

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 184

BRINELL HARDNESS TEST FOR GREY CAST IRON

(standards.iteh.ai)

1st EDITION
ISO/R 184:1961

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BRIEF HISTORY

The ISO Recommendation R 184, *Brinell Hardness Test for Grey Cast Iron*, was drawn up by Technical Committee ISO/TC 25, *Cast Iron*, the Secretariat of which is held by the British Standards Institution (B.S.I.).

Work on this matter which the Technical Committee had already begun in 1955, came to an end in 1959, with the adoption of a proposal as a Draft ISO Recommendation.

On 12 June 1959, the Draft ISO Recommendation (No. 286) was distributed to all the ISO Member Bodies and was approved by the following Member Bodies:

Belgium	Greece	Romania
Burma	Hungary	Spain
Chile	India	Sweden
Czechoslovakia	Italy	Switzerland
Denmark	Netherlands	United Kingdom
Finland	New Zealand	U.S.A.
France	Norway	
Germany	Portugal	

No Member Body opposed the approval of the Draft.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in February 1961, to accept it as an ISO RECOMMENDATION.

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BRINELL HARDNESS TEST FOR GREY CAST IRON

1. SCOPE

This ISO Recommendation refers exclusively to the determination of Brinell hardness of grey cast iron, and not to the determination of hardness of chilled cast iron or of grey cast iron which has been surface-hardened, since these properties only concern specialized foundries.

2. PRINCIPLE OF TEST

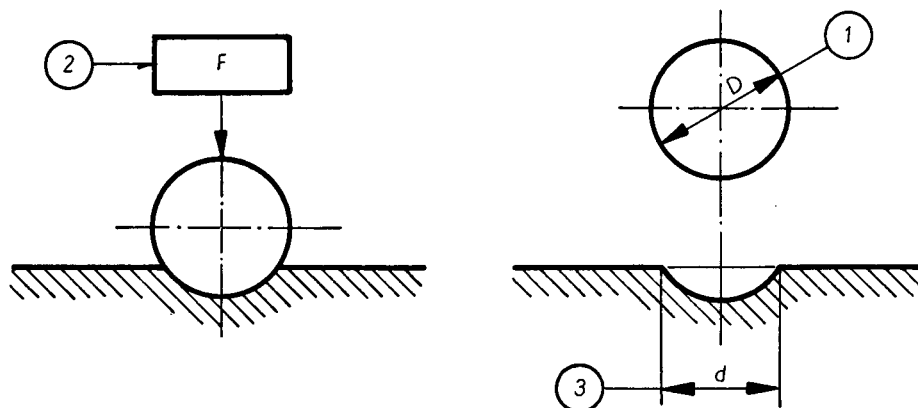
The test consists in forcing a steel ball of diameter D , under a load F , into the test piece and measuring the diameter d of the indentation left in the surface after removal of the load.

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

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3. 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
		$= \frac{\text{test load}}{\text{surface area of indentation (considered as a portion of a sphere)}}$ $= \frac{2F}{\pi D (D - \sqrt{D^2 - d^2})}$



NOTE

The Brinell hardness is denoted by the symbol HB for standard test conditions, i.e.:

ball diameter	10	mm
load	3 000	kgf
duration of loading	15	s

For other conditions, the symbol HB is supplemented by an index indicating the test conditions in the following order:

diameter of ball,
load,
duration of loading.

Example: HB 5/750/15 = Brinell hardness
measured with a ball of 5 mm diameter and
with a load of 750 kgf applied for 15 s.

4. TESTING EQUIPMENT

The ball diameter should be chosen as a function of the thickness of the test piece, namely:

Thickness of the test piece millimetres	Ball diameter millimetres
less than 5	2 \pm 0.0035 or 2.5 \pm 0.0035
from 5 to 15	5 \pm 0.004
more than 15	10 \pm 0.0045

5. TEST REQUIREMENTS

- 5.1 The test is carried out at ambient temperature, unless otherwise specified.
- 5.2 The ball is placed against the surface of the test piece. Pressure is gradually applied to the ball normal to the surface without sudden shocks until the test load is attained. The test load is maintained for 15 ± 1 s.
- 5.3 The test should be carried out on a surface which is sufficiently smooth and even to permit the accurate determination of the diameter of the indentation. It should be free from oxide scale and foreign matter. Care should be taken in preparing the surface to avoid any change in condition, e.g. due to heating or cold working.
- 5.4 The test piece should be placed on a rigid support. The contact surfaces should be clean and free from foreign matter (scale, oil, dirt, etc.). It is important that the test piece lies firmly on the support so that displacement cannot occur during the test.

5.5 The applied load, expressed in kilogrammes-force, should be equal to 30 times the square of the diameter of the ball, expressed in millimetres, i.e. $F = 30 D^2$ for hardnesses above 140 and at the most equal to 450 HB. However, if the first test gives a hardness less than 140 with a load of $30 D^2$, a test should be carried out with a load of $10 D^2$ and the second result should be taken as valid.

The tolerance on the load should be ± 1.0 per cent.

5.6 As a general rule, the distance from the centre of the indentation to the edge of the test piece should be at least $2\frac{1}{2}$ times the diameter of the indentation and the distance between the centres of two adjacent indentations should be at least 4 times the diameter of the indentation. The test is carried out in such a way that nothing occurs to falsify the test result (such as bulging at the edge or distortion of the test piece).

5.7 The diameter of each indentation is measured in two directions at right angles and the mean value of the two readings is used for the purpose of determining the Brinell hardness. The measuring microscope or other measuring device should be capable of measuring the diameter of indentations to an accuracy of ± 0.25 per cent of the diameter of the ball.

REMARKS

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1. It is recommended that the Brinell test as herein defined be not used for materials with a Brinell hardness exceeding 450.

For all hardnesses above than 450 HB, a ball of tungsten carbide should be used, but the test should then be considered as a modified Brinell hardness test, and the hardness symbol should be HBW.

2. There is no general process for converting accurately Brinell hardness into other scales of hardness or tensile strength. These conversions therefore should be avoided, except for special cases where a reliable basis for the conversion has been obtained by comparison tests.

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