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TL 9000
ISO 9001
ISO 14001
OHSAS 18001

LS Cable & System

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Specification

For

EPSU

(Enhanced Performance Sheathed fiber Unit)

00	Mar.27, 2015	Original Issue	Kim, Sangyub	Jun, Youngho	Lee, YuHyoung
Rev. No.	Date	Descriptions	Prepared By	Reviewed By	Approved By

1. SCOPE

1.1 Application

This specification covers the general requirements for Enhanced Performance Sheathed fiber Unit (EPSU) used for blowing installation.

2. OPTICAL FIBER

The optical, geometrical, mechanical and environmental performance of the optical fiber shall be in accordance with Table 1 below.

Table 1. Performance of G.657.A Single Mode Fiber

ITEMS	UNITS	SPECIFICATION	
		G.657.A1	G.657.A2
Attenuation	dB/km	≤ 0.40 at 1310nm ≤ 0.40 at 1383nm ≤ 0.30 at 1550nm	
Chromatic Dispersion	ps/nm.km	≤ 3.5 at 1285nm ~ 1330nm ≤ 18 at 1550nm	
Zero Dispersion Wavelength	nm	1300 ~ 1324	
Zero Dispersion Slope	ps/nm ² .km	≤ 0.092	
Cable PMD (PMD _Q)	ps/ $\sqrt{\text{km}}$	≤ 0.2 (20 section link)	
Cut-off Wavelength (λ_{cc} , Cabled fiber)	nm	≤ 1260	
Attenuation vs. Bending (15mm radius x 10turns)	dB	≤ 0.25 at 1550nm ≤ 1.0 at 1625nm	≤ 0.03 at 1550nm ≤ 0.1 at 1625nm
Attenuation vs. Bending (10mm radius x 1turn)	dB	≤ 0.75 at 1550nm ≤ 1.5 at 1625nm	≤ 0.1 at 1550nm ≤ 0.2 at 1625nm
Attenuation vs. Bending (7.5mm radius x 1turn)	dB	-	≤ 0.5 at 1550nm ≤ 1.0 at 1625nm
Mode Field Diameter	μm	8.9 ± 0.4 at 1310nm	8.6 ± 0.4 at 1310nm
Core/Cladding Concentricity Error	μm	≤ 0.5	
Cladding Diameter	μm	125 ± 0.7	
Cladding Non-circularity	%	≤ 1.0	
Coating Diameter	μm	200 ± 10	
Proof Test	Gpa	≥ 0.69	

3. ABF CONSTRUCTION

The construction of the smooth sheath ABF shall be in accordance with Table 2.

Table 2. the smooth sheath ABF construction

ITEMS		DESCRIPTION		
Number of Fibers		2 or 4	6 or 8	12
Coating Material		UV curable Acrylate Resin		
Outer sheath	Material	HDPE		
	Thickness	Nom. 0.45 mm		
Outer Diameter (Nominal)		1.5 ± 0.2 mm	1.7 ± 0.2 mm	1.9 ± 0.2 mm
Available Unit Color		Blue or Yellow or Orange		

4. FIBER IDENTIFICATION

The color code of the individual fibers within the smooth sheath ABF shall be in accordance with Table 3.

Table 3. The fiber color order of the smooth sheath ABF

	2 core	4 core	6 core	8 core	12 core
1	Red	Red	Red	Red	Red
2	Blue	Blue	Blue	Blue	Blue
3	Filler	White	White	White	White
4	Filler	Green	Green	Green	Green
5	-	-	Yellow	Yellow	Yellow
6	-	-	Grey	Grey	Grey
7	-	-	Filler	Brown	Brown
8	-	-	Filler	Black	Black
9	-	-	-	-	Violet
10	-	-	-	-	Orange
11	-	-	-	-	Aqua
12	-	-	-	-	Pink

5. MECHANICAL / ENVIRONMENTAL PERFORMANCE

5.1 Mechanical and Environmental Performance of the smooth sheath ABF

The mechanical and environmental performance of the smooth sheath ABF shall be in accordance with Table 4 below.

Table 4. The Mechanical Performance of the smooth sheath ABF

ITEMS	TEST METHOD AND ACCEPTANCE CRITERIA
Tensile Performance	# Test method: IEC 60794-1-21 : Method E1 -. Fixed Mandrel Diameter : $\geq 60\text{mm}$ -. Load Mandrel Diameter : $\geq 60\text{mm}$ -. Tensile Load : $9.81 \times W$ (W : mass of 1km of component in kg) -. Unit Length : $\geq 10\text{m}$ -. Rate of extension : $\geq 20\text{mm/min}$ -. Duration Maximum Tension : 1 minute -. Selection of fibers to be monitors : All fibers in the unit # Acceptance Criteria -. Fiber strain at Max. load : $\leq 0.6\%$ -. Change in Attenuation After test : $\leq 0.05\text{dB}$ -. No significant damage to unit component
Crush	# Test method: IEC 60794-1-21 : Method E3 -. Maximum Load: 100N -. Unit Length : $\geq 30\text{m}$ -. During of Maximum Load : 60 seconds -. Selection of fibers to be monitors : All fibers in the unit # Acceptance Criteria -. Change in Attenuation during test : To be recorded -. Change in Attenuation After test : $\leq 0.05\text{dB}$ -. No significant damage to unit component
Repeated bending	# Test method: IEC 60794-1-21 : Method E6 -. Bending diameter : 60mm -. Number of cycles : 25 # Acceptance Criteria -. No significant damage to unit component

Table 4. The Mechanical Performance of the smooth sheath ABF (continued)

ITEMS	TEST METHOD AND ACCEPTANCE CRITERIA
Torsion	# Test method: IEC 60794-1-21 : Method E7 -. Test length : 300mm -. Load : adequate to assure test sample is straight at start of test # Acceptance Criteria -. Change in Attenuation After test : $\leq 0.05\text{dB}$ -. No significant damage to unit component
Kink	# Test method: IEC 60794-1-21 : Method E10 -. Minimum diameter : 60mm # Acceptance Criteria -. No significant damage to unit component
Bend	# Test method: IEC 60794-1-21 : Method E11 -. Mandrel Diameter : = 60mm -. Unit Sample Length : $\geq 30\text{m}$ -. Selection of fibers to be monitors : All fibers in the unit -. Number of cycles : 3 -. Number of turns : 4 # Acceptance Criteria -. Change in Attenuation After test : $\leq 0.05\text{dB}$ -. No significant damage to unit component
Temperature Cycle	# Test method: IEC 60794-1-2 Method F1 -. Length of unit to be tested : $\geq 1\text{km}$ -. Temperature T_A : = -40°C -. Temperature T_B : = $+60^\circ\text{C}$ -. Dwell time : ≥ 24 hours -. Number of Cycles : = 2 -. Selection of fibers to be monitors : All fibers in the unit # Acceptance Criteria -. Attenuation variation during and after test : $\leq 0.15\text{dB/km}$
Water immersion	# Test method: IEC 60793-1-53 -. Length of unit to be tested : $\geq 1\text{km}$ -. Temperature of the water solution : $+20^\circ\text{C} \pm 2.0^\circ\text{C}$ -. Water : Distilled, demineralized or de-ionized water (PH 5.0~8.0) -. Dwell time : ≥ 30 days # Acceptance Criteria -. Attenuation variation : $\leq 0.05\text{dB/km}$

6. PACKAGING AND MARKING

6.1 Standard length of cable shall be 1km. Other cable length is also available if required by customer.

The sheath shall be marked with white characters at intervals of one meter with following information. Other marking is also available if requested by customer.

- 1) Cable type (ex, EPSU)
- 2) Fiber type and counts (ex, G657A1 2F)
- 3) Name of the manufacturer (" LS Cable & System")
- 4) Year of manufacture
- 5) Length marking

6.2 Standard length of cable shall be 4km. Other cable length is also available if required by customer.

6.3 Unit Storage Pan

- 1) The fiber unit shall be supplied in its storage pan. Fiber units shall be laid in the pans in the format of resetted coils

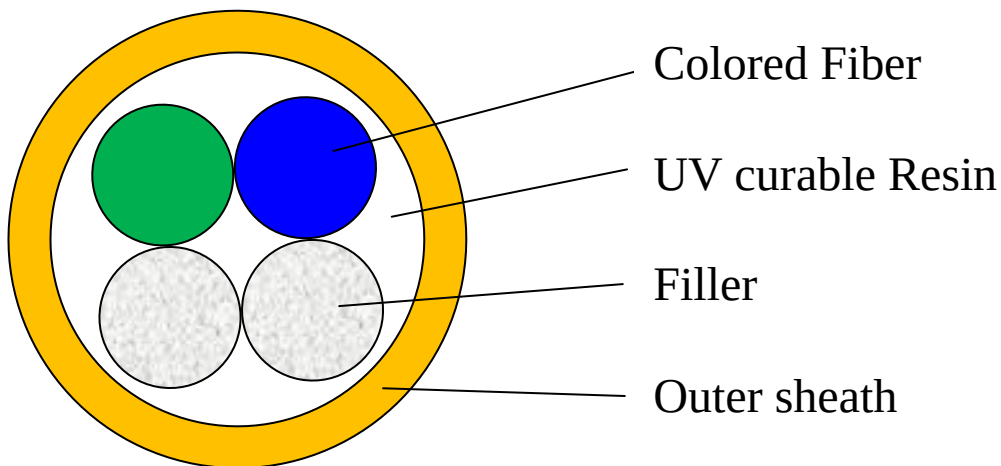
6.4 Cable Reel

6.4.1 The sticker information on the spool

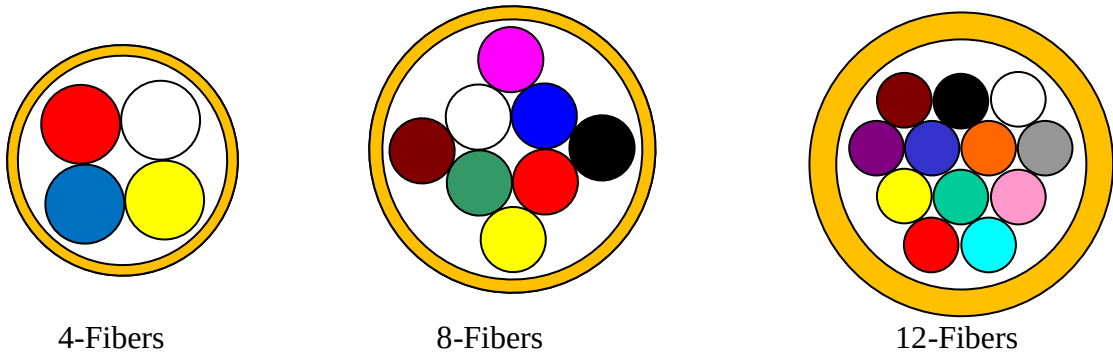
- (1) Cable type and fiber counts
- (2) Length of cable in meters
- (3) Gross weight in kilograms
- (4) Reel number
- (5) Year of manufacture

< Cross-sectional Drawing of Cable >

1. Smooth sheath ABF



2-Fibers Air Blown Fiber



2. Diameter, Weight and Minimum Bending Radius

No. of Fibers	Nominal Diameter (mm)	Approx. Cable Weight (kg/km)	Minimum Bending Radius (mm) (Handling)
2 & 4	1.5 ± 0.2	1.8 ± 0.2	30
6 & 8	1.7 ± 0.2	2.5 ± 0.2	35
12	1.9 ± 0.2	3.2 ± 0.2	40

*) Actual values for cable weight and diameter may deviate from the calculated values given in the table above.