TAIHAN FIBEROPTICS CO., LTD.

SPEC NO. TEC-OPTIC-130502A-2014.06.

TECHNICAL SPECIFICATION

FOR

SINGLE MODE OPTICAL FIBER CABLE

(CENTRAL TUBE DUCT TYPE 12C)

APPROVED BY : _____

J.Y. LEE / HEAD OF TEAM
COMMUNICATION ENGINEERING TEAM

PREPARED BY : _____

G. S. CHO / ENGINEER
COMMUNICATION ENGINEERING TEAM

1. GENERAL

This specification covers the design requirements and performance standard for the supply of optical fiber cable.

1.1 Cable Description

Loose tube cable is a design that has high tensile strength and flexibility in a compact cable size. TAIHAN's loose tube cable provides excellent optical transmission and physical performance.

1.2 Quality

TAIHAN ensure a continuing level of quality in our cable products through several quality control program including ISO 9001.

1.3 Reliability

TAIHAN ensure product reliability through rigorous qualification testing of each product family. Both initial and periodic qualification testing are performed to assure the cable's performance and durability in the field environments.

1.4 Reference

IEC 60793, 60794, ITU-T G.650, G.652D.

2. OPTICAL FIBER

2.1 ITU-T G.652D

TAIHAN offers single mode fiber manufactured by the vapour axial deposition (VAD) process to produce the highest quality glass with excellent geometry, high strength characteristics, and attenuation that approaches theoretical minimum.

The single mode fiber is fully compatible with other commercially available single mode fibers and has the zero dispersion wavelength around 1310nm.

2.2 General Design

Its optical properties are achieved through a germanium doped silica based core with a pure silica cladding. An acrylate protective coating is applied over glass cladding to provide the necessary maximum fiber lifetime.

2.3 Construction

Mode field diameter at 1310nm	9.2um ± 0.4 um
Mode field concentricity error	≤ 0.6um
Cladding diameter	125um ± 0.7um
Cladding non-circularity	≤ 0.7%
Primary coating material	UV curable acrylate
diameter	245 ± 10um

2.4 Optical characteristics (un-cabled)

Attenuation at 1310nm	≤ 0.34 dB/km.
at 1550nm	≤ 0.20 dB/km.
Dispersion between	
at 1285～1330nm	≤ 3.5 ps/(nm.km)
at 1550nm	≤ 18 ps/(nm.km)
Zero dispersion wavelength	1300nm - 1324nm
Zero dispersion slope	≤ 0.090 ps/(nm^2.km)
Cable cut off wavelength	≤ 1260nm
PMD	≤ 0.1 ps/√ km

2.5 Optical characteristics (cable)

Attenuation at 1310nm	≤ 0.35 dB/km.
at 1550nm	≤ 0.25 dB/km.

Dispersion between	
at 1285～1330nm	≤ 3.5 ps/(nm.km)
at 1550nm	≤ 18 ps/(nm.km)
Zero dispersion wavelength	1300nm - 1324nm
Zero dispersion slope	≤ 0.092 ps/(nm^2.km)
Cable cut off wavelength	≤ 1260nm
PMD	≤ 0.1 ps/√ km

2.6 Mechanical characteristics

Fiber proof test level	≥ 1% x 1sec

2.7 Removal of primary coating

For jointing, removal of primary coating is achieved without the use of any chemicals. A simple mechanical operating is sufficient to prepare the fiber for jointing.

3. CABLE

3.1 Central loose tube cable

The cable core contains the loose tube with fibers and jelly compounds which shall be central. And then aramid yarns and water blocking material shall be applied. Finally, a ripcord and outer sheath shall apply over the cable core.

3.3 Cable construction

The cable construction shall be in accordance with following table1, 2 and fig 1, fig 2.

3.4 Sheath marking

Required marking can be indented on the cable sheath at regular intervals of one meter. Continuously sequential numbering shall be employed starting from zero at the inner end. The color of these markings shall preferably be white.

4. CABLE TEST

4.1 Tensile strength

1) Test method	:	IEC-60794-1-2 E1
2) Load value	:	600N
3) Test length	:	not less than 100m
4) Applied time	:	1 hour
5) Acceptable criteria	:	No fiber breakage

4.2 Crush resistance

1) Test method	:	IEC-60794-1-2 E3
2) Applied load	:	1000N/100mm plate (Central loose tube cable)
3) Duration time	:	10 min
4) Acceptable criteria	:	No fiber breakage

4.3 Impact resistance

1) Test method	:	IEC-60794-1-2 E4
2) Test load	:	0.5kg x 0.5m x 10 different point impact
3) Acceptable criteria	:	No fiber breakage

4.4 Water penetration

1) Test method	:	IEC-60794-1-2 F5
2) Test length	:	3m
3) Applied time	:	min.24 hr x 1m height
4) Acceptable criteria	:	No water drip

4.5 Temperature cycling

1) Test method : IEC-60794-1-2 F1
2) Test length : More than 500m
3) Temperature : 23°C, -10 °C, 70 °C,
4) Applied time : 24 hr at each step
5) Acceptable criteria : The difference in the attenuation result before and after(excluding loading) loss variation : Less than 0.1dB

5. PACKING AND MARKING

5.1 Packing-Cable drum

Each length of cable shall have both ends effective sealed. Each cable drum shall be marked to indicate the direction of rotating for reeling of the cable. On both side of the cable drum, required marking shall be printed. The minimum barrel diameter of the drums shall be 40times the nominal diameter of the cable.

5.2 Marking

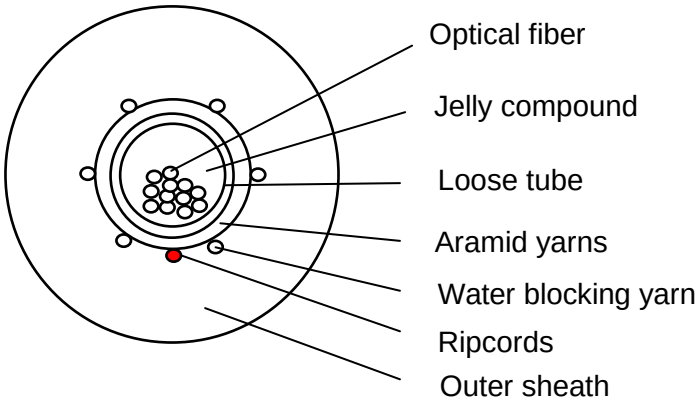
Required letters shall be distinctly marked on a weather proof material on both outer sides of the drum flange. The marking plates shall be made of a non-corrodible material.

Table 1. Color Coding of Optical Fiber in Tube

Number of fiber per tube	1	2	3	4	5	6	7	8	9	10	11	12
12 cores	Blue	Orange	Green	Brown	Slate	White	Red	Black	Yellow	Violet	Pink	Aqua

Fig. 1. Cross section optical fiber cable

-12C cable (Central loose tube cable)



Not to scale

Table 2. Construction of Optical Fiber Cable

Item		Construction
Total fiber number		12
Number of loose tube (ea)		1
Number of fiber per tube (core)		12
Color of loose tube		Natural
Tube	Material	PBT (Polybutylene Terephthalate)
	Outer diameter	Nom. 2.1mm
Water blocking material		Water blocking yarns
Tensile strength material		Aramid yarn
Ripcords (ea)		1
Outer sheath material		Black color HDPE (U.V. resistant)
Storage/Operating/Installation temperature range		-10 °C to +70 °C
Bending Radius	With load	15 X outer diameter of cable
	Without load	10X outer diameter of cable
Cable diameter (Nom.mm)		4.1
Cable Weight (Nom. kg/km)		17
Nominal shipping length (Nom. m)		3000 or 6000