

SLOVENSKI STANDARD

SIST HD 604 S1:1998/A2:2003

01-februar-2003

Elektroenergetski kabli za napetosti 0,6/1 kV in 1,9/3,3 kV s posebnimi ognjevzdržnimi lastnostmi za uporabo v elektrarnah

0,6/1 kV and 1,9/3,3 kV power cables with special fire performance for use in power stations

Starkstromkabel mit besonderen Eigenschaften im Falle eines Brandes für Kraftwerke und einer Nennspannung von 0,6/1 kV und 1,9/3,3 kV

Câbles d'énergie 0,6/1 kV et 1,9/3,3 kV ayant un comportement au feu particulier et destinés aux centrales électriques

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Ta slovenski standard je istoveten z: HD 604 S1:1994/A2:2002

ICS:

13.220.40	Sposobnost vžiga in obnašanje materialov in proizvodov pri gorenju	Ignitability and burning behaviour of materials and products
29.060.20	Kabli	Cables

SIST HD 604 S1:1998/A2:2003

en

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HARMONIZATION DOCUMENT

HD 604 S1/A2

DOCUMENT D'HARMONISATION

HARMONISIERUNGSDOKUMENT

October 2002

ICS 29.060.20; 13.220.40

English version

**0,6/1 kV and 1,9/3,3 kV power cables
with special fire performance
for use in power stations**

Câbles d'énergie 0,6/1 kV et 1,9/3,3 kV
ayant un comportement au feu particulier
et destinés aux centrales électriques

Starkstromkabel mit besonderen
Eigenschaften im Falle eines Brandes für
Kraftwerke und einer Nennspannung von
0,6/1 kV und 1,9/3,3 kV

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This amendment A2 modifies the Harmonization Document HD 604 S1:1994; it was approved by CENELEC on 2002-07-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this amendment 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 amendment exists in two official versions (English, French).

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 second amendment to the Harmonization Document HD 604 S1:1994 was prepared by WG 9 of the Technical Committee CENELEC TC 20 Electric Cable. CENELEC TC 20 confirmed at its Lucerne meeting (May 2000) that the amendment should go to the Unique Acceptance Procedure.

As well as the listed additions and amendments to the particular sections of Parts 3-5, the whole of Part 1 has been re-issued, especially to include the extensive changes to cross-references. Users of HD 604 should note that, in the particular sections, cross-references have only been updated where the complete section has been re-issued. This Part 0 of HD 604 contains a list of relevant changes to cross-references, which should be consulted in conjunction with the particular section. National standards implementing one or more particular sections of HD 604 may update cross-references in advance of changes to the published version of the HD.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as amendment A2 to HD 604 S1 on 2002-07-01.

By decision of the Technical Board (D81/139), this HD exists only in English and French.

The following dates were fixed:

- latest date by which the existence of the amendment has to be announced at national level (doa) 2003-01-01
- latest date by which the amendment has to be implemented at national level by publication of a harmonised national standard or by endorsement (dop) 2003-07-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2005-07-01

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¹⁾ Amendment no. 1 introduces some changes to the text.

²⁾ Amendment no. 1 completely revises the particular section.

³⁾ New section introduced by Amendment no. 1.

⁴⁾ Amendment no. 2 introduces some changes to the text.

⁵⁾ Amendment no. 2 completely revises the particular part or section.

List of updated cross-references

Original Ref	Original title	New Ref	New title
HD 186	Marking by inscription for the identification of cores of electric cables having more than 5 cores	EN 50334	Marking by inscription for the identification of cores of electric cables
HD 405.1	Tests on electric cables under fire conditions Part 1: Test on a single vertical insulated wire or cable	EN 50265-2-1	Common test methods for cables under fire conditions – Test for resistance to vertical flame propagation for a single insulated conductor or cable Part 2-1: Procedures – 1 kW pre-mixed flame
HD 405.3	Tests on electric cables under fire conditions Part 3: Tests on bunched wires or cables	EN 50266 (series)	Common test methods for cables under fire conditions – Test for vertical flame spread of vertically-mounted bunched wires or cables
HD 505 (series)	Common test methods for insulating and sheathing materials of electric cables	EN 60811 (series)	Insulating and sheathing materials of electric cables – Common test methods
HD 602	Test on gases evolved during combustion of materials from cables – Determination of degree of acidity (corrosivity) of gases by measuring pH and conductivity	EN 50267-2-2	Common test methods for cables under fire conditions – Test 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
HD 606 (series)	Measurement of smoke density of electric cables burning under defined conditions	EN 50268 (series)	Common test methods for cables under fire conditions – Measurement of smoke density of cables burning under defined conditions
IEC 502	Extruded solid dielectric insulated power cables for rated voltages from 1 kV to 30 kV	IEC 60502-1	Power cables with extruded insulation and their accessories for rated voltages from 1 kV ($U_m = 1,2$ kV) up to 30 kV ($U_m = 36$ kV) Part 1: Cables for rated voltages of 1 kV ($U_m = 1,2$ kV) and 3 kV ($U_m = 3,6$ kV)
IEC 754-1	Test on gases evolved during combustion of electric cables Part 1: determination of the amount of halogen acid gas evolved during the combustion of polymeric materials taken from cables	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

PART 1: GENERAL REQUIREMENTS

Replace the complete part by the following.

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HD 604 S1:1994/A2:2002

0,6/1 kV AND 1,9/3,3 kV POWER CABLES WITH SPECIAL FIRE PERFORMANCE
FOR USE IN POWER STATIONS

PART 1: GENERAL REQUIREMENTS

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REFERENCES

References are made in this Part 1 to other parts of HD 604 and to other Harmonization Documents and International Standards as follows:

EN 50265 (Series)	Common test methods for cables under fire conditions – Test for resistance to vertical flame propagation for a single insulated conductor or cable
EN 50266 (Series)	Common test methods for cables under fire conditions – Test for vertical flame spread of vertically-mounted bunched wires or cables
EN 50267 (Series)	Common test methods for cables under fire conditions - Tests on gases evolved during combustion of materials from cables
EN 50268 (Series)	Common test methods for cables under fire conditions - Measurement of smoke density of cables burning under defined conditions
EN 50334	Marking by inscription for the identification of cores of electric cables
EN 60811 (Series)	Insulating and sheathing materials of electric cables - Common test methods
HD 21	Polyvinyl chloride insulated cables of rated voltages up to and including 450/750V
HD 22	Rubber insulated cables of rated voltages up to and including 450/750V
HD 383	Conductors of insulated cables – First supplement: Guide to the dimensional limits of circular conductors
HD 605	Electric cables – Additional test methods
IEC 60096-1	Radio frequency cables Part 1: General requirements and measuring methods

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0,6/1,0 kV and 1,9/3,3 kV power cables with special fire performance for use in power stations

Part 1: General requirements

1 General

1.1 Scope

HD 604 applies to rigid and flexible conductor cables for fixed installations having a rated voltage U_0/U of 0,6/1,0 kV or 1,9/3,3 kV. The insulation and sheaths may be either thermoplastic or thermosetting, halogenated or halogen free. The cables are mainly intended for use in power generating plants and sub-stations. All cables have specific fire performance requirements. Cables designed to be installed within the containment area of nuclear power plants (LOCA cables), or cables specifically designed to be radiation resistant are not included in this HD.

Control cables having a minimum conductor size of 1mm² up to 61 cores are included in addition to the range of power supply cables.

This Part 1 specifies the general requirements applicable to these cables; additional or deviating requirements are given in the particular sections of this HD.

Test Methods are specified in EN 50265, EN 50266, EN 50267, EN 50268, EN 60811, HD 21, HD 22, HD 383, HD 605 and IEC 60096-1

The particular types of cables are specified in Parts 3, 4 and 5.

1.2 Object

The objects of this Harmonization Document are:

- to standardise cables that are safe and reliable when properly used, in relation to the technical requirements of the system of which they form a part;
- to state the characteristics and manufacturing requirements directly or indirectly bearing on safety,
- and to specify methods for checking conformity with those requirements.

2 Definitions

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2.1 Definitions relating to insulating and sheathing compounds

2.1.1

insulating and sheathing compounds

the types of insulating and sheathing compounds covered in this HD are listed below, together with their abbreviated designations

2.1.1.1

thermoplastic Polyvinyl Chloride compound (PVC)

combinations of materials suitably selected, proportioned and treated, of which the characteristic constituent is polyvinyl chloride or one of its copolymers. The same term also designates compounds containing both polyvinyl chloride and certain of its copolymers

2.1.1.2

cross-linked Ethylene Propylene Rubber (EPR)

a compound based on ethylene propylene rubber or similar (EPM or EPDM) which when cross-linked complies with the requirements given in the particular sections

2.1.1.3

cross-linked Polyethylene (XLPE)

a thermosetting material formed by the cross-linking of thermoplastic polyethylene compound either by chemical or irradiation methods so as to comply with the requirements given in the particular sections

2.1.1.4

ethylene copolymers

thermoplastic or cross-linked materials in which the characteristic constituent is a copolymer of ethylene such as EVA, EEA, EMA, compounded so as to comply with the requirements given in the particular sections

2.1.1.5**chlorinated synthetic elastomeric compound**

a vulcanised compound in which the characteristic constituent is polychloroprene rubber (PCP) or other chlorinated synthetic elastomer, such as CSP, CPE or NBR/PVC, compounded so as to comply with the requirements given in the particular sections;

NOTE The abbreviations PCP, CSP and CPE are those in common use. Equivalent codings according to ASTM are CR, CSM and CM.

2.1.2**type of compound**

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

2.2 Definitions relating to the tests

NOTE Tests classified as Sample (S) or Routine (R) may be required as part of any Type Approval Schemes.

2.2.1**type tests (symbol T)**

tests required to be made before supplying a type of cable covered by this HD 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 material, design or type of manufacturing process which might change the performance characteristics

2.2.2**sample tests (symbol S)**

tests made on selected lengths of completed cable, 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 test (symbol R)**

tests made on all production cable lengths to demonstrate their integrity

2.2.4**tests after installation**

tests intended to demonstrate the integrity of the cable and its accessories as installed

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 the following values $U_0/U(U_m)$ expressed in kV:

- U_0 is the r.m.s. value between any insulated conductor and earth (metallic covering of the cable or the surrounding medium) - $U_0 = 0,6$ kV or $1,9$ kV;
- U is the r.m.s. value between any two phase -conductors of a multicore cable or of a system of single-core cables - $U = 1,0$ kV or $3,3$ kV;
- U_m is the max. r.m.s. value of the highest system voltage for which the equipment may be used - $U_m = 1,2$ kV or $3,6$ kV.

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.

If used in dc systems, the $0,6/1,0$ kV cables of this HD shall have a maximum voltage against earth not exceeding $1,9$ kV

NOTE The suitability of cables rated $1,9/3,3$ kV for use in d.c. systems should be confirmed with the manufacturer before installation.

3 Marking**3.1 Indication of origin**

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

- 1) either 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 in a contrasting colour on the insulation of at least one core;
 - c) printing, indenting or embossing on the outer surface of the cable.

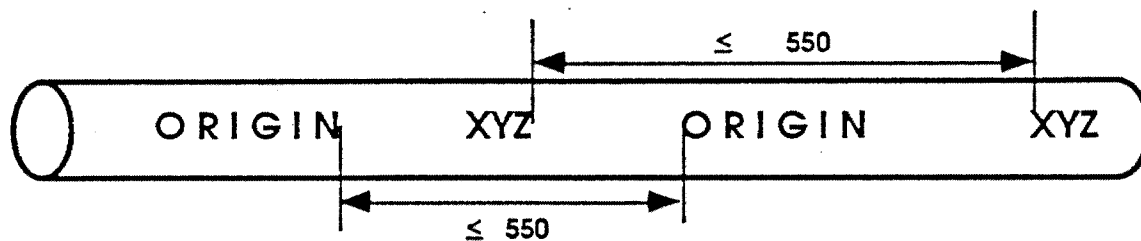
3.1.1 Continuity of marks

Unless otherwise specified in the particular section, 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 surface of the cable,
- 275 mm if the marking is:
 - i) on the insulation of a sheathed cable,
 - ii) on a tape within a sheathed cable.

NOTE A "Specified Mark" is any mandatory mark covered by this part of the HD or by the particular requirements of Part 3 onwards of this HD.

The diagram below shows an example of the marking as used on the outer surface of the cable, where the word "ORIGIN" is for the mandatory information required for 3.1, and "XYZ" is one of any other mandatory marks.



3.2 Additional marking

Additional marking requirements may be specified in the particular sections.

3.3 Durability

Printed markings shall be durable. Compliance with this requirement shall be checked by the test given in subclause 2.5.4 of HD 605.

The printed legend shall be legible after carrying out the test.

3.4 Legibility

All markings shall be legible. Printed markings shall be in contrasting colours.

All colours of the identification thread shall be easy to recognise or easily be made recognisable, if necessary, by cleaning with a suitable solvent.

3.5 Common marking

Under consideration.

3.6 Use of the name CENELEC

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

4 Core identification

The cores shall be identified by colours or numbers when specified in the particular sections. Colouring shall be achieved by the use of coloured insulation or by a coloured surface.

When identification is by numbers, they shall be printed in a colour which contrasts with the core colours. Marking shall comply with EN 50334 unless otherwise specified.

The colours shall be clearly identifiable and durable. Durability shall be checked by the test given in subclause 2.5.4 of HD 605.

Compliance with these requirements shall be verified by visual examination.

5 General requirements for the construction of cables

5.1 Conductors

5.1.1 Material

Conductors shall be either plain or metal-coated annealed copper or plain aluminium in accordance with HD 383, and with particular requirements in particular sections.

5.1.2 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 HD 383, unless otherwise specified in the particular sections.
The classes of the conductors relevant to the various types of cables are given in the particular sections.
Conductors shall be either circular or sector in shape, and of solid metal or stranded.

5.1.3 Check of construction

Compliance with the requirements of 5.1.1 and 5.1.2 including the requirements of HD 383, shall be checked by inspection and by measurement.

5.1.4 Electrical resistance

The resistance of each conductor at 20 °C shall be in accordance with the requirements of HD 383 for the given class of conductor.
Compliance shall be checked by the test given in subclause 3.1.1 of HD 605.

5.1.5 Separator layer

A separator layer may be placed between the conductor and insulation. Unless otherwise specified, it shall be non-hygroscopic
It shall be easily removable from the conductor.

5.2 Insulation

5.2.1 Material

The insulation shall be a compound as specified for each type of cable in the particular sections.
The test requirements and the references to test methods are specified in the particular sections.
The maximum conductor temperature in normal operation and the short circuit temperature for each insulation are specified in the particular sections.

5.2.2 Application

The insulation may consist of one or more bonded layers. It shall be so applied that it fits closely on the conductor or over the separator tape, and it shall be possible to remove it without damage to the insulation itself, to the conductor or to the metal coating if any. If required, compliance shall be checked by inspection and by manual test. The insulation shall be applied by a suitable extrusion process, cross-linked where required, and shall form a compact and homogeneous body.

5.2.3 Thickness

The mean value of the thickness of insulation shall not be less than the specified value for each type and size of cable shown in the tables of the particular sections.
However, the thickness at any one 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 subclause 2.1.1 of HD 605.

5.3 Fillers and tapes

For each type of cable, the particular sections specify whether that cable includes fillers or tapes or whether the sheath or inner covering may penetrate between the cores, thus forming a filling.
Tapes may be applied as separators over the insulation of an individual core or as a binder over the core assembly.

5.3.1 Material

The fillers and tapes, if any, shall be composed of a suitable material.
When fillers or tapes are employed, there shall be no harmful interactions between their constituents and the insulation and/or the sheath.
Compliance with this requirement shall be checked by the test specified in the particular section.

5.3.2 Application

Where fillers are used these may be applied either separately or as part of the inner covering or the inner sheath to form a compact and reasonably circular cable. It shall be possible to strip the fillers, if any, from the cable without damaging the insulation of cores.

5.4 Inner covering (bedding)

The inner covering, if any, may be extruded or lapped or a combination of the two.