
**Metallic powders — Determination of
envelope-specific surface area from
measurements of the permeability to air of a
powder bed under steady-state flow conditions**

*Poudres métalliques — Détermination de la surface spécifique
d'enveloppe à partir de mesures de la perméabilité à l'air d'un lit de
poudre dans des conditions d'écoulement permanent*



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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 10070 was prepared by Technical Committee ISO/TC 119, *Powder metallurgy*.

Annexes A and B of this International Standard are for information only.

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Introduction

The measurement of the permeability of a packed powder bed to a laminar gas flow is the basis of this International Standard. The determination can be made either at constant pressure drop (steady-state flow) or at variable pressure drop (constant volume).

The permeability measured is influenced by the porosity of the bed. For a given particle shape, the values of permeability and porosity can be used to calculate a specific surface area of the powder by means of equations of different types.

The surface area so calculated includes only those walls of the pores in the bed which are swept by the gas flow. It does not take into account closed or blind pores. It is defined as the envelope-specific surface area. It may be very different from the total surface area of particles as measured, for instance, by gas adsorption methods.

A single equation is used in the standard methods described and this entails certain limitations with respect to the type of powder (particle shape) and the porosity of the powder bed for which the method is applicable. Consequently this is not an absolute method, and the value obtained depends upon the procedure used and the assumptions made.

The specific surface area determined can be converted into a mean equivalent spherical diameter (see definitions, clause 3).

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Metallic powders — Determination of envelope-specific surface area from measurements of the permeability to air of a powder bed under steady-state flow conditions

1 Scope

1.1 This International Standard specifies a method of measuring the air permeability and the porosity of a packed bed of metal powder, and of deriving therefrom the value of the envelope-specific surface area. The permeability is determined under steady-state flow conditions, using a laminar flow of air at a pressure near atmospheric. This International Standard does not include the measurement of permeability by a constant volume method.

Several different methods have been proposed for this determination, and several instruments are available commercially. They give similar, reproducible results, provided the general instructions given in this International Standard are respected and the test parameters are identical.

This International Standard does not specify a particular commercial apparatus and corresponding test procedure. However, for the convenience of the user, an informative annex has been included (annex A) which is intended to give some practical information on three specific methods:

- the Lea and Nurse method, involving an apparatus which can be built in a laboratory (see A.1);
- the Zhang Ruifu method, using similar equipment (see A.2);
- the Gooden and Smith method, involving an apparatus which can be built in a laboratory but for which a commercial apparatus also exists (see A.3).

These methods are given as examples only. Other equipment available in various countries is acceptable within the scope of this International Standard.

1.2 This method is applicable to all metallic powders, including powders for hardmetals, up to 1 000 μm in diameter, but it is generally used for particles having diameters between 0,2 μm and 50 μm . It should not be used for powders composed of particles whose shape is far from equiaxial, i.e. flakes or fibres, unless specifically agreed upon between the parties concerned.

This method is not applicable to mixtures of different metallic powders or powders containing binders or lubricant.

If the powder contains agglomerates, the measured surface area may be affected by the degree of agglomeration. If the powder is subjected to a de-agglomeration treatment (see annex B), the method used shall be agreed upon between the parties concerned.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3252:1982, *Powder metallurgy — Vocabulary.*

ISO 3954:1977, *Powders for powder metallurgical purposes — Sampling.*

ISO 4022:1987, *Permeable sintered metal materials — Determination of fluid permeability.*