroguide series (Low OH) and Superguide series (Standard OH)	0.22	25° full angle	-40°C to +150°C*
Polymer Coated Silica/Silica Anhydroguide series (Low OH) and Superguide series (Standard OH)	0.22	25° full angle	-40°C to +100°C - +350°C*
Polymer Coated Silica/Silica Anhydroguide series (Low OH) and Superguide series (Standard OH)	0.12	14° full angle	-40°C to +100°C - +350°C*
Polymer Coated Silica/Silica Anhydroguide series (Low OH) and Superguide series (Standard OH)	0.26	30° full angle	-40°C to +100°C - +350°C*
Borosilicate Glass/Glass	0.55	66° full angle	-45°C to +500°C
ESKA™ Plastic Optical Fiber (PMMA)	0.50	62° full angle	-55°C to +70°C
Fluoride Mid IR Fiber	0.10+	12°+ full angle	-20°C to +150°C
Chalcogenide Fiber	0.10+	12°+ full angle	-200°C to +100°C
Erbium-Doped Fiber	0.23	27° full angle	-40°C to +150°C
Polarization Maintaining Fiber	0.13	15° full angle	-40°C to +150°C

***Note:** Please see detailed fiber data sheet for complete specifications.

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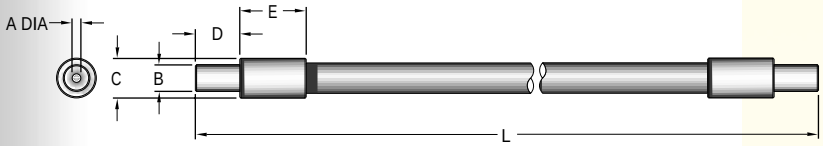
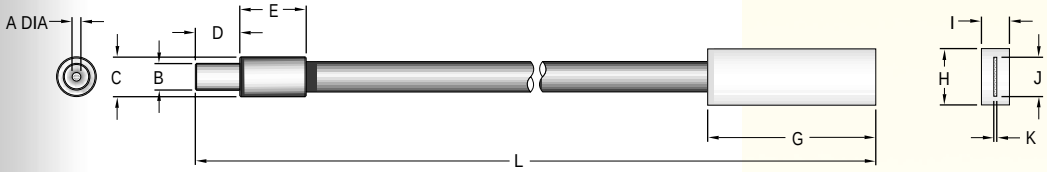
TYPICAL DESIGN CONFIGURATIONS

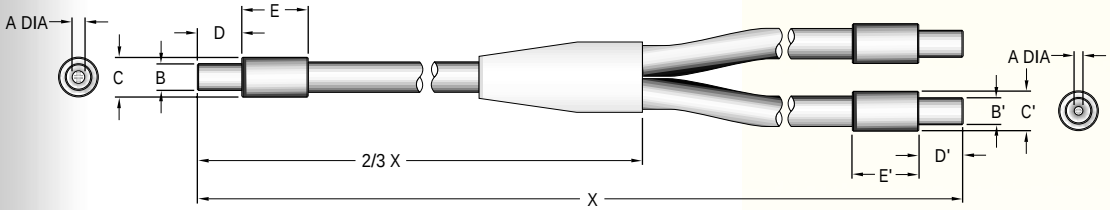
Round-to-Round



Round-to-Slit



Bifurcated Round-to-2 Round



Fiberguide Industries Customization Program
Fiberguide Industries is a full service custom fiber and value-added assembly provider. If you have unique requirements, please contact us to discuss tailoring a product or design to optimize optical performance for your specific application.

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