International Standard ISO 3923/3

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Metallic powders — Determination of apparent density — Part 3 : Oscillating funnel method

Poudres métalliques — Détermination de la masse volumique apparente — Partie 3 : Méthode de l'entonnoir oscillant

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Foreword

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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 3923/3 was developed by Technical Committee ISO/TC 119, *Powder metallurgy*, and was circulated to the member bodies in October 1979.

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

Australia	Germany, F. R.	Romania
Austria	India	South Africa, Rep. of
Bulgaria	Italy	Spain
Canada	Japan	Sweden
Czechoslovakia	Korea, Rep. of	United Kingdom
Egypt, Arab Rep. of	Poland	USA
France	Portugal	USSR

No member body expressed disapproval of the document.

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Metallic powders — Determination of apparent density — Part 3 : Oscillating funnel method

1 Scope and field of application

This part of ISO 3923 specifies the oscillating funnel method for the determination of the apparent density of metallic powders. It is applicable to powders that will not flow freely through a 5 mm diameter orifice (see ISO 3923/1).

The method shall not be applied to powders having particles which may disintegrate during vibration, for example agglomerated, fibrous or acicular particles. A method for the determination of the apparent density of powders containing such particles is specified in ISO 3923/2.

2 References

ISO 3923/1, *Metallic powders — Determination of apparent density — Part 1 : Funnel method.*

ISO 3923/2, *Metallic powders — Determination of apparent density — Part 2 : Scott volumeter method.*[1)]

3 Principle

Measurement of the mass of a certain quantity of powder, which in a loose condition exactly fills a cup of known volume.

The loose condition is obtained by using, when filling the cup, an oscillating funnel placed at a determined distance above the cup.

The ratio between the mass and the volume represents the apparent density.

4 Symbols and designations

Symbol	Designation	Unit
ϱ_a	Apparent density of metallic powders (general term)	g/cm^3
ϱ_{ao}	Apparent density obtained by the oscillating funnel method	g/cm^3
m	Mass of the powder	g
V	Volume of the cup	cm^3

1) At present at the stage of draft.

5 Apparatus

5.1 Oscillating funnel, comprising :

5.1.1 Funnel, having an orifice of $7{,}5\ ^{+0{,}2}_{0}$ mm; see figure 1.

The orifice of the funnel shall be 25 mm above the top surface of the cup and coaxial with it; see figure 2.

5.1.2 Oscillating device, operating on a supply frequency of 50 to 60 Hz, capable of oscillating the funnel horizontally at a frequency of 100 to 120 Hz and with an amplitude range (peak to peak) of 50 to 100 µm.

It is important that the oscillating device does not transmit vibrations to the cup.

5.1.3 Horizontal vibration-free base, to support the cup.

5.2 Cylindrical cup, having a capacity of 25 ± 0,05 cm^3 and an internal diameter of 30 ± 1 mm.

NOTE — The cup and funnel should be made of non-magnetic, corrosion-resistant, metallic material having sufficient wall thickness and hardness to avoid distortion and excessive wear. The inner surfaces of the cup and funnel should be polished.

5.3 Balance, of sufficient capacity, permitting weighing to an accuracy of ± 0,05 g.

6 Sampling

6.1 The test sample shall be of at least 100 cm^3 volume to allow the determination to be carried out on three test portions.

6.2 In general the powder should be tested in the as-received condition. In certain instances the powder may be dried. However, if the powder is susceptible to oxidation, the drying shall take place in vacuum or in inert gas. If the powder contains volatile substances it shall not be dried.

7 Procedure

7.1 Pour the test portion of the powder (not less than 35 cm^3) into the funnel (5.1.1) while keeping the orifice closed with a dry finger.

7.2 Start the oscillating device (5.1.2) and allow the powder to flow into the cup until this is completely filled and flows over.

7.3 Level the powder with a straight-edge, taking care not to compress or pull out powder and not to disturb or vibrate the cup.

7.4 After levelling the powder, tap the cup to settle the powder in order to avoid spilling it during transport. Make sure that there are no adhering particles on the exterior of the cup.

7.5 Determine the mass of the powder to the nearest 0,05 g.

Carry out the determinations on three test portions.

8 Expression of results

The apparent density is given by the formula

$$\varrho_{ao} = \frac{m}{V} = \frac{m}{25}$$

Report the arithmetical mean of the three determinations to the nearest 0,01 g/cm^3, and the highest and the lowest results if the scatter between results exceeds 1 % of the mean.

9 Test report

The test report shall include the following information :

a) reference to this International Standard;

b) all details necessary for the identification of the test sample;

c) the drying procedure, if the powder has been dried;

d) the result obtained;

e) all operations not specified in this International Standard, or regarded as optional;

f) details of any occurrence which may have affected the result.

Dimensions in millimetres

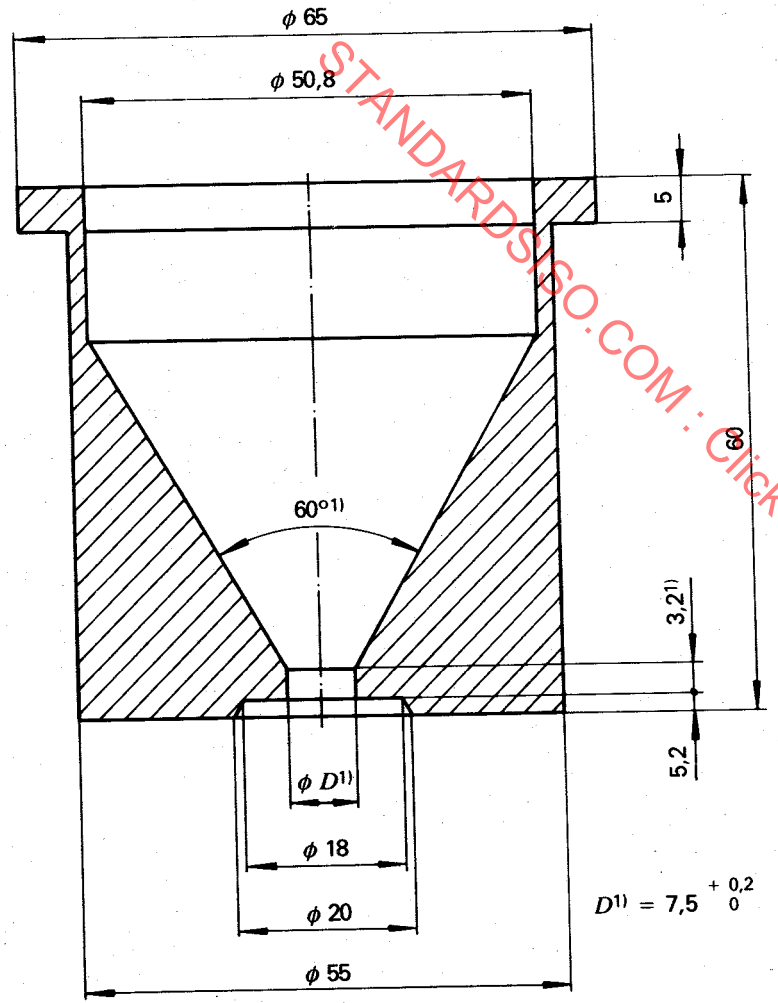

Figure 1 — Test funnel

Dimensions in millimetres

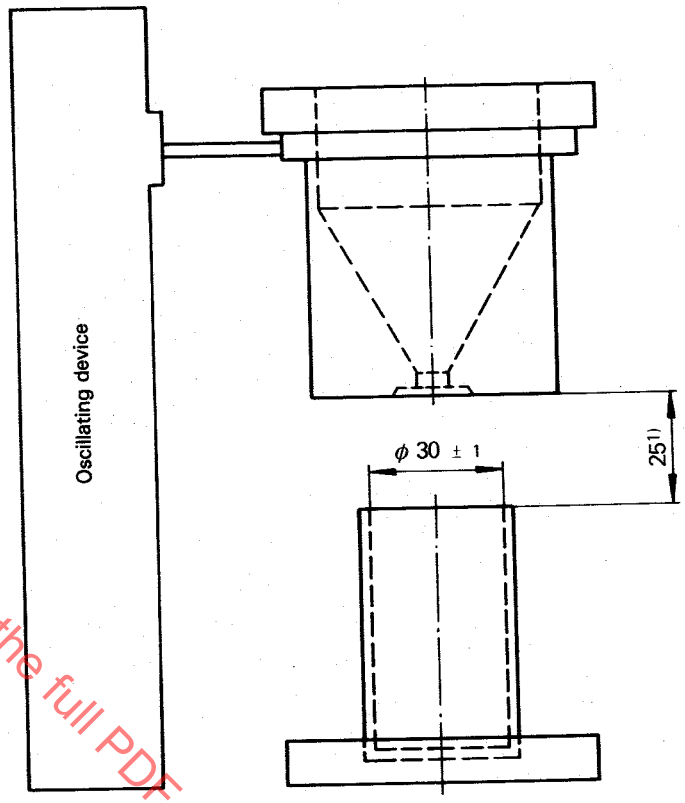

Figure 2 — Test assembly

1) These values are mandatory.