



Standard Test Method for Ultimate Strength of Advanced Ceramics with Diametrically Compressed C-Ring Specimens at Ambient Temperature¹

This standard is issued under the fixed designation C1323; 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 ultimate strength under monotonic loading of advanced ceramics in tubular form at ambient temperatures. The ultimate strength as used in this test method refers to the strength obtained under monotonic compressive loading of C-ring specimens such as shown in Fig. 1 where monotonic refers to a continuous nonstop test rate with no reversals from test initiation to final fracture. This method permits a range of sizes and shapes since test specimens may be prepared from a variety of tubular structures. The method may be used with microminiature test specimens.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.2.1 Values expressed in this test method are in accordance with the International System of Units (SI) and **IEEE/ASTM SI 10**.

1.3 *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:²

C1145 Terminology of Advanced Ceramics

C1161 Test Method for Flexural Strength of Advanced Ceramics at Ambient Temperature

C1239 Practice for Reporting Uniaxial Strength Data and Estimating Weibull Distribution Parameters for Advanced Ceramics

¹ This test method is under the jurisdiction of ASTM Committee C28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.04 on Applications.

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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.

C1322 Practice for Fractography and Characterization of Fracture Origins in Advanced Ceramics

C1368 Test Method for Determination of Slow Crack Growth Parameters of Advanced Ceramics by Constant Stress-Rate Strength Testing at Ambient Temperature

C1683 Practice for Size Scaling of Tensile Strengths Using Weibull Statistics for Advanced Ceramics

E4 Practices for Force Verification of Testing Machines

E6 Terminology Relating to Methods of Mechanical Testing

E337 Test Method for Measuring Humidity with a Psychrometer (the Measurement of Wet- and Dry-Bulb Temperatures)

IEEE/ASTM SI 10 American National Standard for Use of the International System of Units (SI): The Modern Metric System

3. Terminology

3.1 Definitions:

3.1.1 *advanced ceramic*—an engineered, high-performance, predominately nonmetallic, inorganic, ceramic material having specific functional qualities. **(C1145)**

3.1.2 *breaking force*—the force at which fracture occurs. **(E6)**

3.1.3 *C-ring*—circular test specimen geometry with the mid-section (slot) removed to allow bending displacement (compression or tension). **(E6)**

3.1.4 *flexural strength*—a measure of the ultimate strength of a specified beam in bending.

3.1.5 *modulus of elasticity*—the ratio of stress to corresponding strain below the proportional limit. **(E6)**

3.1.6 *slow crack growth*—subcritical crack growth (extension) which may result from, but is not restricted to, such mechanisms as environmentally assisted stress corrosion or diffusive crack growth.

4. Significance and Use

4.1 This test method may be used for material development, material comparison, quality assurance, and characterization. Extreme care should be exercised when generating design data.

4.2 For a C-ring under diametral compression, the maximum tensile stress occurs at the outer surface. Hence, the