

Detection and determination of specified additives in mineral insulating oils

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60666:2010 sisaldab Euroopa standardi EN 60666:2010 ingliskeelset teksti.

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English version

**Detection and determination of specified additives
in mineral insulating oils
(IEC 60666:2010)**

Détection et dosage d'additifs spécifiques
présents dans les huiles minérales
isolantes
(CEI 60666:2010)

Nachweis und Bestimmung spezifizierter
Additive in Isolierflüssigkeiten
auf Mineralölbasis
(IEC 60666:2010)

This European Standard was approved by CENELEC on 2010-07-01. 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, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

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Foreword

The text of document 10/803/FDIS, future edition 2 of IEC 60666, prepared by IEC TC 10, Fluids for electrotechnical applications, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60666 on 2010-07-01.

This European Standard supersedes HD 415 S1:1981.

The main changes with respect to HD 415 S1:1981 are listed below:

- a change in the title from “Detection and determination of specified anti-oxidant additives in insulating oils” to “Detection and determination of specified additives in mineral insulating oils”. The previous edition only addressed the detection and determination of anti-oxidant additives, with particular regard to the DBPC, phenolic inhibitors and anthranilic acid;
- more advanced methods for the determination of such anti-oxidant additives;
- new Annexes B and C which provide methods for the determination of two additives different from the anti-oxidants. In particular, Annex B contains a method for the determination of the concentration in used and unused insulating mineral oils of passivators of the family of derivatives of benzotriazole. Annex C contains a method for the qualitative identification of pour point depressants used in some commercially available paraffinic oils to improve their low temperature properties.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN and CENELEC shall not be held responsible for identifying any or all such patent rights.

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) | 2011-04-01 |
| – latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | 2013-07-01 |

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60666:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

- | | |
|---------------|------------------------------|
| [3] IEC 60422 | NOTE Harmonized as EN 60422. |
| [5] IEC 61198 | NOTE Harmonized as EN 61198. |

Annex ZA
(normative)**Normative references to international publications
with their corresponding European publications**

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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60296	-	Fluids for electrotechnical applications - Unused mineral insulating oils for transformers and switchgear	EN 60296	-
IEC 60475	-	Method of sampling liquid dielectrics	-	-
ISO 5725	Series	Accuracy (trueness and precision) of measurement methods and results	-	-

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INTRODUCTION

General caution, health, safety and environmental protection

This International Standard does not purport to address all the safety problems associated with its use. It is the responsibility of the user of the standard to establish appropriate health and safety practices and determine the applicability of regulatory limitations prior to use.

The mineral oils which are the subject of this standard should be handled with due regard to personal hygiene. Direct contact with eyes may cause slight irritation. In the case of eye contact, irrigation with copious quantities of clean running water should be carried out and medical advice sought.

Some of the tests specified in this standard involve the use of processes that could lead to a hazardous situation. Attention is drawn to the relevant standard for guidance.

This standard involves mineral oils, chemicals and used sample containers. The disposal of these items should be carried out in accordance with current national legislation with regard to the impact on the environment. Every precaution should be taken to prevent the release into the environment of mineral oil.

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DETECTION AND DETERMINATION OF SPECIFIED ADDITIVES IN MINERAL INSULATING OILS

1 Scope

The methods described in this International Standard concern the detection and determination of specified additives in unused and used mineral insulating oils.

The detection methods may be applied to assess whether or not a mineral insulating oil contains an additive as specified by the supplier.

The determination methods are used for the quantitative determination of additives known to be present or previously detected by the appropriate detection method.

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.

IEC 60296, *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

IEC 60475, *Method of sampling liquid dielectrics*

ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*

3 Methods for the determination of anti-oxidant additives

3.1 Determination of phenolic and amine-based antioxidants by infrared (IR) spectrophotometry – Method A

3.1.1 Introductory remark

This method determines the amount of 2,6-di-tert-butyl-para-cresol (DBPC) in unused and used mineral oils by measurement of the infrared absorption at the (O–H) stretching frequency of hindered phenols. It can also be used to determine the amount of 2,6-di-tert-butyl-phenol (DBP), but does not discriminate between them.

The previous test method in the first edition of IEC 60666 described a procedure for the determination of specific antioxidants using IR techniques. This test method was satisfactory with new oils, where no oxidation by-products interfere with the antioxidant. However, this method was less satisfactory for used oils because oxidation by-products may modify the IR baseline, making the detection and quantification of the antioxidants difficult. To overcome this problem, a procedure for preparing a reference oil to be used as a baseline was described. Unfortunately, this procedure was difficult to perform, was time-consuming and did not ensure that the new baseline matched adequately that of the oil to be analysed, because the content of some components of the baseline oil and the analysed oil could be quite different.

This new method describes a procedure for preparing reference, antioxidant-free oils by solid phase extraction (SPE) using silica gel.