



Standard Test Method for Temperature Calibration of Thermomechanical Analyzers¹

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1. Scope

1.1 This test method describes the temperature calibration of thermomechanical analyzers from -50 to 1100°C . (See [Note 1](#).)

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 This standard is similar to ISO 11359–1 but addresses a larger temperature range and utilizes additional calibration materials.

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.* Specific precautionary statements are given in [Section 7](#) and [Note 10](#).

2. Referenced Documents

2.1 *ASTM Standards:*²

[E473 Terminology Relating to Thermal Analysis and Rheology](#)

2.2 *Other Standards:*³

[ISO 11359–1 Thermomechanical Analysis \(TMA\)-Part 1: General Principles](#)

3. Terminology

3.1 *Definitions:*

3.1.1 The terminology relating to thermal analysis appearing in Terminology [E473](#) shall be considered applicable to this document.

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.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

4. Summary of Test Method

4.1 An equation is developed for the linear correlation of the experimentally observed program temperature and the actual melting temperature for known melting standards. This is accomplished through the use of a thermomechanical analyzer with a penetration probe to obtain the onset temperatures for two melting point standards. An alternate, one-point method of temperature calibration, is also given for use over very narrow temperature ranges. (See [Note 2](#).)

NOTE 1—This test method may be used for calibrating thermomechanical analyzers at temperatures outside this range of temperature. However, the accuracy of the calibration will be no better than that of the temperature standards used.

NOTE 2—It is possible to develop a more elaborate method of temperature calibration using multiple (more than two) fusion standards and quadratic regression analysis. Since most modern instruments are capable of heating rates which are essentially linear in the region of use, the procedure given here is limited to a two-point calibration.

5. Significance and Use

5.1 Thermomechanical analyzers are employed in their various modes of operation (penetration, expansion, flexure, etc.) to characterize a wide range of materials. In most cases, the value to be assigned in thermomechanical measurements is the temperature of the transition (or event) under study. Therefore, the temperature axis (abscissa) of all TMA thermal curves must be accurately calibrated either by direct reading of a temperature sensor or by adjusting the programmer temperature to match the actual temperature over the temperature range of interest.

6. Apparatus

6.1 *Thermomechanical Analyzer (TMA)*, The essential instrumentation required to provide the minimum thermomechanical analytical or thermodilatometric capability for this method includes:

6.1.1 *A Rigid Specimen Holder or Platform*, of inert, low expansivity material ($< 1 \mu\text{m m}^{-1} \text{K}^{-1}$) to center the specimen in the furnace and to fix the specimen to mechanical ground.

6.1.2 *A Rigid (expansion compression, flexure, tensile, etc.) Probe*, of inert, low expansivity material ($< 1 \mu\text{m m}^{-1} \text{K}^{-1}$) that contacts with the specimen with an applied compressive or tensile force. For this test method the use of a penetration probe is recommended.