



SLOVENSKI STANDARD

SIST HD 21.1 S2:1998

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Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V - Part 1: General requirements

Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V -- Part 1 : General requirements

Polyvinylchlorid-isolierte Leitungen mit Nennspannungen bis 450/750 V -- Teil 1:
Allgemeine Anforderungen

Conducteurs et câbles isolés au polychlorure de vinyle, de tension assignée au plus
égale à 450/750 V -- Partie 1: Prescriptions générales

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Descriptors: Conductor, cable, flexible cable, rigid cable, single core cable, multicore cable, conductor material, flat cable, tinsel cord, compound, polyvinyl chloride, insulation compound, type test, sample test, routine test, nominal voltage, mark, common marking, identification, colour scheme, construction, insulation, filler, sheath, covering, internal covering, extruded covering, thickness, mean value, specified value, electrical resistance, test, tensile strength, elongation at break, ageing, loss of mass, non contamination, heat shock, pressure, high temperature, low temperature, elongation at low temperature, complete cable, overall dimensions, bending, flexing, voltage test, insulation resistance, absence of short circuits, spark (test), snatch (test), separation of cores, test (under) fire (conditions), guide to use

POLYVINYL CHLORIDE INSULATED CABLES OF RATED
VOLTAGES UP TO AND INCLUDING 450/750 V
PART 1: GENERAL REQUIREMENTS

Conducteurs et câbles isolés au
polychlorure de vinyle, de tension
assignée au plus égale à 450/750 V

Polyvinylchlorid-isolierte
Leitungen mit Nennspannungen
bis 450/750 V

Première partie: Prescriptions générales

Teil 1: Allgemeine Anforderungen

BODY OF THE HD

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The Harmonization Document consists of:

- IEC 227-1 (1979) ed 1; IEC/TC 20, not appended

This Harmonization Document was approved by CENELEC on 1988-06-28.

The English and French versions of this Harmonization Document are provided by the text of the IEC publication and the German version is the official translation of the IEC text.

According to the CENELEC Internal Regulations the CENELEC member National Committees are bound:

to announce the existence of this Harmonization Document at national level by or before 1990-06-01

to publish their new harmonized national standard by or before 1990-12-01

to withdraw all conflicting national standards by or before 1990-12-01.

Harmonized national standards are listed on the HD information sheet, which is available from the CENELEC National Committees or from the CENELEC Central Secretariat.

The CENELEC National Committees are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



REPUBLIKA SLOVENIJA
MINISTRSTVO ZA ZNANOST IN TEHNOLOGIJO
Urad RS za standardizacijo in meroslovje
LJUBLJANA

SIST.....HD.21.1.S2-82-1990
PREVZET PO METODI RAZGLASITVE

FOREWORD

HD21 was originally adopted by CENELEC on 9th July 1975.

Edition 2 of HD21 was implemented on 1st January 1984, and at that time contained 5 parts.

Since 1984, new parts have been published, original parts amended, and in addition HD 505 has superseded HD 385 as the cross-reference for test methods.

This reprint of the 5 parts of Edition 2 of HD21 incorporates all ratified amendments and the change to HD 505.

The new parts 8 and 9 of HD 21, which are Edition 1 versions, are reprinted to incorporate the change to HD 505. The issue of new Part 7 coincides with this reprint.

HD21 now has the following parts:

- HD21.1 S2 - General Requirements (with AM1, AM2, AM3 and AM4)
 HD21.2 S2 - Test Methods (with AM1)
 HD21.3 S2 - Non Sheathed Cables for Fixed Wiring (with AM1)
 HD21.4 S2 - Sheathed Cables for Fixed Wiring
 HD21.5 S2 - Flexible Cables (Cords) (with AM1 and AM2)
 HD21.6 - (Spare)
 HD21.7 S1 - Single core Non-Sheathed Cables for Internal Wiring (90°C conductor temperature)
 HD21.8 S1 - Single Core Non-Sheathed Cables for Decorative Chains
 HD21.9 S1 - Single Core Non-Sheathed Cables for Installation at Low Temperatures

This Edition 2 of part 1 of HD 21 now incorporates:

- AM 1 - dop 1989-09-01
 AM 2 - dop 1990-12-01
 AM 3 - dop 1989-09-01
 AM 4 - dop 1990-07-01

In accordance with the guidance given by CENELEC the dop for this Reprint is 1990-12-01.

References are made, in this Part 1 of HD21, to other parts of this HD and to other Harmonisation Documents as follows:

- HD 308 Identification and Use of Cores of Flexible Cables
 HD 361 System for Cable Designation
 HD 383 Conductors of Insulated Cables (Endorsing IEC 228 and 228A)
 HD 402 Standard Colours for PVC insulation for low frequency Cables and Wires (Endorsing IEC 304)
 HD 405.1 Tests on Electric Cables Under Fire Conditions. Part 1: Test on a single vertical cable (Endorsing IEC 332-1)
 HD 505 Common test methods for insulating and sheathing materials of Electric Cables (Endorsing IEC 811)

In all cases a reference to another HD implies the latest edition of that document



<u>CONTENTS</u>		<u>Page</u>
Foreword		2
1. General		
1.1	Scope	4
1.2	Object	4
1.3	Common marking	4
2. Definitions		
2.1	Definitions relating to insulating and sheathing compounds	5
2.2	Definitions relating to the tests	5
2.3	Rated voltage	5
3. Marking		
3.1	Indication of origin	6
3.2	Durability	6
3.3	Legibility	6
3.4	Common marking	7
3.5	Use of the name CENELEC	7
4. Core identification		
4.1	Flexible cables	7
4.2	Single core non sheathed cables	7
4.3	Multicore sheathed cables for fixed wiring	8
4.4	Colour combination green/yellow	8
5. General requirements for the construction of cables		
5.1	Conductors	8
5.2	Insulation	9
5.3	Filler	12
5.4	Extruded inner covering	13
5.5	Sheath	13
5.6	Test on completed cables	15
6. Guide to use of the cables		20
Appendix 1	Guide to use of the cables	21 - 23
Appendix 2	National marking	24

POLYVINYL CHLORIDE INSULATED CABLES
OF RATED VOLTAGES UP TO AND INCLUDING 450/750V

Part 1: General Requirements

1. General

1.1 Scope

HD21 applies to rigid and flexible cables with insulation and sheath if any, based on polyvinyl chloride, of rated voltages U_0/U up to and including 450/750V used in power installations of nominal voltage not exceeding 450/750 V A.C.

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 HD, in HD 405 Part 1 and HD 505.

The particular types of cables are specified in Part 3 onwards of this HD, and 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 Harmonization Document are to standardize 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

The Common Marking (\blacktriangleleft HAR \blacktriangleright) 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 the Common Marking for cables and cords complying with Harmonised Standards."

Compliance with this Harmonization Document may be certified by the application of the agreed technical procedures for granting the Common Marking (*), 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 Organizations are signatories to the Agreement.

Note: See Appendix 2 to Part 1 for guidance on National Marking

(*) 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".

2. Definitions

2.1 Definitions relating to insulating and sheathing materials

2.1.1 Polyvinyl chloride compound (PVC)

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

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

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 or design 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 completed lengths of cable or as appropriate during manufacturing.

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 of the system shall be not higher than 1.5 times the rated voltage 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

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, indenting or embossing on the insulation of at least one core (the core coloured light blue, if any)
 - c) Printing, indenting or embossing on the sheath, if any.

3.1.1 Continuity of marks

The distance between the end of one complete set of marks and the beginning of the next shall not exceed:

- 500 mm if the marking is on the sheath;
- 200 mm if the marking is on the insulation or on a tape.

3.2 Durability

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

3.3 Legibility

All markings shall be legible.

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

3.4 Common Marking

If the Common Marking (◀HAR▶) is used, it shall be as specified in the "Agreement on the use of the Common Marking for cables and cords complying with Harmonized Specification". It shall consist of:

- 1) Either the common thread as specified and allotted in Appendix 2 to the above mentioned "Agreement".
- 2) Or a continuous (see 3.1.1) marking of the symbols specified and allotted in Appendix 1 to the above mentioned "Agreement", by one of the three alternative methods a), b), c) specified in Sub-Clause 3.1.

3.5 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, 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 Sub Clause 1.8 of Part 2.

The colour schemes shall be as follows:

4.1 Flexible cables

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

4.2 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 type H05V (Part 3, Clauses 4 and 5; Part 7, Clause 2) 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/yellow shall comply with Part 1 Sub-Clause 4.4.

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 type H07V (Part 3, Clauses 2 and 3; Part 9) 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 Part 1 sub-clause 4.4.

Note: Other mono-colours are permitted by National standards, pending CENELEC TC64 harmonisation of installation rules.

4.3 Multicore sheathed cables for fixed wiring

The colour scheme is under consideration.

4.4 Colour combination green/yellow

The distribution of the colours for the core coloured green/yellow shall comply with the following condition (which is in accordance with HD 308): 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/yellow and light 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 light blue is intended for the identification of the core intended to be connected to neutral. If, however, there is no neutral, light blue can be used to identify any core except the earthing or protective conductor.

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

Compliance with the requirements of Part 1 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 Electric resistance

For cables other than tinsel cords the resistance of each conductor at 20°C shall be in accordance with the requirements of HD 383 for the given class of the conductor.

For tinsel cords, the maximum resistance at 20°C shall be as specified in Part 5, Clause 2.

Compliance shall be checked by the test given in Part 2 Sub-clause 2.1.

5.2 Insulation

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5.2.1 Material

The insulation shall be polyvinyl chloride compound of the type specified for each type of cable in the particular specifications.

The test requirements for these compounds are specified in Part 1 Table I.

The insulation compounds TI1, TI2 and TI4 are intended for a maximum continuous conductor temperature of 70°C.

The insulation compound TI3 is intended for a maximum continuous conductor temperature of 90°C.

The maximum temperatures for short-circuit conditions are given in Appendix 1 to Part 1.

5.2.2 Application to the conductor

The insulation shall be so applied that it fits closely on the conductor, but, for cables other than tinsel cords, it shall be possible to remove it without damage to the insulation itself, to the conductor or to the tin coating if any. Compliance shall be checked by inspection and by manual test.