

**SLOVENSKI STANDARD  
SIST EN 50288-2-1:2002****01-september-2002****BUXca Yý U  
SIST EN 50167:1996  
SIST EN 50169:1996**

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**Multi-element metallic cables used in analogue and digital communication and control - Part 2-1: Sectional specification for screened cables characterized up to 100 MHz - Horizontal and building backbone cables**

Multi-element metallic cables used in analogue and digital communication and control -- Part 2-1: Sectional specification for screened cables characterized up to 100 MHz - Horizontal and building backbone cables

Mehradrige metallische Daten- und Kontrollkabel für analoge und digitale Übertragung -- Teil 2-1: Rahmenspezifikation für geschirmte Kabel bis 100 MHz - Kabel für den Horizontal- und Steigbereich

Câbles métalliques à éléments multiples utilisés pour les transmissions et les commandes analogiques et numériques -- Partie 2-1: Spécification intermédiaire pour les câbles blindés pour applications jusqu'à 100 MHz - Câbles horizontaux et verticaux de bâtiment

**Ta slovenski standard je istoveten z: EN 50288-2-1:2001****ICS:**

33.120.20      ž ž ^ Á ä } ^ d ä } ä ä | ä      Wires and symmetrical cables

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EUROPEAN STANDARD

**EN 50288-2-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

February 2001

ICS 33.120.20

Supersedes EN 50167:1994 and EN 50169:1994

English version

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communication and control  
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This European Standard was approved by CENELEC on 1999-10-01. 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.

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, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, 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 50288-2-1 on 1999-10-01.

This European Standard supersedes EN 50167:1994 and EN 50169:1994

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) 2001-09-01
- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 2002-10-01

This part 2-1 is to be used in conjunction with EN 50288-1.

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## 1 Scope

This sectional specification covers cables, characterised up to 100 MHz, with an overall screen intended for 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, the generic specification for multi-element metallic cables used in analogue and digital communication and control, 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 publications are listed hereafter. For dated references, subsequent amendments to or revisions of any 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 publication referred to applies (including amendments).

EN 50173	Information technology - Generic cabling systems
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
IEC 60344	Guide to the calculation of resistance of plain and coated copper conductors of low-frequency cables and wires

## 3 Definitions

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

## 4 Cable construction

### 4.1 Conductor

The conductor shall be solid 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  $\geq 0,4$  mm and  $\leq 0,8$  mm.

### 4.2 Insulation

The insulation shall be either:

- polyolefin (polyethylene or polypropylene to the relevant parts of EN 50290-2), or
- low smoke zero halogen thermoplastic material to the relevant part of EN 50290-2.

The insulation shall meet the requirements of 4.2 of EN 50288-1.

### 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 coverage (for mechanical purposes) shall be 60%. When a foil and braid are used the minimum coverage (for mechanical purposes) shall be 40%.

### 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 coverage (for mechanical purposes) shall be 60%. When a foil and braid are used the minimum coverage (for mechanical purposes) shall be 40%.

### 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 consist of low smoke halogen free flame retardant thermoplastic material in accordance with the relevant part of EN 50290-2.

The sheath shall meet the requirements of 4.12 of EN 50288-1.

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## 5 Tests and requirements for completed cables

When tested as directed by EN 50288-1 the limits given in the tables of this standard shall apply.

### 5.1 Electrical tests

#### 5.1.1 Low-frequency and d.c. electrical measurements

EN 50288-1 clause no.	Parameter	Requirement
5.1.1.1	Conductor loop resistance	The maximum value shall be calculated in accordance with IEC 60344 and shall be $\leq 30 \Omega/100 \text{ m}$
5.1.1.2	Conductor resistance unbalance	$\leq 2\%$
5.1.1.3	Dielectric strength - conductor/conductor - conductor/screen	1 kV d.c. or 700 V 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	$\geq 500 \text{ M}\Omega \text{ km}$
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 clause no.	Parameter	Requirement																		
5.1.2.1	Velocity of propagation	$\geq 0,60$ c at 1 MHz $\geq 0,65$ c at 10 MHz $\geq 0,65$ c at 100 MHz																		
5.1.2.2	Propagation delay difference (skew)	Under consideration																		
5.1.2.3	Attenuation <sup>1)</sup>	<table border="1"> <thead> <tr> <th>1</th> <th>4</th> <th>10</th> <th>16</th> <th>20</th> <th>31,25</th> <th>62,5</th> <th>100</th> <th>MHz</th> </tr> </thead> <tbody> <tr> <td>2,1</td> <td>4,3</td> <td>6,6</td> <td>8,2</td> <td>9,2</td> <td>11,8</td> <td>17,1</td> <td>22,0</td> <td>dB/100m</td> </tr> </tbody> </table>	1	4	10	16	20	31,25	62,5	100	MHz	2,1	4,3	6,6	8,2	9,2	11,8	17,1	22,0	dB/100m
1	4	10	16	20	31,25	62,5	100	MHz												
2,1	4,3	6,6	8,2	9,2	11,8	17,1	22,0	dB/100m												
5.1.2.4	Attenuation unbalance, near end (LCL)	$\geq 40$ dB at 1 MHz $\geq 30$ dB at 10 MHz f.f.s $\geq 20$ dB at 100 MHz f.f.s																		
5.1.2.5	Near-end crosstalk <sup>2)</sup>	<table border="1"> <thead> <tr> <th>1</th> <th>4</th> <th>10</th> <th>16</th> <th>20</th> <th>31,25</th> <th>62,5</th> <th>100</th> <th>MHz</th> </tr> </thead> <tbody> <tr> <td>62</td> <td>53</td> <td>47</td> <td>44</td> <td>42</td> <td>40</td> <td>35</td> <td>32</td> <td>dB</td> </tr> </tbody> </table>	1	4	10	16	20	31,25	62,5	100	MHz	62	53	47	44	42	40	35	32	dB
1	4	10	16	20	31,25	62,5	100	MHz												
62	53	47	44	42	40	35	32	dB												
5.1.2.6	Far-end crosstalk	Under consideration																		
5.1.2.7	Power sum (PS) for cables or screened units of more than 4 pairs or 2 quads	Specified NEXT values shall be met using power summation																		
5.1.2.8	Characteristic impedance <sup>3)</sup>	<table border="1"> <thead> <tr> <th>Nominal Z</th> <th>100 <math>\Omega</math></th> <th>120 <math>\Omega</math></th> <th>150 <math>\Omega</math></th> </tr> </thead> <tbody> <tr> <td>input Z, 1-100 MHz</td> <td>(100<math>\pm</math>15)<math>\Omega</math></td> <td>(120<math>\pm</math>15)<math>\Omega</math></td> <td>(150<math>\pm</math>15)<math>\Omega</math></td> </tr> <tr> <td>mean Z, 10-100 MHz</td> <td>(100<math>\pm</math>10)<math>\Omega</math></td> <td>(120<math>\pm</math>10)<math>\Omega</math></td> <td>(150<math>\pm</math>10)<math>\Omega</math></td> </tr> </tbody> </table>	Nominal Z	100 $\Omega$	120 $\Omega$	150 $\Omega$	input Z, 1-100 MHz	(100 $\pm$ 15) $\Omega$	(120 $\pm$ 15) $\Omega$	(150 $\pm$ 15) $\Omega$	mean Z, 10-100 MHz	(100 $\pm$ 10) $\Omega$	(120 $\pm$ 10) $\Omega$	(150 $\pm$ 10) $\Omega$						
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mean Z, 10-100 MHz	(100 $\pm$ 10) $\Omega$	(120 $\pm$ 10) $\Omega$	(150 $\pm$ 10) $\Omega$																	
5.1.2.9	Return loss <sup>3)</sup>	$\geq 23$ dB from 10 MHz to 100 MHz																		
5.1.2.10	Coupling attenuation	$\geq 55$ dB from 30 MHz to $\leq 100$ MHz f.f.s $\geq 55 - 20\log_{10}(f/100)$ dB from $> 100$ MHz to 1000 MHz f.f.s																		
5.1.2.11	Transfer impedance <sup>4)</sup>	$\leq 50$ m $\Omega$ /m at 1,0 MHz $\leq 100$ m $\Omega$ /m at 10,0 MHz																		
5.1.2.12	Screening attenuation	$\geq 35$ dB up to 100 MHz f.f.s																		
<p>1) The attenuation shall be better than or equal to a curve fitting the specified values over the whole frequency range. Depending on the conductor size and cable impedance, improved performance cables are available for use, e.g. 7 x 0,2 mm 120 <math>\Omega</math> cable gives:</p> <table border="1"> <thead> <tr> <th>MHz</th> <th>1</th> <th>4</th> <th>10</th> <th>16</th> <th>20</th> <th>31,25</th> <th>62,5</th> <th>100</th> </tr> </thead> <tbody> <tr> <td>dB/100m</td> <td>2,4</td> <td>4,6</td> <td>7,0</td> <td>8,7</td> <td>10,0</td> <td>12,0</td> <td>16,5</td> <td>20,0</td> </tr> </tbody> </table>			MHz	1	4	10	16	20	31,25	62,5	100	dB/100m	2,4	4,6	7,0	8,7	10,0	12,0	16,5	20,0
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dB/100m	2,4	4,6	7,0	8,7	10,0	12,0	16,5	20,0												
<p>2) The near-end crosstalk shall be better than or equal to a curve fitting the specified values over the whole frequency range.</p>																				
<p>3) EITHER the input impedance shall be measured OR the mean impedance AND return loss shall be measured. For the measurement of return loss a test sample having a round trip loss <math>\geq 40</math> dB at any measured frequency shall be used.</p>																				
<p>4) It is anticipated that the values of transfer impedance at higher frequencies than specified will be covered by screening attenuation</p>																				

For hybrid and multi-unit cables and cables connected to multiple telecommunications outlets additional crosstalk considerations apply as described in 7.3 of EN 50173.