

tML® HD - FO Breakout Module 2x MPO/MTP® with Pins/8x LC Duplex 50/125µ OM3, SR4



## tML® 24

tML® 24 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® 24 fiber 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 400G 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® cabling system as a proven tML® standard system and in the highly innovative variants tML®Xtended and now tML® 32 for extreme scalability and very easy migration to higher transmission rates such as 40G, 100G, 200G and 400G.

The tML® HD Breakout Module is intended for the installation in the tML® Rack Mount Enclosure 1U (for 8 x Modules). The tML® HD Breakout Module can be used only in combination with the tML® HD patch cord.



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## tML<sup>®</sup> HD - FO Breakout Module 2x MPO/MTP<sup>®</sup> with Pins/8x LC Duplex 50/125μ OM3, SR4

### 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 | 2 x MPO/MTP <sup>®</sup> Male Adapter (aqua) front                                                                       |
| Exit  | 8 x LC Duplex Adapter (aqua) 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        |
| Dimensions  | 110 x 108 x 20 mm      |

### FO Adapters

|                 |                          |
|-----------------|--------------------------|
| Type            | LC Duplex                |
| Application     | Multimode OM3            |
| Design          | One-Piece without flange |
| Connector style | SC simplex               |
| Color           | Aqua                     |
| Material        | Plastic                  |
| Sleeve          | Zirkonia Staight Split   |
| Shutter         | --                       |
| Manufacturer    | tde                      |

### FO Connectors

|                       |                                               |
|-----------------------|-----------------------------------------------|
| Connector Type        | LC Unibody Simplex                            |
| Housing               | Plastic, Aqua                                 |
| Ferrule               | Zirkonia Staight Split, Spring-loaded Axially |
| Ferrule Hole          | 126μ                                          |
| Mating Cycles         | 1.000                                         |
| Operating Temperature | -40°C up to +75°C                             |
| Strain Relief to      | 100 N                                         |
| Manufacturer          | tde                                           |

### Optical performance

| Fiber | Type | Wavelength | Insertion loss typ. | Insertion loss max. | Return loss min. |
|-------|------|------------|---------------------|---------------------|------------------|
|-------|------|------------|---------------------|---------------------|------------------|

## tML<sup>®</sup> HD - FO Breakout Module 2x MPO/MTP<sup>®</sup> with Pins/8x LC Duplex 50/125μ OM3, SR4

|             |    |        |           |         |       |
|-------------|----|--------|-----------|---------|-------|
| 50/125μ OM3 | LC | 850 nm | ≤ 0.20 dB | 0.35 dB | 30 dB |
|-------------|----|--------|-----------|---------|-------|

### FO Adapters

|                 |                          |
|-----------------|--------------------------|
| Type            | MPO/MTP <sup>®</sup>     |
| Application     | Multimode OM3            |
| Design          | without Flange           |
| Connector style | SC Simplex               |
| Key Orientation | Type A, Key up/down      |
| Color           | Aqua                     |
| Material        | Plastic                  |
| Sleeve          | --                       |
| Shutter         | --                       |
| Standards       | IEC 61754-7<br>TIA 604-5 |
| Manufacturer    | US Conec                 |

### FO Connectors

#### Connector

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

### Optical Performance

| Fiber       | Type                 | Wavelength | Insertion loss typ. | Insertion loss max. | Return loss min. |
|-------------|----------------------|------------|---------------------|---------------------|------------------|
| 50/125μ OM3 | MPO/MTP <sup>®</sup> | 850 nm     | ≤ 0.14 dB           | 0.25 dB             | 35 dB            |

### FO Fiber

|                                   |                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Type                              | Corning ClearCurve <sup>®</sup> 50/125μ OM3 multimode fiber                                                                                                                                                                                                                                                                                             |
| Optimized Data Rate over Distance | 40/100 Gb/s über 140 m*<br>10 Gb/s over 300 m<br>1 Gb/s over 1000 m                                                                                                                                                                                                                                                                                     |
| Standard Compliance               | ISO/IEC 11801: type OM3 fiber<br>IEC 60793-2-10: type A1a.2 fiber<br>TIA/EIA: 492AAAC-B<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). |

## tML<sup>®</sup> HD - FO Breakout Module 2x MPO/MTP<sup>®</sup> with Pins/8x LC Duplex 50/125 $\mu$ OM3, SR4

### Optical Specifications

|                    |                                                                                                                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bandwidth          | High Performance EMB* (MHz.km): 2000 at 850 nm only<br>Legacy Performance EMB* (MHz.km): 1500 at 850 nm / 500 at 1300 nm                                                                                                        |
| Attenuation        | At 850 nm max. $\leq 2.3$ dB/km<br>At 1300 nm max. $\leq 0.6$ dB/km                                                                                                                                                             |
| Macrobend Loss     | Mandrel Radius (mm): 37.5 / 15 / 7.5<br>Number of Turns: 100 / 2 / 2<br>Induced Attenuation (dB) at 850 nm: $\leq 0.05$ / $\leq 0.1$ / $\leq 0.2$<br>Induced Attenuation (dB) at 1300 nm: $\leq 0.15$ / $\leq 0.3$ / $\leq 0.5$ |
| Numerical Aperture | $0.200 \pm 0.015$                                                                                                                                                                                                               |
| *                  | Ensured via miniEMBC, per TIA/EIA 455-220A and IEC 60793-1-49, for high performance laser-based systems (up to 10 Gb/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                  | $50.0 \pm 2.5 \mu\text{m}$  |
| Cladding Diameter              | $125.0 \pm 1.0 \mu\text{m}$ |
| Core-Clad Concentricity        | $\leq 1.5 \mu\text{m}$      |
| Cladding Non-Circularity       | $\leq 1.0\%$                |
| Core Non-Circularity           | $\leq 5.0\%$                |
| Coating Diameter               | $242 \pm 5 \mu\text{m}$     |
| Coating-Cladding Concentricity | $< 12 \mu\text{m}$          |

### Environmental

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

### Mechanical Specifications

|            |                                                                                                    |
|------------|----------------------------------------------------------------------------------------------------|
| Proof Test | The entire fiber length is subjected to a tensile stress $\geq 100$ kpsi (0.7 GN/m <sup>2</sup> ). |
| 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                              |

## tML<sup>®</sup> HD - FO Breakout Module 2x MPO/MTP<sup>®</sup> with Pins/8x LC Duplex 50/125μ OM3, SR4

|                     |                                                                                                                                                        |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coating Strip Force | Dry: 0.6 lbs (2.7N)<br>Wet: 14 days in 23°C water soak: 0.6 lbs (2.7N)                                                                                 |
| Cromatic Dispersion | Zero Dispersion Wavelength ( $\lambda_0$ ): 1295 nm $\leq \lambda_0 \leq$ 1315 nm<br>Zero Dispersion Slope (S0): $\leq 0.101$ ps/(nm <sup>2</sup> *km) |

## Product variants & accessories

| Art.-No.            | Description                                                                                                 |
|---------------------|-------------------------------------------------------------------------------------------------------------|
| TML-M08LCAD/MPP09E  | tML <sup>®</sup> HD - FO Breakout Module 2x MPO/MTP <sup>®</sup> with Pins/8x LC APC Duplex 9/125μ OS2, LR4 |
| TML-M08LCD/MPP50G3  | tML <sup>®</sup> HD - FO Breakout Module 2x MPO/MTP <sup>®</sup> with Pins/8x LC Duplex 50/125μ OM3, SR4    |
| TML-M08LCD/MPP50G4  | tML <sup>®</sup> HD - FO Breakout Module 2x MPO/MTP <sup>®</sup> with Pins/8x LC Duplex 50/125μ OM4, SR4    |
| TML-M08LCDS/MPP50G5 | tML <sup>®</sup> HD - FO Breakout Module 2x MPO/MTP <sup>®</sup> with Pins/8x LC Duplex 50/125μ OM5, SR4    |