Designation: E2206 – 11

StandardTest Method for Force Calibration of Thermomechanical Analyzers[1]

This standard is issued under the fixed designation E2206; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method describes the calibration or performance confirmation of the electronically applied force signal for thermomechanical analyzers over the range of 0 to 1 N.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 There is no ISO method equivalent to this standard.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E4 Practices for Force Verification of Testing Machines
E473 Terminology Relating to Thermal Analysis and Rheology
E617 Specification for Laboratory Weights and Precision Mass Standards
E831 Test Method for Linear Thermal Expansion of Solid Materials by Thermomechanical Analysis
E1142 Terminology Relating to Thermophysical Properties
E1363 Test Method for Temperature Calibration of Thermomechanical Analyzers
E2113 Test Method for Length Change Calibration of Thermomechanical Analyzers
E2161 Terminology Relating to Performance Validation in Thermal Analysis

3. Terminology

3.1 The technical terms used in this standard are defined in Terminologies E473, E1142, and E2161 including *calibration, conformance, precision, relative standard deviation, repeatability, reproducibility,* and *thermomechanical analyzer*.

4. Summary of Test Method

4.1 The electronic force signal generated by a thermomechanical analyzer is compared to that exerted by gravity on a known mass. The thermomechanical analyzer may be said to be in conformance if the performance is within established limits, typically 1 %. Alternatively, the force signal may be calibrated using a two-point calibration method.

5. Significance and Use

5.1 Most thermomechanical analysis experiments are carried out with some force applied to the test specimen. This force is often created electronically. It may be constant or changed during the experiment.

5.2 This method demonstrates conformance or calibrates the electronically applied force signal.

5.3 This method may be used for research and development, quality control, manufacturing or regulatory applications.

5.4 Other thermomechanical analyzer calibration functions include temperature by Test Method E1363 and length change by Test Method E2113.

6. Apparatus

6.1 *Thermomechanical Analyzer*—The essential instrumentation required to provide a minimum thermomechanical analysis or thermodilatometric capability for this method includes:

6.1.1 *Rigid Specimen Holder,* inert, low expansivity material [typically <0.6 µm/(m · K)] to center the specimen in the furnace and to fix the specimen to mechanical ground.

NOTE 1—Materials of construction with greater expansivity may be used but shall be reported.

6.1.2 *Rigid (Expansion or Compression) Probe,* inert, low expansivity material [typically <0.6 µm/(m · K)] which contacts the specimen with an applied compressive force (see Note 1).

6.1.3 *Sensing Element,* linear over a minimum range of 2 mm to measure the displacement of the rigid probe to ±1 µm resulting from changes in length of the specimen.

6.1.4 *Programmable Force Transducer,* to generate a constant force (±1.0 %) of up to 1.0 N that is applied through the rigid probe to the specimen.

[1] This test method is under the jurisdiction of ASTM Committee E37 on Thermal Measurements and is the direct responsibility of Subcommittee E37.10 on Fundamental, Statistical and Mechanical Properties.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.