CORNING OPTICAL COMMUNICATIONS GENERIC SPECIFICATION FOR SINGLE-MODE OPTICAL FIBER IN LOOSE TUBE AND RIBBON CABLES

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PGSF001
Revision 18

Corning Optical Communications reserves the right to update this specification without prior notification. Not all fiber types listed below available in every cable design offered. Please see relevant Generic Cable Specification for the available fiber types.

1.0 General Fiber Specifications

1.1 All fibers in the cable must be usable and meet required specifications.

1.2 Each optical fiber shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.

1.3 Each optical fiber shall consist of a germania-doped silica core surrounded by a concentric glass cladding. The fiber shall be a matched clad design, manufactured by the Outside Vapor Deposition (OVD) process.

1.4 Each optical fiber shall be proof tested by the fiber manufacturer at a minimum of 100 kpsi (0.69 GN/m^2).

1.5 The fiber shall be coated with a dual layer acrylate protective coating. The coating shall be in physical contact with the cladding surface.

1.6 The attenuation specification shall be a maximum value for each cabled fiber at 23 ± 5 °C on the original shipping reel.

2.0 Single-mode (Dispersion Un-shifted)

The single-mode fiber utilized in the optical fiber cable shall meet ITU G.652 (Tables A, B, C & D), IEC Specification 60793-2-50 Type B1.3, TIA/EIA 492-CAAB and Telcordia Generic Requirements GR-20-CORE.

Geometry			
2.1	Cladding Diameter	(μm)	125.0 ± 0.7
2.2	Core-to-Cladding Concentricity	(μm)	≤ 0.5
2.3	Cladding Non-Circularity	(%)	≤ 0.7
2.4	Mode Field Diameter 1310 nm 1550 nm	(μm)	 9.2 ± 0.4 10.4 ± 0.5
2.5	Coating Diameter	(μm)	242 ± 5
2.6	Colored Fiber Nominal Diameter	(μm)	249 – 259
2.7	Fiber Curl radius of curvature	(m)	≥ 4.0

Optical		
2.8	Max Cabled Fiber Attenuation Range (dB/km) 1310, 1383 nm 1550 nm	 0.35 - 0.4 0.22 - 0.3
2.9	Point discontinuity (dB) 1310 nm 1550 nm	 ≤ 0.05 ≤ 0.05
2.10	Macrobend Attenuation (dB) Turns Mandrel Radius 1 16 mm 100 25 mm 100 25 mm 100 30 mm	 ≤ 0.03 at 1550 nm ≤ 0.03 at 1310 nm ≤ 0.03 at 1550 nm ≤ 0.03 at 1625 nm
2.11	Cable Cutoff Wavelength (λ_{ccf}) (nm)	≤ 1260
2.12	Zero Dispersion Wavelength (λ_O) (nm)	$1304 \leq \lambda_O \leq 1324$
2.13	Zero Dispersion Slope (S_O) (ps/(nm²•km))	≤ 0.092
2.14	Total Dispersion (ps/(nm•km)) 1550 nm 1625 nm	 ≤ 18.0 ≤ 22.0
2.15	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber	 ≤ 0.06 ≤ 0.1
2.16	IEEE 802.3 GbE - 1300 nm Laser Distance (m)	up to 5000

3.0 Single Mode Non-zero Dispersion-shifted Fiber for Long-haul Telecommunications Applications

This non-zero dispersion-shifted single-mode fiber utilized in the optical fiber cable shall meet ITU G.655 (Tables A, B, C & D), IEC Specification 60793-2-50 Type B4, TIA/EIA 492-EA00 and Telcordia GR-20. The fiber is of a segmented core design with large effective area for enhanced power distribution.

Geometry			
3.1	Cladding Diameter	(μm)	125.0 ± 0.7
3.2	Core-to-Cladding Concentricity	(μm)	≤ 0.5
3.3	Cladding Non-Circularity	(%)	≤ 0.7
3.4	Mode Field Diameter – 1550 nm	(μm)	9.6 ± 0.4
3.5	Effective Area, A_{eff} (Characterized): @ 1550 nm	(μm^2)	 72
3.6	Coating Diameter	(μm)	242 ± 5
3.7	Colored Fiber Nominal Diameter	(μm)	249 – 259

3.8	Fiber Curl radius of curvature	(m)	≥ 4.0

Optical			
3.9	Cabled Fiber Attenuation – 1550 nm	(dB/km)	≤ 0.25
3.10	Point discontinuity – 1550 nm	(dB)	≤ 0.05
3.11	Macrobend Attenuation Turns / Mandrel Radius 1 / 16 mm 1 / 16 mm 100 / 30 mm 100 / 30 mm	(dB)	 ≤ 0.50 at 1550 nm ≤ 0.50 at 1625 nm ≤ 0.05 at 1550 nm ≤ 0.05 at 1625 nm
3.12	Cable Cutoff Wavelength (λ_{ccf})	(nm)	≤ 1360
3.13	Total Dispersion 1530 - 1565 nm 1565 - 1625 nm	(ps/(nm•km))	 2.0 to 6.0 4.5 to 11.2
3.14	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber		 ≤ 0.04 ≤ 0.1

4.0 Single-Mode (Dispersion Un-shifted) Bend Improved Loss Optical Fiber

The single-mode fiber utilized in the optical fiber cable shall meet ITU G.652 (Table D), ITU G.657 (Table A1), IEC Specification 60793-2-50 Type B1.3 and Telcordia Generic Requirements GR-20-CORE.

Geometry			
4.1	Cladding Diameter	(μm)	125.0 ± 0.7
4.2	Core-to-Cladding Concentricity	(μm)	≤ 0.5
4.3	Cladding Non-Circularity	(%)	≤ 0.7
4.4	Mode Field Diameter 1310 nm 1550 nm	(μm)	 8.6 ± 0.4 9.8 ± 0.5
4.5	Coating Diameter	(μm)	242 ± 5
4.6	Colored Fiber Nominal Diameter	(μm)	249 – 259
4.7	Fiber Curl radius of curvature	(m)	≥ 4.0

Optical			
4.8	Cabled Fiber Attenuation – 1310 nm 1550 nm	 (dB/km) (dB/km)	 ≤ 0.4 ≤ 0.3
4.9	Point discontinuity 1310 nm 1550 nm	(dB)	 ≤ 0.05 ≤ 0.05
4.10	Macrobend Attenuation	(dB)	

	Turns Mandrel Radius 1 10 mm 1 10 mm	 ≤ 0.50 at 1550 nm ≤ 1.5 at 1625 nm
4.11	Cable Cutoff Wavelength (λ_{ccf}) (nm)	≤ 1260
4.12	Zero Dispersion Wavelength (λ_O) (nm)	$1304 \leq \lambda_O \leq 1324$
4.13	Zero Dispersion Slope (S_O) (ps/(nm²•km))	≤ 0.089
4.14	Total Dispersion (ps/(nm•km)) 1550 nm 1625 nm	 ≤ 18.0 ≤ 22.0
4.15	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber	 ≤ 0.06 ≤ 0.1

5.0 Single-Mode (Dispersion Un-shifted) Bend-Tolerant Optical Fiber

The single-mode bend-improved optical fiber utilized in the optical fiber cable shall meet ITU-T G.652, Table D, ITU-T G.657, Table A2 and B2, IEC Specification 60793-2-50 Type B1.3 and B6_b, and Telcordia Generic Requirements GR-20-CORE.

Geometry			
5.1	Cladding Diameter	(μm)	125.0 ± 0.7
5.2	Core-to-Cladding Concentricity	(μm)	≤ 0.5
5.3	Cladding Non-Circularity	(%)	≤ 0.7
5.4	Mode Field Diameter 1310 nm 1550 nm	(μm)	 8.6 ± 0.4 9.65 ± 0.5
5.5	Coating Diameter	(μm)	242 ± 5
5.6	Colored Fiber Nominal Diameter	(μm)	249 – 259
5.7	Fiber Curl radius of curvature	(m)	≥ 4.0 m

Optical			
5.8	Cabled Fiber Attenuation 1310, 1383 nm 1550 nm	(dB/km)	 ≤ 0.4 ≤ 0.3
5.9	Point discontinuity 1310 nm 1550 nm	(dB)	 ≤ 0.05 ≤ 0.05
5.10	Macrobend Attenuation Turns Mandrel Radius 1 7.5 mm 1 7.5 mm	(dB)	 ≤ 0.4 at 1550 nm ≤ 0.8 at 1625 nm
5.11	Cable Cutoff Wavelength (λ_{ccf})	(nm)	≤ 1260
5.12	Zero Dispersion Wavelength (λ_O)	(nm)	$1304 \leq \lambda_O \leq 1324$

5.13	Zero Dispersion Slope (S_O) (ps/(nm²•km))	≤ 0.092
5.14	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber	 ≤ 0.06 ≤ 0.2
5.15	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$)	≤ 0.2

6.0 Single-Mode (Dispersion Un-shifted) Bend Insensitive Optical Fiber

The single-mode bend insensitive fiber utilized in the optical fiber cable shall meet ITU G.652 (Table D) and ITU G.657 (Table B3).

Geometry		
6.1	Cladding Diameter (μm)	125.0 ± 0.7
6.2	Core-to-Cladding Concentricity (μm)	≤ 0.5
6.3	Cladding Non-Circularity (%)	≤ 0.7
6.4	Mode Field Diameter (μm) 1310 nm 1550 nm	 8.6 ± 0.4 9.65 ± 0.5
6.5	Coating Diameter (μm)	242 ± 5
6.6	Colored Fiber Nominal Diameter (μm)	249 – 259
6.7	Fiber Curl radius of curvature (m)	≥ 4.0

Optical		
6.8	Cabled Fiber Attenuation (dB/km) 1310, 1383 nm 1550 nm	 ≤ 0.4 ≤ 0.3
6.9	Point discontinuity (dB) 1310 nm 1550 nm	 ≤ 0.05 ≤ 0.05
6.10	Macrobend Attenuation (dB) Turns Mandrel Radius 1 5 mm 1 5 mm	 ≤ 0.10 at 1550 nm ≤ 0.30 at 1625 nm
6.11	Cable Cutoff Wavelength (λ_{ccf}) (nm)	≤ 1260
6.12	Zero Dispersion Wavelength (λ_O) (nm)	1304 ≤ λ_O ≤ 1324
6.13	Zero Dispersion Slope (S_O) (ps/(nm²•km))	≤ 0.092
6.14	Total Dispersion (ps/(nm•km)) 1550 nm 1625 nm	 ≤ 18.0 ≤ 23.0
6.15	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber	 ≤ 0.06 ≤ 0.2

7.0 Single-Mode (Dispersion Un-shifted) low loss fiber.

The single-mode low loss fiber utilized in the optical fiber cable shall meet ITU G.652 (Tables A, B, C & D).

Geometry			
7.1	Cladding Diameter	(μm)	125.0 ± 0.7
7.2	Core-to-Cladding Concentricity	(μm)	≤ 0.5
7.3	Cladding Non-Circularity	(%)	≤ 0.7
7.4	Mode Field Diameter 1310 nm 1550 nm	(μm)	 9.2 ± 0.4 10.4 ± 0.5
7.5	Coating Diameter	(μm)	242 ± 5
7.6	Colored Fiber Nominal Diameter	(μm)	249 – 259
7.7	Fiber Curl radius of curvature	(m)	≥ 4.0

Optical			
7.8	Max Cabled Fiber Attenuation Range 1310, 1383 nm 1550 nm	(dB/km)	 0.33 - 0.35 0.19 - 0.25
7.9	Point discontinuity 1310 nm 1550 nm	(dB)	 ≤ 0.05 ≤ 0.05
7.10	Macrobend Attenuation Turns / Mandrel Radius 1 / 16 mm 100 / 25 mm 100 / 25 mm 100 / 30 mm	(dB)	 ≤ 0.03 at 1550 nm ≤ 0.03 at 1310 nm ≤ 0.03 at 1550 nm ≤ 0.03 at 1625 nm
7.11	Cable Cutoff Wavelength (λ_{ccf})	(nm)	≤ 1260
7.12	Zero Dispersion Wavelength (λ_O)	(nm)	$1304 \leq \lambda_O \leq 1324$
7.13	Zero Dispersion Slope (S_O)	(ps/(nm²•km))	≤ 0.092
7.14	Total Dispersion 1550 nm 1625 nm	(ps/(nm•km))	 ≤ 18.0 ≤ 22.0
7.15	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber		 ≤ 0.04 ≤ 0.1

8.0 Single-Mode (Dispersion Un-shifted) low loss fiber.

The single-mode low loss fiber utilized in the optical fiber cable shall meet ITU G.652 (Tables A & B).

Geometry			
8.1	Cladding Diameter	(μm)	125.0 ± 0.7
8.2	Core-to-Cladding Concentricity	(μm)	≤ 0.5
8.3	Cladding Non-Circularity	(%)	≤ 0.7
8.4	Mode Field Diameter 1310 nm 1550 nm	(μm)	 9.2 ± 0.5 10.5 ± 0.5
8.5	Coating Diameter	(μm)	242 ± 5
8.6	Colored Fiber Nominal Diameter	(μm)	249 – 259
8.7	Fiber Curl radius of curvature	(m)	≥ 4.0

Optical			
8.8	Max Cabled Fiber Attenuation Range 1310 nm 1550 nm	(dB/km)	 0.32 - 0.34 0.18 - 0.20
8.9	Point discontinuity 1310 nm 1550 nm	(dB)	 ≤ 0.05 ≤ 0.05
8.10	Macrobend Attenuation Turns / Mandrel Radius 1 / 16 mm 100 / 25 mm 100 / 25 mm 100 / 30 mm	(dB)	 ≤ 0.1 at 1550 nm ≤ 0.05 at 1310 nm ≤ 0.05 at 1550 nm ≤ 0.05 at 1625 nm
8.11	Cable Cutoff Wavelength (λ_{ccf})	(nm)	≤ 1260
8.12	Zero Dispersion Wavelength (λ_O)	(nm)	$1300 \leq \lambda_O \leq 1324$
8.13	Zero Dispersion Slope (S_O)	(ps/(nm²•km))	≤ 0.092
8.14	Total Dispersion 1550 nm 1625 nm	(ps/(nm•km))	 ≤ 18.0 ≤ 22.0
8.15	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber		 ≤ 0.04 ≤ 0.1

9.0 Single-Mode (Dispersion Un-shifted) low loss and bend improved fiber.

The single-mode low loss and bend improved fiber utilized in the optical fiber cable shall meet ITU G.652 (Tables A, B, C & D) and ITU G.657 (Table A1).

Geometry			
9.1	Cladding Diameter	(μm)	125.0 ± 0.7
9.2	Core-to-Cladding Concentricity	(μm)	≤ 0.5
9.3	Cladding Non-Circularity	(%)	≤ 0.7
9.4	Mode Field Diameter 1310 nm 1550 nm	(μm)	 9.2 ± 0.4 10.4 ± 0.5
9.5	Coating Diameter	(μm)	242 ± 5
9.6	Colored Fiber Nominal Diameter	(μm)	249 – 259
9.7	Fiber Curl radius of curvature	(m)	≥ 4.0

Optical			
9.8	Max Cabled Fiber Attenuation Range 1310, 1383 nm 1550 nm	(dB/km)	 0.33 - 0.35 0.19 - 0.25
9.9	Point discontinuity 1310 nm 1550 nm	(dB)	 ≤ 0.05 ≤ 0.05
9.10	Macrobend Attenuation Turns / Mandrel Radius 1 / 10 mm 1 / 10 mm 10 / 15 mm 10 / 15 mm 100 / 25 mm	(dB)	 ≤ 0.50 at 1550 nm ≤ 1.50 at 1625 nm ≤ 0.05 at 1550 nm ≤ 0.30 at 1625 nm ≤ 0.01 at 1310, 1550, 1625 nm
9.11	Cable Cutoff Wavelength (λ_{ccf})	(nm)	≤ 1260
9.12	Zero Dispersion Wavelength (λ_O)	(nm)	$1304 \le \lambda_O \le 1324$
9.13	Zero Dispersion Slope (S_O)	(ps/(nm²•km))	≤ 0.092
9.14	Total Dispersion 1550 nm 1625 nm	(ps/(nm•km))	 ≤ 18.0 ≤ 22.0
9.15	Cabled Polarization Mode Dispersion ($ps/\sqrt{km}$) PMD Link Design Value Max Individual Fiber		 ≤ 0.04 ≤ 0.1

Revision History

Revision	Date	Reason for Change
1	Sep 2000	Original version for internal distribution review SM and MM in same document for Ribbon and non ribbon cable No LEAF or MetroCor No 50/125 for Ribbon Cables
2	Oct 2000	Split Gen F1 into separate documents for SM (F1) and MM (F2)
3	Nov 2001	Added LEAF and MetroCor
4	Feb 2002	Annual Review • Minor Reference Updates • Tightened SMF Specs since no more B, D, or S used 1) CCC limit to 0.5 um (from 0.8 um). 2) Coating OD tolerance (+/-) to 5 um (from 10 um). 3) MFD to: 9.2 +/- 0.4 um at 1310 nm (from 9.30 +/- 0.50). 10.4 +/- 0.8 um at 1310 nm (from 10.50 +/- 1.00). 4) Added 32 mm mandrel macrobend performance 5) Changed fiber curl to limit of 4.0 m (from 2.0 m). 6) Removed Core OD reference LEAF: Per latest revision of COF PI Sheet (12/01) 1) Changed MFD 2) Added 32 mm mandrel macrobend for 1625 nm. 3) Added dispersion performance for 1565 - 1625 nm. Metro: Per latest revision of COF PI Sheet (12/01) 1) Added 1605 nm macrobend requirement 2) Added dispersion performance for 1565 - 1625 nm.
5	Jul 2002	• Added SMF-28e fiber • Updated references for all SM fiber types • Note: Doc does not reflect post 3/18/02 COF fiber specs.
6	Aug 2002	Changed cabled fiber attenuation for low water peak fiber to 0.4/0.35/0.3 from 0.35/0.31/0.25 dB/km
7	Nov 2002	Annual Review Changed cabled fiber attenuation for low water peak fiber to 0.4/0.4/0.3 from 0.4/0.35/0.3 dB/km
8	Apr 2003	Changed MFD @ 1550, Point discontinuity (1310 & 1550), Bending (1550 & 1625), added dispersion value at 1625 for SMF-28e and updated cladding OD for LEAF in support of new COF fiber specs.
9	Aug 2004	Corrected table numbering in Sections 3 and 5. (DKH)
10	Dec 2005	Struck MetroCor SMF-28e Changes Parameter / Old Spec / New Spec Cladding Non-Circularity: ≤1.0% → ≤0.7% Mode Field Diameter tol @ 1550nm: ±0.8µm → ±0.5µm Macrobend Attenuation @: not → 100 turns / 60mm /

		1625nm spec ≤0.05dB Zero Dispersion Slope 0.092 0.089 Total Dispersion @ 1550nm 18 17.5 Total Dispersion @ 1624nm 22 21.5 Cabled PMD ≤0.5 ≤0.2 NZDF (LEAF) Changes Parameter / Old Spec / New Spec Cladding Non-Circularity ≤1.0% ≤0.7% Cabled PMD ≤0.5 ≤0.1
11	Feb 2006	Change macrobend limit to 0.05dB for one Ø32mm mandrel.
12	Aug 2007	Added performance specs for SMF-28e XB fiber
13	Sep 2008	Corrected Point Discontinuity (.1 to 0.05) for SMF-28e, LEAF and SMF-28xB equivalent fibers. Added MFD at 1310nm for SMF28e and SMF-28xB.
14	Nov 2010	Updated SMF-28e to SMF28e+ and updated LEAF (cabled atten) and Clearcurve fibers. Also, corrected typos in data so it matches COF Purchase specs. Removed reference to matched clad design in section 1.3. Added SBS threshold spec to SMF28e+.
15	Feb 2011	Macrobend attenuation for LBL and ZBL corrected.
16	Aug 2011	Removed SBS threshold spec for e+ due to impending COF project which will remove SBS advantage.
17	Oct 2014	1. Changed dimensions to Radius from Diameter for Macrobend Mandrels whenever necessary to be consistent with the IEC documents. 2. Established coating on all fibers as: “Colored Fiber Nominal Diameter” 249 – 259 microns. 3. Used “Max Cabled Fiber Attenuation Range” whenever applicable.
18	Jun 2025	Added “OVD” requirement to para.1.3.