



Designation: D4065 – 20

Standard Practice for Plastics: Dynamic Mechanical Properties: Determination and Report of Procedures¹

This standard is issued under the fixed designation D4065; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This practice is for general use in gathering and reporting dynamic mechanical data. It incorporates laboratory practice for determining dynamic mechanical properties of plastic specimens subjected to various oscillatory deformations on a variety of instruments of the type commonly called dynamic mechanical analyzers or dynamic thermomechanical analyzers.

1.2 This practice is intended to provide means of determining the transition temperatures, elastic, and loss moduli of plastics over a range of temperatures, frequencies, or time, by free vibration and resonant or nonresonant forced vibration techniques. Plots of elastic and loss moduli are indicative of the viscoelastic characteristics of a plastic. These moduli are functions of temperature or frequency in plastics, and change rapidly at particular temperatures or frequencies. The regions of rapid moduli change are normally referred to as transition regions.

1.3 The practice is primarily useful when conducted over a range of temperatures from -140°C to polymer softening and is valid for frequencies from 0.01 to 1000 Hz.

1.4 This practice is intended for materials that have an elastic modulus in the range from 0.5 MPa to 100 GPa (73 psi to 1.5×10^7 psi).

1.5 Discrepancies in results are known to arise when obtained under differing experimental conditions. Without changing the observed data, reporting in full (as described in this practice) the conditions under which the data were obtained will enable apparent differences observed in another study to be reconciled. An assumption of this technique is that testing is conducted in the region of linear viscoelastic behavior.

1.6 Different modes of deformation, such as tensile, bending and shear, are used, as listed in the referenced test methods.

1.7 Test data obtained by this practice are relevant and appropriate for use in engineering design.

1.8 The values stated in SI units are to be regarded as standard. The values given in parentheses are for information only.

1.9 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific hazards statements are given in Section 8.

NOTE 1—This practice is equivalent to ISO 6721–1.

1.10 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

- D618 Practice for Conditioning Plastics for Testing
- D4000 Classification System for Specifying Plastic Materials
- D4092 Terminology for Plastics: Dynamic Mechanical Properties
- D4440 Test Method for Plastics: Dynamic Mechanical Properties Melt Rheology
- D5023 Test Method for Plastics: Dynamic Mechanical Properties: In Flexure (Three-Point Bending)
- D5024 Test Method for Plastics: Dynamic Mechanical Properties: In Compression
- D5026 Test Method for Plastics: Dynamic Mechanical Properties: In Tension
- D5279 Test Method for Plastics: Dynamic Mechanical Properties: In Torsion
- D5418 Test Method for Plastics: Dynamic Mechanical Properties: In Flexure (Dual Cantilever Beam)

¹ This practice is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.10 on 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.

*A Summary of Changes section appears at the end of this standard