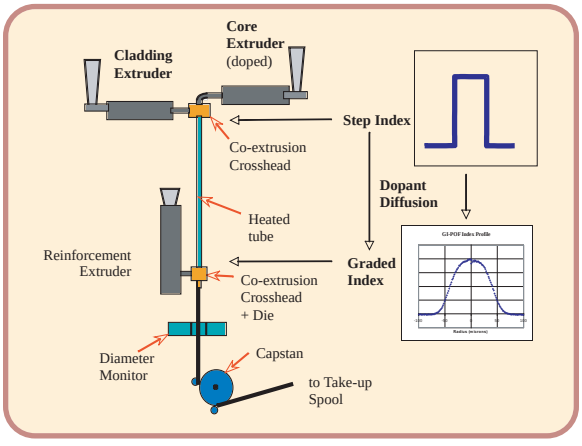
Graded-Index Polymer Optical Fiber (GI-POF)

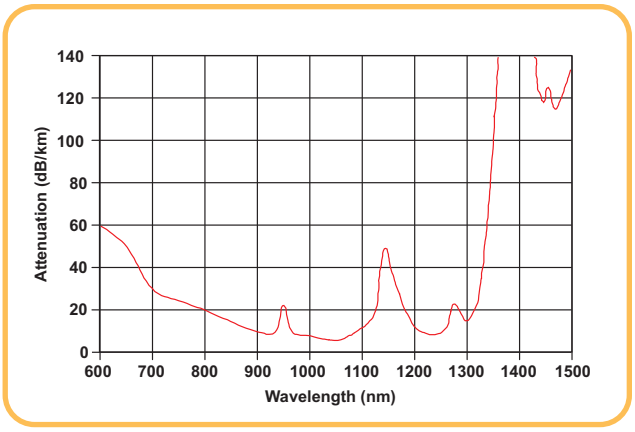
Perfluorinated graded-index polymer optical fibers (GI-POFs) combine high data transmission rates and low attenuation in the commercially desirable 850–1300 nm range. GI-POFs offer a direct replacement and a low-cost alternative to traditional glass. With ease of use and affordability, GI-POFs make an excellent choice for the installation of high-performance fiber networks. In addition, GI-POFs provide a higher transmission bandwidth than any other type of plastic optical fiber.

Until recently, all commercially available POFs have been fabricated from non-fluorinated polymers such as polymethylmethacrylate (PMMA) and, as a result, have had a refractive index that changes in steps. Although inexpensive, these fibers are characterized by large modal dispersion and typically operate at 530 nm or 650 nm, which is well outside of standard communication wavelengths (850 nm or 1300 nm) where high-speed transceivers are readily available. Due to the high attenuation in the near infrared, these fibers are restricted to low performance (<100 Mb/s), short range (<50 m) applications in the visible region.

With the advent of an amorphous perfluorinated polymer, polyperfluoro-butenylvinylether (commercially known as CYTOP®), the limitations presented by step-index POFs have been overcome. Perfluorinated fiber exhibits very low attenuation in the near infrared (~10 dB/km) as shown in the graph above and can support transmission rates up to 10 Gb/s for distances up to 100 m. Moreover, since the perfluorinated optical fiber can be constructed with a graded refractive index, it is capable of supporting bandwidths that are 100 times larger than those provided by conventional POFs. This is due to the interplay between high mode coupling, low material dispersion, and differential mode attenuation.



Unlike conventional glass fibers, which suffer from high interconnection and receiver costs, perfluorinated GI-POFs are easy to install. To add a connector to a glass fiber, the fiber needs to be cleaved using an expensive, specialized tool. Then, epoxy is used to attach the fiber to the connector hardware. Finally, the assembled connector must be polished. In contrast, the GI-POF can be terminated using simple and inexpensive tools, connectors are crimped on, and polishing occurs in mere seconds, leading to a high quality optical link in a fraction of the time. Moreover, GI-POFs are compatible with standard multimode glass fiber transceivers.

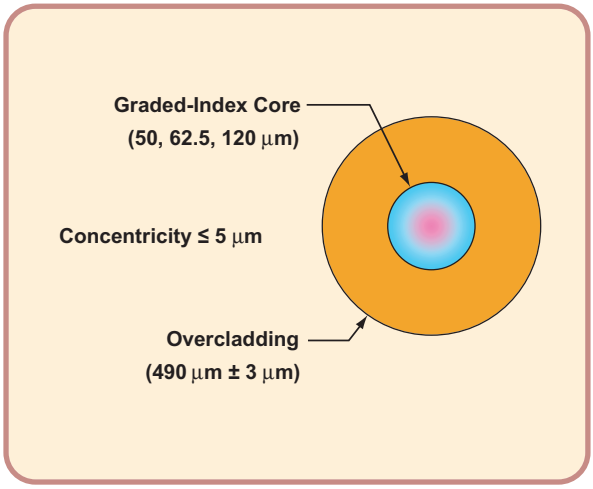


Next-Generation GI-POFs:

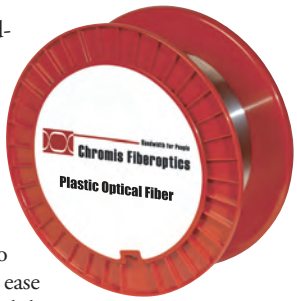
Thorlabs is pleased to offer a line of graded-index polymer optical fibers from Chromis Fiberoptics, a pioneer in plastic optical fiber technology and a world leader in perfluorinated GI-POFs. Unlike conventional preform-based manufacturing processes for GI-POFs, Chromis' patented manufacturing process extrudes fibers directly from bulk materials, resulting in high production rates at unmatched prices.

In order to produce GI-POFs with the properties necessary to meet the demands of high-performance applications, two major hurdles needed to be overcome. First, a technique needed to be developed to produce a high-quality, graded-index structure consistently. Second, the high purity of the perfluorinated material needed to be maintained during the extrusion process so that attenuation levels below 30 dB/m could be achieved.

Chromis' extrusion technology continuously converts high-purity bulk materials into concentric layers of melt streams. As the melt streams are extruded into fiber, the concentric layers fuse to form the graded-index fiber. By controlling the temperature, residence times, and relative flow rates of the core and clad materials, fibers with a wide variety of dimensions and refractive index structures can be formed. By altering the polymer material used in the melt, specialty fibers, such as those used in high temperature or flame-retardant applications, can be produced using the same process.



0.19 NA Graded-Index Plastic Optical Fiber



Thorlabs now offers a line of graded-index polymer optical fibers (GI-POFs) from Chromis Fiberoptics. These multimode fibers offer low attenuation and low material dispersion, thus allowing for high-speed Gigabit Ethernet and multi-gigabit applications at distances up to 100 meters or Fast Ethernet up to 200 meters. These fibers feature the ease of use associated with plastic fibers while providing the low loss, low dispersion, and good transmission characteristics typical of glass fibers at 850 nm and 1300 nm. In addition, these fibers can sustain long-term bending radii that are as small as 5 mm, which is much better than glass fibers of the same core size. GI-POF fiber is simple to terminate and the end face can be polished quickly to produce a low-loss connection. The GI-POF fibers do not require special adapters in order to mate them with like-core-sized glass-equivalent devices. As a result, GI-POF fibers are a direct drop-in glass fiber replacement alternative with a significant cost advantage.

Product Specifications

	GIPOF50	GIPOF62	GIPOF120
Transmission Characteristics			
Attenuation at 850 nm	<60 dB/km		
Attenuation at 1300 nm	<60 dB/km		
Bandwidth at 850 nm	>300 MHz-km		
Numerical Aperture	0.190 ± 0.015	0.190 ± 0.015	0.185 ± 0.015
Macrobend Loss[1]	<0.25 dB	<0.35 dB	<0.60 dB
Zero Dispersion Wavelength	1200-1650 nm		
Dispersion Slope	<0.06 ps/nm^2-km		
Physical Characteristics			
Core Diameter	50 ± 5 µm	62.5 ± 5 µm	120 ± 10 µm
Cladding Diameter	490 ± 5 µm		
Core-Cladding Concentricity	<4 µm	<5 µm	<5 µm
Maximum Tensile Load	7.0 N		
Bending Radius, Long Term	5 mm	5 mm	10 mm
Environmental Performance			
Temperature Induced Attenuation at 850 nm (-20 to +70 °C)	<5 dB/km		
Temperature Induced Attenuation at 850 nm (75 °C, 85% RH, 30 Day Cycle)	<10 dB/km		

1) for 10 turns on a 25mm radius quarter circle

Plastic Optical Fiber

ITEM#	PRICE/m	$	£	€	RMB
GIPOF50	1 to 24 m	$ 1.27	£ 0.90	€ 1,15	¥ 10.80
	25 to 99 m	$ 1.09	£ 0.75	€ 0,95	¥ 9.20
	100 to 499 m	$ 0.90	£ 0.60	€ 0,80	¥ 7.60
	500 to 999 m	$ 0.70	£ 0.50	€ 0,60	¥ 6.00
	1000 and up	$ 0.64	£ 0.45	€ 0,55	¥ 5.50
GIPOF62	1 to 24 m	$ 1.49	£ 1.05	€ 1,35	¥ 12.70
	25 to 99 m	$ 1.28	£ 0.90	€ 1,15	¥ 10.90
	100 to 499 m	$ 1.05	£ 0.70	€ 0,95	¥ 8.90
	500 to 999 m	$ 0.83	£ 0.55	€ 0,75	¥ 7.10
	1000 and up	$ 0.75	£ 0.50	€ 0,65	¥ 6.40
GIPOF120	1 to 24 m	$ 1.84	£ 1.25	€ 1,65	¥ 15.60
	25 to 99 m	$ 1.57	£ 1.10	€ 1,40	¥ 13.30
	100 to 499 m	$ 1.29	£ 0.90	€ 1,15	¥ 10.90
	500 to 999 m	$ 1.02	£ 0.70	€ 0,90	¥ 8.70
	1000 and up	$ 0.92	£ 0.65	€ 0,80	¥ 7.80

Jacketed Plastic Optical Fiber

ITEM#	PRICE/m	$	£	€	RMB
GIPOF50-P	1 to 24 m	$ 1.76	£ 1.20	€ 1,55	¥ 14.90
	25 to 99 m	$ 1.50	£ 1.05	€ 1,35	¥ 12.70
	100 to 499 m	$ 1.24	£ 0.85	€ 1,10	¥ 10.50
	500 to 999 m	$ 0.97	£ 0.65	€ 0,85	¥ 8.20
	1000 and up	$ 0.88	£ 0.60	€ 0,80	¥ 7.50
GIPOF62-P	1 to 24 m	$ 1.98	£ 1.35	€ 1,75	¥ 16.80
	25 to 99 m	$ 1.69	£ 1.15	€ 1,50	¥ 14.30
	100 to 499 m	$ 1.39	£ 0.95	€ 1,25	¥ 11.80
	500 to 999 m	$ 1.09	£ 0.75	€ 0,95	¥ 9.20
	1000 and up	$ 0.99	£ 0.70	€ 0,90	¥ 8.40
GIPOF120-P	1 to 24 m	$ 2.32	£ 1.60	€ 2,05	¥ 19.70
	25 to 99 m	$ 1.98	£ 1.35	€ 1,75	¥ 16.80
	100 to 499 m	$ 1.63	£ 1.10	€ 1,45	¥ 13.80
	500 to 999 m	$ 1.28	£ 0.90	€ 1,15	¥ 10.90
	1000 and up	$ 1.17	£ 0.80	€ 1,05	¥ 9.90

Glue-On Connector for Plastic Optical Fiber

Features

- Standard SC form Factor with Customized Ferrule
- All Material Complies with UL94 V0 and RoHS
- Internal Ferrule Dimension Allows for Direct Connection, No Buffer Removal Required
- F120 Fast Room Temperature Cure Epoxy Recommended for Termination
- Ferrule Material: LCP (Gray Plastic)

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