
Coating powders —

Part 2:

**Determination of density by gas
comparison pycnometer (referee
method)**

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Principle	1
5 Materials	1
6 Apparatus	1
7 Sampling	2
8 Procedure	2
9 Expression of results	3
10 Precision	3
11 Test report	3
Bibliography	4

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 139, *Paints and varnishes*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 8130-2:1992), which has been technically revised. The main changes compared to the previous edition are as follows:

- the scope has been revised editorially;
- the terms and definitions clause ([Clause 3](#)) has been added;
- the gas has been changed from air or helium to helium or nitrogen;
- the procedure has been aligned with actual practice;
- the acceptable difference between two results ([Clause 9](#)) is given as a percentage;
- the text has been editorially revised and the normative references have been updated.

A list of all parts in the ISO 8130 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Coating powders —

Part 2:

Determination of density by gas comparison pycnometer (referee method)

1 Scope

This document specifies a method for the determination of density for all types of coating powders using a gas comparison pycnometer.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8130-14, *Coating powders — Part 14: Vocabulary*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Terms and definitions

ISO/PRF 8130-2

For the purposes of this document, the terms and definitions given in ISO 8130-14 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Principle

The density is calculated from the mass and the volume of the test portion. The volume of a weighed test portion is determined by measuring the volume of gas displaced within a receptacle when the test portion is introduced. This is achieved by measuring the pressure difference which arises due to the displacement of the gas.

5 Materials

5.1 Helium or nitrogen, minimum Grade 4,8, in a steel cylinder.

Other high purity gases may be used provided that the product under test is not affected and this deviation from the method is noted in the test report.

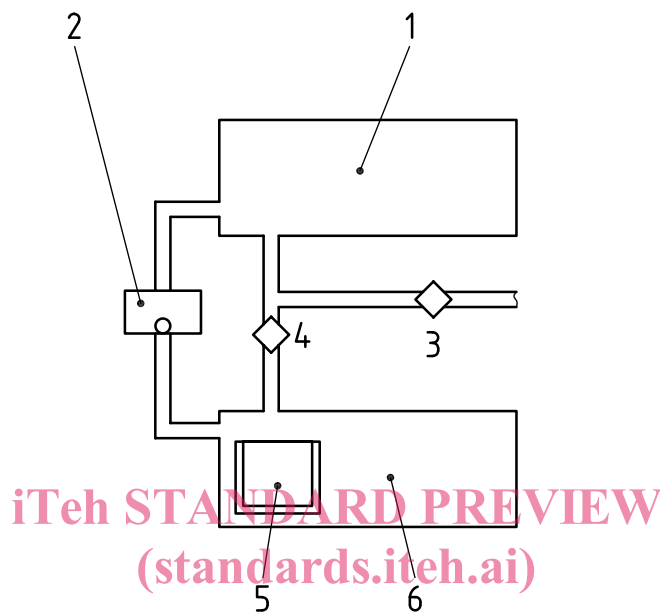
6 Apparatus

Ordinary laboratory apparatus, together with a gas comparison pycnometer for the automatic or manual determination of density.

The essential design of a typical gas comparison pycnometer employs a displacement gas as the medium, outlined in [Figure 1](#). It consists of two chambers, sample and reference, of equal dimensions. The chambers are connected by a valve and a pressure difference meter. The test portion is placed in the sample chamber. The displacement gas is allowed to flow from one chamber into the other chamber and the resulting pressure difference is measured.

NOTE Automated gas pycnometers can help minimize errors compared with manual pycnometers.

Manual pycnometers may be used and due care is needed during testing and measurement.



Key

- 1 reference chamber
- 2 pressure difference meter
- 3 flushing valve
- 4 connecting valve
- 5 sample container
- 6 sample chamber

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Figure 1 — Measuring principle of a gas comparison pycnometer

7 Sampling

Take a representative sample of the product to be tested as described in ISO 15528.

8 Procedure

Carry out the determination in duplicate at $(23 \pm 1) \text{ }^\circ\text{C}$ and, where applicable, at a relative humidity of $(50 \pm 5) \%$.

The procedure depends on the type of pycnometer and the instructions of the apparatus shall be followed.

Calibration of the pycnometer may be performed with a known volume standard or similar test specimens previously measured.

Adjust the apparatus, in particular to allow for the volume of the test sample container.

The measured pressure difference shall not be greater than 1 %.

For manual pycnometers, the swept volumes of the cylinders measured should be equal to or within 0,5 % (relative).

Weigh the sample container to the nearest 1 mg and fill it with the product under test, making sure that no powder is on the outside walls of the container. Weigh the container plus contents to the nearest 1 mg to determine the mass (m) of the test portion.

Place the container and contents in the apparatus and determine the volume of the test portion. Repeat the volume measurement in order to ensure that the reading is consistent and calculate the mean (V) of the two volumes.

NOTE Depending on the grade of gas, a change in density can be observed due to the drying of the test portion.

9 Expression of results

Calculate the density ρ_p , in grams per cubic centimetre, of the coating powder at $(23 \pm 1)^\circ\text{C}$ following [Formula \(1\)](#):

$$\rho_p = \frac{m}{V} \quad (1)$$

where

m is the mass, in grams, of the test portion;

V is the volume, in cubic centimetres, of the test portion.

If the two results differ by more than 2 %, repeat the procedure described in [Clause 8](#).

Calculate the mean of two valid determinations and report the result to the nearest 0,01 g/cm³.

10 Precision

No precision data are currently available.

11 Test report

The test report shall contain at least the following information:

- a) all details necessary to identify the product tested;
- b) a reference to this document, i.e. ISO 8130-2:2021;
- c) the type of gas comparison pycnometer, manual or automated;
- d) the grade and type of the gas used;
- e) the result of the test as indicated in [Clause 9](#);
- f) any deviation from the test method specified;
- g) any unusual features (anomalies) observed during the test.
- h) the date of the test.

Bibliography

- [1] ISO 12154, *Determination of density by volumetric displacement — Skeleton density by gas pycnometry*

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