



Designation: D1229 – 03 (Reapproved 2024)

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

This standard is issued under the fixed designation D1229; 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 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, 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

D395 Test Methods for Rubber Property—Compression Set
D832 Practice for Rubber Conditioning For Low Temperature Testing

D3767 Practice for Rubber—Measurement of Dimensions

D4483 Practice for Evaluating Precision for Test Method Standards in the Rubber and Carbon Black Manufacturing Industries

¹ This test method is under the jurisdiction of ASTM Committee D11 on Rubber and Rubber-like Materials and is 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 www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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 **D395**.

6.2 *Dial Micrometer*, as described in Practice **D3767**.

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 **D832**. The test chamber shall be equipped with a vise, “C” clamp, or other suitable device for holding the compression set jig.