

TECHNICAL SPECIFICATION

LSSS-LN0052-06

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)

Prepared by : D. W. Kang
Kyung-ho, Ha
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 UL444, ANSI/TIA-568-C.2 and IEEE 802.3 and IEC 61156-5 Ed. 2.0 and covers the requirements for unshielded twisted pair (U/UTP) cables of 100Ω , augmented category 6 (Cat.6A).

- Applicable cable size & type ; 4 Pairs

PVC sheath (CMX,CM,CMR,CMP) or **LSZH sheath (332-1, 332-3)**

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 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 shape of sheath shall take inner jacket spacer to improve and satisfy the alien crosstalk.

The sheath shall be uniform and shall not have any defects.

The thickness of outer sheath, spacer and cable diameter shall be shown as table 2.

Table.2 thickness of sheath, spacer and cable diameter

Type	Outer Sheath Thickness (mm)	Jacket spacer Thickness (mm)	OD (mm)
CMP	0.45 ± 0.05	1.0 ± 0.1	8.5 ± 0.2
Others	0.5 ± 0.05	1.2 ± 0.1	8.8 ± 0.2

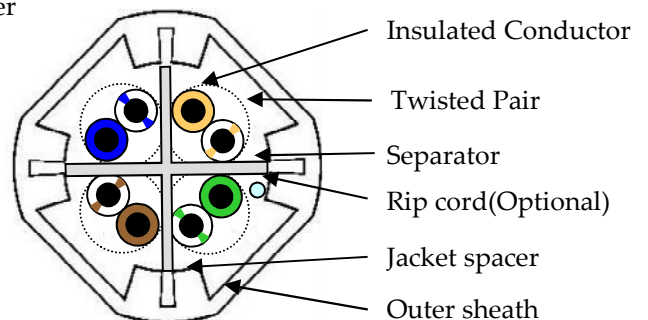


Fig 1. Cross Sectional Diagram of Cable

- 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	$\Omega/100\text{m}$	≤ 9.38
DC Resistance Unbalance	%	≤ 4.00
Mutual Capacitance	$\text{nF}/100\text{m}$	≤ 5.60
Capacitance Unbalance (Pair to Ground)	$\text{pF}/100\text{m}$	≤ 330
Insulation Resistance	$\text{M}\Omega\text{-}305\text{m}$	≥ 100
Dielectric Strength	DC kV/sec	2.5 / 2
Impedance (Characteristic mean)	Ω	$100 \pm 15\%$ ($1 \leq f \leq 500\text{MHz}$)
Return Loss	$\text{dB}/100\text{m}$	$\geq 20 + 5 * \log(\text{freq})$, $1 \leq f < 10\text{MHz}$ ≥ 25 , $10 \leq f < 20\text{MHz}$ $\geq 25 - 7 * \log(\text{freq}/20)$, $20 \leq f \leq 500\text{MHz}$
Attenuation (Insertion Loss)	$\text{dB}/100\text{m}$	$\leq 1.82*\sqrt{(\text{freq})} + 0.0091*(\text{freq}) + 0.25/\sqrt{(\text{freq})}$, $1 \sim 500 \text{MHz}$
NEXT Loss	$\text{dB}/100\text{m}$	$\geq 44.3 - 15*\log(\text{freq}/100)$, $1 \sim 500\text{MHz}$
Power sum NEXT Loss	$\text{dB}/100\text{m}$	$\geq 42.3 - 15*\log(\text{freq}/100)$, $1 \sim 500\text{MHz}$
ELFEXT Loss	$\text{dB}/100\text{m}$	$\geq 27.8 - 20*\log(\text{freq}/100)$, $1 \sim 500\text{MHz}$
Power sum ELFEXT Loss	$\text{dB}/100\text{m}$	$\geq 24.8 - 20*\log(\text{freq}/100)$, $1 \sim 500\text{MHz}$
Power sum Alien NEXT Loss	$\text{dB}/100\text{m}$	$\geq 62.5 - 15*\log(\text{freq}/100)$, Max. 67, $1 \sim 500\text{MHz}$
Power sum Alien ELFEXT Loss	$\text{dB}/100\text{m}$	$\geq 38.2 - 20*\log(\text{freq}/100)$, Max. 67, $1 \sim 500\text{MHz}$
Propagation Delay	$\text{ns}/100\text{m}$	$\leq 534 + 36 / \sqrt{(\text{Freq})}$, $1 \sim 500\text{MHz}$
Propagation Delay Skew	$\text{ns}/100\text{m}$	≤ 45 , $1 \sim 500\text{MHz}$
Nominal Velocity of Propagation	%	67

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 un-aged tensile strength and elongation of FEP insulation, measured in accordance with clause 7.3 of UL 444 shall be minimum 17.2MPa and 200%, 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.

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

A cable marked CMP shall comply with the CMP test specified in NFPA 262.

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.

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-E1VI-X 0.5X004P/xx
Category 6 A U/UTP 4Pair CM	UTP-A-C6G-E1VI-M 0.5X004P/xx
Category 6 A U/UTP 4Pair CMR	UTP-A-C6G-E1VI-R 0.5X004P/xx
Category 6 A U/UTP 4Pair CMP	UTP-A-C6G-F1VI-P 0.5X004P/xx
Category 6 A U/UTP 4Pair LSZH 332-1	UTP-A-C6G-E1ZI-X 0.5X004P/xx
Category 6 A U/UTP 4Pair LSZH 332-3	UTP-A-C6G-E1ZI-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	2007.01.05	T.W. Kim	B.C. Jung	J.S. Baeck	1. Issued
01	2008.09.09	T.W. Kim	J.S. Baeck	Min Son	1. Clause 2.4 : Cross or flat type separator applied 2. Clause 2.5 : Jacket spacer thickness (1.0 → 1.2) & cable diameter (8.5 → 8.8) changed 3. Clause 5.2.2 : Added cable packing plastic reel with box type
02	2010.01.26	K.H. Ha	T.W. Kim	Min Son	1. Clause 4 : Changed reference clause of UL 444
03	2010.07.22	K.H. Ha	T.W. Kim	Min Son	1. Reference standard changed (ANSI/TIA/EIA-568B.2-10 → ANSI/TIA/EIA-568-C.2)
04	2011.08.30	K.H. Ha	T.W. Kim	Y.H. Lee	1. LS Cable & System CI applied
05	2012.07.05	D. W. Kang	T.W. Kim	Y.H. Lee	1. Added LSZH 332-1, 332-3 product to Clause 1 & 4 2. Removed Flat filler of Fig.1 3. Changed sheath thickness & OD deviation range, Clause 2.5 4. Added product part number to Appendix
06	2013.11.14	D. W. Kang	T.W. Kim	J. S. Baeck	1. DC resistance changed to 4%