

SLOVENSKI STANDARD
oSIST prEN ISO 1183-1:2018
01-junij-2018

Polimerni materiali - Metode za določanje gostote nepenjenih polimernih materialov - 1. del: Metoda s potapljanjem, metoda s tekočinskim piknometrom in titracijska metoda (ISO/DIS 1183-1:2018)

Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method (ISO/DIS 1183-1:2018)

Kunststoffe - Verfahren zur Bestimmung der Dichte von nicht verschäumten Kunststoffen - Teil 1: Eintauchverfahren, Verfahren mit Flüssigkeitspyknometer und Titrationsverfahren (ISO/DIS 1183-1:2018)

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 (ISO/DIS 1183-1:2018)

Ta slovenski standard je istoveten z: prEN ISO 1183-1

ICS:

83.080.01	Polimerni materiali na splošno	Plastics in general
-----------	--------------------------------	---------------------

oSIST prEN ISO 1183-1:2018

en,fr,de

DRAFT INTERNATIONAL STANDARD

ISO/DIS 1183-1

ISO/TC 61/SC 5

Secretariat: DIN

Voting begins on:
2018-03-26Voting terminates on:
2018-06-18

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*

ICS: 83.080.01

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN ISO 1183-1:2019

<https://standards.iteh.ai/catalog/standards/sist/88e19721-7a71-4495-99fe-81c8c5c6a8b2/sist-en-iso-1183-1-2019>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.

ISO/CEN PARALLEL PROCESSING



Reference number
ISO/DIS 1183-1:2018(E)

© ISO 2018

iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 1183-1:2019

<https://standards.iteh.ai/catalog/standards/sist/88e19721-7a71-4495-99fe-81c8c5c6a8b2/sist-en-iso-1183-1-2019>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Conditioning	2
5 Methods	2
5.1 Method A — Immersion method.....	2
5.1.1 Apparatus.....	2
5.1.2 Immersion liquid.....	3
5.1.3 Specimens.....	3
5.1.4 Procedure.....	3
5.2 Method B — Liquid pycnometer method.....	4
5.2.1 Apparatus.....	4
5.2.2 Immersion liquid.....	5
5.2.3 Specimens.....	5
5.2.4 Procedure.....	5
5.3 Method C — Titration method.....	6
5.3.1 Apparatus.....	6
5.3.2 Immersion liquids.....	6
5.3.3 Specimens.....	6
5.3.4 Procedure.....	6
6 Correction for buoyancy in air	7
7 Test report	8
Annex A (informative) Liquid systems suitable for use in Method C	9
Annex B (informative) Correction for buoyancy in air	10
Bibliography	12

ISO/DIS 1183-1:2018(E)

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 third edition cancels and replaces the second edition (ISO 1183-1:2012), which has been technically revised.

A list of all parts in the ISO 1183 series can be found on the ISO website.

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

Part 1:

Immersion method, liquid pyknometer method and titration method

WARNING — The use of this document might 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 and to determine the applicability of any regulatory limitations prior to use.

1 Scope

This document 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 pyknometer 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 document 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 might 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 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 472, *Plastics — Vocabulary*

3 Terms and definitions

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

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

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

ISO/DIS 1183-1:2018(E)

3.1**mass** m

quantity of matter contained in a body

Note 1 to entry: It is expressed in kilograms (kg) or grams (g).

3.2**apparent mass** m_{APP}

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

Note 1 to entry: It is expressed in kilograms (kg) or grams (g).

3.3**density** ρ 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 1 to entry: Note 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

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.

5 Methods**5.1 Method A — Immersion method****5.1.1 Apparatus**

5.1.1.1 Analytical balance or instrument specifically designed for measurement of density, accurate to $\pm 0,1$ mg.

An automatically operating instrument may be used. The calculation of density may be done automatically using a computer.

5.1.1.2 Immersion vessel: a beaker or other wide-mouthed container of suitable size for holding the immersion liquid.

5.1.1.3 Stationary support, e. g. a pan straddle, to hold the immersion vessel above the balance pan.

5.1.1.4 Thermometer, graduated at 0,1 °C intervals, covering the range 0 °C to 30 °C.

5.1.1.5 Wire (if required), corrosion-resistant, of diameter not greater than 0,5 mm, for suspending specimens in the immersion liquid.

5.1.1.6 Sinkers, of suitable mass to ensure complete immersion of the specimen, for use when the density of the specimen is less than that of the immersion liquid.

5.1.1.7 Pycnometer, with a side-arm overflow capillary, for determining the density of the immersion liquid when this liquid is not water. The pycnometer shall be equipped with a thermometer graduated at 0,1 °C intervals from 0 °C to 30 °C.

5.1.1.8 Liquid bath, capable of being thermostatically controlled to within $\pm 0,5$ °C, for use in determining the density of the immersion liquid.

5.1.2 Immersion liquid

Use freshly distilled or deionized water, or another suitable liquid, containing not more than 0,1 % of a wetting agent to help in removing air bubbles. The liquid or solution with which the specimen comes into contact during the measurement shall have no effect on the specimen.

The density of immersion liquids other than distilled water need not be measured provided they are obtained from an accredited source and are accompanied by a certificate.

5.1.3 Specimens

Specimens may be in any void-free form except for powder. They shall be of a convenient size to give adequate clearance between the specimen and the immersion vessel and should preferably have a mass of at least 1 g.

When cutting specimens from larger samples, proper equipment shall be used to ensure that the characteristics of the material do not change. The surface of the specimen shall be smooth and free from cavities to minimize the entrapment of air bubbles upon immersion in the liquid, otherwise errors will be introduced.

5.1.4 Procedure

5.1.4.1 Weigh the specimen, to the nearest 0,1 mg, in air while suspended with a wire of maximum diameter 0,5 mm. Record the mass of the specimen.

5.1.4.2 Immerse the specimen, still suspended by the wire, in the immersion liquid (5.1.2), contained in the immersion vessel (5.1.1.2) on the support (5.1.1.3). The temperature of the immersion liquid shall be $23\text{ °C} \pm 2\text{ °C}$ (or $27\text{ °C} \pm 2\text{ °C}$). Remove any adhering air bubbles with a fine wire. Weigh the immersed specimen to the nearest 0,1 mg.

If the measurement is carried out in a temperature-controlled room, the temperature of the whole apparatus, including the immersion liquid, shall be within the range $23\text{ °C} \pm 2\text{ °C}$ (or $27\text{ °C} \pm 2\text{ °C}$).

5.1.4.3 If necessary, determine the density of immersion liquids other than water as follows. Weigh the pycnometer (5.1.1.7) empty and then containing freshly distilled or deionized water at a temperature of $23\text{ °C} \pm 0,5\text{ °C}$ (or $27\text{ °C} \pm 0,5\text{ °C}$). Weigh the same pycnometer, after cleaning and drying, filled with the

ISO/DIS 1183-1:2018(E)

immersion liquid [also at a temperature of $23\text{ °C} \pm 0,5\text{ °C}$ (or $27\text{ °C} \pm 0,5\text{ °C}$)]. Use the liquid bath (5.1.1.8) to bring the water and immersion liquid to the correct temperature. Calculate the density ρ_{IL} , in grams per cubic centimetre, of the immersion liquid at 23 °C (or 27 °C), using the Equation (1):

$$\rho_{\text{IL}} = \frac{m_{\text{IL}}}{m_{\text{W}}} \times \rho_{\text{W}} \quad (1)$$

where

- m_{IL} is the mass of the immersion liquid, in g;
- m_{W} is the mass of the water, in g;
- ρ_{W} is the density of water at 23 °C (or 27 °C), in g/cm^3 .

5.1.4.4 Calculate the density ρ_{S} , in grams per cubic centimetre, of the specimen at 23 °C (or 27 °C), using the Equation (2):

$$\rho_{\text{S}} = \frac{m_{\text{S,A}} \times \rho_{\text{IL}}}{m_{\text{S,A}} - m_{\text{S,IL}}} \quad (2)$$

where

- $m_{\text{S,A}}$ is the apparent mass of the specimen in air, in g;
- $m_{\text{S,IL}}$ is the apparent mass of the specimen in air, in g;
- ρ_{IL} is the density of the immersion liquid at 23 °C (or 27 °C) as stated by the supplier or determined as specified in 5.1.4.3, in g/cm^3 .

For specimens having a density below that of the immersion liquid, the test may be performed in exactly the same way as described above, with the following exception: a sinker of lead or other dense material is attached to the wire, such that the sinker rests below the liquid level, as does the specimen, during immersion. The sinker may be considered a part of the suspension wire. In this case, the upthrust exerted by the immersion liquid on the sinker shall be allowed for by using the Equation (3), rather than Equation (2), to calculate the density of the specimen:

$$\rho_{\text{S}} = \frac{m_{\text{S,A}} \times \rho_{\text{IL}}}{m_{\text{S,A}} + m_{\text{K,IL}} - m_{\text{S+K,IL}}} \quad (3)$$

where

- $m_{\text{K,IL}}$ is the apparent mass of the sinker in the immersion liquid, in g;
- $m_{\text{S+K,IL}}$ is the apparent mass of the specimen and sinker in the immersion liquid, in g.

The buoyancy of the suspension wire in air is normally considered to be negligible, but, for correction for air buoyancy, see Clause 6.

5.1.4.5 Perform the test on a minimum of three specimens and calculate the mean result to three decimal places.

5.2 Method B — Liquid pycnometer method

5.2.1 Apparatus

5.2.1.1 Balance, accurate to $\pm 0,1\text{ mg}$.