

Mineral oil-filled electrical equipment in service -
Guidance on the interpretation of dissolved and free
gases analysis

EESTI STANDARDI EESSÕNA

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Mineral oil-filled electrical equipment in service - Guidance on
the interpretation of dissolved and free gases analysis
(IEC 60599:2022)

Matériels électriques remplis d'huile minérale en service -
Recommandations relatives à l'interprétation de l'analyse
des gaz dissous et des gaz libres
(IEC 60599:2022)

In Betrieb befindliche, mit Mineralöl befüllte elektrische
Geräte - Leitfaden zur Interpretation der Analyse gelöster
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European foreword

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Mineral oil-filled electrical equipment in service – Guidance on the interpretation of dissolved and free gases analysis

Matériels électriques remplis d'huile minérale en service – Recommandations relatives à l'interprétation de l'analyse des gaz dissous et des gaz libres



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IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Mineral oil-filled electrical equipment in service – Guidance on the interpretation of dissolved and free gases analysis

Matériels électriques remplis d'huile minérale en service – Recommandations relatives à l'interprétation de l'analyse des gaz dissous et des gaz libres

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**MINERAL OIL-FILLED ELECTRICAL EQUIPMENT
IN SERVICE – GUIDANCE ON THE INTERPRETATION
OF DISSOLVED AND FREE GASES ANALYSIS**

FOREWORD

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IEC 60599 has been prepared by IEC technical committee 10: Fluids for electrotechnical applications. It is an International Standard.

This fourth edition cancels and replaces the third edition published in 2015. This edition constitutes a technical revision.

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

- a) revision of Clause A.5 on bushings, at the request of IEC subcommittee 36A, in order to transfer to IEC 60599 the corresponding contents of IEC TR 61464 [1]¹ relating to DGA in bushings and include the new information on DGA in bushings available in CIGRE Technical Brochure 771 (2019) [2];

¹ Numbers in square brackets refer to the Bibliography.

- b) revision of Clause A.3 on wind turbine transformers, in order to include in IEC 60599 the new information on DGA in wind turbine transformers available in CIGRE Technical Brochure 771 (2019) [2].

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

Draft	Report on voting
10/1164/FDIS	10/1174/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. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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INTRODUCTION

Dissolved and free gas analysis (DGA) is one of the most widely used diagnostic tools for detecting and evaluating faults in electrical equipment filled with insulating liquid. However, interpretation of DGA results is often complex and should always be done with care, involving experienced insulation maintenance personnel.

This document gives information for facilitating this interpretation. The first edition, published in 1978, has served the industry well, but had its limitations, such as the absence of a diagnosis in some cases, the absence of concentration levels and the fact that it was based mainly on experience gained from power transformers. The second edition (2015) attempted to address some of these shortcomings. Interpretation schemes were based on observations made after inspection of a large number of faulty oil-filled equipment in service and concentrations levels deduced from analyses collected worldwide.

MINERAL OIL-FILLED ELECTRICAL EQUIPMENT IN SERVICE – GUIDANCE ON THE INTERPRETATION OF DISSOLVED AND FREE GASES ANALYSIS

1 Scope

This document describes how the concentrations of dissolved gases or free gases can be interpreted to diagnose the condition of oil-filled electrical equipment in service and suggest future action.

This document is applicable to electrical equipment filled with mineral insulating oil and insulated with cellulosic paper or pressboard-based solid insulation. Information about specific types of equipment such as transformers (power, instrument, industrial, railways, distribution), reactors, bushings, switchgear and oil-filled cables is given only as an indication in the application notes.

This document can be applied, but only with caution, to other liquid-solid insulating systems.

In any case, the indications obtained are given only as guidance with resulting action undertaken only with proper engineering judgment.

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 60475, *Method of sampling insulating liquids*

IEC 60567:2011, *Oil-filled electrical equipment – Sampling of gases and analysis of free and dissolved gases – Guidance*

IEC 61198, *Mineral insulating oils – Methods for the determination of 2-furfural and related compounds*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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>

3.1.1

fault

unplanned occurrence or defect in an item which may result in one or more failures of the item itself or of other associated equipment