

INTERNATIONAL STANDARD



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



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

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

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IEC 60034-18-32

Edition 2.0 2022-01
COMMENTED VERSION

INTERNATIONAL STANDARD



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

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 29.160.01

ISBN 978-2-8322-1073-3

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ROTATING ELECTRICAL MACHINES –

Part 18-32: Functional evaluation of insulation systems (Type II) – Test Electrical endurance qualification procedures for form-wound windings – ~~Evaluation by electrical endurance~~ 1

FOREWORD

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This commented version (CMV) of the official standard IEC 60034-18-32:2022 edition 2.0 allows the user to identify the changes made to the previous IEC 60034-18-32:2010 edition 1.0. Furthermore, comments from IEC TC 2 experts are provided to explain the reasons of the most relevant changes.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 60034-18-32 has been prepared by IEC technical committee 2: Rotating machinery. It is an International Standard.

This second edition cancels and replaces the first 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) Title modified.
- b) Simplification of clauses.
- c) Reduction in the number of test procedures.
- d) Inclusion of full bars and coils as test objects.
- e) A new clause dealing with failures and failure criteria.

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

| Draft | Report on voting |
|-------------|------------------|
| 2/2068/FDIS | 2/2075/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.

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.

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.

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.

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INTRODUCTION

IEC 60034-18-1 presents general principles for the evaluation of insulation systems used in rotating electrical machines.

This document deals exclusively with insulation systems for form-wound windings (Type II) and concentrates on electrical functional evaluation.

In IEC 60034-18-42, tests are described for qualification of Type II insulation systems in voltage-source converter operation. These insulation systems are generally used in rotating machines which have form-wound windings, mostly rated above 700 V r.m.s. The two standards IEC 60034-18-41 and IEC 60034-18-42 separate the systems into those which are not expected to experience partial discharge activity within specified conditions in their service lives (Type I), and those which are expected to experience and withstand partial discharge activity in any part of the insulation system throughout their service lives (Type II).

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ROTATING ELECTRICAL MACHINES –

Part 18-32: Functional evaluation of insulation systems (Type II) – **Test Electrical endurance qualification procedures for form-wound windings – Evaluation by electrical endurance**

1 Scope

This part of IEC 60034-18 describes ~~test~~ qualification procedures for the evaluation of electrical endurance of insulation systems for use in ~~a.c. or d.c.~~ rotating electrical machines using form-wound windings energized with sinusoidal power frequency voltage. The test procedures for the main wall insulation are comparative in nature, such that the performance of a candidate insulation system is compared to that of a reference insulation system with proven service experience. ~~The test procedures are principally directed at the insulation systems in air-cooled machines but may also be used for evaluating parts of the insulation systems in hydrogen-cooled machines. Note that the qualification procedures of inverter duty insulation systems for form-wound windings can be found in IEC 60034-18-42.~~ If no reference system is available, the diagram in Annex A is available for use. The qualification procedures of inverter duty insulation system for form-wound windings can be found in IEC 60034-18-42 or IEC 60034-18-41. A new and informative test procedure for the stress control system is introduced and defined in Annex B. **2**

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 60034-15:2009, *Rotating electrical machines – Part 15: Impulse voltage withstand levels of form-wound stator coils for rotating a.c. machines*

IEC 60034-18-1:2010, *Rotating electrical machines – Part 18-1: Functional evaluation of insulation systems – General guidelines*

IEC TS 60034-18-33:2010, *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 60034-18-41, *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 60034-18-42:2017, *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 60034-18-42:2017/AMD1:2020

IEC 60034-27-1, *Rotating electrical machines – Part 27-1: Off-line partial discharge measurements on the winding insulation*

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

IEC 60216-4-1, *Electrical insulating materials – Thermal endurance properties – Part 4-1: Ageing ovens – Single-chamber ovens*

IEC 62539, *Guide for the statistical analysis of electrical insulation breakdown data*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

mainwall insulation

main electrical insulation that separates the conductors from the earthed stator/rotor core in motor and generator windings

3.2

turn strand insulation

electrical insulation that covers each conductor in coils/bars

3.3

interturn turn insulation

electrical insulation that separates the conductor turns from each other in coils/bars

3.4

corona protection material

~~material which is used to coat a stator coil/bar within the slot portion of the stator core to avoid slot discharges~~

3.5

stress grading material

~~material generally having a non-linear resistivity characteristic, applied to the endwindings of stators to reduce the maximum surface electrical stress~~

3.4

conductive slot coating

conductive paint or tape layer in intimate contact with the mainwall insulation in the slot portion of the coil side, often called semi-conductive coating

Note 1 to entry: The purpose is to prevent partial discharge from occurring between the coil/bar and the stator core.

3.5

stress control coating

paint or tape on the surface of the mainwall insulation that extends beyond the conductive slot coating in high-voltage stator bars and coils

Note 1 to entry: The purpose of the coating is to prevent surface discharges near the slot exit or in the end winding area.