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Multi-element metallic cables used in analogue and digital communication and control - Part 5-2: Sectional specification for screened cables characterized up to 250 MHz - Work area and patch cord cables

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EUROPEAN STANDARD **EN 50288-5-2**

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English version

Multi-element metallic cables used in analogue and digital communication and control Part 5-2: Sectional specification for screened cables characterized up to 250 MHz - Work area and patch cord cables

Câbles métalliques à éléments multiples utilisés pour les transmissions et les commandes analogiques et numériques
Partie 5-2: Spécification intermédiaire pour les câbles blindés pour applications jusqu'à 250 MHz - Câbles de zone de travail et de brassage

Mehradrige metallische Daten- und Kontrollkabel für analoge und digitale Übertragung
Teil 5-2: Rahmenspezifikation für geschirmte Kabel bis 250 MHz - Geräteanschlusskabel und Schaltkabel

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Lithuania, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and United Kingdom.

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

Ref. No. EN 50288-5-2:2003 E

Foreword

This European Standard was prepared by SC 46XC, Multicore, Multipair and Quad Data communication cables, of Technical Committee CENELEC TC 46X, Communication cables.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50288-5-2 on 2003-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2004-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2006-10-01

This Part 5-2 is to be read in conjunction with EN 50288-1.

Contents

1 Scope

This sectional specification covers screened cables, characterised up to 250 MHz, to be used as work area cables to connect a telecommunications outlet to the terminal equipment and for patch cord cables to establish connections on a patch panel as defined in EN 50173.

Work area cables may also be used as patch cord cables in any distributor of a generic building wiring system to interconnect with equipment or to cross-connect between cabling systems.

The electrical, mechanical, transmission and environmental performance characteristics of the screened 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

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the cited publications are listed hereafter. For dated references, subsequent amendments to or revisions of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

EN 50173		Information technology - Generic cabling systems
EN 50288-1		Generic specification for multi-element metallic cables used in analogue and digital communication and control
EN 50289	Series	Communication cables - Specifications for test methods
EN 50290	Series	Communication cables
IEC 60189-2		Low-frequency cables and wires with PVC insulation and PVC sheath - Part 2: Cables in pairs, triples, quads and quintuples for inside installations

3 Definitions

For the purposes of this European Standard the definitions of EN 50288-1 apply.

4 Cable construction

4.1 Conductor

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

The stranded conductor shall consist of seven wires each with a nominal diameter of ≥ 0,12 mm to ≤ 0,21 mm.

The solid conductor nominal diameter shall be ≥ 0,4 mm to ≤ 0,8 mm.

The conductor shall be plain or metal coated.

4.2 Insulation

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

4.3 Cabling elements

The cable element shall be a pair or a quad.

4.4 Identification of cabling elements

Unless otherwise specified, the colour coding for identification is given in IEC 60189-2. 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 relevant part of EN 50290-2.

5 Tests 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

EN 50288-1 Subclause no.	Parameter	Requirement
5.1.1.1	Conductor loop resistance	≤ 29,0 Ω/100 m
5.1.1.2	Conductor resistance unbalance	≤ 2,0 %
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 a.c. for 2 s
5.1.1.4	Insulation resistance	≥ 500 MΩ km using 100 V - 500 V test voltage
5.1.1.5	Mutual capacitance	No requirement specified
5.1.1.6	Capacitance unbalance to earth	≤ 1 600 pF/km

5.1.2 High-frequency electrical and transmission measurements

EN 50288-1 Subclause no.	Parameter	Requirement
5.1.2.1	Velocity of propagation	Phase delay ≤ 534+36/√f ns/100 m, 1 MHz ≤ f ≤ 250 MHz
5.1.2.2	Propagation delay difference (skew)	≤ 40 ns/100 m at 100 MHz
5.1.2.3	Longitudinal attenuation [2) 3) 4)]	1 | 4 | 10 | 16 | 20 | 31,25 | 62,5 | 100 | 155 | 200 | 250 | MHz 3,1 | 5,8 | 9,0 | 11,4 | 12,8 | 16,1 | 23,2 | 29,9 | 38,0 | 43,7 | 49,5 | dB/100m α ≤1,5(1,82√f+0,0169f+0,25/√f), 1 MHz ≤ f ≤ 250 MHz
5.1.2.5	Near-end crosstalk (NEXT) [1) 2)]	1 | 4 | 10 | 16 | 20 | 31,25 | 62,5 | 100 | 155 | 200 | 250 | MHz 66,0 | 65,3 | 59,3 | 56,2 | 54,8 | 51,9 | 47,4 | 44,3 | 41,4 | 39,8 | 38,3 | dB ≥ 74,3-15log(f), 1 MHz ≤ f ≤ 250 MHz (maximum 66 dB)
5.1.2.7.1	Power sum near-end crosstalk [2)] (PSNEXT)	1 | 4 | 10 | 16 | 20 | 31,25 | 62,5 | 100 | 155 | 200 | 250 | MHz 64,0 | 63,3 | 57,3 | 54,2 | 52,8 | 49,9 | 45,4 | 42,3 | 39,4 | 37,8 | 36,3 | dB ≥ 72,3-15log(f), 1 MHz ≤ f ≤ 250 MHz (maximum 64 dB)

<table>
<tr><th>EN 50288-1 Subclause no.</th><th>Parameter</th><th>Requirement</th></tr>
<tr><td>5.1.2.6</td><td>Equal level far-end crosstalk [2] (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>250</td><td>MHz</td></tr>
<tr><td>66,0</td><td>58,0</td><td>50</td><td>45,9</td><td>44</td><td>40,1</td><td>34,1</td><td>30</td><td>26,2</td><td>24,0</td><td>22,0</td><td>dB</td></tr>
</table>
≥ 70-20log(f), 1 MHz ≤ f ≤ 250 MHz (maximum 66 dB), values referenced to 100 m
</td></tr>
<tr><td>5.1.2.7.2</td><td>Power sum equal level Far-end crosstalk [2] (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>250</td><td>MHz</td></tr>
<tr><td>64,0</td><td>55,0</td><td>47,0</td><td>43,0</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>19,0</td><td>dB</td></tr>
</table>
≥ 67-20log(f), 1 MHz ≤ f ≤ 250 MHz (maximum 64 dB), values referenced to 100 m
</td></tr>
<tr><td>5.1.2.8</td><td>Mean characteristic impedance</td><td>100 ± 5 Ω, 120 ± 5 Ω, at 100 MHz</td></tr>
<tr><td>5.1.2.9</td><td>Return loss [2) 5)]</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>200</td><td>250</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>18,0</td><td>17,3</td><td>dB</td></tr>
</table>
≥ 20+5log(f), 4 MHz ≤ f ≤ 10 MHz; 25dB, 10 MHz < f ≤ 20 MHz; 25-7log(f/20), 20 MHz < f ≤ 250 MHz; f.f.s.
</td></tr>
<tr><td>5.1.2.4</td><td>Near-end unbalance attenuation</td><td>≥ 40-10log(f) dB, 1 MHz ≤ f ≤ 250 MHz; f.f.s</td></tr>
<tr><td>5.1.2.10</td><td>Coupling attenuation</td><td>≥ 55 dB, 30 MHz ≤ f ≤ 100 MHz f.f.s
≥ 55-20log(f/100) dB, 100 MHz < f ≤ 1 000 MHz f.f.s</td></tr>
<tr><td>5.1.2.11</td><td>Transfer impedance</td><td>≤ 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>≥ 40 dB, 30 MHz ≤ f ≤ 250 MHz f.f.s

NOTE Measured to 1 GHz.</td></tr>
</table>

[1)] For hybrid and multi-unit cables and cables, PSNEXT between all non fibre recognised cable units shall be 3 dB better than the specified pair to pair NEXT at all specified frequencies.

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

[3)] 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.

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

[5)] For the measurement of return loss a test sample having a round trip loss ≥ 40 dB at any measured frequency should be used.