SLOVENSKI STANDARD
SIST EN 50299-1:2015

01-maj-2015

Nadomešča:
SIST EN 50299:2004

Povezovalni sestavi oljnih kablov za transformatorje in dušilke, pri katerih je najvišja napetost opreme Um od 72,5 kV do 550 kV - 1. del: S tekočino polnjeni kabelski priključki

Oil-immersed cable connection assemblies for transformers and reactors having highest voltage for equipment Um from 72,5 kV to 550 kV - Part 1: Fluid-filled cable terminations

Ölgefüllte Kabelanschlusseinheiten für Transformatoren und Drosselspulen mit einer höchsten Spannung für Betriebsmittel Um von 72,5 kV bis 550 kV - Teil 1: Flüssigkeitsgefüllte Kabelendverschlüsse

Boîte de raccordement de câble pour transformateurs immergés et bobine d'inductance de tensions comprises entre 72,5 kV et 550 kV -- Partie 1: Extrémité de câble remplie d'un fluide

Ta slovenski standard je istoveten z: **EN 50299-1:2014**

ICS:

29.060.20	Kabli	Cables
29.180	Transformatorji. Dušilke	Transformers. Reactors

SIST EN 50299-1:2015 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50299-1

November 2014

ICS 29.180

Supersedes EN 50299:2002 (PART)

English Version

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

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CENELEC

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

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Ref. No. EN 50299-1:2014 E

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Foreword

This document (EN 50299-1:2014) has been prepared by CLC/TC 14 "Power transformers".

The following dates are fixed:

• latest date by which this document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-10-13
• latest date by which the national standards conflicting with this document have to be withdrawn	(dow)	2017-10-13

This document partially supersedes EN 50299:2002, together with EN 50299-2:2014. Changes have been made in this document to bring it line with EN 50299-2:2014.

Dimensions mentioned in EN 50299-1 are valid for fluid-filled cable terminations. Dry-type cable terminations may also fit to these requirements.

A new standard EN 50299-2 is issued which describes requirements for dry-type cable terminations only.

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1 Scope

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

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

The purpose of EN 50299-1 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 50299-1 does not cover direct cable terminations (see 3.1.1.3), 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.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 60076 Series *Power transformers (IEC 60076 Series)*

EN 60296 *Fluids for electrotechnical applications — Unused mineral insulating oils for transformers and switchgear (IEC 60296)*

EN ISO 1302 *Geometrical product specifications (GPS) — Indication of surface texture in technical product documentation (ISO 1302)*

IEC 60141 Series *Tests on oil-filled and gas-pressure cables and their accessories*

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 62067 *Power cables with extruded insulation and their accessories for rated voltages above 150 kV (U_m = 170 kV) up to 500 kV (U_m = 550 kV) — Test methods and requirements*

HD 632 S2 *Power cables with extruded insulation and their accessories for rated voltages above 36 kV (U_m = 42 kV) up to 150 kV (U_m = 170 kV)*

3 Terms and definitions

For the purposes of this document, the following terms and 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

3.1.1
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

3.1.1.1
fluid-filled cable termination
cable termination which includes an insulating fluid as part of the cable connection assembly and comprises a separation between said cable fluid in the cable connection box

3.1.1.2
dry-type cable termination
cable termination which comprises an elastomeric electrical stress control component in intimate contact with a separating insulating barrier (insulator) between the cable insulation and the liquid insulation of the transformer cable connection box. The cable termination does not require any insulating fluid

3.1.1.3
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

3.1.2
cable connection box
part of the transformer which houses the cable termination and the interface to the transformer connection

3.1.2.1
conductor current terminal with removable link
interface to the transformer with removable connection between transformer and socket which allows the transformer to be electrically separated from the cable

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 (U_m);

b) rated currents (I_r);

c) rated short-time and peak withstand currents;

d) rated duration of short-circuit;

e) test voltages and test currents for testing the transformer;

f) test voltage for cable commissioning.

6 Preferred values

6.1 Highest voltage for equipment (U_m)

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 standard values:

72,5 kV – 100 kV – 123 kV – 145 kV – 170 kV – 245 kV – 300 kV – 362 kV – 420 kV – 550 kV.

6.2 Rated currents (I_r)

Sockets shall be selected with a rated current I_r higher than 1,2 times of the rated current of the transformer. They are qualified without performing additional tests or qualifications, to ensure withstand capability of overloading conditions of transformer according to IEC 60076-7.

The rated current I_r shall be selected from the following standard values which are 20 % higher than the rated current of the transformer:

1 000 A – 1 600 A – 2 000 A – 2 500 A – 3 150 A.

Short-time and peak withstand currents as well as the duration of short circuit shall refer to the levels provided by the cable system, not exceeding the values given in IEC 60076-7 loading guide.

6.3 Transformer test voltages

Transformer test voltages shall conform to EN 60076-3.

6.4 Transformer test currents

Transformer test currents shall conform to IEC 60076-7.

6.5 Cable installation test voltage

The cable installation test voltage shall conform to HD 632 S2, IEC 60840 or IEC 62067.

7 Requirements

7.1 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 standard for the cable for which the cable connection box is designed.

The connection interface is defined in Figure 2.

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 EN 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 Dimensions

Figure 1 and Figure 2 show a typical arrangement of a cable connection assembly with entry of the cable from below. Dimensions for cable connection assemblies are defined in Table 1.

The information about surface conditions in Figure 2 is stated in accordance with EN ISO 1302.

NOTE Dimensions, as far as applicable, are harmonised with EN 62271-209:2007, Figure 3.

7.4 Protection against corrosion

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

7.5 Mechanical forces on cable terminations

The cable termination shall be able to withstand a static mechanical force of 2 kN applied transversely to its interface point.

Forces and movements from the transformer can be experienced due to temperature variations and vibrations in service. These forces can act on both transformer and cable termination, and depend largely on transformer layout, termination installation, cable design and methods of mechanical support. The design of any support structure should take into account these forces and movements. It is particularly important that the support for the cable connection box should not be fastened to the clamping flange and/or the cable gland (Figure 1, items 9 and 11).

The cable termination shall be capable of withstanding the vacuum conditions, when the cable connection box is evacuated as part of the liquid filling process of the transformer.

8 Tests

8.1 Factory tests

8.1.1 Check of dimensions

The cable connection box shall comply with the arrangement according to Figure 2 and the dimensions according to Table 1.

8.1.2 Vacuum and pressure tests

One complete cable connection box shall be mounted (with the cable termination replaced by a flange) to demonstrate the same ability to withstand vacuum and pressure as the transformer.

These tests may be performed in conjunction with the vacuum and pressure tests on the transformer.

8.1.3 Dielectric tests

A provisional air-to-oil bushing shall be fitted on the cable connection box (e.g. to the intermediate chamber) to pass dielectric tests of the transformer, with a connection similar to that used in the cable connection box or disconnecting chamber in service.

8.1.4 Mechanical test

A mechanical test shall be performed to prove the requirement given in 7.5.

8.2 Tests after installation

8.2.1 Dielectric tests

The dielectric type tests of the cable termination fitted with a representative cable shall be performed according to HD 632 S2, IEC 60840, IEC 60141 or IEC 62067 in an enclosure filled with transformer oil and with the dimensions given in Figure 2.

In principle, the insulation system of the transformer should not be submitted to DC dielectric stresses, such as those that could be prescribed for cable and relevant termination. Therefore, means should be provided to allow the disconnection of the transformer from the cable (e.g. removable link), unless the transformer supplier accepts that the transformer can be exposed to DC voltage.

If required, the cable termination supplier shall provide a suitable corona shield design for the test after cable installation.

NOTE The cable test may require the installation of electric barriers delivered by the cable termination supplier.

8.2.2 Additional tests

Additional requirements for testing shall be specified by the user in the enquiry.