
Testing methodology for wipers used in electrical insulating oil

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EUROPEAN STANDARD

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Testing methodology for wipers used in electrical insulating oil

Méthodologie d'essai des moyens de
nettoyage utilisés dans les huiles isolantes
à usages électriques

Prüfmethoden für Putzlappen,
die für Isolieröl verwendet werden

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This European Standard was approved by CENELEC on 2002-03-05. 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 has been prepared by CENELEC BTWG 99-1, Insulating oil.

The text of the draft was submitted to the Unique Acceptance Procedure and was approved by CENELEC as EN 50375 on 2002-03-05.

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) 2003-03-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2005-03-01

Annexes designated "normative" are part of the body of the standard.
In this standard, annexes A, B, C, D and E are normative.

Warning: This European Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

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Introduction

Fibres and other particles have a detrimental effect on the dielectric strength of insulating oil. During the maintenance of electrotechnical equipment it is often necessary to use a wiper or cloth to clean components or absorb oil. To minimize contamination by fibres and resultant degradation of oil properties, it is necessary to make a selection of the type of wiper used in this application.

The properties required of wipers for use with insulating oil are as follows:

- low fibre release;
- fibres released from a wiper should have the least possible effect on the dielectric strength of insulating oil;
- high tear resistance;
- should tearing occur, subsequent fibre release should be low;
- oil absorbency should ideally be high;
- the wipers should have no other effect which degrades the properties of insulating oil below those required by IEC 60296.

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1 Scope

This European Standard specifies testing procedures for fibrous wipers to be used with equipment normally containing electrical insulating oil. Such testing is necessary to rank commercial products, so that possible contamination of insulating oil and electrical equipment with fibres during maintenance operations may be minimized.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other standards. 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.

EN 50353	Insulating oil - Determination of fibre contamination by the counting method using a microscope
EN 60156	Insulating liquids - Determination of the breakdown voltage at power frequency - Test method (IEC 60156)
EN 60814	Insulating liquids - Oil-impregnated paper and pressboard - Determination of water by automatic coulometric Karl Fischer titration (IEC 60814)
IEC 60296	Specification for unused mineral insulating oils for transformers and switchgear
ISO 554	Standard atmospheres for conditioning and/or testing - Specifications https://standards.iteh.ai/catalog/standards/sist/f6b61e64-80f0-4766-a6ec-ce6eedc345ae/sist-en-50375-2004

3 Terms and definitions

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

3.1

standard atmosphere

the atmosphere in an enclosure where the temperature is $(23 \pm 2)^\circ\text{C}$ and the relative humidity is $(50 \pm 2)\%$. This standard atmosphere is recommended in ISO 554. When conditioning oil, the enclosure shall also be protected from sunlight to minimize oxidation of the oil

NOTE This atmosphere may be achieved in an enclosure containing a vessel of a saturated solution of tetrahydrated calcium nitrate $[\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}]$.

3.2

conditioned oil

unused oil conforming to IEC 60296 which has been filtered through a membrane filter of pore diameter $1,2\ \mu\text{m}$ or less into a glass vessel cleaned as described in Clause 7 of EN 50353. This oil is then stored in standard atmospheric conditions (3.1) for sufficient time to attain equilibrium

NOTE 1 It has been found that, if stored in a 3 litre standard tall-form beaker, 72 h is sufficient for oil to attain equilibrium.

NOTE 2 Oil conditioned in this manner is expected to have a minimum breakdown strength of 50 kV (measured according to EN 60156) and a maximum water content of 33 mg/kg (measured according to EN 60814).

3.3

standard wiper

a wiper of dimension 250 mm x 250 mm in the as-received condition with no cut or torn edges made after manufacture. The wiper shall be stored in standard atmospheric conditions (3.1) for sufficient time to attain equilibrium

NOTE Manufacturers are advised, for the purpose of testing, to produce standard size wipers (250 mm x 250 mm) on which the edges are representative of those produced in the normal manufacturing process.

4 Test methods

The test methods for wipers are detailed in Annexes A to E and are summarized below.

NOTE Whilst wipers may perform well in these tests, in normal everyday use they may become contaminated with fibres by contact with their environment and these fibres can then be passed on to contaminate the oil. Care should be taken to avoid this. A particular cause for concern is the packaging. To avoid contamination, wipers should be packaged in non-fibre shedding material and the method of dispensing should prevent excessive production of fibres from the wipers or the container.

4.1 Fibre release test (refer to Annex A)

This test simulates the use encountered whilst wiping during maintenance operations and measures the free fibres produced.

For the test to be comparable between different brands of wiper, it is necessary to define the dimensions of the laboratory equipment used during the fibre release test. A standard wiper (3.3) must be tested in standard laboratory equipment. In annex A the dimensions of suitable apparatus are defined.

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4.2 Snagging test (refer to Annex B)

Equipment being wiped often has sharp corners or edges and during use snagging or tearing of the wiper may occur, with subsequent increased fibre release from the torn part of the wiper. This test is designed to establish the increased number of fibres released by snagging a wiper on a standard array of sharp points.

4.3 Equilibrium moisture content (refer to Annex C)

Reduction of the dielectric strength of oil containing fibres is lessened if these fibres have low equilibrium moisture content. The test measures the equilibrium moisture content of a wiper.

NOTE: Natural fibres have greater equilibrium moisture contents than man-made fibres and it is for this reason that wipers made of natural fibres such as cotton, wool or cellulose (paper) cannot be recommended for this application.

4.4 Oil absorbency (refer to Annex D and Annex E)

Wipers are mostly used for cleaning components and mopping up spillages. They should be able to absorb sufficient quantities of oil at a rate suitable for the application. A measurement is made of the amount of oil capable of being absorbed by a wiper and the rate at which it is absorbed.

5 Test report

The test report shall contain the following information:

- a) reference to this European Standard;
- b) full description of sample under test, including name of wiper, manufacturer and description of fibre type (if possible);
- c) breakdown strength of the oil used to carry out test A: initial value; value after the blank test; value after testing the fibre release from the sample;
- d) number and size distribution of fibres released per square metre of wiper in the fibre release test (Annex A);
- e) number and size distribution of fibres released per square metre of wiper after the snagging test (Annex B);
- f) equilibrium moisture content of wiper (Annex C);
- g) oil absorbency of wiper (Annex D);
- h) rate of absorbency of two defined test samples (Annex E);
- i) date of the test.

NOTE This standard comprises a variety of tests. Individual users may apply different weightings to each test to produce a ranking or grading for their application. The suitability of any wiper for a particular application is a matter of agreement between user and supplier.

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