



**SLOVENSKI STANDARD**  
**SIST EN 24491-1:2000**  
**01-december-2000**

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**Metallic powders - Determination of oxygen content by reduction methods - Part 1:  
General guidelines (ISO 4491-1:1989)**

Metallic powders - Determination of oxygen content by reduction methods - Part 1:  
General guidelines (ISO 4491-1:1989)

Metallpulver - Bestimmung des Sauerstoffgehaltes durch Reduktionsverfahren - Teil 1:  
Allgemeine Hinweise (ISO 4491-1:1989)

Poudres métalliques - Dosage de l'oxygene par les méthodes de réduction - Partie 1:  
Directives générales (ISO 4491-1:1989)

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**Ta slovenski standard je istoveten z: EN 24491-1:1993**

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**ICS:**

77.160            Metalurgija prahov            Powder metallurgy

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EUROPEAN STANDARD

EN 24491-1:1993

NORME EUROPÉENNE

EUROPÄISCHE NORM

April 1993

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Descriptors: Powder metallurgy, metallic powder, chemical analysis, determination of content, oxygen, reduction method

English version

**Metallic powders - Determination of oxygen  
content by reduction methods - Part 1: General  
guidelines (ISO 4491-1:1989)**

Poudres métalliques - Dosage de l'oxygène par  
les méthodes de réduction - Partie 1:  
Directives générales (ISO 4491-1:1989)

Metallpulver - Bestimmung des  
Sauerstoffgehaltes durch Reduktionsverfahren -  
Teil 1: Allgemeine Hinweise (ISO 4491-1:1989)

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This European Standard was approved by CEN on 1993-04-02. 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 Central Secretariat or to any CEN member.

The European Standards exist 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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## Foreword

In 1992 ISO 4491-1:1989 "Metallic powders - Determination of oxygen content by reduction methods - Part 1: General guidelines" was submitted to the CEN Primary Questionnaire procedure.

Following the positive result of the CEN/CS Proposal ISO 4491-1:1989 was submitted to the CEN Formal Vote. The result of the Formal Vote was positive.

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 October 1993, and conflicting national standards shall be withdrawn at the latest by October 1993.

According to the Internal Regulations of CEN/CENELEC, the following countries are bound to implement this European Standard :

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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## Endorsement notice

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The text of the International Standard ISO 4491-1:1989 was approved by CEN as a European Standard without any modification.

NOTE: The European references to international publications are given in annex ZA (normative).

**Annex ZA (normative)**  
**Normative references to international publications**  
**with their relevant European publications**

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
ISO 4491-2		Metallic powders - Determination of oxygen content by reduction methods - Part 2: Loss of mass on hydrogen reduction (hydrogen loss)	EN 24491-2	
ISO 4491-3		Metallic powders - Determination of oxygen content by reduction methods - Part 3: Hydrogen-reducible oxygen	-----	----
ISO 4491-4		Metallic powders - Determination of oxygen content by reduction methods - Part 4: Loss of mass on hydrogen reduction (hydrogen loss)	EN 24491-4	

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# INTERNATIONAL STANDARD

# ISO 4491-1

First edition  
1989-10-01

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## Metallic powders — Determination of oxygen content by reduction methods —

### Part 1: General guidelines

iTeh STANDARD PREVIEW

(standards.iteh.ai)

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

*Partie 1: Directives générales*

<https://standards.iteh.ai/catalog/standards/sist/607263a7-1991-4e91-a145-6e77a1f375f8/sist-en-24491-1-2000>



Reference number  
ISO 4491-1 : 1989 (E)

## ISO 4491-1 : 1989 (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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4491-1 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*.

SIST EN 24491-1:2000

ISO 4491 consists of the following parts, under the general title *Metallic powders — Determination of oxygen content by reduction methods*:

- *Part 1: General guidelines*
- *Part 2: Loss of mass on hydrogen reduction (hydrogen loss)*
- *Part 3: Hydrogen-reducible oxygen*
- *Part 4: Total oxygen by reduction-extraction*

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## Introduction

In powder metallurgy, the purity of the powders is an important parameter for the manufacture of sintered metals. Among the various impurities which may be present in a powder, oxygen plays a particular role as it is always present in any metal or alloy powder, and in amounts greater than those encountered in compact metals. Oxygen is mostly combined in the form of oxides which appear in the following ways:

- Oxide film coatings on particle surfaces, spontaneously formed by oxidation of the metal by air or moisture during powder preparation and during handling and storage.
- Oxide inclusions, being either oxides of the main metal remaining locally unreduced during the production process (in the case of reduced powders), or other oxide impurities originating from the raw material and/or from the equipment (e.g. refractory ceramics from melting furnace in atomization processes).

In practice, oxygen contents in metallic powders lie mostly in the range 0,1 % (*m/m*) to 1 % (*m/m*).

The determination of oxygen content can be made by means of many physical or chemical methods, for example

- a) specific methods, such as activation analysis or mass spectrometry, in which the element O is directly determined;
- b) reduction methods, in which oxides present are, totally or partially, reduced by hydrogen or by carbon. Oxygen content is related, either to the loss of mass of the sample through reduction, or to the amount of water or CO/CO<sub>2</sub> produced by the reaction;
- c) separation methods, in which
  - either the oxide phase is selectively dissolved and determined chemically (for example in copper powder, where copper oxide is dissolved by hydrochloric acid);
  - or the metal phase is selectively dissolved, and the insoluble residue (assumed to be oxide) is evaluated (for example in aluminium powder, aluminium is dissolved in bromine-methanol reagent, leaving aluminium oxide).

The present International Standard considers only reduction methods, as these are commonly used in laboratories for analysing a great variety of metal powders.