Designation: D 1043 – 02

Standard Test Method for Stiffness Properties of Plastics as a Function of Temperature by Means of a Torsion Test[1]

This standard is issued under the fixed designation D 1043; 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 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 and health practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—This test method is not equivalent to ISO 458/1:1985 or ISO 458/2:1985 and results cannot be directly compared between the two methods.

2. Referenced Documents

2.1 *ASTM Standards:*

D 618 Practice for Conditioning Plastics for Testing[2]

D 638 Test Method for Tensile Properties of Plastics[2]

D 747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam[2]

D 883 Terminology Relating to Plastics[2]

D 1053 Test Method for Rubber Property—Stiffening at Low Temperatures: Flexible Polymers and Coated Fabrics[3]

D 4000 Classification System for Specifying Plastic Materials[4]

D 4066 Classification System for Nylon Injection and Extrusion Materials[4]

D 4805 Terminology for Plastics Standards[5]

3. Terminology

3.1 *Definitions*—For definitions of the technical terms pertaining to plastics used in this test method, see Terminology D 883 or Terminology D 4805.

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 the specimen may be deflected beyond its elastic limit, the calculated value may not 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, there may be a specification that requires the use of this test method, but with some procedural modifications that take precedence when adhering to the specification. Therefore, it is advisable to refer to that material specification before using this test method. Table 1 in Classification D 4000 lists the current ASTM materials standards.

4.3 This test method is useful for determining the relative changes in stiffness over a wide range of temperatures.

5. Apparatus

5.1 *Testing Machine*—A machine capable of exerting a torque sufficient to deflect a test specimen in the range of 5 to 100° of arc, depending on the stiffness of the specimen and its span. A schematic diagram of a suitable machine is shown in Fig. 1.

NOTE 2—Two machines of different torque capacities are being used: one covers the range of approximately 0.0113 to 0.113 N·m (0.1 to 1.0 in.·lbf) and the other of approximately 0.113 to 1.81 N·m (1.0 to 16 in.·lbf)

[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 April 10, 2002. Published June 2002. Originally published as D 1043 – 49. Last previous edition D 1043 – 99.

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

[3] *Annual Book of ASTM Standards,* Vol 09.01.

[4] *Annual Book of ASTM Standards,* Vol 08.02.

[5] *Annual Book of ASTM Standards,* Vol 08.03.

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

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