ISO/PRF 1675:2022(E)
ISO TC 61/SC 5
Date: 2022-10-28

Plastics — Liquid resins — Determination of density by the pycnometer method

Plastiques — Résines liquides — Détermination de la masse volumique par la méthode du pycnomètre

~~Edited DIS - MUST BE USED FOR FINAL DRAFT~~

Contents

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~~ 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~~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~~www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 5, *Physical-chemical properties*~~,~~ in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 1675:1985), which has been technically revised.

The main changes are as follows:

~~— the standard has been adapted to the current rules of presentation and editing;~~

— the specification of the apparatus has been revised;

— a bibliography with references for the density of air and water has been added.

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~~www.iso.org/members.html.

Plastics — Liquid resins — Determination of density by the pycnometer method

1 Scope

This document specifies a method for the determination of the density of liquid resins using a pycnometer.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

— ISO Online browsing platform: available at ~~https://www.iso.org/obp~~https://www.iso.org/obp

— IEC Electropedia: available at ~~https://www.electropedia.org/~~https://www.electropedia.org/

3.1
density
ρ
ratio of the mass, m, of a sample to its volume, V, at temperature, T

Note 1 to entry: It is expressed in kg/m^3, kg/dm^3 (g/cm^3) or kg/l (g/ml).

4 Principle

Determination of the mass of a resin contained in a pycnometer of known volume at 23 °C.

NOTE This method is easily applicable to low and medium viscosity resins. Difficulties in the procedure can arise for high viscosity resins.

5 Apparatus

5.1 Pycnometer, consisting of a graduated glass flask with a close-fitting ground glass stopper. Alternatively, the pycnometer may be closed with a ground glass stopper with a capillary tube which allows to set a given volume and escape of air bubbles at the same time.

The pycnometer may be equipped with a suitable funnel for easier filling.

The graduated or total volume of the pycnometer at (23,0 ± 0,1) °C, measured by determining the mass of distilled water filled in the pycnometer until the graduation mark or total volume at this temperature, shall have an accuracy of 0,01 % or better (see Clause 7).

5.2 Balance, accurate to 0,2 mg.

5.3 Thermostatic device, capable of being maintained at (23,0 ± 0,1) °C.

5.4 Transparent conical flask, with wide neck (for example Erlenmeyer), stoppered, of capacity 200 ml to 600 ml.

6 Procedure

6.1 Preparation of resin

Place at least 150 g of resin in the conical flask (5.4) and inspect the contents of the flask for bubbles. If any bubbles are observed, allow the stoppered flask to stand long enough for all the bubbles to dissipate before or while bringing the flask and its contents to (23,0 ± 0,1) °C by insertion in the thermostatic device (5.3).

NOTE To accelerate the release of bubbles, especially any adjacent to the walls of the flask, they can be removed by disturbing or detaching them using a fine wire inserted through the neck of the flask.

6.2 Measurement of density

Weigh the empty pycnometer (5.1) to the nearest 0,2 mg.

Place the pycnometer in the thermostatic device (5.3) and fill the pycnometer with resin.

The following points require close attention:

a) bubbles shall not be present in the resin in the pycnometer; if bubbles form, wait for them to disappear, if necessary rubbing the walls of the pycnometer with a fine metal wire, or, better still, empty the pycnometer, clean it and refill;

b) fill the pycnometer exactly to the graduation mark or total volume, depending on the type of pycnometer used;

c) if applicable, remove the funnel prior to the measurement.

Wait at least 30 min and check that the level in the pycnometer remains at the graduation mark or completely filled. If necessary, add a few more drops of resin or remove excess resin using a syringe or other suitable tools.

Weigh the filled pycnometer to the nearest 0,2 mg.

7 Expression of results

The density at 23 °C, ρ_{23}, expressed in grams per millilitre, is given by Formula (1):

$$\rho_{23} = \frac{m_1 - m_0}{V} + \rho_a \qquad (1)$$

where

m_1 is the apparent mass, in grams, of the filled pycnometer at 23 °C;

m_0 is the apparent mass, in grams, of the empty pycnometer at 23 °C;

ρ_a is the density of air at 23 °C / 50 % RH = 0,001 2 g/ml (air buoyancy correction)[1];

V is the volume, in millilitres, of the pycnometer at 23 °C.

Give the result to three decimal places.

To check or determine the volume of the pycnometer at 23 °C using distilled water, Formula (2) may be used:

$$V = \frac{m_2 - m_0}{\rho_e - \rho_a} = \frac{m_2 - m_0}{0{,}996\ 4} \quad (2)$$

Field Code Changed

where

m_2 is the apparent mass, in grams, of the pycnometer filled with distilled water at 23 °C;

ρ_e is the density of distilled water at 23 °C = 0,997 6 g/ml[2].

8 Test report

The test report shall contain the following information:

a) a reference to this document, including its year of publication, i.e. ISO 1675:2022;

b) the complete identification of the material tested;

c) the density at 23 °C, ρ_{23}, expressed in grams per millilitre;

d) details of procedure not specified in this document and any incidents likely to have influenced the results;

e) the date of the test.