

Electrical insulation systems (EIS) — Thermal evaluation of combined liquid and solid components —

Part 1: General requirements

ICS 29.080.30

National foreword

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It is being issued in the Draft for Development series of publications and is of a provisional nature because experience in the international arena is required. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for the Technical Specification. A review of this publication will be initiated not later than 3 years after its publication by the international organization so that a decision can be taken on its status at the end of its 3-year life. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international standard, to extend the life of the Technical Specification for another 3 years or to withdraw it. Comments should be sent in writing to the Secretary of BSI Technical Committee GEL/98, Electrical insulation systems, at British Standards House, 389 Chiswick High Road, London W4 4AL, giving the document reference and clause number and proposing, where possible, an appropriate revision of the text.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

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TECHNICAL SPECIFICATION

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**Electrical insulation systems (EIS) –
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**Part 1:
General requirements**



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INTRODUCTION

This technical specification describes a method for the thermal evaluation of electrical insulation systems (EIS) for electrotechnical products with combined liquid and solid components. Part 1 covers general test requirements. Subsequent parts should cover specific product test requirements.

Prior to this technical specification, the standard procedure for determining the thermal endurance of insulation systems for liquid-immersed products involved one of two processes: firstly, sealed-tube ageing and, secondly, ageing of full-scale models.

The use of full-scale models is impractical, especially for larger products, such as power transformers. Similarly, the use of sealed-tube ageing is not practical when testing components having drastically different thermal capabilities. For example, testing of a system with a solid material with a 200 °C thermal index with a liquid having a 130 °C thermal capability cannot be performed efficiently. Accelerated ageing temperatures, which fairly age the liquid, will result in extremely long ageing times for the solid. Accelerated ageing temperatures, which fairly age the solid, will result in extreme, or even hazardous ageing of the liquid.

This technical specification describes an accelerated thermal ageing procedure and process model that allows for the solid materials to be aged at temperatures separate from the liquid ageing temperatures, all in the same apparatus. The model acts more in the true-life ageing mode of insulation systems, where solid insulation near the active parts is exposed to much higher temperatures than the bulk liquid in the equipment. The model contains all the primary EIS elements, and in relative component ratios which compare with actual electrotechnical products.

The model has a dual temperature capability that allows independent control of the temperature of the solid and liquid components by the use of separate circuits. A detailed bibliography is provided.

This procedure is currently not applicable to EIS with enamel-coated conductors. Recommendations on how to include them are welcome. This standard has been prepared in conjunction with TC 14, Power transformers. Any comments or suggestions from other technical committees to make the standard more general are welcome.

ELECTRICAL INSULATION SYSTEMS (EIS) – THERMAL EVALUATION OF COMBINED LIQUID AND SOLID COMPONENTS –

Part 1: General requirements

1 Scope

This part of IEC 62332 is applicable to EIS containing solid and liquid components where the thermal stress is the dominant ageing factor, without restriction to voltage class. This procedure is not applicable to EIS containing enamel-coated conductors.

This part specifies a dual-temperature test procedure for the thermal evaluation and qualification of electrical insulation systems (EIS).

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 60156: *Insulating liquids – Determination of the breakdown voltage at power frequency – Test method*

IEC 60216-3: *Electrical insulating materials – Thermal endurance properties – Part 3: Instructions for calculating thermal endurance characteristics*

IEC 60216-5: *Electrical insulating materials – Thermal endurance properties – Part 5: Determination of relative thermal endurance index (RTE) of an insulating material*

IEC 60243-1: *Electrical strength of insulating materials – Test methods – Part 1: Tests at power –frequencies*

IEC 60247: *Insulating liquids – Measurement of relative permittivity, dielectric dissipation factor ($\tan \delta$) and d.c. resistivity*

IEC 60250: *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths*

IEC 60296: *Fluids for electrotechnical applications – Unused mineral insulating oils for transformers and switchgear*

IEC 60422: *Supervision and maintenance guide for mineral insulating oils in electrical equipment*

IEC 60450: *Measurement of the average viscometric degree of polymerization of new and aged cellulosic electrically insulating materials*

IEC 60505: *Evaluation and qualification of electrical insulation systems*