



DPC: 20/30412411 DC

BSI Group Headquarters

389 Chiswick High Road London W4 4AL

Tel: +44 (0)20 8996 9000

Fax: +44 (0)20 8996 7400

www.bsigroup.com

Date: 24 January 2020

Origin: International

Latest date for receipt of comments: 19 February 2020

Project No. 2018/00446

Responsible committee: PEL/2 Rotating electrical machinery

Interested committees:

Title: Draft BS EN IEC 60034-18-32 Rotating electrical machines. Part 18-32: Functional evaluation of insulation systems – Electrical endurance qualification procedures for form-wound windings.

Please notify the secretary if you are aware of any keywords that might assist in classifying or identifying the standard or if the content of this standard

- i) has any issues related to 3rd party IPR, patent or copyright
- ii) affects other national standard(s)
- iii) requires additional national guidance or information

WARNING: THIS IS A DRAFT AND MUST NOT BE REGARDED OR USED AS A BRITISH STANDARD. THIS DRAFT IS NOT CURRENT BEYOND 19 February 2020

This draft is issued to allow comments from interested parties; all comments will be given consideration prior to publication. No acknowledgement will normally be sent. **See overleaf for information on the submission of comments.**

No copying is allowed, in any form, without prior written permission from BSI except as permitted under the Copyright, Designs and Patent Act 1988 or for circulation within a nominating organization for briefing purposes. Electronic circulation is limited to dissemination by e-mail within such an organization by committee members.

Further copies of this draft may be purchased from BSI Shop <http://shop.bsigroup.com> or from BSI Customer Services, Tel: +44(0) 20 8996 9001 or email cservices@bsigroup.com. British, International and foreign standards are also available from BSI Customer Services.

Information on the co-operating organizations represented on the committees referenced above may be obtained from <https://standardsdevelopment.bsigroup.com/>.

Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

For national standards, comments will be reviewed by the relevant UK national committee and the resulting standards published as a British Standard.

UK Vote

Please indicate whether you consider the UK should submit a negative (with supporting technical reasons) or positive vote on this draft. Please indicate if you are aware of any reason why this draft standard should not be published as a British Standard.

Submission of Comments

- **Annotated drafts are not acceptable and will be rejected.**
- All comments should be submitted online at <https://standardsdevelopment.bsigroup.com/>. You will need to register in order to comment.

Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
------------------	------------------------

1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	

PROJECT NUMBER:

IEC 60034-18-32 ED2

DATE OF CIRCULATION:

2020-01-24

CLOSING DATE FOR COMMENTS:

2020-03-20

SUPERSEDES DOCUMENTS:

2/1965/CD, 2/1968A/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 CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC☐ ENVIRONMENT☐ QUALITY ASSURANCE☐ SAFETY

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

NOTE FROM TC/SC OFFICERS:

Copyright © 2020 International Electrotechnical Commission, IEC. All rights reserved. It is permitted to download this electronic file, to make a copy and to print out the content for the sole purpose of preparing National Committee positions. You may not copy or "mirror" the file or printed version of the document, or any part of it, for any other purpose without permission in writing from IEC.

CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 General considerations.....	8
4.1 Relationship to Part 1	8
4.2 Selection and designation of test procedures	8
4.3 Reference insulation system.....	9
4.4 Test procedures	9
4.4.1 General	9
4.4.2 Electrical ageing of the mainwall insulation.....	9
4.4.3 Electrical ageing of the conductive slot coating.....	9
4.4.4 Electrical ageing of the stress control coating	10
4.4.5 Electrical ageing of the turn insulation	10
4.5 Extent of tests	10
4.5.1 Full evaluation of the main wall insulation.....	10
4.5.2 Reduced evaluation of the main wall insulation.....	10
4.5.3 Evaluation of the conductive slot coating	10
5 Test objects.....	11
5.1 Construction of test objects	11
5.2 Number of test specimens	11
5.3 Initial quality control tests.....	11
6 Electrical ageing.....	12
6.2 Voltage levels and intended test lives of the main wall insulation.....	12
6.3 Test temperatures during electrical endurance testing of the main wall insulation.....	12
6.3.1 Electrical ageing at room temperature	12
6.3.2 Electrical ageing at elevated temperature	12
6.4 Ageing procedure for the mainwall insulation.....	12
6.5 Ageing procedure for the conductive slot and stress control coating	13
6.5.1 Arrangement of temperature control by heater plates	13
6.5.2 Heating by means of an oven	13
6.5.3 Test parameter.....	13
6.6 Maintenance of stress control coatings.....	14
7 Diagnostic sub-cycle	14
7.1 General.....	14
7.2 Voltage test of the main wall insulation.....	14
7.3 Other diagnostic tests.....	15
8 Failures of the main wall insulation	15
8.1 Failure location and verification	15
8.2 Failed specimen observations	15
9 Qualification of the stress control system.....	15
9.1 Test procedure	15
9.2 Test pass criteria.....	15
10 Functional evaluation of the main wall data	16

10.1 General	16
10.2 Full evaluation (same voltage level and same expected service life).....	16
10.3 Reduced evaluation (same voltage level and same expected service life).....	17
10.4 Recommended data to be recorded	18
10.5 Determining qualification for performances different to the reference system.....	19
10.5.1 Overview	19
10.5.2 Case B: Qualification for the same phase to phase voltage and a different expected service life	19
10.5.3 Case C: Qualification for different voltage level and same expected service life	20
10.5.4 Case D: Qualification for different voltage level and different expected service life	21
10.5.5 Non-linearity of regression lines	22
 Figure 1 – Application of heater elements to a stator bar	13
Figure 2 – Comparison of ageing data from candidate (C) and reference (R) insulation systems showing qualification	17
Figure 3 – Comparison of ageing data from candidate and reference insulation systems showing failure to qualify	17
Figure 4 – Comparison of reduced evaluation test data from four separate candidate systems with that from the reference system.....	18
Figure 5 – Candidate system qualified for the same voltage level and different expected service life	20
Figure 6 – Candidate system qualified for a higher voltage level and the same expected service life	21
Figure 7 – Candidate system qualified for a different service life and different voltage level from the reference	22
Figure A.1: Reference lifeline for mainwall insulation	23
Picture B.1: Typical deterioration mark at the conductive slot coating	24
Picture B.2: Typical deterioration mark at the stress control coating	24
 Table 1 – Phase to ground test voltages in relation to temperature at operating condition	14
Table 2 – Conditions for qualification of candidate system	19

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

- 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.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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 date¹⁾ 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

1 INTRODUCTION

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

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

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

13