

ICS 29.040.10

CCS K 15



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 44663-2024

**Insulating liquids - Unused modified or blended esters for
electrotechnical applications
(English Translation)**

Issued on: September 29, 2024

Implemented on: April 1, 2025

**Issued by: State Administration for Market Regulation, China National
Standardization Administration**

Table of Contents

Preface	
Introduction	
1 Scope	
2 Normative references	
3 Terms and definitions	
4 Categories	
5 Performance, importance and test methods	
6 Minimum performance requirements	
7 Labelling and general delivery requirements	11
Appendix A (Informative) Miscibility, compatibility of insulating liquids and oil displacement of transformers	
Reference	

Foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting.

This document is modified to adopt IEC 63012:2019 "Unused modified or mixed esters for insulating liquids for electrical use".

The technical differences between this document and IEC 63012:2019 and their reasons are as follows.

--- The warning in the introduction of IEC 63012:2019 is placed before the "Scope" in Chapter 1 to meet the needs of technical content;

--- The content of "Scope" has been reorganized to meet the needs of technical content (see Chapter 1);

--- Added normative references to DL/T 429.1 (see Table 1, 5.1.1) to meet the needs of technical content;

--- Replaced ISO 2211 with the normative reference GB/T 23770 (see Table 2, 5.1.2), added normative reference DL/T 429.2 (see Table 2, 5.1.2), deleted the normative reference ISO 2049 (see 4.2) to adapt to my country's technical requirements parts, increasing operability;

--- Replaced ISO 3104 with the normative reference GB/T 30515 (see Table 1, 5.1.3), added the normative reference NB/SH/T 0870 (see Table 1, 5.1.3) to adapt to my country's technical conditions and increase operability;

--- ASTM D4172 (see Table 2, 5.1.4) is replaced by the normative reference NB/SH/T 0189. DL/T 1204 replaces ASTM D1903 (see Table 1, 5.1.6) and replaces NB/SH T0632 with the normative reference ASTM E1269 (see Table 1, 5.1.7) to adapt to my country's technical conditions and increase operability;

--- Replaced ISO 3016 with the normative reference GB/T 3535 (see Table 1, 5.1.8), added normative reference NB/SH/T 0886 (see Table 1, 5.1.8) to adapt to my country's technical conditions and improve operability;

--- IEC 60814 (see Table 1, 5.1.9) was replaced with the normative reference NB/T 42140 to adapt to my country's technical conditions and increase Operability;

--- Replaced ISO 12185 with SH/T 0604 and ISO 3675 with GB/T 1884, and increased the normative the referenced NB/SH/T 0870 (see Table 1, 5.1.11) is used to adapt to my country's technical conditions and increase operability;

--- Added normative references to GB/T 6541 (see Table 2, 5.1.12), added "In case of dispute, the provisions of IEC 62961 shall be followed "Determination" content (see 5.1.12) to adapt to my country's technical conditions and increase operability;

--- The normative reference GB/T 507 replaces IEC 60156 (see Table 1, 5.2.1, 5.2.2) to adapt to my country's technical conditions parts, increasing operability;

--- Added supplementary provisions on the determination method of breakdown voltage of high viscosity and low viscosity ester liquids (see 5.2.1) to meet the technical requirements.

The need for capacity;

--- Replaced IEC 60897 (see Table 2, 5.2.2) with the normative reference GB/T 21222, and replaced IEC 60897 (see Table 2, 5.2.2) with the normative reference GB/T 17648
Replaced IEC TR61294 (see Table 2, 5.2.3) to adapt to my country's technical conditions and increase operability;

--- Replace IEC 60247 with the normative reference GB/T 5654 (see Table 1, Table 2, 5.2.4, 5.2.5, 5.2.6), GB/T 21216 replaced IEC 61620 (see Table 1, 5.2.4) to adapt to my country's technical conditions and increase operability;

--- Added normative reference DL/T 385 (see Table 2, 5.2.7) to adapt to my country's technical conditions and increase operability;

--- The normative reference GB/T 41633.3 replaces IEC 62021-3 (see Table 1, 5.3.1) to adapt to my country's technical requirements parts, increasing operability;

--- DL/T 285 replaced IEC 62535, GB/T 25961 replaced ASTM D1275, GB/T 32508 with

normative references Replaced IEC 62697-1 (see Table 1, 5.3.3) to adapt to my country's technical conditions and increase operability;

--- Added normative reference DL/T 2445 (see Table 2, 5.3.4) to adapt to my country's technical conditions and increase operability;

--- IEC 61125 (see Table 1, 5.4.1) is replaced by the normative reference NB/SH/T 0811.

NB/T 10199 replaced IEC 62770, GB/T 41632 replaced IEC 61099 (see 5.4.1, 5.4.2) to adapt to my country Technical conditions to increase operability;

--- ASTM D7150 (see Table 2, 5.4.4) is replaced by the normative reference NB/SH/T 0930.

GB/T 10065-2007 replaces IEC 60628 (see Table 2, 5.4.5) and replaces SH/T 0803 with the normative reference IEC 61619 (see Table 1, 5.5.2) to adapt to my country's technical conditions and increase operability;

--- The normative references GB/T 261 replaced ISO 2719, GB/T 3536 replaced ISO 2592 (see Table 1, 5.5.4), and Adapt to my country's technical conditions and increase operability;

--- GB/T 21856 replaced OECD301-B, GB/T 21802 replaced OECD301-C, GB/T 21801 replaced OECD301-F (see Table 1, 5.5.6) to adapt to my country's technical conditions and increase operability;

---Change the performance requirement value of "AC breakdown voltage" from $\geq 35\text{kV}/70\text{kV}$ to $\geq 40\text{kV}/70\text{kV}$, and change dibenzyl disulfide the required value was changed from "undetectable" to "undetectable ($\leq 5\text{ mg/kg}$)" (see Table 1) to meet the needs of technical content.

The following editorial changes were made to this document.

--- Change the title "Viscosity" to "Kinematic Viscosity" (see 5.1.3);

--- Added table notes to Table 1 and Table 2, and deleted footnotes a and b of Table 2;

--- Change the title "Stray Gases" to "Gas Generation Characteristics" (see 5.4.4);

--- Replace IEC 60076-14 (see 5.4.2) with the informative reference GB/T 1094.14, and replace IEC 60076-14 (see 5.4.2) with the informative reference GB/T 6986 Replaced ISO 3015 (see 5.1.8), replaced IEC 61039 (see 4.2) with the informative reference GB/T 27750, replaced IEC 61039 (see 4.2) with the informative reference GB/T 27750 the NB/SH/T 0837 referenced replaces IEC 61868 (see 5.1.3).

Introduction

Electrical insulation and heat transfer are the basic functions of insulating liquids in electrical applications. These insulating liquids are usually applied in a homogeneous state, such as the most common Common mineral oils or new synthetic esters, natural esters or

silicone fluids. With the continuous research on improving the performance characteristics of equipment, different insulating liquid combinations. Some examples of known insulation liquid modification include optimizing the cost of insulation liquid use, increasing the cooling performance of insulation liquid, Improve the flash point of insulating liquid, extend the insulation life of equipment or reduce the impact of insulating liquid on the environment.

Currently, there are specific standards for insulating fluids (mineral oils, synthetic esters, natural esters, silicone fluids), but these standards do not include chemically modified in addition, the existing standards do not cover performance characteristics that may exceed the technical requirements in GB/T 41632.

Request for synthetic esters.

Some modified esters or their mixtures are already available as commercial products from insulation liquid suppliers. For example.

- Palm fatty acid ester, with a low viscosity of 5mm²/s at 40°C and a flash point of 176°C;
- A mixture of triglycerides (50%) and monoglycerides (50%) has a low viscosity of 17mm²/s at 40°C and a flash point of 200°C.

The number of applications for ester insulating fluids or their mixtures is expected to continue to grow in the coming years, and there is a need for quality control of these insulating fluids.

The performance characteristics of a mixture should not be assumed to be based solely on the performance characteristics of its individual components.

The purpose of this document is to specify the minimum quality requirements for insulating liquids in new combinations.

Insulating liquid for electrical use, unused Modified or mixed ester warn.

This document does not purport to address all of the safety concerns associated with its use. It is the responsibility of the user of this document to establish appropriate safety precautions prior to use.

health and safety practices, and determine the applicability of regulatory restrictions.

Some of the test operations mentioned in this document may lead to dangerous situations. Please strictly follow the relevant standard test methods and precautions.

The insulating liquids, chemicals and sample containers mentioned in this document should be handled in accordance with current local and national legislation on their impact on the environment.

Every precaution should be taken to prevent release of liquid into the environment.