# IEC 62975

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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

colour inside

## Natural esters – Guidelines for maintenance and use in electrical equipment

## Esters naturels – Lignes directrices pour la maintenance et l'utilisation dans les matériels électriques

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COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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CONTENTS

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# NATURAL ESTERS – GUIDELINES FOR MAINTENANCE AND USE IN ELECTRICAL EQUIPMENT

## FOREWORD

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

| FDIS | Report on voting |
|---|---|
| 10/1123/FDIS | 10/1126/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

Natural esters are increasingly being used in transformers and electrical equipment employed in electrical power generation, transmission, distribution and industrial applications.

The use of natural esters is recommended for equipment where the liquid does not remain in continuous contact with ambient air, such as hermetically sealed units, units with closed conservators equipped with a rubber bag (bladder) or external expansion elements (external bag), units with a headspace having either a nitrogen blanket or a confined volume of air (distribution transformers).

Monitoring and maintaining liquid quality are essential to ensure the reliable operation of natural ester filled electrical equipment. Codes of practice for this purpose have been established by electrical power authorities, power companies and industries in many countries. A review of current experience reveals a wide variation of procedures and criteria. It is possible, however, to compare the value and significance of standardized liquid tests and to recommend uniform criteria for the evaluation of test data.

If a certain amount of liquid deterioration (by degradation or contamination) is exceeded, there is inevitably some erosion of safety margins and the question of the risk of premature failure should be considered. While the quantification of the risk can be very difficult, a first step involves the identification of potential effects of increased deterioration. The philosophy underlying this document is to furnish users with as broad a base of understanding of liquid quality deterioration as is available, so that they can make informed decisions on inspection and maintenance practices.

Unused natural ester liquids are sustainable resources and are readily available. Natural esters are, by most regulations, deemed to be regulated and/or controlled waste. If spills occur, the user should refer to the regulations applicable to their specific location and requirements set by their local authorities.

This document, while technically sound, is mainly intended to serve as a common basis for the preparation of more specific and complete codes of practice by users in the light of local circumstances. Sound engineering judgement should be exerted in seeking the best compromise between technical requirements and economic factors.

Application of natural ester liquids in large power transformers at this time is still relatively limited after 20 years although a very large number of units is operating. While the collection of operating data has allowed for the development of this document, care should be used when applying the recommended values. Manufacturers of natural ester liquids should be contacted with specific questions or concerns.

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

The natural esters which are the subject of this document should be handled in compliance with local regulations and supplier's safety datasheets.

This document is applicable to natural esters, chemicals and used sample containers. The disposal of these items should be carried out according to local regulations regarding their impact on the environment.

# NATURAL ESTERS – GUIDELINES FOR MAINTENANCE AND USE IN ELECTRICAL EQUIPMENT

## 1 Scope

This document provides procedures and guidelines that are intended for the use and maintenance of natural ester liquid in sealed transformers and other electrical equipment.

This document is applicable to natural esters, originally supplied conforming to IEC 62770 and other applicable standards (e.g. ASTM D6871 [1][1]) in transformers, switchgear and electrical apparatus where liquid sampling is practical and where the normal operating conditions specified in the equipment specifications apply.

At present, there is a limited amount of information available for electrical equipment other than transformers.

This document is also intended to assist the power equipment operator to evaluate the condition of the natural ester and maintain it in a serviceable condition. It also provides a common basis for the preparation of more specific and complete local codes of practice.

The document includes recommendations on tests and evaluation procedures and outlines methods for reconditioning and reclaiming the liquid, when necessary.

## 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 60422:2013, *Mineral insulating oils in electrical equipment – Supervision and maintenance guidance*

IEC 60475, *Method of sampling insulating liquids*

IEC 60567, *Oil-filled electrical equipment – Sampling of gases and analysis of free and dissolved gases – Guidance*

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

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

IEC 60970, *Insulating liquids – Methods for counting and sizing particles*

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1 Numbers in square brackets refer to the bibliography.