



BSI Standards Publication

Electrical insulating materials — Thermal endurance properties

Part 7-2: Results of the round robin tests
to validate procedures of IEC TS 60216-7-1
by non-isothermal kinetic analysis of
thermogravimetric data

National foreword

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

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TECHNICAL REPORT



**Electrical insulating materials – Thermal endurance properties –
Part 7-2: 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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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Terms and definitions	7
4 Test specimens	8
5 Test apparatus	9
5.1 Thermogravimetric analyser (TGA)	9
5.2 Purge gas supplied into the TGA furnace	9
6 Test procedures	9
6.1 General.....	9
6.2 Preconditioning of test samples	10
6.3 TGA tests with multiple heating rates	10
6.4 Calculation of the activation energy (E_a).....	10
6.5 Determination of thermal endurance using TGA	11
6.5.1 General	11
6.5.2 Determination of RTE_A by given degree of conversion from reference material (Method A)	11
6.5.3 Determination of TI_A by fixed degree of conversion at 0,05 (Method B)	12
7 Round robin test results	12
7.1 TGA test results	12
7.2 Degree of conversion correlated to the activation energy from conventional heat ageing data	12
7.3 HIC_A determined by Method A and Method B	13
7.4 RTE_A determined by Method A and TI_A by Method B	14
7.5 Difference between RTE_A and TI determined by the conventional heat ageing tests	16
8 Observations from the round robin test results.....	17
8.1 General.....	17
8.2 Sample weight variation	18
8.3 Humidity and hydrolysis of the sample	19
8.4 Consideration on repeatability of TGA curves.....	20
8.5 Baseline drift and responsiveness to heating rates of TGA	21
9 Conclusion and recommendation	24
Bibliography	26

Figure 1 – Fitting curve of plots between degree of conversion and activation energy determined by ISO 11358-2 (example) 11

Figure 2 – Correlation between the initial sample mass of sample A and the difference of RTE_A (TI_A) from TI 19

Figure 3 – Correlation between the initial sample mass of sample B and the difference of RTE_A (TI_A) from TI 19

Figure 4 – Overlay charts of TGA curves in multiple heating rates in multiple laboratories (enlarged)..... 22

Figure 5 – Logarithm plots for activation energy calculation 23

Figure 6 – Fitting curves of degree of conversion vs. activation energy by TGA..... 24

Table 1 – Heat ageing properties of the test specimens by the conventional procedure described in IEC 60216-5.....	9
Table 2 – Degree of conversion identical to the activation energy of the conventional heat ageing	13
Table 3 – HIC_A determined by Method A and Method B for dielectric strength.....	13
Table 4 – HIC_A determined by Method A and Method B for tensile strength	14
Table 5 – HIC_A determined by Method A and Method B for impact strength	14
Table 6 – RTE_A determined by Method A and TI_A by Method B for dielectric strength	15
Table 7 – RTE_A determined by Method A and TI_A by Method B for tensile strength.....	15
Table 8 – RTE_A determined by Method A and TI_A by Method B for impact strength.....	16
Table 9 – Difference between RTE_A or TI_A , and TI for dielectric strength.....	16
Table 10 – Difference between RTE_A or TI_A , and TI for tensile strength	17
Table 11 – Difference between RTE_A or TI_A , and TI for impact strength	17
Table 12 – Comparison of degree of conversion with original or rerun data at 8 K/min.....	21

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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THERMAL ENDURANCE PROPERTIES –****Part 7-2: Results of the round robin tests to validate procedures
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of thermogravimetric data**

FOREWORD

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IEC TR 60216-2-7, which is a Technical Report, has been prepared by IEC technical committee 112: Evaluation and qualification of electrical insulating materials and systems.

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

Enquiry draft	Report on voting
112/354/DTR	112/370/RVC

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.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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 publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication 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/TC112) has been working on the development of IEC TS 60216-7-1 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 UL LTТА Forum has been discussing alternative methods that could speed up the determination of a thermal index. Members of the IEC/TC112 and of the UL LTТА Forum have joined efforts to determine whether the Technical Specification developed by IEC/TC112 can be used to offer an alternative method of evaluating polymeric compounds for a thermal index.

Members of IEC/TC112 and the UL LTТА Forum decided to conduct a round robin test (RRT) using thermogravimetric analysis (TGA) according to ISO 11358-2 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 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.

ELECTRICAL INSULATING MATERIALS – THERMAL ENDURANCE PROPERTIES –

Part 7-2: 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

The purpose of this part of IEC 60216, which is a Technical Report, is 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.

These round robin test results do not provide statistical analysis for precisions. 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 precisions.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

3.1

activation energy

Arrhenius activation energy

E_a

empirical parameter characterizing the exponential temperature dependence of the reaction rate constant

[SOURCE: IUPAC “Goldbook”]

3.2

end-point

limit for a diagnostic property value based on which the thermal endurance is evaluated

3.3

time to end-point

failure time

time to reach the end point or conventional failure

3.4

relative temperature endurance index

RTE

numerical value of the temperature in degrees Celsius at which the estimated time to end-point of the candidate material is the same as the estimated time to end-point of the reference material at a temperature equal to its assessed temperature index

Note 1 to entry: RTE_A is the relative temperature endurance index calculated through the analytical procedure.