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net.work.solution. made in Germany

ISO 9001
TL 9000
ISO 14001

tML® tde Modular Link System

Complex networks in „Plug & Play“

MADE IN GERMANY
tde®
Since 25 Years

tde®
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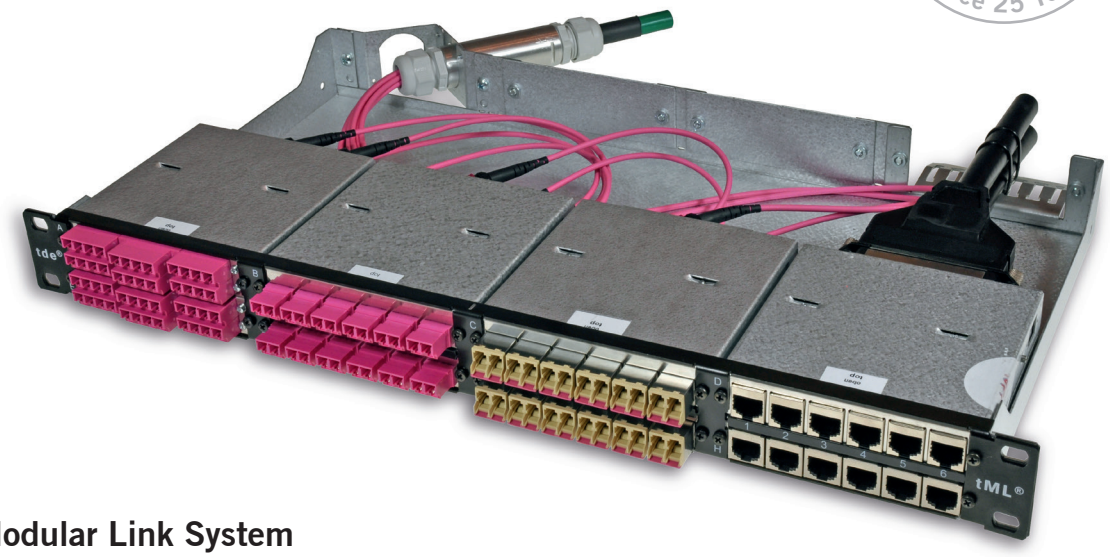

tML® tde Modular Link System

The number of network connections in a Data Center is increasing constantly, due to the ever greater demands made on technology and capacity. A very high packing density and cabling with versatile potential for expansion are fundamental requirements of both server connections and pure storage area networks.

Standard cabling entails a high outlay for any modification to the network infrastructure, as whole sections of the existing cabling frequently have to be replaced and tested. The tML® – tde Modular Link System starts where traditional systems stop.

The system components, ready-fitted with connectors and tested ex works, facilitate very fast installation of both twisted pair and fiber-optic cables. Ready-made trunk cables, providing a high number of pairs or fibers, can simply be plugged together using patch panels.

At the heart of the tML® – tde Modular Link Systems are MPO and Telco connectors, with which 12 optical fibers or 24 copper pairs can be connected simultaneously. Fiber-optic and twisted pair modules can be combined on one rack unit within a panel without difficulty.

This also achieves a high level of investment security whilst doing something for the environment at the same time, as individual components can be replaced and reused when the network is modified, making a contribution to green IT.

Highly compact

Telco for 6x RJ45 GbE TP Links

tML® Systemcable (right) by comparison to the standard

MPO for 6x LWL Duplex links 10GbE or 1x 40GbE

Product characteristics

> Maximum packing density
> Twisted pair and fiber-optic modules can be combined on 1U
> Quick and simple „plug and play“ installation
> Up to 2304 fibers on 1U
> E2000, LC, MT-RJ, MU, SC or ST modules
> Available in OS2, OM1, OM2, OM3 and OM4 configurations
> OM3 and OM4 with bend optimised fibers
> 96x LC duplex ports on 1U (192 fibers)
> 48x RJ45 GbE or 10GbE ports screened on 1U
> 96x MPO Ports auf 1U (2304 fibers)
> Stable, shielded Telco connectors
> Energy-efficient
> System component reusability ensures environmental friendliness
> Simple Migration on 40/100GbE possible
> „Made in Germany“

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Technical Data

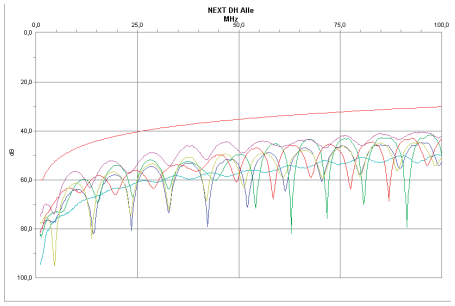
FO Connector Performance					
			insertion loss (dB)		return loss (dB)
Fiber	Type	Wavelength	typical	max	min
50/125µ	**E2000**	**850nm**	**≤ 0,25**	**0,45**	**30**
	LC	850nm	≤ 0,25	0,45	30
	MPO	850nm	≤ 0,25	0,45	20
	MU	850nm	≤ 0,25	0,45	30
	SC	850nm	≤ 0,25	0,45	30
50/125µ OM3	**E2000**	**850nm**	**≤ 0,20**	**0,35**	**30**
	LC	850nm	≤ 0,20	0,35	30
	MPO	850nm	≤ 0,20	0,35	25
	MU	850nm	≤ 0,20	0,35	30
	SC	850nm	≤ 0,20	0,35	30
50/125µ OM4	**E2000**	**850nm**	**≤ 0,10**	**0,30**	**35**
	LC	850nm	≤ 0,10	0,30	35
	MPO	850nm	≤ 0,16	0,30	30
	MU	850nm	≤ 0,10	0,30	35
	SC	850nm	≤ 0,10	0,30	35
62,5/125µ	**E2000**	**850nm**	**≤ 0,25**	**0,45**	**-**
	LC	850nm	≤ 0,25	0,45	-
	MPO	850nm	≤ 0,25	0,45	-
	MU	850nm	≤ 0,25	0,45	-
	SC	850nm	≤ 0,25	0,45	-
9/125µ	**E2000**	**1550nm**	**≤ 0,10**	**0,25**	**55**
	E2000 APC	1550nm	≤ 0,10	0,25	75
	LC	1550nm	≤ 0,10	0,25	55
	LC APC	1550nm	≤ 0,10	0,25	75
	MPO APC	1550nm	≤ 0,10	0,25	75
	MU	1550nm	≤ 0,10	0,25	55
	SC	1550nm	≤ 0,10	0,25	55
	SC APC	1550nm	≤ 0,10	0,25	75

All modules are tested
before delivery **(Plug & Play)**.

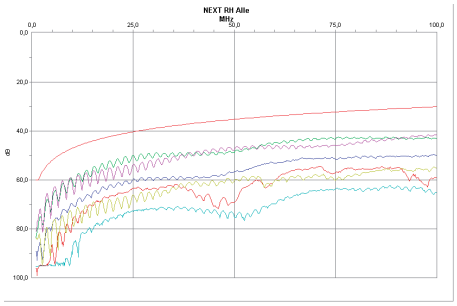
For all fiber optic connectors following applies:

- **> FO connector geometry according to IEC and better**
- **> 100% inspection of all MPO/MTP and SM connectors using interferometers**
- **> MPO/MTP plug has a defined fiber height of 1 - 3,5µ**
- **> Max. adjacent fiber height difference is 0,2µm and for all fibers 0,3µm**

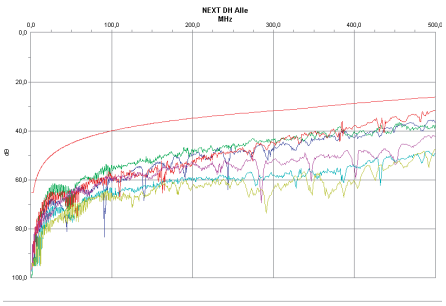
TP Link Performance



TP trunk cable GbE



TP module GbE



TP trunk cable with modules 10GbE

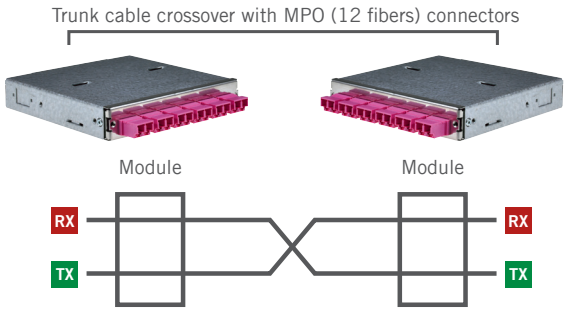
All RJ45 modules and connection cables are tested with Lantester on Cat.5e or Cat.6_A in links.

tML® FO cabling plan

A crossover of both optical fibers is required for transmission between the transmitting and receiving diodes in any fiber-optic cabling system.

tML® Standard configuration according to method C

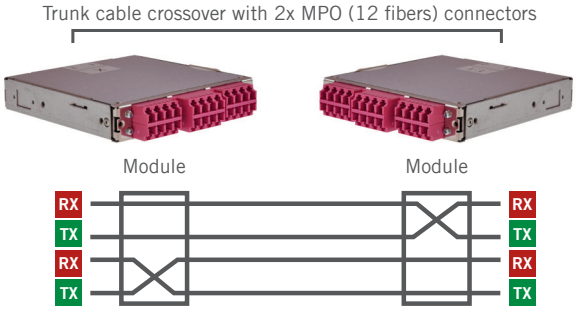
The standard tML® configuration consists of a crossover MPO trunk cable (method C) and two uniform configured modules.



TIA/EIA-568-B.1 Method C
Method A and B on customer request

tML® Xtended configuration similar to method B

The tML® Xtended trunk cable has a type B pin out. There are two different pin outs integrated in one module. In this way the modules are uniformly on both sides. You get the crossover by connecting the two MPO connectors rotated at one module. This utility patent protected configuration allows uniform configured components before and after migration on 40/100GbE.



Xtended configuration similar to method B

tML® FO Trunk Cable (standard configuration)

FO round cable (3mm) MPO Female/Female

Fiber	Part Number
50/125µ OM2	**TML-MP/MP50I12G xxx** [1]
50/125µ OM3	**TML-MP/MP50I12G3- xxx** [1]
50/125µ OM4	**TML-MP/MP50I12G4- xxx** [1]
62,5/125µ	**TML-MP/MP62I12G xxx** [1]
9/125µ	**TML-MP/MP09I12E xxx** [1]

FO Universal cable MPO Female/Female

Fiber	Part Number
50/125µ OM2	**TML-MP/MP50Byy** [2] **Gxxx** [1]
50/125µ OM3	**TML-MP/MP50Byy** [2] **G3-xxx** [1]
50/125µ OM4	**TML-MP/MP50Byy** [2] **G4-xxx** [1]
62,5/125µ	**TML-MP/MP62Byy** [2] **Gxxx** [1]
9/125µ	**TML-MP/MP09Byy** [2] **Exxx** [1]

tML® Xtended FO Trunk Cable

FO round cable (3mm) MPO Male/Male

Fiber	Part Number
50/125µ OM4	**TMLMPP/MPP50I12G4Bxx** [4]

FO Universal cable Male/Male

Fiber	Part Number
50/125µ OM4	**TMLMPP/MPP50Byy** [2] **G4Bxx** [4]

[1] xxx stands for the cable length in m (every length available)

[2] yy stands for the fiber counts: 12, 24, 48, 72, 96, 144

tML® FO Modules MPO (standard configuration)

MPO to 6x E2000 Compact

Fiber	Part Number
50/125µ OM2	TML-M06E2C/MPP50G
50/125µ OM3	TML-M06E2C/MPP50G3
50/125µ OM4	TML-M06E2C/MPP50G4
62,5/125µ	TML-M06E2C/MPP62G
9/125µ	TML-M06E2C/MPP09E
9/125µ	TML-M06E2AC/MPP09E

MPO to 6x E2000 Compact 5TE

Fiber	Part Number
50/125µ OM2	TML-T06E2C/MPP50G [5]
50/125µ OM3	TML-T06E2C/MPP50G3 [5]
50/125µ OM4	TML-T06E2C/MPP50G4 [5]
62,5/125µ	TML-T06E2C/MPP62G [5]
9/125µ	TML-T06E2C/MPP09E [5]
9/125µ	TML-T06E2AC/MPP09E [5]

MPO to 6x SC Duplex

Fiber	Part Number
50/125µ OM2	TML-M06SCDK/MPP50G
50/125µ OM3	TML-M06SCDK/MPP50G3
50/125µ OM4	TML-M06SCDK/MPP50G4
62,5/125µ	TML-M06SCDK/MPP62G
9/125µ	TML-M06SCDK/MPP09E
9/125µ	TML-M06SCADK/MPP09E

MPO to 6x SC Duplex 5TE

Fiber	Part Number
50/125µ OM2	TML-T06SCDK/MPP50G [5]
50/125µ OM3	TML-T06SCDK/MPP50G3 [5]
50/125µ OM4	TML-T06SCDK/MPP50G4 [5]
62,5/125µ	TML-T06SCDK/MPP62G [5]
9/125µ	TML-T06SCDK/MPP09E [5]
9/125µ	TML-T06SCADK/MPP09E [5]

2x MPO to 6x LC Duplex

Fiber	Part Number
50/125µ OM2	TML-M06LCDKH/MPP50G
50/125µ OM3	TML-M06LCDKH/MPP50G3
50/125µ OM4	TML-M06LCDKH/MPP50G4
62,5/125µ	TML-M06LCDKH/MPP62G
9/125µ	TML-M06LCDKH/MPP09E
9/125µ	TML-M06LCADKH/MPP09E

2x MPO to 6x LC Duplex 5TE

Fiber	Part Number
50/125µ OM2	TMLT06LCDKH/MPP50G [5]
50/125µ OM3	TMLT06LCDKH/MPP50G3 [5]
50/125µ OM4	TMLT06LCDKH/MPP50G4 [5]
62,5/125µ	TMLT06LCDKH/MPP62G [5]
9/125µ	TMLT06LCDKH/MPP09E [5]
9/125µ	TMLT06LCADKH/MPP09E [5]

MPO to 12x LC Duplex HD

Fiber	Part Number
50/125µ OM3	TML-M12LCDK/MPP50G3 [7]
50/125µ OM4	TML-M12LCDK/MPP50G4 [7]
9/125µ	TML-M12LCDK/MPP09E [7]
9/125µ	TML-M12LCADK/MPP09E [7]

MPO to 12x LC Duplex HD 5TE

Fiber	Part Number
50/125µ OM3	TML-T12LCDK/MPP50G3 [5 7]
50/125µ OM4	TML-T12LCDK/MPP50G4 [5 7]
9/125µ	TML-T12LCDK/MPP09E [5 7]
9/125µ	TML-T12LCDAK/MPP09E [7]

4x MPO to 6x MPO Dark Fiber

Type C	Part Number
50/125µ OM3	TML-M06/04MPP50G3
50/125µ OM4	TML-M06/04MPP50G4
Type B	**Part Number**
50/125µ OM3	TML-M06/04MPP50G3B
50/125µ OM4	TML-M06/04MPP50G4B

4x MPO to 6x MPO Dark Fiber 5TE

Type C	Part Number
50/125µ OM3	TML-T06/04MPP50G3 [5]
50/125µ OM4	TML-T06/04MPP50G4 [5]
Type B	**Part Number**
50/125µ OM3	TML-T06/04MPP50G3B
50/125µ OM4	TML-T06/04MPP50G4B

tML® Xtended FO Module

2x MPO to 12x LC Duplex HD

Fiber	Part Number
50/125µ OM4	TML-M12LCDK/MP50G4X [7]

2x MPO to 12x LC Duplex HD 5TE

Fiber	Part Number
50/125µ OM4	TML-T12LCDK/MP50G4X [5 7]

[7] Can only be used in conjunction with tML HD LC Duplex patch cords.

[5] Front plates are also available in black. Please add an „S“ to the end of the part number.

tML® TP RJ45 1GbE Solution

for connection of TP Telco modules

Description	Part Number
Telco Female/Female shielded	**TML-TELCO-FF- Cxx** [3]
Telco Female/Female shielded (Industrial)	**TML-TELCO-FF- xx** [3]

TP Module Telco to 6x RJ45 GbE

Description	Part Number
shielded for Rack Mount Enclosure 19“/10“ 1U	**TML-M06RJ45/TELCO-M**

TP Module Telco to 6x RJ45 GbE 5TE

Description	Part Number
shielded for Rack Mount Enclosure 19“ 3U	
Stainless steel	**TML-T06RJ45/TELCO-M**
Black	**TML-T06RJ45/TELCO-MS**

tML® TP RJ45 10GbE Solution

TP Trunk Cable on both ends 6x RJ45 10GbE

Description	Part Number
shielded for Rack Mount Enclosure 19“/10“ 1U	**TML-M06RJ45- xx** [3]

TP Trunk Cable on both ends 6x RJ45 10GbE 5TE

Description	Part Number
shielded for Rack Mount Enclosure 19“ 3U	
Stainless steel	**TML-T06RJ45- xx** [3]
Black	**TML-T06RJ45-S xx** [3]

TP Trunk Cable on both ends 6x RJ45 10GbE

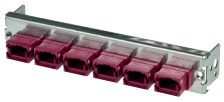
Description	Part Number
both ends connected	**TML-MS06RJ45C26-xx**[3]
one end connected	**TML-MS06RJ45C26-xx**[3]**U**
both ends connected w. LID	**TML-MS06RJ45C26-xx**[3]**L**
one end connected w. LID	**TML-MS06RJ45C26-xx**[3]**LU**

TP Trunk Cable on both ends 6x RJ45 10GbE 5TE

Description	Part Number
both ends connected	**TML-TS06RJ45C26-xx**[3] [5]
one end connected	**TML-TS06RJ45C26-xx**[3]**U**
both ends connected w. LID	**TML-TS06RJ45C26-xx**[3]**L**[5]
one end connected w. LID	**TML-TS06RJ45C26-xx**[3]**LU**[5]

tML® FO Migration to 40GbE

Partial front plate 6x MPO Adapter



Type A	Part Number
Aqua	**TML-M06MP-TK**
Magenta	**TML-M06MP-VI**
Type B	**Part Number**
Grey	**TML-M06MP-GR**

Partial front plate 6x MPO Adapter 5TE

Type A	Part Number
50/125µ OM3	**TML-T06MP-TK** [5]
50/125µ OM4	**TML-T06MP-VI** [5]
Type B	**Part Number**
Grey	**TML-T06MP-GR**

FO Patch cord MPO

Type B M/F	Part Number
50/125µ OM3	**TML-MP/MPP50I12G3B xx** [4]
50/125µ OM4	**TML-MP/MPP50I12G4B xx** [4]
Type C M/F	**Part Number**
50/125µ OM3	**TML-MP/MPP50I12G3C xx** [4]
50/125µ OM4	**TML-MP/MPP50I12G4C xx** [4]
Type B F/F	**Part Number**
50/125µ OM3	**TML-MP/MP50I12G3B xxx** [4]
50/125µ OM4	**TML-MP/MP50I12G4B xxx** [4]

tML® HD FO Patch cord

FO Patch cord LC HD

Description	Part Number
50/125µ OM3	**TML-TLC/TLC50D3Rxxxx** [6]
50/125µ OM4	**TML-TLC/TLC50D4Rxxxx** [6]
9/125µ	**TML-TLC/TLC09D-Rxxxx** [6]
9/125µ	**TML-TLCA/TLCA09DRxxxx** [6]

[3] xx stands for the cable length in m (max. length 60m)

[4] xx stands for the cable length in m

[6] xxxx stands for the cable length in cm

tML® Rack Mount Enclosures + Accessories

Rack Mount 19” 1U

Description	Part Number
for 8x Modules	
Stainless steel	**TML-19/1HE-8-M**
Black	**TML-19/1HE-8-M-S**

Rack Mount 10” 1U

Description	Part Number
for 4x Modules	
Stainless steel	**TML-10/1HE-4-M**
Black	**TML-10/1HE-4-M-S**

Blind plate

Description	Part Number
for Rack Mount Enclosure 19”/10“ 1U	
Stainless steel	**TML-M-BLIND**
Black	**TML-M-BLIND-S**

Cable Mounting Bracket for Fan-out Units

Description	Part Number
for Rack Mount Enclosure 19“/10“ 1U	**TML-K-A**
straight for Rack Mount Enclosure 19“/10“ 1U	**TML-K-A-G**

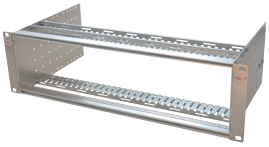
Cable Mounting Bracket

Description	Part Number
6 fold for Rack Mount Enclosure 19“/10“ 1U	**TML-K-B-6**
12 fold for Rack Mount Enclosure 19“/10“ 1U	**TML-K-B-12**

Cable Mounting Blind plate

Description	Part Number
for Rack Mount Enclosure 19“/10“ 1U	**TML-K-BLIND**

Rack Mount 19” 3U



Description	Part Number
for 17x Modules 5TE	
Stainless steel	**TML-19/3HE-17**
Black	**TML-19/3HE-17-S**

Blind plate

Description	Part Number
for Rack Mount Enclosure 19“ 3U	
Stainless steel	**TML-T-BLIND**
Black	**TML-T-BLIND-S**

Rack Mount Enclosure 19”1U extendable

Description	Part Number
for 6x Modules	
Aluminium	**TML-19/1HE-6-M-A**

Cable Mounting Bracket Breakout

Description	Part Number
4 fold for Rack Mount Enclosure extendable	**TML-K-B-4-A**

CUBE

Description	Part Number
for 4x Modules	**TML-CUBE**

DIN Rail Mounting kit

Description	Part Number
adjustable angle (without Module)	**TML-HU-AD-W**

tde®

trans data elektronik GmbH

For 25 years, the internationally successful company tde has specialised in developing and producing scalable cabling systems for highest packing densities. Numerous in-house developments and continuous improvements to the production process have made tde one of the most advanced fibre optics manufacturers in Europe. In addition to standard equipment such as polishing machines and interferometers the product range also includes laser cleaver, glue robots and fully-automatic machines to prepare the fibres.

tde plays an active part in the DKE/UK 412.7 standardisation committee (fibre optics connection technology and passive optical components) and is also represented on the international CENELEC TC 86BXA/WG 01 panel.

Situated in Dortmund, Germany, the company's top priority is to guarantee customers the highest possible standards in quality. So as to always ensure this aspiration tde employees use interferometers to inspect every pre-assembled connector for grinding geometry and make sure that no assembled product leaves the production site without inspection record. To ensure the highest standards in quality tde has a consistent and systematic quality management system and is certified according to ISO 9001 and ISO 14001. With the TL 9000 quality management system tde was the first German company to receive a special certification for the telecommunications industry in 2002.

Renowned customers

Numerous renowned companies place their trust in the network expert's continuous quality assurance, including the prestigious CERN research centre in Switzerland.

tde equipped almost the entire CERN project with fibre optic connections and installed more than 8,000 single and multi-mode MPO connections. Due to the production process especially optimised by tde using laser cleaving, the MPO connector performs extraordinarily well and is now standardised for data centre cable systems.

This makes the connector attractive for all areas in which high packing density takes first priority. Due to cutting-edge production processes and highest standards in quality tde ranks among the worldwide leading technology experts in the fields of multi-fibre and twisted pair technology. The network expert provides these fields with suitable solutions. One of the largest projects was the development of a mobile Telco-based cabling system for the German armed forces. For many years, this system has been in use at many military bases including Afghanistan.

It also serves as the basis for the tML®-system: The modular cabling system consists of the three core components module, trunk cable and module rack and is the result of many years of experience and improvement processes in the field of copper and fibre optics technology. Just like many other innovations made by tde it is protected by multiple patents.

Quality „Made in Germany“

The tde portfolio comprises full system solutions focusing on Plug & Play for high-speed datacom, telecom, industry, medical and defence applications. The network expert's system solutions are exclusively developed, produced and assembled in Germany.

With its very own service department responsible for planning and installation tde offers competent services from a single source. As a member of the “European Code of Conduct” tde is committed to energy efficiency in data centres and with its standardised, flexible and recyclable system components makes an active contribution to green IT. Customer service is provided by qualified employees with a background in distribution and production.

net. work. solution.

ISO 9001, TL 9000 and ISO 14001 certified

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