



Standard Test Method for Monotonic Compressive Strength Testing of Continuous Fiber-Reinforced Advanced Ceramics with Solid Rectangular Cross-section Specimens at Ambient Temperatures¹

This standard is issued under the fixed designation C 1358; 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 compressive strength including stress-strain behavior under monotonic uniaxial loading of continuous fiber-reinforced advanced ceramics at ambient temperatures. This test method addresses, but is not restricted to, various suggested test specimen geometries as listed in the appendix. In addition, specimen fabrication methods, testing modes (load, displacement, or strain control), testing rates (load rate, stress rate, displacement rate, or strain rate), allowable bending, and data collection and reporting procedures are addressed. Compressive strength as used in this test method refers to the compressive strength obtained under monotonic uniaxial loading where monotonic refers to a continuous nonstop test rate with no reversals from test initiation to final fracture.

1.2 This test method applies primarily to advanced ceramic matrix composites with continuous fiber reinforcement: uni-directional (1-D), bi-directional (2-D), and tri-directional (3-D) or other multi-directional reinforcements. In addition, this test method may also be used with glass (amorphous) matrix composites with 1-D, 2-D, 3-D, and other multi-directional continuous fiber reinforcements. This test method does not directly address discontinuous fiber-reinforced, whisker-reinforced, or particulate-reinforced ceramics, although the test methods detailed here may be equally applicable to these composites.

1.3 The values stated in SI units are to be regarded as the standard and are in accordance with Practice E 380.

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. Refer to Section 7 for specific precautions.*

2. Referenced Documents

2.1 ASTM Standards:

C 1145 Terminology of Advanced Ceramics²

D 695M Test Method for Compressive Properties of Rigid Plastics [Metric]³

D 3379 Test Method for Tensile Strength and Young's Modulus for High-Modulus Single-Filament Materials⁴

D 3410/D 3410M Test Method for Compressive Properties of Polymer Matrix Composite Materials With Unsupported Gage Section by Shear Loading⁴

D 3479 Test Methods for Tension-Tension Fatigue of Oriented Fiber, Resin Matrix Composites⁴

D 3878 Terminology of High Modulus Reinforcing Fibers and Their Composites⁴

E 4 Practices for Force Verification of Testing Machines⁵

E 6 Terminology Relating to Methods of Mechanical Testing⁵

E 83 Practice for Verification and Classification of Extensometers⁵

E 337 Test Method for Measuring Humidity with Psychrometer (the Measurement of Wet-and Dry-Bulb Temperatures)⁶

E 380 Practice for Use of International System of Units (SI) (the Modernized Metric System)⁶

E 1012 Practice for Verification of Specimen Alignment Under Tensile Loading⁴

3. Terminology

3.1 Definitions:

3.1.1 The definitions of terms relating to compressive testing, advanced ceramics, and fiber-reinforced composites, appearing in Terminology E 6, Test Method D 695M, Practice E 1012, Terminology C 1145, Test Method D 3410, and Terminology D 3878 apply to the terms used in this test method. Pertinent definitions are shown as follows with the appropriate source given in parentheses. Additional terms used in conjunction with this test method are defined in 3.2.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *advanced ceramic, n*—a highly engineered, high-performance predominantly non-metallic, inorganic, ceramic

¹ This test method is under the jurisdiction of ASTM Committee C-28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.07 on Ceramic Matrix Composites.

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² *Annual Book of ASTM Standards*, Vol 15.01.

³ *Annual Book of ASTM Standards*, Vol 08.01.

⁴ *Annual Book of ASTM Standards*, Vol 15.03.

⁵ *Annual Book of ASTM Standards*, Vol 03.01.

⁶ *Annual Book of ASTM Standards*, Vols 07.02, 11.03, and 15.09.

