INTERNATIONAL STANDARD

ISO 1183-2

Second edition
2019-03

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

Part 2: Density gradient column method

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

Partie 2: Méthode de la colonne à gradient de masse volumique

Reference number
ISO 1183-2:2019(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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 on 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 the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 1183-2:2004), which has been technically revised. The main changes compared to the previous edition are as follows:

— normative references have been changed to undated;

— text has been revised editorially.

A list of all parts in the ISO 1183 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.

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

Part 2:
Density gradient column method

WARNING — The use of this document may involve hazardous materials, operations or equipment. This document 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 document to establish appropriate health and safety practices.

1 Scope

This document specifies a gradient column method for the determination of the density of non-cellular moulded or extruded plastics or pellets in void-free form. Density gradient columns are columns containing a mixture of two liquids, the density in the column increasing uniformly from top to bottom.

NOTE Density is frequently used to follow variations in physical structure or composition of plastic materials. Density can also be useful in assessing the uniformity of samples or specimens. The density of plastic materials can depend upon the choice of specimen preparation method. When this is the case, precise details of the specimen preparation method are intended to be included in the appropriate material specification.

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 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 1183-1, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method*

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

3.1
density
ρ
ratio of the mass m of a sample to its volume V (at the temperature T) expressed in kg/m^3, kg/dm^3 (g/cm^3), or kg/l (g/ml)

Note 1 to entry: The following terms, based upon ISO 80000-4[1], are given in Table 1 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

Conditioning and testing shall be in accordance with ISO 291 or the appropriate material standard. 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 of the density determination 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.

5 Method

5.1 Apparatus

5.1.1 Density gradient column, consisting of a suitable graduated column, not less than 40 mm in diameter, with a cover. The height of the column shall be compatible with the accuracy required. A graduation interval of 1 mm for the scale on the column is normal.

5.1.2 Liquid bath, capable of being thermostatically controlled to within ±0,1 °C or ±0,5 °C, depending on the sensitivity required (see Annex B).

5.1.3 Calibrated glass floats, covering the density range in which measurements are to be made and approximately evenly distributed throughout this range.

These may be purchased from an accredited source or prepared as described in 5.4.1.

5.1.4 Balance, accurate to ±0,1 mg.

5.1.5 Siphon or pipette assembly, for filling the gradient column (5.1.1), as shown in Figure B.1 or B.2, or any other suitable device.

5.2 Immersion liquids

Required are two miscible liquids of different densities, freshly distilled in the case of pure liquids. The densities of various liquids are given in Annex A as a guide.

The liquid with which the specimen comes into contact during the measurement shall have no effect on the specimen.

Prepare the mixture of liquids as specified in 5.4.1.2.