

IEEE Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials

Sponsor

**Standards Coordinating Committee No 4 on Thermal Rating
of the Thermal Endurance Committee
of the IEEE Electrical Insulation Society**

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Foreword

(This Foreword is not a part of IEEE Std 98-1984, IEEE Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials.)

IEEE Std 98-1972 formed a basis for much of the content of the 2nd edition of IEC (International Electrotechnical Commission) 216-1 1974.¹

This edition updates the previous 1972 edition to reflect improvements incorporated in IEC 216-1 [7]² while retaining many of the practical considerations contained in IEEE Std 98-1972.

Future revisions are contemplated to effect better coordination with IEEE Std 1-1969 [11] and with ongoing work in regard to revisions and additions to pertinent IEC Publications.

Suggestions for improvement of this standard will be welcomed. They should be sent to the

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¹International Electrotechnical Commission (IEC) documents are available in the US from the Sales Department, American National Standards Institute, 1430 Broadway, New York, NY 10018.

²Numbers in brackets correspond to those of the references in Section 2 of this standard.

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IEEE Standard for the Preparation of Test Procedures for the Thermal Evaluation of Solid Electrical Insulating Materials

1. Object and Scope

This standard gives principles for the development of test procedures to evaluate the thermal endurance of solid electrical insulating materials and simple combinations of such materials. The results of accelerated thermal endurance tests, which are conducted according to prescribed procedures, may be used to establish temperature indexes for insulating materials. Thermal endurance tests and temperature indexes can be used to provide relative comparisons between the thermal capability of new materials and older, more accepted materials.

Temperature indexes, while giving guidance on materials, should not in themselves be taken to predict the relationship between temperature and life of an insulation material or system in service.

Thermal endurance tests provide a means for determining the rate at which important properties of insulating materials deteriorate irreversibly as a function of temperature and time. Such tests and the temperature indexes derived from them can aid in selecting insulating materials for use in electrical equipment operating under a wide variety of service conditions. Tests for specific insulating materials are not within the scope of this standard. Procedures should be developed for each important kind of insulating material, such as wire enamel, varnish, sheet, and tape, etc.

The test procedures covered by this standard apply to solid insulating materials, including processed compositions of raw materials and simple combinations thereof, before they are fabricated into insulating structures identified with specific parts of electric equipment.

These procedures may or may not apply to the aging characteristics of dielectric fluids or of porous materials impregnated with dielectric fluids.

A distinction between such material tests and tests to evaluate the performance of insulation systems is necessary because the details of the particular use of a material may not be known to its manufacturer.

General principles for designating the thermal capability of insulating systems are given in IEEE Std 1-1969 [11].¹ See also IEEE Std 99-1980 [12] and IEC 611-1978 [10].

¹The numbers in brackets correspond with those of the references in Section 2.

2. References

- [1] ANSI/ASTM Part 39, Electrical Insulation — Test Methods: Solids and Solidfying Fluids.²
- [2] ANSI/ASTM Part 40, Electrical Insulation Specifications: Solids, Liquids, and Gases; Test Methods: Liquid, Gases; Protective Equipment.
- [3] ANSI/ASTM D2029-1968, Test Method for Determining Water Vapor Content of Electrical Insulating Gases by Measurement of Dew Point.
- [4] ANSI/ASTM D2436-1968, Standard Specification for Forced-Convection Laboratory Ovens for Electrical Insulation.
- [5] ANSI/UL 746B-1969, Polymeric Materials — Long Term Property Evaluations.
- [6] IEC 85-1957, Recommendations for the Classification of Materials for the Insulation of Electrical Machinery and Apparatus in Relation to their Thermal Stability in Service.³
- [7] IEC 216-1-1974, Part 1. General Procedures for the Determination of Thermal Endurance Properties, Temperatures Indexes and Thermal Endurance Profiles.
- [8] IEC 216-2-1974, Part 2. List of Materials and Available Tests.
- [9] IEC 610-1978, Principal Aspects of Functional Evaluation of Electrical Insulation Systems: Aging Mechanisms and Diagnostic Procedures.
- [10] IEC 611-1978, Guide for the Preparation of Test Procedures for Evaluating the Thermal Endurance of Electrical Insulation Systems.
- [11] IEEE Std 1-1969, IEEE Standard General Principles for Temperature Limits in the Rating of Electric Equipment.⁴
- [12] IEEE Std 99-1980, IEEE Recommended Practice for the Preparation of Test Procedures for the Thermal Evaluation of Insulation Systems for Electric Equipment.
- [13] IEEE Std IEEE Std 101-1972 (R1980) IEEE Guide for the Statistical Analysis of Thermal Life Test Data. (Also includes Supplement IEEE Std 101A-1974.)

3. Terminology

3.1 Thermal Capability

Thermal capability includes the ability to withstand without failure the maximum short time operating temperatures and the long time integrated degradative effect of temperature and time. It constitutes a design limitation on the use of insulating materials in electrical and electronic equipment to the extent that both thermal softening (or other short term effects) and long term aging affect functional properties.

²ANSI publications are available from the Sales Department, American National Standard Institute, 1430 Broadway, New York, NY 10018.

³IEC Standards are available in the US from the Sales Department, American National Standard Institute, 1430 Broadway, New York, NY 10018.

⁴IEEE Standards are available from the IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854.