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STN	**Kvapaliny pre elektrotechnické aplikácie Nepoužité prírodné esterové kvapaliny pre transformátory a podobné elektrické zariadenia**	**STN EN IEC 62770** 34 6733

Fluids for electrotechnical applications - Unused natural esters for transformers and similar electrical equipment

Táto norma obsahuje anglickú verziu európskej normy.
This standard includes the English version of the European Standard.

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English Version

Fluids for electrotechnical applications - Unused natural esters for transformers and similar electrical equipment (IEC 62770:2024)

Fluides pour applications électrotechniques - Esters naturels neufs pour transformateurs et matériels électriques analogues
(IEC 62770:2024)

Flüssigkeiten für elektrotechnische Anwendungen - Neue natürliche Ester für Transformatoren und ähnliche elektrische Betriebsmittel
(IEC 62770:2024)

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Europäisches Komitee für Elektrotechnische Normung

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

Ref. No. EN IEC 62770:2024 E

European foreword

The text of document 10/1215/FDIS, future edition 2 of IEC 62770, prepared by TC 10 "Fluids for electrotechnical applications" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 62770:2024.

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)	2025-11-30
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2027-11-30

This document supersedes EN 62770:2014 and all of its amendments and corrigenda (if any).

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Endorsement notice

The text of the International Standard IEC 62770:2024 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 standard indicated:

IEC 60076-14	NOTE Approved as EN 60076-14
IEC 60296	NOTE Approved as EN IEC 60296
IEC 60422	NOTE Approved as EN IEC 60422
IEC 61039	NOTE Approved as EN 61039
IEC 61099	NOTE Approved as EN 61099
IEC 61868	NOTE Approved as EN 61868
IEC 63012	NOTE Approved as EN IEC 63012

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.cencenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60156	-	Insulating liquids - Determination of the breakdown voltage at power frequency - Test method	EN IEC 60156	-
IEC 60247	-	Insulating liquids - Measurement of relative permittivity, dielectric dissipation factor (tan d) and d.c. resistivity	EN 60247	-
IEC 60475	-	Method of sampling insulating liquids	EN IEC 60475	-
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 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 61198	-	Mineral insulating oils - Methods for the determination of 2-furfural and related compounds	EN 61198	-
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	-

EN IEC 62770:2024 (E)

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	-
ISO 2049	-	Petroleum products - Determination of colour (ASTM scale)	-	-
ISO 2592	-	Petroleum and related products - Determination of flash and fire points - Cleveland open cup method	EN ISO 2592	-
ISO 3016	-	Petroleum and related products from natural or synthetic sources - Determination of pour point	EN ISO 3016	-
ISO 3104	-	Petroleum products - Transparent and opaque fluids - 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	-
ASTM D1500	-	Standard Test Method for ASTM Color of Petroleum Products (ASTM Colour Scale)	-	-
ASTM D7042	-	Standard Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)	-	-

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Edition 2.0 2024-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Fluids for electrotechnical applications – Unused natural esters for transformers and similar electrical equipment

Fluides pour applications électrotechniques – Esters naturels neufs pour transformateurs et matériels électriques analogues

IEC 62770:2024-10(en-fr)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FLUIDS FOR ELECTROTECHNICAL APPLICATIONS – UNUSED NATURAL ESTERS FOR TRANSFORMERS AND SIMILAR ELECTRICAL EQUIPMENT

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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IEC 62770 has been prepared by IEC technical committee 10: Fluids for electrotechnical applications. It is an International Standard.

This second edition cancels and replaces the first edition published in 2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) Introduction of IEC 63012 which details other liquids not covered by this document. IEC 63012 was published in 2019 after the first edition of IEC 62770 (2013).
b) New Table 1 inserted which clarifies definitions.
c) Appearance and colour requirements now merged.

d) Pour point: Introduction of the importance of LCSET with advice on cold temperature behaviour of natural esters.

e) Additives: new agreed wording inserted on the declaration of additives

f) Flash and fire points: now only determined by Cleveland Open Cup method, since the Pensky-Martens closed cup method was identified as problematic with natural esters.

g) Toxicity: Aquatic toxicity now emphasized.

h) Annex B removed as it is no longer needed since the publication of IEC 63012.

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

Draft	Report on voting
10/1215/FDIS	10/1243/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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

- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

Because of their higher fire points and lower environmental impact relative to hydrocarbon petroleum derived insulating mineral oil, the use of vegetable oils and other natural esters is on the rise as insulating and heat transfer fluids in electrical devices such as transformers.

This document sets performance criteria for unused natural esters earmarked for electrical applications. However, the use of natural esters is recommended only for equipment that is not open to the atmosphere, for example sealed transformers and reactors because these liquids are susceptible to oxidation.

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

Unused natural esters which are the subject of this document should be handled with due regard to personal hygiene. Direct contact with eyes should be avoided. In case of eye contact, irrigation with copious amounts of clean running water should be carried out and medical advice sought.

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

FLUIDS FOR ELECTROTECHNICAL APPLICATIONS – UNUSED NATURAL ESTERS FOR TRANSFORMERS AND SIMILAR ELECTRICAL EQUIPMENT

1 Scope

This document describes specifications and test methods for unused natural esters in transformers and similar liquid-immersed electrical equipment in which a liquid is required as an insulating and heat transfer medium. The exposure of natural ester to air leads to deterioration of the insulating liquid. Use of natural esters is therefore restricted to sealed units, or with the conservator tank protected from the contact with atmosphere by a membrane or other suitable system.

In this document the term "natural esters" applies to insulating liquids for transformers and similar electrical equipment with suitable biodegradability and lower environmental impact. Such natural esters are vegetable oils obtained from seeds, and oils obtained from other suitable biological materials. These oils are comprised of triglycerides.

Natural esters with additives are within the scope of this document. Because of their different chemical composition, natural esters differ from insulating mineral oils and other insulating liquids that have high fire points, such as synthetic esters or silicone fluids.

Natural ester-derived insulating liquids with low viscosity have been introduced but are not covered by this document. IEC 63012 covers these liquids.

This document is applicable only to unused natural esters. Reclaimed natural esters and natural esters blended with other insulating liquids are beyond the scope of this document.

NOTE The chemical nomenclature and scientific notations used in the document are in accordance with the IUPAC handbook (Quantities, Units and Symbols in Physical Chemistry).

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 d) and d.c. resistivity*

IEC 60475, *Method of sampling insulating liquids*

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

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

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

IEC 61198, *Mineral insulating oils – Methods for the determination of 2-furfural and related compounds*

IEC 61619, *Insulating liquids – Contamination by polychlorinated biphenyls (PCBs) – Method of determination by capillary column gas chromatography*

IEC 61620, *Insulating liquids – Determination of the dielectric dissipation factor by measurement of the conductance and capacitance – Test method*

IEC 62021-3, *Insulating liquids – Determination of acidity – Part 3: Test methods for non-mineral insulating oils*

IEC 62535, *Insulating liquids – Test method for detection of potentially corrosive sulphur in used and unused insulating oil*

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)*

ISO 2049, *Petroleum products – Determination of colour (ASTM scale)*

ISO 2592, *Petroleum and related products – Determination of flash and fire points – Cleveland open cup method*

ISO 3016, *Petroleum and related products from natural or synthetic sources – Determination of pour point*

ISO 3104, *Petroleum products – Transparent and opaque fluids – Determination of kinematic viscosity and calculation of dynamic viscosity*

ISO 3675, *Crude petroleum and liquid petroleum products – Laboratory determination of density – Hydrometer method*

ISO 12185, *Crude petroleum and petroleum products – Determination of density – Oscillating U-tube method*

ASTM D1500, *Standard Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)*

ASTM D7042, *Standard Test Method for Dynamic Viscosity and Density of Liquids by Stabinger Viscometer (and the Calculation of Kinematic Viscosity)*