INTERNATIONAL STANDARD

ISO 12771

First edition
1997-05-01

Plastics laboratory ware — Disposable serological pipettes

Matériel de laboratoire en plastique — Pipettes sérologiques à usage unique

Reference number
ISO 12771:1997(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.

International Standard ISO 12771 was prepared by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus,* Subcommittee SC 1, *Volumetric instruments.*

Annex A of this International Standard is for information only.

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

Plastics laboratory ware — Disposable serological pipettes

1 Scope

This International Standard specifies requirements for disposable plastics serological pipettes, gauged to deliver, suitable for general laboratory purposes.

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 1043-1:1987, *Plastics — Symbols — Part 1: Basic polymers and their special characteristics.*

ISO 1769:1975, *Laboratory glassware — Pipettes — Colour coding.*

ISO 8417:—,[1] *Laboratory volumetric instruments — Principles of design and construction of disposable volumetric articles .*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 disposable: Adjective used to describe serological pipettes which are intended to be used once only and then discarded.

NOTE — Such pipettes will only be expected to provide their specified performance during the original operation.

3.2 accuracy (of a pipette): Closeness of agreement between the nominal volume and the true volume, obtained by applying the test procedure specified in clause 9.1. It is quantified by the capacity deviation.

3.3 repeatability (of a number of pipettes): Closeness of agreement between the individual volumes obtained by applying the test procedure specified in 9.2.

NOTE 1: Definitions and terms are in agreement with the "International Vocabulary of Basic and General Terms in Metrology". See ISO 3534-1 for details.

NOTE 2: The definitions for accuracy and repeatability apply only in cases where the distributions are Gaussian.

4 Basis of adjustment

4.1 Unit of volume

The unit of volume is the cubic centimetre (cm^3), for which the name millilitre (ml) may be used.

[1] To be published.

NOTE — The term millilitre (ml) is commonly used as a special name for the cubic centimetre (cm^3), in accordance with the International System of Units (SI).

4.2 Reference temperature

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

When the pipette is required for use in a country which has adopted a reference temperature of 27 °C (the alternative specified in ISO 8417 for tropical use), this figure shall be substituted for 20 °C.

4.3 Adjustment

The pipettes shall be adjusted to deliver the required volume (i.e. the nominal volume or a part of it) with the last drop to be blown out.

5 Dimensions and delivery times

The dimensions and delivery times shall be as shown in table 1.

The delivery time shall be determined with the pipette unplugged, and with distilled water at a temperature of 20 °C.

Table 1 — Capacity, subdivision, dimensions and delivery times

Nominal capacity ml	Smallest scale division ml	Lowest graduation line at ml	External diameter mm	Wall thickness min. mm	Delivery times min. s	Delivery times max. s
0,5	0,01	0,4	4,5 to 4,8	0,8	0,5	3,0
1	0,01	0,9	4,5 to 5,0	0,8	0,5	3,0
1	0,1	0,9	4,5 to 5,0	0,8	0,5	3,0
2	0,01	1,8	5,4 to 6,7	0,9	0,5	4,0
2	0,1	1,8	5,4 to 6,7	0,9	0,5	4,0
5	0,1	4,0	7,6 to 10,0	0,9	0,5	7,0
10	0,1	9,0	9,5 to 11,7	0,9	0,5	8,0

6 Construction

6.1 Material

The pipettes shall be made of translucent plastics material of chemical and physical properties suitable for their intended use. The plastic material or its symbol in accordance with ISO 1043-1 shall be marked on each pipettes.

6.2 Graduation and figuring

The pipettes shall be provided with a graduation in accordance with ISO 8417, and figured accordingly. Graduation and figuring shall be durable until the pipette has been used.

The pipettes shall be graduated from 0 at the top down to the lowest graduation line according to table 1. The distance between the top of the pipette and the zero line shall be at least 90 mm for pipettes with a separate suction tube and 75 mm minimum for pipettes without suction tube.

6.3 Design

6.3.1 Pipettes shall be straight. Any cross-section of a pipette taken in a plane perpendicular to the longitudinal axis shall be reasonably circular.

6.3.2 The lower end of the pipette shall terminate in a delivery jet having a smooth and gradual taper of 10 mm to 65 mm without any sudden constriction at the orifice which could give rise to turbulent outflow. The end of the jet shall be reasonably perpendicular to the longitudinal axis of the pipette.

6.3.3 The suction end shall be perpendicular to the longitudinal axis of the pipette. If a suction tube is provided on the 5 ml and 10 ml sizes, its dimensions shall be as given in table 2.

Table 2 — Dimensions of optional suction tubes

Length	Diameter	
	internal	external
mm	mm	mm
20 to 28	2 to 6	6 to 9

The diameter is measured at the open end of the mouthpiece.

6.4 Workmanship

The pipettes shall be free from defects that may impair their serviceability, such as foreign matter or chips that affect the bore.

6.5 Colour code

The pipettes may be colour coded to indicate their nominal capacity. If they are colour coded, the code shall be in accordance with ISO 1769.

7 Volumetric performance

When tested in accordance with clause 9, the accuracy and repeatability shall be within the limits stated by the manufacturer.

8 Definition of capacity

8.1 Setting of the meniscus

8.1.1 The meniscus shall be 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.

8.1.2 In order that the lowest point of the meniscus may be observed, a shade of some dark material should be placed immediately below and behind the meniscus, which renders the profile of the meniscus dark and clearly visible against a light background.

8.2 Capacity

The capacity corresponding to any graduation line is defined as the volume of water at 20 °C, expressed in millilitres, delivered by the pipette at 20 °C, when emptied from the graduation line to the jet, outflow being unrestricted until it is sure that the meniscus has come to rest in the jet, but with delivery being completed by expelling the last drop by blowing.

NOTE — It should be borne in mind that the delivered volume is the complement of the indicated volume to the total volume, e.g. if the indication on a 10 ml pipette is 4 ml, the delivered volume is 6 ml.

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

The clean pipette shall be held in a vertical position and filled with distilled water to a few millimetres above the graduation line; the falling meniscus shall then be set to the line. Any drop adhering to the jet of the pipette shall be removed by bringing the surface of a glass vessel into contact with the tip of the jet.

Delivery shall then be made into another glass vessel slightly inclined so that the tip of the jet is in contact with the inside of the vessel, but without movement of one against the other throughout the delivery period.

To ensure that delivery is complete, a waiting time of approximately 3 s should be observed before expelling the last drop by blowing and removing the pipette from the receiving vessel.

NOTE — The waiting period of 3 s is specified only for the purpose of definition. In use, it is not necessary to adhere closely to this period; it is sufficient to be certain that the meniscus has come to rest in the jet before blowing out the pipette.

9 Determination of accuracy and repeatability

Volumetric accuracy and repeatability shall be determined for a single pipette or a minimum of 30 pipettes as specified in 9.1 or 9.2.

9.1 Volumetric capacity deviation (single pipette)

Accuracy for a single pipette shall be calculated as follows:

$$\text{Capacity deviation } \% = \frac{100\,(V_1 - V_0)}{V_0}$$

where

V_1 is the capacity at the reference temperature;
V_0 is the nominal capacity of the pipette.

9.2 Volumetric capacity deviation (number of pipettes)

Repeatability for a minimum of 30 pipettes shall be calculated as follows:

$$\text{Repeatability } \% = \frac{100\,(\overline{V} - V_0)}{V_0}$$

where

$\overline{V}$ is the mean of the sample measurements at the reference temperature;
V_0 is the nominal capacity of the pipettes.