
Oil-immersed cable connection assemblies for transformers and reactors having highest voltage for equipment U_m from 72,5 kV to 550 kV

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EUROPEAN STANDARD

EN 50299

NORME EUROPÉENNE

EUROPÄISCHE NORM

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English version

Oil-immersed cable connection assemblies for transformers and reactors having highest voltage for equipment U_m from 72,5 kV to 550 kV

Boîte de raccordement de câble pour transformateurs immergés et bobine d'inductance de tensions comprises entre 72,5 kV et 550 kV

Ölgefüllte Kabelanschlusseinheiten für Transformatoren und Drosselspulen mit einer höchsten Spannung für Betriebsmittel U_m von 72,5 kV bis 550 kV

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This European Standard was approved by CENELEC on 2002-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, 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 European Standard was prepared by the CENELEC Technical Committee TC 14, Power transformers.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50299 on 2002-10-01.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2003-10-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-10-01

The contents of the corrigendum of April 2004 have been included in this copy.

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1 Scope

This standard covers the oil-immersed single-phase connection assembly of cables for transformers and reactors, designed in accordance with EN 60076 series and with EN 60289, respectively.

NOTE In the standard the term "transformer" is used as common definition for transformer and reactor.

The purpose of EN 50299 is to establish for the cable assemblies:

- the electrical and mechanical requirements, including interchangeability;
- the limits of supply;
- the test to be carried out.

It complements and amends, if necessary, the relevant IEC standards and applies to oil immersed cable connections, suitable for fluid-filled or dry-type cable terminations.

EN 50299 does not cover direct cable terminations (see 3.3.3), but, in this case, upon agreement between purchaser and supplier, the standard may be used for guidance except for Figure 1 and Figure 2 which are not applicable.

This standard applies to oil-immersed cable connection boxes on transformers with highest voltage for equipment $U_m = 72,5$ kV to 550 kV, including the current conductor terminal at the cable sealing end of the transformer.

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2 Normative references

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This European Standard 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 this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 60076	Series	Power transformers (IEC 60076 series, mod.)
EN 60289		Reactors (IEC 60289, mod.)
IEC 60141	Series	Test on oil-filled and gas-pressure cables and their accessories
IEC 60296		Specification for unused mineral insulating oils for transformers and switchgear
IEC 60840		Power cables with extruded insulation and their accessories for rated voltages above 30 kV ($U_m = 36$ kV) up to 150 kV ($U_m = 170$ kV) – Test methods and requirements
IEC/TR2 61639		Direct connection between power transformers and gas-insulated metal-enclosed switchgear for rated voltages of 72,5 kV and above

3 Definitions

For the purposes of this European Standard the following definitions apply.

3.1

cable-connection assembly

combination of a cable termination and a cable connection box which mechanically and electrically connects the cable to the transformer

3.2

cable connection box

part of the transformer which houses the cable termination and the interface to the transformer connection

3.3

cable termination

equipment 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

3.3.1

fluid-filled cable termination

cable termination which includes an insulating fluid as part of the cable connection assembly and comprises a segregation between said cable fluid in the cable connection box

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3.3.2

dry-type cable termination (standards.iteh.ai)

cable termination which comprises an elastomeric electrical stress control component in intimate contact with a separating insulating barrier between the cable insulation and the insulation of the cable connection box. The cable termination does not require any insulating fluid

3.3.3

direct cable termination

cable termination directly fitted on the end of the cable without any separating insulating barrier between the cable insulation and the insulation of the cable connection box. The cable enters directly into the cable box via a gland

3.4

disconnect chamber

cable connection box which has an oil/oil bushing fitted between the box and the main transformer tank, in such a manner as to prevent, in service conditions, direct communication of oil in the main tank with the fluid in cable connection box. It is fitted with a disconnecting link

3.5

disconnecting link

removable link inside a disconnect chamber which allows the transformer to be electrically isolated from the cable termination

4 Limits of supply

The limits of supply of transformer and cable termination shall be according to Figure 1.

5 Rated values

The following rated values shall apply:

- a) highest voltage for equipment;
- b) rated insulation level;
- c) rated current;
- d) temperature rise;
- e) rated short-time and peak withstand currents;
- f) rated duration of short-circuit;
- g) cable commissioning test voltage.

6 Preferred values

6.1 Highest voltage for equipment

The highest voltage for equipment U_m of the cable connection shall be equal to the values for the cable and the transformer and shall be selected from the following preferred values:

72,5 kV - 123 kV - 145 kV - 170 kV - 245 kV - 300 kV - 362 kV - 420 kV - 525 (550) kV

6.2 Rated current

The rated current shall be selected from the following preferred values:

400 A – 1 000 A – 1 600 A – 2 000 A

The value of 2 000 A cannot be exceeded.

7 Requirements

7.1 Temperature of connection interface

The current-carrying contact surfaces of the connection interface shall be either bare copper or copper silver-coated or tin-coated or silver-coated aluminium. The temperature of this interface shall not exceed the limit given in the IEC standard for the cable for which the cable connection box is designed.

NOTE As the maximum conductor temperature for cables is limited by the maximum operating temperature for the insulation, there are certain cable insulations which cannot withstand the maximum temperature specified for the transformer if there is heat transfer across the connection interface of the cable termination. For cases when the temperature limit given by the IEC standard cannot be achieved, the supplier of the transformer should provide data on temperature rise of the main circuit end terminal and the insulating liquid as function of current.

7.2 Mechanical requirements

The cable connection box shall be oil-tight and with the same degree of vacuum tightness as the transformer.

It shall be filled with degassed oil, normally under vacuum conditions. However, if the transformer tank is not designed to withstand a vacuum, the oil filling shall be carried out under the same conditions as the main transformer tank. The oil used for filling the cable connection box shall comply with the requirements of IEC 60296 when sampled after filling and remaining in the box for a period of 20 min to 30 min.

Figure 1 is a sketch of a typical arrangement of a cable termination assembly.

The cable supplier provides the details inside the dotted line. The transformer supplier provides the other details. See also data list.

Figure 1 and Figure 2 show the situation when the cable enters from below. The arrangement can be rotated to allow the cable to enter from above or changed to allow the cable to enter horizontally.

7.3 Standard dimensions

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Standard dimensions for cable connection boxes, connections from the transformer in the cable connection box and cable terminations are shown in Figure 2. With the given five sizes, the voltage range U_m from 72,5 kV to 550 kV is covered.

NOTE Design limitations for extruded cables with large conductors or insulation diameters in the 170 kV range, may prevent conformance with this standard.

Standard dimensions for the flange of the complete cable connection box towards the transformer tank given in IEC/TR2 61639 are preferred.

7.4 Disconnecting link

The cable termination may be housed in a disconnect chamber, provided with oil-to-oil bushing to separate the oil in the box from the transformer oil. The purchaser shall specify whether the oil-to-oil bushing is required, or whether the transformer and the cable end sealing with the connection details shall be enclosed in one whole common volume of oil. The purchaser shall also specify whether the oil in the cable connection box is to be connected to a separate conservator.

7.5 Protection against corrosion

The cable connection box shall have the same degree of protection against corrosion as the associated transformer tank.