



Standard Test Method for Temperature Calibration on Cooling of Differential Scanning Calorimeters¹

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1. Scope

1.1 This test method covers the temperature calibration of differential scanning calorimeters on cooling using the difference between transition temperatures upon heating and cooling in the temperature range of 50 to 185°C. An offset in the indicated temperature between heating and cooling experiments, within this temperature range, may be used to provide temperature calibration on cooling at other temperature ranges.

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 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 6.

2. Referenced Documents

2.1 ASTM Standards:²

[D3418](#) Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry

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

[E794](#) Test Method for Melting And Crystallization Temperatures By Thermal Analysis

[E928](#) Test Method for Purity by Differential Scanning Calorimetry

[E967](#) Test Method for Temperature Calibration of Differential Scanning Calorimeters and Differential Thermal Analyzers

¹ This test method is under the jurisdiction of ASTM Committee [E37](#) on Thermal Measurements and is the direct responsibility of Subcommittee [E37.01](#) on Calorimetry and Mass Loss.

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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.

[E1970](#) Practice for Statistical Treatment of Thermoanalytical Data

3. Terminology

3.1 Specific technical terms used in this test method are defined in Terminology [E473](#).

4. Summary of Test Method

4.1 The temperature sensor of the DSC, used to determine the temperature of a transition, is located close to but external to the test specimen. This arrangement causes the indicated temperature to lead or lag the actual specimen temperature on heating/cooling causing the reported temperature to be higher on heating and lower on cooling than the actual specimen transition temperature. A DSC apparatus temperature, that has been calibrated for heating experiments, needs to be re-calibrated for cooling experiments. Such a calibration on cooling is performed using a liquid crystal material, the transition(s) for which are not subject to super-heating or super-cooling.

4.2 The transition temperature of a rapid, non-superheating and non-supercooling transition is determined upon heating and upon cooling. The difference between these two indicated temperatures provides an offset temperature value between heating and cooling experiments at the indicated rate. This offset temperature value, when used with a precise temperature calibration upon heating, may serve as an instrument calibration function upon cooling.

5. Significance and Use

5.1 This test method is useful in calibrating the temperature signal of a differential scanning calorimeter for cooling experiments such as the determination of crystallization temperatures in Test Method [D3418](#) and Test Method [E794](#).

5.2 This test method may be used for research, development, analytical, specification acceptance, quality assurance and control purposes.

6. Precautions

6.1 Toxic or corrosive effluents, or both, may be released when heating the material of this test method and may be harmful to personnel and to the apparatus.