



Standard Test Method for Creep Properties of Adhesives in Shear by Tension Loading (Metal-to-Metal)¹

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1. Scope

1.1 This test method covers the determination of the creep properties of adhesives for bonding metals when tested on a standard specimen and subjected to certain conditions of temperature and tensile stress in a spring-loaded testing apparatus.

1.2 This test method is applicable to the temperature range from -55 to $+260^{\circ}\text{C}$ (-67 to $+500^{\circ}\text{F}$).

1.3 The values stated in SI units are to be regarded as standard. The inch-pound units in parentheses are for information only.

1.4 *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 638 Test Method for Tensile Properties of Plastics²

D 907 Terminology of Adhesives³

D 1002 Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens By Tension Loading (Metal-to-Metal)³

3. Terminology

3.1 *Definitions*—Many terms in this test method are defined in Terminology D 907.

4. Significance and Use

4.1 This test method is useful in research and development for comparison of creep properties of adhesives, particularly as those properties are affected by changes in adhesive formulation or expected service conditions, including temperature, moisture level, and duration of loading.

4.2 The relative size and simplicity of design of the spring-loaded apparatus permits easy portability and transfer from one

environment to the next without disturbing static loads.

4.3 The relative simplicity of design with inexpensive materials permits replication of creep tests at relatively low costs.

5. Apparatus

5.1 *Tension Creep Test Apparatus*, as shown in Fig. 1.⁴ It shall consist of a hollow loading chamber, a solid extension rod with provisions for attachment of test specimens, and a high-temperature-resistant spring.⁵ A testing machine conforming to the requirements of Test Method D 638 is required to apply the static load.

5.2 *Microscope*, calibrated, having $100\times$ magnification.

6. Test Specimens

6.1 Test specimens shall conform to the shape and dimensions shown in Fig. 2. These specimens are similar to the tension lap shear specimens described in Test Method D 1002, except for the holes as shown in Fig. 2.

6.2 Test at least three specimens for each set of standard conditions of load, time, and temperature.

6.3 A complete description of these specimens and the method of preparation is given in Sections 6, 7, and 8 of Test Method D 1002.

6.4 For creep measurements, polish the 12.7-mm ($\frac{1}{2}$ -in.) edges of the bonded area of each test specimen, and scribe with three fine lines across the bondline (Fig. 1).

7. Procedure

7.1 Attach the test apparatus to a testing machine and condition to a prescribed test temperature. Place a specimen within the load chamber of the test apparatus (Fig. 2), and attach to the chamber and load shaft by means of pins.

7.2 Apply the load by the test machine at a rate of 80 to 100 $\text{kgf}/\text{cm}^2/\text{min}$ (1200 to 1400 psi/min). After reaching the desired load, turn up the knurled supporting ring to make contact with the disk (that is, touch plus $\frac{1}{4}$ turn) supporting the compressed spring. Unload the testing machine, remove the entire creep test apparatus (except the loading yoke) from the testing

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

³ *Annual Book of ASTM Standards*, Vol 15.06.

⁴ Detailed working drawings for the construction of the tensile creep test apparatus are available at a nominal cost from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428. Request Adjunct No. 12-422940-00.

⁵ Springs suitable for this apparatus may be obtained from the W. D. Gibson Co., Chicago, IL.