

# TECHNICAL SPECIFICATION

LSSS - LN0080-06

FOR

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

**(Ref : UL444, ANSI/TIA-568-C.2 & IEEE 802.3, IEC 61156-5 Ed. 2.0)**

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**1. SCOPE**

This Specification is based on the standards of UL444 , ANSI/TIA-568C.2 and IEEE 802.3 and IEC 61156-5 Ed. 2.0 and covers the requirements for Segmented Shield twisted pair cables of 100Ω , augmented category 6 (Cat.6A).

- Applicable cable size & type ; 4 Pairs,  
 PVC sheath (CMX,CM,CMR) or LSZH sheath (IEC 60332-1, IEC 60332-3-22 & 24)

**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 Non-continuous Shield**

The non-continuous aluminum tape which is segmented each 2 meter periodic length shall be applied over the core wrapping to increase alien crosstalk performances.

**2.5 Sheath**

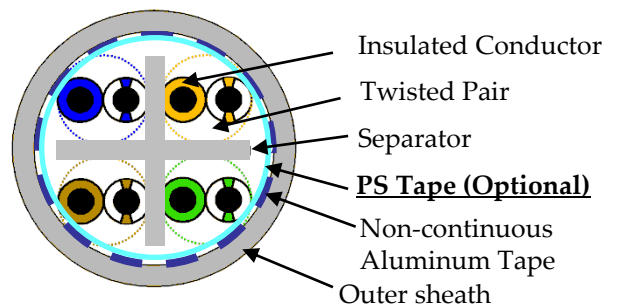
The flame retardant PVC or LSZH(Low Smoke Zero Halogen) compound colored grey or other colors shall be applied over the cable core.

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 (Nom. mm)	Cable diameter (Nom. mm)
0.45 ± 0.05	7.2 ± 0.2



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

### 3. ELECTRICAL CHARACTERISTICS

#### 3.1 Electrical Performances

Characteristics	units	Specification
DC Resistance	Ω/100m	≤ 9.38
DC Resistance Unbalance	%	≤ 5.00
Mutual Capacitance	nF/100m	≤ 5.60
Capacitance Unbalance (Pair to Ground)	pF/100m	≤ 330
Insulation Resistance	MΩ-100m	≥ 500
Dielectric Strength	DC kV/sec	2.5 / 2
Impedance (Characteristic mean)	Ω	100 ± 15% (1 ≤ f ≤ 500MHz)
Return Loss	dB/100m	≥ 20 + 5 * log(freq) , 1 ≤ f < 10MHz ≥ 25 , 10 ≤ f < 20MHz ≥ 25 - 7 * log(freq/20) , 20 ≤ f ≤ 500MHz
Attenuation (Insertion Loss)	dB/100m	≤ 1.82*√(freq) + 0.0091*(freq) + 0.25/√(freq) , 1 ~ 500 MHz
NEXT Loss	dB/100m	≥ 44.3 - 15*log(freq/100) , 1 ~ 500MHz
Power sum NEXT Loss	dB/100m	≥ 42.3 - 15*log(freq/100) , 1 ~ 500MHz
ELFEXT Loss	dB/100m	≥ 27.8 - 20*log(freq/100) , 1 ~ 500MHz
Power sum ELFEXT Loss	dB/100m	≥ 24.8 - 20*log(freq/100) , 1 ~ 500MHz
Power sum Alien NEXT Loss	dB/100m	≥ 62.5 - 15*log(freq/100) , Max. 67, 1 ~ 500MHz
Power sum Alien ELFEXT Loss	dB/100m	≥ 38.2 - 20*log(freq/100) , Max. 67, 1 ~ 500MHz
Propagation Delay	ns/100m	≤ 534 + 36 / √ (Freq) , 1 ~ 500MHz
Propagation Delay Skew	ns/100m	≤ 45 , 1 ~ 500MHz

Frequency (MHz)	Attenuation (dB/100m)	NEXT (dB/100m)	PSNEXT (dB/100m)	ELFEXT (dB/100m)	PSELFEXT (dB/100m)	RL (dB/100m)	PSANEXT (dB/100m)	PSAELFEXT (dB/100m)	PD (ns)	PD skew (ns)
1	2.1	74.3	72.3	67.8	64.8	20.0	67.0	67.0	570	45.0
4	3.8	65.3	63.3	55.8	52.8	23.0	67.0	66.2	552	45.0
8	5.3	60.8	58.8	49.7	46.7	24.5	67.0	60.1	547	45.0
10	5.9	59.3	57.3	47.8	44.8	25.0	67.0	58.2	545	45.0
16	7.5	56.2	54.2	43.7	40.7	25.0	67.0	54.1	543	45.0
20	8.4	54.8	52.8	41.8	38.8	25.0	67.0	52.2	542	45.0
25	9.4	53.3	51.3	39.8	36.8	24.3	67.0	50.2	541	45.0
31.25	10.5	51.9	49.9	37.9	34.9	23.6	67.0	48.3	540	45.0
62.5	15.0	47.4	45.4	31.9	28.9	21.5	65.6	42.3	539	45.0
100	19.1	44.3	42.3	27.8	24.8	20.1	62.5	38.2	538	45.0
200	27.6	39.8	37.8	21.8	18.8	18.0	58.0	32.2	537	45.0
250	31.1	38.3	36.3	19.8	16.8	17.3	56.5	30.2	536	45.0
300	34.3	37.1	35.1	18.3	15.3	16.8	55.3	28.7	536	45.0
400	40.1	35.3	33.3	15.8	12.8	15.9	53.5	26.2	536	45.0
500	45.3	33.8	31.8	13.8	10.8	15.2	52.0	24.2	536	45.0

\*Note) The values above table are provided for information only.

### **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 tensile strength and elongation, measured in accordance with clause 7.3 of UL 444 shall be minimum 16.5MPa and 300% , respectively.

The heat-aged tensile strength and elongation, measured in accordance with clause 7.3 of UL 444 shall be minimum 75% and 75% of un-aged , respectively.

The shrinkage of insulation , measured in accordance with clause 7.4 of UL 444 , shall not exceed 9.5mm.

The bending test of insulation at low temperature , measured in accordance with clause 7.5 of UL 444 , shall show no visible cracks.

### **4.2 Sheath**

The un-aged tensile strength and elongation of PVC sheath, measured in accordance with clause 7.8 of UL 444 shall be minimum 17.24MPa and 100%, respectively.

The heat-aged tensile strength and elongation of PVC sheath, measured in accordance with clause 7.8 of UL 444 shall be minimum 85% and 50% of un-aged, respectively.

The un-aged tensile strength and elongation of LSZH sheath, measured in accordance with clause 6.4.6 & 6.4.7 of IEC 61156-5 shall be minimum 9.0MPa and 100%, respectively.

The heat-aged tensile strength and elongation of LSZH sheath, 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 be complied with IEC 60754-2 and IEC 61034.

### **4.3 Cable Cold Bend**

All cables shall meet the requirements of clause 7.10 of UL 444.

### **4.4 Flame Requirements**

A cable marked CMX shall comply with the VW-1 flame test specified in section 1080 of UL 1581 or IEC 60332-1.

A cable marked CM shall comply with the vertical flame test specified in UL 1685 or IEC 60332-3-22 & 24

A cable marked CMR shall comply with the riser test specified in UL 1666.

## **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 a wooden reel or plastic reel with box.

### **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

- Specification End -

※ APPENDIX – PRODUCT PART NUMBER

Description	Part Number
Category 6A U/UTP 4Pair CMX	UTP-A-C6G-E1VF-X 0.5X004P/xx
Category 6 A U/UTP 4Pair CM	UTP-A-C6G-E1VF-M 0.5X004P/xx
Category 6 A U/UTP 4Pair CMR	UTP-A-C6G-E1VF-R 0.5X004P/xx
Category 6 A U/UTP 4Pair LSZH 60332-1	UTP-A-C6G-E1ZF-X 0.5X004P/xx
Category 6 A U/UTP 4Pair LSZH 60332-3-22 & 24	UTP-A-C6G-E1ZF-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	2011.01.28	T.W. Kim	K.H. Ha	Y.H. Lee	1. New specification
01	2011.08.30	K.H. Ha	T.W. Kim	Y.H. Lee	1. ANSI/TIA-568C.2 standard is applied 2. UL 444 Ed. 2008 is applied
02	2012.04.25	K.H. Ha	T.W. Kim	Y.H. Lee	1. Clause 4.4 Cable Cold Bend is changed. (Latest UL 444 standard is applied)
03	2012.07.05	D. W. Kang	T.W. Kim	Y.H. Lee	1. Added LSZH 332-3 product to Clause 1 2. Changed sheath thickness & OD deviation range, Clause 2.5 3. Added product part number to Appendix
04	2013.01.31	D. W. Kang	T.W. Kim	J.S. Baeck	1. Remove LSZH 332-3 product 2. Changed cross sectional diagram of cable (Fig.1)
05	2015.01.20	V.T.Nam	-	Y.J. Seo	1. Added LSZH IEC 60332-3-22 & 24 product to Clause 1 2. Added IEC 60332-3-22 & 24 to Clause 4.4 3. Added product part number to Appendix
06	2016.07.29	V.T.Nam	-	J.J.Kim	1. Changed the Outer Diameter