



Standard Practice for Plastics: Dynamic Mechanical Properties: Determination and Report of Procedures ¹

This standard is issued under the fixed designation D 4065; 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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the 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 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 -160°C to polymer degradation 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 Apparent discrepancies may arise in results 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.

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

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

1.8 *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 practice to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Specific hazards statements are given in Section 8.

NOTE 1—This practice is technically equivalent to ISO 6721, Part 1.

2. Referenced Documents

2.1 ASTM Standards:

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing²

D 4000 Classification System for Specifying Plastic Materials³

D 4092 Terminology Relating to Dynamic Mechanical Measurements on Plastics³

2.2 ISO Standard:

ISO 6721, Part 1 Plastics—Determination of Dynamic Mechanical Properties, Part 1, General Principles⁴

3. Terminology

3.1 *Definitions*—For definitions of terms relating to this practice, see Terminology D 4092.

4. Summary of Practice

4.1 A specimen of known geometry is placed in mechanical oscillation either at fixed or natural resonant frequencies. Elastic or loss moduli, or both of the specimen are measured while varying time, temperature of the specimen or frequency, or both, of the oscillation. Plots of the elastic or loss moduli, or both, are indicative of viscoelastic characteristics of the specimen. Rapid changes in viscoelastic properties at particular temperatures, times, or frequency are normally referred to as transition regions.

NOTE 2—The particular method for measurement of elastic and loss moduli depends upon the operating principle of the instrument used.

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.

Current edition approved September 10, 2001. Published November 2001. Originally published as D 4065 – 82. Last previous edition D 4065 – 95.

² *Annual Book of ASTM Standards*, Vol 08.01.

³ *Annual Book of ASTM Standards*, Vol 08.02.

⁴ Available from American National Standards Institute, 25 W. 43rd St., New York, NY 10036.

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

