



Standard Test Method for Assignment of the Glass Transition Temperatures by Differential Scanning Calorimetry¹

This standard is issued under the fixed designation E1356; 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 covers the assignment of the glass transition temperatures of materials using differential scanning calorimetry or differential thermal analysis.

1.2 This test method is applicable to amorphous materials or to partially crystalline materials containing amorphous regions, that are stable and do not undergo decomposition or sublimation in the glass transition region.

1.3 The normal operating temperature range is from -120 to 500°C . The temperature range may be extended, depending upon the instrumentation used.

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

1.5 ISO standards 11357-2 is equivalent to this standard.

1.6 *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

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E473 Terminology Relating to Thermal Analysis and Rheology

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

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.

Current edition approved March 15, 2014. Published April 2014. Originally approved in 1991. Last previous edition approved in 2008 as E1356 – 08. DOI: 10.1520/E1356-08R14.

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.

E1142 Terminology Relating to Thermophysical Properties

2.2 ISO Standards:³

11357-2 Differential Scanning Calorimetry (DSC)-Part 2 Determination of Glass Transition Temperature

3. Terminology

3.1 Definitions:

3.1.1 *Definitions*—The following terms are applicable to this test method and can be found in Terminologies E473 and E1142: *differential scanning calorimetry (DSC)*; *differential thermal analysis (DTA)*; *glass transition*; *glass transition temperature (T_g)*; and *specific heat capacity*.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *There are commonly used transition points associated with the glass transition region*—(see Fig. 1).

3.2.1.1 *extrapolated end temperature, (T_e), $^{\circ}\text{C}$* —the point of intersection of the tangent drawn at the point of greatest slope on the transition curve with the extrapolated baseline following the transition.

3.2.1.2 *extrapolated onset temperature, (T_p), $^{\circ}\text{C}$* —the point of intersection of the tangent drawn at the point of greatest slope on the transition curve with the extrapolated baseline prior to the transition.

3.2.1.3 *inflection temperature, (T_i), $^{\circ}\text{C}$* —the point on the thermal curve corresponding to the peak of the first derivative (with respect to time) of the parent thermal curve. This point corresponds to the inflection point of the parent thermal curve.

3.2.1.4 *midpoint temperature, (T_m), $^{\circ}\text{C}$* —the point on the thermal curve corresponding to $1/2$ the heat flow difference between the extrapolated onset and extrapolated end.

3.2.1.5 *Discussion*—Midpoint temperature is most commonly used as the glass transition temperature (see Fig. 1).

3.2.2 *Two additional transition points are sometimes identified and are defined:*

3.2.2.1 *temperature of first deviation, (T_o), $^{\circ}\text{C}$* —the point of first detectable deviation from the extrapolated baseline prior to the transition.

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