# SLOVENSKI STANDARD

# SIST HD 22.4 S3:1998

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Rubber insulated cables of rated voltages up to and including 450/750 V - Part 4: Cords and flexible cables (IEC 245-4:1994, modified)



ICS 29.060.20

Referenčna številka
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HARMONIZATION DOCUMENT **HD 22.4 S3**

DOCUMENT D'HARMONISATION

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ICS 29.060.20

Supersedes HD 22.4 S2:1992

Descriptors: Conductor, cable, flexible cable, rigid cable, single core cable, multicore cable, conductor material, flat cable, compound, polychloroprene, rubber, elastomer, insulation compound, type test, sample test, routine test, nominal voltage, mark, common marking, identification, colour scheme, construction, insulation, separator, filler, sheath, braid, inner layer, outer layer, thickness, mean value, specified value, electrical resistance, test, tensile strength, elongation at break, ageing, air oven, oxygen bomb, hot set, complete cable, overall dimensions, bending, flexing, voltage test, absence of short circuits, spark (test), insulation resistance, wear resistance, test (under) fire (conditions), guide to use, solderability test, braided cord, ordinary sheath, heavy sheath

English version

# Rubber insulated cables of rated voltages up to and including 450/750 V
# Part 4: Cords and flexible cables
# (IEC 245-4:1994, modified)

Conducteurs et câbles isolés au caoutchouc, de tension assignée au plus égale à 450/750 V
Partie 4: Câbles souples
(CEI 245-4:1994, modifiée)

Isolierte Starkstromleitungen mit einer Isolierung aus Gummi mit Nennspannungen bis 450/750 V
Teil 4: Flexible Leitungen
(IEC 245-4:1994, modifiziert)



This Harmonization Document was approved by CENELEC on 1994-12-06. 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, 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

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FOREWORD

HD 22 was originally adopted by CENELEC on 9th July 1975.

Edition 2 of HD 22 was implemented on 1st January 1984, and at that time contained four 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 Edition 3 of HD 22.4 has been introduced to cover the complete revision of the overall dimensions in line with EN 60719, and was approved by TC20 at its Brussels meeting in March 1993.

HD 22 now has the following parts: (* = new edition or new publication available shortly)

| | | |
|---|---|---|
| HD 22.1 S2 | - | General requirements (with AM1 to AM10) |
| HD 22.2 S2 | - | Test methods (with AM1 to AM4 inclusive) |
| HD 22.3 S3* | - | Heat resistant silicone rubber insulated cables |
| HD 22.4 S3 | - | Cords and flexible cables |
| HD 22.5 | - | (Spare) |
| HD 22.6 S2* | - | Arc welding cables |
| HD 22.7 S2* | - | Cables with increased heat resistance for internal wiring for a conductor temperature of 110°C |
| HD 22.8 S2 | - | Polychloroprene or equivalent synthetic elastomer sheathed cable for decorative chains |
| HD 22.9 S2* | - | Single core non-sheathed cables for fixed wiring having low emission of smoke and corrosive gases |
| HD 22.10 S1 | - | EPR insulated and polyurethane sheathed flexible cables |
| HD 22.11 S1 | - | EVA cords and flexible cables |
| HD 22.12 S1* | - | Heat resistant EPR cords and flexible cables |
| HD 22.13 S1* | - | Single and multicore flexible cables, insulated and sheathed with crosslinked compound and having low emission of smoke and corrosive gases |
| HD 22.14 S1* | - | Cords for applications requiring high flexibility |



In order that this revision of Part 4 of HD 22 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.

This draft was submitted to the CENELEC Unique Acceptance Procedure (UAP) in March 1994 and was approved by CENELEC as HD 22.4 S3 on 1994-12-06.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 1995-06-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 1995-12-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 1995-12-01

For products which have complied with HD 22.4 S2:1992 and its amendment A6:1992 before 1995-12-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 1996-12-01.

CONTENTS

# RUBBER INSULATED CABLES OF RATED VOLTAGES UP TO AND INCLUDING 450/750V

## Part 4 : Cords and flexible cables

### 1. Scope

This part (Part 4) of the HD details the particular specifications for EPR insulated and braided cords and for EPR insulated and EPR, rubber or polychloroprene or other equivalent synthetic elastomer sheathed cords and flexible cables of rated voltages up to and including 450/750V.

All cables shall comply with the appropriate requirements given in Part 1 of this HD and the individual types of cable shall each comply with the particular requirements of this Part.

NOTE: The overall dimensions of the cables in this part of HD 22 have been calculated in accordance with EN 60719.

### 2. Braided cord(*)

#### 2.1 Code designation

H03RT-F.

#### 2.2 Rated voltage

300/300V



#### 2.3 Construction



##### 2.3.1 Conductor

Number of conductors : 2 or 3
The conductors shall comply with the requirements given in HD 383 : Conductors of Insulated Cables, for Class 5 conductors, except that the values of the maximum resistance of conductor at 20°C shall be increased by 3%. The wires may be plain or tinned.

##### 2.3.2 Separator

A separator of suitable material may be applied around each conductor.

##### 2.3.3 Insulation

The insulation shall be rubber compound of Type EI 4 applied around each conductor.

The insulation shall be applied by extrusion.

The insulation thickness shall comply with the specified value given in Part 4 Table I, column 2.

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(*) This type is similar to type 245 IEC 51 but has modified requirements.

2.3.4 Fillers

The fillers shall be of textile material.

2.3.5 Assembly of cores and fillers

The cores and textile fillers shall be twisted together.

A centre filler may be used.

The pitch of the laid-up cores shall not exceed 40 mm.

2.3.6 Overall textile braid

The assembly of cores and fillers shall be covered by a textile braid.

2.3.7 Overall diameter

The mean overall diameter shall be within the limits given in Part 4, Table I columns 3 and 4.

2.4 Tests

Compliance with the requirements of sub-clause 2.3 shall be checked by inspection and by the tests given in Table II. For sub-clause 2.3.5, the pitch of the laid-up cores is determined by measuring the length of 10 pitches of a sample and dividing this length by 10. The result is the pitch of the laid-up cores.



2.5 Guide to use (informative)



See HD 516.

TABLE I

DIMENSIONS OF TYPE H03RT-F

| 1 | 2 | 3 | 4 |
|---|---|---|---|
| Number and nominal cross-sectional area of conductors | Thickness of insulation Specified value | Mean overall diameter | |
| | | Lower limit | Upper limit |
| ($mm^2$) | (mm) | (mm) | (mm) |
| 2 x 0.75 | 0.8 | 5.5 | 7.2 |
| 2 x 1 | 0.8 | 5.7 | 7.6 |
| 2 x 1.5 | 0.8 | 6.2 | 8.2 |
| 3 x 0.75 | 0.8 | 5.9 | 7.7 |
| 3 x 1 | 0.8 | 6.2 | 8.1 |
| 3 x 1.5 | 0.8 | 6.7 | 8.8 |

## TABLE II

## TESTS FOR TYPE H03RT-F

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Ref. No. | Tests | Category of test | Test method described in | |
| | | | HD | Clause |
| 1. | Electrical tests | | | |
| 1.1 | Resistance of conductors | T, S | 22.2 | 2.1 |
| 1.2 | Voltage test on completed cable at 2000V | T, S | 22.2 | 2.2 |
| 1.3 | Absence of faults on insulation | R | 22.2 | 2.6 |
| 2. | Provisions covering constructional and dimensional characteristics | | | |
| 2.1 | Checking of compliance with constructional provisions | T, S | 22.1 | Inspection and manual tests |
| 2.2 | Measurement of thickness of insulation | T, S | 22.2 | 1.9 |
| 2.3 | Measurement of overall diameter | | | |
| 2.3.1 | Mean value | T, S | 22.2 | 1.11 |
| 2.4 | Solderability test (Untinned Conductors) | T | 22.2 | 1.12 |
| 3. | Mechanical properties of insulation | | | |
| 3.1 | Tensile test before ageing | T | 505.1.1 | 9.1 |
| 3.2 | Tensile test after ageing in the air oven | T | 505.1.2 | 8.1.3.2a |
| 3.3 | Tensile test after ageing in the oxygen bomb | T | 505.1.2 | 8.3 |
| 3.4 | Hot set test | T | 505.2.1 | 9 |
| 3.5 | Ozone resistance test : either method may be used. | T | | |
| | (a) Method A | | 505.2.1 | 8 |
| | (b) Method B | | 22.2 | 7.3 |
| 4. | Mechanical strength of completed cable | | | |
| 4.1 | Flexing test following, after immersion in water, by a voltage test on cores at 2000 V | T | 22.2 | 3.1 and 2.3 |
| 4.2 | Wear resistance test | T | 22.2 | 3.3 |
| 5. | Resistance to heat of textile braid | T | 22.2 | 8 |

3. Tough ordinary EPR insulated and EPR sheathed cord and flexible cable(**)

3.1 Code designation

H05RR-F.

3.2 Rated voltage

300/500V

3.3 Construction

3.3.1 Conductor

Number of conductors : 2, 3, 4 or 5.

Cross sectional areas : 0.75 mm² up to and including 2.5 mm² for cables having 2 to 5 conductors.
4 mm² and 6 mm² for cables having 3 or 4 conductors.

The conductors shall be in accordance with the requirements given in HD 383 for Class 5 conductors. The wires may be plain or tinned.

3.3.2 Separator



A separator of suitable material may be applied around each conductor:

3.3.3 Insulation



The insulation shall be rubber compound of Type EI 4 applied around each conductor.

The insulation shall be applied by extrusion.

The insulation thickness shall comply with the specified value given in Part 4 Table III, column 2.

3.3.4 Assembly of cores and filler, if any

The cores shall be twisted together.

A centre filler may be used.

(**) This type is similar to type 245 IEC 53 but has modified requirements

3.3.5 Sheath

The sheath shall be rubber compound of Type EM 3, applied around the cores.

The thickness of sheath shall comply with the specified value given in Part 4 Table III, column 3.

The sheath shall be extruded and applied in such a way that it fills the spaces between the cores.

The sheath shall be capable of being removed without damage to the cores.

The colour of sheath is not specified, but if black is used it shall be subject to the test for carbon black content given in Part 4 Table IV, with a requirement for a minimum level as given for EM 3 in Part 1 Table II.

3.3.6 Overall diameter

The mean overall diameter shall be within the limits given in Part 4 Table III, columns 4 and 5.

3.4 Tests

Compliance with the requirements of Part 4 sub-clause 3.3. shall be checked by inspection and by the tests given in Part 4 Table IV.



3.5 Guide to use (informative)

See HD 516.

TABLE III

DIMENSIONS OF TYPE H05RR-F

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Number and nominal cross-sectional area of conductors | Thickness of insulation Specified value | Thickness of sheath Specified value | Mean overall diameter | |
| | | | Lower limit | Upper limit |
| ($mm^2$) | (mm) | (mm) | (mm) | (mm) |
| 2 x 0.75 | 0.6 | 0.8 | 5.7 | 7.4 |
| 2 x 1 | 0.6 | 0.9 | 6.1 | 8.0 |
| 2 x 1.5 | 0.8 | 1.0 | 7.6 | 9.8 |
| 2 x 2.5 | 0.9 | 1.1 | 9.0 | 11.6 |
| 3 x 0.75 | 0.6 | 0.9 | 6.2 | 8.1 |
| 3 x 1 | 0.6 | 0.9 | 6.5 | 8.5 |
| 3 x 1.5 | 0.8 | 1.0 | 8.0 | 10.4 |
| 3 x 2.5 | 0.9 | 1.1 | 9.6 | 12.4 |
| 3 x 4 | 1.0 | 1.2 | 11.3 | 14.5 |
| 3 x 6 | 1.0 | 1.4 | 12.8 | 16.3 |
| 4 x 0.75 | 0.6 | 0.9 | 6.8 | 8.8 |
| 4 x 1 | 0.6 | 0.9 | 7.1 | 9.3 |
| 4 x 1.5 | 0.8 | 1.1 | 9.0 | 11.6 |
| 4 x 2.5 | 0.9 | 1.2 | 10.7 | 13.8 |
| 4 x 4 | 1.0 | 1.3 | 12.7 | 16.2 |
| 4 x 6 | 1.0 | 1.5 | 14.2 | 18.1 |
| 5 x 0.75 | 0.6 | 1.0 | 7.6 | 9.9 |
| 5 x 1 | 0.6 | 1.0 | 8.0 | 10.3 |
| 5 x 1.5 | 0.8 | 1.1 | 9.8 | 12.7 |
| 5 x 2.5 | 0.9 | 1.3 | 11.9 | 15.3 |