

# TECHNICAL SPECIFICATION

LSSS - LN0059-07

FOR

**4 PAIR F/UTP CABLES (AUGMENTED CATEGORY 6)**

**(Ref : ISO/IEC 11801, IEC 61156-5, IEC 60332-1, IEC 60332-3)**

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**1. SCOPE**

This Specification is based on the standards of IEC 61156-5 and ISO/IEC 11801, and covers the requirements for foiled twisted pair (F/UTP) cables of 100Ω , augmented category 6 (Cat.6A).  
 - 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 and minimum acceptable diameter shall be 0.546mm.

**2.2 Insulation**

Each conductor shall be insulated with solid high density polyethylene. The insulation shall be uniform and shall not have any defects. The diameter over the insulation shall be maximum 1.22mm.

**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	
	Base	Stripe	Base	Stripe
1	White	Blue	Blue	-
2	White	Orange	Orange	-
3	White	Green	Green	-
4	White	Brown	Brown	-

\*Note) The Stripe Marking shall be applied on the white color

**2.4 Core Assembly**

Two insulated conductors shall be twisted into a pair and the separator shall be applied into the cable core.

**2.5 Screen**

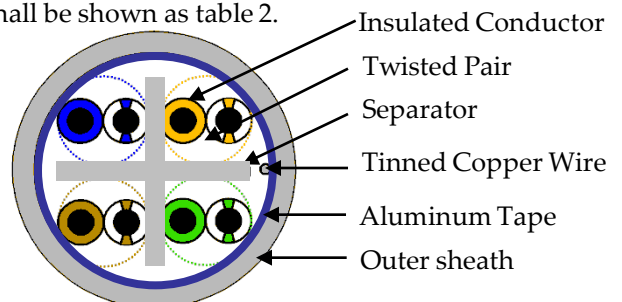
The aluminum tape coated on one side with plastic film shall be applied over the core wrapping for screening.  
 A tinned copper wire with the diameter 0.4mm shall be applied with cable core in jacket.

**2.6 Sheath**

The flame retardant PVC or LSZH(Low Smoke Zero Halogen) compound colored grey or other colors shall be applied over the screening.  
 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)
0.45±0.05	7.2±0.3



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

### 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	≥ 75.3 - 15*log(freq) , 4 ~ 500MHz
Power sum NEXT Loss	dB/100m	≥ 72.3 - 15*log(freq) , 4 ~ 500MHz
ELFEXT Loss	dB/100m	≥ 68 - 20*log(freq) , 4 ~ 500MHz
Power sum ELFEXT Loss	dB/100m	≥ 65 - 20*log(freq) , 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)

### **3.2 Measurements Precaution**

All electrical characteristics specified in clause 3.1 shall be tested on one sample length of 100 meter or greater removed from the package.

## **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 meet 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 F/UTP 4Pair CMX	FTP-A-C6G-E1VN-X 0.5X004P/xx
Category 6A F/UTP 4Pair CM	FTP-A-C6G-E1VN-M 0.5X004P/xx
Category 6A F/UTP 4Pair LSZH 332-1	FTP-A-C6G-E1ZN-X 0.5X004P/xx
Category 6A F/UTP 4Pair LSZH 332-3	FTP-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	2009.01.07	T.W. Kim	B.C.Jeong	Min Son	1. Issued
01	2010.01.26	K.H. Ha	T.W. Kim	Min Son	1. Clause 4. Physical Performance - Latest UL444 standard is applied.
02	2011.08.30	K.H. Ha	T.W. Kim	Y.H. Lee	1. ANSI/TIA-568-C.2 standard is applied. 2. Appendix 1. Channel performance is omitted.
03	2012.07.06	K.H. Ha	T.W. Kim	Y.H. Lee	1. Product part number is added to Appendix. 2. Performance is changed to IEC 61156-5 standard criteria. (Clause 3 & 4) 3. Riser grade is omitted. (Clause 1 & 4.4) 4. Minimum conductor diameter is changed. (Clause 2.1) 5. Changed sheath thickness & OD deviation range, Clause 2.6.
04	2013.05.03	D.W. Kang	T.W. Kim	J.S. Baeck	1. Changed cross sectional diagram of cable (Fig. 1)
05	2013.07.09	D.W. Kang	T.W. Kim	J.S. Baeck	1. Changed equation of NEXT/PSNEXT/ELFEXT/PSELFEXT (Clause 3.1)
06	2014.09.16	K.H. Ha	T.W. Kim	J.S. Baeck	1. The content of Clause 2.6 Sheath is changed.
07	2016.01.05	V.T.Nam	-	J.J.Kim	1. Changed Outer Diameter