



Designation: B 831 – 93 (Reapproved 1998)

Standard Test Method for Shear Testing of Thin Aluminum Alloy Products¹

This standard is issued under the fixed designation B 831; 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 single shear testing of thin wrought and cast aluminum alloy products to determine shear ultimate strengths.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI values given in parentheses are provided 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 The following documents of the issue in effect on the date of material purchase, unless otherwise noted, form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:

B 565 Test Method for Shear Testing of Aluminum and Aluminum-Alloy Rivets and Cold-Heading Wire and Rods²

B 769 Test Method for Shear Testing of Aluminum Alloys²

E 4 Practices for Force Verification of Testing Machines³

E 6 Terminology Relating to Methods of Mechanical Testing³

3. Terminology

3.1 *Definitions*—The definitions of terms relating to shear testing in Terminology E 6 are applicable to the terms used in this test method.

4. Summary of Test Method

4.1 This test method consists of subjecting a full thickness or machined rectangular test specimen to single shear loading to failure in a test fixture using a tension testing machine. The shear strength is calculated from the maximum load required to fracture the specimen.

5. Significance and Use

5.1 The intent of this test method is to provide a means of measuring the ultimate shear strength of thin aluminum alloy wrought and cast products. Data obtained by this test method are used to calculate minimum properties that can be utilized in the design of structural members such as found in aircraft. It is recognized that the loading conditions developed by this test method, and by most others, are not ideal in that they do not strictly satisfy the definitions of pure shear. However, rarely do pure shear conditions exist in structures.

NOTE 1—This test method is not interchangeable with that described in Methods B 565 and B 769. Shear strengths obtained by this test method have been shown to vary from those developed by the other methods.⁴

6. Apparatus

6.1 *Testing Machines*—The testing machines shall conform to the requirements of Practice E 4. The loads used to determine the shear strength shall be within the loading range of the testing machine as defined in Practice E 4.

6.2 Loading Device:

6.2.1 The loading device shall be of the type shown in Fig. 1 and shall be made of a hardened steel.

7. Test Specimens

7.1 The specimen size shall be 1½ in. (38.1 mm) wide by 4½ in. (114 mm) long. The specimen thickness shall be full thickness 0.250 in. under (6.4 mm). The minimum specimen thickness will be dictated by the material's ability to resist buckling around the pin hole area during testing. The specimen is shown in Fig. 2.

7.2 The test area to be sheared shall be centered within ± 0.001 in. (0.025 mm) of the loadline of the specimen.

7.3 Measurement of the thickness and length of the area to be sheared shall be made as follows:

7.3.1 Measurement of the specimen thickness shall be made at a location between the two slots machined into the specimen. Measurement of the length of the shear area shall be between the ends of the slots machined into the specimen, Fig. 2. For dimensions 0.200 in. (5.1 mm) and over, measure to the nearest

¹ This test method is under the jurisdiction of ASTM B-7 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.05 on Testing.

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² *Annual Book of ASTM Standards*, Vol 02.02.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ Davies, R. E., and Kaufman, J. G., "Effects of Test Method and Specimen Orientation on Shear Strengths of Aluminum Alloys," *Proceedings*, ASTM, Vol 64, 1964.