
Preskusne zahteve za pribor, ki se uporablja na elektroenergetskih kablih za naznačene napetosti od 3,6/6(7,2) kV do vključno 20,8/36(42) kV – 1. del: Kabli z ekstrudirano izolacijo

Test requirements on accessories for use on power cables of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV - Part 1: Cables with extruded insulation

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English version

**Test requirements on accessories for use on power cables
of rated voltage from 3,6/6(7,2) kV up to 20,8/36(42) kV
Part 1: Cables with extruded insulation**

Prescriptions relatives aux essais
sur les accessoires des câbles d'énergie
pour des tensions assignées
de 3,6/6(7,2) kV à 20,8/36(42) kV
Partie 1: Câbles à isolation extrudée

Prüfanforderungen für Kabelgarnituren für
Starkstromkabel mit einer Nennspannung
von 3,6/6(7,2) kV bis 20,8/36(42) kV
Teil 1: Kabel mit extrudierter
Kunststoffisolierung

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This Harmonization Document was approved by CENELEC on 2005-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document at national level.

Up-to-date lists and bibliographical references concerning such national implementations 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, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

This Harmonization Document was prepared by the Technical Committee CENELEC TC 20, Electric cables. The text of the draft was submitted to the formal vote and was approved by CENELEC as HD 629.1 S2 on 2005-09-01.

This Harmonization Document supersedes HD 629.1 S1:1996 and its amendment A1:2001; it also includes the changes proposed by CLC/TC 20 WG 11 as draft amendment A2.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 2006-03-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 2006-09-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 2008-09-01

This Harmonization Document has been written as part of a series of standards to satisfy the Public Procurement Directive, and is complementary to HD 620, which covers extruded insulation power cables from 3,6/6(7,2) kV to 20,8/36(42) kV, inclusive.

This standard defines the requirements, which may be called up for joints, stop ends, separable connectors, indoor and outdoor terminations when used with extruded insulation power cables covered by HD 620. The equivalent requirements for paper-insulated power cables are given in HD 629.2 S2.

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The test methods for these accessories are given in EN 61442.

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1 Scope

1.1 General

This standard specifies performance requirements for type tests for cable accessories for use on extruded insulation power cables as specified in HD 620.

Formerly, approvals of such products have been achieved on the basis of national standards and specifications and/or the demonstration of satisfactory service performance. The publication of this CENELEC standard does not invalidate existing approvals. However, products approved to such earlier standards or specifications shall not claim approval to this CENELEC standard unless specifically tested to it.

It is not necessary to repeat these tests, once successfully completed, unless changes are made in the materials, design or manufacturing process, which might affect the performance characteristics.

Accessories for special applications such as submarine cables, ships cables or hazardous situations (explosive environments, fire resistant cables or seismic conditions) are not included.

Test methods are included in EN 61442.

1.2 Type of accessories

The accessories covered by this standard are listed below:

- a) indoor and outdoor terminations of all designs, including terminal boxes;
- b) straight joints, branch joints and stop ends of all designs, suitable for use underground or in air;
- c) screened or unshielded plug-in type or bolted-type separable connectors capable of interfacing with bushing profiles as specified in EN 50180 and EN 50181.

NOTE Joints connecting extruded insulation cables (HD 620) to paper insulated cables (HD 621) are not included. The requirements for these accessories are dealt with in HD 629.2.

1.3 Rated voltage

The rated voltages U_0/U (U_m) of the accessories covered by this standard are 3,6/6(7,2) - 3,8/6,6(7,2) - 6/10(12) - 6,35/11(12) - 8,7/15(17,5) - 12/20(24) - 12,7/22(24) - 18/30(36) - 19/33(36) - 20,8/36(42) kV where:

U_0 is the rated power-frequency voltage between conductor and earth or metallic screen, for which the cable accessory is designed;

U is the rated power-frequency voltage between conductors for which the cable accessory is designed;

U_m is the maximum value of the 'highest system voltage' for which the cable accessory is designed.

1.4 Current

The continuous current rating of a termination or joint for extruded insulation power cables shall be in accordance with the appropriate cable specified in HD 620 and shall be suitable for operation at the rated current and under short circuit fault conditions at the temperatures stated therein.

The current rating of a separable connector is governed by the current rating of the mating bushing (see EN 50180 and EN 50181).

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.

EN 50180	Bushings above 1 kV up to 36 kV and from 250 A to 3,15 kA for liquid filled transformers
EN 50181	Plug-in type bushings above 1 kV up to 36 kV and from 250 A to 1,25 kA for equipment other than liquid filled transformers
EN 61238-1	Compression and mechanical connectors for power cables for rated voltages up to 36 kV ($U_m = 42$ kV) – Part 1: Test methods and requirements (IEC 61238-1:2003, mod.)
EN 61442	Test methods for accessories for power cables with rated voltages from 6 kV ($U_m = 7,2$ kV) up to 36 kV ($U_m = 42$ kV) (IEC 61442)
HD 428.2.2	Three-phase oil-immersed distribution transformers 50 Hz, from 50 to 2 500 kVA with highest voltage for equipment not exceeding 36 kV – Part 2: Distribution transformers with cable boxes on the high-voltage and/or low-voltage side – Section 2: Cable boxes type 1 for use on distribution transformers meeting the requirements of HD 428.2.1 S1
HD 620	Distribution cables with extruded insulation for rated voltages from 3,6/6 (7,2) kV to 20,8/36 (42) kV
HD 631 (series) ¹⁾	Electrical cables - Accessories - Material characterisation
IEC 60050-461	International Electrotechnical Vocabulary - Chapter 461: Electric cables

3 Definitions

For the purposes of this document, the following terms and definitions apply together with those given in IEC 60050-461.

3.1

connector

metallic device to connect cable conductors together (IEV 461-17-03)

3.2

termination

device fitted to the end of a cable to ensure electrical connection with other parts of the system and to maintain the insulation up to the point of connection (IEV 461-10-01)

3.3

indoor termination

termination intended for use where it is not exposed to either solar radiation or weathering

3.4

outdoor termination

termination intended for use where it is exposed to either solar radiation or weathering or both

1) At draft stage.

3.5**terminal box**

air- or compound-filled box fully enclosing a termination (IEV 461-10-03 modified)

3.6**shrouded termination**

indoor termination with additional insulation at the bushing connection and used in an air-filled terminal box

3.7**joint**

accessory suitable for use in air or underground which makes a connection between two or more insulated power cables to form a continuous circuit

3.7.1**type I joint**

joint suitable for use where impact resistance withstand is not required

3.7.2**type II joint**

joint which has impact resistance withstand in accordance with this standard

3.8**straight joint**

accessory making a connection between two cables to form a continuous circuit (IEV 461-11-01)

NOTE For types of joint see 3.7.1 and 3.7.2.

3.9**branch joint**

accessory making a connection of a branch cable to a main cable (IEV 461-11-17)

NOTE For types of joint see 3.7.1 and 3.7.2.

3.10**stop end**

accessory providing a means of insulating the unconnected end of an energized cable (IEV 461-10-07 modified)

3.11**separable connector**

fully insulated termination permitting the connection and the disconnection of a cable to other equipment

3.12**screened separable connector**

separable connector which has a fully screened external surface

3.13**unscreened separable connector**

separable connector which does not have an external screen

3.14**plug-in type separable connector**

separable connector in which the electrical contact is made by a sliding device

3.15**bolted-type separable connector**

separable connector in which the electrical contact is made by a bolted device

**3.16
tracking**

irreversible degradation by formation of paths, which are conductive even under dry conditions, starting and developing on the surface of an insulating material and which may occur on surfaces in contact with air and also on the interfaces between different insulating materials

**3.17
erosion**

irreversible and non-conducting degradation of the surface of the insulator that occurs by loss of material, and which may be uniform, localized or tree-shaped

NOTE Shallow surface traces, commonly tree-shaped, may occur on terminations after partial flashover. These traces are acceptable as long as they are non-conductive. When they are conductive they are classed as tracking.

**3.18
metallic housing**

metal enclosure in intimate contact with the outer screen of a separable connector and having at least the same current carrying capacity to earth as the metallic screen of the cable with which the separable connector is to be used

4 Components

4.1 Connectors

Connectors used within the accessory shall comply with EN 61238-1 where applicable, or with another relevant standard or specification.

4.2 Materials

It is not a pre-requirement for compliance with this performance standard but, if component material characterization is required, the relevant part of HD 631 shall be used.

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5 Test assemblies

5.1 Identification

5.1.1 Cables

The cables used for testing shall comply with HD 620. It is recommended that the test cables be correctly identified as in Annex A.

5.1.2 Connectors

Connectors used within the accessories shall be identified by the specification with which they comply.

5.1.3 Accessories

Accessories to be tested shall be correctly identified with respect to

- name of manufacturer,
- type, designation, manufacturing date or code,
- minimum and maximum cross-sections, material and shape of cable conductor,
- minimum and maximum cable insulation diameters,
- connector type(s),
- rated voltage (see 1.3),
- installation instructions (reference and date),
- list of kit contents.

5.2 Cable conductor cross-section

Unless otherwise specified, the conductor cross-section shall be

- for terminations, joints or stop ends; 120 mm² or 150 mm² or 185 mm²,
- for separable connectors, as indicated in Table 1 for each rating, using either aluminium or copper conductors.

5.3 Assembly

Accessories shall be assembled in the manner specified in the manufacturer's instructions, with the grade and quantity of materials supplied. A joint designed for crossed cores shall be so assembled.

5.4 Terminations

Terminations shall be tested using the arrangement and with the number of samples detailed in Figure 1.

5.5 Terminal boxes

A termination intended to be used in a metallic terminal box shall normally be tested in the specified terminal box, which shall conform to the relevant standards ²⁾.

For practical reasons, it is permissible to carry out the tests with the terminations enclosed in a test terminal box fabricated from rigid metallic mesh or from insulating material lined with metal foil. The box shall allow humidity ingress.

The test terminal box shall be of the same shape and dimensions (e.g. creepage lengths and clearances) as the specified terminal box and be provided with conductor terminals and bushings of the type used in service.

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When only one of the termination samples is required to be tested in the terminal box (see 6.8), the remote end of the test cable may be terminated by any suitable means.

5.6 Joints and stop ends

Joints and stop ends shall normally be designed and tested to withstand a height of water of 1 m (10 kPa (0,1 bar)).

For special applications and in situations subject to a high water table or prone to flooding, this height of water may be insufficient to ensure the satisfactory performance of the moisture seals. In such cases, upon agreement between manufacturer and user, the accessories shall be tested using an increased water height of 20 m (200 kPa (2,0 bar)). The chosen water height shall be recorded in the test report.

Testing at one water height will achieve compliance for that pressure only. Testing at both 1 m and 20 m water heights will achieve compliance for those water heights and all intermediate pressures.

Where a branch joint is being tested, only the main cable shall carry heating current.

²⁾ For example HD 428.2.2.

5.7 Separable connectors

The conductor cross-section of the test cable shall be as defined in Table 1.

Tests on separable connectors shall be performed with the separable connector installed on its mating bushing.

Unscreened separable connectors shall be tested at the minimum phase-to-phase and phase-to-earth clearances recommended by the manufacturer.

Table 1 – Test cable conductor cross-sections for separable connectors

Rating of separable connector	Cable conductor cross-section	
	mm ²	
	Cu	Al
250 A	50	70
400 A	95	150
630 A	185	300
800 A	300	400
1 250 A	500	630

NOTE 1 The current value shall be sufficient to achieve the specified temperature of the cable conductor (see EN 61442, Subclause 9.1).

NOTE 2 The use of the cross-sections in Table 1 may lead to overheating of the bushing while achieving the required conductor temperature. Under these circumstances, it is permissible to use a conductor one size smaller. If bushing failure occurs, the test will be declared void (see 8.3).

5.8 Test arrangements and number of samples

These are detailed in Figures 1 to 5.

6 Range of compliance

6.1 Compliance for one type of accessory for the range of cable conductor cross-sections from 95 mm² to 300 mm² shall be obtained by successfully completing all the appropriate tests of Tables 3 to 8 of this standard on the conductor cross-sections specified in 5.2.

Extension of this compliance for the same type of accessory on larger or smaller conductor cross-sections may be obtained by satisfactory completion of the additional test sequence in Table 10, on the appropriate cross-section.

6.2 For compliance of an accessory for conductor cross-sections outside this range the cross-section to be tested shall be subject to agreement between interested parties.

6.3 Compliance is independent of the cable conductor material; tests may be carried out with either aluminium or copper conductors.

6.4 Compliance for accessories tested on cables with shaped conductors shall cover the same type of accessory when used on cables with circular conductors.

If compliance has been obtained using circular conductors, extension to shaped conductors may be obtained by satisfactory completion of the test sequence in Table 9.

6.5 Compliance is dependent on the cable insulation as detailed in Table 2.

Table 2 – Range of insulation compliance

Test cable insulation	Range of compliance
XLPE	XLPE, HEPR, EPR, PVC
EPR or HEPR	EPR, HEPR, PVC

6.6 Compliance for accessories tested on cables with one type of insulation screen may be extended to another type of insulation screen by satisfactory completion of the test sequence in Table 9.

6.7 Compliance obtained by testing on a cable without longitudinal water-blocking in the metallic screen area shall be extended to a cable with means of longitudinal water-blocking in the metallic screen area but otherwise of the same design. The converse shall not apply.

6.8 Compliance obtained for a three-core accessory shall extend to a single-core accessory of the same design. The converse shall not apply.

6.9 Compliance for a particular design of termination in a specified terminal box shall be obtained by the satisfactory completion of the test sequence in Table 3. If compliance has already been obtained for a termination design separate from the terminal box, it is necessary to carry out the test sequence with only one of the terminations in a terminal box.

Satisfactory completion of the appropriate tests of Table 3 for a termination for one design of terminal box may allow the compliance to be extended to that termination in another terminal box design by comparison of the detail drawings of the boxes. If there are differences in the design and/or dimensions, the impulse voltage test at ambient temperature shall be repeated, by agreement between the manufacturer and the customer.

6.10 Compliance of an accessory tested for a specified U_0 shall extend to operation of the accessory at a lower U_0 .

7 Test sequences

The test sequences for the various types of accessory are detailed in Tables 3 to 8, with additional tests in Tables 9 and 10. The test voltages are summarized in Table 11.

NOTE During the heating cycle voltage test, the manufacturer, at his own discretion, may carry out partial discharge tests at any time, for information only.

7.1 Dynamic short circuit performance

This test is a three-phase test required for single-core cable accessories designed for initial peak current higher than 80 kA and for three-core cable accessories designed for initial peak current higher than 63 kA.

- | | |
|---------|--|
| Class 1 | Three core accessories designed for initial peak currents above 63 kA up to and including 80 kA.
The test current shall be 80 kA initial peak. |
| Class 2 | Three core and single core accessories designed for initial peak currents above 80 kA up to and including 100 kA.
The test current shall be 100 kA initial peak. |
| Class 3 | Three core and single core accessories designed for initial peak currents above 100 kA up to and including 125 kA.
The test current shall be 125 kA initial peak. |