# IEC TR 60216-7-2

Edition 2.0 2024-09
REDLINE VERSION

# TECHNICAL REPORT

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## Electrical insulating materials – Thermal endurance properties – Part 7-2: Accelerated determination of relative thermal endurance using analytical test methods (RTEA) – Results of the round robin tests to validate procedures of IEC TS 60216-7-1 by non-isothermal kinetic analysis of thermogravimetric data

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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# ELECTRICAL INSULATING MATERIALS – THERMAL ENDURANCE PROPERTIES –

## Part 7-2: Accelerated determination of relative thermal endurance using analytical test methods (RTEA) – Results of the round robin tests to validate procedures of IEC TS 60216-7-1 by non-isothermal kinetic analysis of thermogravimetric data

## FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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IEC TR 60216-7-2 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 2016. This edition constitutes a technical revision.

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

a) Annex A (informative) has been added to provide a round robin test with a different polymer type – polybuthylene terephthalate (PBY) – as an additional use case of the method in accordance with IEC TS 60216-7-1;
b) Tables 3 to 11 have been corrected by adding units, and texts have been refined for more technical clarifications of the procedures and observations.

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

| Draft | Report on voting |
|---|---|
| 112/651/DTR | 112/658/RVDTR |

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

A list of all parts in the IEC 60216 series, published under the general title *Electrical insulating materials – Thermal endurance properties*, 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,
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- revised.

**IMPORTANT – The "colour inside" logo on the cover page of this document indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

# INTRODUCTION

IEC technical committee 112, (IEC TC 112) has been working on the development of IEC TS 60216-7-1 [1][1] that considers the use of activation energy determined through thermal analytical tools plus abbreviated conventional heat ageing to determine a thermal index on a polymeric compound. At the same time, the Underwriters Laboratories Long-Term Thermal Aging Forum (UL LTTA Forum) has been discussing alternative methods that ~~could~~ can speed up the determination of a thermal index. Members of the IEC TC 112 and of the UL LTTA Forum have made joint efforts to determine whether the Technical Specification developed by IEC TC 112 can be used to offer an alternative method of evaluating polymeric compounds for a thermal index.

Members of IEC TC 112 and the UL LTTA Forum decided to conduct a round robin test (RRT) using thermogravimetric analysis (TGA) according to ISO 11358-2 [3] on a known compound, with a known activation energy determined through conventional ageing with a view to validate the acceptability of IEC TS 60216-7-1, and to determine whether a similar thermal index ~~could~~ can be calculated. The round robin testing was conducted with conventional TGA by multiple heating rates. However, running isothermal tests can be a follow-up of this RRT.

[1] Numbers in square brackets refer to the Bibliography.

# ELECTRICAL INSULATING MATERIALS – THERMAL ENDURANCE PROPERTIES –

## Part 7-2: Accelerated determination of relative thermal endurance using analytical test methods (RTEA) – Results of the round robin tests to validate procedures of IEC TS 60216-7-1 by non-isothermal kinetic analysis of thermogravimetric data

## 1 Scope

This part of IEC 60216 is intended to validate the procedures of IEC TS 60216-7-1 in providing a similar temperature index to conventional methods used in other parts of the IEC 60216 series.

The round robin test results do not provide statistical analysis for precision. The round robin test focuses on preliminary studies to understand the evaluation and calculation procedures, influence on apparatus, and data variance among laboratories before determination of precision.

## 2 Normative references

There are no normative references in this document.

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Edition 2.0 2024-09

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