
International Standard



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Laboratory glassware — Graduated pipettes — Part 1 : General requirements

Verrerie de laboratoire — Pipettes graduées — Partie 1 : Spécifications générales

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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 835/1 was developed by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*, and was circulated to the member bodies in August 1979.

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

Australia	Germany, F.R.	Netherlands
Brazil	Hungary	Poland
Canada	India	Romania
Chile	Italy	Spain
Czechoslovakia	Korea, Rep. of	United Kingdom
Egypt, Arab Rep. of	Libyan Arab Jamahiriya	USSR
France	Mexico	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

South Africa, Rep. of
USA

This International Standard cancels and replaces ISO Recommendation R 835-1968, of which it constitutes a technical revision.

Laboratory glassware — Graduated pipettes — Part 1 : General requirements

1 Scope and field of application

This part of ISO 835 specifies general requirements for graduated pipettes, adequate for general laboratory purposes.

The requirements specified are in conformity with ISO 384.

NOTE — Particular requirements for the different types of graduated pipette are specified in the following parts of this International Standard :

Part 2 : Graduated pipettes, for which no waiting time is specified (class A and class B)

Part 3 : Graduated pipettes, for which a waiting time of 15 s is specified (class A only)

Part 4 : Graduated pipettes adjusted for blow-out (class B only)

Limits of error for class A pipettes are shown in relation to capacity in annex A and in relation to diameter at the meniscus in annex B.

2 References

ISO 384, *Laboratory glassware — Principles of design and construction of volumetric glassware*.

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

3 Basis of adjustment

3.1 Unit of volume

The unit of volume is the cubic centimetre (cm³), for which the name millilitre (ml) may be used.

NOTE — The term millilitre (ml) is commonly used as a special name for the cubic centimetre (cm³), 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 to liquid volumes.

3.2 Reference temperature

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

NOTE — When the pipette 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 figure shall be substituted for 20 °C.

4 Volumetric accuracy

There shall be two classes of accuracy :

- Class A for the higher grade;
- Class B for the lower grade.

In neither class shall the limit of volumetric error exceed the smallest scale division.

5 Types of pipette

The following types of pipette are specified :

- Graduated pipettes adjusted for delivery of a liquid from zero line at the top to any graduation line; nominal capacity represented by the lowest graduation line.

Class A and class B; no waiting time specified (pipettes type 1, see ISO 835/2).

- Graduated pipettes adjusted for delivery of a liquid from any graduation line down to the jet; nominal capacity represented by the highest graduation line.

Class A and class B; no waiting time specified (pipettes type 2, see ISO 835/2).

- Graduated pipettes adjusted for delivery of a liquid from zero line at the top to any graduation line; nominal capacity obtained by delivery down to the jet.

Class B only; no waiting time specified (pipettes type 3, see ISO 835/2).

- Graduated pipettes adjusted for delivery of a liquid from zero line at the top to any graduation line; nominal capacity obtained by delivery down to the jet.

Class A only; 15 s waiting time specified (see ISO 835/3).

- Graduated pipettes adjusted for delivery of a liquid from any graduation line down to the jet; nominal capacity represented by the highest graduation line.

Class B only; last drop (in the jet) to be blown out (blow-out pipettes, see ISO 835/4).

6 Limits of volumetric error

Errors in the delivered volume shall not exceed the limits shown in table 1. These limits represent the maximum permitted error at any point and also the maximum permissible difference between the errors at any two points.

Table 1 — Capacities, sub-divisions and limits of error

Nominal capacity	Smallest scale division	Limit of error	
		Class A	Class B
ml	ml	± ml	± ml
0,5	0,01	0,005	
1	0,01	0,006	0,01
2	0,02	0,01	0,02
5	0,05	0,03	0,05
10	0,1	0,05	0,1
25	0,1	0,1	—
25	0,2	0,1	0,2

NOTE — If pipettes are required of capacities and/or sub-divisions other than those listed in this table, it is recommended that they conform to the essential requirements of this part of ISO 835.

7 Construction

7.1 Material

Graduated pipettes shall be constructed of glass of suitable chemical and thermal properties, shall be as free as possible from visible defects and shall be reasonably free from internal stress.

7.2 Dimensions

Graduated pipettes shall comply with the dimensional requirements shown in table 2.

7.3 Top of pipette

The top of the pipette shall be finished square with the axis of the pipette and shall be free from any blemishes which might

interfere with the required accurate control by the finger in setting the meniscus. The end may be lightly fire-polished or smoothly ground with a slight bevel on the outside.

7.4 Delivery jet

The lower end of the pipette shall terminate in a delivery jet having a smooth and gradual taper without any sudden constriction at the orifice which could give rise to turbulent outflow.

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

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

7.5 Delivery time

The delivery time is defined as the time occupied by the free descent of the water meniscus from the highest graduation line :

- to the lowest graduation line, in the case of type 1 pipettes;
- to the point at which the meniscus appears to come to rest in the jet, in the case of each other pipette.

The delivery time is determined with the pipette in a vertical position and with the receiving 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.

NOTE — It is important that a glass receiving vessel is used. Capillary effects influencing the delivery time depend considerably on the material on which the liquid runs down.

The delivery time thus determined shall be within the limits specified for the particular pipette.

7.6 Waiting time

The waiting time, if specified, is defined as the period of time to be observed after the meniscus appeared to come to rest in the jet, and before the tip of the jet shall be removed from the receiving vessel.

8 Graduation and figuring

8.1 Graduation lines

8.1.1 Graduation lines shall be clean, permanent and uniform lines of thickness not exceeding 0,3 mm.

8.1.2 All graduation lines shall lie in planes at right angles to the longitudinal axis of the pipette.