SLOVENSKI STANDARD
SIST HD 604 S1:1998

01-februar-1998

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

Ta slovenski standard je istoveten z: **HD 604 S1:1994**

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 **en**

HARMONIZATION DOCUMENT HD 604 S1

DOCUMENT D'HARMONISATION

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Descriptors: Electric cable, electric power station, fire behaviour, specification, characteristics, dimension, test, marking

ENGLISH VERSION

0.6/1 kV power cables with special fire performance for use in power stations

Câbles d'énergie 0,6/1 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

This Harmonization Document was approved by CENELEC on 1993-12-08. 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 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, 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

Ref. No. HD 604 S1:1994 E

FOREWORD

This Harmonisation Document was prepared by WG10 of CENELEC Technical Committee TC20, Electric Cables.

The document contains the following Parts, arranged according to the main constructional features of the cables covered:

Part 1 - General requirements
Part 3 - Single core and multicore PVC insulated and sheathed cables
Part 4 - Single core and multicore XLPE and EPR insulated, PVC or chlorinated elastomer sheathed cables
Part 5 - Single core and multicore halogen-free cables

There is no Part 2, which was to have covered Additional Test Methods. These have been combined with the corresponding Part from HD 603 (Distribution cables of rated voltages 0.6/1kV) to form a separate document, HD 605.

Each of Parts 3-5 inclusive are further divided into particular sections and, by decision of the Technical Board (D68/047) National Committees need at present only implement in their national language those sections having national applicability. The obligation remains however to announce the full HD in public by titles and numbers, and also to withdraw any conflicting national standards.

Page numbering reflects the arrangement into Parts and particular sections, e.g. Page 4-C-3 is page 3 of particular section C of Part 4.

A proposed Part 6, relating to cables for specific use within the containment area of Nuclear Power Stations has not been progressed.

References to other HDs, ENs and international standards are given in the particular parts or sections.

The draft was submitted to the CENELEC members for formal vote in March 1993 and was approved by CENELEC as HD 604 S1 on 8th December 1993.

The following dates were fixed:

- latest date of announcement of the HD at national level (doa) 1994-06-01
- latest date of publication of a harmonised national standard (dop) 1994-12-01
- latest date of withdrawal of conflicting national standards (dow) 1994-12-01

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HD 604 S1:1994
0.6/1KV POWER CABLES WITH SPECIAL FIRE PERFORMANCE FOR USE IN POWER STATIONS

PART 1 : GENERAL REQUIREMENTS

REFERENCES

References are made in this Part 1 to other Parts of HD 604, and to other Harmonisation Documents and International Standards as follows:

HD 21	:	PVC 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 186	:	Marking by inscription for the identification of cores of electric cables having more than five cores
HD 383	:	Conductors of insulated cables
HD 405	:	Tests on electric cables under fire conditions
HD 505	:	Common test methods for insulating and sheathing materials of electric cables
HD 602	:	Test on gases evolved during the combustion of materials from cables: Determination of degree of acidity (corrosivity) of gases by measuring pH and conductivity
HD 605	:	Electric cables: Additional test methods
HD 606	:	Measurement of smoke density of electric cables burning under defined conditions
IEC 96-1	:	Radio frequency cables Part 1: General requirements and measuring methods

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0.6/1.KV 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 Uo/U of 0.6/1kV. 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 special fire requirements or special requirements for nuclear power stations, excluding cables used in and around the containment area.

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 HD 21, HD 22, HD 383, HD 405, HD 505, HD 602, HD 605, HD 606 and IEC 96-1

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

1.2 Object

The objects of this Harmonisation 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

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 suitable 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), Routine (R) or Special Sample (SS) 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 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 compliance with requirements.

2.2.4 Special sample tests (Symbol SS)

Tests made on samples if specified by the purchaser at the time of ordering at a frequency agreed between the purchaser and the manufacturer unless otherwise specified.

2.2.5 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 Uo/U (Um) expressed in kV:

Uo is the r.m.s value between any insulated conductor and earth (metallic covering of the cable or the surrounding medium); Uo = 0.6kV

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 = 1.0kV

Um is the maximum r.m.s. value of the highest system voltage for which the equipment may be used; Um = 1.2kV

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 cables of this HD shall have a maximum voltage against earth not exceeding 1.8kV.

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,

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

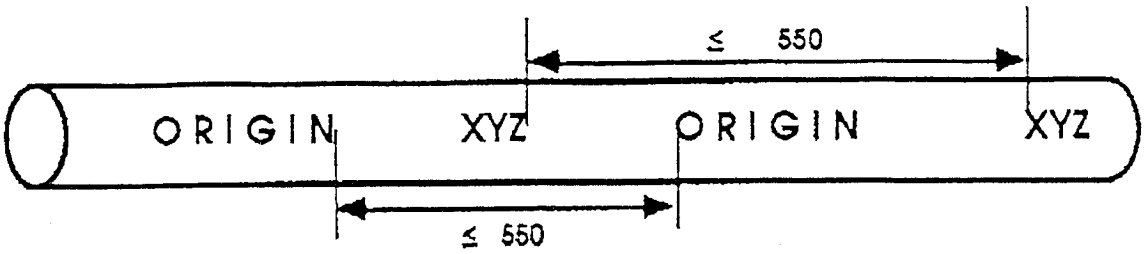
Unless otherwise specified in the particular section, each specified mark shall be regarded as continuous if the distance between the end of the mark and the beginning of the next identical mark does not exceed:

550mm if the marking is on the outer surface of the cable.
275mm 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 sub-clause 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 sub-clause 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 HD186 unless otherwise specified.

The colours shall be clearly identifiable and durable. Durability shall be checked by the test given in sub-clause 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 Sub-clauses 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 sub-clause 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 0.1mm + 10% of the specified value.

Compliance shall be checked by the test given in sub-clause 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.

5.4.1 Material

The material used for inner coverings shall be suitable for uses at the maximum conductor temperature of the cable in normal operation, and compatible with the cable components with which it is in contact.

Compliance with this requirement shall be checked by the test specified in the particular section.

5.4.2 Application

The extruded inner covering shall surround the core assembly completely and may penetrate the spaces between them, giving the assembly a reasonably circular shape. The extruded inner covering shall be easily separable from the cores.

Lapped beddings shall consist of one or more layers of tape covering the entire outer surface of the core assembly.

For each type of cable, the particular sections indicate whether that cable includes an extruded inner covering or a lapped bedding or a combination of these.