



Designation: D575 – 91 (Reapproved 2018)

Standard Test Methods for Rubber Properties in Compression¹

This standard is issued under the fixed designation D575; 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 These test methods cover two test procedures for determining the compression-deflection characteristics of rubber compounds other than those usually classified as hard rubber and sponge rubber.

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.*

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

[D3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products](#)

[D3767 Practice for Rubber—Measurement of Dimensions](#)

[D4483 Practice for Evaluating Precision for Test Method Standards in the Rubber and Carbon Black Manufacturing Industries](#)

[E4 Practices for Force Verification of Testing Machines](#)

3. Summary of Test Methods

3.1 These tests constitute one kind of compression stiffness measurement. Deflection is the change in thickness of the

¹ These test methods are under the jurisdiction of ASTM Committee D11 on Rubber and Rubber-like Materials and are the direct responsibility of Subcommittee D11.10 on Physical Testing.

Current edition approved June 1, 2018. Published August 2018. Originally approved in 1940. Last previous edition approved in 2012 as D575 – 91 (2012). DOI: 10.1520/D0575-91R18.

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.

specimen upon application of a compressive force. The two different procedures are as follows:

3.1.1 *Test Method A—Compression Test of Specified Deflection*—A compression test in which the force required to cause a specified deflection is determined.

3.1.2 *Test Method B—Compression Test at Specified Force*—A compression test in which the specified mass or compressive force is placed on the specimen and the resulting deflection is measured and recorded.

4. Significance and Use

4.1 These test methods are useful in comparing stiffness of rubber materials in compression. They can be used by rubber technologists to aid in development of materials for compressive applications.

5. Apparatus

5.1 *Compression Testing Machine*—A compression testing machine conforming to the requirements of Practices E4, and having a rate of head travel of 12 ± 3 mm/m (0.5 ± 0.1 in./min), may be used for either type of test. Any other type machine that will meet these requirements may be used. For example, a platform scale equipped with a yoke over the platform and a hand-operated screw to apply the force will serve if it will conform to the requirements prescribed for accuracy and rate of travel. Compression tests at specified forces may be performed on any machine that applies minor and major forces gently, without impact, or by placing specified masses gently on the specimen. The machine shall be equipped to permit measurement of the deflection caused by the increase from minor force to major force.

5.2 *Deflection Gage*—The deflection shall be read on a gage of dial type graduated in hundredths of millimetres (or thousands of an inch).

5.3 *Micrometer*—The thickness of the specimen shall be measured in accordance with Test Method A of Practice D3767.

6. Test Specimens

6.1 The test may be performed either on rubber products or on standard test specimens, as specified.

NOTE 1—Comparable results are obtained only when tests are made on

specimens of exactly the same size and shape, tested to the same percentage deflection, or tested under the same force.

6.2 Standard test specimens shall be 28.6 ± 0.1 mm (1.129 \pm 0.005 in.) in diameter (650 mm² (1.000 in.²) in area) and 12.5 ± 0.5 mm (0.49 ± 0.02 in.) in thickness, from which all molded surface layers have been removed.

7. Preparation of Specimens

7.1 The standard test specimens may be prepared as follows: A slab approximately 13 mm (0.51 in.) in thickness may be cut from a product or may be molded from the same compound used in the preparation of the product and ground on both sides to obtain smooth parallel surfaces and the standard thickness of 12.5 ± 0.5 mm (0.49 ± 0.02 in.). The grinding shall be carried out as prescribed in Section 5 of Practice D3183 and shall be done without overheating the rubber. The specimens may then be cut from the slabs by means of a suitable rotating hollow cutting tool similar to that illustrated in Fig. 1. In cutting the specimen, the die shall be suitably rotated in a drill press or similar device and lubricated with soapy water so that a smooth-cut surface having square edges is obtained. The cutting pressure shall be kept sufficiently low to avoid “cupping” of the cut surface.

NOTE 2—The cutting tool is larger in diameter than the specimen to allow for cutting pressure.

7.2 When rubber products are subjected to these tests, the surfaces that will contact the platens of the testing machine shall be cleaned of any dust, bloom, grease, or other foreign material. Grinding is not required because tests on products are intended to be nondestructive.

8. Test Conditions

8.1 The temperature of the testing room shall be maintained at $23 \pm 2^\circ\text{C}$ ($73.4 \pm 3.6^\circ\text{F}$). The specimens to be tested shall be kept in this room for at least 3 h prior to the time of testing. Specimens that have compression properties affected by atmospheric moisture shall be conditioned in an atmosphere controlled to $50 \pm 6\%$ relative humidity for at least 24 h.

Test Method A—Compression Test at Specified Deflection

9. Nature of Test

9.1 In this test method the compressive forces are applied and removed in three successive cycles. The first two cycles are for the purpose of conditioning the specimen, and the readings are taken during the third application of force.

10. Procedure

10.1 After measuring the thickness of the test specimen, place the specimen between the platens of the testing machine. Place sheets of sandpaper³ between the rubber surfaces and the testing machine platens. The sandpaper resists lateral slippage of the rubber at the contact surfaces and should be slightly larger than the specimen. Omit the sandpaper when the surface of the specimen is bonded to metal.

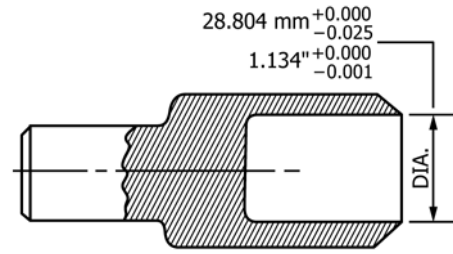


FIG. 1 Cutting Tool

10.2 Apply the force to produce a deflection rate of 12 ± 3 mm/min (0.5 ± 0.1 in./min) until the specified deflection is reached, after which release the force immediately at the same rate. Repeat this loading cycle a second time. Apply the force a third time until the specified deflection is again reached. Read and record the force required.

10.3 If desired, the machine may be stopped at intervals of 5 % deflection during the third application and the force recorded for each deflection so that a stress-strain curve may be drawn.

10.4 Deflection percentage shall be based on the thickness of the specimen prior to the first force application.

10.5 Report the median of values taken from three specimens.

Test Method B—Compression Test at Specified Force

11. Nature of Test

11.1 This test is intended for rapid testing with a constant force type of machine, although it can be performed on the other machines described in 5.1. Because speed with reasonable accuracy is desired, a single force application cycle is used.

12. Procedure

12.1 Apply a specified minor mass or force for a period long enough to adjust the deflection gage, after which apply the major force for 3 s. Read the deflection on the dial gage at the end of the 3-s period. The reading shall not include any deflection caused by the minor force. Calculate the percent deflection on the basis of the original thickness of the specimen.

12.2 Report the median of values taken from three specimens.

13. Report

13.1 Report the following information:

13.1.1 Deflection expressed as a percentage of the original thickness of the specimen,

13.1.2 Force in kilopascals or pounds-force per square inch, based on original cross section,

13.1.3 Description of sample and type of test specimen, including dimensions,

13.1.4 Description of test method and apparatus, and

13.1.5 Date of test.

³ 400 Grit waterproof sandpaper has been found satisfactory.