

ISO 9001 TL 9000 ISO 14001

tML® 24- FO Dark Fiber Module 5HP 4x 24F MPO/12x 12F MPO with Pins 50/125µ OM5, 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[®] - FO Dark Fiber Module MPO/MTP[®]uses all the fibers of the back room cabling and is intended for the installation in the tML[®] Rack Mount Enclosure 3U (for 17 x Modules).



tde® trans data elektronik GmbH

Headquarter address:

Lingener Str. 2 D-49626 Bippen/Ohrte Tel.: +49 5435 9511 0 Fax.: +49 5435 9511 32

Sales office address:

Prinz-Friedrich-Karl-Str. 46 D-44135 Dortmund Tel.: +49 231 8805 61 13 Fax.: +49 231 8805 61 15

info@tde.de | www.tde.de



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 hieght 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	4 x MPO/MTP®(24 Fibers) Male Adapter (red) back
Exit	12 x MPO/MTP®(12 Fibers) Male Adapter (limegreen) front
	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

Туре	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 Adapters

Туре	MPO/MTP®
Application	Multimode OM5
Design	without Flange
Connector style	SC Simplex
Key Orientation	Type A, Key up/down
Color	Limegreen
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 - 3.5µ. The max. adjacent fiber height difference is 0.2µm and for all fibers 0.3µm.

Connector

Туре	MPO/MTP® Female Push Pull Locking
Ferrule	24 Fiber MM Elite® ferrule, PPS
Boot colour	Red
Temperature range	-40°C to +75°C
Manufacturer	tde/US Conec

Optical Performance

Fiber	Туре	Wavelength	Insertion loss typ.	Insertion loss max.	Return loss min.
50/125µ OM5	MPO/MTP®	850 nm	$\leq 0.11 \text{ dB}$	0.25 dB	35 dB

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 - 3.5µ. The max. adjacent fiber height difference is 0.2µm and for all fibers 0.3µm.

Connector

Туре	/IPO/MTP® Male Push Pull Locking with Elite Pins	
Ferrule	12 Fiber MM Elite [®] ferrule, PPS	
Boot colour	Black	
Manufacturer	tde/US Conec	

Optical Performance

Fiber	Туре	Wavelength	Insertion loss typ.	Insertion loss max.	Return loss min.
50/125µ OM5	MPO/MTP®	850 nm	$\leq 0.11 \text{ dB}$	0.25 dB	35 dB

FO Fiber

Туре	Corning ClearCurve® 50/125µ OM5 multimode fiber
Design	Optical fibre G50/125 μm (conform to IEC 60793-2-10 type A1a.4b) with optical core 50 μm +/- 2.5 μm diameter and optical cladding 125 μm +/- 1 μm diameter



Geometrical properties

Core concentricity error	< 5 %
Coating concentricity error	< 1 %
Core coating eccentricity	< 1.5 µm
Eccentricity of coating	< 12 µm
Screen test	≥ 0.7 GPa (100 kpsi)

Transmission characteristics

Attenuation, maximum values 802.5 dB/kmAttenuation, maximum values 8051.8 dB/kmAttenuation, maximum values 8050.7 dB/km1300 nm (cabled fibre)0.7 dB/kmAttenuation, maximum values 8051.7 dB/kmAttenuation, maximum values 8050.64 dB/kmAttenuation, maximum values 8050.64 dB/kmInducabled fibre)0.64 dB/km100 truns, 37.5 mm0.64 dB/km100 truns, 37.5 mm0.5 dB (at 850 nm)100 truns, 37.5 mm0.5 dB (at 850 nm)100 truns, 37.5 mm0.5 dB (at 1300 nm)Macrobending, induced attenuation0.3 dB (at 850 nm)100 truns, 37.5 mm0.3 dB (at 1300 nm)12 truns, 15 mm0.3 dB (at 1300 nm)12 truns, 15 mm0.5 dB (at 1300 nm)13 darobending, induced attenuation0.5 dB (at 1300 nm)2 truns, 15 mm0.5 dB (at 1300 nm)13 truns, 15 mm0.5 dB (at 1300 nm)13 truns, 15 mm0.5 dB (at 1300 nm)2 truns, 15 mm0.5 dB (at 1300 nm)2 truns, 15 mm0.5 dB (at 1300 nm)13 truns, 15 mm0.5 dB (at 1300 nm)14 truns, 15 mm0.5 dB (at 1300 nm)15 mm0.5 dB (at 1300 nm)2 truns, 15 mm0.5 dB (at 1300 nm)16 truns, 15 mm0.5 dB (at 1300 nm)17 truns 4000.5 dB (at 1300 nm)18 truns 400 truns 4000.5 dB (at 1300 nm)19 truns 400 truns 4000.5 dB (at 1300 nm)10 truns 400 truns 4000.5 dB (at 1300 nm)10 truns 400 truns 400 truns 4000.5 dD MIz x km<		
nm (cabled fibre) C / B/km Attenuation, maximum values 850 0.7 dB/km Attenuation, maximum values 850 2.34 dB/km Attenuation, maximum values 950 1.7 dB/km Attenuation, maximum values 950 0.64 dB/km Attenuation, maximum values 950 0.64 dB/km Attenuation, maximum values 950 0.64 dB/km Macrobending, induced attenuation 6.05 dB (at 850 nm) Macrobending, induced attenuation 6.01 dB (at 850 nm) Macrobending, induced attenuation 6.03 dB (at 1300 nm) Macrobending, induced attenuation 6.03 dB (at 300 nm) Macrobending, induced attenuation 6.04 dB/km Macrobending, induced attenuation 6.04 dB /km Macrobending, induced attenuation 6.04 dB /km Macrobending, induced attenuation 6.04 dB /km Macrobendi		2.5 dB/km
1300 nm (cabled fibre) 2.34 dB/km Attenuation, maximum values 953 1.7 dB/km Attenuation, maximum values 953 0.64 dB/km Attenuation, maximum values 953 0.64 dB/km Macrobending, induced attenuation 0.64 dB/km Macrobending, induced attenuation 0.5 dB (at 850 nm) Macrobending, induced attenuation 0.5 dB (at 1300 nm) Macrobending, induced attenuation 0.5 dB (at 1300 nm) Yurns, 37.5 mm 0.3 dB (at 1300 nm) Macrobending, induced attenuation 0.3 dB (at 1300 nm) Yurns, 15 mm 0.3 dB (at 1300 nm) Macrobending, induced attenuation 0.3 dB (at 1300 nm) Yurns, 7.5 mm 0.3 dB (at 1300 nm) Macrobending, induced attenuation 0.3 dB (at 1300 nm) Yurns, 7.5 mm 0.3 dB (at 1300 nm) Bandwidth (0FL), minimum values 1850 MHz x km Bandwidth (0FL), minimum values 1850 MHz x km Bandwidth (0FL), minimum values 1850 MHz x km Bandwidth (0FL), minimum values 100 MHz x km Product min. 953 nm 400 MHz x km Product min. 953 nm 0.200 +/- 0.015 Effective group of refraction 1300 1.477 <td>,</td> <td>1.8 dB/km</td>	,	1.8 dB/km
nm (uncabled fibre)Attenuation, maximum values ns (uncabled fibre)1/ d B/kmAttenuation, maximum values 1300 m (uncabled fibre)0-64 dB/kmMacrobending, induced attenuation 00 turns, 37.5 mm0.5 dB (at 850 nm)Macrobending, induced attenuation 00 turns, 37.5 mm0.5 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 15 mm0.1 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 850 nm)Bandwidth (DFL), minimum values Bandwidth (DFL), minim	,	0.7 dB/km
nm (uncabled fibre)Attenuation, maximum values 1300 nm (uncabled fibre)0.64 dB/kmMacrobending, induced attenuation 100 turns, 37.5 mm0.5 dB (at 850 nm)Macrobending, induced attenuation 100 turns, 37.5 mm0.5 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 15 mm0.1 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 15 mm0.3 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 15 mm0.3 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.3 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.5 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 7.5 mm0.5 dB (at 1300 nm)Bandwidth (OFL), minimum values 850 nm3500 MHz x kmBandwidth (OFL), minimum values poduct min. 850 nm3500 MHz x kmEffective modal Bandwidth-length product min. 953 nm4700 MHz x kmEffective group of refraction 8500 m0.200 +/- 0.015Effective group of refraction 13001.477	,	2.34 dB/km
1300 nm (uncabled fibre)Macrobending, induced attenuation 100 turns, 37.5 mm<0.5 dB (at 850 nm)		1.7 dB/km
100 turns, 37.5 mm Macrobending, induced attenuation < 0.5 dB (at 1300 nm)		0.64 dB/km
100 turns, 37.5 mmMacrobending, induced attenuation 2 turns, 15 mm< 0.1 dB (at 850 nm)	0.	≤ 0.5 dB (at 850 nm)
2 turns, 15 mm6.0.3 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 7.5 mm5.0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm6.0.5 dB (at 1300 nm)Macrobending, induced attenuation 2 turns, 7.5 mm5.0.5 dB (at 1300 nm)Bandwidth (OFL), minimum values 850 nm3500 MHz x kmBandwidth (OFL), minimum values 953 nm500 MHz x kmBandwidth (OFL), minimum values 1000 nm500 MHz x kmEffective modal Bandwidth-length product min. 953 nm4700 MHz x kmEffective modal Bandwidth-length product min. 953 nm4700 MHz x kmEffective group of refraction 850 nm0.200 +/- 0.015Effective group of refraction 13001.477		≤ 0.5 dB (at 1300 nm)
2 turns, 15 mmGeneratingMacrobending, induced attenuation 2 turns, 7.5 mm\$ 0.3 dB (at 850 nm)Macrobending, induced attenuation 2 turns, 7.5 mm\$ 0.5 dB (at 1300 nm)Bandwidth (OFL), minimum values 850 nm\$ 500 MHz x kmBandwidth (OFL), minimum values 1300 nm\$ 000 MHz x kmBandwidth (OFL), minimum values 1300 nm\$ 000 MHz x kmEffective modal Bandwidth-length product min. 953 nm\$ 000 MHz x kmEffective modal Bandwidth-length product min. 953 nm\$ 4700 MHz x kmEffective group of refraction 850 nm\$ 200 +/- 0.015Effective group of refraction 1300\$ 1.477	0.	≤ 0.1 dB (at 850 nm)
2 turns, 7.5 mmMacrobending, induced attenuation 2 turns, 7.5 mm< 0.5 dB (at 1300 nm)		≤ 0.3 dB (at 1300 nm)
2 turns, 7.5 mmBandwidth (OFL), minimum values S50 nm3500 MHz x kmBandwidth (OFL), minimum values S53 nm1850 MHz x kmBandwidth (OFL), minimum values 1300 nm500 MHz x kmEffective modal Bandwidth-length product min. 850 nm4700 MHz x kmEffective modal Bandwidth-length product min. 953 nm4700 MHz x kmEffective group of refraction 850 nm0.200 +/- 0.015Effective group of refraction 13001.477		≤ 0.3 dB (at 850 nm)
850 nmImage: state of the state		≤ 0.5 dB (at 1300 nm)
953 nmBandwidth (OFL), minimum values 1300 nm500 MHz x kmEffective modal Bandwidth-length product min. 953 nm4700 MHz x kmEffective modal Bandwidth-length product min. 953 nm2470 MHz x kmNumerical aperture0.200 +/- 0.015Effective group of refraction 850 nm1.482Effective group of refraction 13001.477	,	3500 MHz x km
1300 nmEffective modal Bandwidth-length product min. 850 nm4700 MHz x kmEffective modal Bandwidth-length product min. 953 nm2470 MHz x kmNumerical aperture Effective group of refraction 850 nm0.200 +/- 0.015Effective group of refraction 13001.477		1850 MHz x km
product min. 850 nm2470 MHz x kmEffective modal Bandwidth-length product min. 953 nm2470 MHz x kmNumerical aperture0.200 +/- 0.015Effective group of refraction 850 nm1.482Effective group of refraction 13001.477		500 MHz x km
product min. 953 nm 0.200 +/- 0.015 Numerical aperture 0.200 +/- 0.015 Effective group of refraction 850 nm 1.482 Effective group of refraction 1300 1.477	0	4700 MHz x km
Effective group of refraction 850 nm1.482Effective group of refraction 13001.477	Ŭ	2470 MHz x km
nm Effective group of refraction 1300 1.477	Numerical aperture	0.200 +/- 0.015
		1.482
	0.	1.477



Product variants & accessories

ArtNo.	Description
TML-T12MPP/04M2-09E	tML® 24 - FO Dark Fiber Module 5HP 4x 24F MPO/12x 12F MPO with Pins 09/125µ OS2, LR4
TML-T12MPP/04M2-50G3	tML® 24- FO Dark Fiber Module 5HP 4x 24F MPO/12x 12F MPO with Pins 50/125µ OM3, SR4
TML-T12MPP/04M2-50G4	tML® 24- FO Dark Fiber Module 5HP 4x 24F MPO/12x 12F MPO with Pins 50/125µ OM4, S4
TML-T12MPP/04M2-50G5	tML® 24- FO Dark Fiber Module 5HP 4x 24F MPO/12x 12F MPO with Pins 50/125µ OM5, SR4