Optical Fiber Cable Specification

6, 24 Fibers(G.652.D : PureBand®) /Loose Tube/ Water Blocking Tape/ Inner Polyethylene Sheath/ Corrugated Steel Tape Armor / Outer Polyethylene Sheath

Figure-8 Form

Aerial Application

Approved by

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1. General

This specification covers the design requirements and performance standards for the supply of low water peak Single-Mode (PureBand®) optical cables to be used in aerial application.
The features described in this document are intended to provide information on the performance of Sumitomo Electric's optical cable and aid in handling and installation.

1.1 Cable Description

Loose Tube Cable is a design that has superior tensile strength and flexibility in a compact cable size. Sumitomo Electric's Loose Tube Cable utilize Reverse Oscillating Lay (ROL) of the loose tube for quick and easy mid-span entry, and provides excellent optical transmission and physical performance. Recommended applications include aerial.

1.2 Quality

Sumitomo Electric ensures a continuing level of quality in our cable products through several programs including ISO 9000.

1.3 Reliability

Sumitomo Electric ensures 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 environment.

1.4 Reference

IEC 60793-1, 60793-2, 60794-1
ITU-T G650, G652

2. Optical Fiber

2.1 Low Water Peak Single-Mode Fiber

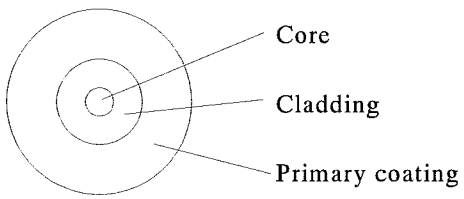
Sumitomo Electric offers Low Water Peak Single Mode (PureBand®) optical fiber, manufactured by the Vapor Axial Deposition (VAD) process to produce the highest quality glass with excellent geometry, high strength characteristics and attenuation that approaches theoretical minimum.
The SM fiber is fully compatible with other commercially available SM fibers and has zero dispersion wavelength around 1310 nm.

2.1.1 General Design

Optical properties of the SM fiber are achieved through a germanium doped silica based core with a pure silica cladding which meets ITU-T G652.D, UV curable acrylate protective coating is applied over the glass cladding to provide the necessary maximum fiber lifetime.

2.2.2 Construction

Mode field diameter at 1310 nm	9.2 ± 0.4 μm
Core/cladding concentricity error	≤ 0.4 μm
Cladding diameter	125.0 ± 1.0 μm
Cladding non-circularity	≤ 1.0 %
Primary coating material	UV curable acrylate
diameter	250 ± 15 μm (Colored)



Cross section of fiber Not to Scale

2.2.3 Optical Characteristics

Attenuation at 1310 nm	≤ 0.35 dB/km
at 1383 nm	≤ 0.36 dB/km
at 1550 nm	≤ 0.22 dB/km
in 1530-1565 nm	≤ 0.25 dB/km
Dispersion at 1550 nm	≤ 18.0 ps/nm·km
Zero dispersion wavelength (λo)	1300-1324 nm
Zero dispersion slope	≤ 0.092 ps/nm^2·km
Cable cut-off wavelength (λcc)	≤ 1260 nm
Polarization Mode Dispersion (PMD_Q)	≤ 0.2 ps/√km (Link design value)

2.2.4 Mechanical Characteristics

Proof stress level	1.2 % (0.86 GPa)
Fiber curl (Fiber radius of curvature)	≥ 4 m

3. Fiber Optic Cable

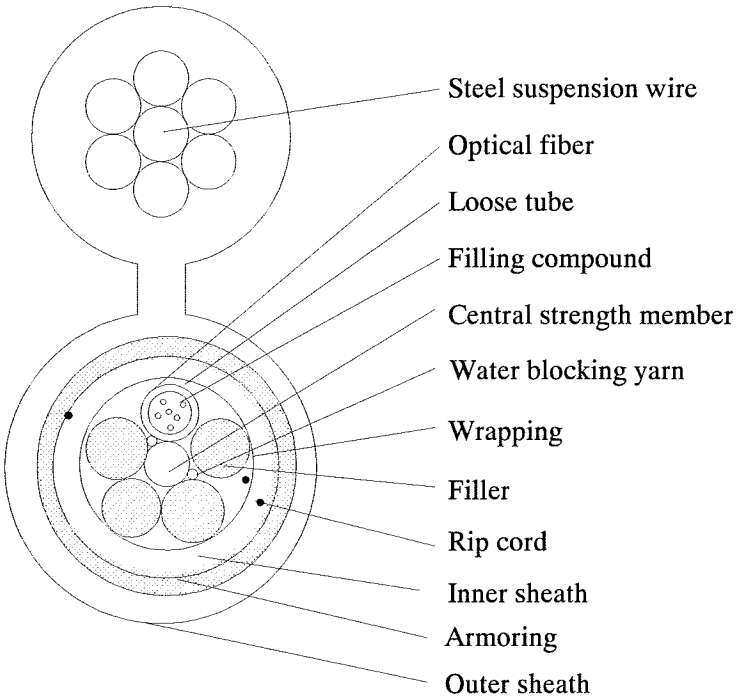
3.1 General Design

The color coded fibers are housed in multiple color coded plastic loose tube which are stranded around a central strength member utilizing Reverse Oscillating Lay (ROL). Water blocking yarn(s) may be applied over strength member.

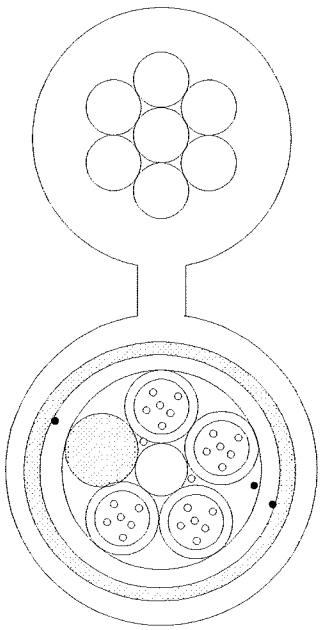
The cable core shall be wrapped with water swellable tape as water block. Inner polyethylene sheath with ripcord underneath is covered over the cable core. A corrugated steel tape armoring and outer polyethylene with steel suspension wire is applied over the cable core to "Figure-8 form".

3.2 Construction

Item	Specification
Central strength member	Steel wire
Loose tube material	PBT
diameter	Nom. 1.85 mm
Filler	Plastic
Yarn	Water blocking yarn(s)
Filling compound in tube	Jelly
Wrapping material	Water blocking tape
Ripcord material	Plastic yarn
Inner sheath material	Polyethylene colored black
thickness	Nom. 1 mm
Armoring material	Corrugated steel tape coated polymer on both sides
thickness	Nom. 0.15 mm (excluding polymer) Nom. 0.25 mm (including polymer)
Outer sheath material	Polyethylene colored black
thickness	Nom. 2 mm
Suspension wire material	7 strands of 1.4 mm galvanized steel wire
sheath	Black polyethylene with nom. 1 mm thickness (web : Nom. 2 mm in height, Nom. 2 mm in width)



Cross section of 6-fiber cable



Cross section of 24-fiber cable

Not to Scale

3.2.1 Buffer Tube Stranding

Fiber count	Max. fiber number per tube	Number of tube & Fillers
6	6	1 tube + 4 filler
24	6	4 tube + 1 filler

3.2.2 Cable Diameter and Weight

Fiber count	Nom. diameter (mm)	Nom. weight (kg/km)
6, 24	13 x 21	295

3.2.3 Color Coding

Each fiber and tube shall be identifiable throughout the length of the cable in accordance with the following color sequence. Fiber color in each tube starts from No. 1 Blue.

Fiber No.	Color 6 fiber tube
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White

Tube No.	Color 6, 24-fiber Cable
1	Blue
2	Orange
3	Green
4	Brown

3.2.4 Sheath Marking

The length and identification marking are hot stamped on the sheath at one meter interval with white color.

The accuracy of the length marking shall be ± 1%.

Re-marking is yellow color, if necessary.

Content of the identification marking for instance,

- Name of manufacture : "SUMITOMO "
- Type of cable and number of fiber : e.g. " **(G652)-FOC" (**: Number of fiber)
- Year of manufacture : e.g. " 2010 "

3.3 Mechanical, Electrical and Environmental Characteristics

The finished cables can be subjected to the following mechanical, electrical and environmental conditions. In these tests, the imprint on the sheath is not considered mechanical damage.

Item	Test Condition	Specification
Tensile Performance	IEC 60794-1-2-E1 Max load: 7,000N	Attenuation change ≤ 0.1 dB* No defect on fiber and sheath
Crush	IEC 60794-1-2-E3 Max load 4,400 N/100 mm for 1 minute Subsequently 2,200N/100 mm for 10 minutes	Attenuation change ≤ 0.1 dB* (under load of 2,2100N/100mm) No defect on fiber and sheath
Impact	IEC 60794-1-2-E4 Impact Energy : 10J No. of impact : 1 in 3 different places	No defect on fiber and sheath
Twist	IEC 60794-1-2-E7 Length : 1 m Weight 150 N Angle : ± 90° No. of cycle : 10	Attenuation change ≤ 0.1 dB* No defect on fiber and sheath
Cable Bend	IEC 60794-1-2-E11 Mandrel Dia. : 20 × Cable Dia. 1 turn No. of cycle : 10	Attenuation change ≤ 0.1 dB* No defect on fiber and sheath
Temperature cycling	IEC 60794-1-2-F1 Temperature : -30°C – +70°C No. of cycle : 2	Attenuation change ≤ 0.1 dB/km
Water Penetration	IEC 60794-1-2-F5B Time : 24 hours	No water leak at the end of 3 m sample (Armor portion excluded)

* : Attenuation 0.1 dB is considered as measurement tolerance.

4. Packaging and Shipping

The minimum barrel diameter of the drum shall be more than 30 times the nominal diameter of the cable. Each length of cable shall have both end effective sealed. The direction of rotation of the color scheme shall be shown by marking the clockwise and anticlockwise ends with red and green adhesive tape respectively.

5. History of Change

The first issue of specification carries the letter A. Each time a specification is re-issued, it carries a consecutive alphabetic letter and a new date. A vertical line in the margin indicate the revised part from the last issue.

Issue No.	Description of change	Date	Incorporated by
A	Initial issue	October 12, 2010	A. Noguchi