



Designation: D1043 – 16 (Reapproved 2024)

Standard Test Method for Stiffness Properties of Plastics as a Function of Temperature by Means of a Torsion Test¹

This standard is issued under the fixed designation D1043; 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 test method covers the determination of the stiffness characteristics of plastics over a wide temperature range by direct measurement of the apparent modulus of rigidity.

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

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—This test method and ISO 458-1 and ISO 458-2 address the same subject matter, but differ in technical content.

1.4 *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
- D638 Test Method for Tensile Properties of Plastics
- D747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam (Withdrawn 2019)³
- D883 Terminology Relating to Plastics
- D1053 Test Methods for Rubber Property—Stiffening at Low Temperatures: Flexible Polymers and Coated Fabrics

¹ This test method 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 Feb. 1, 2024. Published February 2024. Originally approved in 1949. Last previous edition approved in 2016 as D1043 – 16. DOI: 10.1520/D1043-16R24.

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 The last approved version of this historical standard is referenced on www.astm.org.

D4000 Classification System for Specifying Plastic Materials

D5947 Test Methods for Physical Dimensions of Solid Plastics Specimens

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

2.2 ISO Standards:⁴

ISO 458-1 Plastics—Determination of Stiffness in Torsion of Flexible Materials, Part 1: General Method

ISO 458-2 Plastics—Determination of Stiffness in Torsion of Flexible Materials, Part 2: Application to Plasticized Compounds of Homopolymers and Copolymers of Vinyl Chloride

3. Terminology

3.1 *Definitions*—For definitions of the technical terms pertaining to plastics used in this test method, see Terminology D883.

4. Significance and Use

4.1 The property measured by this test is the apparent modulus of rigidity, G , sometimes called the apparent shear modulus of elasticity. It is important to note that this property is not the same as the modulus of elasticity, E , measured in tension, flexure, or compression. The relationship between these properties is shown in Annex A1.

4.2 The measured modulus of rigidity is termed “apparent” since it is the value obtained by measuring the angular deflection occurring when the specimen is subjected to an applied torque. Since it is possible that the specimen will be deflected beyond its elastic limit, the calculated value will not always represent the true modulus of rigidity within the elastic limit of the material. In addition, the value obtained by this test method will also be affected by the creep characteristics of the material, since the load application time is arbitrarily fixed. For many materials, it is possible that there is a specification that requires the use of this test method, but with some procedural

⁴ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.

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