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International Standard



835/2

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**Laboratory glassware — Graduated pipettes —  
Part 2 : Pipettes for which no waiting time is specified**

*Verrerie de laboratoire — Pipettes graduées — Partie 2 : Pipettes sans temps d'attente*

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**Descriptors :** glassware, laboratory glassware, pipettes, categories, specifications, capacity, graduations.

## Foreword

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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 835/2 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	South Africa, Rep. of
Czechoslovakia	Korea, Rep. of	Spain
Egypt, Arab Rep. of	Libyan Arab Jamahiriya	United Kingdom
France	Mexico	USSR

The member body of the following country expressed disapproval of the document on technical grounds :

USA

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

# Laboratory glassware — Graduated pipettes — Part 2 : Pipettes for which no waiting time is specified

## 1 Scope and field of application

This part of ISO 835 specifies requirements for three internationally acceptable series of graduated pipettes, for which no waiting time is specified, and which are adequate for general laboratory purposes. They are adjusted to class A or class B accuracy.

The requirements specified are in conformity with ISO 384 and ISO 835/1.

NOTE — Particular requirements for graduated pipettes with which a waiting time of 15 s is to be observed, are specified in ISO 835/3, and for blow-out pipettes in ISO 835/4.

## 2 References

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

ISO 835/1, *Laboratory glassware — Graduated pipettes — Part 1 : General requirements.*

## 3 Requirements for graduated pipettes

Unless otherwise stated in this International Standard graduated pipettes shall conform to the general requirements specified in ISO 835/1.

### 3.1 Requirements for type 1 pipettes

#### 3.1.1 Definition of capacity

The capacity corresponding to any graduation line of type 1 pipette is defined as the volume of water at 20 °C, expressed in millilitres, delivered by the pipette at 20 °C when emptied from the zero line to that graduation line, the outflow being unrestricted until making the final setting of the meniscus on the graduation line, and no period allowed for drainage of liquid adhering to the wall before making the final setting.

NOTE — Where, exceptionally, the standard 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 zero 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.

#### 3.1.2 Graduation and figuring

3.1.2.1 For class A pipettes, graduation pattern 1 (see ISO 835/1) shall be applied; for figuring of graduation lines, see figure 1.

3.1.2.2 For class B pipettes, graduation pattern 3 (see ISO 835/1) shall be applied; for figuring of graduation lines, see figure 2.

#### 3.1.3 Delivery times

Table 1 — Delivery times of type 1 pipettes

Nominal capacity	Delivery time			
	Class A		Class B	
	min.	max.	min.	max.
ml	s	s	s	s
1	7	10	2	10
2	8	12	2	12
5	10	14	5	14
10	13	17	5	17
25	15	21	9	21

When the delivery time is marked on a pipette, then the observed delivery time and the marked delivery time shall both be within the limits given in table 1 and shall not differ by more than 2 s.

### 3.2 Requirements for type 2 pipettes

#### 3.2.1 Definition of capacity

The capacity corresponding to any graduation line of a type 2 pipette is defined as the volume of water at 20 °C, expressed in millilitres, delivered by the pipette at 20 °C when emptied from that graduation line to the jet, outflow being unrestricted until it is sure that the meniscus has come to rest in the jet before removing the pipette from the receiving vessel.

NOTE — 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 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 unnecessary to adhere closely to this period; it is sufficient to be certain that the meniscus has come to rest in the jet before removing the pipette from contact with the receiving vessel.

### 3.2.2 Graduation and figuring

3.2.2.1 For class A pipettes, graduation pattern 1 (see ISO 835/1) shall be applied; for figuring of graduation lines, see figure 3.

3.2.2.2 For class B pipettes, graduation pattern 2 (see ISO 835/1) shall be applied; for figuring of graduation lines, see figure 4.

3.2.2.3 Lowest and lowest figured graduation lines shall be in accordance with table 2.

Table 2 — Lower end of scale of type 2 pipettes

Nominal capacity	ml	1	2	5	10	25
Lowest figured graduation line	ml	0,1	0,2	0,5	2	4
Lowest graduation line	ml	0,1	0,2	0,5	1,5	2,6

NOTE — These figures are calculated taking into account the requirement that 10 mm of uniform bore shall lie below lowest graduation line.

### 3.2.3 Delivery times

Table 3 — Delivery times of type 2 pipettes

Nominal capacity	Delivery time			
	Class A		Class B	
	min.	max.	min.	max.
ml	s	s	s	s
1	5	7	2	10
2	6	9	2	12
5	8	11	5	14
10	10	13	5	17
25	11	16	9	21

When the delivery time is marked on a pipette, then the observed delivery time and the marked delivery time shall both be within the limits given in table 3 and shall not differ by more than 2 s.

## 3.3 Requirements for type 3 pipettes

### 3.3.1 Definition of capacity

The capacity corresponding to any graduation line of a type 3 pipette is defined as the volume of water at 20 °C, expressed in millilitres, delivered by the pipette at 20 °C when emptied from the zero line to that graduation line — or, in the case of total capacity delivering, to the jet — the outflow being unrestricted until making the final setting of the meniscus on the graduation line, and no period allowed for draining of liquid adhering to the wall before making the final setting.

NOTE — Where, exceptionally, the standard 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 zero 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 — in the case of a total capacity delivering — is complete, a waiting time of approximately 3 s should be observed before 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 unnecessary to adhere closely to this period; it is sufficient to be certain that the meniscus has come to rest in the jet before removing the pipette from contact with the receiving vessel.

### 3.3.2 Graduation and figuring

3.3.2.1 For type 3 pipettes, graduation pattern 3 (see ISO 835/1) shall be applied (see figure 5).

3.3.2.2 Lowest and lowest figured graduation lines shall be in accordance with table 4.

Table 4 — Lower end of scale of type 3 pipettes

Nominal capacity	ml	1	2	5	10	25
Lowest figured graduation line	ml	0,9	1,8	4,5	8	22
Lowest graduation line	ml	0,9	1,9	4,5	8,5	22,4

NOTE — These figures are calculated taking into account the requirement that 10 mm of uniform bore shall lie below lowest graduation line.

3.3.3 Delivery times

When the delivery time is marked on a pipette, then the observed delivery time and the marked delivery time shall both be within the limits given in table 5 and shall not differ by more than 2 s.

Table 5 — Delivery times of type 3 pipettes

Nominal capacity	Delivery time	
	min.	max.
ml	s	s
1	2	10
2	2	12
5	5	14
10	5	17
25	9	21

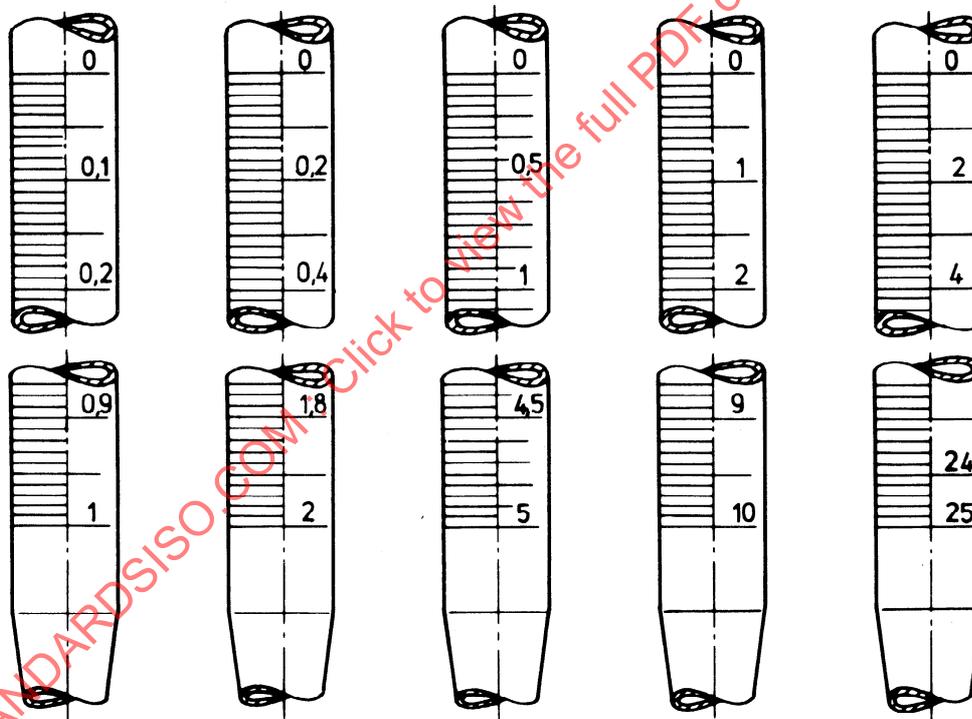


Figure 1 — Graduation and figuring of class A pipettes type 1

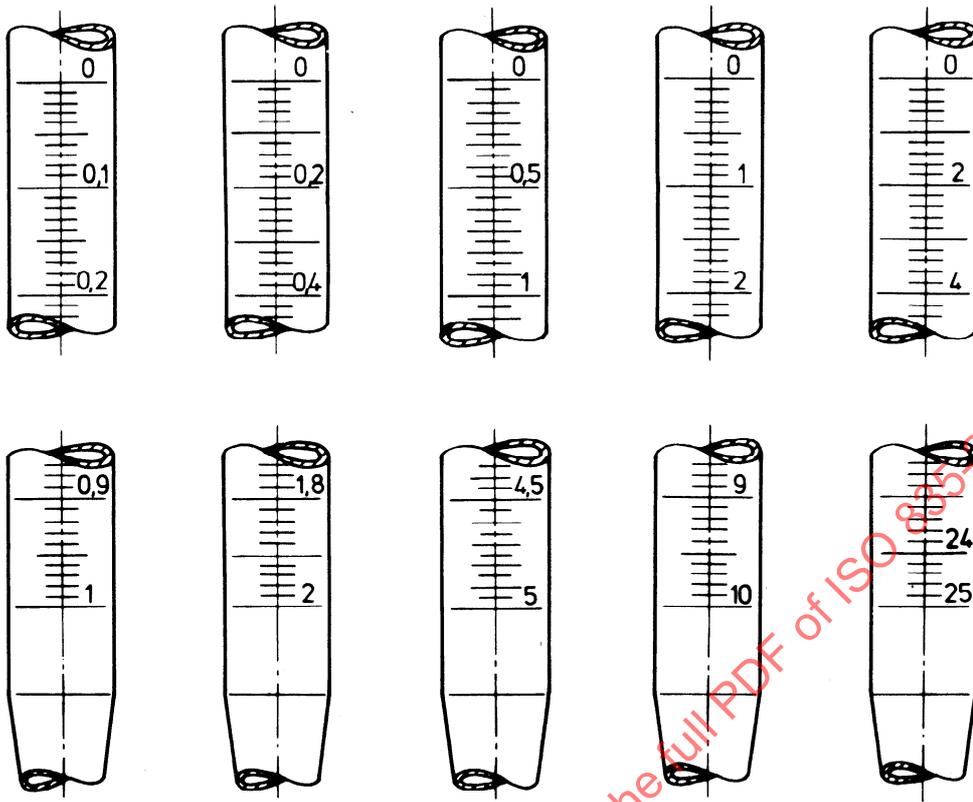


Figure 2 – Graduation and figuring of class B pipettes type 1

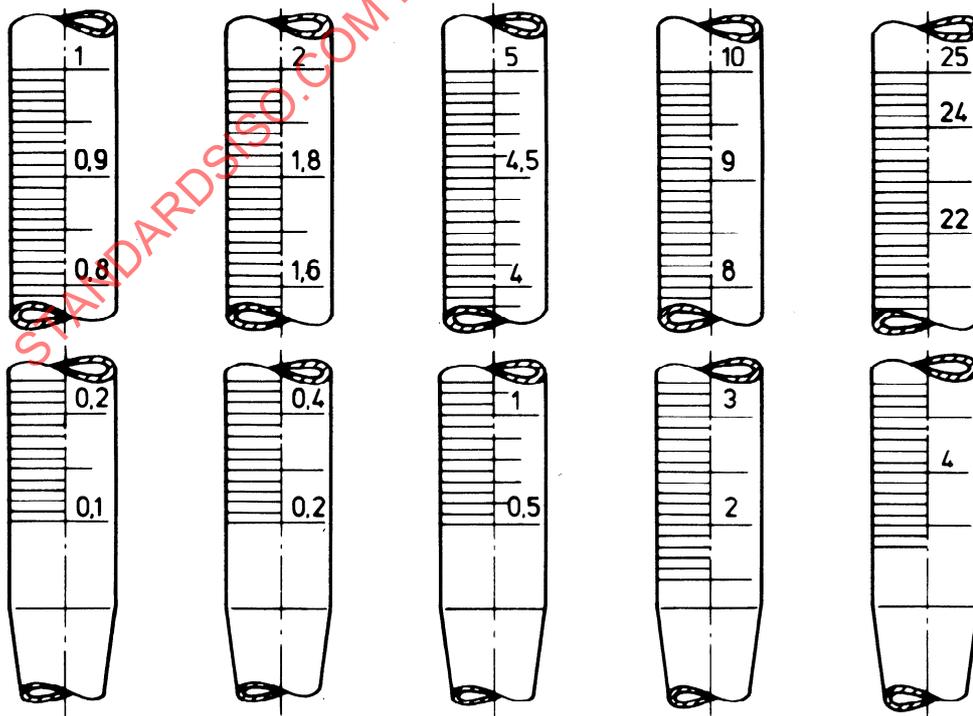


Figure 3 – Graduation and figuring of class A pipettes type 2