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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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## Contents

Page

Foreword .....	iv
Introduction.....	v
1 Scope .....	1
2 Normative references .....	2
3 Apparatus .....	2
4 Sampling and preparation of test pieces .....	2
5 Test procedures.....	3
5.1 Procedure 1 — Determination of apparent hardness .....	3
5.2 Procedure 2 — Determination of microhardness .....	4
6 Expression of results .....	6
6.1 Apparent hardness .....	6
6.2 Microhardness .....	6
7 Repeatability and reproducibility.....	6
7.1 Vickers apparent hardness .....	6
7.2 Rockwell apparent hardness.....	6
7.3 Vickers microhardness .....	6
7.4 Precision statement .....	6
8 Test report.....	7
Annex A (normative) Test conditions and test loads as well as symbols and designations for microhardness values.....	8
Annex B (informative) Repeatability and reproducibility.....	10
Bibliography.....	12

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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.

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

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.

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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:  $HV_a$  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.