

Australian Standard™

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## **Insulating liquids**

### **Part 1: Specification for unused mineral insulating oils for transformers and switchgear**

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[Based on and including the full text of IEC 60296:1982 and  
IEC 60296:1982/Amd.1:1986]

This Australian Standard was prepared by Committee EL/8, Power Transformers. It was approved on behalf of the Council of Standards Australia on 16 February 1999 and published on 5 May 1999.

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The following interests are represented on Committee EL/8:

Australasian Railway Association  
Australian Chamber of Commerce and Industry  
Australian Electrical and Electronic Manufacturers Association  
Australian Institute of Petroleum  
Electricity Supply Association of Australia  
Electricity Supply Engineers Association of New South Wales  
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*This Standard was issued in draft form for comment as DR 97495.*

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## Insulating liquids

### Part 1: Specification for unused mineral insulating oils for transformers and switchgear

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Originated as AS C62—1935.  
Previous edition AS 1767—1975.  
Revised and redesignated AS 1767.1—1999.

## PREFACE

This Standard was prepared by the Standards Australia Committee EL/8, Power Transformers, to supersede AS 1767—1975, *Insulating oil for transformers and switchgear*.

This Standard is based on but not equivalent to, and has been reproduced from, IEC 60296:1982, *Specification for unused mineral insulating oils for transformers and switchgear*, including Amendment 1.

The change required by Amendment 1 is indicated in the IEC text by a double marginal bar set against the relevant clause.

In January 1997, IEC commenced numbering its Standards from 60000 by adding 60000 to the number of each existing Standard. This coordinates IEC numbering with ISO numbering. During the transition period an IEC Standard might be identified by its new number or its old number (e.g. IEC 60050 or IEC 50).

Appendix ZZ lists variations to IEC 60296 for application in Australia. For the purpose of this Standard, the IEC text is amended, supplemented or replaced as set out in Appendix ZZ. These variations are indicated throughout this Standard by a single marginal bar located adjacent to each clause or part thereof affected. (Reference to Appendix ZZ is especially important in cases where additional text or clauses have been introduced.)

Permissible neutralization value and percentage sludge content figures specified in this Standard differ from those specified for the same quantities in AS 1883, *Guide to maintenance and supervision of insulating oils in service*. This reflects significant differences between the two Standards in the methods used to determine these quantities. Each set of numbers is valid in the context of the Standard in which it appears.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements of this Standard.

This Standard is Part 1 of a series which comprises the following:

## AS

- |          |   |
|----------|---|
| 1767     | Insulating liquids  |
| 1767.1   | Part 1: Specification for unused mineral insulating oils for transformers and switchgear (this Standard)                                |
| 1767.2   | Part 2: Test methods  |
| 1767.2.1 | Method 2.1: Determination of the breakdown voltage at power frequency   |
| 1767.2.3 | Method 2.3: Method of sampling liquid dielectrics   |
| 1767.2.4 | Method 2.4: Detection and determination of specified anti-oxidant additives in insulating oils  |
| 1767.2.5 | Method 2.5: Unused hydrocarbon-based insulating liquids—Test methods for evaluating the oxidation stability                             |
| 1767.2.7 | Method 2.7: Determination of PCB contamination in insulating liquids by capillary column gas chromatography—Identification of congeners |

The term ‘normative’ has been used in this Standard to define the application of the appendix to which it applies. A ‘normative’ appendix is an integral part of a Standard.

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title pages.
- (b) In the source text, ‘this Standard’ should read ‘this Australian Standard’.
- (c) A full point should be substituted for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian Standards, as follows:

<i>Reference to International Standard</i>	<i>Australian Standard</i>
IEC	AS
60074 Method for assessing the oxidation stability of insulating oil*	—
60156 Insulating liquids—Determination of the breakdown voltage at power frequency—Test methods	1767 Insulating liquids 1767.2 Part 2: Test methods 1767.2.1 Method 2.1: Determination of the breakdown voltage at power frequency
60247 Measurement of relative permittivity, dielectric dissipation factor and D.C. resistivity of insulating liquids	—
60474 Test methods for oxidation stability of inhibited mineral insulating oil*	—
60475 Method of sampling liquid dielectrics	1767.2.3 Method 2.3: Method of sampling liquid dielectrics
60666 Detection and determination of specified anti-oxidant additives in insulating oils	1767.2.4 Method 2.4: Detection and determination of specified anti-oxidant additives in insulating oils
60733 Determination of water in insulating oils, in oil-impregnated paper and pressboard*	—
60814 Determination of water in insulating liquids by automatic coulometric Karl Fischer titration	—
ISO	
R/91 Petroleum measurement tables	—
2719 Petroleum products—Determination of flash point—Pensky-Martens closed cup method	—
3016 Petroleum oils—Determination of pour point	—
3104 Petroleum products—Transparent and opaque liquids—Determination of kinematic viscosity and calculation of dynamic viscosity	—
3675 Crude petroleum and liquid petroleum products—Laboratory determination of density or relative density—Hydrometer method	—

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\* Reference to these documents has been made redundant by Appendix ZZ. In the case of IEC 60074 and IEC 60474 this is because these publications have been withdrawn and replaced by IEC 61125, upon which AS 1767.2.5 is based. IEC 60733 has been withdrawn and replaced by IEC 60814.

ISO		AS
4793	Laboratory sintered (fritted) filters— Porosity grading, classification and designation	—
5662	Petroleum products—Electrical insulating oils—Detection of corrosive sulphur	—
6295	Petroleum products—Mineral oil determination of interfacial tension of oil against water by the ring method	—

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## AUSTRALIAN STANDARD

**Insulating liquids**

## Part 1:

## Specification for unused mineral insulating oils for transformers and switchgear

## SECTION ONE — GENERAL CONSIDERATIONS AND TEST METHODS

1. **Scope**

- 1.1 This standard covers specifications and test methods for unused mineral insulating oils, as delivered, intended for use in transformers, switchgear and similar electrical equipment in which oil is required as an insulant or for heat transfer. These oils are obtained by distillation and refining of petroleum. Oils with and without additives are within the scope of this standard.
- 1.2 This standard does not apply to mineral insulating oils used as impregnants in cables or capacitors nor to hydrocarbon insulating liquids obtained by synthesis.

*Note.* — Oils complying with the requirements of this standard, of the same class and containing no additives are considered to be compatible with one another and can be mixed in any proportion. This does not necessarily apply to oils containing additives and where the user wishes to mix such oils a check should be made to ensure that the mixture meets the requirements of this standard.

2. **Definitions**2.1 *Additive*

A suitable substance, which is deliberately added to an insulating liquid in small proportion in order to improve certain characteristics.

2.2 *Anti-oxidant*

An additive incorporated in an insulating liquid to reduce or delay its degradation by oxidation.

2.3 *Pour point depressant*

An additive that enables the pour point of a mineral insulating oil to be lowered.

2.4 *Uninhibited oil*

A mineral insulating oil, containing no anti-oxidant, but which may contain other additives.

*Note.* — In certain countries, oil containing up to 0.08% by mass of 2,6-di-tert-butyl-paracresol (DBPC) or 2,6-di-tert-butyl-phenol (DBP) are considered as uninhibited oils.

2.5 *Inhibited oil*

A mineral insulating oil which contains an anti-oxidant.

*Note.* — In certain countries, an inhibited mineral insulating oil is defined as a mineral insulating oil containing at least 0.15% by mass, but no more than 0.40% by mass of 2,6-di-tert-butyl-paracresol (DBPC) or 2,6-di-tert-butyl-phenol (DBP).

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