



Standard Test Method for Determination of Thermal Shock Resistance for Advanced Ceramics by Water Quenching¹

This standard is issued under the fixed designation C1525; 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 describes the determination of the resistance of advanced ceramics to thermal shock by water quenching. The method builds on the experimental principle of rapid quenching of a test specimen at an elevated temperature in a water bath at room temperature. The effect of the thermal shock is assessed by measuring the reduction in flexural strength produced by rapid quenching of test specimens heated across a range of temperatures. For a quantitative measurement of thermal shock resistance, a critical temperature interval is determined by a reduction in the mean flexural strength of at least 30 %. The test method does not determine thermal stresses developed as a result of a steady state temperature differences within a ceramic body or of thermal expansion mismatch between joined bodies. The test method is not intended to determine the resistance of a ceramic material to repeated shocks. Since the determination of the thermal shock resistance is performed by evaluating retained strength, the method is not suitable for ceramic components; however, test specimens cut from components may be used.

1.2 The test method is intended primarily for dense monolithic ceramics, but may also be applicable to certain composites such as whisker- or particulate-reinforced ceramic matrix composites that are macroscopically homogeneous.

1.3 Values expressed in this standard test method are in accordance with the International System of Units (SI) and Standard [IEEE/ASTM SI 10](#).

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.*

¹ This test method is under the jurisdiction of ASTM Committee C28 on Advanced Ceramics and is the direct responsibility of Subcommittee C28.01 on Mechanical Properties and Performance.

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2. Referenced Documents

2.1 ASTM Standards:²

[C373](#) Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whitespace Products, Ceramic Tiles, and Glass Tiles

[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

[C1322](#) Practice for Fractography and Characterization of Fracture Origins in Advanced Ceramics

[E4](#) Practices for Force Verification of Testing Machines

[E6](#) Terminology Relating to Methods of Mechanical Testing

[E616](#) Terminology Relating to Fracture Testing (Discontinued 1996) (Withdrawn 1996)³

[IEEE/ASTM SI 10](#) Standard for Use of the International System of Units (SI): The Modern Metric System

2.2 European Standard:

[EN 820-3](#) Advanced Technical Ceramics—Monolithic Ceramics—Thermomechanical Properties—Part 3: Determination of Resistance to Thermal Shock by Water Quenching⁴

3. Terminology

3.1 Definitions:

3.1.1 The terms described in Terminologies [C1145](#), [E6](#), and [E616](#) are applicable to this standard test method. Specific terms relevant to this test method are as follows:

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from European Committee for Standardization (CEN), 36 rue de Stassart, B-1050, Brussels, Belgium, <http://www.cenorm.be>.