SLOVENSKI STANDARD
SIST EN 60034-18-1:1999/A1:1999

01-april-1999

Rotating electrical machines - Part 18: Functional evaluation of insulation systems - Section 1: General guidelines (IEC 60034-18-1:1992/A1:1996)

Rotating electrical machines -- Part 18: Functional evaluation of insulation systems -- Section 1: General guidelines

Drehende elektrische Maschinen -- Teil 18: Funktionelle Bewertung von Isoliersystemen -- Hauptabschnitt 1: Allgemeine Richtlinien

Machines électriques tournantes -- Partie 18: Evaluation fonctionnelle des systèmes d'isolation -- Section 1: Principes directeurs généraux

Ta slovenski standard je istoveten z: **EN 60034-18-1:1994/A1:1996**

ICS:

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

SIST EN 60034-18-1:1999/A1:1999 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 60034-18-1/A1

December 1996

UDC 621.313:621.315.6:620.1:621.317.08
ICS 29.080.00; 29.160.00

Descriptors: Rotating electrical machine, electrical insulation, operate characteristic, principle

English version

Rotating electrical machines
Part 18: Functional evaluation of insulation systems
Section 1: General guidelines
(IEC 34-18-1:1992/A1:1996)

Machines électriques tournantes
Partie 18: Evaluation fonctionnelle des systèmes d'isolation
Section 1: Principes directeurs généraux
(CEI 34-18-1:1992/A1:1996)

Drehende elektrische Maschinen
Teil 18: Funktionelle Bewertung von Isoliersystemen für drehende elektrische Maschinen
Hauptabschnitt 1: Allgemeine Richtlinien
(IEC 34-18-1:1992/A1:1996)

This amendment A1 modifies the European Standard EN 60034-18-1:1994; it was approved by CENELEC on 1996-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This amendment exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

The text of document 2J/53/FDIS, future amendment 1 to IEC 34-18-1:1992, prepared by SC 2J, Classification of insulation systems for rotating machinery, of IEC TC 2, Rotating machinery, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60034-18-1:1994 on 1996-10-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-08-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 1997-08-01

For products which have complied with EN 60034-18-1:1994 before 1997-08-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2002-08-01.

Endorsement notice

The text of amendment 1:1996 to the International Standard IEC 34-18-1:1992 was approved by CENELEC as an amendment to the European Standard without any modification.

NORME INTERNATIONALE

INTERNATIONAL STANDARD

CEI
IEC
34-18-1

1992

AMENDEMENT 1
AMENDMENT 1

1996-11

Amendement 1

Machines électriques tournantes –

Partie 18:
Evaluation fonctionnelle des systèmes d'isolation –
Section 1: Principes directeurs généraux

Amendment 1

Rotating electrical machines –

Part 18:
Functional evaluation of insulation systems –
Section 1: General guidelines

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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

CODE PRIX
PRICE CODE
J

Pour prix, voir catalogue en vigueur
For price, see current catalogue

FOREWORD

This amendment has been prepared by sub-committee 2J: Classification of insulation systems for rotating machinery, of IEC technical committee 2: Rotating machinery.

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

FDIS	Report on voting
2J/53/FDIS	2J/60/RVD

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

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INTRODUCTION

Replace the text in the fourth paragraph by the following:

IEC 85 deals with thermal evaluation of insulating materials and insulation systems used in electrical equipment. In particular, the thermal classes of insulation systems used in rotating machines such as A, E, B, F and H, as well as the temperatures usually associated with these thermal classes, are established in IEC 85. In the past, materials for insulation systems were often selected solely on the basis of thermal endurance of individual materials. However, the second edition of IEC 85 recognizes that such selection may be used only for screening materials prior to further functional evaluation of a new insulation system which is not service-proven. This evaluation is linked with earlier service experience through the use of a service-proven reference insulation system as the basis for comparative evaluation. Service experience is the preferred basis for assessing the thermal endurance of an insulation system.

Replace the text in the ninth and tenth paragraphs by the following:

In the winding of an electrical machine, different factors of influence can be dominant in different parts (e.g. turn insulation and end winding insulation). Therefore, different criteria may be used to assess those parts of the insulation. It can also be appropriate to apply different procedures of functional evaluation to these parts.

The large differences found in the rotating electrical machine windings, in terms of size, voltage and operating conditions, necessitate the use of different procedures of functional evaluation to evaluate various types of windings. These procedures can also be of different complexity, the simplest being based on a single ageing mechanism (e.g. thermal or electrical). In the present state of the art, only thermal and electrical endurance testing procedures can be specified in some detail. Principles of mechanical, environmental and multifactor functional testing are briefly described to provide a basis for provisions to be developed later where appropriate.

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3 Definitions

Replace, on page 13, subclause 3.2.2 by the following:

3.2.2 **test specimen**: An individual component within a test object which can be used to generate one piece of test data (e.g. time to failure). A test specimen may contain more than one insulation component (e.g. turn insulation and conductor to earth insulation), any one of which can provide that piece of data.

Replace subclause 3.3.1 by the following:

3.3.1 **factor of influence**: A stress or environmental influence which can affect the performance of insulation in the machine during service.

Replace subclause 3.3.2 by the following:

3.3.2 **ageing factor**: A factor of influence which can produce ageing.

Replace, on page 15, subclause 3.4.2 by the following:

3.4.2 **functional test**: A test in which the insulation system of a test object is exposed to ageing factors simulating service conditions, in order to obtain information about serviceability, including evaluation of test results.

4.1 *Effects of ageing factors*

Replace, on page 17, the existing text of the third and fourth paragraphs by the following:

Medium to large machines, using form-wound windings, also are affected by temperature and environment but in addition the electrical and mechanical stresses can also be important ageing factors.

Very large machines, which usually utilize bar-type windings and which can operate in an inert environment such as hydrogen, are normally most affected by mechanical stresses or electrical stresses or both. Temperature and environment can be less significant ageing factors.

4.3 *Functional tests*

Replace the existing text of the second paragraph by the following:

Generally, the functional tests are performed in cycles, each cycle consisting of an ageing sub-cycle and a diagnostic sub-cycle. In the ageing sub-cycle, the test specimens are exposed to the specified ageing factor, intensified appropriately to accelerate ageing. In the diagnostic sub-cycle, the test specimens are subjected to appropriate diagnostic tests to determine the end of test life or to measure relevant properties of the insulation system at that time. In some cases, the ageing factor itself can act as the diagnostic factor and produce the end-point.

Page 19

5.1 *General aspects of thermal functional tests*

Replace the existing text of the fifth paragraph by the following:

The thermal ageing processes in rotating electrical machines can be complex in nature. Since also the insulation systems of rotating machines are generally complicated in varying degrees, simple systems referred to in IEC 85 do not exist in rotating machines.

5.1.1 *Reference insulation system*

Replace the existing text of the second paragraph by the following:

All test procedures shall be equivalent, allowing for the fact that when the design values of the two systems are different, then appropriate differences in temperatures, ageing sub-cycle lengths and diagnostic tests may be used, when technically justified (see table 2).

5.2.1 *Construction of test objects*

Replace the existing texts of the first two paragraphs by the following:

It is expected that the various insulating materials or components making up any insulation system to be evaluated by these test procedures will first be screened properly. Temperature indices for insulating materials may be obtained by following the procedures outlined in IEC 216. However, temperature indices of insulating materials may not be used to classify insulation systems but are to be considered only as indicators for the thermal functional tests for systems.

Wherever economics or the size of the machine, or both, warrant it, an actual machine or machine component should be used as the test object. Usually this means that coils of full cross-section, with actual clearances and creepage distances are needed, though a reduced slot length may be used.

Page 21

5.3.1 *General principles*

This correction applies to the French text only.

Replace, on page 23, the text of the fourth and fifth paragraphs by the following:

In other cases, mechanical stress, moisture exposure and application of voltage are possibly not the best diagnostic tests. It is appropriate to replace them by selected dielectric tests (e.g., measurement of partial discharge or loss tangent) to check the condition of the insulation after each thermal ageing sub-cycle.

It should be realized that greater mechanical stress and higher concentration of the products of decomposition can occur during ageing tests at higher than normal temperature. Also, it is recognized that failures from abnormally high mechanical stress or voltage are generally of a different character from those failures which are produced in long service.

Replace the text of the sixth paragraph by the following:

If it is necessary to verify results in another laboratory it can be found that the actual numerical test-life values differ unless the conditions in the original test are duplicated in extreme detail. However, a comparison of results between qualified laboratories should show the same relative performance differences between candidate and reference systems.

5.3.2.1 *Normal procedure*

Replace the text of the fourth paragraph by the following:

The lowest ageing temperature selected should be such as to produce a log mean test life of about 5000 h or more. In addition, at least two higher ageing temperatures should be selected, separated by intervals of 20 K or more. Intervals of 10 K may be used when tests are made at more than three ageing temperatures.

5.3.2.2 *Verification of effects of minor changes in insulation systems*

Replace, on page 25, the text of the second paragraph by the following:

It is the machine manufacturer's responsibility to determine whether this minor change will affect the thermal endurance graph in a manner which can reduce the thermal endurance of the insulation system. In those cases where the manufacturer believes that there is a possibility of altering the thermal classification by this minor change, he shall perform a verification test. The need for a verification test may also be agreed between the manufacturer and the user.

Replace "can" by "may" *in the last sentence of the third paragraph.*