

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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**Insulating liquids – Unused modified or blended esters for electrotechnical applications**

**Isolants liquides – Esters neufs modifiés ou mélangés pour applications électrotechniques**



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IEC Central Office  
3, rue de Varembe  
CH-1211 Geneva 20  
Switzerland

Tel.: +41 22 919 02 11  
[info@iec.ch](mailto:info@iec.ch)  
[www.iec.ch](http://www.iec.ch)

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## INSULATING LIQUIDS – UNUSED MODIFIED OR BLENDED ESTERS FOR ELECTROTECHNICAL APPLICATIONS

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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

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## 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 61009.

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<sup>2</sup>/s at 40 °C and with flash point of 176 °C.
- Blend of triglycerides (50 %) and monoesters (50 %) with low viscosity of 17 mm<sup>2</sup>/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/synthesized 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 liquid 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/synthesized 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 ( $\tan \delta$ ) 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 60891, *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*