Metallkeraamilised materjalid, välja arvatud kõvasulamid. Näivkõvaduse määramine. Osa 1: Materjalid, mille kõvadus ristlõike ulatuses on põhiliselt ühtlane

Sintered metal materials, excluding hardmetals - Determination of apparent hardness and microhardness

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NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN ISO 4498:2010 sisaldab Euroopa standardi EN ISO 4498:2010 ingliskeelset teksti.	This Estonian standard EVS-EN ISO 4498:2010 consists of the English text of the European standard EN ISO 4498:2010.
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English Version

Sintered metal materials, excluding hardmetals - Determination of apparent hardness and microhardness (ISO 4498:2010)

Matériaux métalliques frittés, à l'exclusion des métaux-durs - Détermination de la dureté apparente et de la microdureté (ISO 4498:2010)

Sintermetalle, ausgenommen Hartmetalle - Bestimmung der Sinterhärte und der Mikrohärte (ISO 4498:2010)

This European Standard was approved by CEN on 26 May 2010.

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Foreword

This document (EN ISO 4498:2010) has been prepared by Technical Committee ISO/TC 119 "Powder metallurgy".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

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Endorsement notice

The text of ISO 4498:2010 has been approved by CEN as a EN ISO 4498:2010 without any modification.

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Introduction

Sintered metal materials generally have a porous structure. Therefore, they can be understood as composite metal/pore materials. That is why this International Standard describes two procedures to determine their hardness:

— Procedure 1 for the macrohardness (this is the apparent hardness);

— Procedure 2 for the microhardness (this is the hardness of the metallic phase only).

Tests in Procedure 1 determine Vickers, Brinell and/or Rockwell macrohardnesses; their acronyms are: HV, HBW and HR. These tests determine the apparent hardness (macrohardness) of the materials because indentations generally include both the solid phase and a number of pores. The usual test forces applied to an indenter are from 10 N to 2 000 N.

The apparent hardness value is often used as an expression of the mechanical strength of the material as a whole; it is usually lower than that of a 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.

The apparent hardness is a macrostructural property. It characterizes the material taken as a whole.

Tests in Procedure 2 determine the Vickers and/or Knoop microhardnesses of the material; their acronyms are: HVa and HKa[1)]. The usual test forces applied to an indenter are from 0,147 N to 1,960 N for Vickers, and 0,981 N for Knoop.

The microhardness is a microstructural property used to control chemical composition, heat treatment or surface treatment. For these purposes, it is necessary to ensure that hardness test indentations are small enough not to include any visible pores, but only the solid phase.

1) Where a is the test load, in kilograms.

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

1 Scope

1.1 This International Standard specifies methods of hardness testing of sintered metal materials, excluding hardmetals.

1.2 Procedure 1 determines the apparent hardness of the whole material.

Procedure 1

— applies to sintered metal materials which have either not been subjected to any heat treatment, or which have been heat treated in such a way that the hardness is essentially uniform to a depth of at least 5 mm below the surface,

— applies to the surfaces of sintered metal materials which have been treated in such a way that the hardness is not uniform in the section to a depth of 5 mm below the surface,

— therefore applies to materials in which the hardness is obtained essentially by surface enrichment by carbon, or by carbon and nitrogen (for example by carburizing, carbonitriding, nitrocarburizing or sulfidizing), and

— applies to materials which have been induction hardened.

1.3 Procedure 2 determines the microhardness of the metal phase.

Procedure 2

— applies to all types of sintered metal materials,

— is used, in particular, to determine the hardness profile of case-hardened or carbonitrided materials in accordance with the method described in ISO 4507, and

— also applies to any sintered metallic materials which have been subjected to surface treatments such as electrodeposited plating, chemical coating, chemical vapour deposition (CVD), physical vapour deposition (PVD), laser, ion bombardment, etc. To determine the microhardness of treated surfaces, Procedure 2 applies.

NOTE However, an international agreement has not yet been reached on a number of factors involved in microhardness testing. Nevertheless, the parameters defined in Procedure 2 are important enough to enable a considerable measure of standardization of extensively used practices.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4507, *Sintered ferrous materials, carburized or carbonitrided — Determination and verification of case-hardening depth by a micro-hardness test*

ISO 4516, *Metallic and other inorganic coatings — Vickers and Knoop microhardness tests*

ISO 6506-1, *Metallic materials — Brinell hardness test — Part 1: Test method*

ISO 6507-1, *Metallic materials — Vickers hardness test — Part 1: Test method*

ISO 6508-1, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*

3 Apparatus

Procedure 1: Vickers, Brinell and Rockwell hardness testing machines and test methods meeting the requirements of ISO 6506-1, ISO 6507-1 and ISO 6508-1, respectively.

Procedure 2: Vickers and Knoop microhardness testing machines and test methods meeting the requirements of ISO 4516.

4 Sampling and preparation of test pieces

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

4.2 The sintered metal surface shall be clean, smooth and flat to obtain well-defined hardness indentations. Test samples will have anvil-support surfaces filed or ground flat wherever practicable, so as to prevent burrs from affecting results. This is particularly important when determining Vickers and Brinell hardness. Emery paper of 180 to 240 grit is acceptable for grinding. It is generally found sufficient to clean the surface with a suitable solvent. If not, the surface may be lightly polished, provided that laboratory measurements have shown that the influence of such polishing is insignificant.

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

4.3 Microhardness can be measured either on the surface of a part or on a cross-section of the part normal to the surface. For microhardness determinations, it is necessary to ensure that the surface is smooth enough to allow measurement of the indentation diagonal length accurately. The sample may then be chemically cleaned, and electrochemically or mechanically polished to reveal porosity. Mechanical polishing should involve minimum local heating or working, so as not to affect hardness. The sample for nickel-alloyed sintered steels can be smoothly etched before measuring the microhardness. This smooth etching of the sample will detect the softer areas of nickel-alloyed sintered steels in order to eliminate them from measurement. This leads to a more precise test result.

Previous impregnation of the part with a thermosetting resin can be beneficial, if the part has more than 8 % open porosity. The surface to be measured shall be flat and smooth. Indentations should have sharp edges in order to carry out accurate diagonal measurement. The thickness of the test piece shall be greater than 1,5 times the length of the impression diagonal.

4.4 Surface curvature introduces a certain error in determining microhardness, which increases as the radius decreases. On convex surfaces, higher hardness values and, on concave surfaces, lower hardness values, than the actual values are obtained. If the Vickers hardness test (apparent hardness or

