SLOVENSKI STANDARD
oSIST prEN 50288-10-1:2007

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Veį elementni kovinski kabli za analogne in digitalne komunikacije in krmiljenje - 10-1. del: Podroį na specifikacija za kable z zmogljivostmi do 500 MHz ï Hrbteniį ni kabli za vodoravno montaģo in montaģo v zgradbah

Multi-element metallic cables used in analogue and digital communication and control - Part 10-1: Sectional specification for cables characterized up to 500 MHz - Horizontal and building backbone cables

Mehradrige metallische Daten- und Kontrollkabel für analoge und digitale Übertragung - Teil 10-1: Rahmenspezifikation für Kabel bis 500 MHz - Horizontal- und Steigbereich

Câbles métalliques à éléments multiples utilisés pour les transmissions et les commandes analogiques et numériques - Partie 10-1: Spécification intermédiaire pour les câbles caractérisés jusqu'à 500 MHz - Câbles horizontaux et câbles verticaux de bâtiments

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ICS:

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ICS

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This draft European Standard is submitted to CENELEC members for CENELEC enquiry.
Deadline for CENELEC: 2007-09-07.

It has been drawn up by CLC/SC 46XC.

If this draft becomes a European Standard, CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

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Foreword

This draft European Standard was prepared by WG 2 of SC 46XC, Multicore, multipair and quad data communication cables, of Technical Committee CENELEC TC 46X, Communication cables. It is submitted to the CENELEC enquiry.

This Part 10-1 is to be read in conjunction with EN 50288-1:2003.

Contents

1 Scope

This sectional specification relates to EN 50288-1, *Multi-element metallic cables used in analogue and digital communication and control.*

It covers cables, characterised up to 500 MHz, to be used in horizontal floor and building backbone wiring for Information technology, Generic-cabling systems.

The electrical, mechanical, transmission and environmental performance characteristics of the cables, related to their reference test methods, are detailed.

This sectional specification is to be read in conjunction with EN 50288-1, which contains the essential provisions for its application.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 50289	Series	Communication cables - Specifications for test methods
EN 50290	Series	Communication cables

3 Definitions, symbols and abbreviations

For the purposes of this standard the definitions given in Clause 3 of EN 50288-1 apply.

Ex – Exogenous (derived or originating externally)

4 Cable construction

4.1 Conductor

The conductor shall be solid copper and meet the requirements of 4.1 of EN 50288-1. The conductor shall be plain or metal coated.

The nominal conductor diameter shall be ≥ 0,52 mm and ≤ 0,80 mm.

4.2 Insulation

The insulation shall be of a suitable material according to the appropriate part or EN 50290-2-23.

4.3 Cabling elements

The cable element shall be a pair or quad.

4.4 Identification of cabling elements

Unless otherwise specified, the colour coding for identification is given in IEC 60189-2 or IEC 60708-1, as appropriate. The colours shall meet the requirements of 4.4 of EN 50288-1.

4.5 Screening of cabling elements

Where appropriate, screening of the cabling elements shall be applied in accordance with 4.5 of EN 50288-1. When a braid is used the minimum braid coverage (for mechanical purposes) shall be 60 %. When a foil and braid are used the minimum braid coverage (for mechanical purposes) shall be 30 %. Coverage is defined in EN 50290-2-1.

4.6 Cable make-up

The cable elements shall be laid up in concentric layer(s) or units to form the cable core.

4.7 Filling compound

Not applicable.

4.8 Interstitial fillers

Where fillers are used they shall meet the requirements of 4.8 of EN 50288-1.

4.9 Screening of the cable core

The screening of the cable core shall be applied in accordance with 4.9 of EN 50288-1. When a braid is used the minimum braid coverage (for mechanical purposes) shall be 60 %. When a foil and braid are used, and/or where a foil is used over each cabling element, the minimum braid coverage (for mechanical purposes) shall be 30 %. Coverage is defined in EN 50290-2-1.

4.10 Moisture barriers

Not applicable.

4.11 Wrapping layers

Where wrapping layers are used they shall be in accordance with 4.11 of EN 50288-1.

4.12 Sheath

The sheath shall be of a suitable material according to the appropriate part of EN 50290-2.

5 Test methods and requirements for completed cables

The following tables give the tests to be applied, together with the respective limits, in order to demonstrate compliance with this specification.

5.1 Electrical tests

5.1.1 Low-frequency and d.c. electrical measurements

Table 1 - Low-frequency and d.c. electrical measurements

EN 50288-1 Clause	Parameter	Requirement
5.1.1.1	Conductor loop resistance	The maximum value shall be ≤ 19 Ω/100 m.
5.1.1.2	Conductor resistance unbalance	≤ 2 %
5.1.1.3	Dielectric strength conductor/conductor and conductor/screen	1,0 kV d.c. or 0,7 kV a.c. for 1 min or 2,5 kV d.c. or 1,7 kV ac. for 2 s
5.1.1.4	Insulation resistance	≥ 500 MΩ.km using (100-500) V test voltage
5.1.1.5	Mutual capacitance	No requirement specified
5.1.1.6	Capacitance unbalance to earth	≤ 1 200 pF/km

5.1.2 High-frequency electrical and transmission measurements

Table 2 - High-frequency electrical and transmission measurements

<table>
<tr><th>EN 50288-1 Clause</th><th>Parameter</th><th>Requirement</th></tr>
<tr><td>5.1.2.1</td><td>Velocity of Propagation</td><td>Phase Delay ≤ 534 + 36/√f ns/100 m, 1 MHz ≤ f ≤ 500 MHz</td></tr>
<tr><td>5.1.2.2</td><td>Propagation delay difference (skew)</td><td>≤ 40 ns/100 m at 100 MHz</td></tr>
<tr><td>5.1.2.3</td><td>Longitudinal Attenuation [b c f]</td><td><table><tr><td>1</td><td>4</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>200</td><td>300</td><td>500</td><td>MHz</td></tr><tr><td>2,0</td><td>3,7</td><td>5,9</td><td>7,4</td><td>8,3</td><td>10,4</td><td>14,9</td><td>19,0</td><td>26,5</td><td>27,5</td><td>34,2</td><td>45,2</td><td>dB/100 m</td></tr></table>α ≤ 1,8 √f + 0,01 f + 0,2/√f, 1 MHz ≤ f ≤ 500 MHz</td></tr>
<tr><td>5.1.2.5</td><td>Near-end Crosstalk (NEXT) [a b]</td><td><table><tr><td>1</td><td>4</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>200</td><td>300</td><td>500</td><td>MHz</td></tr><tr><td>66,0</td><td>65,3</td><td>59,3</td><td>56,2</td><td>54,8</td><td>51,9</td><td>47,4</td><td>44,3</td><td>41,4</td><td>39,8</td><td>37,1</td><td>33,8</td><td>dB</td></tr></table>≥ 74,3 – 15 logf 1 MHz < f ≤ 500 MHz (66 dB max.)</td></tr>
<tr><td>5.1.2.7.1</td><td>Power sum Near-end Crosstalk [a b] (PSNEXT)</td><td><table><tr><td>1</td><td>4</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>200</td><td>300</td><td>500</td><td>MHz</td></tr><tr><td>64,0</td><td>63,3</td><td>57,3</td><td>54,2</td><td>52,8</td><td>49,9</td><td>45,4</td><td>42,3</td><td>39,4</td><td>37,8</td><td>35,1</td><td>31,8</td><td>dB</td></tr></table>≥ 72,3 – 15 logf 1 MHz ≤ f ≤ 500 MHz (64 dB max.)</td></tr>
<tr><td>5.1.2.6</td><td>Equal Level Far-end Crosstalk [b d e] (ELFEXT)</td><td><table><tr><td>1</td><td>4</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>200</td><td>300</td><td>500</td><td>MHz</td></tr><tr><td>66,0</td><td>58,0</td><td>50,0</td><td>45,9</td><td>44,0</td><td>40,1</td><td>34,1</td><td>30,0</td><td>26,2</td><td>24,0</td><td>20,5</td><td>16,0</td><td>dB</td></tr></table>≥ 70 - 20 logf, 1 MHz ≤ f ≤ 500 MHz (66 dB max.), values referenced to 100 m</td></tr>
<tr><td>5.1.2.7.2</td><td>Power Sum Equal Level Far-end Crosstalk [b d e] (PSELFEXT)</td><td><table><tr><td>1</td><td>4</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>200</td><td>300</td><td>500</td><td>MHz</td></tr><tr><td>66,0</td><td>55,0</td><td>47,0</td><td>42,9</td><td>41,0</td><td>37,1</td><td>31,1</td><td>27,0</td><td>23,2</td><td>21,0</td><td>17,5</td><td>13,0</td><td>dB</td></tr></table>≥ 67 - 20 logf, 1 MHz ≤ f ≤ 500 MHz (66 dB max.), values referenced to 100 m
NOTE ExNext is removed as only PS is required.</td></tr>
<tr><td>5.1.2.7.4</td><td>Power Sum Exogenous Crosstalk PSExNEXT [b]</td><td><table><tr><td>1</td><td>4</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>200</td><td>300</td><td>500</td><td>MHz</td></tr><tr><td>75,0</td><td>75,0</td><td>75,0</td><td>75,0</td><td>75,0</td><td>74,6</td><td>70,1</td><td>67,0</td><td>64,2</td><td>62,5</td><td>60,0</td><td>56,5</td><td>dB</td></tr></table>≥ 97 - 15 logf, 1 MHz ≤ f ≤ 500 MHz (75 dB max.)
NOTE Exelfext removed as only PS is required.</td></tr>
</table>

Table 2 - High-frequency electrical and transmission measurements *(continued)*

<table>
<tr><th>EN 50288-1 Clause</th><th>Parameter</th><th>Requirement</th></tr>
<tr><td>5.1.2.7.6</td><td>Power Sum Exogenous Crosstalk PSExELFEXT [b c d]</td><td>
<table>
<tr><td>1</td><td>4</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>200</td><td>300</td><td>500</td><td>MHz</td></tr>
<tr><td>70,0</td><td>70,0</td><td>64,0</td><td>60,0</td><td>58,0</td><td>54,1</td><td>48,1</td><td>44,0</td><td>40,2</td><td>38,0</td><td>34,5</td><td>30,0</td><td>dB</td></tr>
</table>
≥ 84 - 20 logf, 1 MHz ≤ f ≤ 500 MHz(70 dB Maximum),
</td></tr>
<tr><td>5.1.2.8</td><td>Mean Characteristic Impedance</td><td>100 ± 5 Ω, at 100 MHz;</td></tr>
<tr><td>5.1.2.9</td><td>Return loss [a b f]</td><td>
<table>
<tr><td>4</td><td>8</td><td>10</td><td>16</td><td>20</td><td>31,25</td><td>62,5</td><td>100</td><td>155</td><td>250</td><td>300</td><td>500</td><td>MHz</td></tr>
<tr><td>23,1</td><td>24,5</td><td>25,0</td><td>25,0</td><td>25,0</td><td>23,6</td><td>21,5</td><td>20,1</td><td>18,8</td><td>17,3</td><td>17,3</td><td>17,3</td><td>dB</td></tr>
</table>
≥ 20 + 5 log (f), 4 MHz ≤ f ≤ 10 MHz; 25 dB, 10 MHz ≤ f < 20 MHz;
25 - 7 log (f/20), 20 MHz < f ≤ 250 MHz;17,3 dB, 250 MHz < f ≤ 500 MHz
</td></tr>
<tr><td>5.1.2.4</td><td>Near End Unbalance Attenuation</td><td>Level 1 ≥ 43 - 10 log(f) dB, 1 MHz ≤ f ≤ 500 MHz;
Level 2 ≥ 50 - 10 log(f) dB, 1 MHz ≤ f ≤ 500 MHz</td></tr>
<tr><td>5.1.2.10</td><td>Coupling attenuation [g]</td><td>Type 1 ≥ 85 - 20 log f/100 dB, 30 MHz ≤ f ≤ 100 MHz

Type 2 ≥ 55 - 20 logf/100 dB, 30 MHz ≤ f ≤ 100 MHz

Type 3 ≥ 40 - 20 logf/100 dB, 30 MHz ≤ f ≤ 100 MHz</td></tr>
<tr><td>5.1.2.11</td><td>Transfer impedance [g]</td><td>Grade 1 ≤ 10 mΩ/m at 1 MHz; ≤ 10 mΩ/m at 10 MHz;
≤ 30 mΩ/m at 30 MHz

Grade 2 ≤ 50 mΩ/m at 1 MHz; ≤ 100 mΩ/m at 10 MHz;
≤ 200 mΩ/m at 30 MHz</td></tr>
<tr><td>5.1.2.12</td><td>Screening attenuation</td><td>Grade 1 ≥ 60 dB, 30 MHz ≤ f ≤ 500 MHz;

Grade 2 ≥ 40 dB, 30 MHz ≤ f ≤ 500 MHz;</td></tr>
</table>

NOTE See also Table A.1, proposed table for data cable current, voltage and power ratings.

[a] For the measurement of RL the test sample having a round trip loss ≥ 40 dB at any measured frequency shall be used.

[b] The values in the table are for information only. The formula given shall be used to determine compliance, rounded to one decimal place.

[c] The attenuation shall meet values adjusted for temperature up to 60 °C with a temperature coefficient of 0,2 % per degree rise above 20 °C.

[d] No Measurement of ELFEXT and PSELFEXT is required when FEXT is above 70 dB.

[e] ELFEXT and PSELFEXT for cables complying with the requirements of this standard for screening attn, transfer impedance and NEXT values need not be measured and are for information only.

[f] Values between 1 MHz and 4 MHz are for information only.

[g] Not for UTP cables.

5.2 Mechanical tests

EN 50288-1 Clause	Parameter	Requirement
5.2.1	Conductor elongation at break EN 50289-3-2	≥ 10 %
5.2.2	Shrinkage of insulation EN 50289-3-4	≤ 5 %
5.2.3	Crush resistance of the cable EN 50289-3-5	1 000 N/1 min/100 mm Near end Crosstalk, Return Loss and Characteristic Impedance shall remain within the specified limits
5.2.4	Impact resistance of the cable EN 50289-3-6	12,5 mm radius/1J/3 impacts at 1 m from the measured end. Near end Crosstalk, Return Loss and Characteristic Impedance shall remain within the specified limits
5.2.5	Abrasion resistance of the sheath markings EN 50289-3-8	Marking shall remain legible
5.2.6	Simulated installation testing of the cable	
5.2.6.1	Simulated installation testing of the cable EN 50289-3-9 Clause 4	Single Bend 4xdia/10 turns/2 cycles Near end Crosstalk, Return Loss and Characteristic Impedance and Coupling Attenuation (u/c) shall remain within the specified limits
5.2.6.2	Simulated installation testing of the cable EN 50289-3-9 Clause 8	“S” Bend 8xdia/100 m/1 cycle/120 °/1 m/s Near end Crosstalk, Return Loss and Characteristic Impedance and Coupling Attenuation (u/c) shall remain within the specified limits
5.2.7	Tensile performance EN 50289-3-16 Combined with 5.2.6	Load shall be 25 N per pair (i.e.100 N 4 Pair). Near end Crosstalk, Return Loss and Characteristic Impedance and Coupling Attenuation (u/c) shall remain within the specified limits