

tML<sup>®</sup> 24 - FO Module 1x 24F MPO/MTP<sup>®</sup>/12x LC Duplex w. shutter 50/125 $\mu$  OM4



## 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 utility patent protected tML<sup>®</sup> 24 - FO Module MPO/MTP<sup>®</sup> is intended for the installation in the tML<sup>®</sup> Rack Mount Enclosure 1U (for 8 x Modules). The module configuration guarantees an extremely easy migration from 1GbE to 100GbE because there can always be worked on both sides with uniformly configured modules and patch cables. The tML<sup>®</sup> 24 module can be used only in combination with the tML<sup>®</sup>HD patch cord. A special cleaning tool is required to clean the adapters with shutter.



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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 - 3.5 $\mu$ . The max. adjacent fiber height difference is 0.2 $\mu$ m and for all fibers 0.3 $\mu$ 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 <sup>®</sup> Female Adapter (red) back
Exit	12 x LC Duplex Adapter with self-closing shutter (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
Dimensions	110 x 108 x 20 mm

## FO Adapters

Type	MPO/MTP <sup>®</sup>
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 Adapters

When the connector is inserted into the adapter it compress the springs, opening the internal shutter. The internal shutter opens, and due to the special design of the shutter, it will not touch the ferrule end face. As the connector is removed from the adapter, the shutter spring automatically returns the internal shutter to the closed position.

Type	LC Duplex
Application	Multimode OM4
Design	One-Piece without flange
Connector style	SC simplex
Color	Magenta

## tML<sup>®</sup> 24 - FO Module 1x 24F MPO/MTP<sup>®</sup>/12x LC Duplex w. shutter 50/125 $\mu$ OM4

Housing material	Plastic
Sleeve	Zirkonia Staight Split
Self-closing shutter material	Metal
Self-closing shutter protection	Dust an laser light
Manufacturer	tde

### 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 - 3.5 $\mu$ . The max. adjacent fiber height difference is 0.2 $\mu$ m and for all fibers 0.3 $\mu$ m.

#### Connector

Type	MPO/MTP <sup>®</sup> Female Push Pull Locking (magenta)
Ferrule	24 Fiber MM Elite <sup>®</sup> 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 $\mu$ OM4	MPO/MTP <sup>®</sup>	850 nm	$\leq$ 0.12 dB	0.25 dB	35 dB

### FO Connectors

Connector Type	LC Unibody Simplex
Housing	Plastic, Magenta
Ferrule	Zirkonia Staight Split, Spring-loaded Axially
Ferrule Hole	126 $\mu$
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 $\mu$ OM4	LC	850 / 1300 nm	$\leq$ 0.07 dB	0.15 dB	35 dB

### FO Fiber

Type	Draka OM4 50/125 $\mu$ m bend-insensitive multimode fiber (C32)
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Standards and Norms	IEC 60793-2-10: type A1a.3	ITU G.651.1	TIA/EIA-492 AAAD
	ISO/IEC 11801 category OM4	EN 60793-2-10: type A1a.3	ANSI/TIA/EIA-568.C
	ISO/IEC 24764	EN 50173-1 category OM4	IEEE 802.3

### Optical properties

Maximum attenuation value of cable at 850 nm	IEC 60793-1-40	$\leq 3.0$ dB/km
Maximum attenuation value of cable at 1300 nm	IEC 60793-1-40	$\leq 1.0$ dB/km
Attenuation limit according to IEC 60793-2-10, 850 nm	IEC 60793-1-40	$\leq 2.5$ dB/km
Attenuation limit according to IEC 60793-2-10, 1300 nm	IEC 60793-1-40	$\leq 0.8$ dB/km
Inhomogeneity of OTDR trace for any two 1000 metre fiber lengths	IEC 60793-1-40	Max. 0.1 dB/km
Fiber bending loss R=7.5 mm 850/1300 nm	IEC 60793-1-40	$\leq 0.2$ dB / $\leq 0.5$ dB
Fiber bending loss R=15 mm 850/1300 nm	IEC 60793-1-40	$\leq 0.1$ dB / $\leq 0.3$ dB

### Bandwidth

Overfilled (OFL) modal bandwidth at 850 nm	IEC 60793-1-41	$\geq 3500$ MHz*km
Overfilled (OFL) modal bandwidth at 1300 nm	IEC 60793-1-41	$\geq 500$ MHz*km
Effective Modal Bandwidth (EMB) at 850 nm	IEC 60793-1-49	$\geq 4700$ MHz*km
Group index of refraction at 850 nm	IEC 60793-1-22	1.482
Group index of refraction at 1300 nm	IEC 60793-1-22	1.477

### Geometrical / mechanical properties

Core diameter	IEC/EN 60793-1-20	$50 \pm 2$ $\mu$ m
Cladding diameter	IEC/EN 60793-1-20	$125.0 \pm 1.0$ $\mu$ m
Cladding non-circularity	IEC/EN 60793-1-20	$\leq 0.7\%$
Core non-circularity	IEC/EN 60793-1-20	$\leq 5\%$
Core -cladding concentricity error	IEC/EN 60793-1-20	$\leq 1$ $\mu$ m
Primary coating diameter - uncoloured	IEC/EN 60793-1-21	$242 \pm 5$ $\mu$ m
Primary coating diameter - coloured	IEC/EN 60793-1-21	$250 \pm 15$ $\mu$ m
Primary coating non-circularity	IEC/EN 60793-1-21	$\leq 5\%$
Primary coating-cladding concentricity error	IEC/EN 60793-1-21	$\leq 6$ $\mu$ m
Proof stress level	IEC/EN 60793-1-30	$\geq 0.7$ ( $\approx 1\%$ ) GPa
Typical average strip force	IEC/EN 60793-1-32	1.7 N
Strip force (peak)	IEC/EN 60793-1-32	$1.3$ N $\leq F_{\text{peak.strip}} \leq 8.9$ N
Numerical aperture	IEC/EN 60793-1-43	$0.200 \pm 0.015$

### Product variants & accessories

Art.-No.	Description
L-CLEAN-SMART-CS1.25	FO Cleaning Tool 1,25mm for CS and LC Duplex Adapter with self-closing shutter

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Art.-No.	Description
TML-M12LCADS/M2-09E	tML <sup>®</sup> 24 - FO Module 1x 24F MPO/MTP <sup>®</sup> /12x LC APC Duplex w. shutter 9/125 $\mu$ OS2
TML-M12LCDS/M2-09E	tML <sup>®</sup> 24 - FO Module 1x 24F MPO/MTP <sup>®</sup> /12x LC Duplex w. shutter 9/125 $\mu$ OS2
TML-M12LCDS/M2-50G4	tML <sup>®</sup> 24 - FO Module 1x 24F MPO/MTP <sup>®</sup> /12x LC Duplex w. shutter 50/125 $\mu$ OM4
TML-M12LCDS/M2-50G5	tML <sup>®</sup> 24 - FO Module 1x 24F MPO/MTP <sup>®</sup> without Pins/12x LC Duplex w. shutter 50/125 $\mu$ OM5