Irish Standard
I.S. EN IEC 60034-18-1:2023

Version 1.00

Rotating electrical machines - Part 18-1: Functional evaluation of insulation systems - General guidelines

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National Foreword

I.S. EN IEC 60034-18-1:2023 V1.00 is the version of the NSAI adopted European document EN IEC 60034-18-1:2023, *Rotating electrical machines - Part 18-1: Functional evaluation of insulation systems - General guidelines,* including any Corrections, Amendments etc. to EN IEC 60034-18-1:2023.

This normative document by CEN/CENELEC the elaboration of which includes a public enquiry, followed by a Formal Vote of CEN/CENELEC national members and final ratification. This European Standard is published as an identical national standard and every conflicting national standard will be withdrawn. The content of a European Standard does not conflict with the content of any other EN (and HD for CENELEC).

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN IEC 60034-18-1

January 2023

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Supersedes EN 60034-18-1:2010

English Version

Rotating electrical machines - Part 18-1: Functional evaluation of insulation systems - General guidelines (IEC 60034-18-1:2022)

Machines électriques tournantes - Partie 18-1: Évaluation fonctionnelle des systèmes d'isolation - Lignes directrices générales (IEC 60034-18-1:2022)

Drehende elektrische Maschinen - Teil 18-1: Funktionelle Bewertung von Isoliersystemen - Allgemeine Richtlinien (IEC 60034-18-1:2022)

This European Standard was approved by CENELEC on 2023-01-26. 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 CEN-CENELEC Management Centre 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 CEN-CENELEC Management Centre has the same status as the official versions.

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

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Ref. No. EN IEC 60034-18-1:2023 E

European foreword

The text of document 2/2113/FDIS, future edition 3 of IEC 60034-18-1, prepared by IEC/TC 2 "Rotating machinery" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60034-18-1:2023.

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)	2023-10-26
• latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2026-01-26

This document supersedes EN 60034-18-1:2010 and all of its amendments and corrigenda (if any).

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

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Endorsement notice

The text of the International Standard IEC 60034-18-1:2022 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60216 (series) NOTE Approved as EN 60216 (series)

Annex A
(normative)

Normative references to international publications with their corresponding European publications

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.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60034-1	-	Rotating electrical machines - Part 1: Rating and performance	EN 60034-1[1]	-
IEC 60034-18-21	-	Rotating electrical machines - Part 18-21: Functional evaluation of insulation systems - Test procedures for wire-wound windings - Thermal evaluation and classification	EN 60034-18-21	-
IEC 60034-18-31	-	Rotating electrical machines - Part 18-31: Functional evaluation of insulation systems - Test procedures for form-wound windings - Thermal evaluation and classification of insulation systems used in rotating machines	EN 60034-18-31	-
IEC 60034-18-32	-	Rotating electrical machines - Part 18-32: Functional evaluation of insulation systems (Type II) - Electrical endurance qualification procedures for form-wound windings	EN IEC 60034-18-32	-
IEC/TS 60034-18-33	-	Rotating electrical machines - Part 18-33: Functional evaluation of insulation systems - Test procedures for form-wound windings - Multifactor evaluation by endurance under simultaneous thermal and electrical stresses	CLC/TS 60034-18-33	-
IEC 60034-18-34	-	Rotating electrical machines - Part 18-34: Functional evaluation of insulation systems - Test procedures for form-wound windings - Evaluation of thermomechanical endurance of insulation systems	EN 60034-18-34	-

[1] Under preparation. Stage at the time of publication: FprEN 60034-1 and FprEN 60034-1/prAA.

IEC 60034-18-41	2014	Rotating electrical machines - Part 18-41: Partial discharge free electrical insulation systems (Type I) used in rotating electrical machines fed from voltage converters - Qualification and quality control tests	EN 60034-18-41	2014
+ A1	2019		+ A1	2019
IEC 60034-18-42	-	Rotating electrical machines - Part 18-42: Partial discharge resistant electrical insulation systems (Type II) used in rotating electrical machines fed from voltage converters - Qualification tests	EN 60034-18-42	-
IEC 60034-27-3	-	Rotating electrical machines - Part 27-3: Dielectric dissipation factor measurement on stator winding insulation of rotating electrical machines	EN 60034-27-3	-
IEC 60085	-	Electrical insulation - Thermal evaluation and designation	EN 60085	-
IEC 60493-1	-	Guide for the statistical analysis of ageing test data - Part 1: Methods based on mean values of normally distributed test results	-	-
IEC 60505	2011	Evaluation and qualification of electrical insulation systems	EN 60505	2011
IEC 61858-1	2014	Electrical insulation systems - Thermal evaluation of modifications to an established electrical insulation system (EIS) - Part 1: Wire-wound winding EIS	EN 61858-1	2014
IEC 61858-2	2014	Electrical insulation systems - Thermal evaluation of modifications to an established electrical insulation system (EIS) - Part 2: Form-wound EIS	EN 61858-2	2014
IEC 62539	-	Guide for the statistical analysis of electrical insulation breakdown data	-	-

IEC 60034-18-1

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INTERNATIONAL STANDARD

NORME INTERNATIONALE

Rotating electrical machines – Part 18-1: Functional evaluation of insulation systems – General guidelines

Machines électriques tournantes – Partie 18-1: Évaluation fonctionnelle des systèmes d'isolation – Lignes directrices générales

IEC 60034-18-1:2022-12(en-fr)

IEC 60034-18-1

Edition 3.0 2022-12

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Rotating electrical machines – Part 18-1: Functional evaluation of insulation systems – General guidelines

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ROTATING ELECTRICAL MACHINES –

Part 18-1: Functional evaluation of insulation systems – General guidelines

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.
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IEC 60034-18-1 has been prepared by IEC technical committee 2: Rotating machinery. It is an International Standard.

This third edition cancels and replaces the second edition published in 2010. This edition constitutes a technical revision.

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

a) provides general guidelines for functional evaluation of different types of windings as before but incorporates those changes, which have been introduced for the electrical qualification and evaluation of windings which are electrically stressed by converter-supply;
b) is now focused on general guidelines with all technical details of procedures and qualification principles moved to the subsequent parts;

c) details additional general aspects of functional evaluation and qualification, particularly the procedure for comparison between reference and candidate insulation systems, the introduction of the concept of qualification for different expected life-times in service and the evaluation of minor component or manufacturing changes.

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

Draft	Report on voting
2/2113/FDIS	2/2118/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/standardsdev/publications.

A list of all parts in the IEC 60034 series, published under the general title *Rotating electrical machines*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

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

INTRODUCTION

IEC 60034-18 comprises several parts, dealing with different types of functional evaluation and special kinds of test procedures for insulation systems of rotating electrical machines. IEC 60034-18-1 provides general guidelines for such procedures and qualification principles, whereas the subsequent parts IEC 60034-18-21, IEC 60034-18-31, IEC 60034-18-32, IEC TS 60034-18-33, IEC 60034-18-34, IEC 60034-18-41 and IEC 60034-18-42 give detailed procedures for the various types of windings. Beyond that, part IEC 60034-18-41 and IEC 60034-18-42 contain special test procedures for electrical evaluation of windings electrically stressed by converter-supply.

The following standards provide the basis and background for the development of the afore mentioned standards.

IEC 60505 establishes the basis for estimating the ageing of electrical insulation systems under conditions of either electrical, thermal, mechanical, environmental stresses or combinations of these (multifactor stresses). It specifies the general principles and procedures that should be followed defining functional test and evaluation procedures.

The IEC 60216 series deals with the determination of thermal endurance properties of single insulating materials. On the assumption, that the Arrhenius formulas describe the rate of thermal ageing of the materials, test procedures and analyzing instructions for getting characteristic parameters like the “Temperature index” (TI), the “Halving interval” (HIC) and the “Relative thermal endurance index” (RTE) are given. For all these parameters selected properties and accepted end-point-criteria are specified. Consequently, a material may be assigned with more than one temperature index, derived from the measurement of different properties and the use of different end-point criteria.

IEC 60034-18-1 defines general requirements on the qualification of insulation systems, where – for thermal ageing – the Arrhenius equations do not necessarily fit, according to many experiences.

IEC 60085 deals with thermal evaluation of electrical insulation materials and in particular insulation systems used in electrical equipment. In particular, thermal classes of insulation systems are defined and designations are given, such as 130 (B), 155 (F) and 180 (H) for use in rotating machines belonging to IEC 60034-1. In the past, materials for insulation systems were often selected solely on the basis of thermal endurance of individual materials performed according to the IEC 60216 series. However, IEC 60085 recognizes that such selection may be used only for screening materials prior to further functional evaluation of a new insulation system which is not service-proven. Evaluation is performed on the basis of a comparison with a service-proven reference insulation system. Service experience is the preferred basis for assessing the thermal endurance of an insulation system.

IEC 62539 defines statistical methods to analyse times to breakdown and breakdown voltage data obtained from electrical testing of solid insulation materials, for the purposes of characterization of the system and comparison with other insulation systems. The methods of analysis are described for the Weibull-distribution, but other distributions are also presented.

ROTATING ELECTRICAL MACHINES –

Part 18-1: Functional evaluation of insulation systems – General guidelines

1 Scope

This part of IEC 60034 deals with the general guidelines for functional evaluation of electrical insulation systems, used or proposed to be used in rotating electrical machines within the scope of IEC 60034-1, in order to qualify them.

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 60034-1, *Rotating electrical machines – Part 1: Rating and performance*

IEC 60034-18-21, *Rotating electrical machines – Part 18-21: Functional evaluation of insulation systems – Test procedures for wire-wound windings – Thermal evaluation and classification*

IEC 60034-18-31, *Rotating electrical machines – Part 18-31: Functional evaluation of insulation systems – Test procedures for form-wound windings – Thermal evaluation and classification of insulation systems used in rotating machines*

IEC 60034-18-32, *Rotating electrical machines – Part 18-32: Functional evaluation of insulation systems (Type II) – Electrical endurance qualification procedures for form-wound windings*

IEC TS 60034-18-33, *Rotating electrical machines – Part 18-33: Functional evaluation of insulation systems – Test procedures for form-wound windings – Multifactor evaluation by endurance under simultaneous thermal and electrical stresses*

IEC 60034-18-34, *Rotating electrical machines – Part 18-34: Functional evaluation of insulation systems – Test procedures for form-wound windings – Evaluation of thermomechanical endurance of insulation systems*

IEC 60034-18-41:2014, *Rotating electrical machines – Part 18-41: Partial discharge free electrical insulation systems (Type I) used in rotating electrical machines fed from voltage converters – Qualification and quality control tests*
IEC 60034-18-41:2014/AMD1:2019

IEC 60034-18-42, *Rotating electrical machines – Part 18-42: Partial discharge resistant electrical insulation systems (Type II) used in rotating electrical machines fed from voltage converters – Qualification tests*

IEC 60034-27-3, *Rotating electrical machines – Part 27-3: Dielectric dissipation factor measurement on stator winding insulation of rotating electrical machines*

IEC 60085, *Electrical insulation – Thermal evaluation and designation*