



**NSAI**  
Standards

Irish Standard  
I.S. EN ISO 4499-2:2020

# Hardmetals - Metallographic determination of microstructure - Part 2: Measurement of WC grain size (ISO 4499-2:2020)

**I.S. EN ISO 4499-2:2020**

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*This document is based on:*

EN ISO 4499-2:2020

*Published:*

2020-08-05

*This document was published  
under the authority of the NSAI  
and comes into effect on:*

2020-08-24

ICS number:

77.040.99

77.160

NOTE: If blank see CEN/CENELEC cover page

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## National Foreword

I.S. EN ISO 4499-2:2020 is the adopted Irish version of the European Document EN ISO 4499-2:2020, Hardmetals - Metallographic determination of microstructure - Part 2: Measurement of WC grain size (ISO 4499-2:2020)

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**EUROPEAN STANDARD**

**EN ISO 4499-2**

**NORME EUROPÉENNE**

**EUROPÄISCHE NORM**

August 2020

ICS 77.040.99; 77.160

Supersedes EN ISO 4499-2:2010

English Version

**Hardmetals - Metallographic determination of  
microstructure - Part 2: Measurement of WC grain size  
(ISO 4499-2:2020)**

Métaux-durs - Détermination métallographique de la  
microstructure - Partie 2: Mesurage de la taille des  
grains de WC (ISO 4499-2:2020)

Hartmetalle - Metallographische Bestimmung der  
Mikrostruktur - Teil 2: Messung der WC Korngröße  
(ISO 4499-2:2020)

This European Standard was approved by CEN on 1 August 2020.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and United Kingdom.



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**EN ISO 4499-2:2020 (E)**

**Contents**

Page

<b>European foreword.....</b>	<b>3</b>
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## **European foreword**

This document (EN ISO 4499-2:2020) has been prepared by Technical Committee ISO/TC 119 "Powder metallurgy" in collaboration with Technical Committee CEN/SS M11 "Powder metallurgy" the secretariat of which is held by CCMC.

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 February 2021, and conflicting national standards shall be withdrawn at the latest by February 2021.

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

This document supersedes EN ISO 4499-2:2010.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## **Endorsement notice**

The text of ISO 4499-2:2020 has been approved by CEN as EN ISO 4499-2:2020 without any modification.

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# INTERNATIONAL STANDARD

**ISO  
4499-2**

Second edition  
2020-07

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## **Hardmetals — Metallographic determination of microstructure —**

### **Part 2: Measurement of WC grain size**

*Métaux-durs — Détermination métallographique de la  
microstructure —*

*Partie 2: Mesurage de la taille des grains de WC*



Reference number  
ISO 4499-2:2020(E)

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**ISO 4499-2:2020(E)**



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Published in Switzerland

# Contents

Page

<b>Foreword</b> .....	<b>iv</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms, definitions, symbols and abbreviated terms</b> .....	<b>2</b>
3.1 Terms and definitions.....	2
3.2 Symbols and abbreviated terms.....	3
<b>4 General information</b> .....	<b>3</b>
<b>5 Apparatus</b> .....	<b>4</b>
<b>6 Calibration</b> .....	<b>5</b>
<b>7 Grain-size measurement by the linear-intercept method</b> .....	<b>5</b>
7.1 General.....	5
7.2 Sampling.....	6
7.2.1 Sampling of products.....	6
7.2.2 Sampling of microstructure.....	6
7.3 Measurement errors.....	7
7.3.1 Systematic and random errors.....	7
7.3.2 Large WC grain sizes.....	7
7.3.3 Smallest measurable intercept.....	7
<b>8 Reporting</b> .....	<b>8</b>
<b>Annex A (informative) Measurement case study</b> .....	<b>10</b>
<b>Annex B (informative) Report proforma</b> .....	<b>15</b>
<b>Bibliography</b> .....	<b>17</b>

## ISO 4499-2:2020(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.

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 of 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 [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*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/SS M11, *Powder metallurgy*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 4499-2:2008), which has been technically revised.

The main changes compared to the previous edition are as follows:

- former 3.1 has been removed;
- [3.2](#) has been expanded;
- in [Clause 5](#), “Electron back scatter diffraction (EBSD)” has been added;
- in [7.2.1](#), the list has been revised;
- in [7.3.3](#), [Table 1](#), row “Electron back scatter diffraction” has been added and in the row “Scanning electron microscope”, the value for the “Minimum visible intercept length” has been corrected from 200 nm into 400 nm.

A list of all parts in the ISO 4499 series can be found on the ISO website.

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 — Metallographic determination of microstructure —

## Part 2: Measurement of WC grain size

### 1 Scope

This document gives guidelines for the measurement of hardmetal grain size by metallographic techniques only using optical or electron microscopy. It is intended for WC/Co hardmetals (also called cemented carbides or cermets) containing primarily tungsten carbide (WC<sup>1)</sup>) as the hard phase. It is also intended for measuring the grain size and distribution by the linear-intercept technique.

This document essentially covers four main topics:

- calibration of microscopes, to underpin the accuracy of measurements;
- linear analysis techniques, to acquire sufficient statistically meaningful data;
- analysis methods, to calculate representative average values;
- reporting, to comply with modern quality requirements.

This document is supported by a measurement case study to illustrate the recommended techniques (see [Annex A](#)).

This document is not intended for the following:

- measurements of size distribution;
- recommendations on shape measurements. Further research is needed before recommendations for shape measurement can be given.

Measurements of coercivity are sometimes used for grain-size measurement, however, this document is concerned only with a metallographic measurement method. It is also written for hardmetals and not for characterizing powders. However, the method can, in principle, be used for measuring the average size of powders that are suitably mounted and sectioned.

### 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 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 4489:2019, *Hardmetals — Sampling and testing*

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1) DE: Wolframcarbid, EN: tungsten carbide.

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