
International Standard



3878

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Hardmetals — Vickers hardness test

Métaux-durs — Essai de dureté Vickers

Second edition — 1983-08-15

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UDC 669.018.25 : 620.178.152.341

Ref. No. ISO 3878-1983 (E)

Descriptors : powder metallurgy, hardmetals, carbides, tests, hardness tests, Vickers hardness.

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 3878 was developed by Technical Committee ISO/TC 119, *Powder metallurgy*, and was circulated to the member bodies in August 1982.

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It has been approved by the member bodies of the following countries :

Austria	Italy	Sweden
China	Korea, Rep. of	Switzerland
Czechoslovakia	Poland	Thailand
Egypt, Arab Rep. of	Romania	United Kingdom
France	South Africa, Rep. of	USA
Germany, F.R.	Spain	USSR

No member body expressed disapproval of the document.

This second edition cancels and replaces the first edition (i.e. ISO 3878-1976).

Hardmetals — Vickers hardness test

1 Scope and field of application

This International Standard specifies the method of Vickers hardness test for hardmetals.

2 References

ISO 146, *Metallic materials — Hardness test — Verification of Vickers hardness testing machines HV 0,2 to HV 100.*¹⁾

ISO 409, *Metallic materials — Hardness test — Tables of Vickers hardness values for use in tests made on flat surfaces*

— Part 1 : HV 5 to HV 100.

— Part 2 : HV 0,2 to less than HV 5.

ISO 4505, *Hardmetals — Metallographic determination of porosity and uncombined carbon.*

ISO 6507, *Metallic materials — Hardness test — Vickers test*

— Part 1 : HV 5 to HV 100.

— Part 2 : HV 0,2 to less than HV 5.

3 Principle

See ISO 6507/1 and ISO 6507/2.

4 Symbols and designations

See ISO 6507/1 and ISO 6507/2.

5 Apparatus

5.1 Testing machine, capable of applying a predetermined force or forces within the range of 9,807 N to 490,3 N (HV 1 to HV 50), in accordance with ISO 146.

5.2 Indenter, a diamond in the form of a right pyramid with a square base, in accordance with ISO 146.

5.3 Measuring device, capable of measuring indentation diagonals to the following accuracy :

$d < 100 \mu\text{m} : \pm 0,2 \mu\text{m};$

$100 \mu\text{m} < d < 200 \mu\text{m} : \pm 1,0 \mu\text{m};$

$d > 200 \mu\text{m} : \pm 0,5 \%$.

6 Test pieces

6.1 The thickness of the layer removed from the surface of the test piece shall be not less than 0,2 mm.

The test shall be carried out on a surface which is free from foreign matter and, in particular, completely free from lubricants. The test surface shall be polished in accordance with ISO 4505.

Preparation shall be carried out in such a way that any alteration of the surface hardness, for example due to heat or cold working, is minimized.

When determining the hardness of a test piece with a curved surface, a flat surface shall be prepared on the test piece on which to carry out the test.

6.2 The prepared test piece shall be at least 1 mm thick.

The thickness of the test piece shall be sufficient to allow the test to be carried out without breaking or deforming the test piece under the chosen force. For test pieces of small cross-section or of irregular shape, it may be necessary to provide some form of additional support, for example mounting in plastic material.

7 Procedure

7.1 The test force shall be within the range of 9,807 N (HV 1) to 490,3 N (HV 50), the preferred force being 294,2 N (HV 30).

7.2 The test piece shall be placed firmly on a rigid support. The contact surfaces shall be clean and free from foreign matter. It is important that the test piece is placed firmly on the support so that displacement cannot occur during the test.

1) At present at the stage of draft. (Revision of ISO 146.)

7.3 Force the indenter without shock or vibration perpendicularly into the surface to be tested until the applied force attains the specified value. The time from the initial application of force until the full test force is reached shall not be less than 2 s nor greater than 8 s. The duration of the test force shall be 10 to 15 s.

7.4 Throughout the test, the apparatus shall be protected from shock or vibration.

7.5 If possible, at least three hardness determinations shall be made on the test piece.

7.6 The distance between the centre of any indentation and the edge of the test piece shall be at least 2,5 times the mean diagonal of the indentation.

The distance between the centres of two adjacent indentations shall be at least three times the mean diagonal of the indentation. If two adjacent indentations differ in size, the spacing shall be based on the mean diagonal of the larger indentation.

7.7 The satisfactory condition of the indenter shall be verified frequently. Any irregularities in the shape of the indentation may indicate poor condition of the indenter. If the examination of the indenter confirms this, then the test shall be rejected and the indenter renewed.

7.8 Measure the lengths of the two diagonals. The arithmetical mean of the two readings shall be taken for the calculation of the Vickers hardness.

7.9 Attention is drawn to ISO 409/1 and 409/2, which contains conversion tables for use in tests made on flat surfaces.

8 Expression of results

Report the arithmetical mean of the hardness values obtained, rounded to the nearest 10 HV.

9 Test report

The test report shall include the following information :

- a) a reference to this International Standard;
- b) all details necessary for identification of the test sample;
- c) result obtained;
- d) all operations not specified by this International Standard, or regarded as optional;
- e) details of any occurrence which may have affected the result.

NOTE — There is no general process for accurately converting Vickers hardness into other scales of hardness. These conversions, therefore, should be avoided, unless a reliable basis for the conversion can be obtained by comparison tests.

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