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**Kabli z gumijasto izolacijo za naznačene napetosti do vključno 450/750 V – 4.  
del: Vrvice in zvižavi kabli**

Cables of rated voltages up to and including 450/750 V and having crosslinked insulation – Part 4: Cords and flexible cables

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HARMONIZATION DOCUMENT

**HD 22.4 S4**

DOCUMENT D'HARMONISATION

HARMONISIERUNGSDOKUMENT

March 2004

ICS 29.060.20

Supersedes HD 22.4 S3:1995 + A1:1999 + A2:2002

English version

**Cables of rated voltages up to and including 450/750 V  
and having crosslinked insulation  
Part 4: Cords and flexible cables**

Conducteurs et câbles isolés avec  
des matériaux réticulés de tension  
assignée au plus égale à 450/750 V  
Partie 4: Câbles souples

Starkstromleitungen mit vernetzter  
Isolierhülle für Nennspannungen bis  
450/750  
Teil 4: Flexible Leitungen

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

This Harmonization Document was approved by CENELEC on 2004-02-01. 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, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, 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 edition 4 of HD 22.4 has been prepared by Technical Committee CLC/TC 20, Electric cables. It provides a full updating of edition 3, including incorporation of amendment No 1, and introduces other improvements.

HD 22.4 S4 is related to IEC 60245-4 (1994), but is not directly equivalent.

HD 22 now has the following parts:

- HD 22.1 S4 - General requirements
- HD 22.2 S3 - Test methods
- HD 22.3 S4 - Heat resistant silicone rubber insulated cables
- HD 22.4 S4 - 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 use as 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 S2 - Cords for applications requiring high flexibility
- HD 22.15 S1 - Multicore cables insulated and sheathed with heat resistant silicone rubber
- HD 22.16 S1 - Water resistant polychloroprene or equivalent elastomer sheathed flexible cables

The draft Harmonisation Document was submitted to the Unique Acceptance Procedure and approved by GENELEC as HD 22.4 S4 on 2004-02-01.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 2004-08-01
- latest date by which the EN has to be implemented at national level by publication of a harmonised national standard or by endorsement (dop) 2005-02-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 2006-02-01

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## 1 Scope

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

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 Normative references

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.

Publication	Year	Title
EN 50265-2-1	1998	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 - 1kW pre-mixed flame
EN 50334	2001	Marking by inscription for the identification of cores of electric cables
EN 50356	2002	Method of spark testing of cables
EN 60811 (series)		Insulating and sheathing materials of electric and optical cables - Common test methods
HD 383	1993	Conductors of insulated cables (Endorsing IEC 60228 and IEC 60228A)

Table 1 (Spare)

Table 2 (Spare)

## 3 Ordinary EPR insulated and EPR sheathed cord and flexible cable<sup>1)</sup>

### 3.1 Code designation

H05RR-F

### 3.2 Rated voltage

300/500 V

<sup>1)</sup> This is similar to type 60245 IEC 57 up to 1,0 mm<sup>2</sup> but has modified requirements.

### 3.3 Construction

#### 3.3.1 Conductor

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

Cross sectional areas: 0,75 mm<sup>2</sup> up to and including 4 mm<sup>2</sup> for cables having 2 to 5 conductors; 6 mm<sup>2</sup> 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 3, column 2.

#### 3.3.4 Assembly of cores and filler, if any

The cores shall be twisted together.

A centre filler may be used.

#### 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 3, 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 4, with a requirement for a minimum level as given for EM 3 in Part 1, Table 2.

#### 3.3.6 Overall diameter

The mean overall diameter shall be within the limits given in Part 4 Table 3, columns 4 and 5.

#### 3.3.7 Outer marking

The cable shall have the marking H05RR-F printed or embossed on, or indented into, the outer surface of the sheath, or on the insulation of one of the cores. The marking, which shall meet the requirements of 3.2 and 3.3 of Part 1, shall be legible.

### 3.4 Tests

Compliance with the requirements of Part 4, Subclause 3.3 shall be checked by inspection and by the tests given in Part 4, Table 4.

### 3.5 Guide to use (informative)

See HD 516.

Table 3 – Dimensions of type H05RR-F

1 Number and nominal cross- sectional area of conductors mm <sup>2</sup>	2 Thickness of insulation Specified value mm	3 Thickness of sheath Specified value mm	4 Mean overall diameter	
			Lower limit	Upper limit
			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
2 x 4	1,0	1,2	10,6	13,7
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
5 x 4	1,0	1,4	14,6	18,6



Table 4 – Tests for type H05RR-F

1 Ref. No.	2 Tests	3 Cate- gory of test	4 Test method described in	
			HD / EN	Clause
<b>1.</b>	<b>Electrical tests</b>			
1.1	Resistance of conductors	T, S	22.2	2.1
1.2	Voltage test on cores according to specified insulation thickness			
1.2.1	at 1 500 V up to and including 0,6 mm	T	22.2	2.3
1.2.2	at 2 000 V exceeding 0,6 mm	T	22.2	2.3
1.3	Voltage test on completed cable at 2 000 V	T, S	22.2	2.2
1.4	Absence of faults on insulation	R	22.2 <sup>a</sup>	2.6
1.5	Surface resistance of sheath	T	22.2	2.7
<b>2</b>	<b>Provisions covering constructional and dimensional characteristics</b>			
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 thickness of sheath	T, S	22.2	1.10
2.4	Measurement of overall diameter			
2.4.1	Mean value	T, S	22.2	1.11
2.4.2	Ovality	T, S	22.2	1.11
2.5	Solderability test (Plain conductors)	T	22.2	1.12
<b>3</b>	<b>Mechanical properties of insulation</b>			
3.1	Tensile test before ageing	T	60811-1-1	9.1
3.2	Tensile test after ageing in the air oven	T	60811-1-2	8.1.3.2a
3.3	Tensile test after ageing in the air bomb	T	60811-1-2	8.2
3.4	Hot set test	T	60811-2-1	9
<b>4</b>	<b>Mechanical properties of sheath</b>			
4.1	Tensile test before ageing	T	60811-1-1	9.2
4.2	Tensile test after ageing in the air oven	T	60811-1-2	8.1.3.1
4.3	Hot set test	T	60811-2-1	9
<b>5</b>	<b>Compatibility test on cable</b>	T	60811-1-2	8.1.4

Table 4 – Tests for type H05RR-F (continued)

1 Ref. No.	2 Tests	3 Cate- gory of test	4 Test method described in		5 Clause
			HD / EN		
<b>6</b>	<b>Mechanical strength of completed cable</b>				
6.1	Flexing test <sup>b</sup> followed, after immersion in water, by a voltage test on cores - at 1 500 V on cores with specified insulation thickness up to and including 0,6 mm - at 2 000 V on cores with specified insulation thickness exceeding 0,6 mm	T  T	22.2  22.2		3.1 and 2.3  3.1 and 2.3
<b>7</b>	<b>Tests at low temperature</b>				
7.1	Bending test on sheath <sup>c</sup>	T	60811-1-4		8.2
7.2	Elongation test on sheath <sup>d</sup>	T	60811-1-4		8.4
7.3	Impact test on cable at -25 °C	T	60811-1-4		8.5
<b>8</b>	<b>Carbon black content of sheath (where applicable)</b>	T	60811-4-1		11
<b>9</b>	<b>Ozone resistance test for insulation and sheath (either method may be used)</b>	T			
	(a) Method A		60811-2-1		8
	(b) Method B		22.2		7.3
<p><sup>a</sup> Where the spark test is used for checking absence of faults on insulation, EN 50356 may be used in place of the method in HD 22.2.</p> <p><sup>b</sup> Not applicable to cables with conductors greater than 4 mm<sup>2</sup></p> <p><sup>c</sup> Only applicable to cables having mean overall diameters up to and including 12,5 mm</p> <p><sup>d</sup> Only applicable if the mean overall diameter of the cable exceeds 12,5 mm</p>					

#### 4 Ordinary polychloroprene or other equivalent synthetic elastomer sheathed cord and flexible cable <sup>2)</sup>

##### 4.1 Code designation

H05RN-F

##### 4.2 Rated voltage

300/500 V

<sup>2)</sup> This is similar to type 60245 IEC 57 up to 1,0 mm<sup>2</sup> but has modified requirements.

### 4.3 Construction

#### 4.3.1 Conductor

Number of conductors: 2 or 3.

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

#### 4.3.2 Separator

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

#### 4.3.3 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 5, column 2.

#### 4.3.4 Assembly of cores and filler, if any

The cores shall be twisted together.

A centre filler may be used.

#### 4.3.5 Sheath

The sheath shall be rubber compound of Type EM 2 applied around the cores.

The thickness of sheath shall comply with the specified value given in Part 4, Table 5, column 3. The sheath shall be extruded in a single layer 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.

#### 4.3.6 Overall diameter

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

#### 4.3.7 Outer marking

The cable shall have the marking H05RN-F printed or embossed on, or indented into, the outer surface of the polychloroprene sheath. The marking, which shall meet the requirements of 3.2 and 3.3 of Part 1, shall be legible.

### 4.4 Tests

Compliance with the requirements of Part 4, Subclause 4.3 shall be checked and inspected by the tests given in Part 4, Table 6.

### 4.5 Guide to use (informative)

See HD 516.