



Designation: D790 – 17

Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials¹

This standard is issued under the fixed designation D790; 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 are used to determine the flexural properties of unreinforced and reinforced plastics, including high modulus composites and electrical insulating materials utilizing a three-point loading system to apply a load to a simply supported beam (specimen). The method is generally applicable to both rigid and semi-rigid materials, but flexural strength cannot be determined for those materials that do not break or yield in the outer surface of the test specimen within the 5.0 % strain limit.

1.2 Test specimens of rectangular cross section are injection molded or, cut from molded or extruded sheets or plates, or cut from molded or extruded shapes. Specimens must be solid and uniformly rectangular. The specimen rests on two supports and is loaded by means of a loading nose midway between the supports.

1.3 Measure deflection in one of two ways; using crosshead position or a deflectometer. Please note that studies have shown that deflection data obtained with a deflectometer will differ from data obtained using crosshead position. The method of deflection measurement shall be reported.

NOTE 1—Requirements for quality control in production environments are usually met by measuring deflection using crosshead position. However, more accurate measurement may be obtained by using an deflection indicator such as a deflectometer.

NOTE 2—Materials that do not rupture by the maximum strain allowed under this test method may be more suited to a 4-point bend test. The basic difference between the two test methods is in the location of the maximum bending moment and maximum axial fiber stresses. The maximum axial fiber stresses occur on a line under the loading nose in 3-point bending and over the area between the loading noses in 4-point bending. A four-point loading system method can be found in Test Method [D6272](#).

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 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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1.5 *The text of this standard references notes and footnotes that provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the standard.*

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.*

NOTE 3—This standard and ISO 178 address the same subject matter, but differ in technical content.

1.7 *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](#)
- [D638 Test Method for Tensile Properties of Plastics](#)
- [D883 Terminology Relating to Plastics](#)
- [D4000 Classification System for Specifying Plastic Materials](#)
- [D4101 Specification for Polypropylene Injection and Extrusion Materials](#)
- [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](#)
- [E4 Practices for Force Verification of Testing Machines](#)
- [E83 Practice for Verification and Classification of Extensometer Systems](#)

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.

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