



Designation: D8069 – 17a

Standard Test Method for Determining Flexural Modulus of Full Section Pultruded Fiber Reinforced Polymer (FRP) Composite Members with Doubly Symmetric Cross Sections under Bending¹

This standard is issued under the fixed designation D8069; 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 Flexural Modulus of pultruded open and closed fiber reinforced polymer (FRP) composites of doubly symmetrical cross sections (sections having geometric symmetry about both the major and minor axes) about their geometric centroid subjected to flexure and shear. This test method utilizes a three-point loading system applied to a simply supported beam.

1.2 The values stated in SI units are to be regarded as the standard. The values provided in parentheses are for information only.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

NOTE 1—The is no known ISO equivalent to this standard.

1.4 *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

D883 Terminology Relating to Plastics

D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

¹ This test method is under the jurisdiction of ASTM Committee **D20** on Plastics and is the direct responsibility of Subcommittee **D20.18** on Reinforced Thermosetting Plastics.

Current edition approved Dec. 1, 2017. Published January 2018. Originally approved in 2017. Last previous edition approved in 2017 as D8069–17. DOI: 10.1520/D8069-17A.

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.

D3878 Terminology for Composite Materials

D4000 Classification System for Specifying Plastic Materials

D4762 Guide for Testing Polymer Matrix Composite Materials

E4 Practices for Force Verification of Testing Machines

E6 Terminology Relating to Methods of Mechanical Testing

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

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

E2309/E2309M Practices for Verification of Displacement Measuring Systems and Devices Used in Material Testing Machines

3. Terminology

3.1 *Definitions*—Terminology **D3878** defines terms relating to high-modulus fibers and their composites. Terminology **D883** defines terms relating to plastics. Terminology **E6** defines terms relating to mechanical testing. In the event of a conflict between terms, Terminology **D3878** shall have precedence over the other terminologies.

3.2 Definitions of variables used in calculations as shown in Section **11** and **12** are as follows:

$P_{20\%}$ = 20% of estimated ultimate load, N (lbf)

I = moment of inertia about the neutral axis, mm⁴ (in.⁴)

L = test span length, mm (in.)

h = total height of test specimen, mm (in.)

$P_{5\%}$ = 5% of estimated ultimate load, N (lbf)

P = load value used to calculate E , N (lbf)

δ = deflection value used to calculate E , mm (in.)

$\delta_{20\%}$ = deflection at 20% of estimated ultimate load, mm (in.)

$\delta_{5\%}$ = deflection at 5% of estimated ultimate load, mm (in.)

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

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