



Designation: D 3658 – 01

## Standard Test Method for Determining the Torque Strength of Ultraviolet (UV) Light- Cured Glass/Metal Adhesive Joints<sup>1</sup>

This standard is issued under the fixed designation D 3658; 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 covers the simplistic comparison of strengths of glass/metal joints when the adhesive is cured by ultraviolet (UV) radiation and standard specimens are used and tested under specified conditions of preparation, radiation, and load.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are provided for information purposes only.

1.3 This test method involves torque loading UV-bonded hexagonal metal blocks to glass plates.

1.4 This test method may be used to obtain comparative torque strength-to-failure data for other bonded joint systems, radiation cured or not.

1.5 *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:

A 109 Specification for Steel, Strip, Carbon, (0.25 Maximum Percent), Cold-Rolled<sup>2</sup>

A 167 Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip<sup>2</sup>

B 36 Specification for Brass Plate, Sheet, Strip, and Rolled Bar<sup>3</sup>

B 152 Specification for Copper Sheet, Strip, Plate and Rolled Bar<sup>3</sup>

B 209 Specification for Aluminum and Aluminum-Alloy Sheet and Plate<sup>4</sup>

B 265 Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate<sup>5</sup>

D 907 Terminology of Adhesives<sup>6</sup>

D 1002 Test Method for Apparent Shear Strength of Single-Lap-Joint Adhesively Bonded Metal Specimens by Tension Loading (Metal-to-Metal)<sup>6</sup>

### 3. Terminology

3.1 *Definitions*—Many of the terms in this test method are defined in Terminology D 907.

### 4. Significance and Use

4.1 This test method provides reasonably accurate information with regard to the ability of UV curing adhesives to withstand torsional shearing forces. It may be used to determine the effect of environment on torsional shear strength.

### 5. Apparatus

5.1 Test system consisting of apparatus capable of transferring a uniform and continuous torque to the bonded hexagonal block (schematically shown in Fig. 1), and a safety shield or other safety device to prevent injury from possible shattering glass.

5.2 An accurate and reliable means of recording load to failure, that is, x-y or strip chart recorder, should also be part of the test system.

### 6. Test Specimens

6.1 Recommended specimens are as shown in Fig. 2.

6.2 Selection of the test metal for hexagonal blocks is at the discretion of the user; however, the following grades are recommended (see Test Method D 1002):

Metal	Specification
Brass	B 36, Alloy 8
Copper	B 152, Type A
Aluminum	B 209, Alloy 2024, T3 Temper
Steel	A 109, Grade 2
Corrosion-resisting steel	A 167, Type 302
Titanium	B 265

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D14 on Adhesives and is the direct responsibility of Subcommittee D 14.80 on Metal Bonding Adhesives.

Current edition approved March 10, 2001. Published May 2001. Originally published as D 3658 – 78. Last previous edition D 3658 – 90 (1995).

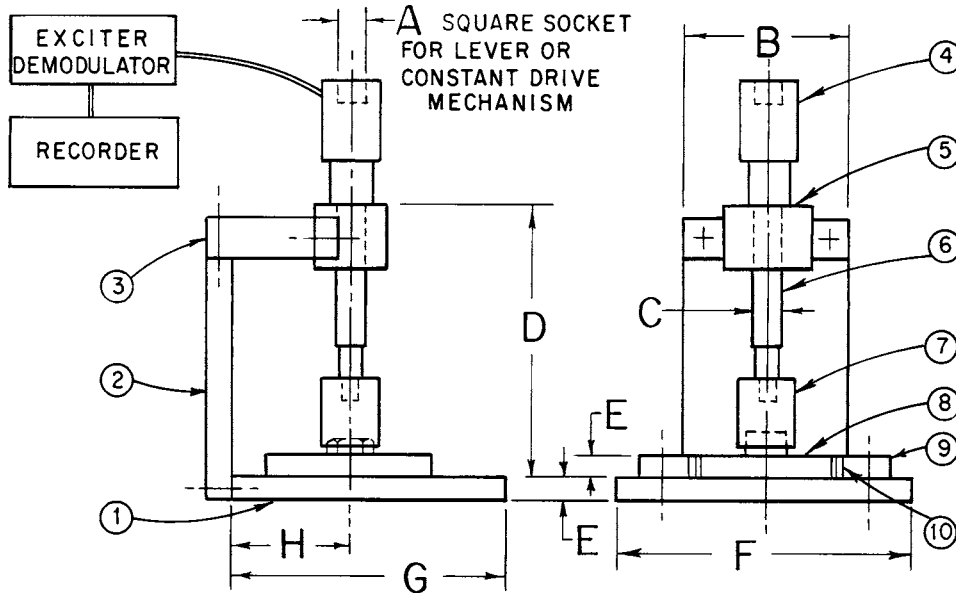
<sup>2</sup> *Annual Book of ASTM Standards*, Vol 01.03.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 02.01.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 02.02.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 02.04.

<sup>6</sup> *Annual Book of ASTM Standards*, Vol 15.06.



Details

- 1—Base plate
- 2—Upright
- 3—Mounting bracket
- 4—Lebow socket wrench sensor Model 2133-103
- 5—Pillow block—Boston #PPB10
- 6—Extension—Armstrong #4-105 A
- 7—1-in. (25.4-mm) hexagonal socket—Armstrong #A4-632
- 8—UV specimen (see Fig. 2)
- 9—Adjustable side guides (Fig. 2)
- 10—Neoprene pad (bonded to Detail 9) (Fig. 2)

**Dimensions**

	in.	mm
A	0.50	13
B	3.75	95
C	0.62	16
D	5.50	140
E	0.50	13
F	6.75	170
G	6.25	160
H	2.62	66

**FIG. 1 UV Testing Apparatus**

6.3 Hexagonal blocks may be reused after testing by bonding the opposite end of the block or by cleaning the original bonded end by sanding or grinding and taking care to ensure that ends are smooth and parallel.

6.4 Selection of the glass plate is at the discretion of the user. Standard 1/2-in. (13-mm) thick pressed plate glass is recommended.

**7. Preparation of Test Specimens**

7.1 The assembly and cure of the specimen is recommended as shown in Fig. 3.

7.2 Cut glass plates 3 by 3 in. (76 by 76 mm) square to fit the holding fixture without lateral movement.

7.3 A recommended cleaning procedure is to soak the glass plates in a dilute detergent solution for 2 to 3 min, followed by

light scrubbing with an absorbent cleaning tissue.<sup>7</sup> Then thoroughly rinse the glass plates with distilled or deionized water and air dry.

7.4 Metal hexagonal blocks, 1/2 in. (13 mm) high, may be prepared by light sanding with 400 grade wet or dry emery paper, followed by solvent wiping, such as 1,1,1-trichloroethane.

NOTE 1—Preparation of adherends are recommended only. Users may employ methods conducive to actual practice. Reported data should be qualified as to the method of surface preparation.

<sup>7</sup> Kimwipes, available from Kimberly-Clark Corp., 128 N. Lake, Neenah, Wisc. 54956, or equivalent, have been found satisfactory for this purpose.