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# REDLINE VERSION



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## Insulating liquids – Determination of the breakdown voltage at power frequency – Test method

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

# INSULATING LIQUIDS – DETERMINATION OF THE BREAKDOWN VOLTAGE AT POWER FREQUENCY – TEST METHOD

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International Standard IEC 60156 has been prepared by IEC technical committee TC 10: Fluids for electrotechnical applications.

This third edition cancels and replaces the second edition published in 1995. This edition constitutes a technical revision and, mainly, confirms the content of the previous edition even if some advances are included. The test method has not been changed for practical reason due to the very large number of instrumentation disseminated around the world, although the use of stirring is now recommended.

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

FDIS	Report on voting
10/1061/FDIS	10/1065/RVD

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## INTRODUCTION

As normally applied, breakdown voltage of insulating liquids is not a basic material property but an empirical test procedure intended to indicate the presence of contaminants such as water and solid suspended matter and the advisability of carrying out a drying and filtration treatment.

The AC breakdown voltage value of insulating liquids strongly depends on the particular set of conditions used in its measurement. Therefore, standardized testing procedures and equipment are essential for the unambiguous interpretation of test results.

The method described in this document applies to either acceptance tests on new deliveries of insulating liquids, or testing of treated liquids prior to or during filling into electrical equipment, or to the monitoring and maintenance of oil-filled apparatus in service. It specifies rigorous sample-handling procedures and temperature control that should be adhered to when certified results are required. For routine tests, especially in the field, less stringent procedures may be practicable and it is the responsibility of the user to determine their effect on the results.

Annex A (informative) describes, for comparison, an alternative test method which could be introduced in the future. Annex B (informative) describes special test methods, using cells which may include low volume samples. Annex C (informative) describes a reference material for a performance test and check according to IEC 60060-3[1]<sup>1</sup>.

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<sup>1</sup> Numbers in square brackets refer to the Bibliography.

## INSULATING LIQUIDS – DETERMINATION OF THE BREAKDOWN VOLTAGE AT POWER FREQUENCY – TEST METHOD

### 1 Scope

This document specifies the method for determining the dielectric breakdown voltage of insulating liquids at power frequency. The test ~~portion, contained~~ procedure is performed in a specified apparatus, where the oil sample is subjected to an increasing AC electrical field ~~by means of a constant rate of voltage rise~~ until breakdown occurs. The method applies to all types of insulating liquids of nominal viscosity up to  $350 \text{ mm}^2/\text{s}^{-1}$  at  $40 \text{ }^\circ\text{C}$ . It is appropriate both for acceptance testing on unused liquids at the time of their delivery and for establishing the condition of samples taken in monitoring and maintenance of equipment.

### 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 60052: 1960, Recommendations for voltage measurement by means of sphere-gaps (one sphere earthed)~~

~~IEC 60060, High-voltage test techniques~~

IEC 60475: ~~1974, Method of sampling insulating liquids~~ ~~dielectrics~~



# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

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**Insulating liquids – Determination of the breakdown voltage at power frequency – Test method**

**Isolants liquides – Détermination de la tension de claquage à fréquence industrielle – Méthode d'essai**





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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60475, *Method of sampling insulating liquids*

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

**ISOLANTS LIQUIDES – DÉTERMINATION DE LA TENSION DE CLAQUAGE  
À FRÉQUENCE INDUSTRIELLE – MÉTHODE D'ESSAI**

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La Norme internationale IEC 60156 a été établie par le comité d'études 10 de l'IEC: Fluides pour applications électrotechniques.

Cette troisième édition annule et remplace la deuxième édition parue en 1995. Cette édition constitue une révision technique et valide essentiellement le contenu de l'édition précédente même si elle comporte certaines améliorations. La méthode d'essai n'a pas été modifiée pour des raisons pratiques et du fait du très grand nombre de dispositifs de mesure utilisés au niveau international, même si l'emploi de l'agitateur est maintenant recommandé.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
10/1061/FDIS	10/1065/RVD

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Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

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## INTRODUCTION

La tension de claquage des isolants liquides, telle qu'elle est généralement appliquée, n'est pas une propriété fondamentale du matériau, mais une procédure d'essai empirique destinée à révéler la présence de produits contaminants comme l'eau ou des matières solides en suspension, et permettre ainsi de décider de l'opportunité d'effectuer un traitement de séchage et de filtration.

La valeur de la tension de claquage sous courant alternatif des isolants liquides dépend beaucoup de l'ensemble des conditions particulières appliquées pour son mesurage. En conséquence, des procédures d'essai et un équipement normalisés sont essentiels pour interpréter sans ambiguïté les résultats d'essai.

La méthode décrite dans le présent document s'applique soit aux essais de réception de nouvelles livraisons d'isolants liquides, soit aux essais de liquides traités, avant ou pendant le remplissage de matériels électriques, soit à la surveillance et à la maintenance des appareils remplis d'huile en service. Elle spécifie des méthodes rigoureuses de manipulation des échantillons et de vérification des températures auxquelles il convient de se conformer quand des résultats certifiés sont exigés. Pour les essais de routine, notamment sur le terrain, des procédures moins rigoureuses peuvent être appliquées et il revient alors à l'utilisateur de déterminer leurs effets sur les résultats obtenus.

L'Annexe A (informative) décrit, à titre de comparaison, une autre méthode d'essai qui pourrait être adoptée à l'avenir. L'Annexe B (informative) décrit des méthodes d'essai spéciales utilisant des cellules qui peuvent contenir des échantillons de faible volume. L'Annexe C (informative) décrit un matériau de référence pour un essai de détermination des caractéristiques ou un contrôle de caractéristiques conformément à l'IEC 60060-3[1]<sup>1</sup>.

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<sup>1</sup> Les chiffres entre crochets renvoient à la Bibliographie.

## **ISOLANTS LIQUIDES – DÉTERMINATION DE LA TENSION DE CLAQUAGE À FRÉQUENCE INDUSTRIELLE – MÉTHODE D'ESSAI**

### **1 Domaine d'application**

Le présent document spécifie la méthode de détermination de la tension de claquage diélectrique des isolants liquides à fréquence industrielle. La procédure d'essai est réalisée dans un appareil spécifié dans lequel l'échantillon d'huile est soumis à un champ électrique alternatif croissant jusqu'à l'obtention du claquage. La méthode est applicable à tous les types d'isolants liquides de viscosité nominale allant jusqu'à 350 mm<sup>2</sup>/s à 40 °C. Elle convient aussi bien pour les essais de réception de liquides neufs à la livraison que pour définir l'état des échantillons prélevés lors de la surveillance et de la maintenance des matériels.

### **2 Références normatives**

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IEC 60475, *Méthode d'échantillonnage des liquides isolants*