

STANDARDS AUSTRALIA

RECONFIRMATION

OF

AS 1816.2—2007

Metallic materials—Brinell hardness test

Method 2: Verification and calibration of testing machines

RECONFIRMATION NOTICE

Technical Committee MT-009 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

Certain documents referenced in the publication may have been amended since the original date of publication. Users are advised to ensure that they are using the latest versions of such documents as appropriate, unless advised otherwise in this Reconfirmation Notice.

Approved for reconfirmation in accordance with Standards Australia procedures for reconfirmation on 20 March 2017.

The following are represented on Technical Committee MT-009:

Australasian Institute of Surface Finishing
Australian Chamber of Commerce and Industry
Australian Industry Group
Australian Steel Institute
Bureau of Steel Manufacturers of Australia
Galvanizers Association of Australia
Galvanizing Association of New Zealand
New Zealand Metal Roofing Manufacturers

NOTES

Metallic materials—Brinell hardness test

Method 2: Verification and calibration of testing machines

PREFACE

This Standard was prepared by the Standards Australia Committee MT-006, Mechanical Testing of Metals to supersede AS 1816.2—2002, *Metallic materials—Brinell hardness test*, Method 2: *Verification and calibration of testing machines*.

This Standard is identical with, and has been reproduced from ISO 6506-2:2005, *Metallic materials—Rockwell hardness test*, Part 2: *Verification and calibration of testing machines*.

The objective of this Standard is to specify the method for verification and calibration of Brinell hardness testing machines.

The objective of this edition is to adopt the current edition of ISO 6506-2 to revise the method for verification and calibration of Brinell hardness testing machines.

AS

1815 Metallic materials—Rockwell hardness test

1815.1 Method 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)

1815.2 Method 2: Verification and calibration of testing machines (scales A, B, C, D, E, F, G, H, K, N, T)

1815.3 Method 3: Calibration of reference blocks (scales A, B, C, D, E, F, G, H, K, N, T)
(ISO 6508-3:2005, MOD)

1816 Metallic materials—Brinell hardness test

1816.1 Method 1: Test method (ISO 6506-1:2005, MOD)

1816.2 Method 2: Verification and calibration of testing machines (this Standard)

1816.3 Method 3: Calibration of reference blocks

1816.4 Method 4: Table of hardness values

1817 Metallic materials—Vickers hardness test

1817.1 Method 1: Test method (ISO 6507-1:1997, MOD)

1817.2 Method 2: Verification of testing machines

1817.3 Method 3: Calibration of reference blocks

5016 Metallic materials—Conversion of hardness values

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (b) In the source text ‘this part of ISO 6506’ should read ‘this Australian Standard’.
- (c) A full point should be substituted for a comma when referring to a decimal marker.

References to International Standards should be replaced by references to Australian Standards as follows:

<i>Reference to International Standard</i>	<i>Australian Standard</i>
ISO	AS
376 Metallic materials—Calibration of force-proving instruments used for verification of uniaxial testing machines	2193 Calibration and classification of force measuring systems
6506 Metallic materials—Brinell hardness test	1816 Metallic materials—Brinell hardness test
6506-1 Part 1: Test method	1816.1 Part 1: Test method (ISO 6506-1:1999, MOD)
6506-3 Part 3: Calibration of reference blocks	1816.3 Method 3: Calibration of reference blocks
6507 Metallic materials—Vickers hardness test	1817 Metallic materials—Vickers hardness test
6507-1 Part 1: Test method	1817.1 Method: Test method (ISO 6507-1:1997, MOD)

The term ‘informative’ has been used in this Standard to define the application of the annex to which it applies. An ‘informative’ annex is only for information and guidance.

1 Scope

This part of ISO 6506 specifies a method of verification and calibration of testing machines used for determining Brinell hardness in accordance with ISO 6506-1.

It specifies a direct method for checking the main functions of machine operation and an indirect method suitable for the overall checking of the machine. The indirect method may be used independently for periodic routine checking of machine operation while in service.

If a testing machine is also to be used for other methods of hardness testing, it should be verified independently for each method.

This part of ISO 6506 is also applicable to portable hardness testing machines.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 376:2004, *Metallic materials — Calibration of force-proving instruments used for the verification of uniaxial testing machines*

ISO 6506-1:2005, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6506-3, *Metallic materials — Brinell hardness test — Part 3: Calibration of reference blocks*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

3 General conditions

Before a Brinell hardness testing machine is verified, the machine shall be checked to ensure that it is properly set up in accordance with the manufacturer's instructions.

Especially, it should be checked that:

- a) the plunger holding the ball slides correctly in its guide;
- b) the ball-holder with a ball (from a lot verified in accordance with 4.3) is firmly mounted in the plunger;
- c) the test force is applied and removed without shock, vibration or overrun and in such a manner that the readings are not influenced;

- d) if the measuring system is integrated into the machine:
 - the change from removing the test force to measuring mode does not influence the readings;
 - the illumination does not affect the readings; and
 - the centre of the indentation is in the centre of the field of view, if necessary.

4 Direct verification

4.1 General

4.1.1 Direct verification should be carried out at a temperature of $(23 \pm 5) ^\circ\text{C}$. If the verification is made outside this temperature range, this shall be reported in the verification report.

4.1.2 The instruments used for verification and calibration shall be traceable to national standards.

4.1.3 Direct verification involves:

- a) the calibration of the test force;
- b) the verification of the indenter ball;
- c) the calibration of the measuring system;
- d) the verification of the testing cycle.

4.2 Calibration of the test force

4.2.1 Each test force shall be measured within the working range of the testing machine. Whenever applicable, this shall be done at no less than three positions of the plunger uniformly spaced throughout its range of movement during testing.

4.2.2 Three measurements shall be made for each force at each position of the plunger. Immediately before each measurement is taken, the plunger shall be moved in the same direction as during testing.

4.2.3 The force shall be measured by one of the following two methods:

- by means of a force-proving instrument in accordance with ISO 376:2004 class 1, or
- by balancing against a force, accurate to $\pm 0,2 \%$, applied by means of calibrated masses or another method with the same accuracy.

4.2.4 Each measurement of a force shall be within $\pm 1,0 \%$ of the nominal test force, as defined in ISO 6506-1.

4.3 Verification of the indenter ball

4.3.1 The indenter consists of a ball and an indenter holder. The verification applies only to the ball.

4.3.2 For the purpose of verifying the size and the hardness of the balls, a sample selected at random from a batch shall be tested. The balls verified for hardness shall be discarded.

4.3.3 The balls shall be polished and free from surface defects.

4.3.4 The user shall either measure the balls to ensure that they meet the following requirements or shall obtain balls from a supplier certifying that the following conditions are met.

4.3.4.1 The diameter shall be determined by taking the mean value of not less than three single values of diameter measured at different positions on the ball. No single value shall differ from the nominal diameter by more than the tolerance given in Table 1.

Table 1 — Tolerances for different ball diameters

Ball diameter mm	Tolerance mm
10	$\pm 0,005$
5	$\pm 0,004$
2,5	$\pm 0,003$
1	$\pm 0,003$

4.3.4.2 The characteristics of the hardmetal balls shall be as follows.

a) Hardness: The hardness shall be not less than 1 500 HV , when determined using a test force of at least 4,903 N, in accordance with ISO 6507-1. The hardmetal ball may be tested directly on this spherical surface or by sectioning the ball and testing on the ball interior.

b) Density: $\rho = (14,8 \pm 0,2) \text{ g/cm}^3$.

The following chemical composition is recommended:

- tungsten carbide (WC) balance;
- total other carbides 2,0 %;
- cobalt (Co) 5,0 % to 7,0 %.

4.4 Calibration of the measuring system

4.4.1 The scale of the measuring system shall be graduated to permit estimation of the diameter of the indentation to within $\pm 0,5 \%$.

4.4.2 The measuring system shall be verified by measurements made on an object micrometer at a minimum of five intervals over each working range. The maximum error of each interval shall not exceed 0,5 %.

4.4.3 When measuring a projected area, the maximum error shall not exceed 1 % of the area.

4.4.4 Hand held microscopes should be calibrated in accordance to the procedure of this standard and the tolerances of the manufacturer.

4.5 Verification of the testing cycle

The testing cycle shall conform with the testing cycle specified in ISO 6506-1 and shall be timed with an uncertainty less than $\pm 1,0 \text{ s}$.