SLOVENSKI STANDARD
oSIST prEN IEC 61189-2-809:2022

01-oktober-2022

Preskusne metode za električne materiale, tiskana vezja in druge povezovalne strukture in sestave - 2-809. del: Preskus X/Y CTE s termomehansko analizo (TMA) za tanke podložne materiale

Test methods for electrical materials, printed board and other interconnection structures and assemblies - Part 2-809: X/Y Coefficient of Thermal Expansion Test (CTE) for Thick Base Materials by TMA

Méthodes d'essai pour les matériaux électriques, les cartes imprimées et autres structures d'interconnexion et ensembles - Partie 2-809: Essai du coefficient de dilatation thermique (CTE) X/Y pour matériaux de base épais à l'aide d'un analyseur thermomécanique (TMA)

Ta slovenski standard je istoveten z: **prEN IEC 61189-2-809:2022**

ICS:

31.180	Tiskana vezja (TIV) in tiskane plošče	Printed circuits and boards

oSIST prEN IEC 61189-2-809:2022 **en**

91/1800/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

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IEC TC 91 : ELECTRONICS ASSEMBLY TECHNOLOGY

SECRETARIAT: Japan	SECRETARY: Mr Masahide Okamoto
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

☐ EMC ☐ ENVIRONMENT ☒ QUALITY ASSURANCE ☐ SAFETY

☒ SUBMITTED FOR CENELEC PARALLEL VOTING	☐ NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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Recipients of this document are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

TITLE:

Test methods for electrical materials, printed board and other interconnection structures and assemblies - Part 2-809: X/Y Coefficient of Thermal Expansion Test (CTE) for Thick Base Materials by TMA

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

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21 INTERNATIONAL ELECTROTECHNICAL COMMISSION

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25 **OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES–**

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65 Electronics assembly technology.

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

FDIS	Report on voting
XX/XX/FDIS	XX/XX/RVD

67

68 Full information on the voting for the approval of this International Standard can be found in the
69 report on voting indicated in the above table.

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

A list of all parts in the IEC 61189 series, published under the general title Test methods for electrical materials, printed board and other interconnection structures and assemblies, 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 "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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

TEST METHODS FOR ELECTRICAL MATERIALS, PRINTED BOARD AND OTHER INTERCONNECTION STRUCTURES AND ASSEMBLIES –

Part 2-809: X/Y Coefficient of Thermal Expansion Test (CTE) for Thick Base Materials by TMA

1 Scope

This International Standard defines the method to be followed for the determination of the X/Y coefficient of thermal expansion of electrical insulating materials by the use of a thermomechanical analyser (TMA).

This method is applicable to materials that are solid of the entire range of temperature used, and retain sufficient hardness and rigidity over the temperature range so that irreversible indentation of the specimen by the sensing probe does not occur.

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 60194, Printed board design, manufacture and assembly – Terms and definitions

3 Terms and definitions

For the purposes of this document, the following terms and definitions given in IEC 60194 apply.

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

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

4 Test Specimens

4.1 The test specimens shall be between 0,5 mm to 7,5 mm thick. This thickness may be “as received” or may be laminated by the user from pre-impregnated “B” stage material. If laminated by the user, the user shall be responsible for the layup and curing parameters used for quality acceptance by the manufacturer.

NOTE The repeatability of the test results will vary by the factors, such as layup used, the resin to glass ratio and the ultimate cure of the laminated stack, etc.

4.2 The test specimens shall be between 5 mm to 12 mm in length and between 5 mm to 10 mm in width. The width of the specimen shall be less than the length. CTE specimen in X direction, as shown in Figure 1, the width direction is x direction; CTE specimen in Y direction, as shown in Fig. 1, is in Y direction.

NOTE The “X” direction shall be the fill (weft) of the woven fiber and the “Y” direction shall be the machine direction (warp) of the woven fiber.

4.3 Opposing sides of the test specimen shall be parallel and surfaces shall be polished with 600 grit sandpaper to remove debris and protruding fibers. After that then be cleaned using isopropyl alcohol and dried for 1 hour at 110°C ±2°C.

NOTE The one hour prebake may be eliminated if conditon (6.1) is performed immediately after final polish.

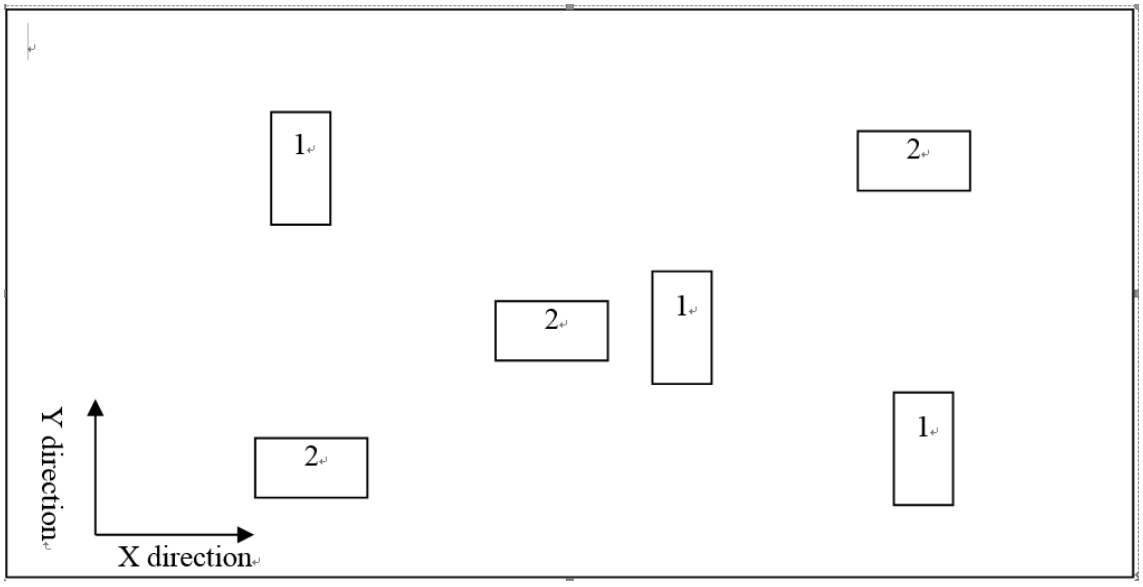

Figure1 – Diagram of sample direction

NOTE Sample 1 is CTE sample in X direction; Sample 2 is CTE sample in Y direction.

4.4 Unless otherwise specified, three specimens shall be prepared in both warp and weft direction of the glass fiber from the same piece of material, and be marked with “X” and “Y” directions.

5 Test Apparatus

5.1 Thermomechanical Analyzer (TMA) capable of determination of dimensional change to within 0,001 mm over the specified temperature range.

5.2 Circulating air oven capable of maintaining 110 °C ± 2 °C.

5.3 Dessicator or low humidity drying cabinet capable of maintaining an atmosphere less than 30% relative humidity at 23 °C ± 2 °C.

6 Test Procedure

6.1 Immerse the specimen in isopropyl alcohol with agitation for 20 seconds, and then dried for 1 hour ± 10 minutes at 110 °C ± 2 °C in oven. After removal from the oven, the specimen shall be cooled for 40 minutes in desiccator or drying cabinet before testing.

6.2 Calibrate the TMA instrument in accordance with the manufacturer’s instructions.

6.3 Test of CTE in X direction.

6.3.1 Measure the size of the specimen, recorded as H (See Figure 2).

NOTE The width direction of the test sample should always be perpendicular to the test sample placement platform.

6.4 Place the specimen on the stage of the TMA. Taking care that the specimen is centered and resting flat on the stage. The thermocouple wire should be in contact with the specimen or as near to the specimen as possible.

6.5 Place weights on the sensing probe and lower the TMA probe to ensure that the probe is in contact with the specimen with a 0,04 N to 0,10 N load.

6.6 Heat the specimen at the rate of 5 ± 0,5 °C/min to a temperature which is 10 °C greater than the required temperature range. The general test temperature range is 30 °C to 260 °C.

NOTE The testing temperature range shall be specified by the user so that the manufacturer and the user can test under the same temperature range. The repeatability may be unacceptable if tested over different temperature ranges.

6.7 Record the dimensional change of the specimen with an appropriate range on X-Y recorder.

6.8 Three specimens at least should be tested of the same material. Retest of a specimen may only be used as reference and shall not be treated as an independent test of a new specimen.

6.9 Repeat the procedure 6.1 to 6.8 to test the “Y” direction.

6.10 Three specimens at least should be tested of the same material. Retest of a specimen may only be used as reference and shall not be treated as an independent test of a new specimen.

7 Calculations

Calculate the average coefficient of thermal expansion over the temperature interval according to the following formula:

$$\alpha = \frac{\Delta H}{H \times \Delta T} \times 10^6$$

where

α is the average coefficient of thermal expansion, unit in μm/(m • °C);

ΔH is dimensional change of the specimen over the temperature interval(See Figure 1), unit in mm;

H is Initial size of the specimen, unit in mm;

ΔT is the temperature interval (See Figure 1), unit in °C.

NOTE In most of the modern TMA instruments, the calculations are handled by the system software.

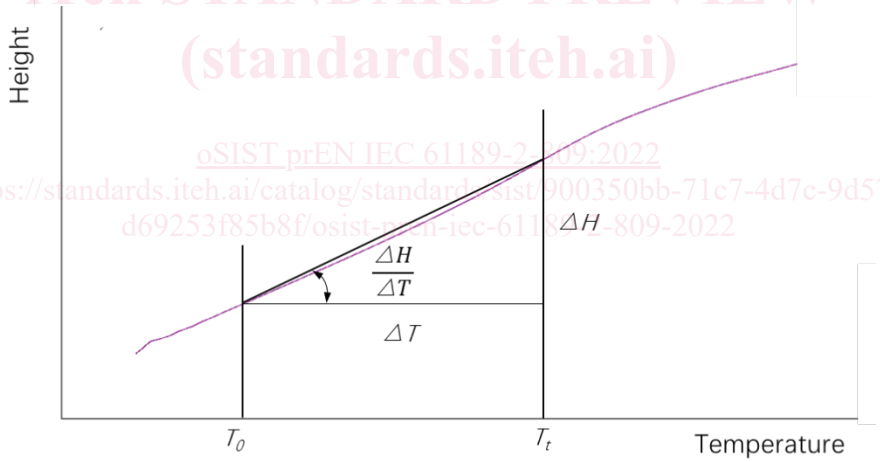

Figure2 – Specimen size Versus Temperature

8 Report

The report shall include:

a) The test method number and revision level;

b) The identification and description of the material tested;

c) The Initial size of the specimen in both “X” and “Y” directions;

d) The room temperature and the relative humidity under which the test was conducted;

e) The date of the test;

f) The temperature ramp up rate;

g) The calculated average “X” coefficient of expansion for three specimens;

h) The calculated average “Y” coefficient of expansion for three specimens;

i) Any deviation from the test method;

j) The name of the person conducting the test.

Bibliography

IPC-TM-650 Method 2.4.41 *Coefficient of Linear Thermal Expansion of Electrical Insulating Materials*