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BSI Standards Publication

Rotating electrical machines

Part 27-3: Dielectric dissipation factor measurement on stator winding insulation of rotating electrical machines

bsi.

National foreword

This British Standard is the UK implementation of EN 60034-27-3:2016. It is identical to IEC 60034-27-3:2015.

The UK participation in its preparation was entrusted to Technical Committee PEL/2, Rotating electrical machinery.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Europäisches Komitee für Elektrotechnische Normung

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European foreword

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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) 2016-12-24
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2019-06-24

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

IEC TS 60034-27	NOTE	Harmonized as CLC/TS 60034-27.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When 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 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 60060-2	-	High-voltage test techniques - Part 2: Measuring systems	EN 60060-2	-

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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ROTATING ELECTRICAL MACHINES –

Part 27-3: Dielectric dissipation factor measurement on stator winding insulation of rotating electrical machines

FOREWORD

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International Standard IEC 60034-27-3 has been prepared by IEC technical committee 2: Rotating machinery.

This first edition cancels and replaces the first edition of IEC TR 60894 published in 1987. This edition constitutes a technical revision.

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

a) digital measurement of dissipation factor and capacitance included;
b) limits for dissipation factor values given;
c) detailed description of measuring techniques;
d) extension of scope to complete windings.

The text of this standard is based on the following documents:

FDIS	Report on voting
2/1803/FDIS	2/1804/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

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 publication 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.

INTRODUCTION

This International Standard provides guidelines for dielectric dissipation factor measurements on form-wound stator bars or coils as well as for complete windings.

The dielectric dissipation factor is a measure of the dielectric losses in the stator winding insulation. Measurement of dielectric dissipation factor is an appropriate means of assessing the quality of new and also aged stator winding insulation of rotating electrical machines. Especially, the method is useful for assessing the uniform quality of manufacturing and the dielectric behaviour of the insulation as a whole. For aged stator windings, the dielectric dissipation factor provides information about insulation condition.

The dielectric dissipation factor measurements give no indication of the distribution of loss within the insulation and – in contrast to off-line partial discharge measurements – do not permit localization of weak points of the insulation system.

The main principle is to measure the dielectric dissipation factor over a range of voltages and to derive different characteristic dielectric loss parameters as basis for the evaluation.

Empirical limits verified in practice can be used as a basis for evaluating the quality of stator winding insulation systems in manufacturing. Furthermore, trend evaluation, e.g. diagnostic tests as part of the functional evaluation of insulation systems or in connection with servicing and overhaul of rotating machines, can also provide information on ageing processes, necessary further measures and intervals between overhauls. However, such trend evaluations cannot be used to predict the time to failure of a stator winding insulation.

ROTATING ELECTRICAL MACHINES –

Part 27-3: Dielectric dissipation factor measurement on stator winding insulation of rotating electrical machines

1 Scope

This part of IEC 60034 provides guidelines for the test procedures and the interpretation of test results for dielectric dissipation factor measurements on the stator winding insulation of rotating electrical machines. These guidelines are valid for rotating electrical machines with conductive slot coatings operating at a rated voltage of 6 kV and higher.

This standard applies to individual form-wound stator bars and coils outside a core (uninstalled), individual stator bars and coils installed in a core and complete form-wound stator winding of machines in new or aged condition.

This International Standard applies to all kind of vacuum impregnated or resin-rich (fully-loaded) taped bars, coils and complete windings. It is not applicable to non-impregnated individual bars and coils or non-impregnated complete windings.

Requirements for the dielectric dissipation factor characteristics of individual form-wound stator bars and coils of machines with rating voltages from 6 kV and higher when tested with 50 Hz or 60 Hz alternating voltages are given.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60060-2, *High-voltage test techniques – Part 2: Measuring systems*

3 Terms and definitions

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

3.1
rated voltage
U_N
voltage or voltage range between lines at the terminals (also called line-to-line voltage) assigned, generally by a manufacturer, for a specified operating condition of a machine

3.2
dielectric dissipation factor
tan δ
tangent of the dielectric loss angle δ (complement of the insulation power factor angle) at predetermined values of temperature, frequency, and voltage or dielectric stress

Note 1 to entry: Other terms sometimes used for this property are tan delta, loss tangent, dielectric loss factor or dielectric power factor. Between the dielectric dissipation factor and the power factor (the cosine of power factor