

INTERNATIONAL STANDARD

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Plastics — Methods for determining the density of non-cellular plastics —

Part 1: Immersion method, liquid pycnometer method and titration method

*Plastiques — Méthodes de détermination de la masse volumique des
plastiques non alvéolaires —*

*Partie 1: Méthode par immersion, méthode du pycnomètre en milieu
liquide et méthode par titrage*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 1183-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*.

Together with the other parts (see below), this part of ISO 1183 cancels and replaces ISO 1183:1987, which has been technically revised.

ISO 1183 consists of the following parts, under the general title *Plastics — Methods for determining the density of non-cellular plastics*:

- *Part 1: Immersion method, liquid pycnometer method and titration method*
- *Part 2: Density gradient column method*
- *Part 3: Gas pycnometer method*

Plastics — Methods for determining the density of non-cellular plastics —

Part 1: Immersion method, liquid pycnometer method and titration method

WARNING — The use of this part of ISO 1183 may involve hazardous materials, operations or equipment. This part of ISO 1183 does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this part of ISO 1183 to establish appropriate health and safety practices and to determine the applicability of any regulatory limitations prior to use.

1 Scope

This part of ISO 1183 specifies three methods for the determination of the density of non-cellular plastics in the form of void-free moulded or extruded objects, as well as powders, flakes and granules.

- **Method A: Immersion method**, for solid plastics (except for powders) in void-free form.
- **Method B: Liquid pycnometer method**, for particles, powders, flakes, granules or small pieces of finished parts.
- **Method C: Titration method**, for plastics in any void-free form.

NOTE This part of ISO 1183 is applicable to pellets as long as they are void-free. Density is frequently used to follow variations in physical structure or composition of plastic materials. Density may also be useful in assessing the uniformity of samples or specimens. Often the density of plastic materials will depend upon the choice of specimen preparation method. When this is the case, precise details of the specimen preparation method will have to be included in the appropriate material specification. This note is applicable to all three methods.

2 Normative references

The following referenced documents are indispensable for the application 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 31-3, *Quantities and units — Part 3: Mechanics*

ISO 291:1997, *Plastics — Standard atmospheres for conditioning and testing*

ISO 472:1999, *Plastics — Vocabulary*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and the following apply.

3.1

mass

quantity of matter contained in a body

NOTE It is expressed in kilograms (kg) or grams (g).

3.2

apparent mass

mass of a body obtained by measuring its weight using an appropriately calibrated balance

NOTE It is expressed in kilograms (kg) or grams (g).

3.3

density

ρ
the ratio of the mass m of a sample to its volume V (at the temperature t), expressed in kg/m³, kg/dm³ (g/cm³) or kg/l (g/ml)

NOTE The following terms, based upon ISO 31-3, are given here for clarification.

Table 1 — Density terms

Term	Symbol	Formulation	Units
Density	ρ	m/V	kg/m ³ kg/dm ³ (g/cm ³) kg/l(g/ml)
Specific volume	v	$V/m (= 1/\rho)$	m ³ /kg dm ³ /kg (cm ³ /g) l/kg(ml/g)

4 Conditioning

The test atmosphere shall be in accordance with ISO 291. In general, conditioning specimens to constant temperature is not required, because the determination itself brings the specimen to the constant temperature of the test.

Specimens which change in density during the test to such an extent that the change is greater than the required accuracy shall be conditioned prior to measurement in accordance with the applicable material specification. When changes in density with time or atmospheric conditions are the primary purpose of the measurements, the specimens shall be conditioned as described in the material specification and, if no material specification exists, then as agreed upon by the interested parties.