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Multicore and symmetrical pair/quad cables for digital communications to be used in harsh environments - Part 1: Generic specification (IEC 62012-1:2002)

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EUROPEAN STANDARD

**EN 62012-1**

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2002

ICS 33.120.20

English version

**Multicore and symmetrical pair/quad cables for digital communications  
to be used in harsh environments  
Part 1: Generic specification  
(IEC 62012-1:2002)**

Câbles multiconducteurs à paires  
symétriques et quartes pour transmission  
numérique utilisés en environnement  
difficile  
Partie 1: Spécification générique  
(CEI 62012-1:2002)

Mehradrige und symmetrische  
paar-/viererveilte Kabel  
für digitale Kommunikation  
zur Anwendung in rauher Umgebung  
Teil 1: Fachgrundspezifikation  
(IEC 62012-1:2002)

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This European Standard was approved by CENELEC on 2002-10-01. 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, Hungary, Iceland, Ireland, Italy, 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

The text of document 46C/503/FDIS, future edition 1 of IEC 62012-1, prepared by SC 46C, Wires and symmetric cables, of IEC TC 46, Cables, wires, waveguides, r.f. connectors, r.f. and microwave passive components and accessories, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 62012-1 on 2002-10-01.

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) 2003-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-10-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, B and ZA are normative and annexes C and D are informative.

Annex ZA has been added by CENELEC.

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## iTeh STANDARD PREVIEW

### Endorsement notice

The text of the International Standard IEC 62012-1:2002 was approved by CENELEC as a European Standard without any modification.

SIST EN 62012-1:2004

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60811-1-2	NOTE	Harmonized as EN 60811-1-2:1995 (not modified).
IEC 60811-3-1	NOTE	Harmonized as EN 60811-3-1:1995 (not modified).
IEC 60811-4-1	NOTE	Harmonized as EN 60811-4-1:1995 (not modified).
IEC 60811-4-2	NOTE	Harmonized as EN 60811-4-2:1999 (modified).

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## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

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).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60028	1925	International standard of resistance for copper	-	-
IEC 60050-701	- <sup>1)</sup>	International electrotechnical vocabulary - Chapter 701: Telecommunications, channels and networks	-	-
IEC 60050-704	- <sup>1)</sup>	Chapter 704: Transmission	-	-
IEC 60050-722	- <sup>1)</sup>	Chapter 722: Telephony	-	-
IEC 60068-2	Series	Environmental testing Part 2: Tests	EN 60068-2	Series
IEC 60189-1	1986	Low-frequency cables and wires with PVC insulation and PVC sheath Part 1: General test and measuring methods	-	-
IEC 60304	1982	Standard colours for insulation for low- frequency cables and wires	HD 402 S2	1984
IEC 60332-1	1993	Tests on electric cables under fire conditions Part 1: Test on a single vertical insulated wire or cable	- <sup>2)</sup>	-
IEC 60332-2	1989	Part 2: Test on a single small vertical insulated copper wire or cable	HD 405.2 S1 <sup>3)</sup>	1991
IEC 60332-3	Series	Part 3: Tests on bunched wires or cables	- <sup>4)</sup>	1993

<sup>1)</sup> Undated reference.

<sup>2)</sup> EN 50265-1:1998 and EN 50265-2-1:1998, which are related to IEC 60332-1:1993, apply.

<sup>3)</sup> HD 405.2 S1 is superseded by EN 50265-1:1998 and EN 50265-2-2:1998.

<sup>4)</sup> The series EN 50266, which is related to the series IEC 60332-3, applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60754-1	- <sup>1)</sup>	Test on gases evolved during combustion of materials from cables Part 1: Determination of the amount of halogen acid gas	- <sup>5)</sup>	-
IEC 60811-1-1	1993	Insulating and sheathing materials of electric and optical cables - Common test methods Part 1-1: General application - Measurement of thickness and overall dimensions - Tests for determining the mechanical properties	EN 60811-1-1	1995
IEC 60811-1-3	1985	Common test methods for insulating and sheathing materials of electric cables Part 1: Methods for general application - Section 3: Methods for determining the density - Water absorption tests - Shrinkage test	HD 505.1.3 S2 <sup>6)</sup>	1991
IEC 60811-1-4	1985	Insulating and sheathing materials of electric and optical cables - Common test methods Part 1-4: General application - Tests at low temperature	EN 60811-1-4 <sup>7)</sup>	1995
IEC 61034-1	- <sup>1)</sup>	Measurement of smoke density of cables burning under defined conditions Part 1: Test apparatus	- <sup>8)</sup>	-
IEC 61034-2	- <sup>1)</sup>	Part 2: Test procedure and requirements	- <sup>9)</sup>	-

<sup>5)</sup> EN 50267-1:1998 and EN 50265-7-1:1998, which are related to IEC 60754-1:1994, apply.

<sup>6)</sup> HD 505.1.3 S2 is superseded by EN 60811-1-3:1995, which is based on IEC 60811-1-3:1993.

<sup>7)</sup> EN 60811-1-4 includes corrigendum May 1986 + A1:1993 to IEC 60811-1-4.

<sup>8)</sup> EN 50268-1:1999, which is related to IEC 61034-1:1997, applies.

<sup>9)</sup> EN 50268-2:1999, which is related to IEC 61034-2:1997, applies.

NORME  
INTERNATIONALE  
INTERNATIONAL  
STANDARD

CEI  
IEC

62012-1

Première édition  
First edition  
2002-06

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**Câbles multiconducteurs à paires symétriques  
et quartes pour transmissions numériques  
utilisés en environnements sévères –**

**Partie 1:**

**Spécification générique**

(standards.iteh.ai)

**Multicore and symmetrical pair/quad cables  
for digital communications to be used in  
harsh environments –**

**Part 1:**

**Generic specification**

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS TO BE USED IN HARSH ENVIRONMENTS –****Part 1: Generic specification**

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 62012-1 has been prepared by subcommittee 46C: Wires and symmetric cables, of IEC technical committee 46: Cables, wires, waveguides, RF connectors, RF and microwave passive components and accessories.

This bilingual version (2004-02) replaces the English version (2002-06).

The text of this standard is based on the following documents:

FDIS	RVD
46C/503/FDIS	46C/535/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The French version of this standard has not been voted upon.

This standard constitutes Part 1 of the IEC 62012 series, published under the general title *Multicore and symmetrical pair/quad cables for digital communications to be used in harsh environments*.

Part 2 is currently in preparation.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2007. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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## INTRODUCTION

The cables used for customer premises cabling or other IT cabling may have to work in harsh environments. This can be in case of fire but also due to conditions of installation in industrial plant. This standard will be supplemented by sectional specifications addressing a particular function as defined in 1.4. Detail specifications will refer to one or several sectional specifications depending upon the actual design of the cable.

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# MULTICORE AND SYMMETRICAL PAIR/QUAD CABLES FOR DIGITAL COMMUNICATIONS TO BE USED IN HARSH ENVIRONMENTS –

## Part 1: Generic specification

### 1 General

#### 1.1 Scope

This part of IEC 62012 specifies the definitions and test methods, when used in harsh environment, of symmetrical pair and quad cables used in digital communication systems such as ISDN, local area networks and data communication systems. This standard gives guidance concerning the design and testing of these cables.

#### 1.2 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.

IEC 60028:1925, *International Standard of resistance for copper*

IEC 60050(701), *International Electrotechnical Vocabulary (IEV) – Chapter 701: Telecommunications, channels and networks*

IEC 60050(704), *International Electrotechnical Vocabulary (IEV) – Chapter 704: Transmission*

IEC 60050(722), *International Electrotechnical Vocabulary (IEV) – Chapter 722: Telephony*

IEC 60068-2 (all parts), *Environmental testing – Part 2: Tests*

IEC 60189-1:1986, *Low-frequency cables and wires with PVC insulation and PVC sheath – Part 1: General test and measuring methods*

IEC 60304:1982, *Standard colours for insulation for low-frequency cables and wires*

IEC 60332-1:1993, *Tests on electric cables under fire conditions – Part 1: Test on a single vertical insulated wire or cable*

IEC 60332-2:1989, *Tests on electric cables under fire conditions – Part 2: Test on a single small vertical insulated copper wire or cable*

IEC 60332-3 (all parts), *Tests on electric cables under fire conditions – Part 3: Tests on bunched wires or cables*

IEC 60754-1, *Test on gases evolved during combustion of materials from cables – Part 1: Determination of the amount of halogen acid gas*

IEC 60811-1-1:1993, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section 1: Measurement of thickness and overall dimensions – Tests for determining the mechanical properties*

IEC 60811-1-3:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Three: Methods for determining the density – Water absorption tests – Shrinkage test*

IEC 60811-1-4:1985, *Common test methods for insulating and sheathing materials of electric cables – Part 1: Methods for general application – Section Four: Tests at low temperature*

IEC 61034-1, *Measurement of smoke density of cables burning under defined conditions – Part 1: Test apparatus*

IEC 61034-2, *Measurement of smoke density of cables burning under defined conditions – Part 2: Test procedure and requirements*

### 1.3 Definitions

For the purposes of this document, the definitions given in IEC 60050-701, IEC 60050-704, IEC 60050-722 and IEC 61156-1 apply.

### 1.4 Environmental considerations

The cables shall be designed to perform in one or more of the following environmental condition.

It is the intention of this standard that any cables defined as compliant with one or more of the categories referred to in definitions of 1.3 shall also be compliant with the electrical, mechanical and environmental requirement given below when tested in accordance with Clauses 3 and 4.

#### 1.4.1 Fire resistance

When subjected to fire according to the test described in 3.4.6, the cables shall be capable of transmitting the expected signal with or without degradation as described in the detail specification.

#### 1.4.2 Temperature

When subjected to temperature according to the test described in 3.5, the cables shall be capable of transmitting the expected signal with or without degradation as described in the detail specification.

#### 1.4.3 Nuclear radiations ( $\alpha$ , $\beta$ , $\gamma$ )

When subjected to radiations according to the test described in 3.7, the cables shall be capable of transmitting the expected signal with or without degradation as described in the detail specification.

#### 1.4.4 Chemical

When subjected to chemical agents accordingly to the test described in 3.6, the cables shall be capable of transmitting the expected signal with or without degradation as described in the detail specification.

## 2 Materials and cable construction

### 2.1 General remarks

The choice of materials and cable construction shall be suitable for the intended application and installation of the cable.

### 2.2 Cable construction

The cable construction shall be in accordance with the details and dimensions given in the relevant detail cable specification.

#### 2.2.1 Conductor

The conductor may be either solid or stranded. The solid conductor shall be circular in section and may be plain or metal-coated. Normally, the solid conductor shall be drawn in one piece. Joints in the solid conductor are permitted, provided that the tensile strength of a joint is not less than 85 % of the unjointed solid conductor.

When the conductor consists of annealed copper, it shall be uniform in quality and free from defects. The properties of the copper shall be in accordance with IEC 60028.

The stranded conductor shall consist of strands circular in section and assembled without insulation between them by concentric stranding or bunched.

The individual strands of the conductor may be plain or metal-coated.

Normally, the individual strands shall be drawn in one piece. Joints in individual strands are permitted provided that the tensile strength of a joint is not less than 85 % of the tensile strength of the unjointed individual strand. Joints in the complete stranded conductor are not permitted unless allowed and specified in the relevant detail cable specification.

#### 2.2.2 Insulation

Conductor insulation shall be composed of one or more suitable dielectric materials. The insulation may be solid, cellular or composite (e.g. foam skin)

The insulation shall be continuous, having a thickness as uniform as possible.

The insulation shall be applied to fit closely to the conductor. The stripping properties of the insulation shall be checked in accordance with the method specified in 3.4 of IEC 60189-1. It shall be possible to strip the insulation from the conductor easily and without damage to the conductor.

When required the insulated conductors shall be coloured for identification. Colours shall correspond reasonably with the standard colours shown in IEC 60304.

#### 2.2.3 Colour code

The colour code for insulation is given in the relevant detail cable specification

#### 2.2.4 Cable element

The cable element is

- a single insulated conductor, or