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TECHNICAL REPORT

**Electrical insulation systems – Procedures for thermal evaluation –
Part 2: Selection of the appropriate test method for evaluation and classification of electrical insulation systems**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Electrical insulation systems – Procedures for thermal evaluation – Part 2: Selection of the appropriate test method for evaluation and classification of electrical insulation systems

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IEC TR 61857-2 has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems. It is a Technical Report.

This second edition cancels and replaces the first edition published in 2015. This edition constitutes a technical revision.

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

a) The Introduction is expanded to convey that both TC 112 and TC 2 have established EIS test standards.
b) Clause 4 introduces the fact that there are four stress factors, not only thermal. This essential concept carries over into part of Clause 5.
c) The large number of established standards are organized into common concept groups in Tables 1 to 5:
    1) Table 1 covers an overview of EIS evaluations for background and structure.
    2) Table 2 covers evaluation of test objects prior to the start of long-term thermal ageing using screening tests.
    3) Table 3 covers test standards for the evaluation of thermal stresses in air and has an increased number of standards.
    4) Table 4 covers standards for special environmental applications other than in air.
    5) Table 5 covers standards for the modification of an established EIS.

The text of this Technical Report is based on the following documents:

Enquiry draft	Report on voting
112/671/DTR	112/682/RVDTR

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

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at http://www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at http://www.iec.ch/publications.

A list of all parts in the IEC 61857 series, under the general title *Electrical insulation systems – Procedures for thermal evaluation*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

INTRODUCTION

This document is part of a series of IEC test standards for the thermal evaluation and classification of an electrical insulation system (EIS). The total series of EIS test standards are the responsibility of IEC TC 112 for general test standards and IEC TC 2, Rotating machinery, for more specific information for motors and generators.

The following are TC 112 series standards.

– The IEC 61857 series [1] is for the thermal evaluation and classification of an EIS. These standards are for the evaluation and classification of a new EIS.

– The IEC 61858 series [2] is for modification of an established EIS after the EIS has been established using the IEC 61857 series [1]. The IEC 61858 series [2] does not result in the thermal evaluation and classification of an EIS; it addresses the procedures for modifications. It does not assign a thermal class rating to the modification. The evaluation is to develop measurable information as to the influence of additional stresses on the expected performance of the EIS caused by the proposed modification.

– IEC 63177 [3], IEC 60085 [4] and IEC 60505 [5] specify basic EIS evaluation information and recommended prethermal ageing or screening tests.

The following are IEC TC 2 series standards.

– The IEC 60034-18 series [6], while similar to the IEC 61857 series [1], provides additional information for an EIS to be used in rotating machinery.

IEC 60505 [5] is the base standard for both the IEC 60034-18 series [6] and the IEC 61857 series [1]. For both series of EIS test standards, the procedure is to use accelerated thermal ageing. Accelerated thermal ageing of an EIS is intended to evaluate the thermal classification of the EIS for projected long-term performance by generating measurable performance at elevated ageing temperatures and projecting to expected performance at lower operating temperatures.

IEC 60505 [5] provides four categories of ageing stresses which influence the performance of products in use under a wide range of operating conditions. In IEC 60505 [5], the stresses are presented as thermal (T), electrical (E), environmental (E) and mechanical (M). In this document, environmental (E) is replaced with ambient (A) to avoid the confusion of having two stresses represented by the same letter. In this document, the stresses are therefore presented as thermal (T), electrical (E), ambient or environmental (A) and mechanical (M).

In many applications, it can be important to include the evaluation of other ageing stresses in addition to or in combination with thermal stress; this is known as multifactor evaluation. The relevant IEC TC specifies the requirements for a particular application.

This document is presented as a selection guide to provide information to help users identify the most appropriate standard for the application.

IEC 60034-18-1:2022 [7] states:

IEC 60085 [4] deals with thermal evaluation of electrical insulation materials and in particular insulation systems used in electrical equipment. In particular, thermal classes of insulation systems are defined and designations are given, such as 130 (B), 155 (F) and 180 (H) for use in rotating machines belonging to IEC 60034-1 [8]. In the past, materials for insulation systems were often selected solely on the basis of thermal endurance of individual materials performed according to the IEC 60216 series [9]. However, IEC 60085 [4] 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. Evaluation is performed on the basis of a comparison with a service-proven reference insulation system. Service experience is the preferred basis for assessing the thermal endurance of an insulation system.

[SOURCE: IEC 60034-18-1:2022 [7], Introduction]

IEC 60034-18-1:2022 [7] also states:

The IEC 60034-18 series [6] comprises several parts, dealing with different types of functional evaluation and special kinds of test procedures for insulation systems of rotating electrical machines. IEC 60034-18-1 [10] provides general guidelines for such procedures and qualification principles, whereas the subsequent parts IEC 60034-18-21 [11], IEC 60034-18-31 [12], IEC 60034-18-32 [13], IEC TS 60034-18-33 [14], IEC 60034-18-34 [15], IEC 60034-18-41 [16] and IEC 60034-18-42 [17] give detailed procedures for the various types of windings. Beyond that, IEC 60034-18-41 [16] and IEC 60034-18-42 [17] contain special test procedures for electrical evaluation of windings electrically stressed by converter-supply.

[SOURCE: IEC 60034-18-1:2022 [7], Introduction]

1 Scope

This part of IEC 61857, which is a Technical Report, gives guidelines to identify the appropriate standard for the evaluation of a proposed electrical insulation system (EIS). Some of the standards evaluate the EIS using one stress factor which is thermal. Other standards evaluate the thermal stress factor with adjustments to the conditioning applied prior to the diagnostic testing to simulate applications in air. A third group of these standards when the application is other than in air.

This document is applicable to existing or proposed EIS used in electrotechnical products across a wide range of operating voltages of IEC standards. This document identifies the appropriate standard based on construction and intended operating application.

2 Normative references

There are no normative references in this document.