
INTERNATIONAL STANDARD



3369

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Impermeable sintered metal materials and hardmetals — Determination of density

Matériaux en métal fritté imperméable et métaux durs — Détermination de la masse volumique

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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 3369 was drawn up by Technical Committee ISO/TC 119, *Powder metallurgical materials and products*, and circulated to the Member Bodies in March 1974.

It has been approved by the Member Bodies of the following countries :

| | | |
|----------|-----------------------|----------------|
| Austria | Japan | Sweden |
| Bulgaria | Poland | Turkey |
| Canada | Portugal | United Kingdom |
| Chile | Romania | U.S.A. |
| France | South Africa, Rep. of | U.S.S.R. |
| Italy | Spain | Yugoslavia |

The Member Body of the following country expressed disapproval of the document on technical grounds :

Ireland

Impermeable sintered metal materials and hardmetals — Determination of density

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method of determining the density of impermeable sintered metal materials and hardmetals.

NOTE — For determination of density of permeable sintered metal materials, see ISO 2738, *Permeable sintered metal materials — Determination of density and open porosity*.

2 REFERENCES

ISO . . ., *Sintered metal materials, excluding hardmetals — Sampling*.¹⁾

ISO . . ., *Hardmetals — Sampling and preparation of test pieces*.¹⁾

3 PRINCIPLE

Weighing of a test piece first in air and then in a liquid, and determination of the density by calculation.

4 APPARATUS AND MATERIALS

4.1 Precision balance having a capacity which will permit readings within $\pm 0,1$ mg on weighings up to 10 g and $\pm 0,001$ % above 10 g.

The weights shall be calibrated and have a density not less than 7 g/cm^3 .

4.2 Arrangement of racks or a **suspension wire** according to figures 1 and 2. In each case the suspension wire shall have a maximum diameter of 0,25 mm. Heavier gauge wire shall only be used if necessary to support the test piece.

4.3 Vessel for the weighing liquid. For test pieces of volume less than 10 cm^3 the vessel shall be dimensioned so that when the test piece is lowered into the liquid the rise in liquid level is less than 2,5 mm.

4.4 Distilled or de-ionized and preferably degassed water, to which 1 or 2 drops of a wetting agent have been added.

The following values shall be used for the density in air, ρ_w , of distilled water:

| Temperature °C | ρ_w g/cm ³ |
|-------------------|-------------------------------|
| 15 | 0,998 1 |
| 16 | 0,997 9 |
| 17 | 0,997 7 |
| 18 | 0,997 6 |
| 19 | 0,997 4 |
| 20 | 0,997 2 |
| 21 | 0,997 0 |
| 22 | 0,996 7 |
| 23 | 0,996 5 |
| 24 | 0,996 3 |
| 25 | 0,996 0 |
| 26 | 0,995 8 |
| 27 | 0,995 5 |
| 28 | 0,995 2 |
| 29 | 0,994 9 |
| 30 | 0,994 6 |

NOTES

1 Other liquids may be used if their density in air at the testing temperature is known to four places of decimals.

2 Using brass weights in air, the value of ρ_w is $0,001\ 06 \text{ g/cm}^3$ smaller than the true density of water measured in a vacuum.

5 TEST PIECE

5.1 Sampling shall be carried out in accordance with ISO . . . or ISO . . .

5.2 The volume of the test piece shall be at least $0,5 \text{ cm}^3$. If it is required to determine the density of pieces having a volume less than $0,5 \text{ cm}^3$, group several pieces together to make one determination, provided that each piece has a volume not less than $0,05 \text{ cm}^3$.

1) In preparation.

5.3 The surface of the test piece shall be thoroughly cleaned from adhering foreign material, such as dirt, grease and oil.

6 PROCEDURE

6.1 Place the test piece in the upper rack (figure 1) or pan (figure 2). The lower rack shall be completely immersed and the suspension wire shall be hanging freely from the pan and partially immersed in the liquid. Remove all air bubbles and weigh (m_1).

6.2 Place the test piece on the lower rack (figure 1) or suspend it by means of the wire (figure 2). Lower the test piece into the vessel containing the liquid so that only the suspension wire breaks the surface of the liquid. Remove all air bubbles and weigh.

6.3 Weighings up to 10 g shall be read to 0,1 mg and weighings above 10 g shall be read to 0,001 %.

6.4 The test piece, liquid and surrounding air shall be at the same temperature when weighing is carried out. The temperature of the liquid shall be determined. When distilled water is used, its density shall be taken from the table in 4.4.

7 EXPRESSION OF RESULTS

The density, ρ , of the test piece, in grams per cubic centimetre, is given by the formula :

$$\rho = \frac{m_1 \times \rho_1}{m_2}$$

where

ρ_1 is the density in air of the liquid, in grams per cubic centimetre;

m_1 is the mass, in grams, of the test piece determined by weighing in air;

m_2 is the mass, in grams, of the liquid displaced by the test piece, determined by subtracting the apparent mass of the test piece in the liquid from the mass of the test piece in air.

Report the result rounded to the nearest 0.01 g/cm³.

8 TEST REPORT

The test report shall include the following information :

- a) reference to this International Standard;
- b) all details necessary for identification of the test sample;
- c) the result obtained;
- d) all operations not specified by this International Standard, or regarded as optional;
- e) details of any occurrence which may have affected the result.

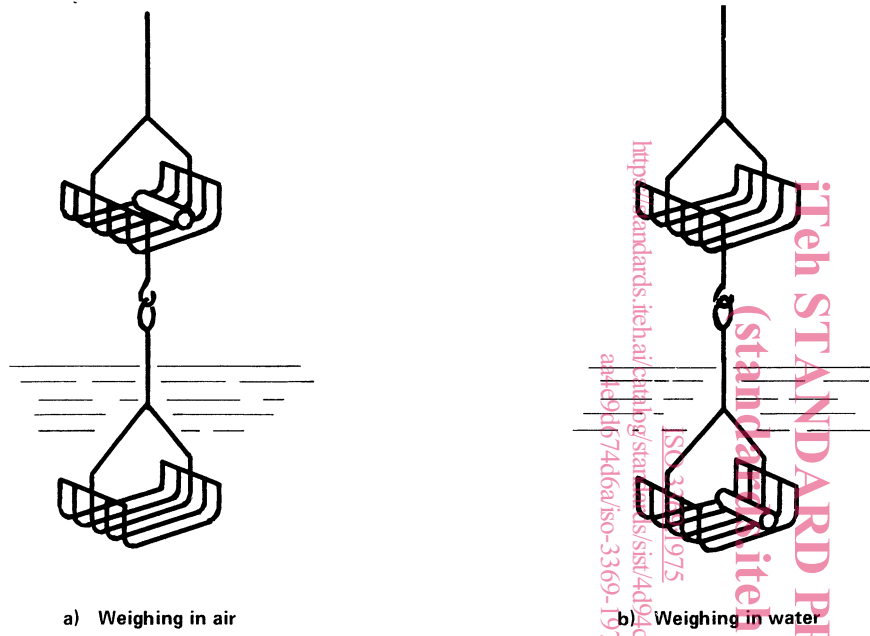


FIGURE 1

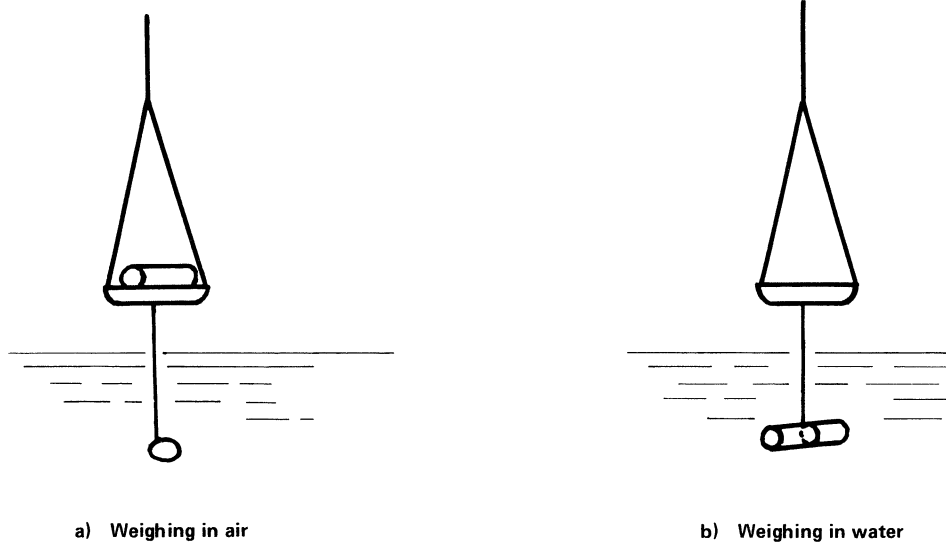


FIGURE 2

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