

tML[®] 24 - HD FO Breakout Module 5HP 1x 24F MPO/MTP[®] with Pins/10x LC Duplex 50/125 μ OM4



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



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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 - 3.5 μ . The max. adjacent fiber height difference is 0.2 μ m and for all fibers 0.3 μ m. 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	1 x MPO/MTP [®] Male Adapter (red) front
Exit	10 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.
50/125 μ OM4	LC	850 / 1300 nm	\leq 0.07 dB	0.15 dB	35 dB

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FO Adapters

Type	MPO/MTP [®]
Application	Singlemode / Multimode
Design	without Flange
Connector style	SC Simplex
Key Orientation	Type A, Key up/down
Color	Red
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[®] plug has a defined fiber height of 1 - 3.5 μ m. The max. adjacent fiber height difference is 0.2 μ m and for all fibers 0.3 μ m.

Connector

Type	MPO/MTP [®] Male Push Pull Locking with Elite Pins (magenta)
Ferrule	24 Fiber MM Elite [®] ferrule, PPS
Boot colour	Red
Temperature range	-40°C to +75°C
Manufacturer	tde/US Conec

Optical Performance

Fiber	Type	Wavelength	Insertion loss typ.	Insertion loss max.	Return loss min.
50/125 μ OM4	MPO/MTP [®]	850 nm	≤ 0.12 dB	0.25 dB	35 dB

FO Fiber

Type	Corning ClearCurve [®] 50/125 μ 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)

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** 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 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 μ m
Cladding Diameter	125.0 \pm 1.0 μ m
Core-Clad Concentricity	\leq 1.5 μ m
Cladding Non-Circularity	\leq 1.0%
Core Non-Circularity	\leq 5.0%
Coating Diameter	242 \pm 5 μ m
Coating-Cladding Concentricity	< 12 μ 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 ²).
Length	Fiber lengths available up to 17.6 km/spool.

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Performance Characterizations

Refractive Index Difference	1%
Effective Group Index of Refraction	850 nm: 1.480 1300 nm: 1.479
Fatigue Resistance Parameter (nd)	20
Coating Strip Force	Dry: 0.6 lbs (2.7N) Wet: 14 days in 23°C water soak: 0.6 lbs (2.7N)
Chromatic Dispersion	Zero Dispersion Wavelength (λ_0): 1295 nm $\leq \lambda_0 \leq$ 1315 nm Zero Dispersion Slope (S_0): ≤ 0.101 ps/(nm ² *km)

Product variants & accessories

Art.-No.	Description
TML-T10LCAD/M2P09E	tML [®] 24 - HD FO Breakout Module 5HP 1x 24F MPO/MTP [®] with Pins/10x LC APC Duplex 9/125 μ OS2
TML-T10LCD/M2P50G3	tML [®] 24 - HD FO Breakout Module 5HP 1x 24F MPO/MTP [®] with Pins/10x LC Duplex 50/125 μ OM3
TML-T10LCD/M2P50G4	tML [®] 24 - HD FO Breakout Module 5HP 1x 24F MPO/MTP [®] with Pins/10x LC Duplex 50/125 μ OM4
TML-T10LCDS/M2P50G5	tML [®] 24 - HD FO Breakout Module 5HP 1x 24F MPO/MTP [®] with Pins/10x LC Duplex 50/125 μ OM5