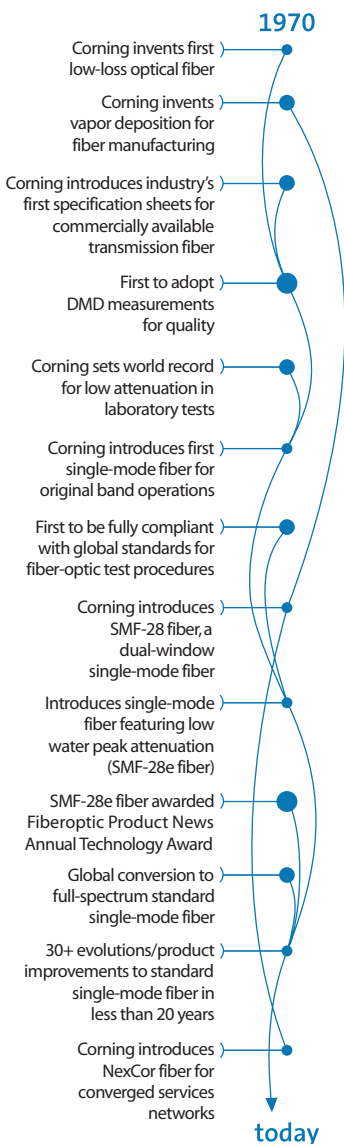


# Corning® SMF-28e+™ Optical Fiber Product Information



## Optical Fiber



### *Trusted Performance Today and in the Future*

Corning Optical Fiber continues to push single-mode fiber to new levels and evolve its standard single-mode optical fiber offering by adding the performance advantage of NexCor® technology to the trusted SMF-28e® optical fiber. The result is Corning® SMF-28e+™ optical fiber, a full spectrum single-mode fiber that is fully backward compatible with legacy single-mode fibers and is the latest in a long line of fiber optic innovations from Corning.

Corning® SMF-28e+™ optical fiber, an ITU-T G.652.D-compliant optical fiber, is expanding the capability and performance of the world's metropolitan and access networks that support all broadband applications, including CATV and fiber to the home (FTTH). Significant performance advantages compared to the industry's legacy single-mode fibers include:

- \* NexCor's MaxPower™ technology's 3 dB Stimulated Brillouin Scattering threshold improvement, enabling twice the optical launch power for better system reach and coverage
- \* Improved macrobend specifications, from 0.05 dB to 0.03 dB, for improved handling and ease of installation, critical considerations in today's access network designs
- \* Tighter zero dispersion wavelength ( $\lambda_0$ ) specification, specifically the  $\lambda_0$  tolerance has been improved from a range of  $\pm 10$  nm to  $\pm 7$  nm, to enable lower cost transmitters and simplified network planning.

As with all Corning fiber products, SMF-28e+ fiber complies with the industry's most stringent requirements, including:

- ITU-T Recommendation G.652 (Tables A, B, C and D)
- IEC Specifications 60793-2-50 Type B1.3
- TIA/EIA 492-CAAB
- Telcordia Generic Requirements GR-20-CORE

## **Innovation Built on a Solid Foundation of Quality and Proven Performance**

Corning® SMF-28e+™ is the latest evolution of Corning single-mode fiber, boasting superior full-spectrum performance and world-class specifications to empower metro and access networks and maximize the performance of FTTH and CATV networks. Corning is the only fiber manufacturer with the leadership and commitment to provide this capability for single-mode fiber.

Based on the solid foundation of reliability and consistency of Corning® SMF-28e® fiber, the industry benchmark for single-mode fiber performance, Corning SMF-28e+ fiber has the same quality transmission, splicing, handling and coating performance that customers have trusted for years. It offers significant performance advantages, while maintaining full compatibility and interoperability with legacy single-mode networks. As a result, Corning expects this product to be preferred by customers for an increasing number of network projects.

Corning has demonstrated unparalleled leadership in single-mode fiber innovation and a commitment to quality for more than 30 years. We believe that fiber is a long-term investment and should be chosen wisely. Only Corning SMF-28e+ fiber can offer increased performance capabilities with transparent innovation that is backed by the unsurpassed expertise and proven performance of Corning. To maximize the performance of your optical network, rely on the company that invented optical fiber for communications.

### **Corning® Optical Fiber – The Measure of Trust**

#### **Corning's Service Advantage**

Corning Optical Fiber delivers the world's most comprehensive package of innovative products and services, including:

- \* Worldwide sales support and door-to-door customer service
- \* Full range of fibers and special order capabilities
- \* Specialized support from technical experts
- \* Extensive fiber delivery capabilities with proven success rates
- \* Real-time, web-based customer information
- \* Dedicated account support for our long-term supply customers
- \* Fiber support services and technical information for end-customers

At Corning Optical Fiber, we strive to provide the best possible customer service and technical support – before, during and after the sale. As a customer, you'll benefit from our established and extensive support infrastructure that's ready to meet your specific needs.

#### **Corning's Product Advantage**

Our enhanced, dual acrylate CPC® coatings provide excellent protection. Designed to be mechanically stripped, with an outside diameter of 245 µm, they are optimized for many single- and multi-fiber cable designs, including loose tube, ribbon, slotted core and tight buffer cables.

Corning is committed to product excellence and meeting the evolving needs of our customers. As updates to fiber characteristics or performance specifications become available, they will be posted on the Corning Optical Fiber website at [www.corning.com/opticalfiber](http://www.corning.com/opticalfiber).

## Optical Specifications

### Fiber Attenuation

#### Maximum Attenuation

Wavelength (nm)	Maximum Value* (dB/km)
1310	0.33 – 0.35
1383**	0.31 – 0.35
1490	0.21 – 0.24
1550	0.19 – 0.20
1625	0.20 – 0.23

\*Maximum specified attenuation value available within the stated ranges.

\*\*Attenuation values at this wavelength represent post-hydrogen aging performance.

Alternate attenuation offerings available upon request.

#### Attenuation vs. Wavelength

Range (nm)	Ref. $\lambda$ (nm)	Max. $\alpha$ Difference (dB/km)
1285 – 1330	1310	0.03
1525 – 1575	1550	0.02

The attenuation in a given wavelength range does not exceed the attenuation of the reference wavelength ( $\lambda$ ) by more than the value  $\alpha$ .

#### Macrobend Loss

Mandrel Diameter (mm)	Number of Turns	Wavelength (nm)	Induced Attenuation* (dB)
32	1	1550	$\leq 0.03$
50	100	1310	$\leq 0.03$
50	100	1550	$\leq 0.03$
60	100	1625	$\leq 0.03$

\*The induced attenuation due to fiber wrapped around a mandrel of a specified diameter.

#### Point Discontinuity

Wavelength (nm)	Point Discontinuity (dB)
1310	$\leq 0.05$
1550	$\leq 0.05$

## Dimensional Specifications

### Glass Geometry

Fiber Curl	$\geq 4.0$ m radius of curvature
Cladding Diameter	$125.0 \pm 0.7$ $\mu\text{m}$
Core-Clad Concentricity	$\leq 0.5$ $\mu\text{m}$
Cladding Non-Circularity	$\leq 0.7\%$

### Cable Cutoff Wavelength ( $\lambda_{\text{ccf}}$ )

$$\lambda_{\text{ccf}} \leq 1260 \text{ nm}$$

### Mode-Field Diameter

Wavelength (nm)	MFD ( $\mu\text{m}$ )
1310	$9.2 \pm 0.4$
1550	$10.4 \pm 0.5$

### Dispersion

Wavelength (nm)	Dispersion Value [ps/(nm $\cdot$ km)]
1550	$\leq 18.0$
1625	$\leq 22.0$

Zero Dispersion Wavelength ( $\lambda_0$ ):  $1310 \text{ nm} \leq \lambda_0 \leq 1324 \text{ nm}$

Zero Dispersion Slope ( $S_0$ ):  $\leq 0.092 \text{ ps}/(\text{nm}^2 \cdot \text{km})$

### Polarization Mode Dispersion (PMD)

	Value (ps/ $\sqrt{\text{km}}$ )
PMD Link Design Value	$\leq 0.06^*$
Maximum Individual Fiber	$\leq 0.2$

\*Complies with IEC 60794-3: 2001, Section 5.5, Method 1, September 2001.

The PMD link design value is a term used to describe the PMD of concatenated lengths of fiber (also known as PMD<sub>L</sub>). This value represents a statistical upper limit for total link PMD. Individual PMD values may change when cabled.

## Environmental Specifications

Environmental Test	Test Condition	Induced Attenuation 1310 nm, 1550 nm & 1625 nm (dB/km)
Temperature Dependence	$-60^\circ\text{C}$ to $+85^\circ\text{C}^*$	$\leq 0.05$
Temperature Humidity Cycling	$-10^\circ\text{C}$ to $+85^\circ\text{C}^*$ up to 98% RH	$\leq 0.05$
Water Immersion	$23 \pm 2^\circ\text{C}$	$\leq 0.05$
Heat Aging	$85 \pm 2^\circ\text{C}^*$	$\leq 0.05$

\*Reference temperature =  $+23^\circ\text{C}$

Operating Temperature Range:  $-60^\circ\text{C}$  to  $+85^\circ\text{C}$

### Coating Geometry

Coating Diameter	$245 \pm 5$ $\mu\text{m}$
Coating-Cladding Concentricity	$< 12$ $\mu\text{m}$

## How to Order

Contact your sales representative,  
or call the Optical Fiber Customer  
Service Department:  
Ph: 607-248-2000 (U.S. and Canada)  
+44-1244-525-325 (Europe)  
Email: opticalfibres@corning.com  
Please specify the fiber type, attenuation  
and quantity when ordering.

## Mechanical Specifications

### Proof Test

The entire fiber length is subjected to a tensile stress  $\geq 100$  kpsi (0.7 GPa)\*.

\*Higher proof test levels available.

### Length

Fiber lengths available up to 50.4\* km/spool.

\*Longer spliced lengths available.

## Performance Characterizations

Characterized parameters are typical values.

<b>Core Diameter</b>	8.2 $\mu\text{m}$
<b>Numerical Aperture</b>	0.14 <i>NA is measured at the one percent power level of a one-dimensional far-field scan at 1310 nm.</i>
<b>Zero Dispersion Wavelength (<math>\lambda_0</math>)</b>	1317 nm
<b>Zero Dispersion Slope (<math>S_0</math>)</b>	0.088 ps/(nm <sup>2</sup> •km)
<b>Effective Group Index of Refraction (<math>N_{\text{eff}}</math>)</b>	1310 nm: 1.4670 1550 nm: 1.4677
<b>Fatigue Resistance Parameter (<math>N_f</math>)</b>	20
<b>Coating Strip Force</b>	Dry: 0.6 lbs. (3N) Wet, 14-day room temperature: 0.6 lbs. (3N)
<b>Rayleigh Backscatter Coefficient (for 1 ns Pulse Width)</b>	1310 nm: -77 dB 1550 nm: -82 dB
<b>Stimulated Brillouin Scattering Threshold</b>	20 dBm <sup>(1)</sup>

#### Notes:

(1) When characterized with a transmitter specifying 17 dBm SBS threshold over standard single-mode fiber. While absolute SBS threshold is a function of distance and signal format, SMF-28e+™ fiber offers a 3 dB improvement over standard single-mode fiber independent of these variables.

## Formulas

### Dispersion

$$\text{Dispersion} = D(\lambda) \approx \frac{S_0}{4} \left[ \lambda - \frac{\lambda_0^4}{\lambda^3} \right] \text{ps}/(\text{nm} \cdot \text{km}),$$

for  $1200 \text{ nm} \leq \lambda \leq 1625 \text{ nm}$

$\lambda$  = Operating Wavelength

### Cladding Non-Circularity

$$\text{Non-Circularity} = \left[ 1 - \frac{\text{Min. Cladding Diameter}}{\text{Max. Cladding Diameter}} \right] \times 100$$

### Corning Incorporated [www.corning.com/opticalfiber](http://www.corning.com/opticalfiber)

One Riverfront Plaza  
Corning, NY 14831  
U.S.A.

Ph: 800-525-2524 (U.S. and Canada)  
607-248-2000 (International)

Email: [cofic@corning.com](mailto:cofic@corning.com)

SMF-28e+ is a trademark and Corning, SMF-28e and NexCor are registered trademarks of Corning Incorporated, Corning, N.Y.

Any warranty of any nature relating to any Corning optical fiber is only contained in the written agreement between Corning Incorporated and the direct purchaser of such fiber.

©2006, Corning Incorporated