



Standard Test Method for Through-Thickness “Flatwise” Tensile Strength and Elastic Modulus of a Fiber-Reinforced Polymer Matrix Composite Material¹

This standard is issued under the fixed designation D7291/D7291M; 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 determines the through-thickness “flatwise” tension strength and elastic modulus of fiber reinforced polymer matrix composite materials. A tensile force is applied normal to the plane of the composite laminate using adhesively bonded thick metal end-tabs. The composite material forms are limited to continuous-fiber or discontinuous fiber (tape or 2-dimensional fabric, or both) reinforced composites.

1.2 The through-thickness strength results using this test method will in general not be comparable to Test Method [D6415](#) since this method subjects a relatively large volume of material to an almost uniform stress field while Test Method [D6415](#) subjects a small volume of material to a non-uniform stress field.

1.3 The values stated in either SI units or inch-pound units are to be regarded separately as standard. Within the text, the inch-pound units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with the standard.

1.4 *This standard does not purport to address all of the safety problems, 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

[D792](#) Test Methods for Density and Specific Gravity (Rela-

tive Density) of Plastics by Displacement
[D883](#) Terminology Relating to Plastics
[D3171](#) Test Methods for Constituent Content of Composite Materials
[D3878](#) Terminology for Composite Materials
[D5229/D5229M](#) Test Method for Moisture Absorption Properties and Equilibrium Conditioning of Polymer Matrix Composite Materials
[D5687/D5687M](#) Guide for Preparation of Flat Composite Panels with Processing Guidelines for Specimen Preparation
[D6415](#) Test Method for Measuring the Curved Beam Strength of a Fiber-Reinforced Polymer-Matrix Composite
[E4](#) Practices for Force Verification of Testing Machines
[E6](#) Terminology Relating to Methods of Mechanical Testing
[E122](#) Practice for Calculating Sample Size to Estimate, With Specified Precision, the Average for a Characteristic of a Lot or Process
[E177](#) Practice for Use of the Terms Precision and Bias in ASTM Test Methods
[E251](#) Test Methods for Performance Characteristics of Metallic Bonded Resistance Strain Gages
[E456](#) Terminology Relating to Quality and Statistics
[E691](#) Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method
[E1012](#) Practice for Verification of Testing Frame and Specimen Alignment Under Tensile and Compressive Axial Force Application
[E1309](#) Guide for Identification of Fiber-Reinforced Polymer-Matrix Composite Materials in Databases (Withdrawn 2015)³
[E1434](#) Guide for Recording Mechanical Test Data of Fiber-Reinforced Composite Materials in Databases (Withdrawn 2015)³
[E1471](#) Guide for Identification of Fibers, Fillers, and Core Materials in Computerized Material Property Databases (Withdrawn 2015)³

¹ This test method is under the jurisdiction of ASTM Committee [D30](#) on Composite Materials and is the direct responsibility of Subcommittee [D30.06](#) on Interlaminar Properties.

Current edition approved Oct. 1, 2015. Published November 2015. Originally approved in 2007. Last previous edition approved in 2007 as D7291/D7291M-07. DOI: 10.1520/D7291_D7291M-15.

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.