Irish Standard
I.S. EN 61181:2007

Mineral oil-filled electrical equipment - Application of dissolved gas analysis (DGA) to factory tests on electrical equipment (IEC 61181:2007 (EQV))

I.S. EN 61181:2007

Incorporating amendments/corrigenda issued since publication:

EN 61181:2007/A1:2012

The National Standards Authority of Ireland (NSAI) produces the following categories of formal documents:

I.S. xxx: Irish Standard – national specification based on the consensus of an expert panel and subject to public consultation.

S.R. xxx: Standard Recommendation - recommendation based on the consensus of an expert panel and subject to public consultation.

SWiFT xxx: A rapidly developed recommendatory document based on the consensus of the participants of an NSAI workshop.

This document replaces:	*This document is based on:*	*Published:*
EN 61181:1993	EN 61181:2007 EN 61181:1993	5 April, 2007 12 August, 1993

This document was published
under the authority of the NSAI and comes into effect on:

14 May, 2007

ICS number:
29.040.10
29.180

NSAI
1 Swift Square,
Northwood, Santry
Dublin 9

T +353 1 807 3800
F +353 1 807 3838
E standards@nsai.ie
W NSAI.ie

Sales:
T +353 1 857 6730
F +353 1 857 6729
W standards.ie

Údarás um Chaighdeáin Náisiúnta na hÉireann

I.S. EN 61181:2007

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61181/A1

May 2012

ICS 29.040

English version

Mineral oil-filled electrical equipment - Application of dissolved gas analysis (DGA) to factory tests on electrical equipment

(IEC 61181:2007/A1:2012)

Matériels électriques imprégnés d'huile minérale -
Application de l'analyse des gaz dissous (AGD) lors d'essais en usine de matériels électriques
(CEI 61181:2007/A1:2012)

Getränkte Isolierstoffe -
Verwendung der Gasanalyse für gelöste Gase (DGA) als Werksprüfung für elektrische Betriebsmittel
(IEC 61181:2007/A1:2012)

This amendment A1 modifies the European Standard EN 61181:2007; it was approved by CENELEC on 2012-03-29. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Ref. No. EN 61181:2007/A1:2012 E

Foreword

The text of document 10/881/FDIS future edition 1 of IEC 61181:2007/A1, prepared by IEC/TC 10 "Fluids for electrotechnical applications" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 61181:2007/A1:2012.

The following dates are fixed:

• latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2012-12-29
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2015-03-29

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

Endorsement notice

The text of the International Standard IEC 61181:2007/A1:2012 was approved by CENELEC as a European Standard without any modification.

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 61181

April 2007

ICS 29.040.10; 29.180

Supersedes EN 61181:1993

English version

Mineral oil-filled electrical equipment - Application of dissolved gas analysis (DGA) to factory tests on electrical equipment

(IEC 61181:2007)

Matériels électriques imprégnés d'huile minérale - Application de l'analyse des gaz dissous (AGD) lors d'essais en usine de matériels électriques (CEI 61181:2007)

Getränkte Isolierstoffe - Verwendung der Gasanalyse für gelöste Gase (DGA) als Werksprüfung für elektrische Betriebsmittel (IEC 61181:2007)

This European Standard was approved by CENELEC on 2007-03-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Ref. No. EN 61181:2007 E

Foreword

The text of document 10/675/FDIS, future edition 2 of IEC 61181, prepared by IEC TC 10, Fluids for electrotechnical applications, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61181 on 2007-03-01.

This European Standard supersedes EN 61181:1993.

EN 61181:2007 includes the following significant technical changes with respect to EN 61181:1993:

– the specific procedures used during factory tests (sampling location, sampling frequency, gas extraction and chromatographic analysis in the laboratory) are described in more detail;

– information is provided in Annex A concerning the residual gas contents recommended before thermal tests on power transformers, typical gas values observed during the tests and cases where gas formation during the tests was followed by problems in the transformers;

– typical values observed during chopped lightning-impulse tests on instrument transformers are indicated in Annex B.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2007-12-01
– latest date by which the national standards conflicting with the EN have to be withdrawn	(dow)	2010-03-01

Annex ZA has been added by CENELEC.

_____

Endorsement notice

The text of the International Standard IEC 61181:2007 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60076	NOTE	Harmonized in EN 60076 series (partially modified).
IEC 60599	NOTE	Harmonized as EN 60599:1999 (not modified).
IEC 60044	NOTE	Harmonized in EN 60044 series (partially modified).

_____

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60567	-[1)]	Oil-filled electrical equipment - Sampling of gases and of oil for analysis of free and dissolved gases - Guidance	EN 60567	2005[2)]

[1)] Undated reference.

[2)] Valid edition at date of issue.

This page is intentionally left BLANK.

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MINERAL OIL-FILLED ELECTRICAL EQUIPMENT – APPLICATION OF DISSOLVED GAS ANALYSIS (DGA) TO FACTORY TESTS ON ELECTRICAL EQUIPMENT

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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

This consolidated version of IEC 61181 consists of the second edition (2007) [documents 10/675/FDIS and 10/688/RVD] and its amendment 1 (2012) [documents 10/881/FDIS and 10/886/RVD]. It bears the edition number 2.1.

The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 61181 has been prepared by IEC technical committee 10: Fluids for electrotechnical applications.

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

a) the specific procedures used during factory tests (sampling location, sampling frequency, gas extraction and chromatographic analysis in the laboratory) are described in more detail;
b) information is provided in Annex A concerning the residual gas contents recommended before thermal tests on power transformers, typical gas values observed during the tests and cases where gas formation during the tests was followed by problems in the transformers;
c) typical values observed during chopped lightning-impulse tests on instrument transformers are indicated in Annex B.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The "colour inside" logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION

IEC technical committee 10, responsible for IEC 61181, has prepared guidelines for performing DGA measurements during factory testing on equipment filled with mineral insulating oil in order to ensure consistency in the industry and improve the confidence with which the results will be used.

DGA is used routinely as a standard quality control procedure during and after factory tests on electrical equipment, for example during temperature-rise and chopped lightning-impulse tests, to indicate that a design meets specified requirements. Due to the small quantities of gases generated during factory tests, specific requirements are necessary for the sampling and analysis of oil samples and the interpretation of results.

Acceptance criteria are beyond the scope of TC 10. Attention is drawn, however, to the fact that the guidelines issued by CIGRE in 1993-1995 [1][1] do not apply any more to transformers manufactured today, the design of which having been improved. Examples of values actually observed today are indicated in Annexes A and B.

[1] Figures in square brackets refer to the bibliography.

MINERAL OIL-FILLED ELECTRICAL EQUIPMENT – APPLICATION OF DISSOLVED GAS ANALYSIS (DGA) TO FACTORY TESTS ON ELECTRICAL EQUIPMENT

1 Scope

This International Standard specifies oil-sampling procedures, analysis requirements and procedures, and recommends sensitivity, repeatability and accuracy criteria for the application of dissolved gas analysis (DGA) to factory testing of new power transformers, reactors and instrument transformers filled with mineral insulating oil when DGA testing has been specified.

The most effective and useful application of DGA techniques to factory testing is during the performance of long-term tests, typically temperature-rise (heat run) and overloading tests on power transformers and reactors, also impulse tests on instrument transformers. DGA may also be valuable for over-excitation tests run over an extended period of time.

Experience with DGA results, before and after short-time dielectric tests, indicates that DGA is normally less sensitive than electrical and acoustic methods for detecting partial discharges. However, DGA will indicate when these partial discharges become harmful to the insulation and may be detected by inspection [2].

2 Normative references

The following referenced document is indispensable for the application 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 60567: *Guide for the sampling of gases and of oil from oil-filled electrical equipment and for the analysis of free and dissolved gases*~~

IEC 60475:2011, *Method of sampling insulating liquids*

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

3 General caution, health, safety and environmental protection

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

The mineral insulating oils which are the subject of this standard should be handled with due regard to personal hygiene. Direct contact with the eyes may cause 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 standard involve the use of processes that could lead to a hazardous situation. Attention is drawn to the relevant standard for guidance.

This standard is applicable to mineral insulating oils and used sample containers, the disposal or decontamination of which must be done according to local regulations. Every precaution should be taken to prevent release of mineral oil into the environment.