ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION

R 192

VICKERS HARDNESS TEST
FOR LIGHT METALS AND THEIR ALLOYS

1st EDITION

March 1961

BRIEF HISTORY

The ISO Recommendation R 192, *Vickers Hardness Test for Light Metals and their Alloys*, was drawn up by Technical Committee ISO/TC 79, *Light Metals and their Alloys*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question by the Technical Committee began in 1956 and led in 1958 to the adoption of a Draft ISO Recommendation.

In December 1958, this Draft ISO Recommendation (No. 265) was circulated to all the ISO Member Bodies for enquiry. It was approved by the following Member bodies:

Austria	Hungary	Poland
Belgium	India	Portugal
Brazil	Ireland	Spain
Burma	Israel	Sweden
Canada	Italy	Switzerland
Finland	Japan	United Kingdom
France	Netherlands	U.S.S.R.
Germany	New Zealand	Yugoslavia

One Member Body opposed the approval of the Draft: Romania.

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

VICKERS HARDNESS TEST
FOR LIGHT METALS AND THEIR ALLOYS

1. PRINCIPLE OF TEST

The test consists in forcing an indenter, in the form of a right pyramid with a square base and specified angle between opposite faces at the vertex, under a load F, into the metal, and measuring the diagonal d of the indentation left in the surface after removal of the load.

The Vickers hardness is the ratio of the test load F (expressed in kilogrammes-force) to the sloping area (expressed in square millimetres) of the indentation, considered as a right pyramid with a square base, of diagonal d, and having at the vertex the same angle as the penetrator.

2. SYMBOLS AND DESIGNATIONS

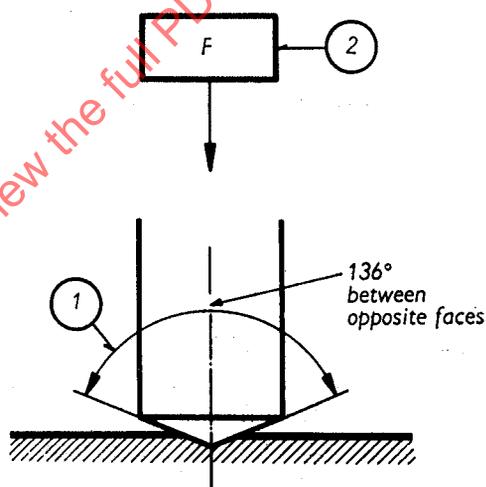| Number	Symbol	Designation
1	—	Angle at the vertex of the pyramidal penetrator (136°)
2	F	Test load, in kilogrammes-force
3	d	Arithmetic mean of the two diagonals, d_1 and d_2, in millimetres
4	HV	Vickers hardness $= \dfrac{\text{test load}}{\text{area of indentation}}$ $= \dfrac{2F \sin \dfrac{136°}{2}}{d^2}$ $= 1.854 \dfrac{F}{d^2}$ (approx.)

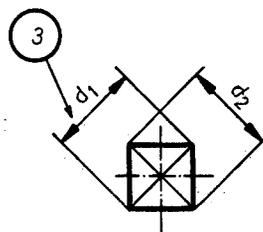FIG. 1

136° between opposite faces

FIG. 2

NOTE

The symbol HV is supplemented by an index indicating the load and the duration of loading.

Example: HV 10   = Vickers hardness, measured under a load of 10 kgf, applied for the normal time;

HV 10/15 = Vickers hardness, measured under a load of 10 kgf, applied for 15 seconds.

3. TESTING EQUIPMENT

3.1 The indenter consists of a right diamond pyramid with a square base. The angle at the vertex between opposite faces of the indenter is $136° \pm 0.5°$.

    3.1.1 All four faces of the indenter are equally inclined to the axis of the indenter (within 0.5°) and meet in a point, i.e. any line of junction between opposite faces is less than 0.002 mm in length. A common form of point, when examined under high magnification, is shown in Figure 3. The limiting length of 0.002 mm is shown in the same figure.

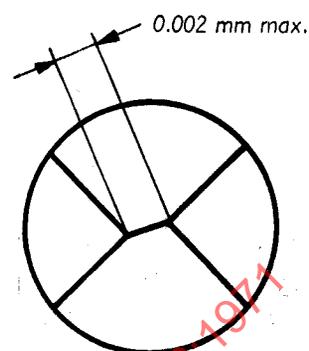   **3.1.2** The indenter should be well polished and free from cracks or other surface defects.

0.002 mm max.

FIG. 3

4. TEST REQUIREMENTS

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

4.2 The indenter, when normal to and in contact with the surface to be tested, is forced, without shock or vibration, into this surface until the applied load attains the specified value in 10 seconds minimum. This load is maintained for 30 ± 2 seconds.

4.3 The test should be carried out on a surface to be tested which is sufficiently smooth and even to permit the accurate determination of the diagonal of the indentation. It should be free from foreign matter. Care should be taken in preparing the surface to avoid any prejudicial change in condition, e.g. due to heating or cold working. The finish of the surface must be such that the accuracy of measurement detailed in clause 4.9 may be obtained.

4.4 The radius of curvature of curved surfaces to be tested should be not less than 5 mm. The testing of curved surfaces with smaller radii should be the subject of special agreement.

4.5 The test piece should be placed on a rigid support. The contact surfaces should be clean and free from foreign matter (oil, dirt, etc.). It is important that the test piece lies firmly on the support, so that displacement cannot occur during the test.

4.6 The thickness of the test piece or of the layer under test should be at least 1.5 times the diagonal of the indentation. No deformation should be visible at the back of the test piece after the test.

4.7 The distance from the centre of any indentation to the edge of the test piece or the edge of any other indentation should be not less than 2½ times the diagonal of the indentation.