

tML<sup>®</sup> HD - FO Breakout Module 5HP 2x MPO/MTP<sup>®</sup> with Pins/8x LC Duplex 50/125μ OM4 40GbE



## tML<sup>®</sup> 24

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

The tML<sup>®</sup> HD Breakout Module 5HP MPO/MTP<sup>®</sup> is intended for the installation in the tML<sup>®</sup> Rack Mount Enclosure 3U (for 17 x Modules). The tML<sup>®</sup> HD Breakout Module can be used only in combination with the tML<sup>®</sup> HD patch cord.



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## tML® HD - FO Breakout Module 5HP 2x MPO/MTP® with Pins/8x LC Duplex 50/125µ OM4 40GbE

### Technical Data

The end faces of the connectors are optimized by means of Lasercleaving and machine polish. The MPO/MTP®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®Male Adapter (magenta) front
Exit	8 x LC Duplex 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	LC Duplex
Application	Multimode OM4
Design	One-Piece without flange
Connector style	SC simplex
Color	Magenta
Material	Plastic
Sleeve	Zirkonia Staight Split
Shutter	--
Manufacturer	tde

### FO Connectors

Connector Type	LC Unibody Simplex
Housing	Plastic, Magenta
Ferrule	Zirkonia Staight Split, Spring-loaded Axially
Ferrule Hole	126 µ
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.
50/125µ OM4	LC	850 / 1300 nm	≤ 0.07 dB	0.15 dB	35 dB

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### 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 TIA 604-5
Manufacturer	US Conec

### FO Connectors

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.

#### 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

### 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* 10 Gb/s over 550 m 1 Gb/s over 1100 m
Standard Compliance	ISO/IEC 11801: type OM4 fiber** IEC 60793-2-10: type A1a.3 fiber** TIA/EIA: 492AAAD 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

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### Optical Specifications

Bandwidth	High Performance EMB* (MHz.km): 4700 at 850 nm only Legacy Performance EMB** (MHz.km): 3500 at 850 nm / 500 at 1300 nm
Attenuation	At 850 nm max. $\leq 2.3$ dB/km At 1300 nm max. $\leq 0.6$ dB/km
Macrobend Loss	Mandrel Radius (mm): 37.2 / 15 / 7.5 Number of Turns: 100 / 2 / 2 Induced Attenuation (dB) at 850 nm: $\leq 0.05$ / $\leq 0.1$ / $0.2$ 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 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	$50.0 \pm 2.5 \mu\text{m}$
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	$-60^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	$\leq 0.10$
Temperature Humidity Cycling	$-10^{\circ}\text{C}$ to $+85^{\circ}\text{C}$ and 4% to 98% RH	$\leq 0.10$
Water Immersion	$23^{\circ}\text{C} \pm 2^{\circ}\text{C}$	$\leq 0.20$
Heat Aging	$85^{\circ}\text{C} \pm 2^{\circ}\text{C}$	$\leq 0.20$
Damp Heat	$85^{\circ}\text{C}$ at 85% RH	$\leq 0.20$
Operating Temperature Range	$-60^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	

### Mechanical Specifications

Proof Test	The entire fiber length is subjected to a tensile stress $\geq 100$ kpsi ( $0.7 \text{ GN/m}^2$ ).
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 1300 nm: 1.479
Fatigue Resistance Parameter (nd)	20

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Coating Strip Force	Dry: 0.6 lbs (2.7N) 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 Zero Dispersion Slope ( $S_0$ ): $\leq 0.101$ ps/(nm <sup>2</sup> *km)

## Product variants & accessories

Art.-No.	Description
TML-T08LCAD/MPP09E	tML <sup>®</sup> HD - FO Breakout Module 5HP 2x MPO/MTP <sup>®</sup> with Pins/8x LC APC Duplex 9/125μ OS2 40GbE
TML-T08LCD/MPP50G3	tML <sup>®</sup> HD - FO Breakout Module 5HP 2x MPO/MTP <sup>®</sup> with Pins/8x LC Duplex 50/125μ OM3 40GbE
TML-T08LCD/MPP50G4	tML <sup>®</sup> HD - FO Breakout Module 5HP 2x MPO/MTP <sup>®</sup> with Pins/8x LC Duplex 50/125μ OM4 40GbE