INTERNATIONAL STANDARD

ISO 1042

Fourth edition
1998-07-01

Laboratory glassware — One-mark volumetric flasks

Verrerie de laboratoire — Fioles jaugées à un trait

Reference number
ISO 1042:1998(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.

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.

ISO 1042 was developed by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, Subcommittee SC 1, *Volumetric instruments*.

This fourth edition cancels and replaces the third edition (ISO 1042:1983) by incorporating the following changes:

a) flasks with capacities of 1, 2, 20 and 5 000 ml have been added;

b) flasks with conical body shape have been added;

c) flasks with wider neck have been added;

d) material has been more precisely defined and a test method for capacity introduced;

e) sizes of ground joints have been added in tables 1 and 2.

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Internet central@iso.ch
X.400 c=ch; a=400net; p=iso; o=isocs; s=central

Printed in Switzerland

Introduction

Volumetric flasks together with analytical balances are the fundamental tools for the preparation of volumetric standard solutions — the basis of chemical analysis. The design of narrow-necked class A volumetric flasks has been optimized to achieve the fewest possible acceptable errors.

With the increasing popularity of piston-operated pipettors, there is market pressure for the manufacture of volumetric flasks with wider necks so that pipettor tips may be inserted to remove solution directly. Wide-necked flasks will of necessity be of lower accuracy than the corresponding capacities of narrow-necked flasks and the insertion of any extraneous device may introduce other errors.

It is therefore recommended that narrow-necked class A volumetric flasks are used for the production of standard solutions and where necessary, a suitable quantity should be poured into an intermediate vessel into which the pipettor tip may be introduced.

In accordance with good laboratory practice, only narrow-necked class A volumetric flasks conforming to this International Standard should be used for precise analytical purposes.

Laboratory glassware — One-mark volumetric flasks

1 Scope

This International Standard specifies requirements for an internationally acceptable series of one-mark volumetric flasks, suitable for general laboratory purposes.

The specifications in this International Standard are in conformity with ISO 384 and with OIML Recommendation No. 4.

2 Normative references

The following standards contain provisions which, through references in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 383:1976, *Laboratory glassware — Interchangeable conical ground joints.*

ISO 719:1985, *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 Basis of adjustment

3.1 Unit of volume

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

NOTE — The term millilitre (ml) is commonly used as a special name for the cubic centimetre (cm^3), in accordance with a decision of the twelfth Conférence Générale des Poids et Mesures. The term millilitre is acceptable, in general, for references in International Standards to capacities of volumetric glassware and it is used, in particular, in the present text.

3.2 Reference temperature

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

When the flask is required for use in a country which has adopted a standard reference temperature of 27 °C, however, this value shall be substituted for 20 °C.

4 Classes of accuracy

Two classes of accuracy are specified:

— **Class A** for the higher grade,

— **Class B** for the lower grade.

5 Series of capacities

The series of nominal capacities of one-mark volumetric flasks is as follows (in millilitres):

1 - 2 - 5 - 10 - 20 - 25 - 50 - 100 - 200 - 250 - 500 - 1 000 - 2 000 - 5 000

All these flasks may be finished with a plain neck or may include a stopper.

NOTE — If volumetric flasks of capacities other than those listed above are required, it is recommended that they conform, as far as possible, to the essential requirements of this International Standard.

6 Definition of capacity

The capacity of a volumetric flask is defined as the volume of water at 20 °C, expressed in millilitres, contained by the flask at 20 °C, when filled to the graduation line.

Where, exceptionally, the reference temperature is 27 °C, this value shall be substituted for 20 °C.

Setting the meniscus shall be performed according to ISO 4787:

The meniscus is set so that the plane of the top edge of the graduation line is horizontally tangential to the lowest point of the meniscus, the line of sight being in the same plane.

7 Accuracy

The capacity of the flasks shall not differ from the nominal capacity by more than the maximum permitted errors shown in tables 1 and 2.

8 Construction

8.1 Material

Volumetric flasks shall be made from glass of hydrolytic class not lower than HGB3 in accordance with ISO 719 with a coefficient of thermal expansion not exceeding 3,3 x 10^{-6} $°C^{-1}$.

NOTE — Borosilicate glass 3.3 in accordance with ISO 3585 is included in this requirement.

The glass shall be as free as possible from visible defects and reasonably free from internal stress, which would impair the performance of the flasks.

8.2 Wall thickness

Volumetric flasks shall be sufficiently robust in construction to withstand normal usage and the wall thickness shall show no gross departures form uniformity.

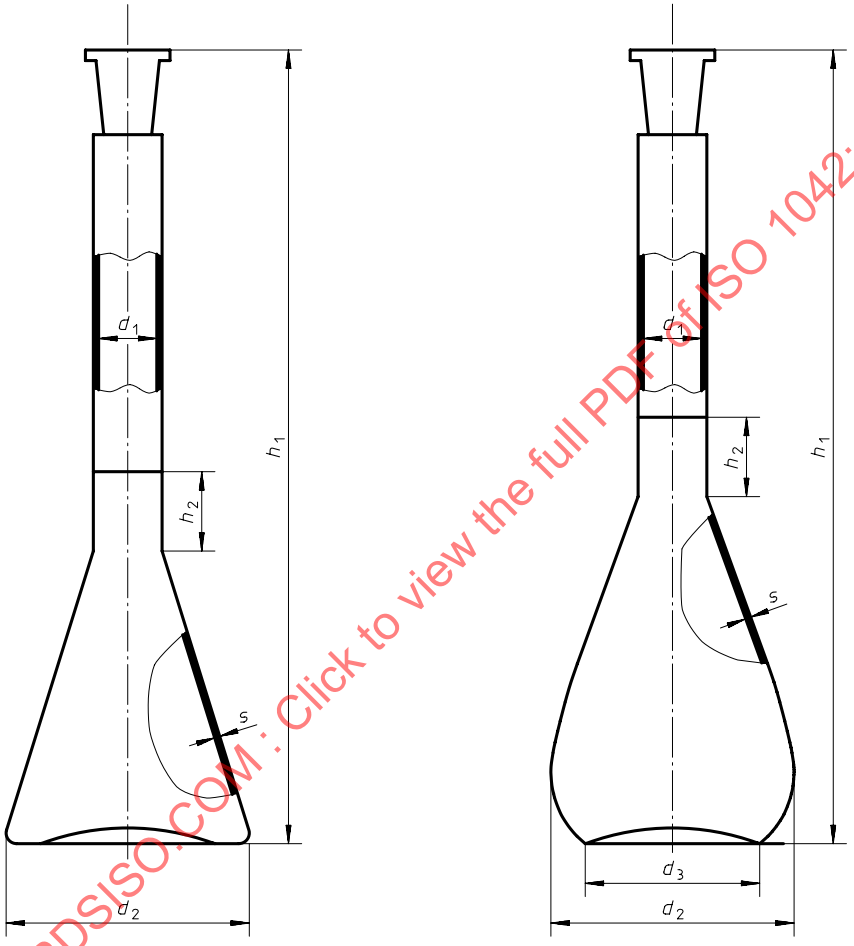

Figure 1 — One-mark volumetric flasks showing alternative shapes

Table 1 — Dimensions and maximum permitted errors for narrow-necked flasks

Essential dimensions			Tolerances		Recommended dimensions					
Nominal capacity	Internal neck diameter	Distance of graduation line[1]	Maximum permitted errors		Overall height[2]	Bulb diameter	Base diameter	Wall thickness	Ground joint[3]	
			Class A	Class B					k4	k6
ml	d_1 mm	h_2 mm min.	ml	ml	h_1 ± 5 mm	d_2 mm (approx.)	d_3 mm min.	s mm min.		
1	7 ± 1	5	± 0,025	± 0,050	65	13	13	0,7	7/11	7/16
2	7 ± 1	5	± 0,025	± 0,050	70	17	15	0,7	7/11	7/16
5	7 ± 1	5	± 0,025	± 0,050	70	22	15	0,7	7/11	7/16
10	7 ± 1	5	± 0,025	± 0,050	90	27	18	0,7	7/11	7/16
20	9 ± 1	5	± 0,040	± 0,080	110	39	18	0,7	10/13	10/19
25	9 ± 1	5	± 0,040	± 0,080	110	40	25	0,7	10/13	10/19
50	11 ± 1	10	± 0,060	± 0,120	140	50	35	0,7	12/14	12/21
100	13 ± 1	10	± 0,100	± 0,200	170	60	40	0,7	12/14[4]	12/21[4]
200	15,5 ± 1,5	10	± 0,150	± 0,300	210	75	50	0,8	14/15	14/23
250	15,5 ± 1,5	10	± 0,150	± 0,300	220	80	55	0,8	14/15	14/23
500	19 ± 2	15	± 0,250	± 0,500	260	100	70	0,8	19/17	19/26
1 000	23 ± 2	15	± 0,400	± 0,800	300	125	85	1,0	24/20	24/29
2 000	27,5 ± 2,5	15	± 0,600	± 1,200	370	160	110	1,2	29/22	29/32
5 000	38 ± 3	15	± 1,200	± 2,400	475	215	165	1,2	34/23	34/35

1) Minimum distance of graduation line from any point of change of diameter.
2) Overall height without stopper in accordance with figure 1.
3) In accordance with ISO 383.
4) Alternative ground joint size 14/15 and 14/23.

Table 2 — Dimensions and maximum permitted errors for wide-necked flasks

Essential dimensions			Tolerances		Recommended dimensions					
Nominal capacity	Internal neck diameter	Distance of graduation line[1]	Maximum permitted errors		Overall height[2]	Bulb diameter	Base diameter	Wall thickness	Ground joint[3]	
			Class A	Class B					k4	k6
ml	d_1 mm	h_2 mm min.	ml	ml	h_1 ± 5 mm	d_2 mm (approx.)	d_3 mm min.	s mm min.		
5	9 ± 1	5	± 0,040	± 0,080	70	22	15	0,7	10/13	10/19
10	9 ± 1	5	± 0,040	± 0,080	90	27	18	0,7	10/13	10/19
20	11 ± 1	5	± 0,060	± 0,120	105	39	18	0,7	12/14	12/21
25	11 ± 1	5	± 0,060	± 0,120	110	40	25	0,7	12/14	12/21
50	13 ± 1	10	± 0,100	± 0,200	140	50	35	0,7	14/15	14/23
1 000	27,5 ± 2,5	15	± 0,600	± 1,200	300	125	85	1,0	29/22	29/32

1) Minimum distance of graduation line from any point of change of diameter.
2) Overall height without stopper in accordance with figure 1.
3) In accordance with ISO 383.

8.3 Shape

The body of the flask may be pear-shaped or conical, as shown in figure 1, so as to provide a large base on which the flask shall stand with its axis vertical without rocking or spinning. Other shapes of flasks are also admissible. Flasks of capacity 25 ml and larger shall not topple, when placed empty (without stopper) on a surface inclined at an angle of 15° to the horizontal. Flasks of capacity below 25 ml shall not topple, when similarly tested at an angle of 10° to the horizontal. Details about the dimensions in figure 1 are given in tables 1 and 2.

NOTE — The internal neck diameter and the distance of the graduation line from any point of change of diameter are essential dimensions for the accuracy of the flasks. The recommended dimensions in tables 1 and 2 have been found suitable for particular use and size.

Table 3 — Shape of flask body

Nominal capacity, ml	**Shape of body**
1 and 2	conical (see figure 1)
5 to 50	conical or pear-shaped
100 to 5 000	pear-shaped (see figure 1)

8.4 Neck

The neck of the flask, excluding the socket and bulge if present, shall be approximately cylindrical and there shall be no undue variation in internal diameter or wall thickness. The axis of the neck shall be perpendicular to the plane of the base of the flask.

The top of the neck of a plain neck flask shall be finished with a strengthening flange. Such necks, which are suitable for stoppers, shall be ground to a socket size complying with the provisions of ISO 383, and shall be selected from the k4 or k6 series of this International Standard. Tables 1 and 2 give an overview of all essential and recommended dimensions of the volumetric flasks.

There may be an enlargement of diameter in the neck below the ground joint to enable better mixing of liquid.

8.5 Stopper

The stopper, if provided, shall be a good fit in the flask neck and may be of glass, solid or hollow-blown, or of a suitably inert plastics material.

8.6 Dimensions

Volumetric flasks shall comply with the essential dimensions shown in tables 1 and 2, these dimensions being considered to be essential for accuracy and convenience in use. The recommended dimensions listed in tables 1 and 2 provide guidance as they have proved satisfactory in use. The graduation line shall be placed in the lower two-thirds of the neck of the flask, and shall be not less than the stated minimum distance from any point at which the neck begins to change in diameter.

9 Graduation line

The graduation line shall be a clean, permanent, uniform line, of thickness not exceeding 0,4 mm, lying in a plane parallel to the base of the flask and completely encircling its neck.

10 Test method for capacity and accuracy

Testing of capacity and accuracy shall be performed according to ISO 4787.