Designation: B 647 – 84 (Reapproved 2000)

Standard Test Method for Indentation Hardness of Aluminum Alloys by Means of a Webster Hardness Gage[1]

This standard is issued under the fixed designation B 647; 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 indentation hardness of aluminum alloys with a Webster hardness gage, Model B.

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

NOTE 1—Two other models, A and B-75, are in use, but are not covered in this test method. Model A does not provide numerical values of hardness and Model B-75 covers only a part of the range of interest for aluminum alloys.

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:*

E 6 Terminology Relating to Methods of Mechanical Testing[2]

E 10 Test Method for Brinell Hardness of Metallic Materials[2]

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials[2]

3. Terminology

3.1 *Definitions*—The definitions of terms relating to hardness testing appearing in Terminology E 6 shall be considered as applying to the terms used in this test method.

4. Significance and Use

4.1 The Webster hardness gage is portable and therefore useful for in situ determination of the hardness of fabricated parts and individual test specimens for production control purposes. It is not as sensitive as Rockwell or Brinell hardness machines; see 10.2.

4.2 This test method should be used only as cited in applicable material specifications.

5. Apparatus (Fig. 1)

5.1 The Webster hardness gage, Model B, consists of three main parts: the frame, operating handle, and penetrator housing assembly. The penetrator housing assembly includes the principal working parts, including the penetrator, loading spring, adjusting nut, penetrator housing, housing key, return spring, and dial indicator.

5.2 The indentor is a hardened steel truncated cone.

5.3 The dial indicator is graduated from 1 to 20, and is actuated by the penetrator so that the higher the reading, the higher is the hardness of the test material.

5.4 The configuration of the Webster hardness gage is such that it is operated like a pair of pliers.

5.5 The clearance between the penetrator and the anvil is about 6 mm (¼ in.), limiting the thickness of sample that can be tested.

6. Test Parts or Specimens

6.1 Any part or piece of material greater than 1 mm (0.04 in.) in thickness and equal to or less than 6 mm (¼ in.) in thickness and with a clear flat area at an edge approximately 25 by 25 mm (1 by 1 in.) in size is suitable for test.

6.2 The surfaces shall be essentially parallel, smooth, clean, and free of mechanical damage. The test surface may be lightly polished to eliminate scratches or die lines.

6.3 The clear, flat area shall be such that there will be a clear distance of at least 3 mm (⅛in.) from the edge of the part or specimen.

6.4 Parts or specimens with a slight taper or curvature may also be tested if a round anvil is used, as described in 8.1.1 and Fig. 2.

7. Calibration

7.1 *Zero Adjustment*:

7.1.1 Operate the instrument against the bare anvil and note whether or not the indicator gives the zero (full-scale) reading.

7.1.2 A correction in zero reading is normally not needed except for one of the reasons listed below:

7.1.2.1 A new penetrator has been installed,

7.1.2.2 The dial indicator is changed from one instrument to another, or

7.1.2.3 Excessive wear has taken place.

[1] This test method is under the jurisdiction of ASTM Committee B07 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 03.01.

FIG. 1 Webster Hardness Gage, Model B

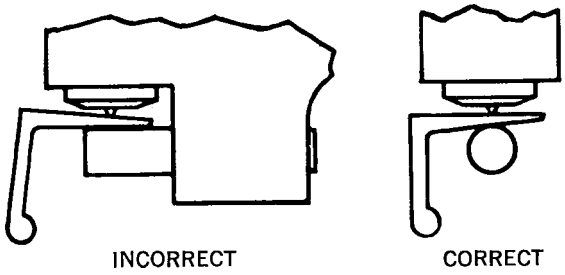

FIG. 2 Making the Test

7.1.3 If an adjustment in zero is needed, turn the zero adjustment screw below the indicator dial slowly (Fig. 3), while operating the tester against the bare anvil and maintaining handle pressure, until the hand of the dial indicator rests on the zero line (which is located at the full-scale reading of 20).

FIG. 3 Zero Adjustment Screw, A (indicated by arrow)

7.1.4 The zero adjustment should never be used to make the indicator read correctly on a standard sample.

7.2 *Load Spring Adjustment*:

7.2.1 Measure the hardness of a standard sample of medium to low hardness, either one furnished with the tester or one developed from reference stock; the dial should show the reading indicated for the standard within ±0.5.

7.2.2 If the readings on the standard or the bare anvil, or both, do not indicate the proper values, adjust the load spring with the special wrench provided until agreement is reached (Fig. 4).

8. Procedure

8.1 Place the test part or specimen between the penetrator and the anvil, and apply pressure to the handle.

8.1.1 If the test part or specimen has a slight taper or curvature, use a round anvil and apply the gage in such a way that the penetrator is applied normal to the test surface and the anvil bears along a line that is parallel to the surface in contact with the penetrator, as illustrated in Fig. 2.

8.2 Apply sufficient pressure to cause the flat face of the penetrator housing to come in contact with the surface of the test part or specimen.

NOTE 2—Excess pressure on the handle is not harmful and does not affect the reading, but neither is it necessary, as the hardness reading is determined solely by the spring deflection.

8.3 Read the hardness from the dial indicator. Report the reading to the nearest 0.5.

NOTE 3—For relatively soft materials, the dial may indicate some drift

FIG. 4 Adjusting Load on Load Spring

toward lower numbers with time, after the initial pressure. It is recommended that readings be made quickly and that the highest observed value be used.

9. Report

9.1 The report shall include the following:

9.1.1 Identification of material tested,

9.1.2 Model and serial number of hardness gage,

9.1.3 Number of readings taken,

9.1.4 Average of hardness values, rounded to the nearest half division, and

9.1.5 Date of test.

10. Precision and Bias

10.1 The Webster hardness gage, Model B, is useful for hardness measurements of material in the range from 3003-0 to 7075-T6 representing a range in Rockwell hardness from about 5 HRE to 110 HRE.

10.2 The application of portable impressors, such as the Webster, will produce greater variation in hardness readings than standard fixed frame procedures, such as Test Methods E 10 and E 18. Further, since the scale of the Webster hardness gage, Model B, has 20 divisions compared to 110 for the Rockwell E scale, it is also less sensitive than the Rockwell scale.

10.3 The variation in readings that results from the application of the Webster hardness impressor has not yet been established.