
INTERNATIONAL STANDARD



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Metallic powders — Determination of loss of mass on hydrogen reduction (hydrogen loss)

*Poudres métalliques — Détermination de la perte de masse après réduction par l'hydrogène
(perte dans l'hydrogène)*

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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.

International Standard ISO 4491 was developed by Technical Committee ISO/TC 119, *Powder metallurgical materials and products*, and was circulated to the member bodies in June 1977.

It has been approved by the member bodies of the following countries :

Australia	Germany	Spain
Austria	Italy	Sweden
Bulgaria	Korea, Rep. of	United Kingdom
Canada	Mexico	U.S.A.
Chile	Poland	U.S.S.R.
Czechoslovakia	Portugal	Yugoslavia
Egypt, Arab Rep. of	Romania	
France	South Africa, Rep. of	

No member body expressed disapproval of the document.

Metallic powders — Determination of loss of mass on hydrogen reduction (hydrogen loss)

1 SCOPE

This International Standard specifies a method for the determination of the relative loss of mass which a metallic powder undergoes when heated in a stream of pure dry hydrogen under specified conditions.

The purpose of this test is to evaluate a chemical powder characteristic which is of importance to the powder metallurgical industry. The test is not intended as a means for the determination of the content of specific elements. (See the annex.)

2 FIELD OF APPLICATION

This test method is applicable to unalloyed, partially alloyed and completely alloyed powders of the metals listed in the table. It is not applicable to lubricated powders or to mixtures of metal powders.

The results can be influenced by the presence of reducible, oxidizable or volatile metals, metalloids or compounds present (see the annex). The results obtained on such powders shall be used with caution and their interpretation shall be subject to agreement between supplier and user.

3 REAGENTS

The following two gases, with a maximum oxygen content of 0,005 % and a dew point not higher than -45°C .

3.1 Hydrogen.

3.2 Nitrogen or argon.

4 APPARATUS

An example of a suitable test arrangement is shown schematically in the figure.

4.1 Laboratory balance of sufficient capacity, and capable of weighing to an accuracy of $\pm 0,000\text{ g}$.

4.2 Electrically heated tubular furnace that can be continuously operated at the appropriate temperatures given in the table and that has a control system capable of maintaining the temperature in that part of the tube containing a boat within the temperature tolerance stated in the table.

NOTE — When testing magnetic powders, it is recommended that wire-wound furnaces should be wound non-inductively.

4.3 Gas-tight tube of quartz or similar refractory material (for example dense alumina). The inside diameter of the tube should be between 25 and 40 mm and its length such that it extends about 200 mm beyond each end of the furnace.

NOTE — When a large number of hydrogen loss determinations are to be carried out, a larger furnace than that described in this International Standard, and one which permits several test portions to be tested simultaneously, may be used, provided that the temperature and time conditions shown in the table are fulfilled and the results obtained are in agreement with those obtained when the test is carried out according to this International Standard.

4.4 Totally enclosed thermocouple, for example platinum/platinum-rhodium, and an **indicating or recording instrument**, permitting the measurement of temperature with an accuracy of $\pm 5^{\circ}\text{C}$.

4.5 Boats, preferably of high alumina ceramic with a polished surface. Other materials, for example quartz and nickel, may be used when test conditions allow. The boat should be of such dimensions, for example 75 mm long and 12 mm wide, that the thickness of the powder, when uniformly distributed, does not exceed 3 mm.

New boats shall be pretreated in a stream of hydrogen at the test temperature and stored in a desiccator.

A boat may be used more than once, provided that it is always used for testing the same metal powder or type thereof and provided that it is carefully cleaned by mechanical means between determinations and stored in a desiccator.

4.6 Cylinders containing hydrogen and either nitrogen or argon, with pressure gauges and flow meters to control the flow of gas.

5 SAMPLING

5.1 The powder shall be tested in the as-received condition.

5.2 The loss in mass shall be determined on two test portions.

5.3 The mass of the test portion shall be approximately 5 g, except that for powders of low apparent density it may be reduced to comply with the requirements of 4.5 and 6.2.