AS 60422:2017

Australian STANDARD

Mineral insulating oils in electrical equipment—Supervision and maintenance guidance (IEC 60422, Ed. 4.0 (2013) MOD)

STANDARDS Australia

This Australian Standard® was prepared by Committee EL-008, Power Transformers. It was approved on behalf of the Council of Standards Australia on 26 February 2017.
This Standard was published on 14 March 2017.

The following are represented on Committee EL-008:

- Australian Chamber of Commerce and Industry
- Australian Industry Group
- Australian Institute of Petroleum
- Electricity Engineers Association, New Zealand
- Energy Efficiency and Conservation Authority of New Zealand
- Energy Networks Australia
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- Rail Industry Safety and Standards Board

This Standard was issued in draft form for comment as DR AS 60422:2016.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard®

Mineral insulating oils in electrical equipment—Supervision and maintenance guidance (IEC 60422, Ed. 4.0 (2013) MOD)

Originated as AS CC11—1965.
Previous edition AS 1883—1992.
Revised and redesignated as AS 60422:2017.

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Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 978 1 76035 701 6

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-008, Power Transformers, to supersede AS 1883—1992, *Guide to maintenance and supervision of insulating oils in service*. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to give guidance to assist users of electrical power equipment filled with or immersed in mineral insulating oils supplied in accordance with AS 1767.1, *Insulating liquids*, Part 1: *Specification for unused mineral insulating oils for transformers and switchgear*, in monitoring and evaluating the condition of oil by recommended standardized tests and procedures and maintaining the oil in serviceable conditions by reconditioning and reclaiming.

It is recognized that oils in service may become contaminated with polychlorinated biphenyls (PCBs). It is not the intention of this Standard to specify the degree of contamination which may be permitted. Reference needs to be made to the appropriate legislation.

This Standard is an adoption with national modifications and has been reproduced from IEC 60422, Ed. 4.0 (2013), *Mineral insulating oils in electrical equipment—Supervision and maintenance guidance*, and its Corrigendum 1 (2013), and has been varied as indicated in Appendix ZZ to take account of Australian conditions.

The title and designation of this Australian Standard have been changed to align with the IEC Standard on which it is based.

This Standard is structured in the following layout:

(a) Preface.

(b) IEC 60422 and its Corrigendum 1 (2013) (unedited from the Scope to the final clause of the IEC Standard).

(c) Appendix ZZ—Australian variations to the IEC Standard.

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

(i) In the source text ‘this International Standard’ should read ‘this Australian Standard’.

(ii) A full point substitutes for a comma when referring to a decimal marker.

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

Reference to International Standard		*Australian Standard*	
IEC		AS	
		1767	Insulating liquids
60156	Insulating liquids—Determination of the breakdown voltage at power frequency—Test method	1767.2.1	Part 2: Test methods Method 2.1: Determination of the breakdown voltage at power frequency
60247	Insulating liquids—Measurement of relative permittivity, dielectric dissipation factor (tan δ) and d.c. resistivity	1767.2.2	Method 2.2: Test methods—Measurement of relative permittivity, dielectric dissipation factor (tan δ) and d.c. resistivity
60296	Fluids for electrotechnical applications—Unused mineral insulating oils for transformers and switchgear	1767.1	Part 1: Specification for unused mineral insulating oils for transformers and switchgear

IEC		AS	
60475	Method of sampling liquid dielectrics	1767.2.3	Part 2: Test methods Method 2.3: Method of sampling liquid dielectrics
60666	Detection and determination of specified additives in mineral insulating oils	1767.2.4	Part 2: Test methods Method 2.4: Detection and determination of specified anti-oxidant additives in insulating oils
60814	Insulating liquids—Oil-impregnated paper and pressboard—Determination of water by automatic coulometric Karl Fischer titration	1767.2.8	Method 2.8: Test methods—Determination of water in oil-impregnated paper and pressboard by automatic coulometric Karl Fischer titration (IEC 60814, Ed. 2.0 (1997) MOD)
61125	Unused hydrocarbon based insulating liquids—Test methods for evaluating the oxidation stability	1767.2.5	Part 2: Test methods Method 2.5: Unused hydrocarbon-based insulating liquids—Test methods for evaluating the oxidation stability
61619	Insulating liquids—Contamination by polychlorinated biphenyls (PCBs)—Method of determination by capillary column gas chromatography	1767.2.7	Part 2: Test methods Method 2.7: Determination of PCB contamination in insulating liquids by capillary column gas chromatography—Identification of congeners

Only international references that have been adopted as Australian Standards have been listed.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the annex or appendix to which they apply. A ‘normative’ annex or appendix is an integral part of a Standard, whereas an ‘informative’ annex or appendix is for information and guidance only.

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INTRODUCTION

Insulating mineral oils are used in electrical equipment employed in the generation, transmission, distribution and use of electrical energy, so that the amount of oil in service, worldwide, amounts to hundreds of millions of kilograms.

Monitoring and maintaining oil quality is essential to ensure the reliable operation of oil-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 oil tests and to recommend uniform criteria for the evaluation of test data.

If a certain amount of oil 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 standard is to furnish users with as broad a base of understanding of oil quality deterioration as is available, so that they can make informed decisions on inspection and maintenance practices.

Unused mineral oils are limited resources and should be handled with this in mind. Used mineral oils are, by most regulations, deemed to be controlled waste. If spills occur this may have a negative environmental impact especially if the oil is contaminated by persistent organic pollutants such as polychlorinated biphenyls (PCBs).

This International Standard, whilst 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 will have to be exerted in seeking the best compromise between technical requirements and economic factors.

Reference should also be made to instructions from the equipment manufacturer.

General caution

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

The mineral oils and oil additives which are the subject of this standard should be handled with due regard to personal hygiene. Direct contact with the eyes may 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. For more information, refer to the safety data sheet provided by the manufacturer. Some of the tests specified in this standard involve the use of processes that could lead to a hazardous situation. Attention is drawn to the relevant standard for guidance.

Environment

This standard is applicable to mineral oils, chemicals and used sample containers.

Attention is drawn to the fact that, at the time of writing this standard, some mineral oils in service are known to be contaminated to some degree by PCBs.

Because of this, safety countermeasures should be taken to avoid risks to workers, the public and the environment during the life of the equipment, by strictly controlling spills and emissions. Disposal or decontamination of these oils should be carried out strictly according to local regulations. Every precaution should be taken to prevent release of mineral oil into the environment.

AUSTRALIAN STANDARD

Mineral insulating oils in electrical equipment—Supervision and maintenance guidance (IEC 60422, Ed. 4.0 (2013) MOD)

1 Scope

This International Standard gives guidance on the supervision and maintenance of the quality of the insulating oil in electrical equipment.

This standard is applicable to mineral insulating oils, originally supplied conforming to IEC 60296, in transformers, switchgear and other electrical apparatus where oil sampling is reasonably practicable and where the normal operating conditions specified in the equipment specifications apply.

This standard is also intended to assist the power equipment operator to evaluate the condition of the oil 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 standard includes recommendations on tests and evaluation procedures and outlines methods for reconditioning and reclaiming oil and the decontamination of oil contaminated with PCBs.

NOTE The condition monitoring of electrical equipment, for example by analysis of dissolved gases, furanic compounds or other means, is outside the scope of this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 60296:2012, *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

IEC 60475, *Method of sampling liquid dielectrics*

IEC 60666:2010, *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*

IEC 61125:1992, *Unused hydrocarbon based insulating liquids – Test methods for evaluating the oxidation stability*

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