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**Hardmetals — Sampling and testing of  
powders using sintered test pieces**

*Métaux-durs — Échantillonnage et essais des poudres au moyen  
d'éprouvettes frittées*

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ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*, Subcommittee SC 4, *Sampling and testing methods for hardmetals*.

This second edition cancels and replaces the first edition (ISO 4884:1978), which has been technically revised. The main changes compared to the previous edition are as follows:

- [Clause 2](#) has been revised;
- in [Table 1](#), second row: the reference on ISO 3326 has been replaced;
- in [Table 1](#), fifth row: the reference has been replaced by ISO 3738-1 and ISO 3738-2;
- in [Table 1](#), sixth row: the reference to ISO 3878 has been replaced by ISO 6507-1, ISO 6507-2, ISO 6507-3 and ISO 6507-4;
- in [Table 1](#), seventh row: the reference has been replaced by ISO 4499-1, ISO 4499-2 and ISO 4499-3;
- in [Table 1](#), eighth row: the reference has been replaced by ISO 4499-4;
- in [Table 1](#), ninth row: has been added;
- the Bibliography has been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

# Hardmetals — Sampling and testing of powders using sintered test pieces

## 1 Scope

This document specifies procedures for the sampling and testing of powder mixtures for the manufacture of hardmetals, using sintered test pieces. It also covers the preparation of test pieces.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 3327, *Hardmetals — Determination of transverse rupture strength*

ISO 3369, *Impermeable sintered metal materials and hardmetals — Determination of density*

ISO 3738-1, *Hardmetals — Rockwell hardness test (scale A) — Part 1: Test method*

ISO 3738-2, *Hardmetals — Rockwell hardness test (scale A) — Part 2: Preparation and calibration of standard test blocks*

ISO 3954, *Powders for powder metallurgical purposes — Sampling*

ISO 4499-1, *Hardmetals — Metallographic determination of microstructure — Part 1: Photomicrographs and description*

ISO 4499-2, *Hardmetals — Metallographic determination of microstructure — Part 2: Measurement of WC grain size*

ISO 4499-3, *Hardmetals — Metallographic determination of microstructure — Part 3: Measurement of microstructural features in Ti (C, N) and WC/cubic carbide based hardmetals*

ISO 4499-4, *Hardmetals — Metallographic determination of microstructure — Part 4: Characterisation of porosity, carbon defects and eta-phase content*

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

ISO 6507-2, *Metallic materials — Vickers hardness test — Part 2: Verification and calibration of testing machines*

ISO 6507-3, *Metallic materials — Vickers hardness test — Part 3: Calibration of reference blocks*

ISO 6507-4, *Metallic materials — Vickers hardness test — Part 4: Tables of hardness values*

ISO 28079, *Hardmetals — Palmqvist toughness test*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3954 apply and the following.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

### 4 Sampling

4.1 Sampling from a lot shall be carried out in accordance with ISO 3954.

4.2 In the event that a batch is blended into one lot in one blender as the last operation before separation into containers, then by agreement between producer and consumer, one or more test samples may be taken from the blender.

### 5 Preparation of test pieces

5.1 The test pieces shall be processed from the test sample in conformity with their grade and dimensions. All the test pieces for each type of testing shall be sintered simultaneously under the same conditions and in the same furnace.

5.2 To ensure that the characteristics of the test pieces prepared from the lot of powder are significant, the appropriate manufacturing conditions shall be used in the production of the test pieces.

5.3 The dimensions of the test pieces shall comply with the requirements of the relevant International Standards specified in [Table 1](#). For the determination of porosity, one or more test pieces shall be sectioned to enable a total area of not less than 1 cm<sup>2</sup> to be examined.

### 6 Testing

Tests on sintered test pieces from a lot of powder shall be carried out in accordance with the International Standards given in [Table 1](#).

Table 1 — Tests

Type of testing	International Standard
Determination of magnetic characteristics	NOTE In addition to the referred standards, the analysis of magnetic characteristics (coercivity and magnetic saturation) of the hardmetals is common usage. These analysis are device-specific so that is not possible to describe this within standards. ISO 3326 was therefore withdrawn.
Determination of transverse rupture strength	ISO 3327
Determination of density	ISO 3369
Determination of hardness HRA	ISO 3738-1 ISO 3738-2
Determination of hardness HV	ISO 6507-1 ISO 6507-2 ISO 6507-3 ISO 6507-4
Determination of microstructure	ISO 4499-1 ISO 4499-2 ISO 4499-3
Determination of porosity, carbon defects and eta-phase content	ISO 4499-4
Determination of fracture toughness (Palmqvist toughness)	ISO 28079

The determination of the characteristics listed in [Table 1](#) may be carried out on the same test pieces but the determination of hardness, microstructure and porosity shall not be carried out before the determination of transverse rupture strength.

NOTE 1 Because of the high scatter given by the transverse rupture test, its value is limited when testing an individual lot of powder.

NOTE 2 Chemical analysis can be carried out on a test sample taken from the powder lot or on a sintered test piece.

## Bibliography

- [1] ISO 3326<sup>1)</sup>, *Hardmetals — Determination of (the magnetization) coercivity*
- [2] ISO 3878<sup>1)</sup>, *Hardmetals — Vickers hardness test*

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1) Withdrawn standard.