SLOVENSKI STANDARD
oSIST prEN IEC 60034-18-32:2020

01-november-2020

Električni rotacijski stroji - 18-32. del: Funkcionalno vrednotenje izolacijskih sistemov - Električno vrednotenje postopkov kvalificiranja za za predhodno oblikovana navitja

Rotating electrical machines - Part 18-32: Functional evaluation of insulation systems - Electrical endurance qualification procedures for form-wound windings

Drehende elektrische Maschinen - Teil 18-32: Funktionelle Bewertung von Isoliersystemen - Prüfverfahren für Wicklungen mit vorgeformten Elementen - Bewertung der elektrischen Lebensdauer

Machines électriques tournantes - Partie 18-32: Evaluation fonctionnelle des systèmes d'isolation - Procédures d'essai pour enroulements préformés - Evaluation par endurance électrique

Ta slovenski standard je istoveten z: **prEN IEC 60034-18-32:2020**

ICS:

29.080.30	Izolacijski sistemi	Insulation systems
29.160.01	Rotacijski stroji na splošno	Rotating machinery in general

oSIST prEN IEC 60034-18-32:2020 **en,fr,de**

2/2016/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER:	
IEC 60034-18-32 ED2	
DATE OF CIRCULATION:	CLOSING DATE FOR VOTING:
2020-09-11	**2020-12-04**
SUPERSEDES DOCUMENTS:	
2/1983/CD, 2/2001A/CC	

IEC TC 2 : ROTATING MACHINERY	
SECRETARIAT: United Kingdom	SECRETARY: Mr Charles Whitlock
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING ☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

Attention IEC-CENELEC parallel voting

The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting.

The CENELEC members are invited to vote through the CENELEC online voting system.

This document is still under study and subject to change. It should not be used for reference purposes.

Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

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

PROPOSED STABILITY DATE: 2024

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ROTATING ELECTRICAL MACHINES –

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

FOREWORD

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

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

The main technical changes with regard to the previous edition are as follows.

a) Simplification of clauses
b) Reduction in the number of test procedures
c) Inclusion of full bars and coils as test objects
d) A new clause dealing with failures and failure criteria

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

FDIS	Report on voting
2/XX/FDIS	2/XX/RVD

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

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date[1)] 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.

NOTE A table of cross-references of all IEC TC2 publications can be found in the IEC TC2 dashboard on the IEC website.

1) The National Committees are requested to note that for this publication the maintenance result date is ....

INTRODUCTION

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

This Standard 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).

ROTATING ELECTRICAL MACHINES –

Part 18-32: Functional evaluation of insulation systems – Electrical endurance qualification procedures for form-wound windings

1 Scope

This part of IEC 60034-18 describes qualification procedures for the evaluation of electrical endurance of insulation systems for use in rotating electrical machines using form-wound windings. The test procedures 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. 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.

2 Normative references

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.

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* Amendment 1 (1996)

IEC 60034-18-33: *Rotating electrical machines – Part 18-33: Functional evaluation of insulation systems – Test procedures for multifunctional evaluation of form-wound windings by endurance under combined thermal and electrical stresses of insulation systems used in rotating machines*

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 60034-18-41:2014)*

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

IEC 61251 *Electrical insulating materials – A.C. voltage endurance evaluation – Introduction*

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

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 60505: *Evaluation and qualification of electrical insulation systems*

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 measurements on stator winding insulation of rotating electrical machines*

3 Terms and definitions

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

3.1
mainwall insulation
main electrical insulation that separates the conductors from the earthed stator/rotor core in motor and generator windings

3.2
strand insulation
electrical insulation that covers each conductor in coils/bars

3.3
turn insulation
electrical insulation that separates the conductor turns from each other in coils/bars

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 2 to entry: The purpose of the coating is to prevent surface discharges in the end winding area.

3.6
stress control system
generic name for the combination of the conductive slot coating and stress control coating in high-voltage stator bars and coils

3.7
confidence interval
a range of values so defined that there is a specified probability that the value of a parameter (voltage, stress or time) lies within it

3.8
test temperature
is the temperature measured by temperature sensors either under the grounding plates or at the specimens surface (oven heating) at the straight part of the coil/bar

4 General considerations

4.1 Relationship to IEC 60034-18-1

The principles of Part 1 of IEC 60034-18 should be followed unless the recommendations of this International Standard indicate otherwise.

4.2 Selection and designation of test procedures

One or more of the procedures in this International Standard should be suitable for the majority of evaluations. Evaluation is usually performed by the manufacturer of the machine/coils or by a third party laboratory. It is the manufacturer's responsibility to justify the most suitable

procedure on the basis of past experience and knowledge of the insulation systems to be compared.

Following test procedures are described:

- Mainwall insulation
- Turn insulation only together with the main insulation test
- Conductive slot coating
- Stress control coating
- Mainwall insulation, where voltage level and/or life time differs from the reference system

4.3 Reference insulation system

A reference insulation system should be tested using a test procedure equivalent to that used for the candidate system (see IEC 60034-18-1). The reference insulation system should have service experience at not less than 75 % of the intended maximum rated voltage of the candidate system. When extrapolation of the insulation thickness is used, information such as “different insulation thickness at same electrical field stress levels by obtaining equal or similar breakdown time” should be provided showing the correlation between electrical lifetime and electrical stress for the different insulation thicknesses. If no reference insulation system is available the diagram in Annex A shall be used as criterion.

4.4 Test procedures

4.4.1 General

Electrical ageing tests are usually performed at fixed voltage levels until failure (mainwall insulation) or in combination with elevated temperature until signs of deterioration occur (conductive slot coating system). Statistical evaluation of the results of testing should be performed according to IEC 62539.

4.4.2 Electrical ageing of the mainwall insulation

From such tests, characteristic times to failure at each voltage level are obtained. The results for both the candidate system and the reference system should be reported on a graph, as shown by the example in Figure 2, and compared. There is no proven physical basis for extrapolation of this characteristic to the service voltage level $U_N/\sqrt{3}$, where U_N is the r.m.s. rated phase to phase voltage.

In service, electrical ageing of the mainwall insulation is primarily caused by continuous electrical stress at power frequency. In addition, the insulation is required to withstand transient overvoltages arising from switching surges or inverter supply. The ability of the mainwall insulation to withstand transient overvoltages from converter supplies may be demonstrated by the system’s performance using IEC 60034-18-42.

This standard describes electrical ageing of the mainwall insulation, carried out at power frequency or higher. In order to keep acceleration of ageing in a linear progression, a maximum of 10 times of the power frequencies is appropriate. Latest experiences with the application of 60034-18-42 show that a frequency of up to 1000 Hz ca ben used as well. Care shall be taken that the dielectric losses do not increase the temperature of the insulation beyond the service temperature to avoid additional thermal ageing effects. (IEC 60034-18-33 table 1)

4.4.3 Electrical ageing of the conductive slot coating

Ageing of conductive slot coating can be described as a successive degradation of the conductive material caused by partial discharges. The conductive slot coating system shows a notable dependency not only of the electrical field strength, but also of the applied temperature