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Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

<p>See Eesti standard EVS-EN IEC 60216-1:2026 sisaldab Euroopa standardi EN IEC 60216-1:2026 ingliskeelset teksti.</p> <p>Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.</p> <p>Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 31.01.2026.</p> <p>Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.</p>	<p>This Estonian standard EVS-EN IEC 60216-1:2026 consists of the English text of the European standard EN IEC 60216-1:2026.</p> <p>This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation.</p> <p>Date of Availability of the European standard is 31.01.2026.</p> <p>The standard is available from the Estonian Centre for Standardisation and Accreditation.</p>
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ICS 17.220.99, 29.035.01

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English Version

Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results (IEC 60216-1:2025)

Matériaux isolants électriques - Propriétés d'endurance
thermique - Partie 1: Méthodes de vieillissement et
évaluation des résultats d'essai
(IEC 60216-1:2025)

Elektroisolierstoffe - Eigenschaften hinsichtlich des
thermischen Langzeitverhaltens - Teil 1:
Warmlagerungsverfahren und Auswertung von
Prüfergebnissen
(IEC 60216-1:2025)

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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

European foreword

The text of document 112/698/FDIS, future edition 7 of IEC 60216-1, prepared by TC 112 "Evaluation and qualification of electrical insulating materials and systems" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60216-1:2026.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2027-01-31
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2029-01-31

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IEC 60216 series	NOTE	Approved as EN 60216 series
ISO 2578:1993	NOTE	Approved as EN ISO 2578:1998 (not modified)
IEC 60216-8	NOTE	Approved as EN 60216-8
IEC 60216-2	NOTE	Approved as EN 60216-2
IEC 60216-3	NOTE	Approved as EN IEC 60216-3
IEC 60212	NOTE	Approved as EN 60212
IEC 60216-3:2021	NOTE	Approved as EN IEC 60216-3:2021 (not modified)
IEC 60216-8:2013	NOTE	Approved as EN 60216-8:2013 (not modified)

INTERNATIONAL STANDARD

**Electrical insulating materials - Thermal endurance properties -
Part 1: Ageing procedures and evaluation of test results**



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INTERNATIONAL ELECTROTECHNICAL COMMISSION

Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results

FOREWORD

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IEC 60216-1 has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems. It is an International Standard.

This seventh edition cancels and replaces the sixth edition published in 2013. This edition constitutes a technical revision.

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

- a) the definition for temperature index (TI) has been updated;
- b) requirements for selection of related materials used, e.g. in different colours (5.1.2), have been added;
- c) test procedure for thickness sensitivity (5.5 and 6.6) has been added;
- d) Annex C "Concepts in earlier editions" has been deleted.

The text of this International Standard is based on the following documents:

Draft	Report on voting
112/698/FDIS	112/706/RVD

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

The language used for the development of this International Standard is English.

A list of all parts in the [IEC 60216 series \[1\]](#), published under the general title *Electrical insulating materials – Thermal endurance properties*, can be found on the IEC website.

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 www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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- reconfirmed,
- withdrawn, or
- revised.

INTRODUCTION

The listing of the thermal capabilities of electrical insulating materials, based on service experience, was found to be impractical, owing to the rapid development of polymer and insulation technologies and the long time necessary to acquire appropriate service experience. Accelerated ageing and test procedures were therefore needed to obtain the necessary information. The [IEC 60216 series \[1\]](#) has been developed to formalize these procedures and the interpretation of their results.

Physico-chemical models postulated for the ageing processes led to the almost universal assumption of the Arrhenius equations to describe the rate of ageing. Out of this arose the concept of the temperature index (TI) as a single-point characteristic based upon accelerated ageing data. This is the numerical value of the temperature in degrees Celsius at which the time taken for deterioration of a selected property to reach an accepted end-point is that specified (usually 20 000 h).

NOTE The term Arrhenius is widely used (and understood) to indicate a linear relationship between the logarithm of a time and the reciprocal of the thermodynamic (absolute or kelvin) temperature. The correct usage is restricted to such a relationship between a reaction rate constant and the thermodynamic temperature. The common usage is employed throughout this document.

The large statistical scatter of test data which was found, together with the frequent occurrence of substantial deviations from the ideal behaviour, demonstrated the need for tests to assess the validity of the basic physico-chemical model. The application of conventional statistical tests, as set out in [IEC 60493-1:2011 \[2\]](#), fulfilled this requirement, resulting in the confidence limit (TC) of TI, but the simple, single-point TI was found inadequate to describe the capabilities of materials. This led to the concept of the thermal endurance profile (TEP), incorporating the temperature index, its variation with specified ageing time, and a confidence limit.

A complicating factor is that the properties of a material subjected to thermal ageing possibly do not all deteriorate at the same rate, and different end-points can be relevant for different applications. Consequently, a material can be assigned more than one temperature index, derived, for example, from the measurement of different properties and the use of different end-point times.

It was subsequently found that the statistical confidence index included in the TEP was not widely understood or used. However, the statistical tests were considered essential, particularly after minor modifications to make them relate better to practical circumstances: the concept of the halving interval (HIC) was introduced to indicate the rate of change of ageing time with temperature. TEP was then abandoned, with the TI and HIC being reported in a way which indicated whether or not the statistical tests had been fully satisfied. At the same time, the calculation procedures were made more comprehensive, enabling full statistical testing of data obtained using a diagnostic property of any type, including the particular case of partially incomplete data. Simultaneously with the development of the [IEC 60216 series \[1\]](#), other standards were being developed in ISO, intended to satisfy a similar requirement for plastics and rubber materials. These are [ISO 2578:1993 \[3\]](#) and [ISO 11346 \[4\]](#), respectively, which use less rigorous statistical procedures and more restricted experimental techniques. A simplified calculation procedure is defined in [IEC 60216-8 \[5\]](#).

1 Scope

This part of IEC 60216 specifies the general ageing conditions and procedures to be used for deriving thermal endurance characteristics and gives guidance in using the detailed instructions and guidelines in the other parts of IEC 60216.

Although originally developed for use with electrical insulating materials and simple combinations of such materials, the procedures are considered to be of more general applicability and are widely used in the assessment of materials not intended for use as electrical insulation.

In the application of this document, it is assumed that a practically linear relationship exists between the logarithm of the time required to cause the predetermined property change and the reciprocal of the corresponding absolute temperature (Arrhenius relationship).

For the valid application of this document, no transition, in particular no first-order transition, is expected to occur in the temperature range under study.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60212, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60216-3:2021, *Electrical insulating materials - Thermal endurance properties - Part 3: Instructions for calculating thermal endurance characteristics*

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

IEC 60216-4-1, *Electrical insulating materials - Thermal endurance properties - Part 4-1: Ageing ovens - Single-chamber ovens*

IEC 60493-1:2011, *Guide for the statistical analysis of ageing test data - Part 1: Methods based on mean values of normally distributed test results*

IEC 60216-4 series, *Electrical insulating materials – Thermal endurance properties – Part 4: Ageing ovens*

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>