

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 146

CALIBRATION OF VICKERS HARDNESS TESTING MACHINES

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BRIEF HISTORY

The ISO Recommendation R 146, *Calibration of Vickers Hardness Testing Machines*, was drawn up by Technical Committee ISO/TC 17, *Steel*, the Secretariat of which is held by the British Standards Institution (B.S.I.).

Study of this ISO Recommendation was undertaken by Working Group ISO/TC 17/WG 1, *Methods of Mechanical Testing for Steel*, at its meeting, held in London, in November 1954.

Technical Committee ISO/TC 17, at its plenary meeting, held in London, in March 1957, examined the final draft proposal drawn up by the Working Group. After a number of minor modifications had been made in it, the decision was reached to submit it by correspondence to the members of the Technical Committee. The results of this consultation showed that further amendments were needed, and a revised draft incorporating these amendments was adopted as a Draft ISO Recommendation.

On 11 July 1958, the Draft ISO Recommendation (No. 204) was distributed to all the ISO Member Bodies and was approved, subject to small modifications, by the following Member Bodies:

Austria	France	Norway
Belgium	Germany	Poland
Bulgaria	Hungary	Romania
Burma	India	Spain
Chile	Israel	Sweden
Czechoslovakia	Italy	Switzerland
Denmark	Japan	United Kingdom
Finland	New Zealand	Yugoslavia

One Member Body opposed the approval of the Draft: U.S.S.R.

The Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in February 1960, to accept it as an ISO RECOMMENDATION.

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CALIBRATION OF VICKERS HARDNESS TESTING MACHINES

1. SCOPE

This ISO Recommendation applies to the calibration of testing machines for determining Vickers hardness in accordance with ISO Recommendation R 81, *Vickers Hardness Test for Steel*.

If a machine is also intended for other methods of hardness testing, it should be calibrated for each method.

2. DIRECT CALIBRATION

Direct calibration involves:

1. Calibration of the load-applying mechanism (see clause 2.1) and verification of the indenter (see clause 2.2),
which together constitute the standard for the method of test, and
2. Verification of the measuring device (see clause 2.3).

Before calibration is carried out, certain details of the testing machine should be checked *.

* Before a Vickers hardness testing machine is calibrated, the machine should be examined to ensure that:

- (a) The machine is properly set up;
- (b) The plunger holding the penetrator is capable of sliding in its guide, under its own weight, but without any appreciable clearance;
- (c) The indenter-holder is mounted firmly in the plunger;
- (d) The load can be applied and removed without shock and in such a manner that the readings are not influenced;
- (e) If the measuring device is integral with the machine,
 1. the change from loading to measuring does not influence the readings,
 2. the method of illumination does not affect the readings,
 3. the centre of the indentation is in the centre of the field of view.

2.1 Calibration of the load-applying mechanism

- 2.1.1 The calibration of the load-applying mechanism at the required loads should be carried out either directly by means of standardized weights (masses) or indirectly by means of an elastic device or proving levers.
- 2.1.2 Each test load should be measured and, wherever possible, this should be done at not less than three positions of the plunger throughout its range of movement.
- 2.1.3 The test load should be measured by one of the following three methods:
- (a) Balancing against standardized weights (masses) accurate to ± 0.1 per cent, or
 - (b) Balancing against a standardized load, accurate to ± 0.2 per cent, or
 - (c) Measuring the true load by means of the deformation of an elastic device previously calibrated to an accuracy of ± 0.5 per cent.
- 2.1.4 Three readings should be taken for each load at each position of the plunger. Immediately before each reading is taken, the plunger should have been moved in the same direction as during testing.
- 2.1.5 Each reading of the measured load should be within ± 1 per cent of the nominal load.

2.2 Verification of the indenter

- 2.2.1 The verification of the form of the diamond indenter can be made by direct measurement of its shape or by measurements of its projection on a screen.
- 2.2.2 The angle between opposite faces of the pyramid should be $136^\circ \pm 0.5^\circ$.

2.3 Verification of the measuring device

- 2.3.1 All four faces should be equally inclined to the axis of the pyramid within 0.5° . They should meet in a point, any line of junction between opposite faces being less than 0.002 mm in length.
- 2.3.2 The measuring microscope or other measuring device should be checked with a micrometer and should be accurate as follows:

up to	0.2 mm	± 0.001 mm
over	0.2 mm	± 0.002 mm.