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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

Machines électriques tournantes –
Partie 18-42: Systèmes d'isolation électrique résistants aux décharges partielles (Type II) utilisés dans des machines électriques tournantes alimentées par convertisseurs de tension – Essais de qualification

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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IEC 60034-18-42 edition 1.1 contains the first edition (2017-02) [documents 2/1854/FDIS and 2/1856/RVD] and its amendment 1 (2020-08) [documents 2/1998/FDIS and 2/2008/RVD].

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

International Standard IEC 60034-18-42 has been prepared by IEC Technical Committee 2: Rotating machinery.

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

NOTE A table of cross-references of all TC 2 publications can be found on the IEC TC 2 dashboard on the IEC website.

The committee has decided that the contents of the base publication and its amendment 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- withdrawn,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 document using a colour printer.

INTRODUCTION

The approval of electrical insulation systems for use in rotating electrical machines fed from voltage converters is set out in two International Standards. These standards 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). For both Type I and Type II insulation systems, the power drive system integrator (the person responsible for co-ordinating the electrical performance of the entire power drive system) shall inform the machine manufacturer what voltage will appear at the machine terminals in service. The machine manufacturer will then decide upon the severity of the tests appropriate for qualifying the insulation system. For insulation systems which have been qualified through IEC 60034-18-41 or IEC 60034-18-42 for use in converter-fed applications, an impulse voltage insulation class may be derived. This indicates the ability of the insulation to withstand the electric stresses resulting from converter operation. For Type I systems, the severity is based on the impulse rise time and the peak to peak voltage. For Type II systems, the severity is additionally affected by the impulse voltage repetition rate and the fundamental voltage characteristics. After installation of the converter/machine system, it is recommended that the system integrator measures the phase to phase and phase to ground voltages between the terminals and ground to check for compliance.

IEC 60034-18-41

Type I insulation systems are dealt with in IEC 60034-18-41. These systems are generally used in rotating machines with rated voltage less than 700 V r.m.s. and tend to have random-wound coils. In IEC 60034-18-41, the necessary normative references and definitions are given together with a review of the effects arising from converter operation. Having established the technical basis for the evaluation procedure, the conceptual approach and test programmes are then described.

IEC 60034-18-42

In IEC 60034-18-42, tests are described for qualification of Type II insulation systems. These insulation systems are generally used in rotating machines which have form-wound windings, mostly rated above 700 V r.m.s. The qualification procedure is completely different from that used for Type I insulation systems and involves destructive ageing of test objects under accelerated conditions. The manufacturer requires a life curve (as described in IEC 60034-18-32) for the insulation system that can be interpreted by use of appropriate calculations and/or experimental procedures to provide an estimate of life under the service conditions with converter drive. Great importance is attached to the qualification of any stress control system that is used and testing here should be performed under sinusoidal and repetitive impulse conditions applied separately. If the insulation system can be shown to provide an acceptable life under the specified ageing conditions, it is qualified for use.

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

1 Scope

This part of IEC 60034 defines criteria for assessing the insulation system of stator/rotor windings of single or polyphase AC machines which are subjected to repetitive impulse voltages, such as those generated by pulse width modulation (PWM) converters, and are expected to experience and withstand partial discharge activity during service. It specifies electrical qualification tests on representative specimens to verify fitness for operation with voltage-source converters. It also describes an additional classification system which defines the limits of reliable performance under converter-fed conditions.

Although this document deals with voltage converters, it is recognised that there are other types of converters that can create repetitive impulse voltages. For these converters, a similar approach to testing can be used.

Qualification of insulation systems may not be required for rotating machines which are only fed from voltage converters for starting and so they are excluded from this document.

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 60034-1:2010, *Rotating electrical machines – Part 1: Rating and performance*

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

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 – Test procedures for form-wound windings – Evaluation by electrical endurance*

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

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

IEC TS 61934, *Electrical insulating materials and systems – Electrical measurement of partial discharges (PD) under short rise time and repetitive voltage impulses*