



Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers— Tension¹

This standard is issued under the fixed designation D412; 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 procedures used to evaluate the tensile (tension) properties of vulcanized thermoset rubbers and thermoplastic elastomers. These methods are not applicable to ebonite and similar hard, low elongation materials. The methods appear as follows:

Test Method A—Dumbbell and Straight Section Specimens
Test Method B—Cut Ring Specimens

NOTE 1—These two different methods do not produce identical results.

1.2 The values stated in either SI or non-SI units shall be regarded separately as normative for this standard. The values in each system may not be exact equivalents; therefore each system must be used independently, without combining values.

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.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D1349 Practice for Rubber—Standard Conditions for Testing

D1566 Terminology Relating to Rubber

D3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets

D3183 Practice for Rubber—Preparation of Pieces for Test Purposes from Products

D3767 Practice for Rubber—Measurement of Dimensions

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.

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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.

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

2.2 *ASTM Adjunct:*

Cut Ring Specimens, Method B (D412)³

2.3 *ISO Standards:*

ISO 37 Rubber, Vulcanized and Thermoplastic Determination of Tensile Stress-Strain Properties⁴

3. Terminology

3.1 *Definitions:*

3.1.1 *tensile set*—the extension remaining after a specimen has been stretched and allowed to retract in a specified manner, expressed as a percentage of the original length. (D1566)

3.1.2 *tensile set-after-break*—the tensile set measured by fitting the two broken dumbbell pieces together at the point of rupture.

3.1.3 *tensile strength*—the maximum tensile stress applied in stretching a specimen to rupture. (D1566)

3.1.4 *tensile stress*—a stress applied to stretch a test piece (specimen). (D1566)

3.1.5 *tensile stress at-given-elongation*—the stress required to stretch the uniform cross section of a test specimen to a given elongation. (D1566)

3.1.6 *thermoplastic elastomers*—a diverse family of rubber-like materials that unlike conventional vulcanized rubbers can be processed and recycled like thermoplastic materials.

3.1.7 *ultimate elongation*—the elongation at which rupture occurs in the application of continued tensile stress.

3.1.8 *yield point*—that point on the stress-strain curve, short of ultimate failure, where the rate of stress with respect to strain, goes through a zero value and may become negative. (D1566)

³ Detailed drawings are available from ASTM Headquarters, 100 Barr Harbor Drive, Conshohocken, PA 19428. Order Adjunct No. ADJD0412.

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.