



BSI Standards Publication

Multi-element metallic cables used in analogue and digital communication and control

Part 11-2: Sectional specification for
un-screened cables, characterized from
1 MHz up to 500 MHz for work area,
patch cord and data centre applications

National foreword

This British Standard is the UK implementation of EN 50288-11-2:2015.

The UK participation in its preparation was entrusted to Technical Committee EPL/46, Cables, wires and waveguides, radio frequency connectors and accessories for communication and signalling.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2015.

Published by BSI Standards Limited 2015

ISBN 978 0 580 64595 2

ICS 33.120.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 September 2015.

Amendments/corrigenda issued since publication

Date	Text affected
-------------	----------------------

EUROPEAN STANDARD

EN 50288-11-2

NORME EUROPÉENNE

EUROPÄISCHE NORM

September 2015

ICS 33.120.10

English Version

Multi-element metallic cables used in analogue and digital communication and control - Part 11-2: Sectional specification for un-screened cables, characterized from 1 MHz up to 500 MHz for work area, patch cord and data centre applications

Câbles métalliques à éléments multiples utilisés pour les transmissions et les commandes analogiques et numériques - Partie 11-2: Spécification intermédiaire pour les câbles non écrantés, caractérisés de 1 MHz à 500 MHz
- Câbles horizontaux et câbles verticaux de bâtiment

Mehradrige metallische Daten- und Kontrollkabel für analoge und digitale Kommunikation - Teil 11-2: Rahmenspezifikation für ungeschirmte Kabel von 1 MHz bis 500 MHz für Geräteanschlusskabel, Schaltkabel und Anwendungen für Rechenzentren

This European Standard was approved by CENELEC on 2015-08-03. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents	Page
European foreword	3
1 Scope	4
2 Normative references	4
3 Terms, definitions, symbols and abbreviations	5
3.1 Terms and definitions.....	5
3.2 Symbols and abbreviations.....	5
4 Cable construction	5
4.1 Conductor.....	5
4.2 Insulation.....	5
4.3 Cabling elements.....	5
4.4 Identification of cabling elements.....	5
4.5 Screening of cabling elements.....	5
4.6 Cable make-up.....	5
4.7 Filling compound.....	6
4.8 Interstitial fillers.....	6
4.9 Screening of the cable core.....	6
4.10 Moisture barriers.....	6
4.11 Wrapping layers.....	6
4.12 Sheath.....	6
5 Test methods and requirements for completed cables	6
5.1 Electrical tests.....	6
5.2 Mechanical tests.....	10
5.3 Environmental tests.....	11
5.4 Fire performance tests.....	11
Annex A (informative) Maximum voltage, current and temperature rating for cables used for POE applications	12
Annex B (informative) Blank Detail Specification	13
B.1 General.....	13
B.2 Document Details.....	13
B.3 Generic specification EN 50288-1.....	14
Tables	
Table 1 – Low-frequency and d.c. electrical measurements.....	6
Table 2 – High-frequency electrical and transmission measurements.....	7
Table 3 – Mechanical test requirements.....	10
Table 4 – Environmental test requirements.....	11
Table A.1 – Maximum recommended voltage, current, current density and conductor temperature for cables when used for POE applications.....	12
Table B.1 – Blank detail specification for symmetrical pair/quad cables for digital communications.....	14

European foreword

This document (EN 50288-11-2:2015) has been prepared by CLC/SC 46XC "Multicore, multipair and quad data communication cables," of CLC/TC 46X, "Communication cables".

The following dates are fixed:

- latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2015-08-03
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2018-08-03

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This Part 11-2 is to be read in conjunction to EN 50288-1.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

This standard covers the Principle Elements of the Safety Objectives for Electrical Equipment Designed for Use within Certain Voltage Limits (LVD - 2006/95/EC).

1 Scope

This sectional specification covers un-screened cables, characterised from 1 MHz up to 500 MHz, to be used to construct cords for use in cabling specified in the EN 50173 series of standards.

The premises-specific cabling standards of the EN 50173 series reference the D1 requirements of this specification for the cable used within cords of the “reference implementations” of those standards. The alternative D2 requirements of this specification may be used to produce cords for other implementations and applications including the direct connection of equipment in data centres.

This sectional specification contains the electrical, mechanical, transmission and environmental performance characteristics and requirements of the cables when tested in accordance with the referenced test methods.

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

The cables covered in this sectional specification are intended to operate with voltages and currents normally encountered in communications systems. These cables are not intended to be used in conjunction with low impedance sources, for example the electrical power supplies of public utility mains.

2 Normative references

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

EN 50288-1:2013, *Multi-element metallic cables used in analogue and digital communication and control – Part 1: Generic specification*

EN 50289-3-2, *Communication cables – Specifications for test methods – Part 3-2: Mechanical test methods – Tensile strength and elongation for conductor*

EN 50289-3-4, *Communication cables – Specifications for test methods – Part 3-4: Mechanical test methods – Tensile strength, elongation and shrinkage of insulation and sheath*

EN 50289-3-5, *Communication cables – Specifications for test methods – Part 3-5: Mechanical test methods – Crush resistance of the cable*

EN 50289-3-6, *Communication cables – Specifications for test methods – Part 3-6: Mechanical test methods – Impact resistance of the cable*

EN 50289-3-8, *Communication cables – Specifications for test methods – Part 3-8: Mechanical test methods – Abrasion resistance of cable sheath markings*

EN 50289-3-9:2001, *Communication cables – Specifications for test methods – Part 3-9: Mechanical test methods – Bending tests*

EN 50289-3-16, *Communication cables – Specifications for test methods – Part 3-16: Mechanical test methods – Cable tensile performance*

EN 50289-4-6, *Communication cables – Specifications for test methods – Part 4-6: Environmental test methods – Temperature cycling*

EN 50290-2 series, *Communication cables – Part 2: Common design rules and construction*

EN 60708, *Low-frequency cables with polyolefin insulation and moisture barrier polyolefin sheath* (IEC 60708)

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 Terms, definitions, symbols and abbreviations

3.1 Terms and definitions

For the purposes of this document, the terms and definitions of EN 50288-1 apply.

3.2 Symbols and abbreviations

For the purposes of this document, the following abbreviations apply.

EX Exogenous (derived or originating externally)

POE Power Over Ethernet

4 Cable construction

4.1 Conductor

The conductor shall be solid or stranded annealed copper and meet the requirements of EN 50288-1:2013, 4.1

The solid conductor nominal diameter shall be $\geq 0,40$ mm and $\leq 0,80$ mm.

The stranded conductor shall consist of seven wires each with a nominal diameter of $\geq 0,10$ mm to $\leq 0,21$ mm.

NOTE Constructions with 'copper clad' conductors **do not** meet the requirements.

4.2 Insulation

The insulation shall be of a suitable material in accordance with the appropriate part of the EN 50290-2 series.

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 shall be as specified in IEC 60189-2 or EN 60708, as appropriate. The colours shall comply with the requirements of EN 50288-1:2013, 4.4.

4.5 Screening of cabling elements

Not applicable.

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 comply with the requirements of EN 50288-1:2013, 4.8.

4.9 Screening of the cable core

Not applicable.

4.10 Moisture barriers

Not applicable.

4.11 Wrapping layers

Where wrapping layers are used they shall comply with the requirements of EN 50288-1:2013, 4.11

4.12 Sheath

The sheath shall be of a suitable material and comply with the appropriate part of the EN 50290-2 series.

5 Test methods and requirements for completed cables

5.1 General

The following tables specify the tests that shall be applied to the completed cable, together with the requirements to demonstrate compliance with this sectional specification.

5.2 Electrical tests

5.2.1 Low-frequency and DC electrical measurements

Table 1 – Low-frequency and DC electrical measurements

EN 50288-1:2013 Sub-clause	Parameter	Requirement
5.1.1.1	Conductor loop resistance	(D1) $\leq 28,0 \Omega/100 \text{ m}$ (D2) $\leq 34,0 \Omega/100 \text{ m}$
5.1.1.2	Conductor resistance unbalance	$\leq 2\%$
	Pair resistance unbalance	$\leq 4\%$
5.1.1.3	Dielectric strength conductor/conductor	1,0 kV DC or 0,7 kV AC for 1 min or 2,5 kV DC or 1,7 kV AC for 2 s
5.1.1.4	Insulation resistance	$\geq 5\,000 \text{ M}\Omega \cdot \text{km}$ when tested in accordance with EN 50289-1-4
5.1.1.5	Mutual capacitance	No requirement specified
5.1.1.6	Capacitance unbalance to earth	$\leq 1\,200 \text{ pF/km}$

5.2.2 High-frequency electrical and transmission measurements

Table 2 – High-frequency electrical and transmission measurements

EN 50288-1:2013 Sub-Clause	Parameter	Requirement																										
5.1.2.1	Velocity of Propagation	Phase Delay $\leq 534 + 36/\sqrt{f}$ ns/100 m, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$																										
5.1.2.2	Propagation delay difference (skew)	≤ 45 ns/100 m at 100 MHz																										
5.1.2.3	D1 Longitudinal Attenuation ^{b, c, f, g, h}	<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>300</td><td>500</td><td>MHz</td> </tr> <tr> <td>2,9</td><td>5,5</td><td>8,5</td><td>10,8</td><td>12,1</td><td>15,2</td><td>21,7</td><td>27,8</td><td>35,0</td><td>40,1</td><td>49,9</td><td>66,2</td><td>dB/100 m</td> </tr> </table> $\alpha \leq 1,5 (1,82\sqrt{f} + 0,0091f + 0,25/\sqrt{f})$, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	2,9	5,5	8,5	10,8	12,1	15,2	21,7	27,8	35,0	40,1	49,9	66,2	dB/100 m
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
2,9	5,5	8,5	10,8	12,1	15,2	21,7	27,8	35,0	40,1	49,9	66,2	dB/100 m																
5.1.2.3.1	D2 Longitudinal attenuation ^{b, c, f, g, h}	<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>300</td><td>500</td><td>MHz</td> </tr> <tr> <td>3,6</td><td>6,7</td><td>10,6</td><td>13,5</td><td>15,2</td><td>19,1</td><td>27,6</td><td>35,6</td><td>45,3</td><td>52,3</td><td>65,9</td><td>88,8</td><td>dB/100 m</td> </tr> </table> $\alpha \leq 3,225\sqrt{f} + 0,0333f + 0,3/\sqrt{f}$, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	3,6	6,7	10,6	13,5	15,2	19,1	27,6	35,6	45,3	52,3	65,9	88,8	dB/100 m
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
3,6	6,7	10,6	13,5	15,2	19,1	27,6	35,6	45,3	52,3	65,9	88,8	dB/100 m																
5.1.2.4	Near End Unbalance Attenuation	Level 1 $\geq 40 - 10 \log f$ dB, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$ Level 2 $\geq 50 - 10 \log f$ dB, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$																										
5.1.2.5	Near-end Crosstalk (NEXT) ^b	<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>300</td><td>500</td><td>MHz</td> </tr> <tr> <td>75,3</td><td>66,3</td><td>60,3</td><td>57,2</td><td>55,8</td><td>52,9</td><td>48,4</td><td>45,3</td><td>42,4</td><td>40,8</td><td>38,1</td><td>34,8</td><td>dB</td> </tr> </table> $\geq 75,3 - 15 \log f$, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	75,3	66,3	60,3	57,2	55,8	52,9	48,4	45,3	42,4	40,8	38,1	34,8	dB
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
75,3	66,3	60,3	57,2	55,8	52,9	48,4	45,3	42,4	40,8	38,1	34,8	dB																
5.1.2.6	D1 Attenuation to crosstalk ratio at the far end ^{b, d} (ACR-F)	<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>300</td><td>500</td><td>MHz</td> </tr> <tr> <td>68,0</td><td>58,0</td><td>50,0</td><td>45,9</td><td>42,0</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> $\geq 68 - 20 \log f$, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$, values referenced to 100 m	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	68,0	58,0	50,0	45,9	42,0	40,1	34,1	30,0	26,2	24,0	20,5	16,0	dB
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
68,0	58,0	50,0	45,9	42,0	40,1	34,1	30,0	26,2	24,0	20,5	16,0	dB																
5.1.2.7.1	Power sum Near-end Crosstalk ^b (PSNEXT)	<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>300</td><td>500</td><td>MHz</td> </tr> <tr> <td>72,3</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> $\geq 72,3 - 15 \log f$, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	72,3	63,3	57,3	54,2	52,8	49,9	45,4	42,3	39,4	37,8	35,1	31,8	dB
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
72,3	63,3	57,3	54,2	52,8	49,9	45,4	42,3	39,4	37,8	35,1	31,8	dB																
5.1.2.7.2	Power Sum Attenuation to crosstalk ratio at the far end ^{b, d} (PSACR-F)	<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>300</td><td>500</td><td>MHz</td> </tr> <tr> <td>65,0</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> $\geq 65 - 20 \log f$, $1 \text{ MHz} \leq f \leq 500 \text{ MHz}$, values referenced to 100 m	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	65,0	55,0	47,0	42,9	41,0	37,1	31,1	27,0	23,2	21,0	17,5	13,0	dB
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
65,0	55,0	47,0	42,9	41,0	37,1	31,1	27,0	23,2	21,0	17,5	13,0	dB																

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

EN 50288-1:2013 Sub-clause	Parameter	Requirement																										
5.1.2.7.4	Power Sum Exogenous Crosstalk PSExNEXT ^{b, e}	<table border="1" data-bbox="582 450 1433 546"> <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>67,0</td><td>67,0</td><td>67,0</td><td>67,0</td><td>67,0</td><td>67,0</td><td>65,6</td><td>62,5</td><td>59,6</td><td>58,0</td><td>57,3</td><td>52,0</td><td>dB</td> </tr> </table> <p data-bbox="582 566 1193 600">≥ 92,5 - 15 log f, 1 MHz ≤ f ≤ 500 MHz (67 dB max.)</p>	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	67,0	67,0	67,0	67,0	67,0	67,0	65,6	62,5	59,6	58,0	57,3	52,0	dB
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
67,0	67,0	67,0	67,0	67,0	67,0	65,6	62,5	59,6	58,0	57,3	52,0	dB																
5.1.2.7.6	Power Sum Attenuation to crosstalk ratio at the far end Exogenous Crosstalk PSExACR-F ^{b, c, d, e}	<table border="1" data-bbox="582 654 1433 750"> <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>67,0</td><td>66,2</td><td>58,2</td><td>54,1</td><td>52,2</td><td>48,3</td><td>42,3</td><td>38,2</td><td>34,4</td><td>32,2</td><td>28,7</td><td>24,2</td><td>dB</td> </tr> </table> <p data-bbox="582 770 1414 831">≥ 78,2 - 20 log f, 1 MHz ≤ f ≤ 500 MHz (67 dB max.) values referenced to 100 m</p>	1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz	67,0	66,2	58,2	54,1	52,2	48,3	42,3	38,2	34,4	32,2	28,7	24,2	dB
1	4	10	16	20	31,25	62,5	100	155	200	300	500	MHz																
67,0	66,2	58,2	54,1	52,2	48,3	42,3	38,2	34,4	32,2	28,7	24,2	dB																
5.1.2.8	Mean Characteristic Impedance	(100 ± 5) Ω, at 100 MHz																										
5.1.2.9	Return loss ^{a, b, f}	<table border="1" data-bbox="582 1028 1433 1124"> <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>23,0</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> <p data-bbox="582 1144 1342 1234">≥ 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</p>	4	8	10	16	20	31,25	62,5	100	155	250	300	500	MHz	23,0	24,5	25,0	25,0	25,0	23,6	21,5	20,1	18,8	17,3	17,3	17,3	dB
4	8	10	16	20	31,25	62,5	100	155	250	300	500	MHz																
23,0	24,5	25,0	25,0	25,0	23,6	21,5	20,1	18,8	17,3	17,3	17,3	dB																
5.1.2.10	Coupling attenuation	<p data-bbox="582 1265 662 1294">Type II</p> <p data-bbox="582 1301 1145 1361">≥ 55 dB, 30 MHz ≤ f ≤ 100 MHz; ≥ 55-20 log (f/100) dB, 100 MHz ≤ f ≤ 500 MHz</p> <p data-bbox="582 1368 662 1397">Type III</p> <p data-bbox="582 1404 1145 1464">≥ 40 dB, 30 MHz ≤ f ≤ 100 MHz; ≥ 40-20 log (f/100) dB, 100 MHz ≤ f ≤ 500 MHz</p>																										
5.1.2.11	Transfer impedance	Not applicable																										
5.1.2.12	Screening attenuation	Not applicable																										

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

EN 50288-1 Sub-clause	Parameter	Requirement
NOTE See also Table A.1, proposed table for data cable current, voltage and power ratings.		
a		For the measurements 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 from 0,2% per degree rise from 20°C to 40°C and 0,4% per degree rise for the temperature range 40°C to 60°C.
d		No measurement of ACR-F and PSACR-F is required when FEXT is above 70 dB.
e		Values between 1 MHz and 4 MHz are for information only.
f		ELFEXT had been replaced by ACR-F.
g		Bundled cables have a greater attenuation, Maximum 10% increase
h		D1 meets the requirements of the "reference implementations" of the EN 50173 series. D2 provides an alternative performance for other cabling implementations including direct connection of equipment in data centres.

5.3 Mechanical tests

Table 3 – Mechanical test requirements

EN 50288-1:2013 Sub-clause	Parameter	Requirement
5.2.1	Conductor elongation at break EN 50289-3-2	≥ 8%
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 / 1 J / 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. 10 strokes Force: 4 N
5.2.6 ^a	Simulated installation testing of the cable	
5.2.6.1 ^a	Simulated installation testing of the cable EN 50289-3-9:2001, Clause 4 Procedure 2	"U" Bend 4 X diameter / 4 cycles Near end Crosstalk, Return Loss and Characteristic Impedance and Coupling Attenuation (u/c) shall remain within the specified limits.
5.2.6.2 ^a	Simulated installation testing of the cable EN 50289-3-9:2001, Clause 8 Procedure 2	"S" Bend 8 X diameter / 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 50 N per mm ² per conductor, max. 25N per pair. Near end Crosstalk, Return Loss and Characteristic Impedance and Coupling Attenuation (u/c) shall remain within the specified limits.
5.2.8	Flexing performance of the cable (only applicable for cables with stranded conductors for patch and work area) EN 50289-3-9:2001, Clause 5	Weight calculated/copper N, mandrel diameter 40 mm No. of cycles 100 Return loss, characteristic impedance and NEXT shall remain within the specified limits
^a Only applicable for cables with solid conductors for patch and work areas.		

5.4 Environmental tests

Table 4 – Environmental test requirements

EN 50288-1:2013 Sub-clause	Parameter	Requirement
5.3.1	Cold bend performance of the cable EN 50289-3-9	Mandrel diameter 8 X OD, No of turns: 4 Temperature: -20°C ± 2°C No cracks when examined visually without magnification
5.3.5	Temperature cycling EN 50289-4-6	The attenuation shall meet the adjusted values according to note ^c in Table 2 when subjected to 2 temperature cycles between 20°C and 60°C.
5.3.6	Hot shock test	As specified in EN 50290-2-27

5.5 Fire performance tests

Fire performance tests shall be conducted in accordance with EN 50288-1:2013, 5.4.

Annex A (informative)

Maximum voltage, current and temperature rating for cables used for POE applications

Table A.1 specifies the maximum recommended voltage, current density and conductor temperature for cables when used for POE applications.

Table A.1 – Maximum recommended voltage, current, current density and conductor temperature for cables when used for POE applications

Parameter	Unit	Requirement
Maximum communication service voltage ^a	V	100
Maximum current density	A/mm ²	3
Maximum short circuit power density for periods < 1 s	W/mm ²	350
Maximum service power density	W/mm ²	100
Maximum conductor surface temperature in service	°C	60
^a 300 V for Bell Voltage for some telephone installation is allowed.		

WARNING The maximum voltages, currents and temperatures shown in Table A.1 apply to cables specified in this European Standard which are intended to be used solely for communication technologies. The cables specified in this European Standard are **not intended** for and **shall not** be connected to and/or used on the mains utility electrical supply.

Annex B (informative)

Blank Detail Specification

B.1 General

Annex B is a Blank Detail Specification for un-screened work area, patch cord and data centre cables characterised from 1 MHz up to 500 MHz, for industrial or environmental demanding areas,. It covers cables for information technology generic cabling systems. The following pages detail the required information, which should be entered in the spaces provided.

B.2 Document Details

B.2.1 Name and address of the organisation that has prepared the document

B.2.2 EN document number, issue number and date of issue

B.2.3 Address of the organisation from which the document is available

B.2.4 Related documents

B.2.5 Any other reference to the cable, national reference, trade name, etc.

B.2.6 A complete description of the cable which shall include

B.2.6.1 type and number of elements;

B.2.6.2 nominal impedance;

B.2.6.3 screening;

B.2.6.4 application;

B.2.6.5 category, found in EN 50173;

B.2.6.6 other distinguishing performance characteristics.

EXAMPLE 4 pair, unshielded twisted pair cable for use in horizontal floor wiring, having a nominal impedance of 100 Ω , meeting the transmission requirements of Category 6, the coupling attenuation requirements of Type III and M₂.

B.2.7 Details of the cable material and construction

B.2.8 Special requirements for bending radius or operating temperatures.

B.2.9 List of cable characteristics. They are separated into electrical, transmission, mechanical and environmental characteristics.

NOTE 1 The recommended environmental severities are derived from the MICE table requirements of EN 50173-1. These recommendations were made to better reflect the cable behaviour.

NOTE 2 When these severities are noted "N/A" the cable is expected to meet the requirement of the related environment by design without the need to be tested.

NOTE 3 Ingress requirements using particles is not applicable to cable.

NOTE 4 Rapid change of temperature is irrelevant for cables.

NOTE 5 Electromagnetic requirements coming from the MICE table of EN 50173-1 have been dealt with by using the requirements that are given for Transfer impedance, Screening attenuation and coupling attenuation. ESD requirements are considered non-applicable.

B.3 Generic specification EN 50288-1

B.3.1 Appropriate sub clause references in the generic specification EN 50288-1

B.3.2 Requirements applicable to this cable. The values entered shall meet as a minimum the requirements of sectional specification EN 50288-11-2

B.3.3 Comments – Relevant remarks

Table B.1 – Blank detail specification for symmetrical pair/quad cables for digital communications

Cable construction	EN 50288-11-2:2015 sub-clause		
	4.1	Conductor description	
	4.2	Insulation description: Maximum diameter	
	4.3	Elements: (pair or quad)	
	4.4	Identification of cable elements:	
	4.5	Screening of the cable element: (screening elements, materials, construction)	
	4.6	Cable make-up: (number of cable elements, layers, etc)	
	4.7	Filling compounds:	
	4.8	Interstitial fillers:	
	4.9	Screen of the cable core: (screening elements, materials, construction)	
	4.10	Moisture barriers:	
	4.11	Protective wrappings:	
	4.12	Sheath: Material Nominal thickness Colour Maximum overall diameter	
	4.13	Bedding layers for metallic protection:	
	4.14	Metallic protection:	
	4.15	Cable integral suspension strand:	
	4.16	Oversheath: Material Nominal thickness Colour Maximum overall diameter	
	4.17	Fauna proofing	
	4.18	Chemical and/or environmental proofing:	

Table B.1 (continued)

Mechanical Parameters	EN 50288-1:2013 Sub-clause		
	5.2.1	Conductor elongation at break EN 50289-3-2	
	5.2.2	Shrinkage of insulation EN 50289-3-4	
	5.2.3	Crush resistance of the cable EN 50289-3-5	
	5.2.4	Impact resistance of the cable EN 50289-3-6	
	5.2.5	Abrasion resistance of the sheath markings EN 50289-3-8	
	5.2.6.1	Simulated installation testing of the cable "U" bend EN 50289-3-9:2001, Clause 4 Procedure 2	
	5.2.6.2	Simulated installation testing of the cable "S" bend EN 50289-3-9:2001, Clause 8 Procedure 2	
	5.2.7	Tensile performance EN 50289-3-16 combined with 5.2.6 of this standard	
Electrical Characteristics	EN 50288-1:2013 Sub-clause	Requirements	Comments
	5.1	All electrical characteristics at 20°C	
Conductor loop resistance	5.1.1.1	$\leq \dots \Omega/\text{km}$	
Conductor resistance unbalance (inside pair or quad)	5.1.1.2	$\leq \dots \%$	
Resistance unbalance between pairs		$\leq \dots \%$	
Dielectric strength:			
Conductor/conductor	5.1.1.3	$\dots \text{kV}$	
Conductor/screen	5.1.1.3	$\dots \text{kV}$	
Insulation resistance:			
Conductor/conductor	5.1.1.4	$\dots \text{M}\Omega/\text{km}$	
Conductor/screen	5.1.1.4	$\geq \dots \text{M}\Omega/\text{km}$	
Mutual capacitance	5.1.1.5	$\leq \dots \text{nF}/\text{km}$	
Capacitance unbalance to earth	5.1.1.6	$\leq \dots \text{pF}/\text{km}$	

Table B.1 (concluded)

Transmission characteristics	5.1	Relevant sectional specification for the office area are set (all electrical characteristics at 20°C) – only special agreed values are described in following sub clauses	
Velocity of propagation	5.1.2.1	$\geq \dots \text{ ns}/100 \text{ m at } f[\text{MHz}]$	
Propagation delay difference (skew)	5.1.2.2	$\leq \dots \text{ ns}/100 \text{ m at } f[\text{MHz}]$	
Longitudinal attenuation	5.1.2.3	$\leq \dots \text{ dB}/100 \text{ m at } f[\text{MHz}]$	
Temperature effects		$\leq \dots \text{ }^\circ\text{C}$	
Environmental effects		$\geq \dots \text{ } \%$	
Near-end unbalance attenuation	5.1.2.4	$\geq \dots \text{ dB at } f[\text{MHz}]$	
Power sum near-end crosstalk (PSNEXT)	5.1.2.7.1	$\geq \dots \text{ dB at } f[\text{MHz}]$	
Near-end crosstalk (NEXT)	5.1.2.5	$\geq \dots \text{ dB at } f[\text{MHz}]$	
Power sum equal level far-end crosstalk (PSELFEXT)	5.1.2.7.2	$\geq \dots \text{ dB at } f[\text{MHz}]$	
Equal level far-end crosstalk (ELFEXT)	5.1.2.6	$\geq \dots \text{ dB at } f[\text{MHz}]$	
Mean characteristic impedance	5.1.2.8	$\dots \Omega$	
Return loss	5.1.2.9	$\geq \dots \text{ dB at } f[\text{MHz}]$	
PSExNEXT	5.1.2.7.4	$\geq \dots \text{ dB at } f[\text{MHz}]$	
PSExACR-F	5.1.2.7.6	$\geq \dots \text{ dB at } f[\text{MHz}]$	
Screening characteristics (at 20 °C)	N/A		
Screening attenuation	N/A		
Transfer impedance	N/A		
Coupling attenuation	5.1.2.10	$\geq \text{ dB, } 30 \text{ MHz} \leq f \leq 100 \text{ MHz}$ $\geq \text{ dB} - 20 \log(f/100) \text{ dB,}$ $100 \text{ MHz} \leq f \leq 1\,000 \text{ MHz}$	

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

Useful Contacts:

Customer Services

Tel: +44 845 086 9001

Email (orders): orders@bsigroup.com

Email (enquiries): cservices@bsigroup.com

Subscriptions

Tel: +44 845 086 9001

Email: subscriptions@bsigroup.com

Knowledge Centre

Tel: +44 20 8996 7004

Email: knowledgecentre@bsigroup.com

Copyright & Licensing

Tel: +44 20 8996 7070

Email: copyright@bsigroup.com



...making excellence a habit.™