

# TECHNICAL SPECIFICATION

LSSS-LN0095-02

FOR

**4 PAIR U/FTP CABLES (500MHz CATEGORY 6A)**

**(Ref : IEC 61156-5, IEC 60332-1, IEC 60332-3, IEC 61034 & IEC 60754)**

Prepared by : D. W. Kang  
Dong-wan, Kang  
Engineer  
SCS & Wireless Development Team

Checked by : T. W. Kim  
Tae-woo, Kim  
Manager  
SCS & Wireless Development Team

Approved by : J. Baek K.  
Jong-seb, Baek  
Manager  
SCS & Wireless Development Team

**1. SCOPE**

This specification is based on the standards of IEC 61156-5, IEC 60332-1, IEC 60332-3, IEC 61034 & IEC 60754 and covers the requirements for each individual pair foiled twisted pair (U/FTP) cables of 100Ω, Category 6A (Cat.6A, Class E<sub>A</sub>).  
 - Applicable cable size & type ; 4 Pairs, PVC or LSZH sheath

**2. CABLE CONSTRUCTION**

**2.1 Conductor**

The conductors shall be solid, annealed and bare copper with a diameter of AWG23.

**2.2 Insulation**

Each conductor shall be insulated skin-foam-skin 3 layers with polyethylene.  
 The insulation shall be uniform and shall not have any defects.

**2.3 Color code**

The color code of insulation shall be shown as Table 1.

**Table 1. Color code of insulation**

Pair No	A - wire	B - wire
1	White	Blue
2	White	Orange
3	White	Green
4	White	Brown

**2.4 PiMF and Core Assembly**

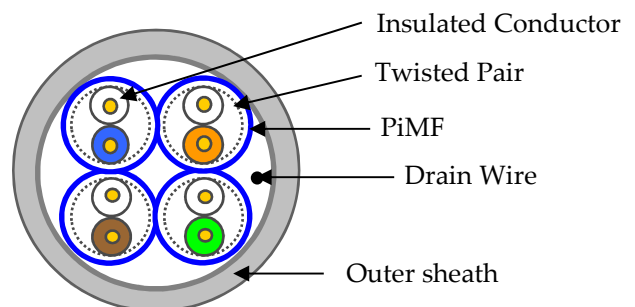
Two insulated conductors shall be twisted into a pair and each four pairs shall be wrapped with aluminum tape coated on one side with plastic film for screening.  
 After pair shielding, four twisted pairs shall be assembled into a cable core.  
 The PET film shall be applied over the core wrapping, if necessary.  
 A tinned copper wire with the diameter of 0.4mm shall be applied with cable core in jacket.

**2.5 Sheath**

The flame retardant PVC or LSZH(Low Smoke Zero Halogen) compound colored grey or other colors shall be applied over the cable core.  
 The sheath shall be uniform and shall not have any defects.  
 The thickness of outer sheath and cable diameter shall be shown as table 2.

**Table.2 thickness of sheath and cable diameter**

Outer sheath thickness (mm)	Cable diameter (mm)
0.5±0.05	7.1±0.2



**Fig 1. Cross Sectional Diagram of Cable**

- The drawing appearing on this page may be subject to change or modification without any prior notice -

### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 Electrical Performances

Characteristics	units	Specification
DC Resistance	Ω/100m	≤ 9.5
DC Resistance Unbalance	%	≤ 2.00
Capacitance Unbalance (Pair to Ground)	pF/km (800~1000Hz)	≤ 1600
Insulation Resistance	MΩ·m	≥ 5000
Dielectric Strength	DC kV/sec	2.5 / 2
Impedance (Characteristic mean)	Ω	100 ± 5% (at 100MHz)
Return Loss	dB/100m	≥ 20 + 5 * log(freq) , 4 ≤ f < 10MHz ≥ 25 , 10 ≤ f < 20MHz ≥ 25 - 7 * log(freq/20) , 20 ≤ f ≤ 500MHz (min. 17.3dB)
Attenuation (Insertion Loss)	dB/100m	≤ 1.82*√(freq) + 0.0091*(freq) + 0.25/√(freq) , 4 ~ 500 MHz
NEXT Loss	dB/100m	≥ <b>75.3 - 15*log(freq)</b> , 4 ~ 500MHz
Power sum NEXT Loss	dB/100m	≥ <b>72.3 - 15*log(freq)</b> , 4 ~ 500MHz
ELFEXT Loss	dB/100m	≥ <b>68 - 20*log(freq)</b> , 4 ~ 500MHz
Power sum ELFEXT Loss	dB/100m	≥ <b>65 - 20*log(freq)</b> , 4 ~ 500MHz
Propagation Delay	ns/100m	≤ 534 + 36 / √ (Freq) , 4 ~ 500MHz
Propagation Delay Skew	ns/100m	≤ 45, 4~500MHz

Freq. (MHz)	Attenuation (dB/100m) Max.	NEXT (dB/100m) Min.	PSNEXT (dB/100m) Min.	ELFEXT (dB/100m) Min.	PSELFEXT (dB/100m) Min.	RL (dB/100m) Min.	P.Delay (ns/100m) Max.
4	3.8	66.3	63.3	56.0	53.0	23.0	552
8	5.3	61.8	58.8	49.9	46.9	24.5	547
10	5.9	60.3	57.3	48.0	45.0	25.0	545
16	7.5	57.2	54.2	43.9	40.9	25.0	543
20	8.4	55.8	52.8	42.0	39.0	25.0	542
25	9.4	54.3	51.3	40.0	37.0	24.3	541
31.25	10.5	52.9	49.9	38.1	35.1	23.6	540
62.5	15.0	48.4	45.4	32.1	29.1	21.5	539
100	19.1	45.3	42.3	28.0	25.0	20.1	538
200	27.6	40.8	37.8	22.0	19.0	18.0	537
250	31.1	39.3	36.3	20.0	17.0	17.3	536
300	34.3	38.1	35.1	18.5	15.5	17.3	536
400	40.1	36.3	33.3	16.0	13.0	17.3	536
500	45.3	34.8	31.8	14.0	11.0	17.3	536

The cable performance between 1MHz and 4MHz is achieved by design only and it is therefore not necessary to test for this performance below 4MHz. (According to the IEC 61156-5 standard)

#### **4. PHYSICAL PROPERTIES**

##### **4.1 Insulation**

The un-aged elongation, measured in accordance with clause 6.4.4 of IEC 61156-5 shall be minimum 100%, respectively.

The shrinkage of insulation , measured in accordance with clause 6.5.1 of IEC 61156-5 shall not exceed 5%.

The bending test of insulation at low temperature, measured in accordance with clause 6.5.3 of IEC 61156-5 shall show no visible cracks.

##### **4.2 Sheath**

The un-aged tensile strength and elongation, measured in accordance with clause 6.4.6 & 6.4.7 of IEC 61156-5 shall be minimum 9MPa and 100%, respectively.

The heat-aged tensile strength and elongation , measured in accordance with clause 6.5.4 & 6.5.5 of IEC 61156-5 shall be minimum 70% and 50% of un-aged, respectively.

The LSZH compound shall comply with IEC 60754-2 and IEC 61034.

##### **4.3 Cable Cold Bend**

All cables shall meet the requirements of clause 6.5.7 of IEC 61156-5.

##### **4.4 Flame Requirements**

A cable marked "IEC 60332-1" or "CMX" shall meet the VW-1 flame test specified in IEC 60332-1.

A cable marked "IEC 60332-3" or "CM" shall meet the vertical flame test specified in IEC 60332-3.

## 5. PACKING AND IDENTIFICATION

### **5.1 Cable Marking**

The marking on the sheath shall be applied by black ink printing and repeated through the outer sheath clearly.

The following details shall be marked on the sheath,

- Length marking (Meter and/or Feet intervals)
- Manufacturer name
- Transmission performance, AWG size and number of pairs, Flame test classification
- others (if ordered by purchaser).

### **5.2 Cable Packing**

5.2.1 The standard delivery length of cable is 305m.

Other length of cable shall be applied, if ordered by purchaser.

5.2.2 Each length of completed cable shall be wound on reel-in-box or a wooden reel.

### **5.3 Marking on tag or reel**

The following details shall be marked on a tag affixed to each shipping item.

- AWG size and number of pairs
- Flame test classification
- Manufacturer name and logo
- length
- Others

- End of Specification -

## ※ APPENDIX – PRODUCT PART NUMBER

Description	Part Number
Category 6A U/FTP 4Pair CMX	USP-A-C6G-E1VN-X 0.5X004P/xx
Category 6A U/FTP 4Pair CM	USP-A-C6G-E1VN-M 0.5X004P/xx
Category 6A U/FTP 4Pair LSZH 332-1	USP-A-C6G-E1ZN-X 0.5X004P/xx
Category 6A U/FTP 4Pair LSZH 332-3	USP-A-C6G-E1ZN-M 0.5X004P/xx

- xx denotes color: WH=White, BL=Blue, GY=Gray, VI=Violet, OR=Orange, RD=Red, GN=Green, YL=Yellow, BK=Black  
 - Other colors are available

REV.	Date	Prepared By	Checked By	Approved By	Remark
00	2012.03.28	K.H. Ha	T.W. Kim	Y.H. Lee	1. Issued
01	2012.07.06	K.H. Ha	T.W. Kim	Y.H. Lee	1. Product part number is added to Appendix. 2. Riser grade is omitted. (Clause 1 & 4.4) 3. Changed sheath thickness & OD deviation range, Clause 2.5. 4. Clause 3.1 Electrical performance is changed. 5. Clause 4. Physical properties is changed. - IEC standard is updated. - Contents for flame requirement are changed. 6. Clause 2.4 & Fig.1 Drain wire is added.
02	2013.08.08	D.W.Kang	T.W.Kim	J.Baeck	1. Clause 3.1 Electrical Performance (NEXT/FEXT equation were changed)