SLOVENSKI STANDARD
SIST ISO 384:1995

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Laboratorijska steklovina - Načela za oblikovanje in konstruiranje volumetrijske steklovine

Laboratory glassware -- Principles of design and construction of volumetric glassware

Verrerie de laboratoire -- Principes de conception et de construction de la verrerie volumétrique

Ta slovenski standard je istoveten z: **ISO 384:1978**

ICS:

17.060	Merjenje prostornine, mase, gostote, viskoznosti	Measurement of volume, mass, density, viscosity
71.040.20	Laboratorijska posoda in aparati	Laboratory ware and related apparatus

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INTERNATIONAL STANDARD 384

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Laboratory glassware — Principles of design and construction of volumetric glassware

Verrerie de laboratoire — Principes de conception et de construction de la verrerie volumétrique

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 384 was developed by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, and was circulated to the member bodies in February 1976.

It has been approved by the member bodies of the following countries :

Australia	Hungary	South Africa, Rep. of
Austria	India	Spain
Belgium	Israel	Turkey
Canada	Italy	United Kingdom
Chile	Mexico	U.S.A.
Czechoslovakia	Netherlands	U.S.S.R.
France	Poland	
Germany	Romania	

No member body expressed disapproval of the document.

This International Standard cancels and replaces ISO Recommendation R 384-1964, of which it constitutes a technical revision.

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Laboratory glassware — Principles of design and construction of volumetric glassware

1 SCOPE AND FIELD OF APPLICATION

This International Standard sets out principles for drawing up specifications for articles of volumetric glassware.

2 REFERENCES

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

ISO 1769, *Laboratory glassware — Pipettes — Colour coding.*

ISO 4791/II, *Laboratory glassware — Vocabulary — Part II.* [1)]

3 UNIT OF VOLUME, AND REFERENCE TEMPERATURE

3.1 Unit of volume

The unit of volume shall be the cubic centimetre (cm^3) or, in special cases, the cubic decimetre (dm^3) or cubic millimetre (mm^3).

NOTE — The term millilitre (ml) is commonly used as a special name for the cubic centimetre (cm^3) and, similarly the litre (l) for the cubic decimetre (dm^3) and the microlitre (μl) for the cubic millimetre (mm^3), in accordance with the International System of units (SI).

3.2 Reference temperature

The standard reference temperature, i.e. the temperature at which the article of volumetric glassware is intended to contain or deliver its nominal volume (nominal capacity), shall 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.

4 VOLUMETRIC ACCURACY

4.1 In a specification where two classes of accuracy are required,

— the higher grade shall be designated "class A";

— the lower grade shall be designated "class B".

4.2 Limits of volumetric error shall be specified for each type of article having regard to the method and purpose of use and the class of accuracy.

4.3 The numerical values of limits of volumetric error for articles of volumetric glassware for general purposes shall be chosen from the series 10 — 12 — 15 — 20 — 25 — 30 — 40 — 50 — 60 — 80, or a suitable decimal multiple thereof. [2)]

4.4 The limits of volumetric error specified for a series of sizes of an article should provide a reasonably uniform progression in relation to capacity when plotted on a logarithmic graph as shown in annex A. Such a graph should be included as an annex to all specifications in which a series of three or more sizes of an article is specified.

4.5 Where two classes of accuracy are specified, then the limits of volumetric error permitted for class B should, in general, be approximately twice those permitted for class A.

4.6 For all articles having a scale, the maximum permitted volumetric error for either class of accuracy shall not exceed the volume equivalent of the smallest scale division.

1) In preparation.

2) This is the R'' 10 series of preferred numbers and has been adopted because decimal sub-multiples of some of the unrounded numbers, for example 31,5, would appear to imply a degree of precision which is not intended and which could not be measured in practice.

4.7 Where two classes of accuracy are specified, the class A limit of volumetric error specified for any article shall not be smaller than that calculated from the maximum permitted diameter at the relevant graduation line by the formulae detailed in annex B; the corresponding class B limit shall be derived in accordance with 4.5.

Where only one class of accuracy is specified, the limit of volumetric error specified for any article shall be similarly determined, on the basis of a preliminary decision as to whether class A or class B accuracy is appropriate to the article in question.

A nomograph, plotted on a logarithmic scale as shown in annex B, should be included, as an annex, in all specifications for articles of volumetric glassware.

4.8 The limit of volumetric error specified for any article designed for delivery shall also be not less than four times the standard deviation (RMS) determined experimentally by an experienced operative from a series of at least twenty replicable determinations of delivered capacity on the same article, carried out strictly in accordance with the method specified for that article.

5 METHODS OF VERIFICATION AND USE

5.1 The method of verification should be clearly specified for each article of volumetric glassware.

5.2 Any difference between the method of verification and the method of use shall be clearly indicated.

5.3 Delivery times and, where applicable, waiting times for all articles intended for delivery of a liquid shall be specified.[1)]

5.4 Setting of the meniscus shall be performed by one of the two methods detailed below. Wherever practicable, the meniscus should descend to the position of setting.

a) The meniscus is set so that the plane of the upper edge of the graduation line is horizontally tangential to the lowest point of the meniscus, the line of sight being in the same plane. In the case of a mercury meniscus, however, the highest point of the meniscus is set to the lower edge of the graduation line.

b) The meniscus is set so that the plane of the centre of the graduation line is horizontally tangential to the lowest point of the meniscus. The eye is raised towards the plane and observes the front and back portions of the line apparently meeting the lowest point simultaneously. In the case of a mercury meniscus, the eye is lowered towards the plane of the centre of the graduation line.

NOTE — The difference between meniscus positions resulting from the alternative methods of setting is the volume equivalent to one-half the thickness of the graduation line. In the case of articles where the capacity is read as the difference between two meniscus readings (for example on a burette) then no error results if the article is manufactured using one method and is later used by the other method. Even in most unfavourable cases of single-mark articles (for example large flasks), when working to the highest attainable accuracy, the difference resulting from use of the two methods is unlikely to exceed 30 % of the class A limit of error, and a correction can be calculated where necessary.

5.5 When the article is used with opaque wetting liquids, the horizontal line of sight shall be taken through the upper edge of the meniscus, and where necessary an appropriate correction shall be applied.

6 CONSTRUCTION

6.1 Material

Volumetric glassware shall be constructed of glass of suitable chemical and thermal properties. It shall be as free as possible from visible defects and shall be reasonably free from internal stress.

6.2 Shape

All articles shall be of a shape which will facilitate emptying and drainage, and should preferably be of circular cross-section.

6.3 Capacity

6.3.1 The numerical values of capacity of articles of volumetric glassware for general purposes should preferably be chosen from the series 10 — 20 — 25 — 50, or a decimal multiple or submultiple thereof.

6.3.2 The numerical value of the volume equivalents of the smallest division on articles having a scale shall be chosen from the series 1 — 2 — 5, or a decimal multiple or submultiple thereof.

6.3.3 In the case of a special purpose article of volumetric glassware which is to be graduated for direct reading of capacity when used with a specific liquid other than water, the specification should also indicate the corresponding capacity when used with pure water so that the latter can be used for verification.

1) See definitions given in ISO 4791/II.

6.4 Stability

Vessels provided with a flat base shall stand firmly thereon without rocking when placed on a level surface and, unless specified otherwise, the axis of the graduated portion of the vessel should be vertical. Wherever practicable, vessels shall not topple when placed empty on a surface inclined at an angle to the horizontal to be specified for each article.

Vessels provided with a base which is not circular shall meet this requirement in all directions.

6.5 Delivery jets

6.5.1 Delivery jets should be strongly constructed with a smooth and gradual taper without any sudden constriction at the orifice.[1)]

6.5.2 The end of the jet shall be finished by one of the methods listed below in order of preference :

a) smoothly ground square with the axis, slightly bevelled on the outside and fire-polished;

b) smoothly ground square with the axis and slightly bevelled on the outside;

c) cut square with the axis and fire-polished.

A fire-polished finish reduces the danger of chipping in use, but should not result in constriction, as indicated in 6.5.1, or in undue stress.

6.5.3 The jet should form an integral part of an article intended for class A and should preferably form an integral part of an article intended for class B.

6.6 Stoppers

6.6.1 Glass stoppers should preferably be ground so as to be interchangeable, in which case the ground portions shall comply with ISO 383. If individually fitted, they shall be well ground so as to prevent leakage, preferably with a taper of approximately 1/10.

6.6.2 Stoppers of a suitably inert plastics material may be permitted as an alternative to glass. In such cases, the glass socket into which the stopper fits should preferably comply with ISO 383.

6.7 Stopcocks or similar devices

6.7.1 Stopcocks and similar devices shall be designed to permit smooth and precise control of outflow and to prevent a rate of leakage greater than that allowed in the specification for the article.

6.7.2 Stopcocks and similar devices shall be made from glass or from suitable inert plastics material.

6.7.3 All-glass stopcocks shall have the key and barrel finely ground preferably to a taper of 1/10 and shall comply with appropriate national or international specifications.

6.7.4 Glass stopcock barrels to receive plastics keys shall be polished internally.

6.7.5 Stopcock components may be fitted with suitable retaining devices.

7 LINEAR DIMENSIONS

7.1 Linear dimensional requirements shall be specified for all articles of volumetric glassware in such a way as to ensure that :

a) the article is convenient and satisfactory for its intended use;

b) in a series of sizes of an article, unnecessary inconsistencies in shape and proportions can be avoided;

c) a limitation is placed on the maximum internal diameter at the graduation line or lines (see 4.7 and annex B); this limitation may be a direct limitation on diameter or an indirect one by a minimum limitation on scale length;

d) the requirement for spacing of graduation lines specified in 9.1.2 is achieved;

e) the stability requirements of 6.4 can be achieved.[2)]

Linear dimensions shall be specified in millimetres.

7.2 Dimensional requirements should not be more restrictive than is necessary to achieve the aims listed in 7.1.

7.3 In order to permit maximum freedom in manufacture within the restrictions imposed by 7.1, dimensions may be divided into two categories of importance and classified as "essential dimensions" and "guidance dimensions".

1) A reason for not permitting a sudden constriction at the orifice is that such a shape could conceal the fact that the jet had been damaged, cut back and re-fired. Following such treatment the volume delivered by the article could have been altered beyond the specified limits of volumetric error without any visible evidence of this fact.

2) The stability requirement is controlled by the angle of displacement from the vertical at which the centre of gravity comes vertically above the edge of the base. The height of the centre of gravity is not only a function of the specified dimensions but is also affected by the distribution of mass in the various parts of the article. It is, however, important to ensure that the specified dimensions do not make it difficult or impossible to achieve the required stability.