

# SLOVENSKI STANDARD

## SIST HD 21.1 S4:2003

01-februar-2003

Nadomešča:  
SIST HD 21.1 S3:1998

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**Kabli s polivinilkloridno izolacijo za naznačene napetosti do vključno 450/750 V - 1. del: Splošne zahteve**

Cables of rated voltages up to and including 450/750 V and having thermoplastic insulation - Part 1: General requirements

Starkstromleitungen mit thermoplastischer Isolierhülle für Nennspannungen bis 450/750 V - Teil 1: Allgemeine Anforderungen

Conducteurs et câbles isolés avec des matériaux thermoplastiques de tension assignée au plus égale à 450/750 V - Partie 1: Prescriptions générales

**Ta slovenski standard je istoveten z: HD 21.1 S4:2002**

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HARMONIZATION DOCUMENT

**HD 21.1 S4**

DOCUMENT D'HARMONISATION

HARMONISIERUNGSDOKUMENT

November 2002

ICS 29.060.20

Supersedes HD 21.1 S3:1997

English version

**Cables of rated voltages up to and including 450/750 V  
and having thermoplastic insulation  
Part 1: General requirements**

Conducteurs et câbles isolés  
avec des matériaux thermoplastiques  
de tension assignée au plus égale  
à 450/750 V  
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Starkstromleitungen mit thermoplastischer  
Isolierhülle für Nennspannungen  
bis 450/750 V  
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This Harmonization Document was approved by CENELEC on 2002-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document on a national level.

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

This Harmonization Document exists in three official versions (English, French, German).

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

This edition 4 of HD 21.1 has been prepared by the Technical Committee CENELEC TC 20, Electric cables.

HD 21 was originally adopted by CENELEC on 9th July 1975.

Edition 2 of HD 21 was implemented on 1st January 1984. A third edition of Part 1 was published in September 1997.

This 4<sup>th</sup> edition provides a full updating, including incorporation of amendments ratified during the maintenance of Part 3 onwards of HD 21, and introduces other improvements.

HD 21.1 S4 is related to IEC 60227-1:1993, but is not directly equivalent.

HD 21 now has the following parts:

HD 21.1 S4	General requirements
HD 21.2 S3	Test methods
HD 21.3 S3	Non sheathed cables for fixed wiring
HD 21.4 S2	Sheathed cables for fixed wiring (Reprint)
HD 21.5 S3	Flexible cables (cords)
HD 21.6	(Spare)
HD 21.7 S2	Single core non-sheathed cables for internal wiring for a conductor temperature of 90 °C
HD 21.8 S2	Single core non-sheathed cables for decorative chains (with A1 inclusive)
HD 21.9 S2	Single core non-sheathed cable for installation at low temperatures
HD 21.10 S2	Extensible leads
HD 21.11 S1	Cables for luminaires
HD 21.12 S1	Heat-resistant flexible cables (cords)
HD 21.13 S1	Oil resistant PVC sheathed cables with two or more conductors
HD 21.14 S1	Flexible cables (cords), insulated and sheathed with halogen-free thermoplastic compounds

In order that this revision of Part 1 of HD 21 does not introduce unnecessary changes to long-established clause numbers, the normative references (which would otherwise be inserted as clause 2 are given in annex A.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as HD 21.1 S4 on 2002-09-01.

The following dates were fixed:

-	latest date by which the existence of the HD has to be announced at national level	(doa)	2003-03-01
-	latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement	(dop)	2003-09-01
-	latest date by which the national standards conflicting with the HD have to be withdrawn	(dow)	2003-09-01

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

Annexes designated "informative" are given for information only.

In this standard, annex A is normative and annex B is informative.

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## 1 General

### 1.1 Scope

HD 21 applies to rigid and flexible cables with insulation and sheath, if any, based on thermoplastic materials, of rated voltages  $U_0/U$  up to and including 450/750 V, used in power installations.

NOTE For some types of flexible cables, the term "cord" is used.

This Part 1 specifies the General Requirements applicable to these cables.

The test methods specified are given in Part 2 of this Harmonisation Document (HD), or in the common test methods for cables given in EN 50265, EN 50267, EN 50268 and EN 60811.

The particular types of cables are specified in Part 3 onwards of this HD, which are hereafter referred to as "the particular specifications".

The code designations of these types of cables are in accordance with HD 361.

### 1.2 Object

The objects of this HD are to standardise cables and cords that are safe and reliable when properly used, to state the characteristics and manufacturing requirements directly or indirectly bearing on safety, and to specify methods for checking conformity with those requirements.

### 1.3 Common Marking

#### 1.3.1 General

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The Common Marking (<HAR>) signifies that the manufacturer has been assessed and his production is subjected to continuing surveillance in accordance with the technical procedures by a recognised national Approval Organisation which is a signatory to the "Agreement on the use of a Commonly Agreed Marking for Cables and Cords complying with Harmonised Specifications."

Compliance with this HD may be certified by the application of the agreed technical procedures for granting the Common Marking<sup>1)</sup>, which are the recognised means of ensuring that a manufacturer is competent and takes all reasonable care to produce cables complying with this HD.

The Common Marking may be used, under these conditions, by manufacturers in countries which have implemented this HD and in which the national Approval Organisations are signatories to the Agreement.

NOTE See annex B to Part 1 for guidance on national marking.

<sup>1)</sup> These are given in Appendices 4 and 5 of the 'Agreement on the use of a Commonly Agreed Marking for Cables and Cords complying with Harmonised Specifications'.

### 1.3.2 Extensible leads

For extensible leads the Common Marking, as defined in paragraph one of 1.3.1 is shown by a special mark (<HAR> COIL or <HAR> CCCCC) in association with the indication of origin.

This mark signifies that the coiling process has been carried out in a controlled manner and that the product will meet the requirements of this HD. The application of this additional mark also signifies that the producer of the extensible lead is subject to regular and systematic surveillance by a signatory to the agreement as a condition for use of that mark.

## 2 Definitions

### 2.1 Definitions relating to insulating and sheathing materials

#### 2.1.1

##### **type of compound**

the category in which a compound is placed according to its properties, and determined by specific tests. The type designation is not directly related to the composition of the compound

#### 2.1.2

##### **polyvinyl chloride compound (PVC)**

combinations of materials, of which polyvinyl chloride is the characteristic constituent, suitably selected, proportioned and treated which meet the requirements given in the particular specification

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### 2.2 Definitions relating to the tests

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[17d1-73643c98/sist-hd-21-1-s4-2003](https://standards.iteh.ai/catalog/standards/sist/16234e4a-6ea5-4a78-9195-17d1-73643c98/sist-hd-21-1-s4-2003)

#### 2.2.1 **type tests (Symbol T)**

tests required to be made before supplying a type of cable covered by this standard on a general commercial basis, in order to demonstrate satisfactory performance characteristics to meet the intended application. These tests are of such a nature that, after they have been made, they need not be repeated unless changes are made in the cable materials, design or type of manufacturing process which might change the performance characteristics

#### 2.2.2

##### **sample tests (Symbol S)**

tests made on samples of completed cable, or components taken from a completed cable adequate to verify that the finished product meets the design specifications

#### 2.2.3

##### **routine tests (Symbol R)**

tests made on all production cable lengths to demonstrate their integrity

### 2.3 Rated voltage

The rated voltage of a cable is the reference voltage for which the cable is designed, and which serves to define the electrical tests.

The rated voltage is expressed by the combination of two values  $U_0/U$ , expressed in volts:

$U_0$  being the r.m.s. value between any insulated conductor and "earth" (metal covering of the cable or the surrounding medium);

$U$  being the r.m.s. value between any two phase-conductors of a multicore cable or of a system of single-core cables.

In an alternating current system, the rated voltage of a cable shall be at least equal to the nominal voltage of the system for which it is intended.

This condition applies both to the value  $U_0$  and to the value  $U$ .

In a direct current system, the nominal voltage between conductors shall be not higher than 1,5 times the rated voltage ( $U$ ) of the cable, and the nominal voltage between any conductor and earth shall not be higher than 1,5 times the rated voltage ( $U_0$ ) of the cable.

NOTE The operating voltage of a system may permanently exceed the nominal voltage of such a system by 10 %. A cable can be used at a 10 % higher operating voltage than its rated voltage if the latter is at least equal to the nominal voltage of the system.

### 3 Marking

#### 3.1 Indication of origin

##### 3.1.1 General

Cables shall be provided with an identification of origin consisting of either

1. the manufacturer's identification thread, or
2. the continuous marking of the manufacturer's name or trademark, or (if legally protected) identification number, by one of the three following methods;

- a) printed tape within the cable;
- b) printing, indenting or embossing on the insulation of at least one core (the core coloured blue, if any)
- c) printing, indenting or embossing on the sheath, if any.

##### 3.1.2 Extensible leads

For extensible leads an additional mark of indication of origin shall be applied to identify the coiler. It shall consist of one of the following:

1. an additional embossed mark clearly discernible on the extensible part regardless of any additional processing such as the moulding on of a plug;
2. an additional moulded mark subject to the conditions as in 1 above;
3. the addition of a sleeve bearing a clear and indelible marking which shall remain identifiable during normal use and which shall not be removed during any further processing;
4. additional printing on the ends of the extensible lead, provided such marking shall not be obliterated during any subsequent processing and remains identifiable during normal use.



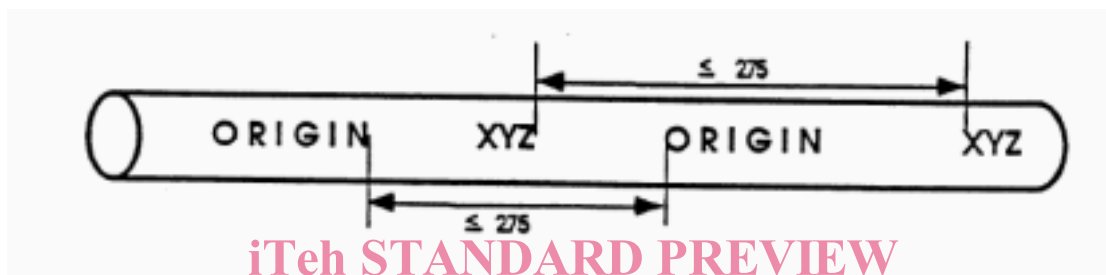
### 3.2 Continuity of marks

Each specified mark shall be regarded as continuous if the distance between the end of the mark and the beginning of the next identical mark does not exceed:

- 550 mm if the marking is on the outer sheath of the cable
- 275 mm if the marking is:
  - (i) on the insulation of an unsheathed cable,
  - (ii) on the insulation of a sheathed cable,
  - (iii) on a tape within a sheathed cable.

NOTE A 'Specified Mark' is any mandatory mark covered by this Part 1 of the HD or by the particular requirements of Part 3 onwards of this HD, or the optional Common Marking (<HAR>).

The diagram below shows an example of the marking as used on the insulation of an unsheathed cable.



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This requirement shall not apply to the additional marking for extensible leads described in 3.1.2 of this Part 1.

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### 3.3 Durability

Printed markings shall be durable. Compliance with this requirement shall be checked by the test given in 1.8 of Part 2.

### 3.4 Legibility

All markings shall be legible.

The colours of the identification threads shall be easy to recognise or easily made recognisable, if necessary by cleaning with petrol or other suitable solvent.

### 3.5 Common Marking

#### 3.5.1 General

If the Common Marking (<HAR>) is used, it shall be as specified in the "Agreement on the use of a Commonly Agreed Marking for Cables and Cords complying with Harmonised Specifications". It shall consist of either

1. the common thread as specified and allotted in appendix 2 to the above mentioned "Agreement", or,
2. a continuous (see 3.2) marking of the symbols specified and allotted in appendix 1 to the above mentioned "Agreement", by one of the three methods a), b), c) specified in 3.1.1.

### 3.5.2 Extensible leads

If under the terms of the above mentioned 'Agreement' the Common Marking for extensible leads (<HAR> COIL or <HAR> CCCCC) is used it shall consist of one of the markings described for extensible leads in 3.1.2 and shall be applied in association with the indication of origin.

### 3.6 Use of the name CENELEC

The name CENELEC, in full or abbreviated, shall not be marked on, or in, the cables.

### 3.7 Code designation

Each cable or cord shall have its full code designation marked continuously (see 3.2) on the sheath or on the insulation of one core. The code designation for each cable is given in the particular specifications in Part 3 onwards of this HD.

NOTE The particular specifications in Part 3 onwards of this HD presently specify either no such marking, or marking of only part of the code designation. The requirement in this 3.7 supersedes that in the particular specifications, which will be amended in due course.

## 4 Core identification

### 4.1 General requirements

Identification of the cores of a cable shall be achieved by the use of coloured insulation or by a coloured surface.

Each core of a multicore cable shall have only one colour, except the core identified by a combination of the colours green-and-yellow. In multicore cables, the colours green and yellow shall not be used separately as single colours.

The colours shall be clearly identifiable and durable. Durability shall be checked by the test given in 1.8 of Part 2.

### 4.2 Colour schemes

#### 4.2.1 Flexible cables

The core colours, and their rotational position, for flexible cables and cords shall be in accordance with HD 308.

#### 4.2.2 Single core non-sheathed cables

The core colours, which should be a reasonable match to those given in HD 402, shall be chosen from the following:

- a) for cable types rated 300/500 V (H05 types) the following mono-colours are recognised: black, blue, brown, grey, orange, pink, red, turquoise, violet, white, green and yellow. Bi-colours of any combination of the above mono-colours are permitted. The distribution of the colours for the core bi-coloured green-and-yellow shall comply with 4.3 of Part 1;

NOTE The use of green or yellow in some countries may be forbidden or restricted by national safety or other regulations. In some countries, green is specifically permitted for decorative chains

- b) for cable types rated 450/750 V (H07 types) the following mono-colours are recognised: black, blue, brown, grey, orange, pink,

red, turquoise, violet and white. Bi-colours shall not be used except the combination of the mono-colours green and yellow, the distribution of the colours of which shall comply with 4.3 of Part 1.

NOTE Other mono-colours are permitted by national standards, pending CENELEC TC 64 harmonisation of installation rules.

#### 4.2.3 **Multicore sheathed cables for fixed wiring**

The core colours shall be in accordance with HD 308.

#### 4.3 **Colour combination green-and-yellow**

The distribution of the colours for the core coloured green-and-yellow shall comply with the following condition: for every 15 mm length of core, one of these colours shall cover at least 30 % and not more than 70 % of the surface of the core, the other colour covering the remainder.

NOTE Information on the use of the colours green-and-yellow and blue.

It is understood that the colours green and yellow, when they are combined as specified above are recognised exclusively as a means of identification of the core intended for use as earth connection or similar protection, and that the colour blue is intended for the identification of the core intended to be connected to neutral. If, however, there is no neutral, blue can be used to identify any core except the earthing or protective conductor.

#### 4.4 **Core identification of flexible cables by the "Marking by inscription" method**

Where the cores of cables are identified by marking by inscription, this shall be in accordance with EN 50334.

### 5 **General requirements for the construction of cables**

#### 5.1 **Conductors**

##### 5.1.1 **Material**

The conductors shall consist of annealed copper, except for the wires of tinsel cords, for which a copper alloy may be used. The wires may be tinned.

##### 5.1.2 **Construction**

The maximum diameters of the wires of flexible conductors - other than the conductors of tinsel cords - and the minimum number of the wires of rigid conductors shall be in accordance with HD 383.

The classes of the conductors relevant to the various types of cables are given in the particular specifications.

Conductors of cables for fixed installations shall be circular solid, circular stranded or compacted circular stranded conductors.

For tinsel cords each conductor shall comprise a number of strands or groups of strands, twisted together, each strand being composed of one or more flattened wires of copper or copper alloy, helically wound on a thread of cotton, polyamide or similar material.

##### 5.1.3 **Check of construction**