Corning OptiFocus™ Collimating Lensed Fiber
Product Information

CORNING
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Photonic Materials

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Corning OptiFocus™ Lensed Fibers are award-winning, high performance components for collimating and focusing light. Flexibility and precise control of lens geometry enable versatility in beam diameter and working distance, Corning OptiFocus Lensed Fibers represent the next generation in optical fiber coupling to active and passive devices.

Product Description

Corning OptiFocus Collimating Lensed Fiber is a monolithic device consisting of a plano-convex refractive lens, fusion spliced to a single-mode optical fiber. The lens itself is thermally formed using a proprietary Corning process from a glass that is expansion-matched to an optical fiber. This results in a collimator whose reliability and operating conditions are the same as those of the optical fiber. The lens forming process is suitable for making a wide range of lens sizes; thus the beam diameter and working distance can be tailored to customer specifications.

Key Benefits

The collimating lensed fiber is designed to enable next generation, high speed, low loss fiber optic systems. The physical characteristics and performance attributes allow these key benefits:

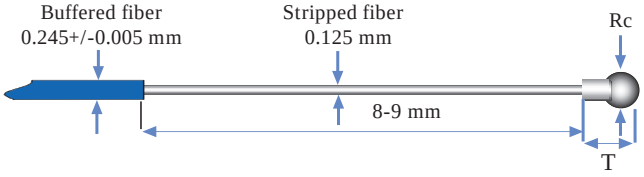
- Customized lens design
- Low insertion loss
- Device design flexibility
- Device miniaturization
- Perfectly Gaussian beam profile
- Reduction of material and assembly cost
    - No collimator assembly
    - No fiber to lens alignment
    - Reliable performance

Applications

OptiFocus Lensed Fiber is designed for use in a variety of applications:

- MEMS-based devices
- Arrayed devices
- Silicon optical bench
- Optical monitoring devices
- High power connectors
- Dissimilar fiber connectors
- Optical Tx/Rx
- Planar waveguide devices
- Low numerical aperture applications
- Modulators
- Other micro-optic devices

Figure 1. Typical dimensions of the lens, stripped fiber and buffered fiber.



Capabilities

Standard Products

Corning's proprietary manufacturing process enables the consistent production of high performance, quality lenses.

Optical Performance Characteristics for Standard Products

Product Code	700043	700109
Mode-field Diameter (MFD)	62 µm +/- 2 µm	18 µm +/- 2 µm
Thickness (T)	826 µm +/- 18 µm	187 µm +/- 18 µm
Radius of Curvature (Rc)	227 µm +/- 2 µm	50 µm +/- 2 µm
Distance to Beam Waist (f)	2.5 mm +/- 0.3 mm	0.15 mm +/- 0.03 mm
AR Coating	R<0.10% at 1525 - 1625 nm	R<0.10% at 1525 - 1625 nm
Fiber Type	SMF-28™	SMF-28™
Pigtail Length	2.2 m + 0 m, - 0.6 m	2.2 m + 0 m, - 0.6 m
Insertion Loss	<0.2 dB	<0.3 dB
Return Loss	>60 dB	>50 dB
Refractive Index of Lens	1.4446 @ 1550 nm	1.4446 @ 1550 nm
	1.4469 @ 1310 nm	1.4469 @ 1310 nm

Customized Products

Lensed fiber can be tailored to collimate or focus light with a range of beam diameters and optimum working distances.

Figure 2. The thickness of the lens (T) and radius of curvature (Rc) defines the mode-field diameter (MFD) and the distance to beam waist (f). The ball site is equal to 2xRc.

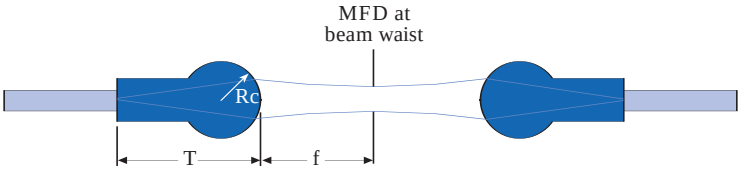
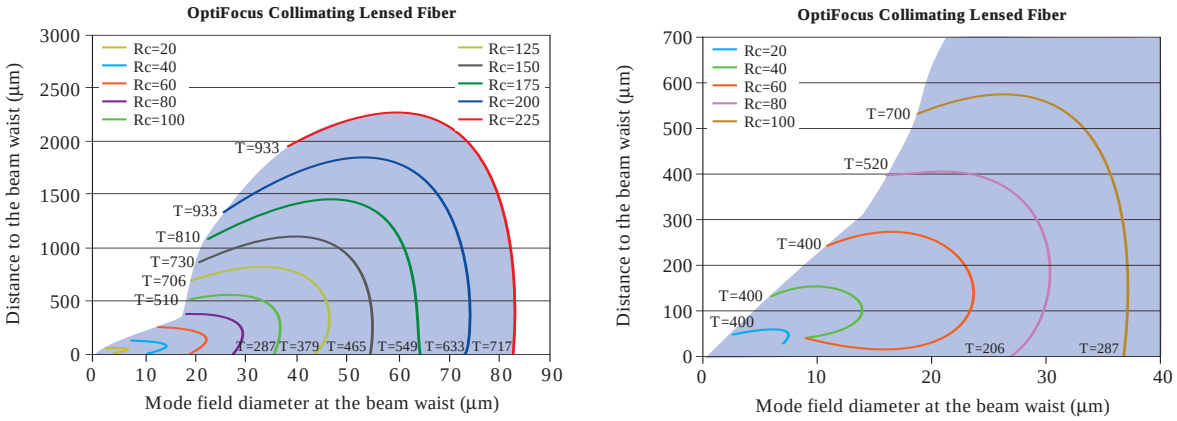


Figure 3. The shaded regions in Figure 3 show the theoretical range of the various combinations of mode-field diameter at the beam waist (MFD) and the distance to beam waist (f) available with SMF-28 fiber operating at 1550 nm. The radius of curvature (Rc) and the thickness (T) can also be read from the plot. For example, if a MFD of 60 µm and f of 1000 µm is needed, an OptiFocus lensed fiber with Rc of approximately 170 µm and T of approximately 600 µm will be required.



Lens Geometry

The lens geometry will depend on the desired optical characteristics. The pictures below show examples of Corning's capabilities.

Performance

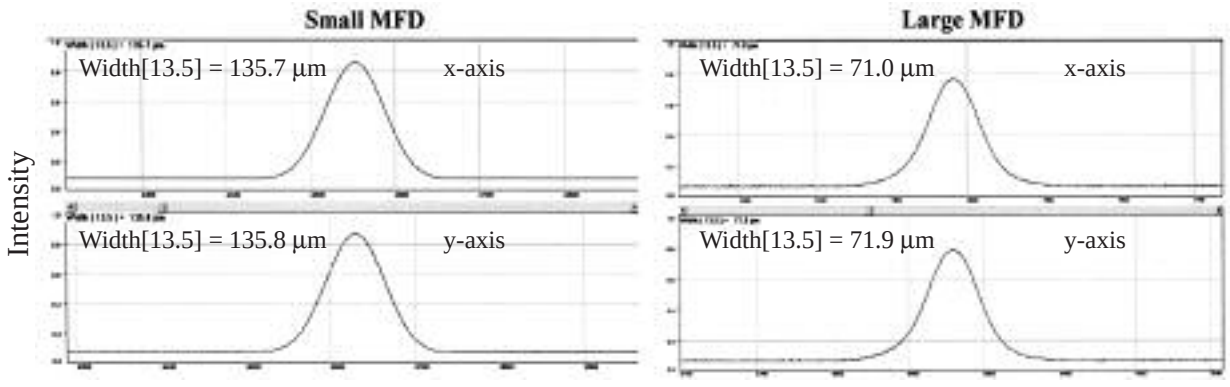
The performance of custom lens products depends on the lens geometry. Lensed fibers of varying geometries have been made with insertion loss under 0.2 dB per pair.

Gaussian Beam Profile

Figure 4. The intensity profile of the beam along two orthogonal directions from the OptiFocus lenses at the beam waist show perfect Gaussian behavior. The value on the upper left corner is the MFD of the lensed fiber. Since the gaussian beam profile in Figure 4a was obtained with a 10X objective, the value of MFD is 135.7/10=13.57 µm.

Figure 4a

Figure 4b



Terms and Definitions

Optical Performance Terms and Definitions	
MFD	Mode-field diameter at the beam waist is the diameter of the beam defined on $1/e^2$ basis. The beam waist is the location in a Gaussian beam where the wavefront has an infinite radius of curvature and the beam diameter is minimum.
Insertion Loss	Insertion loss is defined as the total loss due to insertion of a pair of lenses in the system. The value is expressed as insertion loss per pair of lenses.
Working Distance	Working distance is defined as twice the distance to beam waist for an application in which light from one lens is received by a similar lens. In the case when the light from the lens is accepted into a receiver/detector or the lens collects the light from a device (planar waveguide, laser diode, etc.), the working distance is the distance to beam waist.

Ordering Information

Each lens geometry is designed to meet the optical performance required by the customer. Please contact Photonic Materials for more information.

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