INTERNATIONAL STANDARD

ISO 385

First edition
2005-04-15

Laboratory glassware — Burettes

Verrerie de laboratoire — Burettes

Reference number
ISO 385:2005(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web 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.

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 385 was prepared by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, Subcommittee SC 6, *Laboratory and volumetric ware*.

This first edition cancels and replaces ISO 385-1:1984, ISO 385-2:1984 and ISO 385-3:1984, which have been technically revised and combined into one document.

Laboratory glassware — Burettes

1 Scope

This International Standard provides metrological and construction requirements for an internationally acceptable series of burettes, suitable for general laboratory purposes.

The details specified are in accordance with the principles of design and construction of volumetric glassware given in ISO 384.

NOTE For piston burettes, see ISO 8655-3.

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 384:1978, *Laboratory glassware — Principles of design and construction of volumetric glassware*

ISO 719, *Glass — Hydrolytic resistance of glass grains at 98 °C — Method of test and classification*

ISO 4787:1984, *Laboratory glassware — Volumetric glassware — Methods for use and testing of capacity*

3 Terms and definitions

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

3.1
delivery volume
volume of liquid discharged from a volumetric instrument, such as a burette

NOTE Due to retention of liquid on the inner surface of the volumetric instrument, the volume of liquid delivered is not identical with the volume of liquid contained by the volumetric instrument.

3.2
delivery time
time required for the descent of the liquid meniscus from the zero line to the lowest graduation line of the volumetric instrument

3.3
waiting time
time to be observed after apparent completion of the liquid delivery of the volumetric instrument and before the final reading of the delivered volume is taken

NOTE A waiting time applies for burettes Class AS (see 5.2).

4 Basis of adjustment

4.1 Unit of volume

The basic unit of volume shall be the millilitre (ml), which is equivalent to one cubic centimetre (cm^3).

4.2 Delivery volume

Burettes shall be adjusted with water to deliver their volume (Ex), from the zero line to any graduation line, the outflow being unrestricted until approaching the final position of the meniscus. For burettes with a waiting time (Class AS), 30 s shall elapse before final setting of the meniscus.

4.3 Reference temperature

The standard reference temperature, i.e. the temperature at which the burette is intended to deliver its nominal volume (nominal capacity), shall be 20 °C.

When the burette is required for use in a country which has adopted a standard reference temperature of 27 °C (the alternative recommended in ISO 384 for tropical use), this value shall be substituted for 20 °C.

5 Types and classes of accuracy

5.1 Classes of accuracy

Two classes of accuracy are specified:

— Class A (subdivided into Classes A and AS) for the higher grade;

— Class B for the lower grade.

5.2 Types of burette

The following two types of burette are specified:

— that for which no waiting time is specified (Classes A and B);

— that for which a waiting time of 30 s is specified (Class AS).

6 Maximum permissible errors

6.1 Errors in the delivered volume shall not exceed the limits given in Table 1. These limits represent the maximum permitted error at any point on the scale, and also the maximum permissible difference between the errors at any two points.

Table 1 — Capacities, subdivisions and maximum permissible error

Nominal capacity	Subdivision	Maximum permissible error	
		Classes A and AS	Class B
ml	ml	ml	ml
1	0,01	± 0,006	± 0,01
2	0,01	± 0,01	± 0,02
5	0,01	± 0,01	± 0,02
5	0,02	± 0,01	± 0,02
10	0,02	± 0,02	± 0,05
10	0,05	± 0,03	± 0,05
25	0,05	± 0,03	± 0,05
25	0,10	± 0,05	± 0,10
50	0,10	± 0,05	± 0,10
100	0,20	± 0,10	± 0,20

6.2 If burettes are required with nominal capacities and/or subdivisions other than those listed in Table 1, they shall conform to the essential requirements of this International Standard.

The relationships between maximum permissible error and capacity, as well as between maximum permissible error and meniscus diameter as given in ISO 384:1978, Annex A and Annex B, shall be observed.

7 Material

Burettes shall be manufactured from glass of chemical resistance and thermal properties at least to HGB3 in accordance with ISO 719, shall be as free as possible from visible defects, and shall be free from internal stress. If the burette is of Schellbach tubing, the coloured stripe on the back of the burette shall be durable and shall not exceed 40 % of the circumference of the tube.

NOTE The durability of coloured enamel stripes can be assessed by the test methods specified in ISO 4794.

Some components of burettes may be manufactured from, or have components manufactured from, suitable inert materials such as ceramics or plastics (see 8.3).

8 Construction

8.1 Dimensions

Burettes may be supplied with an auto-zero device and liquid storage reservoir. In this case the overall length of the burette when assembled to the reservoir should not exceed 1 050 mm.

Burettes not provided with such a filling device shall comply with the dimensional requirements shown in Table 2.

Table 2 — Dimensional requirements

Nominal capacity	Subdivision	Scale length		Overall length
		mm	mm	mm
ml	ml	min.	max.	max.
1	0,01	150	200	575
2	0,01	200	300	650
5	0,01	480	600	820
5	0,02	250	600	800
10	0,02	480	600	820
10	0,05	250	450	620
25	0,05	480	600	820
25	0,10	250	450	620
50	0,10	500	600	820
100	0,20	550	650	870
Distance of zero line from top of burette:				⩾ 50 mm
Distance of lowest graduation line from top of stopcock:				⩾ 50 mm
Length of tube of uniform bore below lowest graduation line:				⩾ 20 mm
Distance of end of jet from underside of stopcock:				⩾ 50 mm

8.2 Top of burette

The top of each burette, if not provided with a filling device, shall be smoothly finished with a strengthening flange or bead which shall lie in a plane at right angles to the axis of the burette. Burettes with subdivisions of 0,05 ml or less, if not fitted with a filling stopcock, should preferably be finished with a cylindrical cup at the top. Larger diameter burettes may be fitted with a funnel top for special purposes.

The length of the tube of uniform bore between the zero graduation line and the cup shall be at least 20 mm.

8.3 Stopcocks and similar devices

8.3.1 Stopcocks shall be of good quality construction to allow smooth and precise control of outflow, and to prevent a rate of leakage greater than that allowed by 8.4. Suitable key-retaining devices should be fitted.

8.3.2 Stopcocks of conventional design, made entirely of glass, shall have the barrel and key finely ground to a taper, usually of 1:10.

8.3.3 Stopcocks of other designs, whether glass or suitable inert alternative materials such as ceramics or plastics, are allowed provided they comply with the requirements of 8.3.1.

8.3.4 Stopcocks used on Class A and Class AS burettes should preferably be integral with the burette and have jets that form an integral part of the stopcock. If this is not the case, then for Class A and Class AS burettes each removable component shall be clearly identified to link it to the nominal burette tube size for which it is designed. For individually certified burettes, removable components shall clearly be identified (typically with a permanently inscribed or printed number) to link them to the individual burette.

8.4 Stopcock leakage

8.4.1 A stopcock of conventional design made entirely of glass or intended for use with grease shall be tested for leakage with the burette clamped in a vertical position, the stopcock free from grease, the barrel and key wetted with water, and the burette filled initially to the zero line with water. The rate of leakage, with the key in either of the fully shut-off positions, shall not exceed one scale subdivision in the case of Class A or Class AS burettes or two scale subdivisions in the case of Class B burettes, in 20 min.

Other all-glass stopcocks shall be subjected to similar tests with their component parts free from grease and wetted with water.

8.4.2 In addition to this test, a double-bore stopcock shall not show a rate of leakage greater than that given above when tested similarly with the burette empty, the key of the stopcock in the normal delivery position and the filling tube connected to a suitable graduated tube filled with water to a level of 250 mm above the zero line of the burette.

8.4.3 If the stopcock is of such material that it is intended for use without grease, it shall be tested in a similar manner. The rate of leakage shall not exceed one-half of one scale subdivision in the case of Class A or Class AS burettes, or one scale subdivision in the case of Class B burettes, in 50 min.

8.4.4 For all leakage tests, in order to ensure a sufficiently accurate determination, precautions shall be taken to avoid large temperature changes (and evaporation) during the period of test.

NOTE The leakage tests specified above are suitable for specification and referee purposes. For many other purposes, a quicker test may be necessary, in which case a vacuum leakage arrangement is suitable. Such a test is not suitable for specification purposes owing to the difficulty of standardizing all the conditions. Any particular quick test apparatus can be calibrated by the use of several burettes whose leakage rates have been determined by means of the leakage test specified above.

8.5 Delivery jet

8.5.1 The jet shall be made from either thick-walled capillary tubing or a suitable inert plastic material and, if it forms an integral part of the burette, shall have no cavity at the join likely to trap air bubbles.

8.5.2 The jet shall be solidly manufactured with a smooth and gradual taper, without any sudden constriction at the orifice which could give rise to a turbulent outflow.

The end of the jet shall be finished by one of the following methods, in order of preference:

a) smoothly ground with the plane of the tip at right angles to the axis, slightly bevelled on the outside and, if desired, fire-polished;

b) moulded, with the plane of the tip at right angles to the axis and slightly bevelled on the outside;

c) cut at right angles to the longitudinal axis and fire-polished.

A fire-polished finish reduces the danger of chipping in use, but should not result in constriction, as indicated in the first sentence of this subclause, or in undue stress, as indicated in Clause 7.

8.6 Delivery time

The delivery time (see 3.2) of the burette shall be determined with water, with the stopcock fully open and with the jet not in contact with the side of the receiving vessel.

The delivery time determined in this way shall be within the specified limits (see Table A.1 or B.1). In the case of a detachable jet, the appropriate delivery time shall apply when the correct jet is fitted in accordance with the manufacturer's instructions.