SLOVENSKI STANDARD
SIST EN 50482:2008

01-maj-2008

Nadomeġļa:
SIST HD 587 S1:2001

Instrumentni transformatorji - Trifazni induktivni napetostni transformatorji z Um do 52 kV

Instrument transformers - Three-phase inductive voltage transformers having Um up to 52 kV

Messwandler - Dreiphasige Spannungswandler mit Um bis 52 kV

Transformateurs de mesure - Transformateurs inductifs de tension triphasés avec Um jusqu'à 52 kV

Ta slovenski standard je istoveten z: **EN 50482:2008**

ICS:

17.220.20	Merjenje elektriļnih in magnetnih veliļin	Measurement of electrical and magnetic quantities

SIST EN 50482:2008 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 50482

January 2008

ICS 17.220.20

Supersedes HD 587 S1:1993

English version

Instrument transformers - Three-phase inductive voltage transformers having U_m up to 52 kV

Transformateurs de mesure - Transformateurs inductifs de tension triphasés avec U_m jusqu'à 52 kV

Messwandler - Dreiphasige Spannungswandler mit U_m bis 52 kV

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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

Ref. No. EN 50482:2008 E

Foreword

This European Standard was prepared by the Technical Committee CENELEC TC 38X, Instrument transformers.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50482 on 2007-09-01.

This European Standard supersedes HD 587 S1:1993. It is to be used in conjunction with EN 60044-2:1999.

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)	2008-09-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-09-01

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1 General

1.1 Scope

This European Standard specifies the requirements and tests for new three-phase voltage transformers with U_m up to 52 kV and frequencies from 15 Hz to 100 Hz, for use with electrical instruments or electrical protective devices.

NOTE Single-phase voltage transformers connected in a three-phase bank are not covered in this document.

1.2 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 60044-2:1999, Instrument transformers – Part 2: Inductive voltage transformers
(IEC 60044-2:1997, mod.)

EN 60270:2001, High-voltage test techniques – Partial discharge measurements (IEC 60270:2000)

HD 588.1 S1:1991, High-voltage test techniques – Part 1: General definitions and test requirements
(IEC 60060-1:1989 + corr. March 1990)

2 Definitions

Clause 2 of EN 60044-2:1999 is applicable with the following additions:

2.3 Additional definitions for three-phase inductive voltage transformers

2.3.1
three-phase voltage transformer

a voltage transformer which has three line-to-neutral primary windings the neutral point of which can be earthed or unearthed and in which one or more of the three line-to-neutral secondary windings can be connected for three-phase operation or residual voltage operation

2.3.2
rated output of a three-phase voltage transformer
the per phase value of the apparent power (in volt-amperes at a specified power factor) that a three-phase voltage transformer is intended to supply to the secondary circuit, at the rated secondary voltage and with rated per-phase burden connected to it

3 General requirements

Clause 3 of EN 60044-2:1999 applies.

4 Normal and special service conditions

Clause 4 of EN 60044-2:1999 applies.

5 Ratings

5.1 Standard values of rated voltages

5.1.1 Rated primary voltages

The standard values of rated line-to-line primary voltage of three-phase voltage transformer shall be one of the values of nominal system voltage designated by EN 60044-2:1999.

NOTE The performance of a voltage transformer as a measuring or protection transformer is based on the rated primary voltage, whereas the rated insulation level is based on one value of the highest voltages for equipment of EN 60071.

5.1.2 Rated secondary voltages

The rated line-to-line secondary voltage shall be chosen according to practice at the location where the transformer is to be used. The values given below are considered standard values for three-phase voltage transformers:

– 100 V and 110 V;

– 200 V, for extended secondary circuits.

NOTE Whenever possible, the rated transformation ratio should be a simple value. If one of the following values: 10 – 12 – 15 – 20 – 25 – 30 – 40 – 50 – 60 – 80 and their decimal multiples is used for the rated transformation ratio together with one of the rated secondary voltages of this subclause, the majority of the standard values of nominal system voltage of IEC 60038 will be covered.

5.1.3 Rated secondary voltages for residual windings

The rated secondary voltages of windings intended to be connected in broken-delta with similar windings to produce a residual voltage are given in 13.3.

5.2 Standard values of rated output

The standard values of rated output per phase at a power factor of 0,8 lagging, expressed in volt-amperes, are:

$$\underline{10} – 15 – \underline{25} – 30 – \underline{50} – 75 – \underline{100} – 150 – 200 \text{ VA}$$

The underlined values are preferred values.

NOTE For a given transformer, provided one of the values of rated output is standard and associated with a standard accuracy class, the declaration of other rated outputs, which may be non-standard values but associated with other standard accuracy classes, is not precluded.

5.3 Standard values of rated voltage factor

Subclause 5.3 of EN 60044-2:1999 applies.

5.4 Limits of temperature rise

Unless otherwise specified below the temperature rise of a voltage transformer at the specified voltage, at the rated frequency and at the rated burden or at the highest burden, if there are several rated burden, at any power factor between 0,8 lagging and unity, shall not exceed the appropriate value given in Table 3 of EN 60044-2:1999.

a) All three-phase transformers, irrespective of voltage factor (VF) and time rating, shall be capable of operating continuously with a balanced three-phase voltage of 1,2 times rated primary voltage. The steady state temperature rise shall not exceed the limits given in Table 3 of EN 60044-2:1999.

b) Three-phase earthed transformers having a voltage factor of 1,5 for 30 s or 1,9 for 30 s shall after the application of 1,2 times rated primary voltages for sufficient time to reach stable thermal conditions, be capable of operating with a balanced three-phase voltage of respectively 0,866 or 1,1 times the rated primary voltage applied for 30 s, one line terminal of the primary winding being connected to the neutral of that winding. The temperature rise shall not exceed by more than 10 K the value specified in Table 3 of EN 60044-2:1999.

c) Three-phase earthed transformers having a voltage factor of 1,9 for 8 h shall after the application of 1,2 times rated primary voltage for sufficient time to reach stable thermal conditions, be capable of operating with a balanced three-phase voltage of 1,1 times rated line-to-line voltage applied for 8 h, one line terminal of the primary winding being connected to the neutral point of the winding. The temperature rise shall not exceed by more than 10 K the value specified in Table 3 of EN 60044-2:1999.

Table 3 of EN 60044-2:1999 as well as the text and the notes, except a), b), and c) above apply.

6 Design requirements

6.1 Insulation requirements

These requirements apply to all types of inductive voltage transformers. For gas-insulated voltage transformers supplementary requirements may be necessary (presently under consideration in IEC/TC 38).

6.1.1 Rated insulation levels, primary windings

The rated insulation level shall be one of those given in Table 4 of EN 60044-2:1999.

6.1.2 Other requirements for primary winding insulation

6.1.2.1 Power-frequency withstand voltage

Subclause 6.1.2.1 of EN 60044-2:1999 applies.

6.1.2.2 Power-frequency withstand voltage for earthed terminal

Subclause 6.1.2.2 of EN 60044-2:1999 applies.

6.1.2.3 Partial discharges

Partial discharge requirements are applicable to inductive three-phase voltage transformers having U_m greater than or equal to 7,2 kV. The partial discharge level shall not exceed the limits specified in Table 1, at the partial discharge test voltages specified in the same table after prestressing according to the procedures of 9.2.3.3.

Table 1 – Permissible partial discharge levels for various neutral earthing system and test voltages

Type of network earthing	Type of voltage transformer	Single-phase partial discharge test voltage	Permissible partial discharge level pC
Earthed neutral system VF ≤ 1,5	Earthed transformer	U_m 1,2 U_m / √ 3	50 20
	Unearthed transformer	U_m 1,2 U_m / √ 3	50 20
Isolated or non-effectively earthed neutral system VF > 1,5	Earthed transformer	U_m 1,2 U_m / √ 3	50 20
	Unearthed transformer	U_m 1,2 U_m / √ 3	50 20

6.1.2.4 Chopped lighting-impulse

Subclause 6.1.2.4 of EN 60044-2:1999 applies.

6.1.3 Between-section insulation requirements

Subclause 6.1.3 of EN 60044-2:1999 applies.

6.1.4 Insulation requirements for secondary windings

Subclause 6.1.4 of EN 60044-2:1999 applies.

6.1.5 Requirements for external insulation

6.1.5.1 Pollution

For outdoor inductive voltage transformers, with ceramic insulators, susceptible to contamination, the creepage distances for given pollution levels are given in Table 8 of EN 60044-2:1999.

6.2 Short-circuit withstand capability

The voltage transformer shall be designed and constructed to withstand without damage, when energized at rated voltage, the mechanical and thermal effects of an external three-phase short-circuit for the duration of 1 s.

7 Classification of tests

Clause 7 of EN 60044-2:1999 applies.

8 Type tests

8.1 Temperature-rise tests

Subclause 8.1 of EN 60044-2:1999 applies.

8.2 Short-circuit withstand capability test

Subclause 8.2 of EN 60044-2:1999 applies.

8.3 Impulse test on primary winding

8.3.1 General

The impulse tests shall be performed in accordance with HD 588.1 S1.

The impulse voltage tests generally consist of voltage applications at reference and rated voltage levels. The reference impulse voltage shall be between 50 % and 75 % of the rated impulse withstand voltage. The peak value and waved-shape of the impulse voltage shall be recorded.

Evidence of failure in the test may be given by variation in the records at both reference and rated impulse withstands voltages.

8.3.2 Lightning impulse test

The test voltage shall have the appropriate value given in Table 4 of EN 60044-2:1999 depending on the highest voltage for equipment and the specified insulation level.

8.3.2.1 Earthed primary windings

The test voltage shall be applied between each line terminal of the primary winding and earth. The neutral point of the primary winding, the non-tested line terminals, the frame, case (if any) and the core (if intended to be earthed) shall be earthed during the test.

The test shall be performed with both positive and negative polarities. Fifteen consecutive impulses of each polarity, not corrected for atmospheric conditions, shall be applied to each of the three terminals.

8.3.2.2 Unearthed primary winding

The test voltage shall be applied between each line terminal of the primary winding and earth; the other line terminals, the frame; case (if any) and the core (if intended to be earthed) shall be earthed during the test.

The test shall be performed with both positive and negative polarities. Fifteen consecutive impulses of each polarity, not corrected for atmospheric conditions, shall be applied to each of the three terminals.

NOTE The application of 15 positive and 15 negative impulses is specified for testing the external insulation. If other tests are agreed between manufacturer and purchaser to check the external insulation, the number of lightning impulses may be reduced to three of each polarity, not corrected for atmospheric conditions.

8.3.2.3 Test evaluation

In order to improve the failure detection, an additional quantity shall be recorded.

At the manufacturer's discretion, the earth connection may be made through a suitable current recording device. The secondary terminals may be connected together and earthed or may be connected to a suitable device for recording the voltage wave appearing across the secondary winding(s) during test.

The transformer has passed the test if for each polarity:

– no disruptive discharge occurs in the non self-restoring internal insulation;

– no flashovers occur across the non self-restoring external insulation;

– no other evidence of insulation failure is detected (i.e. variations in the wave-shape of the recorded quantities).

8.4 Wet test for outdoor type transformers

Subclause 8.4 of EN 60044-2:1999 applies.

9 Routine tests

9.1 Verification of terminal markings

Subclause 9.1 of EN 60044-2:1999 applies.

9.2 Power frequency tests on primary winding and partial discharge measurement

9.2.1 General

Subclause 9.2.1 of EN 60044-2:1999 applies.

9.2.2 Test voltage

The test voltages shall have the appropriate values given in Table 4 of EN 60044-2:1999 depending on the highest voltage for equipment.

When there is a considerable difference between the specified highest voltage for equipment (U_m) and the specified rated primary voltages, the induced voltage shall be limited to five times the rated primary voltage.

Alternatively, at the discretion of the manufacturer, the induced voltage test may be made by a succession of single-phase tests. In this case any winding may be earthed at any terminal at the discretion of the manufacturer, but the test shall be repeated with such alternative connections as may be necessary to produce in turn the required test voltage between line terminals and between each line terminal and earth. Exciting the primary winding directly with a balanced three-phase voltage of the specified value may also make the test.

The test voltage shall be measured at the high-voltage side in each case. The frame, case (if any) and the core (if intended to be earthed) shall be connected together and earthed.