



Designation: D2990 – 17

Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep- Rupture of Plastics¹

This standard is issued under the fixed designation D2990; 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 the determination of tensile and compressive creep and creep-rupture of plastics under specified environmental conditions (see 3.2).

1.2 In these test methods three-point loading, as described in Test Methods D790, is used for measurement of creep in flexure. However, four-point loading using the equipment and principles described in D6272 is also permitted as an option.

1.3 For measurements of creep-rupture, tension is the preferred stress mode because for some ductile plastics rupture does not occur in flexure or compression.

1.4 Test data obtained by these test methods are relevant and appropriate for use in engineering design.

1.5 The values stated in SI units are to be regarded as the standard. The values in parentheses are for information only.

1.6 *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.* A specific warning statement is given in 6.8.2.

NOTE 1—This standard and ISO 899 Parts 1 and 2 address the same subject matter, but differ in technical content (and results cannot be directly compared between the two test methods). ISO 899 Part 1 addresses tensile creep and creep to rupture and ISO 899 Part 2 addresses flexural creep. Compressive creep is not addressed in ISO 899.

2. Referenced Documents

2.1 ASTM Standards:²

D543 Practices for Evaluating the Resistance of Plastics to Chemical Reagents

¹ These test methods are under the jurisdiction of ASTM Committee D20 on Plastics and are the direct responsibility of Subcommittee D20.10 on Mechanical Properties.

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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.

D618 Practice for Conditioning Plastics for Testing
D638 Test Method for Tensile Properties of Plastics
D695 Test Method for Compressive Properties of Rigid Plastics
D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
D883 Terminology Relating to Plastics
D1822 Test Method for Tensile-Impact Energy to Break Plastics and Electrical Insulating Materials
D4000 Classification System for Specifying Plastic Materials
D4065 Practice for Plastics: Dynamic Mechanical Properties: Determination and Report of Procedures
D4968 Practice for Annual Review of Test Methods and Specifications for Plastics
D5947 Test Methods for Physical Dimensions of Solid Plastics Specimens
D6272 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials by Four-Point Bending

3. Terminology

3.1 Definitions:

3.1.1 For definitions of terms used in this test method and associated with plastics issues refer to the terminology contained in standard D883.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *creep modulus*—the ratio of initial applied stress to creep strain.

3.2.2 *creep strain*—the total strain, at any given time, produced by the applied stress during a creep test.

3.2.2.1 *Discussion*—The term creep, as used in this test method, reflects current plastics engineering usage. In scientific practice, creep is often defined to be the nonelastic portion of strain. However, this definition is not applicable to existing engineering formulas. Plastics have a wide spectrum of retardation times, and elastic portions of strain cannot be separated in practice from nonelastic. Therefore, wherever “strain” is mentioned in these test methods, it refers to the sum of elastic strain plus the additional strain with time.

*A Summary of Changes section appears at the end of this standard