
Multi-element metallic cables used in analogue and digital communication and control - Part 5-1: Sectional specification for screened cables characterized up to 250 MHz - Horizontal and building backbone cables

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English version

**Multi-element metallic cables used in analogue
and digital communication and control
Part 5-1: Sectional specification for screened cables
characterized up to 250 MHz -
Horizontal and building backbone cables**

Câbles métalliques à éléments multiples
utilisés pour les transmissions
et les commandes analogiques
et numériques

Partie 5-1: Spécification intermédiaire
pour les câbles blindés
pour applications jusqu'à 250 MHz

Câbles horizontaux et câbles verticaux
de bâtiment

Mehradrige metallische Daten-
und Kontrollkabel für analoge
und digitale Übertragung

Teil 5-1: Rahmenspezifikation
für geschirmte Kabel bis 250 MHz -
Kabel für den Horizontal-
und Steigbereich

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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

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

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1 Scope

This sectional specification covers screened cables, characterised up to 250 MHz, to be used in horizontal floor and building backbone wiring as defined in EN 50173.

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 <small>SIST EN 50288-5-1:2004</small>
EN 50290	Series	Communication cables <small>https://standards.iteh.ai/catalog/standards/sist/56026ee3-2fd8-4a46-91f6-468f734f1476/sist-en-50288-5-1-2004</small>
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 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 $\geq 0,5$ mm and $\leq 0,8$ mm.

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	$\leq 19,0 \Omega/100 \text{ m}$
5.1.1.2	Conductor resistance unbalance	$\leq 2,0 \%$
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	$\geq 500 \text{ M}\Omega \text{ km}$ using 100 V - 500 V test voltage
5.1.1.5	Mutual capacitance	No requirement specified
5.1.1.6	Capacitance unbalance to earth	$\leq 1600 \text{ pF/km}$

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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 $\leq 534+36/\sqrt{f}$ ns/100 m, $1 \text{ MHz} \leq f \leq 250 \text{ MHz}$																								
5.1.2.2	Propagation delay difference (skew)	$\leq 40 \text{ ns}/100 \text{ m}$ at 100 MHz																								
5.1.2.3	Longitudinal attenuation ^{2) 3) 4)}	<table border="1"> <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>2,1</td><td>3,8</td><td>6,0</td><td>7,6</td><td>8,5</td><td>10,8</td><td>15,5</td><td>19,9</td><td>25,3</td><td>29,1</td><td>33,0</td><td>dB/100 m</td> </tr> </table> $\alpha \leq 1,82\sqrt{f}+0,0169f+0,25/\sqrt{f}$, $1 \text{ MHz} \leq f \leq 250 \text{ MHz}$	1	4	10	16	20	31,25	62,5	100	155	200	250	MHz	2,1	3,8	6,0	7,6	8,5	10,8	15,5	19,9	25,3	29,1	33,0	dB/100 m
1	4	10	16	20	31,25	62,5	100	155	200	250	MHz															
2,1	3,8	6,0	7,6	8,5	10,8	15,5	19,9	25,3	29,1	33,0	dB/100 m															
5.1.2.5	Near-end crosstalk (NEXT) ^{1) 2)}	<table border="1"> <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>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>38,3</td><td>dB</td> </tr> </table> $\geq 74,3-15\log(f)$, $1 \text{ MHz} \leq f \leq 250 \text{ MHz}$ (maximum 66 dB)	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
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															

EN 50288-1 Subclause no.	Parameter	Requirement																								
5.1.2.7.1	Power sum near-end crosstalk ²⁾ (PSNEXT)	<table border="1" data-bbox="624 360 1485 479"> <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>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>36,3</td><td>dB</td> </tr> </table> <p data-bbox="624 495 1369 528">≥ 72,3-15log(f), 1 MHz ≤ f ≤ 250 MHz (maximum 64 dB)</p>	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
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															
5.1.2.6	Equal level far-end crosstalk ²⁾ (ELFEXT)	<table border="1" data-bbox="624 539 1485 658"> <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>50,0</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>22,0</td><td>dB</td> </tr> </table> <p data-bbox="624 674 1353 734">≥ 70-20log(f), 1 MHz ≤ f ≤ 250 MHz (maximum 66 dB), values referenced to 100 m</p>	1	4	10	16	20	31,25	62,5	100	155	200	250	MHz	66,0	58,0	50,0	45,9	44,0	40,1	34,1	30,0	26,2	24,0	22,0	dB
1	4	10	16	20	31,25	62,5	100	155	200	250	MHz															
66,0	58,0	50,0	45,9	44,0	40,1	34,1	30,0	26,2	24,0	22,0	dB															
5.1.2.7.2	Power sum equal level far-end crosstalk ²⁾ (PSELFEXT)	<table border="1" data-bbox="624 748 1485 866"> <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> <p data-bbox="624 882 1289 943">≥ 67-20log(f), 1 MHz ≤ f ≤ 250 MHz (maximum 64 dB), values referenced to 100 m</p>	1	4	10	16	20	31,25	62,5	100	155	200	250	MHz	64,0	55,0	47,0	43,0	41,0	37,1	31,1	27,0	23,2	21,0	19,0	dB
1	4	10	16	20	31,25	62,5	100	155	200	250	MHz															
64,0	55,0	47,0	43,0	41,0	37,1	31,1	27,0	23,2	21,0	19,0	dB															
5.1.2.8	Mean characteristic impedance	<p data-bbox="596 987 1059 1021">100 Ω ± 5 Ω, 120 Ω ± 5 Ω, at 100 MHz</p> <p data-bbox="596 1043 995 1093">iTech STANDARD PREVIEW (standards.itech.ai)</p>																								
5.1.2.9	Return loss ^{2) 5)}	<table border="1" data-bbox="624 1106 1485 1240"> <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> <p data-bbox="624 1256 1493 1317">≥ 20+5log(f), 4 MHz ≤ f ≤ 10 MHz; 25,0dB, 10 MHz < f ≤ 20 MHz; 25-7log(f/20), 20 MHz < f ≤ 250 MHz; f.f.s.</p>	4	8	10	16	20	31,25	62,5	100	155	200	250	MHz	23,1	24,5	25,0	25,0	25,0	23,6	21,5	20,1	18,8	18,0	17,3	dB
4	8	10	16	20	31,25	62,5	100	155	200	250	MHz															
23,1	24,5	25,0	25,0	25,0	23,6	21,5	20,1	18,8	18,0	17,3	dB															
5.1.2.4	Near-end unbalance attenuation	<p data-bbox="596 1346 1134 1379">≥ 40-10log(f) dB, 1 MHz ≤ f ≤ 250 MHz; f.f.s</p>																								
5.1.2.10	Coupling attenuation	<p data-bbox="596 1467 1050 1500">≥ 55 dB, 30 MHz ≤ f ≤ 100 MHz; f.f.s</p> <p data-bbox="596 1500 1230 1534">≥ 55-20log(f/100) dB, 100 MHz < f ≤ 1 000 MHz f.f.s</p>																								
5.1.2.11	Transfer impedance	<p data-bbox="596 1568 1201 1601">≤ 50 mΩ/m at 1 MHz; ≤100 mΩ/m at 10MHz;</p> <p data-bbox="596 1601 868 1635">≤200mΩ/m at 30 MHz</p>																								
5.1.2.12	Screening attenuation	<p data-bbox="596 1664 1070 1697">≥ 40 dB, 30 MHz ≤ f ≤ 250 MHz; f.f.s</p> <p data-bbox="596 1727 906 1760">NOTE Measured to 1 GHz.</p>																								
<p data-bbox="185 1783 1453 1843">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.</p> <p data-bbox="185 1850 1453 1910">²⁾ The values in the table are for information only. The formula given shall be used to determine compliance, rounded to one decimal place.</p> <p data-bbox="185 1917 1453 1977">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.</p> <p data-bbox="185 1984 911 2018">⁴⁾ Values between 1 MHz and 4 MHz are for information only.</p> <p data-bbox="185 2024 1453 2085">⁵⁾ For the measurement of return loss a test sample having a round trip loss ≥ 40 dB at any measured frequency should be used.</p>																										