CORNING OPTICAL COMMUNICATIONS GENERIC SPECIFICATION FOR MULTIMODE OPTICAL FIBER IN LOOSE TUBE AND RIBBON CABLES

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Revision: 10

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 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 (0.7 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 MULTIMODE (62.5/125 µm)

2.1 Standard 62.5/125 µm Fiber (OM1)

The fiber shall meet the following specifications:

- EIA/TIA-492AAAA-A-1997, “Detail Specification for 62.5-μm Core Diameter/125-μm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers."
- IEC 60793-2-10, “Product specifications – Sectional specification for category A1 multimode fibres”, Type A1b 62,5/125 µm graded index fibre.

Geometry			
2.1.1	Core Diameter	(μm)	62.5 ± 2.5
2.1.2	Core Non-Circularity		≤ 5 %
2.1.3	Cladding Diameter	(μm)	125.0 ± 2.0
2.1.4	Cladding Non-Circularity		≤ 1.0 %
2.1.5	Core-to-Cladding Concentricity	(μm)	≤ 1.5

2.1.6	Coating Diameter	(μm)	242 ± 5
2.1.7	Colored Fiber Nominal Diameter	(μm)	253 - 259

Optical			
2.1.8	Cabled Fiber Attenuation 850 nm 1300 nm	(dB/km)	 ≤ 3.4 ≤ 1.0
2.1.9	Point Discontinuity 850 nm 1300 nm	(dB)	 ≤ 0.2 ≤ 0.2
2.1.10	Macrobend Attenuation Turns / Mandrel OD 100 / 75 ± 2 mm 100 / 75 ± 2 mm	(dB)	 ≤ 0.5 at 850 nm ≤ 0.5 at 1300 nm
2.1.11	Cabled Effective Modal Bandwidth[1)] 850 nm	(MHz•km)	 ≥ 220
2.1.12	IEEE 802.3 GbE Distance 1000BASE-SX Window (850 nm) 1000BASE-LX Window (1300 nm)	(m)	 up to 300 up to 550
2.1.13	OFL Bandwidth 850 nm 1300 nm	(MHz•km)	 ≥ 200 ≥ 500
2.1.14	Numerical Aperture		0.275 ± 0.015

1) As predicted by RML BW, per TIA/EIA 455-204 and IEC 60793-1-41, for *intermediate performance laser based systems* (up to 1 Gb/s).

3 MULTIMODE (50/125 µm)

3.1 Standard 50/125 µm Fiber – 150 (OM2)

The fiber shall meet the following specifications:

- EIA/TIA-492AAAB, "Detail Specification for 50-μm Core Diameter/125-μm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers."
- IEC 60793-2-10, “Product specifications – Sectional specification for category A1 multimode fibres”, Type A1a.1 50/125 µm graded index fibre.

Geometry		
2.1.1	Core Diameter	50.0 ± 2.5 μm
2.1.2	Core Non-Circularity	≤ 5 %
2.1.3	Cladding Diameter	125.0 ± 1.0 μm
2.1.4	Cladding Non-Circularity	≤ 1.0 %
2.1.5	Core-to-Cladding Concentricity	≤ 1.5 μm
2.1.6	Coating Diameter	242 ± 5 μm

2.1.7	Colored Fiber Nominal Diameter	253 – 259 μm

Optical		
3.1.8	Cabled Fiber Attenuation 850 nm 1300 nm	 ≤ 3.0 dB/km ≤ 1.0 dB/km
3.1.9	Point discontinuity 850 nm 1300 nm	 ≤ 0.2 dB ≤ 0.2 dB
3.1.10	Macrobend Attenuation Turns / Mandrel OD 850 nm: 100 / 37.5 mm 1300 nm: 100 / 37.5 mm 850 nm: 2 / 15 mm 1300 nm: 2 / 15 mm 850 nm: 2 / 7.5 mm 1300 nm: 2 / 7.5 mm	 ≤ 0.05 dB ≤ 0.15 dB ≤ 0.10 dB ≤ 0.30 dB ≤ 0.20 dB ≤ 0.50 dB
3.1.11	Cabled Effective Modal Bandwidth[1] 850 nm	 ≥ 950 MHz•km
3.1.12	IEEE 802.3z GbE Distance 1000BASE-SX Window (850 nm) 1000BASE-LX Window (1300 nm)	 up to 750 m up to 600 m
3.1.13	IEEE 802.3ae 10 GbE Distance 10GBASE-S Window (850 nm)	 up to 150 m
3.1.14	OFL Bandwidth 850 nm 1300 nm	 ≥ 700 MHz•km ≥ 500 MHz•km
3.1.15	Numerical Aperture	0.200 ± 0.015

1) As predicted by minEMBc, per TIA/EIA 455-220 and IEC 60793-1-49 for *high performance laser-based systems* (up to 10 Gb/s).

3.2 Laser-optimized 50/125 µm Fiber – 300 (OM3)

The fiber shall meet the following specifications:

- EIA/TIA-492AAAC, "Detail Specification for 850-nm Laser-Optimized, 50-μm Core Diameter/125-μm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers."
- IEC 60793-2-10, “Product specifications – Sectional specification for category A1 multimode fibres”, Type A1a.2 850 nm laser-optimized 50/125 µm graded index fibre.

The fiber shall have the same specified performance and geometry values as standard 50/125 µm fiber (section 3.1) except as noted below.

3.3.1	Cabled Fiber Attenuation (dB/km) 850 nm 1300 nm	 ≤ 3.0 ≤ 1.0
3.3.2	Cabled Effective Modal Bandwidth[1)] (MHz•km) 850 nm	 ≥ 2000
3.3.3	IEEE 802.3 GbE Distance (m) 1000BASE-SX Window (850 nm) 1000BASE-LX Window (1300 nm)	 up to 1000 up to 600
3.3.4	IEEE 802.3 10 GbE Distance (m) 10GBASE-S Window (850 nm)	 up to 300
3.3.5	OFL Bandwidth (MHz•km) 850 nm 1300 nm	 ≥ 1500 ≧ 500

1) As predicted by minEMBc, per TIA/EIA 455-220 and IEC 60793-1-49, for *high performance laser-based systems* (up to 10 Gb/s).

3.3 Laser-optimized 50/125 µm Fiber – 550 (OM4)

The fiber shall meet the requirements of EIA/TIA-492AAAD, "Detail Specification for 850-nm Laser-Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber."

The fiber shall have the same specified performance and geometry values as standard 50/125 µm fiber (section 3.1) except as noted below.

3.4.1	Cabled Fiber Attenuation (dB/km) 850 nm 1300 nm	 ≤ 3.0 ≤ 1.0
3.4.2	Cabled Effective Modal Bandwidth[1] (MHz•km) 850 nm 953 nm[2]	 ≥ 4700 ≥ 2470
3.4.3	IEEE 802.3 GbE Distance (m) 1000BASE-SX Window (850 nm) 1000BASE-LX Window (1300 nm)	 up to 1100 up to 600
3.4.4	IEEE 802.3 10 GbE Distance[1] (m) 10GBASE-S Window (850 nm)	 up to 550
3.4.5	OFL Bandwidth (MHz•km) 850 nm 953 nm[2] 1300 nm	 ≥ 3500 ≥ 1850 ≧ 500

1) The 550m distance is equivalent to a 4700 EMB system with standards-compliant transceiver and fiber characteristics, 3.0 dB/km cable attenuation and 1.0 dB total connector loss.
2) For multi-wavelength transmission systems between 846-943 nm.

3.4 Laser-optimized 50/125 µm Fiber – 600 (OM4)

The fiber shall meet the requirements of EIA/TIA-492AAAD, "Detail Specification for 850-nm Laser-Optimized, 50-µm Core Diameter/125-µm Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers Suitable for Manufacturing OM4 Cabled Optical Fiber."

The fiber shall have the same specified performance and geometry values as standard 50/125 µm fiber (section 3.1) except as noted below.

3.4.1	Cabled Fiber Attenuation (dB/km) 850 nm 1300 nm	 ≤ 3.0 ≤ 1.0
3.4.2	Cabled Effective Modal Bandwidth[1] (MHz•km) 850 nm	 ≥ 5350
3.4.3	IEEE 802.3 GbE Distance (m) 1000BASE-SX Window (850 nm) 1000BASE-LX Window (1300 nm)	 up to 1100 up to 600
3.4.4	IEEE 802.3 10 GbE Distance[1] (m) 10GBASE-S Window (850 nm)	 up to 600
3.4.5	OFL Bandwidth (MHz•km) 850 nm 1300 nm	 ≥ 3500 ≧ 500

1) The 600m distance is equivalent to a 5350 EMB system with standards-compliant transceiver and fiber characteristics, 3.0 dB/km cable attenuation and 1.0 dB total connector loss.

4.0 Performance Comparison Chart

Multimode optical fiber performances referenced in this specification.

Fiber Type	Maximum Attenuation 850/1300 nm (dB/km)	Minimum OFL BW 850/1300 nm (MHz•km)	Minimum Effective Modal BW 850 nm (MHz•km)	1 GbE Distance 850/1300 nm (meters)	10 GbE Distance 850 nm (meters)
62.5/125 μm Standard	3.4/1.0	200/500	≥ 220	300/550[1)]	33
50/125 μm Laser-optimized - 150	3.0/1.0	700/500	≥ 950	750/600[1)]	150[2)]
50/125 μm Laser-optimized - 300	3.0/1.0	1500/500	≥ 2000	1000/600[1)]	300[2)]
50/125 μm Laser-optimized - 550	3.0/1.0	3500/500	≥ 4700	1100/600[1)]	550[3)]
50/125 μm Laser-optimized - 600	3.0/1.0	3500/500	≥ 5350	1100/600[1)]	600[4)]

1) Guaranteed distance for Gigabit Ethernet compliant systems.
2) Guaranteed distance for 10 Gigabit Ethernet compliant systems.
3) The 550m distance is equivalent to a 4700 EMB system with standards-compliant transceiver and fiber characteristics, 3.0 dB/km cable attenuation, and 1.0 dB total connector loss.
4) The 600 m distance is equivalent to a 5350 EMB system with standards-compliant transceiver and fiber characteristics, 3.0 dB/km cable attenuation, and 1.0 dB total connector loss

Revision History

Revision	Date	Reason for Change
1	Sep 2000	Original version for internal distribution review SM and MM in same document (F1) for Ribbon and non-Ribbon cable No LEAF or MetroCor No 50/125 for Ribbon Cables
2	Jan 2002	Minor changes to numbering used
3	Jan 2002	Updated format. Removed Colored fiber OD info
4	March 2002	Deleted FDDI Fiber
5	June 2002	Updated laser-optimized mm Information
6	Nov 2002	Annual Review (MM separate document)
7	Oct 2004	Major revision for Pretium introduction: • Added specs for SXi (150 m) and eSX+ (550 m). • Reduced attenuation at 850 nm to 3.0 dB/km for 50 um laser optimized fibers. • Reduced cladding non-circularity and core-clad concentricity values (for all but FDDI) to reflect better COF values. • Harmonized footnote language with marketing literature. Added “OVD” requirement to para.1.3.
8	Oct 2008	Transmission code changes for MM fiber • Added specs for eSX+ (600 m) • Reduced attenuation at 1300 nm to 1.0 dB/km for all fibers • Reduces Attenuation at 850 nm to 3.4 dB/km for 62.5 um fibers • Removed enhanced 62.5 um fiber specs and standard 50 um fiber specs.
9	Oct 2009	Updated to include reference to IEC compliance (including OM4) Updated to include improved bend specifications for Multimode ClearCurve (“Ultra-bend” 7.5 performance)
10	Nov 2016	Added 953 nm bandwidth performance.