

ICS 19.060
CCS N71



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 231.2-2022

**Metallic materials-Brinell hardness test-Part 2: Verification and
calibration of testing machines**

金属材料 布氏硬度试验 第2部分：硬度计的检验与校准

(English Translation)

Issued on: July 11, 2022

Implemented on: February 1, 2023

**Issued by: State Administration for Market Regulation;
Standardization Administration of China**

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Foreword

This document was drafted in accordance with the rules provided in GB/T 1.1-2020

Directives for Standardization - Part 1: Rules for the Structure and Drafting of
Standardizing Documents.

This document is Part 2 of GB/T 231 Metallic materials - Brinell hardness test. The
following parts have been released for GB/T 231:

- Part 1: Test method;
- Part 2: Verification and calibration of testing machines;
- Part 3: Calibration of reference blocks;
- Part 4: Tables of hardness values.

This document replaces GB/T 231.2-2012 Metallic materials - Brinell hardness test -
Part 2: Verification and calibration of testing machines; compared with GB/T 231.2-
2012, the major technical changes are as follows:

- According to the force-diameter indices, MODIFY the hardness ranges of low, medium and high reference blocks used for indirect verification of hardness testing machine, and the relative repeatability of the hardness testing machine corresponding to different hardness ranges of the tested hardness testing machine, as well as the permissible error (see 6.7 and 6.9; 5.7 and 5.8 of the 2012 edition);
- ADD Annex B "Verification of hardness testing machines that are incapable of meeting the specified force/time profile" (see Annex B).

This document adopts the modification of ISO 6506-2:2017 Metallic materials - Brinell hardness test - Part 2: Verification and calibration of testing machines.

Compared with ISO 6506-2:2017, this document is adjusted, in structure, as follows:

- CHANGE 5.3.4.1 and 5.3.4.2 in ISO 6506-2:2017 to 5.3.5 and 5.3.6.

There are technical differences between this document and ISO 6506-2:2017, and the clauses involved in these differences have been marked by a vertical single line (|) in the outer margin of the document. The specific technical differences and their reasons are as follows:

- REPLACE ISO 6506-1 WITH GB/T 231.1, which adopts the international standard by modification, (see Clause 1, 5.2.4, 5.5.2, 6.4, A.1 and Annex B), to adapt to the technical conditions in China;
- REPLACE ISO 6506-3 WITH GB/T 231.3, which adopts the international standard by modification, (see Clause 1, 5.4.3, 6.1), to adapt to the technical conditions in China;
- ADD reference to GB/T 36416.1-2018 (see Clause 3);
- REPLACE ISO 6507-1 (see 5.3.4.2) WITH GB/T 4340.1, which adopts the international standard by modification, to adapt to the technical conditions in China.

This document makes the following editorial changes:

- MODIFY the numbers "1", "2" and "3" used to indicate "Hardness range of the hardness testing machine" in the first column of Table 2 and Table 3 to Chinese

characters "low", "medium" and "high", respectively (see 6.7);

-- MODIFY the symbol "x" used to indicate "required inspection items" in Table 4 to the symbol "sqrt", and ADD the symbol "-" to indicate "non-inspected items" (see Clause 7);

-- NUMBER the unnumbered formulas in Annex A of ISO 6506-2:2017 in sequence (see Annex A);

Annex A of ISO 6506-2:2017 to the symbol "E" [see Formula (A.10), Formula (A.13) and Table A.9].

1 Scope

This document specifies methods of direct and indirect verification of testing machines used for determining Brinell hardness in accordance with GB/T 231.1 and also specifies when these two types of verification have to be performed.

The direct verification involves checking that individual machine performance parameters fall within specified limits whereas the indirect verification utilizes hardness measurements of reference blocks, calibrated in accordance with GB/T 231.3, to check the machine's overall performance.

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

This document is applicable to both fixed location and portable hardness testing machines. For machines that are incapable of satisfying the specified force-time profile, the direct verification of force and testing cycle can be modified by the use of Annex B.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the version corresponding to that date is applicable to this document; for undated references, the latest version (including all amendments) is applicable to this document.

GB/T 231.1, Metallic materials - Brinell hardness test - Part 1: Test method (GB/T 231.1-2018, ISO 6506-1:2014, MOD)

GB/T 231.3, Metallic materials - Brinell hardness test - Part 3: Calibration of reference blocks (GB/T 231.3-2022, ISO 6506-3:2014, MOD)

GB/T 4340.1, Metallic materials - Vickers hardness test - Part 1: Test method (GB/T 4340.1-2009, ISO 6507-1:2005, MOD)

GB/T 13634, Metallic materials - Calibration of force-proving instruments used for the verification of uniaxial testing machines (GB/T 13634-2019, ISO 376:2011, IDT)

GB/T 36416.1, Testing machine vocabulary - Part 1: Material testing machines
type of illumination shall remain unchanged. No mean measured diameter shall differ from the certified mean diameter of the reference indentation by more than $\pm 0.5\%$ 2.

5.5.1 The testing cycle is to be verified by the testing machine manufacturer at the time

of manufacture and when the testing machine undergoes repair which might have affected the testing cycle. Verification of the testing cycle at other times is as specified in Table 4.

5.5.2 The testing cycle shall be verified to conform with the testing cycle defined in

GB/T 231.1, taking into account any uncertainty associated with the timing measurements.

6.1 Indirect verification should be carried out at a temperature of $(23 \pm 5) ^\circ\text{C}$ by means

of reference blocks calibrated in accordance with GB/T 231.3. If the verification is made outside of this temperature range, this shall be reported in the verification report. The test and bottom surfaces of the reference blocks and the surfaces of indenters shall not contain any additives or corrosion products.

6.2 The testing machine shall be verified for each test force and for each size of ball

used. For each test force, at least two reference blocks shall be selected from the hardness ranges specified in Table 2 (for $0.102 \times F/D^2 = 30$) and Table 3 (for other