

## What is MPO/MTP™?

### Difference between MPO and MTP™

**MPO** (Multi-fibre Push-On) is a compact, multi-fibre connector described in the two standards IEC 61754-7 [int.] and TIA-604-5 [USA]. This connector comes in flavours of 12, 16, 24, 48, 72, 84 or 96 fibres contained in rows of 12 or 16 fibres.



**MTP™** is the US Conec variant of the MPO connector. With the MTP US Conec have enhanced the original MPO with the introduction of a removable case together with better protection of the fibres and pin connections. MTP™ is a registered trademark of US Conec.

As of today, all vendors have implemented these and other enhancements to the MPO connector. Hence there is virtually no difference between MPO and MTP™ connectors.

### MPO / MTP™ design

Below figure shows the main building blocks of the MPO connector. These are:

**Fibre position:** The fibres in a MPO connector is grouped in rows of 12 or 16 fibres where fibre #1 is the one closest to the “White Dot”.

The standard defines connectors for 12 fibres (MPO-12), 16 fibres (MPO-16), 24 fibres (MPO-24) and so forth up to 96 fibres. The row containing fibres 1 to 12 is defined as the row closest to the “Key”.

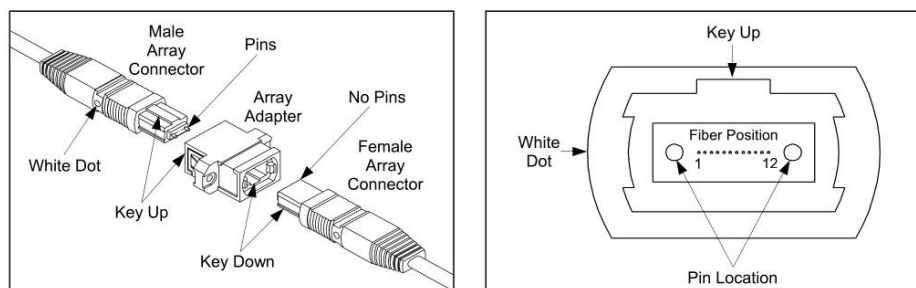
For all connectors the uppermost row shall be found at the same place, meaning that an MPO-24 connector shall be able to fit into a MPO-12 port where the first row shall be connected to the 12 fibres in the MPO-12 port.

MPO-12 and MPO-16 will not fit together due to the fibre mis-alignment.

**White Dot:** The “White Dot” indicates where fibre #1 (PL1) is to be found. PL1 will always be the fibre positioned in the uppermost fibre row closest to the “White dot”.

**Key:** The MPO features a “Key” helping the MPO connector to be inserted correctly into the port.

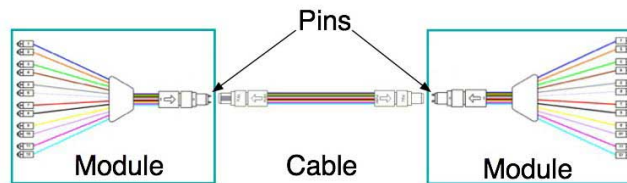
The “Key” also defines where to find the uppermost row of fibres, as this row is the row closest to the “Key”.



### Male / Female:

**Female.** The connectors without steering pins are used in each end of the cables.

**Male:** MPO/MTP™ with steering pins are used in the port side, e.g. in LGX and QSFP modules.

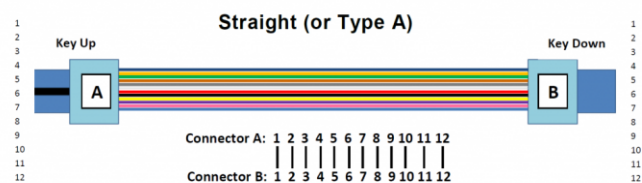


## MTP™ / MPO Cable layout

The TIA standard TIA-568 defines 20+ different cables. For MPO/MTP™ TIA 568 has defined the following three types:

### Type A (“Straight”)

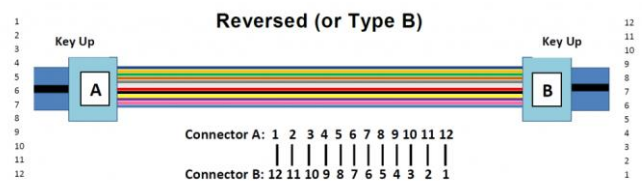
Type A is parallel cables where the fibres are going “Straight through” from A- to B-end. Type A specifies that the A-end shall feature a “key up” connector, whereas the B-end shall feature “Key down” connector.



Type A will be used between the equipment and a patch panel/LGX box.

### Type B (“Twisted”)

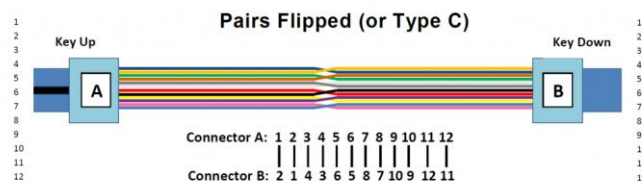
Type B is cables where the fibres are crossed between the A- and B-end. Type B specifies that both A- and B-end shall feature a “Key up” connector.



Type B will be used between equipment, or between patch panels.

### Type C (“Pairs twisted”)

Type C is cables where each fibre pairs are twisted between A- and B-end. Type C specifies that the A-end shall feature a “key up” connector, whereas the B-end shall feature “Key down” connector.



Type C is described as cables for special situations.

## Patch cables

TIA has specified two types of patch cords (depicted below) where the “A-to-B” patch cord is mostly used.



## Which fibre types to use?

Fibres are either singlemode or multimode.

For shorter distances (less than 500 m) **multimode** fibre (OM3, OM4, or OM5) has been dominant until recently. Following table gives a summary of the different multimode cables:

Bandwidth	Multimode fibre length					
	1 GbE	10 GbE	25 GbE	40 GbE	100 GbE	400 GbE
OM1	275 m	33 m	---	---	---	---
OM2	550 m	82 m	---	---	---	---
OM3	550 m	300 m	70 m	100 m	70 m	70 m
OM4	550 m	400 m	100 m	150 m	150 m	1500 m
OM5	550 m	400 m	100 m	150 m	150 m	150 m

OM5 is a wideband optical fibre optimised for the wavelength band between 850nm and 940nm. OM5 will be used for bandwidth equal to or higher than 100 GbE.

**Singlemode** fibres (normally ITU-T G.652) are used for longer distances as well as patch cords.

- ITU-T G.652A/B is optimised for longer distances at 1310 nm.
- ITU-T G.652C/D is an enhancement of A/B, where the waterpeak has been eliminated. G.652C/D has been the preferred long-distance fibre since approx. 2005.
- ITU-T G.657A holds a higher bend tolerance than G.652. G.657A is currently the preferred fibre for patch cords.

The fiber end in a MPO/MTP™ connector are angled differently if the fiber is multimode or singlemode. The **multimode fibres are UPC** (Ultra Physical Contact) connects whereas **singlemode fibres are APC** (Angled Physical Contact Connector).

