
INTERNATIONAL STANDARD



3738

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

Hardmetals — Rockwell hardness test (scale A)

Métaux durs — Essai de dureté Rockwell (échelle A)

First edition — 1976-07-01

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 3738:1976

<https://standards.iteh.ai/catalog/standards/sist/e40af0b0-f475-462d-9b90-09d9cea87ad6/iso-3738-1976>

UDC 621.762.1 : 661.665.2 : 620.178.152.42

Ref. No. ISO 3738-1976 (E)

Descriptors : powder metallurgy, hardmetals, mechanical tests, hardness tests, Rockwell hardness.

Price based on 2 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (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 set up 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 3738 was drawn up by Technical Committee ISO/TC 119, *Powder metallurgical materials and products*, and was circulated to the Member Bodies in April 1975.

STANDARD PREVIEW
(standards.iteh.ai)

It has been approved by the Member Bodies of the following countries :

Austria	Ireland	Sweden
Brazil	Italy	Turkey
Bulgaria	Korea, Rep. of	United Kingdom
Canada	Mexico	U.S.S.R.
Czechoslovakia	Portugal	Yugoslavia
Egypt, Arab Rep. of	Romania	
France	South Africa, Rep. of	
Germany	Spain	

[ISO 3738:1976](#)

<https://standards.iteh.ai/catalog/standards/sist/e40af0b0-f475-462d-9b90-09d9ceac7440/iso-3738-1976>

The Member Body of the following country expressed disapproval of the document on technical grounds :

U.S.A.

Hardmetals – Rockwell hardness test (scale A)

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method of Rockwell hardness test (scale A) for hardmetals.

NOTE – Attention is drawn to an agreement between the Secretariats of ISO Technical Committees for metals (ISO/TC 17, 26, 79, 119 and 155) to establish an integration of the existing ISO publications for Rockwell hardness testing into one single International Standard which should apply to all metallic materials. Depending on the results of this co-ordination work, the present International Standard may be revised or withdrawn within a few years.

2 REFERENCE

ISO/R 80, *Rockwell hardness test (B and C scales) for steel.*

3 PRINCIPLE

The test consists in forcing a conical diamond indenter into a test piece in two operations and measuring the permanent increase e of the depth of indentation by means of a depth gauge under defined conditions.

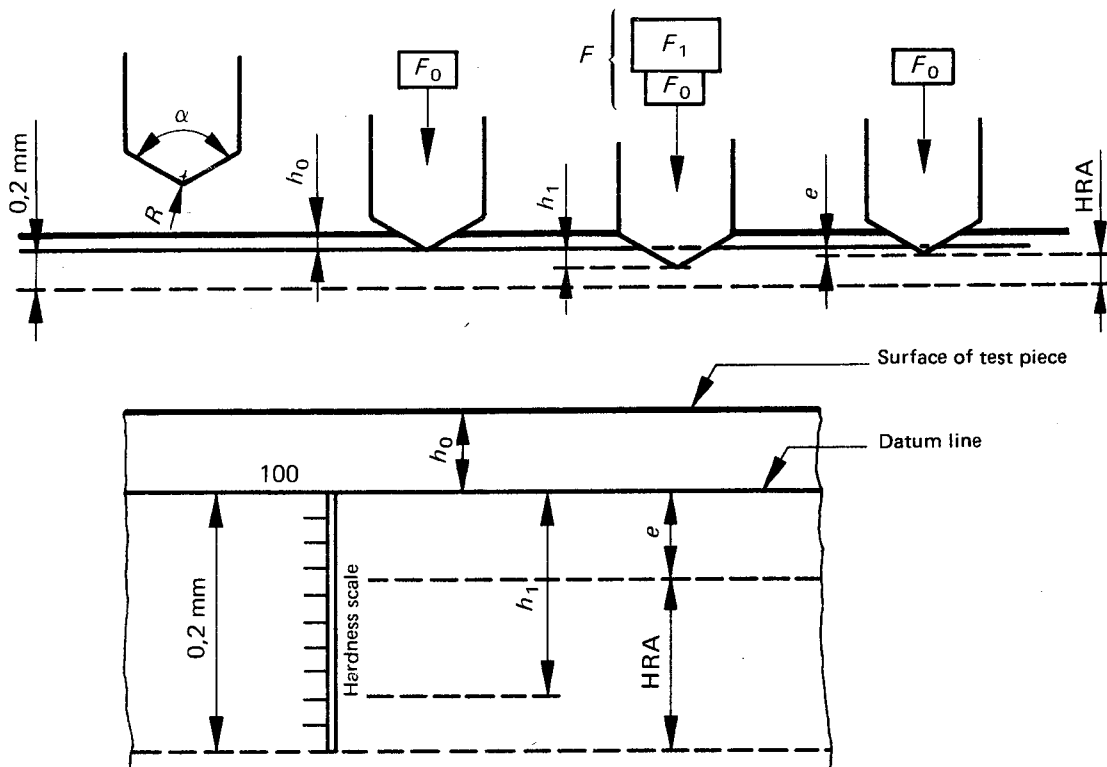
The unit of measurement for e is 0,002 mm; from the measurement of e , a number known as the Rockwell A hardness is deduced.

4 SYMBOLS AND DESIGNATIONS

See table 1 and the figure.

TABLE 1

Symbol	Designation
α	Angle at the tip of the diamond cone (120°)
R	Radius of curvature at the tip of the cone (0,2 mm)
F_0	Preliminary load = 98 ± 2 N ($10 \pm 0,2$ kgf)
F_1	Additional load = 491 N (50 kgf)
F	Total load = $F_0 + F_1 = 98 + 491 = 589 \pm 4$ N ($60 \pm 0,45$ kgf)
h_0	Depth of indentation under preliminary load before application of additional load
h_1	Increase in depth of indentation under additional load
e	Permanent increase of depth of indentation under preliminary load after removal of additional load, expressed in units of 0,002 mm
HRA	Rockwell hardness A = $100 - e$



5 APPARATUS

5.1 Testing equipment with a reading accuracy of 0,2 unit or better of Rockwell A scale.

5.2 Conical diamond indenter in accordance with ISO/R 80.

5.3 Three standard hardmetal test blocks in accordance with table 2. The finish of both the top and bottom surfaces of each standard test block shall be $R_a \leq 0,2 \mu\text{m}$.

TABLE 2

Group of standard test blocks	Nominal hardness of standard test blocks	Permissible variation of hardness on each test block
	HRA	HRA
I	85,5 ± 1,0	0,6
II	88,5 ± 1,0	0,6
III	91,0 ± 1,0	0,6

NOTE — Determinations shall be made using standard equipment.

6 SAMPLING

6.1 The test shall be carried out on a surface which is prepared so that its roughness is $R_a \leq 0,2 \mu\text{m}$.

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

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

When determining the hardness of a test piece with a curved surface, the radius of curvature of the latter shall be not less than 15 mm.

In order to determine the hardness of a test piece with radius of curvature less than 15 mm, a flat surface, at least 1 mm wide but preferably 3 mm wide, shall be prepared on which to carry out the test.

6.2 The prepared test piece shall be at least 1,6 mm thick.

6.3 The surface of the test piece on which the indenter is applied shall be parallel to the support surface within 0,1 mm for each 10 mm of length.

7 PROCEDURE

7.1 The order of procedure shall be in accordance with ISO/R 80, with the following alterations.

7.1.1 The first two readings after a new indenter has been mounted shall be disregarded.

7.1.2 The speed of applying the additional load shall be limited so that the movement of the indenter, when the load $F = 589 \text{ N}$ is applied, shall be completed in 5 to 8 s with no test piece on the testing equipment.

7.1.3 The time of applying the additional load after the movement of the pointer has stopped shall not exceed 2 s. While maintaining the preliminary load, remove the additional load gradually within 2 s.

7.2 Select a standard block having a value closest to the expected hardness of the test piece. Determine the Rockwell A hardness at three points on the block. The average of the three readings shall be within ± 0,5 HRA of the nominal hardness number of the block.

If the average value differs from the nominal hardness number by more than ± 0,5 HRA, check the testing equipment and the diamond indenter to correct the cause of the error.

If the average value differs from the nominal hardness number by ± 0,3 to ± 0,5 HRA, correct the average value of the hardness of the test piece, giving due regard to the algebraic sign.

7.3 Before determining the hardness, take an initial reading on the test piece. This reading shall be disregarded. Then determine the hardness on the test piece at three points situated on the diagonal or on the greatest dimension (on the longitudinal axis for cylindrical test pieces), equidistant from each other than from the apex of the angle or the edges of the test piece.

7.4 The distance between the centres of two adjacent indentations shall be at least 2 mm, and the distance from the centre of any indentation to an edge of the test piece shall be at least 1 mm.

8 EXPRESSION OF RESULTS

8.1 The hardness of an individual test piece shall be the arithmetic mean of three readings rounded to the nearest 0,5 HRA.

8.2 When testing a lot, the arithmetic mean values shall be rounded to the nearest 0,5 HRA.

9 TEST REPORT

The test report shall include the following information :

- a) reference to this International Standard;
- b) all details necessary for identification of the test sample;
- c) the 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 results.

NOTE — There is no general process for converting accurately Rockwell hardness into other scales of hardness. These conversions, therefore, should be avoided, except for special cases where a reliable basis for conversion has been obtained by comparison tests.