

FIBRE OPTIC CABLE: PATCH CORD (SIMPLEX AND DUPLEX ZIP)

1. SCOPE

This specification covers the requirements of IEC standards and AS/ACIF S008 for optical patch cord (Simplex and Duplex) in telecommunication applications.

2. STANDARDS AND REGULATIONS

Unless otherwise specified, all cables shall be in accordance with all applicable section of the latest editions of the following Codes, Standards and Regulations, and their current amendments.

STD./REG.	DESIGNATION TITLE	REFERENCE
International Electro technical Commission(IEC)	Optical fibers, Generic Specification	IEC 60793-1
	Optical fibers, Product specification	IEC 60793-2
	Optical fiber cables, Generic specification	IEC 60794-1
	Optical fiber cables, Product specification	IEC 60794-2
	Tests on Optical fiber cables under fire conditions Part 1: Test on a single vertical insulated cable	IEC 60332-1
	General Construction and Test requirements of low voltage shipboard power cables	IEC 60092-350
International Telecommunication Union	Characteristics of a multi-mode optical fiber	ITU-T G.651
	Characteristics of a single-mode optical fiber and cable	ITU-T G.652
	Characteristics of a bending-loss insensitive single-mode optical fiber and cable for the access network	ITU-T G.657
Underwriters Laboratories	Follow-up and Inspection of optical fiber cable	UL 1651
Australian Communication Industry Forum	Requirements for customer cabling products	AS/ACIF S008

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3. CABLE TYPE

The specification covers the general and construction requirements for patch cord cables.

The optical fiber shall be buffered fibers and surrounded with reinforcing aramid yarn. And the Jacket shall be extruded over the aramid yarn.

Table 1. Types of Cables

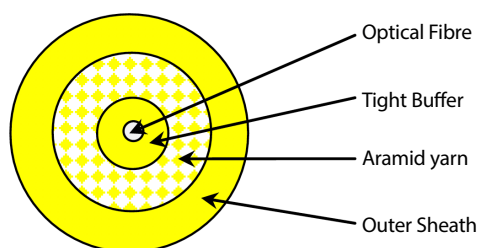
CABLE DESIGNATION	CABLE TYPE	FIBER TYPE	NUMBER OF FIBERS	BUFFER TYPE	STRENGTH MEMBER	OUTER SHEATH
Patch Cord	Simplex	SMF G.652D G.657A1	1	Tight-buffer (LSZH)	Aramid yarn	Halogen free Polyolefin LSZH
	Duplex ZIP	& MMF OM1 OM2 OM3 OM4	2			

Table 2. Diameter, Weight, Bending Radius and Tensile Load

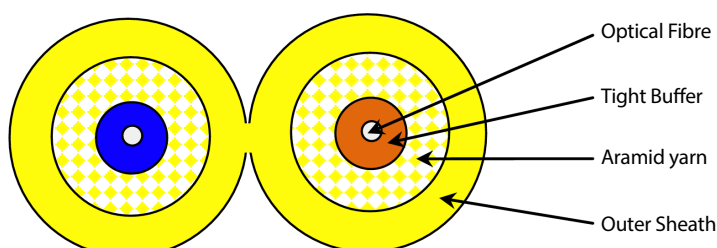
TYPE	BUFFER DIAMETER (μm)	CABLE DIAMETER (mm)	APPROX. CABLE WEIGHT (kg/km)	MINIMUM BENDING RADIUS (mm)	TENSILE LOAD	
					INSTALLATION (N)	OPERATION (N)
Simplex	900±50	2.0 (± 0.2)	4.1	30	150	70
		2.4 (± 0.2)	6.4	30	190	90
		3.0 (± 0.2)	9.4	30	200	100
Duplex ZIP		2.0*4.0 (± 0.2)	8.1	30	300	140
		2.4*4.8 (± 0.2)	12.7	30	380	180
		3.0*6.0 (± 0.2)	18.8	30	400	200

Cable Cross-sectional Drawing

Simplex



Duplex ZIP



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4. CONSTRUCTION AND IDENTIFICATION

4.1 Optical Fiber

The optical fiber shall be a glass fiber that carries light along its length. It shall be composed of core, cladding and coating layer. Optical fibers shall meet the requirements of IEC 60793-1 and 60793-2.

Table 3. Optical fiber of Single Mode Fiber

ATTRIBUTE	DETAIL	UNIT	SPECIFICATION	
			SM G.652D	SM G.657A1
Attenuation Coefficient	at 1310nm	dB/km	≤ 0.40	≤ 0.40
	at 1550nm		≤ 0.30	≤ 0.30
Chromatic Dispersion	at 1290nm ~ 1330nm	ps/nm.km	≤ 2.8	≤ 2.8
	at 1550 nm		≤ 18	≤ 18
Zero Dispersion Wavelength		nm	1300 ~ 1322	1300 ~ 1322
Zero Dispersion Slope		ps/nm ² .km	≤ 0.095	≤ 0.095
PMD Coefficient		ps/√ km	≤ 0.4	≤ 0.4
Cut-off Wavelength		nm	≤ 1260	≤ 1260
Mode Field Diameter	at 1310nm	μm	9.2 ± 0.5	8.6 ± 0.5
Cladding Diameter		μm	125 ± 1	125 ± 1
Core/Clad concentricity error		μm	≤ 0.8	≤ 0.8
Cladding Non-circularity		%	≤ 1	≤ 1
Coating Diameter		μm	245 ± 15	245 ± 15

Table 4. Optical fiber of Multi Mode Fiber

ATTRIBUTE	DETAIL	UNIT	SPECIFICATION			
			MM62.5 (OM1)	MM50 (OM2)	MM50 (OM3)	MM50 (OM4)
Attenuation Coefficient	at 850nm	dB/km	≤ 3.5	≤ 3.0	≤ 3.0	≤ 3.0
	at 1300nm		≤ 1.5	≤ 1.0	≤ 1.0	≤ 1.0
Bandwidth	at 850nm	MHz.km	≥ 200	≥ 500	≥ 1500	≥ 3500
	at 1300 nm		≥ 500	≥ 500	≥ 500	≥ 500
Numerical Aperture		-	0.275 ± 0.015	0.20 ± 0.015	0.20 ± 0.015	0.20 ± 0.015
Core Diameter		μm	62.5 ± 3.0	50 ± 3.0	50 ± 3.0	50 ± 3.0
Cladding Diameter		μm	125 ± 2.0	125 ± 2.0	125 ± 2.0	125 ± 2.0
Cladding Non-circularity		%	≤ 2.0	≤ 2.0	≤ 2.0	≤ 1.0
Core/Cladding Concentricity Error		μm	≤ 3.0	≤ 3.0	≤ 3.0	≤ 3.0
Coating Diameter		μm	245 ± 15	245 ± 15	245 ± 15	245 ± 15

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4.2 Optical Fiber

The tight buffer shall consist of an extruded layer of halogen free compound. The color of tight buffer shall be follow below table. Other color of buffer may be applicable when purchaser required.

Table 5. Color of Buffer

TYPE	SIMPLEX	DUPLEX ZIP
SMF	Yellow	Blue, Orange
MMF	Orange	Blue, Orange

4.3 Strength Member

Aramid Yarn, as a strength member applied under outer sheath for reinforcing.

4.4 Outer Sheath

The sheath shall be an extruded layer of halogen free compound. The color of outer sheath shall be follow below table. Other color of sheath may be applicable when purchaser required.

Table 6. Color of Outer Sheath

TYPE	SIMPLEX	DUPLEX ZIP
SMF	Yellow	Yellow
MMF 62.5	Orange	Orange
MMF 50	Aqua	Aqua

5. TEST

The following test shall be carried out in accordance with IEC 60794-1-2 and this specification.

5.1 Routine Test

Routine tests shall be carried out all cables manufactured and shall be in accordance with specified standards.

5.1.1. Measurement of thickness of sheath test per clause 13.2 of IEC 60092-350

5.1.2. Measurement of attenuation of optical cable per method C of IEC 60793-1-40

PROPERTIES	WAVELENGTH	SMF (G.652D, G.657A1)	MMF (OM1)	MMF (OM2, OM3, OM4)
Attenuation	850 nm	N/A	Max 3.5 dB/km	Max 3.0 dB/km
	1300 nm	N/A	Max 1.5 dB/km	Max 1.0 dB/km
	1310 nm	Max 0.4 dB/km	N/A	N/A
	1550 nm	Max 0.3 dB/km	N/A	N/A

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5.2 Type Test (Mechanical and Environmental properties)

The following type test shall be carried out in accordance with specified standards.

5.2.1. Tensile performance per IEC 60794-1-2-E1.

The test shall examine only the behavior of the attenuation for the cable on load.

CONDITIONS	TEST	SMF (at 1550 nm)	MMF (at 1300 nm)
Installation	Change in attenuation	≤ 0.2 dB	≤ 0.2 dB
Operation			

* Applicable tensile load are followed by table 2.

5.2.2. Crush test per IEC 60794-1-2-E3

CONDITIONS	TEST	SMF (at 1550 nm)	MMF (at 1300 nm)
Load max = 200N/5 cm 5min.	Change in attenuation	≤ 0.2 dB	≤ 0.2 dB

5.2.3. Impact test per IEC 60794-1-2-E4

CONDITIONS	TEST	SMF (at 1550 nm)	MMF (at 1300 nm)
3J, 1 impact 3point	Change in attenuation	≤ 0.2 dB	≤ 0.2 dB

5.2.4. Torsion test per IEC 60794-1-2-E7

CONDITIONS	TEST	SMF (at 1550 nm)	MMF (at 1300 nm)
15N, ±180°, 2m, 10 cycles	Change in attenuation	≤ 0.2 dB	≤ 0.2 dB

5.2.5. Temperature cycling test per IEC 60794-1-2-F1

CONDITIONS	TEST	SMF (at 1550 nm)	MMF (at 1300 nm)
Temperature cycle: +20°C → -20°C → +70°C → +20°C Number of cycle: 2 Time per cycle: 8 hours	Change in attenuation	≤ 0.2 dB	≤ 0.2 dB

5.2.6. Weather(sunlight) resistance test per UL 1581

CONDITIONS	TEST
300hr, xenon-arc, 1cycle	85% of retention for tensile strength and elongation

5.2.7. Flame retardant test per IEC 60332-1

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6. CABLE MARKING

The cable shall be marked at interval of at least 1meter.

TMC follow printed marking information provided by customer.

7. CABLE LENGTH

Nominal length of cable is 1km.

Other length of cable may be applicable when purchaser required.

8. PACKING

Each length of the finished cable shall be wound on the plywood drum and then packing into box.

The packing would be prevented to damage on the cable during transportation.

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