

Rubber insulated cables of rated voltages up to and including 450/750 V -  
Part 16: Water resistant polychloroprene or equivalent synthetic elastomer  
sheathed cables

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English version

**Rubber insulated cables of rated voltages up to and  
including 450/750 V  
Part 16: Water resistant polychloroprene or equivalent  
synthetic elastomer sheathed cables**

Conducteurs et câbles isolés au  
caoutchouc de tension assignée  
au plus égale à 450/750 V  
Partie 16: Câbles sous gaines en  
polychloroprène ou élastomère  
synthétique équivalent résistant à l'eau

Isolierte Starkstromleitungen mit  
einer Isolierhülle aus Gummi mit  
Nennspannungen bis 450/740 V  
Teil 16: Wasserbeständige schwere  
Schlauchleitung mit Mantel aus  
Polychloropren oder gleichwertigem  
synthetischen Gummi

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This Harmonization Document was approved by CENELEC on 1999-08-01. 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, Czech Republic, 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

## 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 or revised.

This edition of HD 22.16 has been introduced to cover flexible cables for submersible pumps and similar applications in water up to 10 m depth and up to a maximum of 40°C. It was agreed by TC 20 at its Barcelona meeting (May 1998) to go forward to UAP.

HD22 now has the following parts:

- HD 22.1 S3 - General requirements
- HD 22.2 S3 - Test methods
- 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 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 polymer and having low emission of smoke and corrosive gases
- HD 22.14 S1 -- 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 synthetic elastomer sheathed cables

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as HD 22.16 S1 on 1999-08-01.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 2000-02-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 2000-08-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 2001-08-01

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## 1 Scope

This part (Part 16) of the HD details the particular specifications for water resistant EPR insulated, polychloroprene or other equivalent synthetic elastomer sheathed flexible cables of rated voltages up to and including 450/750V, meant for applications in fresh water up to 10m depth and water temperatures up to 40°C.

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

HD 22.16 incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to HD 22.16 only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

HD 186	Marking by inscription for the identification of cores of electric cables having more than five cores
HD 383	Conductors of insulated cables (endorsing IEC 60228 and 60228A)
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 - 1kW pre-mixed flame
EN 60719	Calculation of the lower and the upper limits for the average outer dimensions of cables with circular copper conductors and of rated voltages up to and including 450/750V
EN 60811 (series)	Insulating and sheathing materials of electric cables - Common test methods

## 3 Water-resistant polychloroprene or other equivalent synthetic elastomer sheathed flexible cable

### 3.1 Code designation

H07RN8-F

### 3.2 Rated voltage

450/750V

### 3.3 Construction

#### 3.3.1 Conductor

Number of conductors : 1, 2, 3, 4 or 5.

The conductors shall comply 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 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 Table 1, column 2.

### 3.3.4 Tape

An optional non-hygroscopic tape may be applied on each core.

Where the insulation of conductors having a nominal cross-section in excess of 4 mm<sup>2</sup> is covered with a non-hygroscopic tape, it shall be helically wound with an overlap of at least 1 mm.

The tape shall be applied to the insulation in such a manner that it can be removed without damage to the insulation.

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

The cores shall be twisted together.

A centre filler may be used.

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In the case of cores having conductors of large cross-section a non-hygroscopic tape may be applied around the core assembly before application of the sheath, provided that the finished cables shall not have any substantial cavity in the outer interstices between the cores.

### 3.3.6 Sheath

The core or core assembly shall be covered with a sheath.

The sheath shall be made up as follows:

- (a) For cables with a specified sheath thickness up to and including 2,4 mm - sheath in a single layer, rubber compound type EM 2.
- (b) For cables with a specified sheath thickness greater than 2,4 mm - either in a single layer, rubber compound type EM 2 - or in two layers, with the inner layer made of one of the rubber compounds type, EM 2 or EM 3 and the outer layer of the rubber compound type EM 2.

The thickness of sheath shall comply with the specified value given in Table 1, columns 3, 4 and 5.

The sheath applied in a single layer or the inner layer of the sheath in two layers shall, for cables with 2 to 5 cores, fill the spaces between the cores.

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

For non-electrical tests on sheaths in two layers see Part 1, subclause 5.5.2.2.

### 3.3.7 Overall diameter

The mean overall diameter shall be within the limits given in Table 1, columns 6 and 7.

### 3.3.8 Outer markings

At least the designatory marking RN8 shall be printed or embossed on, or indented into, the outer sheath.

The marking shall be continuous, in accordance with Part 1, subclause 3.2.

## 3.4 Tests

Compliance with the requirements of subclause 3.3 shall be checked by inspection and by the tests given in Table 2.

The tests at low temperature shall be restricted to cables having conductor(s) not exceeding 16 mm<sup>2</sup>.

## 3.5 Guide to use (informative)

See HD 516.

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Table 1 - Dimensions of Type H07RN8-F

1	2	3	4	5	6	7
Number & nominal cross sectional area of conductors	Thickness of insulation  Specified value	Thickness of sheath Specified value			Mean overall diameter	
		One layer	Two layers		Lower limit	Upper limit
			Inner layer	Outer layer		
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
1 x 1,5	0,8	1,4	-	-	5,7	7,1
1 x 2,5	0,9	1,4	-	-	6,3	7,9
1 x 4	1,0	1,5	-	-	7,2	9,0
1 x 6	1,0	1,6	-	-	7,9	9,8
1 x 10	1,2	1,8	-	-	9,5	11,9
1 x 16	1,2	1,9	-	-	10,8	13,4
1 x 25	1,4	2,0	-	-	12,7	15,8
1 x 35	1,4	2,2	-	-	14,3	17,9
1 x 50	1,6	2,4	-	-	16,5	20,6
1 x 70	1,6	2,6	1,6	1,6	18,6	23,3
1 x 95	1,8	2,8	1,1	1,7	20,8	26,0
1 x 120	1,8	3,0	1,2	1,8	22,8	28,6
1 x 150	2,0	3,2	1,3	1,9	25,2	31,4
1 x 185	2,2	3,4	1,4	2,0	27,6	34,4
1 x 240	2,4	3,5	1,4	2,1	30,6	38,3
1 x 300	2,6	3,6	1,4	2,2	33,5	41,9
1 x 400	2,8	3,8	1,5	2,3	37,4	46,8
1 x 500	3,0	4,0	1,6	2,4	41,3	52
2 x 1	0,8	1,3	-	-	7,7	10,0
2 x 1,5	0,8	1,5	-	-	8,5	11,0
2 x 2,5	0,9	1,7	-	-	10,2	13,1
2 x 4	1,0	1,8	-	-	11,8	15,1
2 x 6	1,0	2,0	-	-	13,1	16,8
2 x 10	1,2	3,1	1,2	1,9	17,7	22,6
2 x 16	1,2	3,3	1,3	2,0	20,2	25,7
2 x 25	1,4	3,6	1,4	2,2	24,3	30,7

Table 1 (continued)

1	2	3	4	5	6	7
Number & nominal cross sectional area of conductors	Thickness of insulation	Thickness of sheath Specified value			Mean overall diameter	
	Specified value	One layer	Two layers		Lower limit	Upper limit
			Inner layer	Outer layer		
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
3 x 1	0,8	1,4	-	-	8,3	10,7
3 x 1,5	0,8	1,6	-	-	9,2	11,9
3 x 2,5	0,9	1,8	-	-	10,9	14,0
3 x 4	1,0	1,9	-	-	12,7	16,2
3 x 6	1,0	2,1	-	-	14,1	18,0
3 x 10	1,2	3,3	1,3	2,0	19,1	24,2
3 x 16	1,2	3,5	1,4	2,1	21,8	27,6
3 x 25	1,4	3,8	1,5	2,3	26,1	33,0
3 x 35	1,4	4,1	1,6	2,5	29,3	37,1
3 x 50	1,6	4,5	1,8	2,7	34,1	42,9
3 x 70	1,6	4,8	1,9	2,9	38,4	48,3
3 x 95	1,8	5,3	2,1	3,2	43,3	54
3 x 120	1,8	5,6	2,2	3,4	47,4	60
3 x 150	2,0	6,0	2,4	3,6	52	66
3 x 185	2,2	6,4	2,5	3,9	57	72
3 x 240	2,4	7,1	2,8	4,3	65	82
3 x 300	2,6	7,7	3,1	4,6	72	90
4 x 1	0,8	1,5	-	-	9,2	11,9
4 x 1,5	0,8	1,7	-	-	10,2	13,1
4 x 2,5	0,9	1,9	-	-	12,1	15,5
4 x 4	1,0	2,0	-	-	14,0	17,9
4 x 6	1,0	2,3	-	-	15,7	20,0
4 x 10	1,2	3,4	1,4	2,0	20,9	26,5
4 x 16	1,2	3,6	1,4	2,2	23,8	30,1
4 x 25	1,4	4,1	1,6	2,5	28,9	36,6
4 x 35	1,4	4,4	1,7	2,7	32,5	41,1
4 x 50	1,6	4,8	1,9	2,9	37,7	47,5
4 x 70	1,6	5,2	2,0	3,2	42,7	54
4 x 95	1,8	5,9	2,3	3,6	48,4	61
4 x 120	1,8	6,0	2,4	3,6	53	66
4 x 150	2,0	6,5	2,6	3,9	58	73
4 x 185	2,2	7,0	2,8	4,2	64	80
4 x 240	2,4	7,7	3,1	4,6	72	91
4 x 300	2,6	8,4	3,3	5,1	80	101

Table 1 (concluded)

1	2	3	4	5	6	7
Number & nominal cross sectional area of conductors	Thickness of insulation	Thickness of sheath Specified value			Mean overall diameter	
	Specified value	One layer	Two layers		Lower limit	Upper limit
			Inner layer	Outer layer		
(mm <sup>2</sup> )	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
5 x 1	0,8	1,6	-	-	10,2	13,1
5 x 1,5	0,8	1,8	-	-	11,2	14,4
5 x 2,5	0,9	2,0	-	-	13,3	17,0
5 x 4	1,0	2,2	-	-	15,6	19,9
5 x 6	1,0	2,5	1,0	1,5	17,5	22,2
5 x 10	1,2	3,6	1,4	2,2	22,9	29,1
5 x 16	1,2	3,9	1,5	2,4	26,4	33,3
5 x 25	1,4	4,4	1,7	2,7	32,0	40,4

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