



Designation: D7791 – 22

Standard Test Method for Uniaxial Fatigue Properties of Plastics¹

This standard is issued under the fixed designation D7791; 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.

1. Scope*

1.1 This test method covers the determination of dynamic fatigue properties of plastics in uniaxial loading. This method is applicable to rigid and semi-rigid plastics. Uniaxial loading systems with tension and compression capabilities are used to determine these properties. Stress and strain levels are below the proportional limits of the material where the strains and stresses are relatively elastic.

1.2 This test method can be used with two procedures:

1.2.1 *Procedure A*, fatigue testing in tension.

1.2.2 *Procedure B*, fatigue testing in compression, only for rigid plastics.

1.3 Comparative tests can be run in accordance with either procedure, provided that the procedure is found satisfactory for the material being tested.

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

1.5 *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.*

NOTE 1—There is no known ISO equivalent to this standard.

1.6 *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

D618 Practice for Conditioning Plastics for Testing

¹ This test method is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.10 on Mechanical Properties. Current edition approved July 1, 2022. Published July 2022. Originally approved in 2012. Last previous edition approved in 2017 as D7791 - 17. DOI:10.1520/D7791-22.

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.

D638 Test Method for Tensile Properties of Plastics
D695 Test Method for Compressive Properties of Rigid Plastics
D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
D883 Terminology Relating to Plastics
D1505 Test Method for Density of Plastics by the Density-Gradient Technique
D2839 Practice for Use of a Melt Index Strand for Determining Density of Polyethylene
D3479/D3479M Test Method for Tension-Tension Fatigue of Polymer Matrix Composite Materials
D4883 Test Method for Density of Polyethylene by the Ultrasound Technique
D5947 Test Methods for Physical Dimensions of Solid Plastics Specimens
E4 Practices for Force Calibration and Verification of Testing Machines
E83 Practice for Verification and Classification of Extensometer Systems
E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods
E466 Practice for Conducting Force Controlled Constant Amplitude Axial Fatigue Tests of Metallic Materials
E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
E1942 Guide for Evaluating Data Acquisition Systems Used in Cyclic Fatigue and Fracture Mechanics Testing

3. Terminology

3.1 *Definitions*—Definitions of terms applying to this test method appear in Terminology **D883**.

3.2 *Definitions*:

3.2.1 *compressive proportional limit*—maximum elastic stress or strain exhibited by a material in compression as observed in Test Method **D695**.

3.2.2 *mean strain, n*—algebraic average of the maximum and minimum strains in one cycle.

3.2.3 *mean stress, n*—algebraic average of the maximum and minimum stresses in one cycle.

3.2.4 *R ratio, n*—ratio of the minimum stress or strain to the maximum stress or strain that the specimen is loaded.

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