

tML<sup>®</sup> - FO Dark Fiber Module 5HP MPO/MTP<sup>®</sup> 4x MPO with Pins/6x MPO with Pins 50/125μ OM4, SR4



## tML<sup>®</sup> - tde Modular Link

tML<sup>®</sup> is a patented, modular cabling system consisting of the three key components module, trunk cable and rack mount enclosure. The system components are 100 percent manufactured, pre-assembled and tested in Germany. They enable plug-and-play installation on site – especially in data centres, but also in industrial environments – within the shortest possible time. Heart of the system are the rear MPO/MTP<sup>®</sup> and Telco connectors, which can be used to connect at least six or twelve ports at a time. Depending on the module configuration, transfer rates of up to 200G are currently possible with SR4. The fibre optic and TP modules can be used together in a module carrier with a very high port density. The tde offers its tML<sup>®</sup> cabling system as a proven tML<sup>®</sup> standard system and in the highly innovative variants tML<sup>®</sup> Xtended, tML<sup>®</sup> 24 System and now tML<sup>®</sup> 32 System for extreme scalability and very easy migration to higher transmission rates such as 40G, 100G, 200G and 400G.

The tML<sup>®</sup> - FO Module MPO/MTP<sup>®</sup> uses the "dark fibers" of the trunk cable and is intended for the installation in the tML<sup>®</sup> Rack Mount Enclosure 3U.



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## Technical Data

The end faces of the connectors are optimized by means of Lasercleaving and machine polish. The MPO/MTP<sup>®</sup> plug has a defined fiber height of 1 - 3.5μ. The max. adjacent fiber height difference is 0.2μm and for all fibers 0.3μm. All system components (modules, trunk cables and patch cords) are co-ordinated for the reaching of the performance particularly. The module is marked with sequential serial number and article number. The modules are ROHS compliant.

|       |  |
|-------|--|
| Entry | 4 x MPO/MTP <sup>®</sup> (12 Fibers) Male Adapter (magenta) back   |
| Exit  | 6 x MPO/MTP <sup>®</sup> (8 Fibers) Male Adapter (magenta) front   |
| Tests | Interferometer, Insertion Loss, Return Loss and Visual Final Inspection; all measured values are electronically archived |
|       | QS-Managementsystem ISO 9001, ISO 14001 and TL 9000  |

|             |                        |
|-------------|------------------------|
| Box         | Galvanized steel sheet |
| Front Panel | Stainless steel        |

## FO Adapters

|                 |                          |
|-----------------|--------------------------|
| Type            | MPO/MTP <sup>®</sup>     |
| Application     | Multimode OM4            |
| Design          | without Flange           |
| Connector style | SC Simplex               |
| Key Orientation | Type A, Key up/down      |
| Color           | Magenta                  |
| Material        | Plastic                  |
| Sleeve          | --                       |
| Shutter         | --                       |
| Standards       | IEC 61754-7<br>TIA 604-5 |
| Manufacturer    | US Conec                 |

## FO Connectors

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### Connector

|              |   |
|--------------|---|
| Type         | MPO/MTP <sup>®</sup> Male Push Pull Locking with Elite Pins (magenta) |
| Ferrule      | 12 Fiber MM Elite <sup>®</sup> ferrule, PPS                           |
| Boot colour  | Black   |
| Manufacturer | tde/US Conec  |

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### Optical Performance

| Fiber       | Type                 | Wavelength    | Insertion loss typ. | Insertion loss max. | Return loss min. |
|-------------|----------------------|---------------|---------------------|---------------------|------------------|
| 50/125μ OM4 | MPO/MTP <sup>®</sup> | 850 / 1300 nm | ≤ 0.12 dB           | 0.25 dB             | 35 dB            |

### FO Fiber

|                                   |  |
|-----------------------------------|--|
| Type                              | Corning ClearCurve <sup>®</sup> 50/125μ OM4 multimode fiber  |
| Optimized Data Rate over Distance | 40/100 Gb over 170 m*<br>10 Gb/s over 550 m<br>1 Gb/s over 1100 m  |
| Standard Compliance               | ISO/IEC 11801: type OM4 fiber**<br>IEC 60793-2-10: type A1a.3 fiber**<br>TIA/EIA: 492AAAD<br>ITU: ITU G651.1   |
| *                                 | Distances specified in the 40G/100G per IEEE 802.3ba standard are 150m on OM4 and 100m on OM3; Corning fibers are manufactured to tighter dispersion specifications and thereby support the extended distances shown in the table (assuming cable attenuation ≤3.0 dB/km and same 1.0 dB of connector loss for OM3 that the standard requires for OM4) |
| **                                | Assumes IEC draft standard is harmonized with 492AAAD which was approved by TIA  |

### Optical Specifications

|                    |   |
|--------------------|---|
| Bandwidth          | High Performance EMB* (MHz.km): 4700 at 850 nm only<br>Legacy Performance EMB** (MHz.km): 3500 at 850 nm / 500 at 1300 nm   |
| Attenuation        | At 850 nm max. ≤ 2.3 dB/km<br>At 1300 nm max. ≤ 0.6 dB/km   |
| Macrobend Loss     | Mandrel Radius (mm): 37.2 / 15 / 7.5<br>Number of Turns: 100 / 2 / 2<br>Induced Attenuation (dB) at 850 nm: ≤ 0.05 / ≤ 0.1 / 0.2<br>Induced Attenuation (dB) at 1300 nm: ≤ 0.15 / ≤ 0.3 / ≤ 0.5 |
| Numerical Aperture | 0.200 ± 0.015   |
| *                  | Ensured via miniEMBc, per TIA/EIA 455-220A and IEC 60793-1-49, for high performance laser-based systems (up to 10Gb/s)  |
| **                 | OFL BW, per TIA/EIA 455-204 and IEC 60793-1-41, for legacy and LED-based systems (typically up to 100 Mb/s)   |

### Dimensional Specifications

|                                |                |
|--------------------------------|----------------|
| Core Diameter                  | 50.0 ± 2.5 μm  |
| Cladding Diameter              | 125.0 ± 1.0 μm |
| Core-Clad Concentricity        | ≤ 1.5 μm       |
| Cladding Non-Circularity       | ≤ 1.0%         |
| Core Non-Circularity           | ≤ 5.0%         |
| Coating Diameter               | 242 ± 5 μm     |
| Coating-Cladding Concentricity | < 12 μm        |

## tML® - FO Dark Fiber Module 5HP MPO/MTP® 4x MPO with Pins/6x MPO with Pins 50/125µ OM4, SR4

### Environmental

| Environmental Test           | Test Condition                  | Induced Attenuation 850 nm & 1300 nm (dB/km) |
|------------------------------|---------------------------------|--|
| Temperature Dependence       | -60°C to +85°C                  | ≤ 0.10                                       |
| Temperature Humidity Cycling | -10°C to +85°C and 4% to 98% RH | ≤ 0.10                                       |
| Water Immersion              | 23°C ± 2°C                      | ≤ 0.20                                       |
| Heat Aging                   | 85°C ± 2°C                      | ≤ 0.20                                       |
| Damp Heat                    | 85°C at 85% RH                  | ≤ 0.20                                       |
| Operating Temperature Range  | -60°C to +85°C                  |  |

### Mechanical Specifications

|            |  |
|------------|--|
| Proof Test | The entire fiber length is subjected to a tensile stress ≥ 100 kpsi (0.7 GN/m²). |
| Length     | Fiber lengths available up to 17.6 km/spool.                                     |

### Performance Characterizations

|                                     |  |
|-------------------------------------|--|
| Refractive Index Difference         | 1%   |
| Effective Group Index of Refraction | 850 nm: 1.480<br>1300 nm: 1.479  |
| Fatigue Resistance Parameter (nd)   | 20   |
| Coating Strip Force                 | Dry: 0.6 lbs (2.7N)<br>Wet: 14 days in 23°C water soak: 0.6 lbs (2.7N)   |
| Chromatic Dispersion                | Zero Dispersion Wavelength ( $\lambda_0$ ): 1295 nm $\leq \lambda_0 \leq$ 1315 nm<br>Zero Dispersion Slope ( $S_0$ ): $\leq 0.101$ ps/(nm²*km) |

## Product variants & accessories

| Art.-No.          | Description   |
|-------------------|---|
| TML-T06/04MPP50G3 | tML® - FO Dark Fiber Module 5HP MPO/MTP® 4x MPO with Pins/6x MPO with Pins 50/125µ OM3, SR4 |
| TML-T06/04MPP50G4 | tML® - FO Dark Fiber Module 5HP MPO/MTP® 4x MPO with Pins/6x MPO with Pins 50/125µ OM4, SR4 |