



Designation: D 1229 – 87 (Reapproved 1997)^{ε1}

Standard Test Method for Rubber Property—Compression Set at Low Temperatures¹

This standard is issued under the fixed designation D 1229; 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.

^{ε1} NOTE—Keywords were added and equations in 9.1 were corrected editorially in March 1998.

1. Scope

1.1 This test method covers evaluation of the ability of vulcanized rubbers that have been compressed at room temperature and then subjected to low temperature (air or carbon dioxide atmosphere), to recover from deformation when taken from the clamping device while still at the low temperature.

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.*

2. Referenced Documents

2.1 ASTM Standards:

D 395 Test Methods for Rubber Property—Compression Set²

D 832 Practice for Rubber Conditioning for Low Temperature Testing²

D 3767 Practice for Rubber—Measurement of Dimensions²

D 4483 Practice for Determining Precision for Test Method Standards in the Rubber and Carbon Black Industries²

3. Summary of Test Method

3.1 At room temperature, a test specimen is compressed to 25 % of its original thickness and exposed for a specified time at a specified low temperature.

3.2 Upon release from compression, the specimen is allowed to recover while remaining at the test temperature.

3.3 The residual deformation of the specimen is measured 10 s and 30 min after removal from the compressive device.

3.4 Compression set of the specimen is calculated according to the equations in 9.1.

4. Significance and Use

4.1 Rubber products, such as hydraulic seals on aircraft, submarine hatch gaskets, and hydraulic brake cups, may be exposed to varying temperature extremes. This test method provides a means of determining the extent to which recovery from compression at normal ambient temperatures is inhibited upon release of the compressive force during subsequent exposure at low temperatures.

5. Compression Set

5.1 For the purpose of this test method, compression set of vulcanizates shall be the loss in thickness of the specimen expressed as a percentage of the original deflection. This set, unlike conventional compression set at elevated temperatures, is temporary since the specimen will regain its original dimensions when brought back to room temperature or slightly above.

6. Apparatus

6.1 *Compression Set Jigs*, with suitable steel spacer bars in accordance with Method B of Test Methods D 395.

6.2 *Dial Micrometer*, as described in Practice D 3767.

6.3 *Cold Box*, cooled by solid carbon dioxide (Dry Ice), liquid carbon dioxide, liquid nitrogen, or mechanically refrigerated, preferably by the top-opening type, and capable of temperature control within $\pm 1^\circ\text{C}$ (1.8°F) of the specified testing temperature as prescribed in Practice D 832. The test chamber shall be equipped with a vise, “C” clamp, or other suitable device for holding the compression set jig.

7. Test Specimen

7.1 The standard test specimen shall be a cylindrical disk 29.0 ± 0.5 mm (1.14 ± 0.02 in.) in diameter and 12.5 ± 0.5 mm (0.49 ± 0.02 in.) in thickness, as specified in Test Methods D 395.

8. Procedure

8.1 *Original Thickness Measurement*—Measure the original thickness, t_o , at the center of the specimen to the nearest 0.02 mm (0.001 in.).

8.2 *Application of Load*—Place a test specimen between

¹ This test method is under the jurisdiction of ASTM Committee D-11 on Rubber and is the direct responsibility of Subcommittee D11.14 on Time and Temperature-Dependent Physical Properties.

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² *Annual Book of ASTM Standards*, Vol 09.01.