Optical Fiber Assemblies

Ocean Optics offers an extensive line of optical fibers and accessories -- including patch cords, bifurcated assemblies, bushings, and splitters -- for a variety of UV-VIS and VIS-NIR applications. All optical fibers couple easily via SMA terminations to our miniature fiber optic spectrometers, light sources and sampling optics. Ocean Optics optical fibers offer great flexibility, both in the literal sense (by transporting light around corners, for example) and in the way fiber-based systems are constructed (by linking light sources and sampling optics, for example, to create an optical interface to the spectrometer). Optical fibers allow the user to easily convert the optical interface from one setup to another -- absorbance, reflectance and emission are the three basic options -- to create an almost endless variety of optical-sensing systems.

These silica-core and silica-clad optical fibers are optimized for the UV-VIS (200-750 nm) or VIS-NIR (450-1000 nm). Standard assemblies are 2 meters in length, and are available in sizes ranging from 8 µm to 1000 µm in diameter. Custom options include optical fibers with solarization-resistance properties (for applications <250 nm), and in lengths other than 2 meters.

Caution!

- **Gently remove the plastic cover from the SMA connector before use. Pulling the SMA connector away from the fiber when removing the plastic cover will permanently damage the fiber**.
- When fibers break, they stop transmitting light. Be sure to inspect fibers by eye to determine if light is being transmitted.
- Do not coil the fiber too tightly. The maximum sustained bend radius of a 400 µm fiber is 10 cm. Bending the fiber will cause attenuation. To minimize this effect, add extra strain relief to both ends of the fiber.
- Do not exceed the temperature specifications for the materials involved: 200°C for the fiber, 100°C for PVC cabling, 100°C for standard epoxy.
- Do not allow the fiber to be bent at a sharp angle. A bending radius of less than one inch is dangerous.
- Keep connectors and probe tips covered when the fibers are not being used.
- Clean ends of the fibers with lens paper and distilled water, alcohol, or acetone. Avoid scratching the surface.
- Do not immerse fiber ends in caustic materials or other solutions that can damage quartz or aluminum.

Operation

Patch Cords

Patch cords are single strands of optical fiber. The active part consists of a silica core, surrounded by a silica cladding material. The fiber is very fragile, and if not protected by a suitable buffer material, would be nearly useless for most applications. The buffer materials are polymer coatings that provide mechanical strength, either polyamide or Teflon. Cabling further protects the buffer-coated fiber. Our standard laboratory cabling is blue PVC. Other cabling that is available includes stainless steel monocoil. The ends of the fibers are cleaved, epoxied into the connectors, and polished.

Bifurcated Assemblies and Splitters

Bifurcated assemblies and splitters allow you to route light from 1 location to 2 locations, or to collect light from 2 locations and combine the output into 1 location. The assemblies are shaped like a “Y” with a stainless steel breakout located midway from the ends of the fibers. The common end of bifurcated assemblies has 2 fibers laying side by side. The spatial difference between the two fibers may be important in your application. If this difference matters, then a splitter is required. The common end of a bifurcated fiber can be coupled to a larger diameter single fiber with a splice bushing to create a functional splitter.

Splice Bushings, Bulkhead Fittings

Splice bushings are used to couple two SMA-terminated fibers together. Simply screw each fiber into the splice bushing finger-tight. Bulkhead fittings are used to fixture a fiber onto a panel. Install the bulkhead by drilling a hole in the wall where you wish to mount the fiber. Fasten with the lock washer and nut provided.

Solarization-resistant Fibers

If you are using a UV light source, the UV radiation degrades the silica in a standard patch cord over time, resulting in increased absorption and invalid data. The degradation is called solarization. The active part of our solarization-resistant fibers consists of a silica core, surrounded by a silica cladding material. Then the fiber is coated in aluminum, which prevents the fiber from solarizing.

Optical Fiber Color Codes

All Ocean Optics optical fibers are color-coded for simple identification. There are two color bands on one end of the fiber. The color band nearest the termination identifies the fiber type (i.e., its wavelength optimization), and is either white (UV/VIS) or black (VIS/NIR). The second color band identifies the diameter of the fiber, and is one of several different colors. Use the table below as a handy reference.

Band Color	Core Diameter (μm)
Purple	8 (VIS/NIR only)
Blue	50
Green	100
Yellow	200
Gray*	300
Red	400
Brown	600
Clear	1000

Band Color	Fiber Type
White	UV/VIS
Black	VIS/NIR

* The 300 μm optical fiber is a solarization-resistant fiber for applications <250 nm.

Specifications

Jacket:	Acrylate (temperature range -40° to 100° C), for 50 μm optical fibers Nylon (temp range -40° to 100° C), for 100, 200, 400, 600 and 1000 μm optical fibers Aluminum (temp range -269° C to 400° C), for 300 μm solarization-resistant fibers
Sheathing/cabling:	PVC with Kevlar reinforcement (standard) PVC Monocoil (optional) BX flexible metal sleeve (optional)
Connector/termination:	SMA 905
Fiber core:	pure fused silica
Cladding:	doped fused silica
Fiber profile:	step-index multi-mode
Operating wavelengths:	UV-VIS (200-750 nm) VIS-NIR (450-1000 nm)
Numerical aperture:	0.22
Recommended minimum bend radius:	momentary = 200x the fiber radius (for standard patch cords) long term = 400x the fiber radius (for standard patch cords)