

INTERNATIONAL STANDARD

ISO
4498-1

Second edition
1990-08-01

Sintered metal materials, excluding hardmetals — Determination of apparent hardness —

Part 1: Materials of essentially uniform section hardness

<https://standards.iteh.ai/catalog/standards/sist/bc-14027-4/iso-4498-1-1990>
ISO 4498-1:1990
Matériaux métalliques frittés à l'exclusion des métaux-durs —
Détermination de la dureté apparente —

Partie 1: Matériaux ayant essentiellement une dureté uniforme dans la
section



Reference number
ISO 4498-1:1990(E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4498-1 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*.

This second edition cancels and replaces the first edition (ISO 4498-1:1978), of which it constitutes a minor technical revision.

ISO 4498 consists of the following parts, under the general title *Sintered metal materials, excluding hardmetals — Determination of apparent hardness*:

- *Part 1: Materials of essentially uniform section hardness*
- *Part 2: Case-hardened ferrous materials, surface enriched by carbon or carbon and nitrogen*
- *Part 3: Materials with hardened surfaces obtained by treatments other than those of ISO 4498-2*

Annex A forms an integral part of this part of ISO 4498.

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International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Introduction

The hardness value obtained by testing a sintered metal material with Brinell, Rockwell and Vickers test equipment is called the apparent hardness. Since the sample is a composite of solid material and pores, the hardness value is usually lower than that of solid material of the same composition and metallurgical condition. However, this does not imply that the functional characteristics (for example wear resistance) are necessarily inferior to those of an equivalent full-density material.

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Sintered metal materials, excluding hardmetals — Determination of apparent hardness —

Part 1:

Materials of essentially uniform section hardness

1 Scope

This part of ISO 4498 specifies methods of hardness testing of sintered metal materials.

It applies to

- a) sintered materials which have not been subjected to heat treatment;
- b) sintered materials heat treated in such a way that the hardness is essentially uniform to a depth of at least 5 mm below the surface.

NOTE 1 Sintered metal materials which, because of a surface treatment, for example case hardening, do not conform with requirement b) will be covered by subsequent parts of this International Standard.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 4498. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4498 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6506:1981, *Metallic materials — Hardness test — Brinell test*.

ISO 6507-1:1982, *Metallic materials — Hardness test — Vickers test — Part 1: HV 5 to HV 100*.

ISO 6508:1986, *Metallic materials — Hardness test — Rockwell test (scales A - B - C - D - E - F - G - H - K)*.

3 Apparatus

The test equipment shall be in accordance with ISO 6506, ISO 6507-1 or ISO 6508.

4 Sampling and preparation of test pieces

4.1 Since the apparent hardness of a sintered material depends on the density, which can vary throughout a part, the position of the hardness indentations, for the purpose of quality control, shall be agreed between the interested parties.

4.2 The sintered metal surface shall be clean, smooth and flat to obtain well-defined hardness indentations. This is particularly important when determining Vickers and Brinell hardness. It is generally found sufficient to clean the surface with a suitable solvent. If not, the surface may be lightly polished, provided that the laboratory measurements have shown that the influence of such polishing is insignificant.

NOTE 2 This polishing may be carried out, for example, by using metallographic paper or a 6 µm diamond paste.

5 Test requirements

5.1 The tests shall be made in accordance with the requirements of ISO 6506, ISO 6507-1 or ISO 6508 but with the additional requirements given in 5.2 to 5.5.

5.2 The hardness class to which a test piece belongs shall be determined by Vickers hardness testing using a test force of 49,03 N (HV 5). The test conditions shall then be selected from table 1 according to the class determined. Details of the conditions for the Rockwell test are given in annex A.

The Vickers hardness shall be the reference method and shall be used, for example, in cases of dispute.

NOTE 3 In cases where it is not possible to carry out a Vickers hardness test, the Rockwell hardness method may be used as the reference method.

If, after the initial HV 5 test, there is any doubt as to the hardness class to be chosen, the lower class shall be selected.

When a material specification covers more than one hardness class, the test shall be conducted under the conditions appropriate to the lower hardness limit given in the material specification.

5.3 For some test pieces, it will be necessary to use smaller test forces than those specified in table 1 in order to meet the requirements of ISO 6506, ISO 6507-1 or ISO 6508. This will be particularly so

- a) for thin test pieces;
- b) for test pieces of small cross-sectional area;
- c) when the designated test area is very small;
- d) when the test piece or its mount is likely to be distorted.

When such test conditions are necessary, the details shall be agreed between the interested parties.

It should be noted that, in these circumstances, the scatter of the results will be greater than under normal test conditions and that the value obtained will be less representative of the state of the material since the indentation will be very small.

5.4 When determining Vickers hardness, an indentation shall be discarded if it does not have clearly defined corners.

5.5 Five acceptable indentations shall be made and the corresponding hardness values calculated (or simply read in the case of Rockwell testing). The lowest hardness value shall be discarded. Another procedure of treatment of results is permitted by agreement between the interested parties.

6 Expression of results

Report the arithmetical mean of the four determinations retained (see 5.5), rounded to the nearest whole number.

Hardness values shall not be converted from one scale, i.e. Vickers, Brinell or Rockwell, to another.

7 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all details necessary for the identification of the test sample;
- c) the result obtained, followed by the appropriate symbol and test conditions in accordance with ISO 6506, ISO 6507-1 or ISO 6508;
- d) any operation not specified by this International Standard, or regarded as optional;
- e) details of any occurrence which may have affected the result.

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Table 1

Hardness class (HV 5)	Test conditions
15 to 60	HV 5 HBS 2,5/15,625/30 HRH
> 60 to 100	HV 5 HBS 2,5/31,25/15 HRF
> 100 to 200	HV 5 HBS 2,5/62,5/10 HRB
> 200 to 400	HV 10 HBW 2,5/187,5/10 HRA
> 400	HV 20 HBW 2,5/187,5/10 HRC

NOTE — The Brinell hardness is denoted by the following symbols:

- HBS in cases where a steel ball is used;
- HBW in cases where a hardmetal ball is used.

Annex A
(normative)

Conditions for Rockwell hardness test

Table A.1

Rockwell hardness	Type of indenter	Preliminary test force	Total test force
		N	N
HRA	Diamond cone: 120°	98,07	588,4
HRB	Ball: 1,587 5 mm (1/16 in)	98,07	980,7
HRC	Diamond cone: 120°	98,07	1 471
HRF	Ball: 1,587 5 mm (1/16 in)	98,07	588,4
HRH	Ball: 3,175 mm (1/8 in)	98,07	588,4

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UDC 669-138.8:620.178.1

Descriptors: powder metallurgy, sintered products, tests, hardness tests.

Price based on 3 pages
