

164

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 403

BRINELL HARDNESS TEST FOR COPPER AND COPPER ALLOYS

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BRIEF HISTORY

The ISO Recommendation R 403, *Brinell Hardness Test for Copper and Copper Alloys*, was drawn up by Technical Committee ISO/TC 26, *Copper and Copper Alloys*, the Secretariat of which is held by the Deutscher Normenausschuss (DNA).

Work on this question by the Technical Committee began in 1958 and led, in 1961, to the adoption of a Draft ISO Recommendation.

In February 1962, this Draft ISO Recommendation (No. 501) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member Bodies:

Australia	Germany	Republic of South Africa
Bulgaria	India	Spain
Burma	Italy	Sweden
Canada	Japan	Switzerland
Denmark	Netherlands	Turkey
Finland	Poland	United Kingdom
France	Portugal	Yugoslavia

Three Member Bodies opposed the approval of the Draft:

Belgium
U.S.A.
U.S.S.R.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1964, to accept it as an ISO RECOMMENDATION.

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BRINELL HARDNESS TEST FOR COPPER AND COPPER ALLOYS

1. PRINCIPLE OF TEST

The test consists in forcing a steel ball of diameter D , under a load F , into the test piece and measuring the diameter d of the indentation left in the surface after removal of the load.

The Brinell hardness HB is the ratio of the test load F (expressed in kilogrammes-force) to the curved surface area (expressed in square millimetres) of the indentation which is assumed to be spherical and of diameter D .

The test is carried out at ambient temperature, unless otherwise specified.

2. SYMBOLS AND DESIGNATIONS

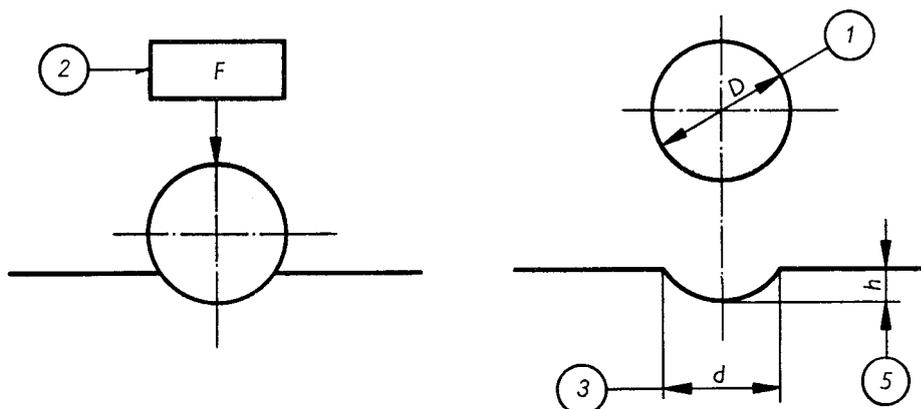
Number	Symbol	Designation
1	D	Diameter of the ball, in millimetres
2	F	Test load, in kilogrammes-force
3	d	Diameter of indentation, in millimetres
4	HB	Brinell hardness $= \frac{\text{test load in kgf}}{\text{surface area of indentation in mm}^2}$ $= \frac{2F}{\pi D (D - \sqrt{D^2 - d^2})}$
5	h	Depth of indentation, in millimetres $= \frac{F}{\pi D \times \text{HB}}$

NOTE

The Brinell hardness is denoted by the symbol HB supplemented by an index indicating the test conditions in the order :

diameter of ball,
load,
duration of loading.

Example: HB 10/500/15 = Brinell hardness measured with a ball of 10 mm diameter and with a load of 500 kgf applied for 15 seconds.



3. TESTING EQUIPMENT

3.1 The diameter and tolerances of the approved ball should be:

Diameter of ball millimetres	Tolerance * millimetres
10	± 0.0045
5	± 0.0040
2.5	± 0.0035
2	± 0.0035
1	± 0.0035

3.2 The ball is of hardened and tempered steel** having a hardness of at least 850 HV (taking into account the curvature of the ball, when testing); it should be polished and free from surface defects. The indenter should be examined regularly for damage or defects and replaced whenever these are found. The result of any test found to have been made with a damaged or distorted ball should be discarded.

3.3 2.5 mm, 2 mm and 1 mm diameter balls should not be used for cast material.

4. TEST PROCEDURE

4.1 The ball is brought into contact with the surface of the test piece and pressure is applied normal to the surface. The pressure is increased gradually without vibration or sudden shocks until the test load is attained. The test load is maintained for 10 to 15 s. Other durations with appropriate tolerances may be specified by special agreement.

* The tolerances correspond to Grade 6 of the ISA System (ISA Bulletin 25). Balls for ball bearings normally satisfy these tolerances.

** If for any reason a ball of material other than hardened and tempered steel is used, the test should be described as a modified Brinell test and the symbol "HB" should not be employed.