



NSAI
Standards

Irish Standard
I.S. EN ISO 4491-4:2019

Metallic powders - Determination of oxygen content by reduction methods - Part 4: Total oxygen by reduction-extraction (ISO 4491-4:2019)

I.S. EN ISO 4491-4:2019

Incorporating amendments/corrigenda/National Annexes issued since publication:

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National Foreword

I.S. EN ISO 4491-4:2019 is the adopted Irish version of the European Document EN ISO 4491-4:2019, Metallic powders - Determination of oxygen content by reduction methods - Part 4: Total oxygen by reduction-extraction (ISO 4491-4:2019)

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EUROPEAN STANDARD

EN ISO 4491-4

NORME EUROPÉENNE

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May 2019

ICS 77.160

Supersedes EN ISO 4491-4:2013

English Version

Metallic powders - Determination of oxygen content by reduction methods - Part 4: Total oxygen by reduction-extraction (ISO 4491-4:2019)

Poudres métalliques - Dosage de l'oxygène par les méthodes de réduction - Partie 4: Oxygène total par réduction-extraction (ISO 4491-4:2019)

This European Standard was approved by CEN on 25 April 2019.

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EN ISO 4491-4:2019 (E)

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European foreword

This document (EN ISO 4491-4:2019) 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of an identical text or by endorsement, at the latest by November 2019, and conflicting national standards shall be withdrawn at the latest by November 2019.

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 4491-4:2013.

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Endorsement notice

The text of ISO 4491-4:2019 has been approved by CEN as EN ISO 4491-4:2019 without any modification.

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INTERNATIONAL STANDARD

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Third edition
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Metallic powders — Determination of oxygen content by reduction methods —

Part 4: Total oxygen by reduction-extraction

*Poudres métalliques — Dosage de l'oxygène par les méthodes de
réduction —*

Partie 4: Oxygène total par réduction-extraction



Reference number
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ISO 4491-4:2019(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).

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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.

This document was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*, Subcommittee SC 2, *Sampling and testing methods for powders (including powders for hardmetals)*.

This third edition cancels and replaces the second edition (ISO 4491-4:2013), of which it constitutes a minor revision. The changes compared to the previous edition are as follows:

- addition of [Clause 3](#) (Terms and definitions);
- [Clause 6](#), changing from 0,1 mg to 0,000 1 g;
- changing carbon monoxide to CO and carbon dioxide to CO₂.

A list of all parts in the ISO 4491 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.

Introduction

The determination of the oxygen content of metallic powders is of the utmost importance in many fields of powder metallurgy.

The standard methods described in ISO 4491-2 and ISO 4491-3 do not give the total oxygen content of the sample, as some oxygen-containing constituents are not reduced by hydrogen.

Therefore, a standard method for the determination of the total oxygen content is needed. The most frequently used method is reduction-extraction. It can be carried out with various commercially available instruments working according to different principles of extraction and measurement.

The results of the analysis depend on the type of equipment used and on the test parameters selected. However, as indicated in [Clauses 4 to 7](#), it is always possible, for a given type of metal powder, to optimize the test conditions to obtain reproducible and accurate results with any of the commercially available instruments, provided they are designed for testing the metal powder considered.

It is not possible to standardize one or more particular instruments. However, certain basic points of procedure are considered for the analysis of metallic powders (see [Clause 7](#)).

NOTE The reduction-extraction method is also applicable to nitrogen determination and certain instruments permit simultaneous measurement of oxygen and nitrogen contents. However, the determination of nitrogen is not covered by this document.

Metallic powders — Determination of oxygen content by reduction methods —

Part 4: Total oxygen by reduction-extraction

1 Scope

This document specifies a method for the determination of the total oxygen content of metallic powders by reduction-extraction at high temperature.

By agreement, this method is also applicable to the determination of the total oxygen content of sintered metal materials.

The method is applicable to all powders of metals, alloys, carbides, and mixtures thereof which are non-volatile under the test conditions. The sample can be in powder or compact form.

The analysis is carried out on the powder as supplied, but the method is not applicable if the powder contains a lubricant or binder. If such substances are present, the method may be used only if they can first be completely removed by a method not affecting the oxygen content of the powder.

This document is to be read in conjunction with ISO 4491-1.

2 Normative references

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

ISO 4491-1, *Metallic powders — Determination of oxygen content by reduction methods — Part 1: General guidelines*

3 Terms and definitions

No terms and definitions are listed in this document.

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 Principle

A test portion of the sample is heated in a graphite crucible at high temperature, either under vacuum or in a flow of an inert carrier gas. Oxygen in the sample is converted to oxides of carbon. These are extracted and transformed completely to either carbon monoxide (CO) or carbon dioxide (CO₂), which is determined by a suitable gas analysis method.

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