



Designation: D5649 – 01 (Reapproved 2008)

## Standard Test Method for Torque Strength of Adhesives Used on Threaded Fasteners<sup>1</sup>

This standard is issued under the fixed designation D5649; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method is used to make comparative assessments of the securing or locking effect of adhesives used in threaded assemblies.

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

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:*<sup>2</sup>

D907 Terminology of Adhesives

D2651 Guide for Preparation of Metal Surfaces for Adhesive Bonding

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

### 3. Terminology

3.1 *Definitions*—For technical terms pertaining to adhesives, see Terminology D907.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *breakaway torque, n*—the initial torque required to break the bond measured at the first movement between the nut and the bolt when unscrewing an unseated assembly.

3.2.2 *on torque, n*—the maximum torque required to screw the nut onto a preapplied adhesive-coated bolt.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D14.60 on Adhesive Material Classification System.

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<sup>2</sup> 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.

3.2.3 *prevailing torque, n*—the torque measured after the initial breakage of the bond measured at 180° rotation of the nut.

### 4. Summary of Test Method

4.1 This test method consists of determining the torque required to unscrew a bonded nut and bolt assembly. Breakaway torque and prevailing torque are determined.

### 5. Significance and Use

5.1 This test method provides reasonably accurate information with regard to the determination of the securing or locking effect of adhesives used in threaded fasteners. This test method may also be used to determine the degree of cure and the effect of environment on torque strength.

5.2 The accuracy of the test results depends to a large degree on the thread clearance of the test fasteners and the inclusion of air bubbles in the bond line. Data generated by this test method should be safety-factored accordingly if used as quality assurance acceptance or rejection.

### 6. Apparatus

6.1 *Electronic Recording*—Test machine consisting of a clamping device to secure the bolt head, and a device for turning the nut with simultaneous measurement and registration of the torque as a function of the angle of turning by direct analog or digital means.

6.2 *Direct Reading*—A clamping device to secure the head of the bolt, and a torque wrench accurate to  $\pm 5\%$ .

### 7. Test Specimens

7.1 Any size and substrate fasteners may be used upon agreement between the supplier and the user of adhesives.

7.2 Unless otherwise agreed upon between the user and the adhesive manufacturer, degrease all non-plated nuts and bolts (refer to Guide D2651), store in an atmosphere of low humidity, and keep them clean.

7.3 Where desired, and if agreed upon between the user and the adhesive manufacturer, non-plated nuts and bolts may be used as received, reoiled, or after other special treatments.

7.4 Plated nuts and bolts do not normally require any special cleaning prior to assembly.