
Copper LAN Cable

1. SCOPE**1.1. Content**

This specification describes the general requirements for CommScope copper LAN cable.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. In the event of conflict between the requirements of this specification and the drawing or any CommScope documents listed below, the drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. CommScope® Documents

- A. Applicable Product Drawing
- B. EMS0092 Environmental Specifications for Enterprise Apparatus Products

2.2. Industrial Standards

- A. EN 50173-1 Information Technology; Generic Cabling Systems
- B. EN 50288 Multi-element metallic cables used in analogue and digital communication and control
- C. ISO/IEC 11801 Information technology – Generic Cabling for Customer Premises
- D. IEC 60332 Tests on electric and optical fiber cables under fire conditions – Test for vertical flame propagation for a single insulated wire or cable – Test for vertical flame spread of vertically-mounted bunches wires or cables.
- E. IEC 60754-1 Test on gases evolved during combustion of electric cables – Determination of the amount of halogen acid gas
- F. IEC 60754-2 Test of gases evolved during combustion of electric cables – Determination of degree of acidity of gases evolved during the combustion of materials taken from electric cables by measuring pH and conductivity.
- G. IEC 61034 Measurement of smoke density of cables burning under defined conditions
- H. IEC 61156 Multicore and symmetrical pair/quad cables for digital communications.
- I. RAL No 840-HR Colour register
- J. UL 444 section 6.7 Communications cables – Durability of printing
- K. ISO/IEC 14763-2 Information technology – Implementation and operation of customer premises cabling – Part 2: Planning and installation

3. REQUIREMENTS**3.1. Design and Construction**

The product shall be of design, construction and physical dimensions as specified on the applicable drawing.

3.2. Materials

- Materials shall be as specified on the applicable drawing.
- Product and processing shall be in accordance with CommScope requirements for environmental-related substances as per EMS0092.
- Cable jacket material is identified on the cable drawing. This material shall comply to the standards as mentioned in underneath table:

| <i>Jacket material</i> | <i>Fire rating</i> | <i>Toxicity</i> | <i>Acid gas</i> | <i>Smoke density</i> |
|------------------------|--------------------|-----------------|-----------------|----------------------|
| PVC | IEC 60332-1-2 | - | - | - |
| LSZH | IEC 60332-1-2 | IEC 60754-1 | IEC 60754-2 | IEC 61034-2 |
| LSFRZH | IEC 60332-3-24 | IEC 60754-1 | IEC 60754-2 | IEC 61034-2 |

3.3. Ratings

- Installation temperature: 0 to 50°C
- Operating temperature: -20 to 60°C

3.4. Transmission Performance

Transmission performance shall be according to ISO/IEC 11801, EN 50173-1 and standards listed in the table underneath.

| Category ⁽¹⁾ | Construction ⁽¹⁾ | IEC requirement ^{(2) (3) (6) (7) (8) (9)} | | EN requirement ^{(2) (3)} |
|-------------------------|-----------------------------|--|-------------|-----------------------------------|
| SOLID CABLE | | | | |
| 5 | UTP | ISO/IEC 11801 1 st Edition 1995 Cat5 | | - |
| 5e | UTP | IEC 61156-5 Cat 5e | | EN 50288-3-1 |
| | F/UTP | | | EN 50288-2-1 |
| | SF/UTP | | | |
| 6 | UTP | IEC 61156-5 Cat 6 | | EN 50288-6-1 |
| | U/FTP | | | EN 50288-5-1 |
| | F/UTP | | | |
| | F/FTP | | | |
| 6A | UTP | IEC 61156-5 Cat 6A | | EN 50288-11-1 |
| | F/UTP | | | EN 50288-10-1 |
| | F/FTP | | | |
| 7 | F/FTP | IEC 61156-5 Cat 7 | | EN 50288-4-1 |
| | S/FTP | | | |
| 7A | S/FTP | IEC 61156-5 Cat 7A | | EN 50288-9-1 |
| 1200MHZ | S/FTP | 22AWG | IEC 61156-7 | - |
| STRANDED CABLE | | | | |
| 5e | UTP | IEC 61156-6 Cat 5e | | EN 50288-3-2 |
| | F/UTP | | | EN 50288-2-2 |
| | SF/UTP | | | |
| 6 | UTP | IEC 61156-6 Cat 6 | | EN 50288-6-2 |
| 7 | S/FTP | IEC 61156-6 Cat 7 | | EN 50288-4-2 |
| 7A | S/FTP | IEC 61156-6 Cat 7A | | EN 50288-9-2 ⁽⁵⁾ |
| 1200MHZ | S/FTP | IEC 61156-6 Cat 7A ⁽⁴⁾ | | - |

NOTE⁽¹⁾

Cable Category and construction are indicated in Product Drawing NAME

NOTE⁽²⁾

In the event of conflict between IEC and EN requirements, IEC requirements shall take preference.

NOTE⁽³⁾

For Characteristic/Input Impedance [Z_0/Z_{in}] and Mean Z_0/Z_{in} , see Annex included in this document.

NOTE⁽⁴⁾

1200MHz S/FTP stranded cable is according to IEC 61156-6 Cat 7_A requirements. Values in the frequency range from 1000MHz up to 1200MHz should be according to the proper formulae of mentioned standard (extrapolated up to 1200MHz).

NOTE⁽⁵⁾

This standard is in draft status at the moment of editing this document.

NOTE⁽⁶⁾

Coupling attenuation parameter shall be according to requirements defined in IEC 61156-5 Ed.2.1 Dec'12 (solid cable) and IEC 61156-6 Ed.3.1 Dec'12 (stranded cable) according following table:

| Cable Construction/ Category | Cat 5e | Cat 6 | Cat 6A | Cat 7 | Cat 7 _A | 1200 |
|---------------------------------|---------|---------|---------|--------|--------------------|------------|
| UTP | --- | --- | --- | --- | --- | --- |
| U/FTP | Type II | Type II | Type Ib | --- | --- | --- |
| F/UTP | Type II | Type II | Type Ib | --- | --- | --- |
| SF/UTP | Type II | Type II | Type Ib | --- | --- | --- |
| F/FTP | --- | --- | Type Ib | Type I | --- | --- |
| S/FTP | --- | --- | Type Ib | Type I | Type I | Type I (*) |

Type I requirements 30 to 100MHz: >85dB

Type Ib requirements 30 to 100MHz: >70dB

Type II requirements 30 to 100MHz: >55dB

(*) For solid cables, according to requirements defined in IEC 61156-7 Ed1.1 Dec'12. For stranded cables, according to requirements defined in IEC 61156-6 Ed.3.1 Dec'12, extrapolated up to 1200MHz.

The absorbing clamp method, as defined in IEC 62153-4-5, is the preferred test methodology for coupling attenuation parameter.

NOTE⁽⁷⁾

Transfer impedance parameter shall be according to requirements defined in IEC 61156-5 Ed.2.1 Dec'12 (solid cable) and IEC 61156-6 Ed.3.1 Dec'12 (stranded cable) according following table:

| Cable Construction/Category | Cat 5e | Cat 6 | Cat 6A | Cat 7 | Cat 7A | 1200 |
|-----------------------------|----------|----------|----------|----------|---------|-------------|
| UTP | --- | --- | --- | --- | --- | --- |
| U/FTP | Grade II | Grade II | Grade II | --- | --- | --- |
| F/UTP | Grade II | Grade II | Grade II | --- | --- | --- |
| SF/UTP | Grade II | Grade II | Grade II | --- | --- | --- |
| F/FTP | --- | --- | Grade II | Grade II | --- | --- |
| S/FTP | --- | --- | Grade I | Grade I | Grade I | Grade I (*) |

(*) For solid cables, according to requirements defined in IEC 61156-7 Ed.1.1 Dec'12. For stranded cables, according to requirements defined in IEC 61156-6 Ed.3.1 Dec'12.

The "Short-Short without damping resistor method" (test method C), as defined in IEC 62153-4-3, is the preferred test methodology for transfer impedance parameter. Test method defined at EN 50289-01-06 can be used as alternative method.

NOTE⁽⁸⁾

TCL parameter shall be according to requirements defined in IEC 61156-5 Ed.2.1 Dec'12 (solid cable) and IEC 61156-6 Ed.3.1 Dec'12 (stranded cable) according following table:

| Cable Construction/Category | Cat 5e | Cat 6 | Cat 6A | Cat 7 | Cat 7A | 1200 |
|-----------------------------|----------|----------|----------|---------|---------|-------------|
| UTP | Level II | Level II | Level II | --- | --- | --- |
| U/FTP | Level II | Level II | Level II | --- | --- | --- |
| F/UTP | Level II | Level II | Level II | --- | --- | --- |
| SF/UTP | Level II | Level II | Level II | --- | --- | --- |
| F/FTP | --- | --- | Level I | Level I | --- | --- |
| S/FTP | --- | --- | Level I | Level I | Level I | Level I (*) |

(*) For solid cables, according to requirements defined in IEC 61156-7 Ed.1.1 Dec'12. For stranded cables, according to requirements defined in IEC 61156-6 Ed.3.1 Dec'12.

Segregation Class, according to IEC 14763-2 is defined according following table:

| Cable Construction/ Category | Cat 5e | Cat 6 | Cat 6A | Cat 7 | Cat 7A | 1200 |
|---------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| UTP | b/c/d ⁽³⁾ | b/c/d ⁽³⁾ | b/c/d ⁽³⁾ | b/c/d ⁽³⁾ | b/c/d ⁽³⁾ | b/c/d ⁽³⁾ |
| U/FTP | c ⁽²⁾ | c ⁽²⁾ | c ⁽²⁾ | --- | --- | --- |
| F/UTP | c ⁽²⁾ | c ⁽²⁾ | c ⁽²⁾ | --- | --- | --- |
| SF/UTP | c ⁽²⁾ | c ⁽²⁾ | c ⁽²⁾ | --- | --- | --- |
| F/FTP | --- | --- | c ⁽²⁾ | d ⁽¹⁾ | --- | --- |
| S/FTP | --- | --- | c ⁽²⁾ | d ⁽¹⁾ | d ⁽¹⁾ | d ⁽¹⁾ |

NOTE⁽⁹⁾

(1) Cables meeting the Type I coupling attenuation requirements of IEC 61156-5 and IEC 61156-6 meet segregation Class "d".

(2) Cables meeting the Type II coupling attenuation requirements of IEC 61156-5 and IEC 61156-6 meet segregation Class "c".

(3) Cables meeting the Level 2 TCL requirements of IEC 61156-5 and IEC 61156-6 meet segregation Class "b". These cables may deliver performance of segregation Class "c" or "d" provided that the following requirements are also met, according to IEC 14763-2:

- Class "c": TCL at (30 to 100MHz) $\geq 60 - 10 \cdot \log_{10}(\text{freq})$
- Class "d": TCL at (30 to 100MHz) $\geq 70 - 10 \cdot \log_{10}(\text{freq})$

Minimum separation, according to IEC 14763-2 is defined according following table:

| Segregation Class | Free space separation (mm) | Containment applied to information technology or mains power cabling | | |
|-------------------|----------------------------|--|---|---------------------------------|
| | | Open metallic containment (mm) | Perforated metallic containment ⁽¹⁾ (mm) | Solid metallic containment (mm) |
| d | 10 | 8 | 5 | 0 |
| c | 50 | 38 | 25 | 0 |
| b | 100 | 75 | 50 | 0 |
| a | 300 | 225 | 150 | 0 |

(1) The upper surface of installed cables shall be at least 10 mm below the top of the barrier

3.5. Physical & Esthetical Characteristics

- A. Stripability of the jacket: max. 80N to strip 50 mm of the jacket.
- B. Min. bending radius of the cable during installation: 8 x outer diameter
- C. Min. bending radius of the cable after installation: 4 x outer diameter
- D. Insulation colours shall be blue, orange, green, brown and white in accordance with IEC 60304. Coloured trace on white wires is optional.

| | |
|---------------|------------------|
| <i>Pair 1</i> | White and Blue |
| <i>Pair 2</i> | White and Orange |
| <i>Pair 3</i> | White and Green |
| <i>Pair 4</i> | White and Brown |

- E. Jacket colour shall be in accordance with RAL Colour register No 840-HR:

| <i>Cable colour</i> | <i>RAL</i> | <i>Cable colour</i> | <i>RAL</i> |
|---------------------|------------|---------------------|------------|
| Black | 9011 | Blue | 5012 |
| White | 9003 | Violet | 4005 |
| Brown | 8016 | Red | 3000 |
| Grey | 7035 | Orange | 2003 |
| Green | 6018 | Yellow | 1021 |

3.6. Cable Print Legend

COMMSCOPE ISO-EN COMPLIANT XXXXXX <basenr specific info> YYWW Z (SEQUENTIAL No) METER

- A. XXXXXX – is CommScope's manufacturing location.
- B. <basenr specific info> is described on the drawing of the relevant base number.
- C. YYWW is date code: YY - Year, WW – Week i.e.: 1321 = year 2013, week 21 (per specification 102-60)
- D. Z is manufacturing batch #.
- E. Sequential meter marking every meter. Sequential meter is not returned to zero for each length. Sequential meter accuracy to be $\pm 1\%$.
- F. Print legend shall be in capital characters, font 'Courier', font style 'Regular', character height:
 - 2,5 mm for cable $\varnothing < 5,5$ mm
 - 3,0 mm for cable $\varnothing \geq 5,5$ mm
- G. Print colour shall be white or yellow for black or brown jackets and shall be black for all other jacket colours.
- H. Print durability shall be per UL 444 section 6.7.

3.7. Packaging Length Tolerance

Tolerance applicable for different length should be as follow:

| <i>Length [meter]</i> | <i>Tolerance</i> |
|-----------------------|------------------|
| 305 | 0 + 6% |
| 500 | 0 + 4% |
| 1000 | 0 + 2% |

For any other non-specified length, the tolerance of the immediately lower length should be applied, for instance in case of 600 m, then 0 + 4% shall be applied.

3.8. Packaging and Labeling

Product should be delivered according to specified in drawing.

4. PRODUCT QUALIFICATION AND RE-QUALIFICATION TEST SEQUENCE

Quality provisions are based upon the philosophy of TQM (Total Quality Management) with a system approved to EN ISO 9001 by Lloyds Register Quality Assurance.

4.1. Responsibility for Quality

Unless otherwise stated in the customer order, it shall be CommScope's responsibility to assure qualification and lot conformance to this specification. CommScope may utilize its own or other testing and inspection facilities acceptable to the customer.

4.2. Qualification Conformance & Re-qualification Test Sequence

For the purposes of internal qualification, the program shall consist of:

A. Sample Selection

For each cable type, 3 samples of 110m of different date code shall be provided for qualification purpose. These samples shall comply with the requirements defined on the drawing and in this specification. Deviations in the cable jacket color and the cable print legend are accepted for qualification samples. Third party certificate can be accepted from an independent laboratory recognized by CommScope.

B. Re-qualification Testing

If changes - significantly affecting form, fit or function - are made to the product or manufacturing process, re-qualification testing shall be initiated, consisting of all or part of the original testing sequence as determined by CommScope.

5. REVISION SUMMARY

This paragraph is reserved for a revision summary of changes and additions made to this specification.

- Updated format and Company name.

ANNEX: Characteristic/Input Impedance [Z_o/Z_{in}] and Mean Z_o/Z_{in} considerations

| | | Test Parameter | |
|----------------------------|-----------------------|---|--|
| | | Characteristic/ Input Impedance⁽¹⁾ | Mean Characteristic/ Input Impedance |
| Test Requirement | Solid cable | Available limits from IEC 61156-5 Ed.2.1 Dec'12 | $100\Omega \pm 5\% @ 100\text{MHz}$ per IEC 61156-5 Ed.2.1 Dec'12 |
| | Stranded cable | Available limits from IEC 61156-6 Ed.3.1 Dec'12 | $100\Omega \pm 5\% @ 100\text{MHz}$ |
| Additional comments | | Upper and lower limits from IEC 61156-5 Ed. 1.0 Mar '02 and IEC 61156-6 Ed. 1.0 Mar 02 are considered ONLY for information. | -- |

NOTE⁽¹⁾

Due to test method followed by CommScope, obtained parameter is Input impedance instead of Characteristic impedance. In any case, the same requirement is applicable for both.