

## Multi-Mode Fiber Cables – Technical Specifications

### GENERAL DESCRIPTION

FORTE offers the full range of multimode fibers for all its cables, whether for installations or assemblies. Apart from the OM1 type, all of them are bending-optimized fiber incorporating technology to deliver enhanced macro-bending performance produced by a unique Plasma Chemical Vapor Deposition (PCVD) process..

All fibers are designed for use at 850 nm and/or 1300 nm. In addition, the fibers are suitable for use in premises wiring applications like LANs with video, data, and or voice services using LED, VCSEL, and Fabry-Perot laser sources and are thus compliant with all relevant network standards.

**OM1 Fiber 62.5/125.** This fiber is a graded-index multimode fiber suitable for transmission speeds of up to 10 Gb/s. It has a 62.5 µm core diameter and a 125 µm cladding diameter.

**OM2 Fiber 50/125.** This fiber is a bend-insensitive, graded-index multimode fiber designed for transmission speeds of 1 Gbps but also appropriate for transmission speeds of up to 10 Gb/s.

**OM3 Fiber 50/125.** This fiber is a laser-optimized, bend-insensitive, graded-index multimode fiber designed for transmission speeds of 10 Gb/s and beyond.

**OM4 Fiber 50/125.** This fiber is a laser-optimized, bend-insensitive, graded-index multimode fiber designed for transmission speeds of 10 Gb/s and beyond.

**OM5 Fiber 50/125.** This fiber is a laser-optimized, bend-insensitive, graded-index multimode fiber designed for transmission speeds of 10 Gb/s and beyond. OM5 is backwards compatible with OM4 and supports single-wavelength or multi-wavelength transition systems in the vicinity of 850 nm to 950 nm.

## MINIMUM SYSTEM REACH – TRANSMISSION DISTANCE

| IEEE Standard            | OM1     | OM2     | OM3     | OM4     | OM5     |
|--------------------------|---------|---------|---------|---------|---------|
| 100BASE-FX               | 2'000 m | 2'000 m | 2'000 m | 2'000 m | 2'000 m |
| 1000BASE-SX              | 275 m   | 550 m   | 550 m   | 550 m   | 550 m   |
| 10GBASE-SR               | 33 m    | 82 m    | 300 m   | 550 m   | 550 m   |
| 25GBASE-SR               |         |         | 70 m    | 100 m   | 100 m   |
| 40GBASE-SR4 <sup>1</sup> |         |         | 100 m   | 150 m   | 150 m   |
| 100GBASE-SR4             |         |         | 100 m   | 100 m   | 100 m   |
| 400GBASE-SR4.2           |         |         | 70 m    | 100 m   | 100 m   |
| 40G-BiDi                 |         |         | 100 m   | 150 m   | 200 m   |
| 100G-BiDi                |         |         | 70 m    | 100 m   | 150 m   |
| 40G SWDM4                |         |         |         | 350 m   | 400 m   |
| 100G SWDM4               |         |         |         | 100 m   | 150 m   |

## OPTICAL SPECIFICATION

| Designation                                | Units   | OM1      | OM2                      | OM3                      | OM4                      | OM5 <sup>2</sup>         |
|--------------------------------------------|---------|----------|--------------------------|--------------------------|--------------------------|--------------------------|
| Overfilled Modal Bandwidth                 | 850nm   | MHz x km | ≥ 200                    | ≥ 500                    | ≥ 1650                   | ≥ 3850                   |
|                                            | 1300 nm | MHz x km | ≥ 500                    | ≥ 500                    | ≥ 550                    | ≥ 550                    |
| Effective Modal Bandwidth                  | 850nm   | MHz x km |                          |                          | ≥ 2200                   | ≥ 5170                   |
|                                            | 953 nm  | MHz x km |                          |                          |                          | ≥ 2710                   |
| Cabled Fiber Attenuation (maximum)         | 850nm   | dB/km    | ≤ 3.5                    | ≤ 3.0                    | ≤ 3.0                    | ≤ 3.0                    |
|                                            | 1300 nm | dB/km    | ≤ 1.5                    | ≤ 1.0                    | ≤ 1.0                    | ≤ 1.0                    |
| Numerical aperture                         |         |          | 0.275 ± <sup>0.015</sup> | 0.200 ± <sup>0.015</sup> | 0.200 ± <sup>0.015</sup> | 0.200 ± <sup>0.015</sup> |
| Group Index of Refraction                  | 850nm   |          | 1.496                    | 1.482                    | 1.482                    | 1.482                    |
|                                            | 1300 nm |          | 1.491                    | 1.477                    | 1.477                    | 1.477                    |
| Macro bending loss, r = 7.5 mm, 2 turns    | 850nm   | dB       |                          | ≤ 0.2                    | ≤ 0.2                    | ≤ 0.2                    |
|                                            | 1300 nm | dB       |                          | ≤ 0.5                    | ≤ 0.5                    | ≤ 0.5                    |
| Macro bending loss, r = 15 mm, 2 turns     | 850nm   | dB       |                          | ≤ 0.1                    | ≤ 0.1                    | ≤ 0.1                    |
|                                            | 1300 nm | dB       |                          | ≤ 0.3                    | ≤ 0.3                    | ≤ 0.3                    |
| Macro bending loss, r = 37.5 mm, 100 turns | 850nm   | dB       | ≤ 0.5                    | ≤ 0.5                    | ≤ 0.5                    | ≤ 0.5                    |
|                                            | 1300 nm | dB       | ≤ 0.5                    | ≤ 0.5                    | ≤ 0.5                    | ≤ 0.5                    |
| Bending-optimized fiber                    |         |          |                          | yes                      | yes                      | yes                      |

## DIMENSIONAL SPECIFICATION

| Designation                          | Units | OM1         | OM2      | OM3 | OM4 | OM5 |
|--------------------------------------|-------|-------------|----------|-----|-----|-----|
| Core Diameter                        | μm    | 62.5 ± 2.5  | 50 ± 2.5 |     |     |     |
| Core non-Circularity                 | %     | ≤ 5         |          |     |     |     |
| Core-Cladding Concentricity Error    | μm    | ≤ 1.5       |          |     |     |     |
| Cladding Diameter                    | μm    | 125.0 ± 1.0 |          |     |     |     |
| Cladding non-Circularity             | %     | ≤ 1.0       |          |     |     |     |
| Coating Diameter                     | μm    | 242 ± 7     |          |     |     |     |
| Coating non-Circularity              | %     | ≤ 5         |          |     |     |     |
| Coating-Cladding Concentricity Error | μm    | ≤ 10        |          |     |     |     |

## MECHANICAL SPECIFICATION

| Designation                                   | Units | OM1                                 | OM2 | OM3 | OM4 | OM5 |
|-----------------------------------------------|-------|-------------------------------------|-----|-----|-----|-----|
| Tensile proof test at fiber elongation = 1 %  | GPa   | ≥ 0.7 (100 kpsi)                    |     |     |     |     |
| Dynamic Tensile Strength                      | GPa   | median > 3.8 (550 kpsi)             |     |     |     |     |
| Dynamic Fatigue, unaged and aged <sup>3</sup> | -     | n <sub>d</sub> ≥ 20                 |     |     |     |     |
| Average Coating Strip Force                   | N     | 1 ≤ F <sub>avg-strip</sub> ≤ 3      |     |     |     |     |
| Peak Coating Strip Force                      | N     | 1.3 ≤ F <sub>peak-strip</sub> ≤ 8.9 |     |     |     |     |

## ENVIRONMENTAL SPECIFICATION

| Designation                    | Induced attenuation        | OM1                      | OM2 | OM3 | OM4 | OM5 |
|--------------------------------|----------------------------|--------------------------|-----|-----|-----|-----|
| Temperature Cycling,           | Δα ≤ 0.1 dB/km 850/1300 nm | -60°C to +85°C           |     |     |     |     |
| Temperature - Humidity Cycling | Δα ≤ 0.1 dB/km 850/1300 nm | -10°C to +85°C, 4-98% RH |     |     |     |     |
| Water Immersion                | Δα ≤ 0.1 dB/km 850/1300 nm | 30 days; 23°C            |     |     |     |     |
| Dry Heat                       | Δα ≤ 0.1 dB/km 850/1300 nm | 30 days; 85°C            |     |     |     |     |
| Damp Heat                      | Δα ≤ 0.1 dB/km 850/1300 nm | 30 days; 85°C; 85% RH    |     |     |     |     |

## OTHERS

| Designation      | OM1      | OM2 | OM3 | OM4 | OM5 |
|------------------|----------|-----|-----|-----|-----|
| Coating material | Acrylate |     |     |     |     |

**STANDARDS**

| Designation         | OM1                     | OM2                     | OM3                     | OM4                     | OM5                     |
|---------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| IEC / EN 60793-2-10 | Type A1-OM1             | Type A1-OM2             | Type A1-OM3             | Type A1-OM4             | Type A1-OM5             |
| ISO / IEC 11801     | Category OM1            | Category OM2            | Category OM3            | Category OM4            | Category OM5            |
| TIA / EIA 492       | AAAF<br>(formerly AAAA) | AAAF<br>(formerly AAAB) | AAAF<br>(formerly AAAC) | AAAF<br>(formerly AAAD) | AAAF<br>(formerly AAAE) |
| ITU-T               | G.651.1                 |                         |                         |                         |                         |