

tML<sup>®</sup> 24 - FO Trunk Cable 1x 24F MPO w. Pins/1x 24F MPO w. Pins 24E9/125 $\mu$  OS2 LSHF Type A,  
Length: xx in m



## 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 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> 12, tML<sup>®</sup> 24, tML<sup>®</sup> 32 and now tML<sup>®</sup> 24+ System for extreme scalability and very easy migration to higher transmission rates such as 40G, 100G, 200G, 400G and 800G and more.

The tML<sup>®</sup> - FO trunk cable is intended for the connection of two tML<sup>®</sup>24 - FO Modules.



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## Technical Data

The tML<sup>®</sup>- FO trunk cable is preterminated with MPO/MTP<sup>®</sup> connectors on both ends. 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 fan-out unit is optimized for tML<sup>®</sup> - Cable Mounting Bracket for Fan-out Units. The module is marked with sequential serial number and article number.

## 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> APC Male Push Pull Locking with Elite Pins (green)
Ferrule	24 Fiber SM 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.
9/125 $\mu$ OS2	MPO/MTP <sup>®</sup> APC	1550 nm	≤ 0.10 dB	0.25 dB	75 dB

## FO Fan-Out

Fan-out length	50 mm
Ø Fan-out	16 mm
Ø Single unit	3.8 mm
Single unit length	78 ± 5 cm (not stepped)

## FO Cables

### Mechanical characteristics

Temperature range	Storage -25 to +70°C, IEC 60794-1-22 F1
	Pulling in -10 to +50°C
	Operation -25 to +60°C
Tensile performance	IEC 60794-1-21 E1
Crush resistance	IEC 60794-1-21 E3
Impact	IEC 60794-1-21 E4

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Repeated bending	IEC 60794-1-21 E6
Torsion	IEC 60794-1-21 E7
Bend	IEC 60794-1-21 E11
Water penetration	IEC 60794-1-22 F5

## General characteristics

Sheath colour	green, similar to RAL 6016
Zero halogen, no corrosive gases	IEC 60754-1/-2, EN 60754-1/-2, VDE 0482-754-1/-2
Flame propagation	IEC 60332-1-2, EN 60332-1-2, VDE 0482-332-1-2
Flame spread	IEC 60332-3-24, EN 50266-2-4, VDE 0482-266-2-4
Reaction to fire (Euroclasses)	cIEC 61034-1/-2, EN 61034-1/-2, VDE 0482-1034-1/-2
Reaction to fire (Euroclasses)	EN 13501-6: D <sub>ca</sub>

Cabletype	Universal U-DQ(ZN)BH for indoor and outdoor use
	non metallic, dry interstices, rodent protection, flame retardant, in accordance with IEC 60332.1 and IEC 60332.3 C
Fibertype	E9/125 G.652.D
No. of fibers	24
Loose tube	1
Sheath $\varnothing$	8.2 mm
Weight	72 kg/km
Bending radius	125 mm
Tensile load short term	3,500 N
Tensile load continuous	1.500 N
Crush resistance short term	5.000 N
Crush resistance continuous	3.000 N
Fire load	336 kWh/km
	1210 MJ/km

## Length tolerances (prefabricated with plugs)

Tolerances for lengths up to 40m	$\pm$ 100 cm
Tolerances for lengths up to 100m	$\pm$ 100 cm
Tolerances for lengths from 100m	$\pm$ 2%

## FO Fiber

### Optical properties

Maximum attenuation (cabled)	1310 nm: 0.34 / 1383 nm: 0.34* dB/km (*post hydrogen aging performance)
Maximum Chromatic Dispersion	3.5 ps/(nm x km)
Zero Dispersion Wavelength $\lambda_0$	1304 $\leq \lambda_0 \leq$ 1324 nm

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Maximum Zero Dispersion Slope $S_0$	0.092 ps/(nm <sup>2</sup> x km)
Mode-Field Diameter	9.2 +/- 0,4 $\mu$ m
Maximum Cable Cut-off Wavelength $\lambda_{CC}$	1260 nm
PDM Link Design Value	$\leq 0.04$ ps/ $\sqrt$ km
Max. individual fibre PMD	$\leq 0.1$ ps/ $\sqrt$ km
Max. individual cable PMD	$\leq 0.2$ ps/ $\sqrt$ km
Refractive Index	1.4676

## Mechanical properties

Cladding diameter	125.0 +/- 1.0 $\mu$ m
Maximum Core/Cladding Concentricity Error	0.5 $\mu$ m
Maximum Cladding Non-Circularity	0.7 %
Coating diameter	245 +/-5 $\mu$ m
Maximum Cladding/Coating Concentricity Error	12 $\mu$ m
Operating temperature range	-60 to +85°C
Test load	100 kpsi

## Product variants & accessories

Art.-No.	Description
TML-M2P/M2P09B24E-Axx	tML <sup>®</sup> 24 - FO Trunk Cable 1x 24F MPO w. Pins/1x 24F MPO w. Pins 24E9/125 $\mu$ OS2 LSHF Type A, Length: xx in m
TML-M2P/M2P09B48E-Axx	tML <sup>®</sup> 24 - FO Trunk Cable 2x 24F MPO w. Pins/2x 24F MPO w. Pins 48E9/125 $\mu$ OS2 LSHF Type A, Length: xx in m
TML-M2P/M2P09B72E-Axx	tML <sup>®</sup> 24 - FO Trunk Cable 3x 24F MPO w. Pins/3x 24F MPO w. Pins 72E9/125 $\mu$ OS2 LSHF Type A, Length: xx in m
TML-M2P/M2P09B96E-Axx	tML <sup>®</sup> 24 - FO Trunk Cable 4x 24F MPO w. Pins/4x 24F MPO w. Pins 96E9/125 $\mu$ OS2 LSHF Type A, Length: xx in m