NSAI
Standards

Irish Standard
I.S. EN IEC 63012:2019

Insulating liquids - Unused modified or blended esters for electrotechnical applications

I.S. EN IEC 63012:2019

Incorporating amendments/corrigenda/National Annexes issued since publication:

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National Foreword

I.S. EN IEC 63012:2019 is the adopted Irish version of the European Document EN IEC 63012:2019, Insulating liquids - Unused modified or blended esters for electrotechnical applications

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 63012

July 2019

ICS 29.040.10

English Version

Insulating liquids - Unused modified or blended esters for electrotechnical applications (IEC 63012:2019)

Isolants liquides - Esters neufs modifiés ou mélangés pour applications électrotechniques (IEC 63012:2019)

Isolierflüssigkeiten – Neue modifizierte oder verschnittene Ester für elektrotechnische Anwendungen (IEC 63012:2019)

This European Standard was approved by CENELEC on 2019-06-13. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 10/1078/FDIS, future edition 1 of IEC 63012, prepared by IEC/TC 10 "Fluids for electrotechnical applications" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 63012:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-03-13
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-06-13

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

Endorsement notice

The text of the International Standard IEC 63012:2019 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:

IEC 60076-14	NOTE	Harmonized as EN 60076-14
IEC 60296	NOTE	Harmonized as EN 60296
IEC 60422	NOTE	Harmonized as EN 60422
IEC 61039	NOTE	Harmonized as EN 61039
IEC 61203	NOTE	Harmonized as EN 61203
IEC 61868	NOTE	Harmonized as EN 61868
IEC 62975	NOTE	Harmonized as EN IEC 62975[1]
ISO 3015	NOTE	Harmonized as EN ISO 3015

[1] Under preparation. Stage at the time of publication: prEN 62975.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60156	-	Insulating liquids - Determination of the breakdown voltage at power frequency - Test method	-	-
IEC 60247	-	Insulating liquids - Measurement of relative permittivity, dielectric dissipation factor (tan δ) and d.c. resistivity	EN 60247	-
IEC 60628	-	Gassing of insulating liquids under electrical stress and ionization	HD 488 S1	-
IEC 60666	-	Detection and determination of specified additives in mineral insulating oils	EN 60666	-
IEC 60814	-	Insulating liquids - Oil-impregnated paper and pressboard - Determination of water by automatic coulometric Karl Fischer titration	EN 60814	-
IEC 60897	-	Methods for the determination of the lightning breakdown voltage of insulating liquids	-	-
IEC 61099	2010	Insulating liquids - Specifications for unused synthetic organic esters for electrical purposes	EN 61099	2010
IEC 61125	-	Insulating liquids - Test methods for oxidation stability - Test method for evaluating the oxidation stability of insulating liquids in the delivered state	EN IEC 61125	-
IEC/TR 61294	-	Insulating liquids - Determination of the partial discharge inception voltage (PDIV) - Test procedure	-	-
IEC 61619	-	Insulating liquids - Contamination by polychlorinated biphenyls (PCBs) - Method of determination by capillary column gas chromatography	EN 61619	-
IEC 61620	-	Insulating liquids - Determination of the dielectric dissipation factor by measurement of the conductance and capacitance - Test method	EN 61620	-
IEC 62021-3	-	Insulating liquids - Determination of acidity - Part 3: Test methods for non-mineral insulating oils	EN 62021-3	-
IEC 62535	-	Insulating liquids - Test method for detection of potentially corrosive sulphur in used and unused insulating oil	EN 62535	-
IEC 62697-1	-	Test methods for quantitative determination of corrosive sulfur compounds in unused and used insulating liquids - Part 1: Test method for quantitative determination of dibenzyldisulfide (DBDS)	EN 62697-1	-
IEC 62770	-	Fluids for electrotechnical applications - Unused natural esters for transformers and similar electrical equipment	EN 62770	-
IEC 62961	-	Insulating liquids - Test methods for the determination of interfacial tension of insulating liquids - Determination with the ring method	EN IEC 62961	-

ISO 2049	-	Petroleum products - Determination of colour (ASTM scale)	-	-
ISO 2211	-	Liquid chemical products - Measurement of colour in Hazen units (platinum-cobalt scale)	-	-
ISO 2592	-	Petroleum products - Determination of flash and fire points - Cleveland open cup method	-	-
ISO 2719	-	Determination of flash point - Pensky-Martens closed cup method	EN ISO 2719	-
ISO 3016	-	Petroleum products - Determination of pour point	EN ISO 3016	-
ISO 3104	-	Petroleum products - Transparent and opaque liquids - Determination of kinematic viscosity and calculation of dynamic viscosity	EN ISO 3104	-
ISO 3675	-	Crude petroleum and liquid petroleum products - Laboratory determination of density - Hydrometer method	EN ISO 3675	-
ISO 12185	-	Crude petroleum and petroleum products - Determination of density - Oscillating U-tube method	EN ISO-12185	
		Surface active agents - Determination of interfacial tension of solutions of surface active agents by the stirrup or ring method	EN 14210	
ASTM D1275	-	Methods A and B: Standard test method for corrosive sulfur in electrical insulating oils	-	-
ASTM D1903	-	Standard practice for determining the coefficient of thermal expansion of electrical insulating liquids of petroleum origin, and askarels	-	-
ASTM D3300	-	Standard test method for dielectric breakdown voltage of insulating oils ofpetroleum origin under impulse conditions	-	-
ASTM D4172	-	Standard test method for wear preventive characteristics of lubricating fluid (four-ball method)	-	-
ASTM D7150	-	Standard test method for the determination of gassing characteristics of insulating liquids under thermal stress at low temperature	-	-
ASTM D7896	-	Standard test method for thermal conductivity, thermal diffusivity and volumetric heat capacity of engine coolants and related fluids by transient hot wire liquid thermal conductivity method	-	-
ASTM E1269	-	Standard test method for determining specific heat capacity by differential scanning calorimetry	-	-
DIN 51350-1	-	Testing of lubricants - Testing in the four-ball tester - Part 1: General working principles	-	-
DIN 51350-2	-	Testing of lubricants - Testing in the four-ball tester - Part 2: Determination of welding load of liquid lubricants	-	-
DIN 51350-3	-	Testing of lubricants - Testing in the four-ball tester - Part 3: Determination of wearing characteristics of liquid lubricants	-	-
OECD 301-B	-	OECD Guidelines for the testing of chemicals - Section 3: Environmental fate and behaviour - 301 Ready biodegradability - 301 B: CO2 Evolution test	-	-
OECD 301-C	-	OECD Guidelines for the testing of chemicals - Section 3: Environmental fate and behaviour - 301 Ready biodegradability - 301 C: Modified MITI test	-	-
OECD 301-F	-	OECD Guidelines for the testing of chemicals - Section 3: Environmental fate and behaviour - 301 Ready biodegradability - 301 F: Manometric respirometry test	-	-
EPA 712-C-98-076		US EPA OPPTS Series 835: Fate, transport and transformation test guidelines - Group C: Laboratory biological transformation test guidelines - 835.3110 Ready biodegradability	-	-

IEC 63012

Edition 1.0 2019-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Insulating liquids – Unused modified or blended esters for electrotechnical applications

Isolants liquides – Esters neufs modifiés ou mélangés pour applications électrotechniques

IEC 63012:2019-05(en-fr)

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IEC 63012

Edition 1.0 2019-05

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Insulating liquids – Unused modified or blended esters for electrotechnical applications

Isolants liquides – Esters neufs modifiés ou mélangés pour applications électrotechniques

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INSULATING LIQUIDS – UNUSED MODIFIED OR BLENDED ESTERS FOR ELECTROTECHNICAL APPLICATIONS

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 63012 has been prepared by IEC Technical Committee 10: Fluids for electrotechnical applications.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
10/1078/FDIS	10/1082/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

INTRODUCTION

Electrical insulation and heat transfer are essential functions of insulating liquids for electrotechnical applications. Until recently, these liquids have been normally homogeneous, selected from different categories, such as most common mineral oils or newer synthetic esters, natural esters or silicone liquids. The continuous research for improvement of performance characteristics of equipment drives an interest in exploring benefits from combinations of liquids. Some known examples of desired improved characteristics include optimized liquid cost, increased cooling performance, improved flash point, extended insulation life or reduced environmental impacts.

Currently, international standards exist for specifically defined liquid categories (mineral oils, synthetic esters, natural esters, silicone liquids). None of them cover chemically modified natural ester liquids or blends of various esters. Moreover, the existing standards do not cover synthetic esters whose characteristics may go beyond the limits defined in IEC 61099.

Some modified esters or their blends are already available as commercial products by liquid suppliers. Examples are:

- Palm fatty acid ester with low viscosity of 5 mm^2/s at 40 °C and with flash point of 176 °C.
- Blend of triglycerides (50 %) and monoesters (50 %) with low viscosity of 17 mm^2/s at 40 °C and with flash point of 200 °C.

The number of sources for ester liquids or their blends is expected to grow over the coming years. Such liquids need to be characterized to confirm suitability for the intended application by the user. Performance characteristics of blends should not be solely assumed from performance characteristics of their individual components. This document is to provide minimum requirements on characterization of new compositions.

WARNING

This document sets performance criteria for unused modified/synthetized or blended esters earmarked for electrical applications. This document does not purport to address all the safety problems associated with their use. It is the responsibility of the user of this document to establish appropriate health and safety practices and determine the applicability of regulatory limitation prior to use.

Performance of some of the tests mentioned in this document could lead to a hazardous situation. Attention is drawn to the relevant standard test method for guidance.

The disposal of liquids, chemicals and sample containers mentioned in this document should be carried out in accordance with current local and national legislation with regards to the impact on the environment. Every precaution should be taken to prevent the release of the liquid into the environment.

INSULATING LIQUIDS – UNUSED MODIFIED OR BLENDED ESTERS FOR ELECTROTECHNICAL APPLICATIONS

1 Scope

This document defines requirements for the characterization of unused modified esters or blends of unused esters used as insulating liquids for electrotechnical applications. It does not cover liquids that contain any proportion of used liquids.

The liquids covered by this document are intended mainly for transformer applications.

Unused modified/synthetized esters are derived from a natural or synthetic base, or are blends of both. This document covers a variety of ester liquids not covered by other standards specific to natural esters (IEC 62770) or synthetic esters (IEC 61099).

As it addresses various categories of liquids, this document also covers a wide range of values for certain performance characteristics. An important property is viscosity, which can affect the design and cooling performance of electrical equipment. A categorization is defined based on the kinematic viscosity of the different liquids. The category of low viscosity ester liquids is established.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60156, *Insulating liquids – Determination of the breakdown voltage at power frequency – Test method*

IEC 60247, *Insulating liquids – Measurement of relative permittivity, dielectric dissipation factor* (*tan* δ) *and d.c. resistivity*

IEC 60666*, Detection and determination of specified additives in mineral insulating oils*

IEC 60628, *Gassing of insulating liquids under electrical stress and ionization*

IEC 60814, *Insulating liquids – Oil-impregnated paper and pressboard – Determination of water by automatic coulometric Karl Fischer titration*

IEC 60897, *Methods for the determination of the lightning impulse breakdown voltage of insulating liquids*

IEC 61099:2010, *Insulating liquids – Specifications for unused synthetic organic esters for electrical purposes*

IEC 61125, *Insulating liquids – Test methods for oxidation stability – Test method for evaluating the oxidation stability of insulating liquids in the delivered state*

IEC TR 61294, *Insulating liquids – Determination of the partial discharge inception voltage (PDIV) – Test procedure*