



# SLOVENSKI STANDARD

## SIST EN 50525-1:2011

01-julij-2011

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**Električni kabli - Nizkonapetostni energetski kabli z nazivno napetostjo do vključno 450/750 V (U0/U) - 1. del: Splošne zahteve**

Electric cables - Low voltage energy cables of rated voltages up to and including 450/750 V (U0/U) - Part 1: General requirements

Kabel und Leitungen - Starkstromleitungen mit Nennspannungen bis 450/750 V (U0/U) - Teil 1: Allgemeine Anforderungen

Câbles électriques - Câbles d'énergie basse tension de tension assignée au plus égale à 450/750 V (U0/U) - Partie 1: Exigences générales

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**Ta slovenski standard je istoveten z: EN 50525-1:2011**

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**ICS:**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 50525-1**

May 2011

ICS 29.060.20

Supersedes HD 21.1 S4:2002, HD 22.1 S4:2002

English version

**Electric cables -  
Low voltage energy cables of rated voltages up to and including  
450/750 V ( $U_0/U$ ) -  
Part 1: General requirements**

Câbles électriques	-	Kabel und Leitungen	-
Câbles d'énergie basse tension de tension assignée au plus égale à 450/750 V ( $U_0/U$ )	-	Starkstromleitungen mit Nennspannungen bis 450/750 V ( $U_0/U$ ) - Teil 1: Allgemeine Anforderungen	-
Partie 1: Exigences générales			

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**CENELEC**

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

**Management Centre: Avenue Marnix 17, B - 1000 Brussels**

## Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 20, Electric cables.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50525-1 on 2011-01-17.

This document, which is one of a multipart series, supersedes HD 21.1 S4:2002 and HD 22.1 S4:2002.

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

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) 2012-01-17
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2014-01-17

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## Introduction

EN 50525 derives from CENELEC Harmonization Documents HD 21 and HD 22. It has the following parts:

- Part 1: General requirements;
- Part 2: Cables for general applications;
- Part 3: Cables with special fire performance.

Parts 2 and 3 are further subdivided for the particular cables and applications.

NOTE Annex E gives a full description of the structure of EN 50525, its content and its derivation from HD 21 and HD 22.

An intention of the conversion work, which forms part of an overall CENELEC initiative to convert remaining HDs to ENs, is to create a structure for the EN that will be sufficiently robust to ensure a simple means of making future additions or amendments.

As part of the work there has been a review of the market relevance of cable types in HD 21 and HD 22, and changes have been made accordingly.

Some matters previously in HD 21 and HD 22 are now in separate publications thus:

- Insulating, sheathing and covering materials – EN 50363 series;
- Electrical test methods – EN 50395;  
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- Non-electrical test methods – EN 50396.

The collective object of all parts of EN 50525 is:

- to standardise cables that are safe and reliable when properly selected, installed and used;
- to state the characteristics and manufacturing requirements directly or indirectly bearing on safety; and
- to specify methods for checking conformity with those requirements.

European and national regulations contain requirements and recommendations relating to the environment. CENELEC TC 20 has published a Technical Report (TR) that offers guidance and assistance to standard-writers of TC 20, to take into account the relevant environmental aspects as far as they are specific to electric cables in normal use. The TR is CLC/TR 62125, *Environmental statement specific to TC 20 - Electric cables*

This EN takes account, where appropriate and practicable, of the guidance in CLC/TR 62125.

Cables within EN 50525 satisfy the essential health and safety requirements of the Low Voltage Directive (2006/95/EC).

## 1 Scope

This European Standard gives the general requirements for rigid and flexible energy cables of rated voltages  $U_0/U$  up to and including 450/750 V a.c., used in power installations and with domestic and industrial appliances and equipment.

NOTE 1 For some types of flexible cables, the term "cord" is used.

NOTE 2 Rated voltages are given by reference to alternating current (a.c.) systems. Use of the cables in direct current (d.c.) systems is permitted.

NOTE 3 National regulations may prescribe additional performance requirements for cables that are not given in the particular requirements. For example for buildings with high levels of public access, additional fire performance requirements may be applicable.

The test methods for checking conformity with the requirements are given in other standards (see Introduction).

The particular types of cables are specified in EN 50525-2 (series) and EN 50525-3 (series). The individual parts within those two series are collectively referred to hereafter as "the particular specifications".

Only the sizes (conductor class, cross-sectional area), number of cores, other constructional features and rated voltages given in the particular specification apply to the individual cable type.

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

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## 2 Normative references

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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.

NOTE One or more references to the standards below are in respect of a specific sub-division of that standard, for instance a clause, a table, a class or a type. Cross-references to these standards are undated and, at all times, the latest version applies.

EN 50267-2-1		Common test methods for cables under fire conditions – Tests on gases evolved during combustion of materials from cables – Part 2-1: Procedures – Determination of the amount of halogen acid gas
EN 50267-2-2		Common test methods for cables under fire conditions – Tests on gases evolved during combustion of materials from cables – Part 2-2: Procedures – Determination of degree of acidity of gases for materials by measuring pH and conductivity
EN 50334		Marking by inscription for the identification of cores of electric cables
EN 50363	Series	Insulating, sheathing and covering materials for low-voltage energy cables
EN 50395		Electrical test methods for low voltage energy cables
EN 50396		Non electrical test methods for low voltage energy cables
EN 60228		Conductors of insulated cables (IEC 60228)
EN 60684-2		Flexible insulating sleeving – Part 2: Methods of test (IEC 60684-2)



HD 308	Identification of cores in cables and flexible cords
HD 361	System for cable designation
HD 516	Guide to use of low voltage harmonized cables

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

#### 3.1

##### **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

NOTE 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.

#### 3.2

##### **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

#### 3.3

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

tests made on all production cable lengths to demonstrate their integrity

#### 3.4

##### **dummy core**

extruded element having the same overall diameter as the insulated core

### 4 Rated voltage

The rated voltage of a cable is the reference voltage for which the cable is designed.

The rated voltage in an alternating current system, is expressed by the combination of two values  $U_0/U$ , expressed in volts, where:

- $U_0$  is the r.m.s. value between any insulated conductor and "earth" (metal covering of the cable or the surrounding medium);
- $U$  is 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 should be at least equal to the nominal voltage of the system for which it is intended. This condition applies to the values of both  $U_0$  and  $U$ .

NOTE For information about the maximum permanent permitted operating voltage of the system (a.c. or d.c.) refer to HD 516.

## 5 Requirements for the construction of cables

### 5.1 General

The requirements given in this Part 1 shall apply to all cables in EN 50525, except where otherwise specified in the particular specification.

NOTE The particular specification may deviate from the general requirements, either by addition, subtraction or amendment.

### 5.2 Conductors

#### 5.2.1 Material

The conductors shall be copper, and in accordance with EN 60228.

The wires of conductors may be plain or metal coated, for example with tin or silver. Coated wires shall be covered with a continuous layer of the coating.

There shall be no visible gaps in the continuous layer, when examined with normal or corrected vision.

#### 5.2.2 Construction

The maximum diameters of the wires of flexible conductors and the minimum number of the wires of rigid conductors shall be in accordance with EN 60228.

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

#### 5.2.3 Separator between conductor and insulation

Unless otherwise specified in the particular specification it is permitted to place a separator tape between the conductor and the insulation.

#### 5.2.4 Check of construction

Compliance with the requirements of 5.2.1, 5.2.2 and 5.2.3, including the requirements of EN 60228, shall be checked by inspection and by measurement.

#### 5.2.5 Electrical resistance

The resistance of each conductor at 20 °C shall be in accordance with the requirements of EN 60228 for the given class of the conductor.

Compliance shall be checked by the test given in Clause 5 of EN 50395.

### 5.3 Insulation

#### 5.3.1 Material

The insulation material shall be specified in the particular specification, and shall be selected from those given in EN 50363.

The requirements for the insulation are specified in the relevant part of EN 50363, which also gives the maximum continuous conductor operating temperatures for each insulation compound.

NOTE The maximum operating and short-circuit temperatures for a particular cable may be lower than that for the specific insulation compound. See HD 516 for further guidance.

### 5.3.2 Application to the conductor

The insulation shall be applied by extrusion, such that it fits closely on the conductor, but does not adhere to it. It shall be possible to remove it without damage to the insulation itself, to the conductor or to the metal coating if any. It is permitted to apply the insulation in a single layer, or in a number of coherent layers. Where more than one layer is used, all testing shall be carried out on the complete insulation as though it were a single layer.

NOTE Insulation applied in more than one layer does not conform to the definition of "Double insulation" given, for instance, in HD 60364.

Compliance shall be checked by inspection and by manual test.

### 5.3.3 Thickness

The mean value of the thickness of insulation shall be not less than the specified value for each type and size of cable shown in the tables of the particular specifications.

However, the thickness at any place may be less than the specified value provided that the difference does not exceed 0,1 mm + 10 % of the specified value.

Compliance shall be checked by the test given in 4.1 of EN 50396.

## 5.4 Core identification

### 5.4.1 General

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

The colours shall be clearly identifiable and durable. Durability shall be checked by the test given in 5.1 of EN 50396.

NOTE 1 It is not a requirement of the standard that colours should be an exact match against a particular scheme or chart. If there is a case of doubt about the identification of a particular colour, reference should be made to HD 402.

NOTE 2 Cores identified by the colour blue, and those identified by the bi-colour green-and-yellow, have specific functionality that is described in EN 60445. The application of cables with these colours is specified in HD 60364 and the equivalent national standards implementing the HD.

### 5.4.2 Single core cables – Non-sheathed cables

The core colours 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 5.4.4.
- 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 5.4.4.

### 5.4.3 Multicore sheathed cables

#### 5.4.3.1 Identification by colour

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.

For multicore cables with two to five cores, the core colours, and their rotational position in the cable, shall be in accordance with HD 308.

#### 5.4.3.2 Identification by numbering

Where the particular specification permits identification of the cores of multicore cables by numbering, it shall conform to EN 50334.

#### 5.4.3.3 Cables with more than five cores

Multicore cables with more than five cores shall be identified in accordance with Annex D.

#### 5.4.4 Colour combination green-and-yellow

The combination of the colours green-and-yellow shall be such that, on any 15 mm length of the core, one of these colours covers at least 30 % and not more than 70 % of the surface of the core, the other colour covering the remainder of that surface.

NOTE This requirement is in accordance with EN 60445.

Compliance shall be checked using one of the test methods in 5.2 of EN 50396.

### 5.5 Assembly of cores

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For flat cables the cores shall be laid parallel.

The cores of circular cables shall be twisted together.

Additional requirements for assembly may be given in the particular specification.

### 5.6 Other components

#### 5.6.1 General

Apart from a sheath, any of the following components may be included in the construction of the cables:

- a) interstitial fillers;
- b) strain-bearing members;
- c) inner covering;
- d) inner sheath;
- e) metallic screen;
- f) textile braid covering.