

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

**Classification of insulating liquids**

**Classification des liquides isolants**

Standards  
(<https://standards.iteh.ai>)  
Document Preview

[IEC 61039:2025](#)

<https://standards.iteh.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025>



**THIS PUBLICATION IS COPYRIGHT PROTECTED**  
**Copyright © 2025 IEC, Geneva, Switzerland**

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat  
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)

#### About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

#### About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

#### IEC publications search - [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

#### IEC Customer Service Centre - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

---

#### A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

#### A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

#### Recherche de publications IEC -

#### [webstore.iec.ch/advsearchform](http://webstore.iec.ch/advsearchform)

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

#### IEC Just Published - [webstore.iec.ch/justpublished](http://webstore.iec.ch/justpublished)

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

#### Service Clients - [webstore.iec.ch/csc](http://webstore.iec.ch/csc)

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: [sales@iec.ch](mailto:sales@iec.ch).

#### IEC Products & Services Portal - [products.iec.ch](http://products.iec.ch)

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications, symboles graphiques et le glossaire. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

#### Electropedia - [www.electropedia.org](http://www.electropedia.org)

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 500 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 25 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

---

**Classification of insulating liquids**

**Classification des liquides isolants**

Standards  
(<https://standards.iteh.ai>)  
Document Preview

[IEC 61039:2025](https://standards.iteh.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025)

<https://standards.iteh.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025>

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

---

ICS 29.040.10

ISBN 978-2-8327-0162-1

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD.....	3
INTRODUCTION.....	5
1 Scope.....	6
2 Normative references .....	6
3 Terms and definitions .....	6
4 ISO classification system.....	6
5 Classification of electrical insulating liquids .....	7
5.1 General.....	7
5.2 Class classification .....	7
5.3 Category classification .....	8
5.4 Identifying code .....	8
6 Summarizing outline .....	11
Bibliography.....	12
Figure 1 – Meaning of all the letters and digits present in the classification of insulating liquids .....	11
Table 1 – Class classification of petroleum products or related products.....	7
Table 2 – Examples of classification for different insulating liquids .....	10

ITeh Standards  
(<https://standards.iteh.ai>)  
Document Preview

[IEC 61039:2025](https://standards.iteh.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025)

<https://standards.iteh.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## CLASSIFICATION OF INSULATING LIQUIDS

## 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at <https://patents.iec.ch>. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 61039 has been prepared by IEC technical committee 10: Fluids for electrotechnical applications. It is an International Standard.

This third edition cancels and replaces the second edition published in 2008. This edition constitutes a technical revision.

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

- a) updating of the classification of insulating liquids, taking into account the largest number possible of substances that have, or may have, a possible application in electrical components.

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

Draft	Report on voting
10/1249/FDIS	10/1258/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/publications](http://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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

**iTeh Standards**  
**(<https://standards.itih.ai>)**  
**Document Preview**

[IEC 61039:2025](#)

<https://standards.itih.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025>

## INTRODUCTION

### WARNING – Health and safety

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 insulating liquids which are the subject of this document should be handled with due regard to personal hygiene. Direct contact with eyes can cause slight irritation. In the case of eye contact, irrigation with copious quantities of clean running water should be carried out and medical advice sought.

Some of the tests specified in this document involve the use of processes that could lead to a hazardous situation. Attention is drawn to the relevant standard for guidance.

### WARNING – Environment

This document involves insulating liquids, chemicals and used sample containers. The disposal of these items can be subject to regulatory requirements with regard to their impact on the environment.

All insulating liquids that float on water are generally a water hazard, as they reduce oxygen ingress into the water. No liquid, regardless of its classification, can be freely spilled in the environment. The handling of insulating liquids can be subject to regulatory requirements with regard to their impact on the environment. Every precaution should be taken to prevent the release of insulating liquids into the environment.

Document Preview

[IEC 61039:2025](https://standards.iteh.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025)

<https://standards.iteh.ai/catalog/standards/iec/ed68a530-e005-4f47-8030-12ffb861babe/iec-61039-2025>

# CLASSIFICATION OF INSULATING LIQUIDS

## 1 Scope

This document establishes the detailed classification of the N family (insulating liquids) that belongs to class L (lubricants, industrial oils and related products) in accordance with ISO 8681 and ISO 6743-99, affecting product categories that include products derived from petroleum processing, synthetic chemical products and synthetic and natural esters.

This document applies to unused liquids. For liquids in service, additional testing can be required to ensure compliance with this document.

## 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 60296, *Fluids for electrotechnical applications – Mineral insulating oils for electrical equipment*

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

ISO 8681, *Petroleum products and lubricants – Method of classification – Definition of classes*

OECD 301:1992, *OECD guidelines for testing of chemicals – Ready biodegradability*

ASTM D240, *Standard test method for heat of combustion of liquid hydrocarbon fuels by bomb calorimeter*

## 3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

## 4 ISO classification system

ISO 8681 sets out the main rules of the classification system that applies to petroleum products, lubricants and related products. This document sets out the classification method which can be used for electrical insulating liquids.

ISO 8681 suggests, as far as possible, to choose the application field as the main principle for the classification of petroleum products, lubricants, and related products. It also suggests classifying on the basis of the product typology, for example fuels are classified first of all on the basis of typology and secondly on the basis of end use.



The ISO classification principle is based on the allocation of a code consisting of letters and numbers for the main classes and categories of petroleum products.

The complete nomination consists of:

- the initials "ISO";
- the class of the petroleum product or related product, indicated by a letter (see Table 1), which shall be clearly separated from the other symbols;
- the category, indicated by a group of four letters, the first one always identifying the family to which it belongs and the others assuming a meaning, appropriately explained in the reference standard, which depends on the particular category of concerned products;
- (optional) some numbers, which can be added, to complete the nomination and that have a meaning appropriately explained in the reference standard for that particular category of products.

In compliance with ISO 8681, the code should have the following general form:

ISO – CLASS – CATEGORY –NUMBERS (if applicable)

or the short form:

CLASS – CATEGORY –NUMBERS (if applicable)

## 5 Classification of electrical insulating liquids

### 5.1 General

In accordance with ISO 8681, the classification system indicates the products with a nomination that includes:

- the abbreviation "ISO";
- the class of the petroleum products or related products indicated by a letter that in this document has the meaning defined in Table 1;
- the category indicated by four letters whose meaning is explained in 5.3;
- a seven-digit number that makes up the identification code (described in 5.4).

### 5.2 Class classification

The class of petroleum products or related products is indicated by a letter having the meaning reported in Table 1.

**Table 1 – Class classification of petroleum products or related products**

Class	Indication
F	Fuels
S	Solvents and raw materials for chemical industry
L	Lubricants, industrial oils and related products
W	Waxes
B	Bitumen

In accordance with ISO 6743-99:2002, the electrical insulating liquids belong to class L "lubricants, industrial oils and related products".

### 5.3 Category classification

In the case where the specific classification of insulating liquids is described in the corresponding standard, it shall have priority over the classification given in this document. For example, for mineral oils, IEC 60296 shall be applied.

The four letters identify the category, with the following meaning:

- First letter

The first letter, which identifies the insulating liquid family, will be N: Electrical insulation (ISO 6743-99:2002, Table 1).

- Second letter

The second letter identifies the main application field as follows:

- C capacitors;
- T transformers and switching equipment;
- S switching equipment operating at temperature lower than  $-10\text{ °C}$ ;
- Y cables.

NOTE 1 In order to provide an indication of fire behaviour of insulating liquids, and also wishing to benefit from the experience gained by CT 14 of CENELEC, the following parameters have been added as well as the classifications "fire point" and "low heat value".

- Third letter

The third letter identifies the presence of antioxidant additives, if applicable. Liquids may contain different antioxidants and different levels of antioxidants. Check with corresponding liquid standards. The third letter is defined as:

- U if no antioxidant additives are present;
- I if antioxidant additives are present.

NOTE 2 In this document Classification I also encompasses category T according to IEC 60296.

- Fourth letter

The fourth letter identifies the fire point as determined in accordance with ISO 2592. At the time of writing of this document, liquids falling into category L are being phased out from use. There is no IEC International Standard covering such liquids.

- O if the fire point is  $< 300\text{ °C}$ ;
- K if the fire point is  $\geq 300\text{ °C}$ ;
- L if the fire point of the liquid is not detectable.

### 5.4 Identifying code

To complete the nomination, a seven-digit number is added, with the following meaning:

- First three digits

The first three digits correspond to the last three digits of the IEC reference standard identifier, if applicable, using number 000 in the case where the IEC reference standard is missing.

- Fourth digit