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

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ICS 29.035.10; 29.060.20

Referenčna številka
SIST HD 629.2 S1:1998(en)

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ICS 29.060.20

Descriptors: Electric power transmission, electric cable, insulated cable, solid electrical insulation, electrical insulating paper, accessories, definition, specification, test

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 2: Cables with impregnated paper insulation**

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

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

This Harmonization Document was approved by CENELEC on 1997-07-01. 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).

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CENELEC

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

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FOREWORD

HD 629.2 was prepared by WG11 of the Technical Committee of CENELEC TC20, Electric cables, and has been written as part of a series of standards to satisfy the Public Procurement Directive. It is complementary to HD 621, which covers impregnated paper insulated power cables from 3,6/6(7,2)kV to 20,8/36(42)kV, inclusive.

The standard defines the requirements which may be called up for joints, stop ends, separable connectors indoor and outdoor terminations when used with impregnated paper insulated power cables covered by HD 621. The equivalent requirements for extruded insulation power cables are given in HD 629.1.

The test methods for these accessories are given in HD 628.

This draft was submitted to the CENELEC Formal Vote (3MV) in November 1996 and was approved by CENELEC as HD 629.2 S1 on 1997-07-01.

The following dates were fixed:

- | | | | |
|---|--|-------|------------|
| - | latest date by which the existence of the HD has to be announced at national level | (doa) | 1997-12-01 |
| - | latest date by which the HD has to be implemented at national level by publication of a harmonised national standard or by endorsement | (dop) | 1998-06-01 |
| - | latest date by which the national standards conflicting with the HD have to be withdrawn | (dow) | 1998-06-01 |

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**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 2 : Cables with impregnated paper insulation

1. Scope

1.1 General

This standard specifies performance requirements for cable accessories for use on impregnated paper insulated power cables as specified in HD 621.

Accessories which the manufacturer can demonstrate to have provided satisfactory service experience do not need to be type tested.

After they have been made, these tests need not be repeated, unless changes are made in the materials, design or manufacturing process which might affect the performance characteristics.

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

1.2 Types of accessories

The accessories covered by this standard are listed below:

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

NOTE: Transition joints connecting extruded insulation cables (HD 620) to impregnated paper insulated cables (HD 621) are included.

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 rms where <https://standards.iteh.ai/catalog/standards/sist/9137dcefbcf2-4076-b42b-92511998>

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

U is the rated power-frequency voltage between conductors for which the accessory may be used.

U_m is the maximum value of the 'highest system voltage' for which the cable accessory may be used.

1.4 Current

The continuous current rating of a termination or joint for impregnated paper insulated power cables shall be in accordance with the appropriate cable specified in HD 621 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. (EN 50180 and EN 50181.)

2. Normative references

This Part 2 of HD 629 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 these publications, apply to this Part 2 of HD 629 only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

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 36kV 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
HD 620	Distribution cables with extruded insulation for rated voltages from 3,6/6 (7,2)kV up to and including 20,8/36(42)kV
HD 621	Medium voltage impregnated paper insulated distribution cables
HD 628	Test methods for accessories for power cables with rated voltage from 3,6/6kV ($U_m = 7,2$ kV) up to and including 20,8/36kV ($U_m = 42$ kV)
HD 631	Materials characterisation
IEC 50(461)	International electrotechnical vocabulary Chapter 461 Electric cables
EN 50180	Bushings above 1kV up to 36kV and from 250A to 3150A for liquid filled transformers
EN 50181	Plug-in type bushings above 1kV up to 36kV and from 250A to 1250A for equipment other than liquid filled transformers

3. Definitions

For the purpose of this standard the following definitions apply:

- 3.1 connector:** a metallic device to connect cable conductors together (IEV 461-17-03)
- 3.2 termination:** a 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:** a termination intended for use where it is not exposed to either solar radiation or weathering
- 3.4 outdoor termination:** a termination intended for use where it is exposed to either solar radiation or weathering or both
- 3.5 terminal box:** an air- or compound-filled box fully enclosing a termination (IEV 461-10-03 modified)
- 3.6 shrouded termination:** an indoor termination with additional insulation at the bushing connection and used in an air-filled terminal box

- 3.7 **joint:** an 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:** a joint suitable for use where an impact resistance withstand is not required
- 3.7.2 **type II joint:** a joint which has an impact resistance withstand in accordance with this standard
- 3.8 **straight-joint:** an 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:** an 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 **transition joint:** a straight or branch joint making a connection between paper insulated cables and cables with extruded insulation (IEV 461-11-04 modified)
- Note:** for types of joint see 3.7.1 and 3.7.2
- 3.11 **radial field joint:** a joint where the individual cores are screened throughout the joint
- Note:** for types of joint see 3.7.1 and 3.7.2
- 3.12 **non-radial field joint:** a joint which does not contain individual core screens.
- Note:** for types of joint see 3.7.1 and 3.7.2
- 3.13 **stop-end:** an accessory providing a means of insulating the unconnected end of an energised cable (IEV 461-10-07, modified)
- 3.14 **separable connector:** a fully insulated termination permitting the connection and the disconnection of a cable to other equipment
- 3.15 **screened separable connector:** a separable connector which has a fully screened external surface
- 3.16 **unscreened separable connector:** a separable connector which does not have an external screen <https://standards.iteh.ai/catalog/standards/sist/9137dcef-bcf2-4076-b42b-667d232b9e14/sist-hd-629-2-s1-1998>
- 3.17 **plug-in type separable connector:** a separable connector in which the electrical contact is made by a sliding device
- 3.18 **bolted-type separable connector:** a separable connector in which the electrical contact is made by a bolted device.

4. Test assemblies

4.1 Cables

The cables used for testing shall comply with HD 621, and HD 620 as relevant.

It is recommended that the test cables be correctly identified as in Annexes A1 and A2.

4.2 Connectors

Connectors used within the accessory shall comply with a relevant standard or specification.

NOTE: A CENELEC standard for connectors is under consideration. Until it is finalised, manufacturers and users may agree to specify either a recognised international standard, or relevant national standards or specifications.

4.3 Cable cross-section

Unless otherwise specified, the cable cross-section shall be:

- (a) for terminations, joints or stop ends; 120 or 150 or 185 or 240 mm²;
- (b) for separable connectors, as indicated in Table 1 for each rating, using either aluminium or copper conductors.

4.4 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.

4.5 Terminations

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

4.6 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.⁽¹⁾

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.

When only one of the termination samples is required to be tested in the terminal box (see sub-clause 5.5), the remote end of the test cable may be terminated by any suitable means.

⁽¹⁾ For example prHD 428.2.2

4.7 Joints and stop ends

Joints and stop ends shall normally be designed to withstand a head of water of 1,0m. For special applications, e.g. installations in situations subject to a high water table or where prone to flooding, this head of water may be insufficient to ensure the satisfactory performance of the moisture seals. In these circumstances, a customer may specify an increased head of water, up to a maximum equivalent to a pressure of 2 bar gauge.

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

4.8 Separable connectors

The 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.

Table 1: Test cable cross-sections for separable connectors

Rating	Cable cross-section (mm ²)	
	Cu	Al
250 A	*	*
400 A	150	240
630 A	*	*
800 A	*	*
1250 A	*	*
* under consideration		

4.9 Test arrangements and number of samples

These are detailed in Figures 1 to 5.

5. Range of Compliance

5.1 Compliance for one type of accessory for the range of cable cross-sections from 95mm² to 300mm², shall be obtained by successfully completing all the appropriate tests of Tables 2 to 7 of this standard on the cable cross-sections specified in sub-clause 4.3.

Extension of this compliance for the same type of accessory on larger or smaller cable cross-sections may be obtained by satisfactory completion of the additional test sequence in Table 9, on the appropriate cross-section of cable.

5.2 Compliance is independent of the cable conductor material; tests may be carried out on either aluminium or copper.

5.3 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 for circular conductors, extension to shaped conductors may be obtained by satisfactory completion of the test sequence in Table 8.

- 5.4 Compliance obtained for a three-core accessory shall extend to a single-core accessory of the same design.

Compliance obtained for a single-core accessory shall extend to a three-core accessory of the same design, if the latter is subjected to the immersion test of sub-clause 9.3 of HD 628 as appropriate and the dynamic short circuit test of clause 12 of HD 628.

- 5.5 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 2. 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 2 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. 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.

- 5.6 Compliance shall be restricted to the electrical design and type of cables (i.e. belted or radial field, draining or non-draining) on which tests have been conducted.

6. Test Methods

These are detailed in HD 628.

For three-phase testing of non-radial field joints a three-phase transformer or three single-phase transformers shall be used to energise the accessories under test. Single-phase transformers shall be star-connected with the neutral point earthed.

7. Test Sequences

The test sequences for the various types of accessory are detailed in Tables 2 to 7, with additional tests in Tables 8 and 9. The test voltages and requirements are summarised in Table 10.

8. Test Results

8.1 General

All the test samples shall meet the requirements of the relevant test sequence.

If any of the test samples does not meet the requirements, it shall be dismantled and inspected and the result of that inspection recorded in the test report.

The examination at the end of a test sequence is for information only but shall be recorded in the test report.

HD 631 shall be used to identify the profile of properties of the main components of the accessory.

8.2 Accessory failure

If an accessory fails to meet the requirements due to either installation or test procedure errors, the test shall be declared void without discrediting the accessory.