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I.S. EN ISO 4498:2010

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

## I.S. 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 Mikrohärté (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of an identical text or by endorsement, at the latest by December 2010, and conflicting national standards shall be withdrawn at the latest by December 2010.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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STANDARD**

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

*Matériaux métalliques frittés, à l'exclusion des métaux-durs —  
Détermination de la dureté apparente et de la microdureté*



Reference number  
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## 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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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ISO 4498 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*, Subcommittee SC 3, *Sampling and testing methods for sintered metal materials (excluding hardmetals)*.

This second edition cancels and replaces the first edition (ISO 4498:2005), of which it constitutes a minor revision.

## 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:  $HV_a$  and  $HK_a^{1)}$ . 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.

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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.

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