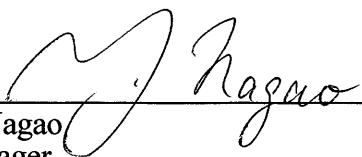


Optical Fiber Cable Specification

**12, 24, 48 Low Water Peak Single-Mode Optical Fiber
“PureBand[®]” (ITU-T G.652D)/
Loose Tube/Jelly Filled/
Inner Polyethylene Sheath/
Steel Tape Armoring/ Outer Polyethylene Sheath**

Direct Burial 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 optical fiber “**PureBand**®” (ITU-T G.652D) cables to be used for duct and direct burial applications. 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 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 midspan entry, and provides excellent optical transmission and physical performance.

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 (SM) Fiber

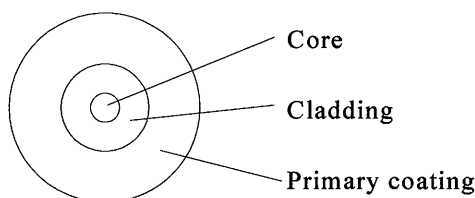
Sumitomo Electric Industries, Ltd. (SEI) offers a low water peak single-mode optical fiber “**PureBand**®” made by the Vapor Phase Axial Deposition (VAD) method, which enables customers to construct high performance wired networks for voice, video, and/or data transmission.

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 G.652D. UV curable acrylate protective coating is applied over the glass cladding to provide the maximum fiber lifetime.

2.1.2 Construction

Mode field diameter at 1310 nm	$9.2 \pm 0.4\mu\text{m}$
Mode field concentricity error	$\leq 0.4\mu\text{m}$
Cladding diameter	$125 \pm 1\mu\text{m}$
Cladding non-circularity	$\leq 1\%$
Primary coating material	UV curable acrylate
Diameter	$250 \pm 15\mu\text{m}$ (Colored fiber)



Cross section of fiber

Not to Scale

2.1.3 Optical Characteristics

Attenuation at 1310 nm	≤ 0.35 dB/km
at 1383 nm*	≤ 0.35 dB/km
at 1550 nm	≤ 0.25 dB/km
Dispersion at 1310 nm	≤ 3.5 ps/nm·km
at 1550 nm	≤ 18 ps/nm·km
Zero dispersion wavelength	1300-1324 nm
Zero dispersion slope	≤ 0.092 ps/nm·km
Cable cut-off wavelength (λ_{cc})	≤ 1260 nm
Polarization mode dispersion	≤ 0.20 ps/ $\sqrt{\text{km}}$ (Link design value: PMDq)
NOTE * : Attenuation increase due to hydrogen aging at this wavelength will be ≤ 0.01 dB/km in accordance with IEC 60793-2-50 test procedure.	

2.1.4 Mechanical Characteristics

Proof stress level	1.2 % (0.86 GPa)
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3. Fiber Optic Cable

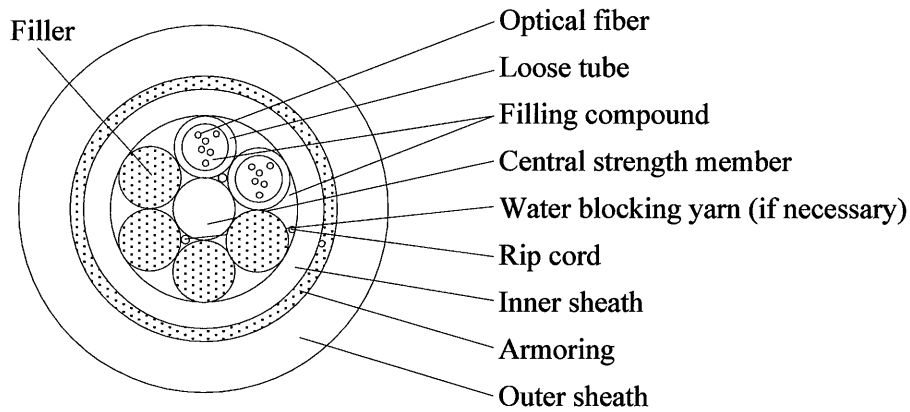
3.1 General Design

The colour coded fibres are housed in multiple colour coded plastic loose tube which are stranded around a strength member utilizing Reverse Oscillating Lay (ROL). Water blocking compound, filling the interstices within the core, provides protection against water ingress. Polyethylene sheath with ripcord underneath is covered over the cable core for the inner sheath.

A corrugated steel tape armoring and outer polyethylene with ripcord underneath steel tape are applied over the inner sheathed cable core.

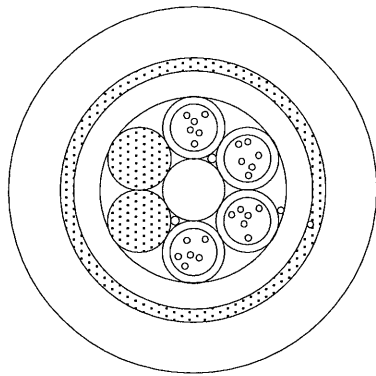
3.2 Construction

Item	Specification
Central strength member	Steel wire
Loose tube material	PBT
diameter	Nom. 1.85 mm (for 12, 24 fiber cable) Nom. 2.2 mm (for 48 fiber cable)
Filling compound in tube	Jelly
Filler (if necessary)	Plastic(s)
Yarn (if necessary)	Water blocking yarn(s)
Ripcord	Plastic yarn
Inner sheath material	Polyethylene colored black
thickness	Nom. 1.0 mm
Armoring material	Corrugated steel tape coated polymer on both sides
thickness	Nom. 0.15 mm (steel tape)
Outer sheath material	Polyethylene colored black
thickness	Nom. 2.0 mm

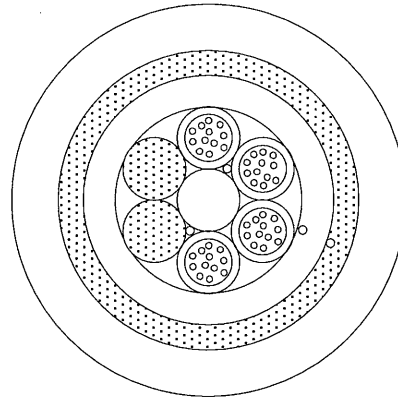


Cross section of 12-fiber optical cable

Not to Scale



Cross section of 24-fiber optical cable



Cross section of 36-fiber optical cable

Not to Scale

3.2.1 Buffer Tube Stranding

<u>Fiber count</u>	<u>Max. fiber number per tube</u>	<u>Number of tube & Fillers</u>
12, 24	6	6
48	12	6

3.2.2 Cable Diameter and Weight

<u>Fiber count</u>	<u>Nom. diameter (mm)</u>	<u>Nom. weight (kg/km)</u>
12,24	13.0	180
48	14.0	210

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.

<u>Fiber No.</u>	<u>Color</u>		
	<u>12, 24-fiber Cable</u>	<u>48-fiber Cable</u>	
1	Blue	Blue	Blue
2	Orange	Orange	Orange
3	Green	Green	Green
4	Brown	Brown	Brown
5	Slate	Slate	Slate
6	White	White	White
7	N/A	Red	Red
8	N/A	Black	Black
9	N/A	Yellow	Yellow
10	N/A	Violet	Violet
11	N/A	Rose	Rose
12	N/A	Aqua	Aqua

<u>Tube No.</u>	<u>Color</u>	<u>12-fiber Cable</u>	<u>24-fiber Cable</u>	<u>48-fiber Cable</u>
1	Blue	SM×6	SM×6	SM×12
2	Orange	SM×6	SM×6	SM×12
3	Green	--	SM×6	SM×12
4	Brown	--	SM×6	SM×12

3.2.4 Sheath Marking

The length and identification marking are printed on the sheath at one meter in interval with white color. The accuracy of the length marking shall be $\pm 1\%$. Re-marking is yellow color, if necessary.

- Name of manufacture : “ SUMITOMO ”
- Year of manufacture : e.g. “ 2014 ”
- Type of cable and number of fiber core
: “SM **C”
(** : Number of fiber)

3.3 Mechanical and Environmental Characteristics

The finished cables shall be designed to meet the following mechanical 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 Load : 3kN Duration time : 1 min.	No damage to the fiber. No crack on the sheath.
Cable Bend	IEC 60794-1-2-E11 Mandrel radius : 20 × Cable diameter No. of turn : 1 No. of cycles : 5	No damage to the fiber. No crack on the sheath.
Compression	IEC 60794-1-2-E3 Load: 3,000 N/100 mm	No damage to the fiber. No crack on the sheath.
Temperature Cycling	IEC 60794-1-2-F1 -30 - +70°C	Attenuation increase ≤ 0.05 dB/km
Water Penetration	IEC 60794-1-2-F5A Head of water : 1 m Test period : 24 Hrs.	No water leakage at end of 3 m length (excluded armor portion)

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.

<u>Issue No.</u>	<u>Description of change</u>	<u>Date</u>	<u>Incorporated by</u>
A	Initial issue	March 7, 2014	K. Okada
B	Add 12-fiber cable	March 17, 2014	K. Okada