100Gbps MMF MDI Specifications

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IEEE P802.3db 100 Gb/s, 200 Gb/s, and 400 Gb/s
Short Reach Fiber Task Force
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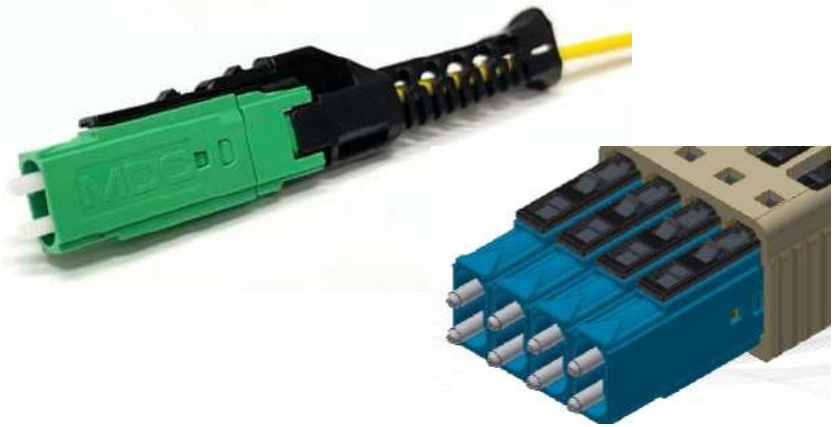
- Summary

Duplex fiber optic connectors

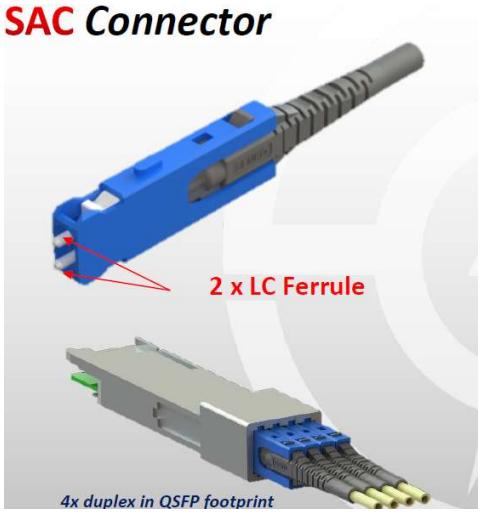
- CS Connector

- MDC Connector



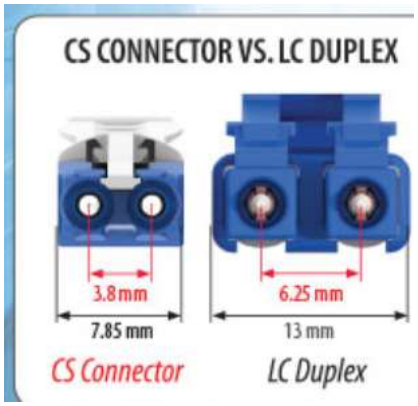
- LC Connector

- SAC Connector



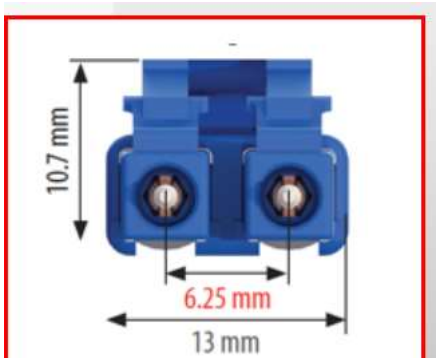
Duplex fiber optic connectors dimensions

- CS Connector

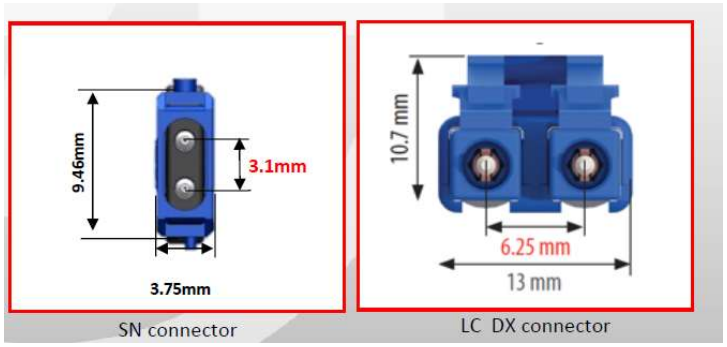


- MDC Connector

- LC Connector



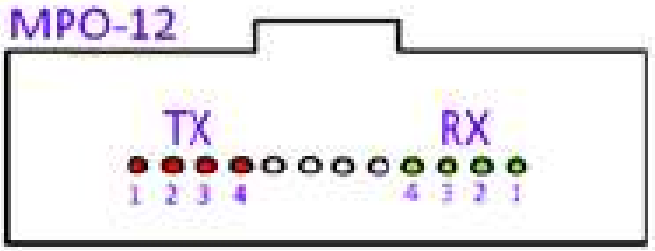
- SAC Connector



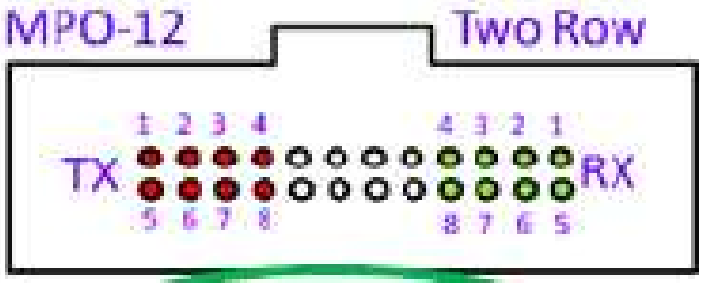
MPO fiber optic connectors

- MPO

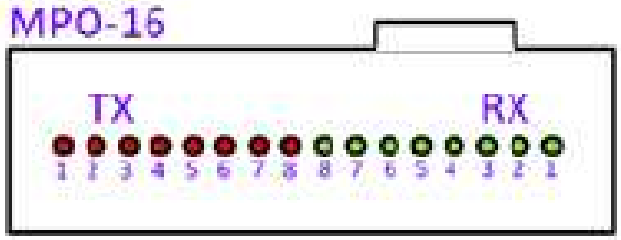
- MPO-12



- MPO-24



- MPO-16



Summary of Mechanical Interface Standards

	TIA Standards		IEC Standards	
Connector	Standard	Status	Standard	Status
CS	TIA-604-19	In ballot	None	-
LC	TIA-604-10	Published 2008	IEC 61754-20	Published 2012
MDC	None	-	IEC 61754-37	NP
SAC	None	-	IEC61754-36	NP
MPO-12	TIA-604-5	Published 2019	IEC 61754-7-1	Published 2014
MPO-24	TIA-604-5	Published 2019	IEC 61754-7-2	Published 2017
MPO-16	TIA-604-18-A	Published 2018	IEC 61754-7-4	CD

Summary of Connector Performance Standards

	TIA Standards		IEC Standards	
Connector	Standard	Status	Standard	Status
APC MM	None	-	None	-

Current connector text in IEEE standards

1xx.10.2.2.2 Maximum discrete reflectance

The maximum discrete reflectance shall be less than –20 dB.

1xx.10.3 Medium Dependent Interface (MDI)

The x00GBASE-SRx PMD is coupled to the fiber optic cabling at the MDI. The MDI is the interface between the PMD and the “fiber optic cabling” (as shown in Figure 1xx–5). The x00GBASE-SRx PMD is coupled to the fiber optic cabling through one connector plug into the MDI optical receptacle as shown in Figure 1xx–7. Example constructions of the MDI include the following:

a) PMD with a connectorized fiber pigtail plugged into an adapter;

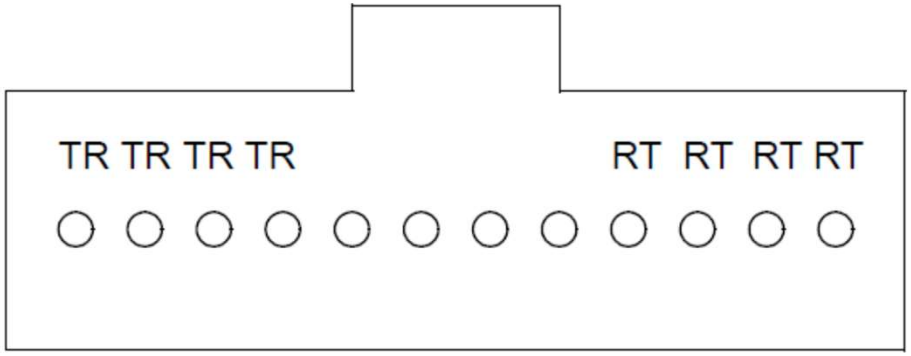
b) PMD receptacle.

NOTE—Compliance testing is performed at TP2 and TP3 as defined in 1xx.5.1, not at the MDI.

Current connector text in IEEE standards (cont.)

1xx.10.3.1 Optical lane assignments

- The xx type TR and xx type RT TxRx pairs of x00GBASE-SRx PMD shall occupy the positions depicted in Figure 1xx–6 when looking into the MDI receptacle with the connector keyway feature on top.



Current connector text in IEEE standards (cont.)

1xx.10.3.2 MDI requirements

The MDI shall optically mate with the compatible plug on the optical fiber cabling. The MDI adapter or receptacle shall meet the dimensional specifications for interface 7-1-3: *MPO adapter interface - opposed keyway configuration*, or interface 7-1-10: *MPO active device receptacle, flat interface*, as defined in IEC 61754-7-1. The plug terminating the optical fiber cabling shall meet the dimensional specifications of inter-face 7-1-4: *MPO female plug connector, flat interface for 2 to 12 fibers*, as defined in IEC 61754-7-1. Figure 150–7 shows an MPO female plug connector with flat interface, and an MDI. The MDI connection shall meet the interface performance specifications of IEC 61753-1 and IEC 61753-022-2 for performance grade Bm/2m.

Modified connector text for 400GBASE-SR8

1xx.10.3.1 MDI requirements

- 400GBASE-SR8 has two optical lane assignment options: Option A for a dual-row twelve-fiber interface, and option B for a single-row sixteen-fiber interface.

- For a dual-row twelve-fiber interface, the eight transmit and eight receive optical lanes of 400GBASE-SR8 shall occupy the positions depicted in Figure 138–7a (option A) when looking into the MDI receptacle with the connector keyway feature on top. The interface contains sixteen active lanes within 24 total positions. The four center positions in each row are unused. The transmit optical lanes occupy the leftmost four
- positions in each row. The receive optical lanes occupy the rightmost four positions in each row.

- For a single-row sixteen-fiber interface, the eight transmit and eight receive optical lanes of 400GBASE-SR8 shall occupy the positions depicted in Figure 138–7a (option B) when looking into the MDI receptacle with the connector keyway feature on top. The interface contains sixteen active lanes within sixteen total positions. The transmit optical lanes occupy the leftmost eight positions. The receive optical lanes occupy the rightmost eight positions.

Modified connector text for 400GBASE-SR8 (cont.)

1xx.10.3.1 MDI requirements

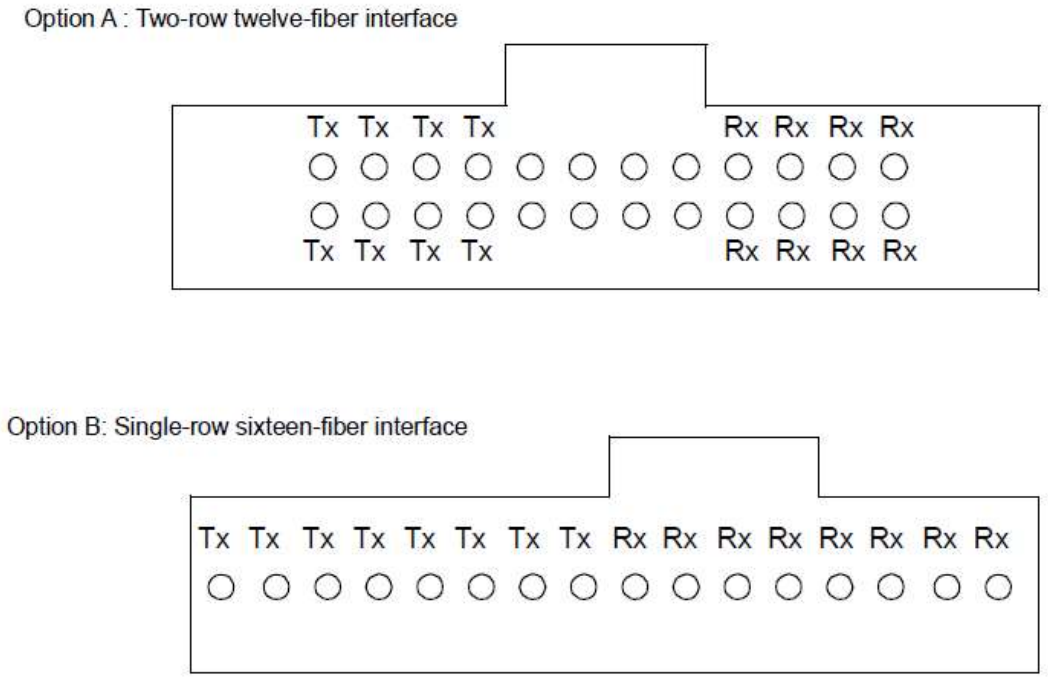


Figure 138–7a—Optical lane assignments for 400GBASE-SR8

Modified connector text for 400GBASE-SR8 (cont.)

1xx.10.3.4 MDI requirements

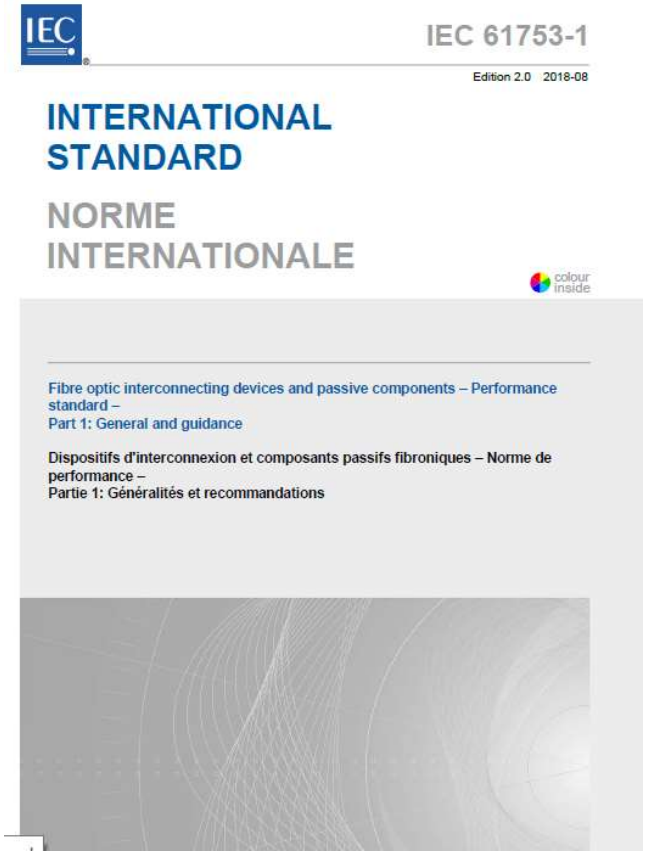
- The MDI shall optically mate with the compatible plug on the optical fiber cabling. The MDI connection
- shall meet the interface performance specifications of IEC 61753-1 and IEC 61753-022-2 for performance grade Bm/2m. 400GBASE-SR8 has two optical lane assignment options: Option A for a dual-row twelve-fiber interface, and option B for a single-row sixteen-fiber interface.

- For Option A, the MDI adapter or receptacle shall meet the dimensional specifications for interface 7-2-3:
- *MPO adapter interface - opposed keyway* configuration, or interface 7-2-10: *MPO active device receptacle, flat interface*, as defined in IEC 61754-7-2. The plug terminating the optical fiber cabling shall meet the dimensional specifications of interface 7-2-4: *MPO female plug connector, flat interface for 16 to 24 fibers*, as defined in IEC 61754-7-2. The MPO female plug connector and MDI are structurally similar to those depicted in Figure 138–8, but with two rows of fibers.

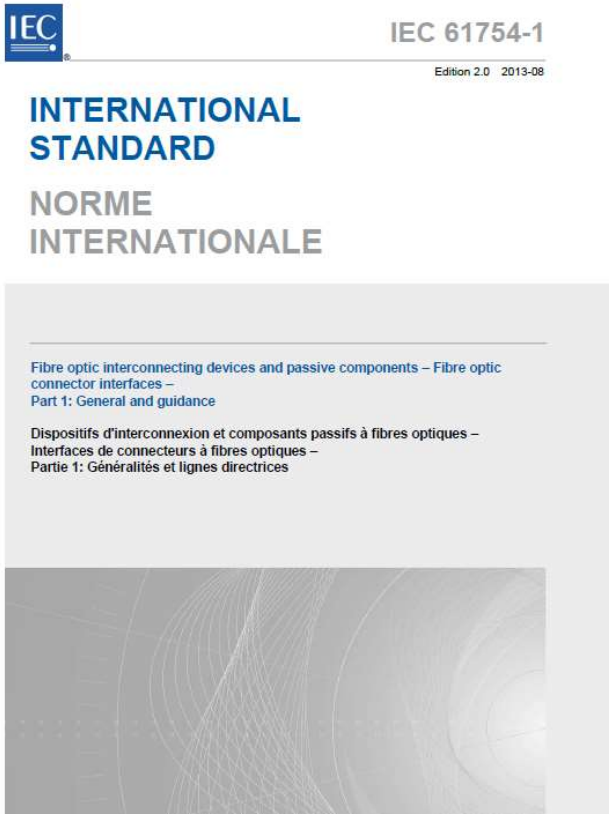
- For Option B, the MDI adapter or receptacle shall meet the dimensional specifications for designation FOCIS 18 A-1-0, or designation FOCIS 18 R-1x16-1-0-1-2-0, as defined in ANSI/TIA-604-18-A. The plug terminating the optical fiber cabling shall meet the dimensional specifications of designation FOCIS 18 P-1x16-1-0-2-2-0, as defined in ANSI/TIA-604-18-A. The MPO female plug connector and MDI are structurally similar to those depicted in Figure 138–8, but with sixteen fibers and an offset keyway as well as a different pin diameter and location.

IEC Standards

- Performance Standards
  - IEC 61753 series
  - Edition 2: 2018



- Mechanical Interface Standards
  - IEC 61754 series
  - Edition 2: 2013



IEC 61753-022-2 (ref by IEEE)

- Performance Standard
  - IEC 61753-022-2
  - Edition 2: 2012
  - Under revision to update to latest changes made to IEC 61753-1

Table A.18 – Multi mode connectors

Optical performance criteria for multi mode connectors		
Test	**Requirement**	
Attenuation of random mated connectors IEC 61300-3-34 for single-fibre connector and IEC 61300-3-45 for multi-fibre connector (Note 1)	**Attenuation grades**	**Attenuation at 850 nm**
	Grade A_m	Not specified at this time
	Grade B_m	≤ 0,3 dB mean ≤ 0,6 dB max. for ≥ 97 % of the connections
	Grade C_m	≤ 0,5 dB mean ≤ 1,0 dB max. for ≥ 97 % of the connections
	Grade D_m	Not specified at this moment
Random mated return loss: IEC 61300-3-6	**Return loss grades**	**Return loss at 850 nm**
	Grade 1_m	Not specified at this time
	Grade 2_m	≥ 20 dB (mated)

Summary of SAC and MDC Standardization

- At the June 2019 TIA TR-42.13 meeting, a straw poll determined that the committee preference was to take no action on project initiation for standard development of either proposed connector (SN or MDC) at this time
  - Option 1: 10 votes in favor – No action to move either connector forward.
  - Option 2: 2 votes in favor – Move to standardize both connectors
  - Option 3: 2 votes in favor – Standardize one or the other
- At the October 2019 IEC SC86B/WG6 meeting, a similar discussion was held with a different outcome
  - Same options considered but decision to move forward to standardize both connectors
  - It was agreed to submit NPs on the SAC and MDC connectors
    - 86B/4252/NP– Fibre optic connector interfaces **- Part 36: Type SAC connector family**
    - 86B/4263/NP– Fibre optic connector interfaces - **Part 37: Type MDC connector family**

IEC 61754-36 (New connector proposed to IEEE)

- 86B/4252/NP
  - Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces **- Part 36: Type SAC connector family**
  - Circulated 11/08/2019
  - Closed 2/21/2020
  - Working draft will not be reviewed until October meeting

- Swiss comment noted
  - Both proposed very small form factor duplex connectors, SAC and MDC, should be harmonized before standardization.
  - They are intended for the same application, have similar dimensions and are introduced at the same time but are not fully compatible.
  - For those who assemble the cables, trunks, etc. the two different incompatible connector types create additional efforts. It creates complexity in the supply chain (high stocks or long, uncertain delivery times) and it generates already confusion in the market.
  - Also the users have to deal with this complexity of differentiating between to very similar but not compatible connector types.
  - All these issues slow down the roll-out of this technology.

- Swiss comments were noted but there are no plans to harmonize the SAC and the MDC connectors

IEC 61754-37 (New connector proposed to IEEE)

- 86B/4263/NP
  - Fibre optic interconnecting devices and passive components – Fibre optic connector interfaces - Part 37: **Part 37: Type MDC connector family**
  - Circulated 11/29/2019
  - Closed 1/31/2020
  - Working draft will not be reviewed until October meeting

- Same Swiss comment noted
  - Both proposed very small form factor duplex connectors, SAC and MDC, should be harmonized before standardization.
  - They are intended for the same application, have similar dimensions and are introduced at the same time but are not fully compatible.
  - For those who assemble the cables, trunks, etc. the two different incompatible connector types create additional efforts. It creates complexity in the supply chain (high stocks or long, uncertain delivery times) and it generates already confusion in the market.
  - Also the users have to deal with this complexity of differentiating between to very similar but not compatible connector types.
  - All these issues slow down the roll-out of this technology.

- Swiss comments were noted but there are no plans to harmonize the SAC and the MDC connectors

Summary

- IEC 61753-022-2 is still a good reference
  - But would have to be modified to include a return loss requirement for an APC MM connector
  - There is no knownPerformance Standard for a Multimode APC connector

- New work has started in IEC on two new mechanical interface standards
  - IEC 61754-36, Type SAC
  - IEC 61754-37, Type MDC
  - While they could be published in the timeline for IEEE 802.3db, this is highly unlikely