

# Pyknometers —

## Part 1: Specification

[ISO title: Pyknometers]

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# Committees responsible for this British Standard

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- Association of Clinical Biochemists
- British Laboratory Ware Association
- British Lampblown Scientific Glassware Manufacturers' Association Ltd.
- Department of Health and Social Security
- Department of Trade and Industry — Laboratory of the Government Chemist
- Glass Manufacturers' Federation
- Institute of Medical Laboratory Sciences
- Medical Sterile Products Association
- Ministry of Defence
- Society of Chemical Industry

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# National foreword

This Part of this British Standard has been prepared under the direction of the Laboratory Apparatus Standards Committee and is identical with ISO 3507 “*Pyknometers*”, published in 1976 by the International Organization for Standardization (ISO).

BS 733 was first published in 1937 under the title “*Density bottles*” and was subsequently revised in 1952 and again in 1965. BS 733:1965 is withdrawn. The principal changes in this Part of this revision include a change of title to “*Pyknometers*” in order to accommodate the Lipkin and Sprengel instruments which cannot be described as density bottles, the omission of the 100 mL size of Gay-Lussac bottle and the omission of the appendices describing determination of capacity, calculation of density and measurement of liquid in bulk. It is intended to publish the revised appendices in due course as BS 733-2.

The unit of capacity remains the cubic centimetre, for which the name “millilitre” is used throughout.

ISO is considering a proposal from the UK for the re-instatement of the 100 mL Gay-Lussac bottle and, should the proposal be accepted, it is intended that this Part of this revision will be amended accordingly.

**Terminology and conventions.** The text of the International Standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

The lower case “l” has been used as an abbreviation for the litre. In British Standards it is current practice to use a capital “L” as the abbreviation for the litre.

Wherever the words “International Standard” appear, referring to this standard, they should be read as “British Standard”.

**Cross references.** The Technical Committee has reviewed the provisions of ISO 383, to which reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard. A related British Standard is BS 572 “*Interchangeable conical ground glass joints*”.

**NOTE** The reference, in the footnote to 6.1, to ISO 4789 (in course of preparation) for which there is no corresponding British Standard constitutes informative matter only and, since no mandatory requirements are involved, the validity of this British Standard is not affected.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

## Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope and field of application

This International Standard specifies requirements for an internationally acceptable series of pycnometers for general laboratory use for the determination of the densities of liquids.

Specialized pycnometers for use with particular products, or otherwise not in common use, are excluded. Sufficient details to define such pycnometers should be included in International Standards specifying or describing their use.

A device suitable for adjusting the liquid level in the neck of the Reischauer pycnometer is shown in the Annex.

## 2 Basis of adjustment

### 2.1 Unit of volume

The unit of volume shall be the cubic centimetre (cm<sup>3</sup>), for which the name millilitre (ml) may be used.

### 2.2 Reference temperature

If the precise capacity is marked on a pycnometer, the verification temperature at which this precise capacity is determined shall also be marked. The temperature should preferably be 20 °C.

**NOTE** When it is necessary in tropical countries to work at an ambient temperature considerably above 20 °C, and these countries do not wish to use the standard reference temperature of 20 °C, it is recommended that they adopt a temperature of 27 °C.

## 3 Types and series of sizes

Two types of pycnometer tube and three types of pycnometer flask are specified, as listed in Table 1 and illustrated in Figure 1 to Figure 5. Types 1 and 2, of tubular form, are for suspension; types 3, 4 and 5, of flask form, are free-standing on flat bases.

Types 1 and 4, and type 2 if provided with caps, are recommended for use with volatile liquids. Type 5 is recommended for very viscous materials.

The series of sizes for each type of pycnometer shall be as shown in Table 1.

**NOTE** The nominal capacities in Table 1 are expressed for convenience in millilitres (used here as a special name for the cubic centimetre) because density is commonly expressed in grams per millilitre, but the pycnometers are equally suitable for determination of density or relative density in any desired units.

Table 1 — Types and sizes of pycnometers

| Type | Designation | Nominal capacities<br>ml |   |   |    |       |
|------|-------------|--------------------------|---|---|----|-------|
| 1    | Lipkin      | 1                        | 2 | 5 | 10 |       |
| 2    | Sprengel    |                          |   | 5 | 10 | 25    |
| 3    | Gay-Lussac  |                          |   |   | 10 | 25 50 |
| 4    | Reischauer  |                          |   |   |    | 25 50 |
| 5    | Hubbard     |                          |   |   |    | 25    |

## 4 Definition of capacity

### 4.1

#### precise capacity

the volume, in millilitres, of water at the reference temperature contained by the pycnometer, also at that temperature. The volume, according to type, is defined as follows:

Type 1: Between zero lines of the two scales

Type 2: From tip of jet to graduation line

Types 3 and 5: To top of bore of stopper

Type 4: To zero line of scale

the preferred reference temperature is 20 °C but other temperatures may be selected as appropriate

### 4.2

#### nominal capacity

the precise capacity rounded to the nearest appropriate value given in Table 1

## 5 Difference between actual capacity and nominal capacity

The difference between the actual capacity and the nominal capacity of a pycnometer shall not exceed the appropriate maximum value shown in Table 2 and Table 3.

## 6 Construction

### 6.1 Material

Pycnometers should preferably be made from borosilicate glass of class 1 hydrolytic resistance<sup>1)</sup>, and shall be as free as possible from visible defects and reasonably free from internal strain. Stoppers or taps shall be made from glass having similar thermal properties to that used for the pycnometers to which they are fitted. Pycnometers made from soda-lime glass may require more frequent calibration than those made from borosilicate glass.

<sup>1)</sup> An International Standard (ISO 4789) covering the classification of laboratory glasses according to their hydrolytic resistance is in preparation.