

# Graduated pipettes —

**Part 2: Specification for pipettes for  
which no waiting time is specified —**

**[ISO title: Laboratory glassware —  
Graduated pipettes — Part 2: Pipettes  
for which no waiting time is required]**

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This British Standard, having been prepared under the direction of the Laboratory Apparatus Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 May 1982

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### Amendments issued since publication

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## National foreword

This Part of this British Standard has been prepared under the direction of the Laboratory Apparatus Standards Committee. It is identical with ISO 835/2 "Laboratory glassware — Graduated pipettes — Part 2: Pipettes for which no waiting time is specified" published in 1981 by the International Organization for Standardization (ISO).

BS 700 was originally published in 1937 and first revised in 1952 under the title "Graduated pipettes and one-mark cylindrical pipettes". The standard was again revised in 1962, when the one-mark cylindrical pipettes were omitted from it, and account was taken of international standardization work in progress at that time.

In 1968 ISO/R 835 was published which covered graduated pipettes types I and II, and BS 700 was revised in 1976 to take into account this ISO Recommendation and amendments to it that were under consideration. The earlier edition of BS 700 included requirements for a type III pipette which was adjusted for content from the jet to any graduation line. This was omitted from the 1976 revision because of lack of demand and was replaced by another pipette, also designated type III, but adjusted for delivery from the zero line (at the top) to the jet. In addition, the 1976 revision included requirements for a blowout pipette, adjusted for delivery from the highest graduation line (at the top) to the jet, but with the last drop expelled by blowing. The method of use of this pipette is the responsibility of the user and for this reason alternative scales were permitted; one with the zero at the jet and the other with the zero at the highest graduation line, which reflects the general method of using the pipette as a dispenser. Pipettes of types III and IV were of class B accuracy only, and delivery times for types I and II pipettes were reduced.

Proposals made by the UK for further revision of ISO/R 835 to include shorter delivery times for types I and II pipettes were accepted, and in 1981 the ISO Recommendation was revised and published in four Parts, ISO 835/1 to 835/4. The equivalent British Standards for ISO 835/1 and ISO 835/4 are BS 700-1 and BS 700-3 respectively. The Technical Committee responsible for this British Standard, whilst approving ISO 835/3 as an international standard, decided that there should be no British Standard corresponding to ISO 835/3 because graduated pipettes having a 15 s waiting time are not used in the UK and its markets.

The principal differences between the 1976 edition and this edition include the introduction of a 0.5/0.01 ml pipette and a 25/0.01 ml pipette, both of class A accuracy. The blow-out pipettes are no longer designated as type IV and the alternative scale arrangement, with the zero at the top, for these pipettes has been deleted. The maximum scale lengths of the types 2, 3 and blow-out pipettes have been increased by 10 %, and the ranges of the delivery times for class B types 1, 2 and 3 have been widened.

This Part of this standard, together with Parts 1 and 3, supersedes BS 700:1976 which is withdrawn.

**Terminology and conventions.** The text of the international standard has been approved as suitable for publication as a British Standard without deviation. Some terminology and certain conventions are not identical with those used in British Standards; attention is drawn especially to the following.

The comma has been used throughout as a decimal marker. In British Standards it is current practice to use a full point on the baseline as the decimal marker.

Wherever the words “International Standard” appear, referring to this standard, they should be read as “British Standard”.

### Cross-references

International standard	Corresponding British Standard
ISO 384-1978	BS 5898:1980 Specification for principles of design and construction of volumetric glassware for laboratory use (Identical) BS 700 Graduated pipettes
ISO 835/1-1981	Part 1:1982 Specification for general requirements (Identical)
ISO 835/4-1981	Part 3:1982 Specification for blow-out pipettes (Identical)

The reference to ISO 835/3, which appears in clause 1 is for information only, and the lack of a corresponding British Standard does not affect the validity of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 6, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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## 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

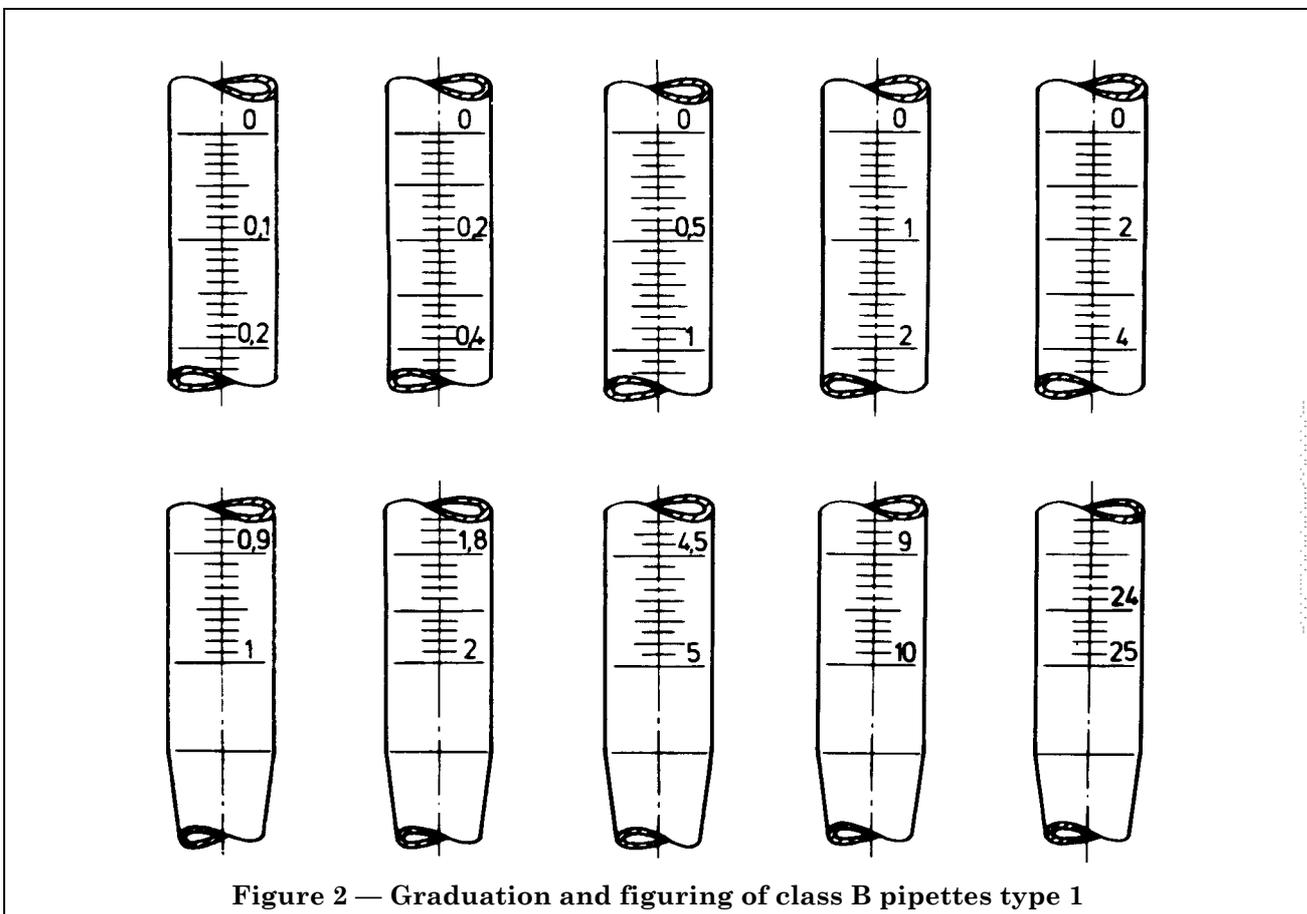
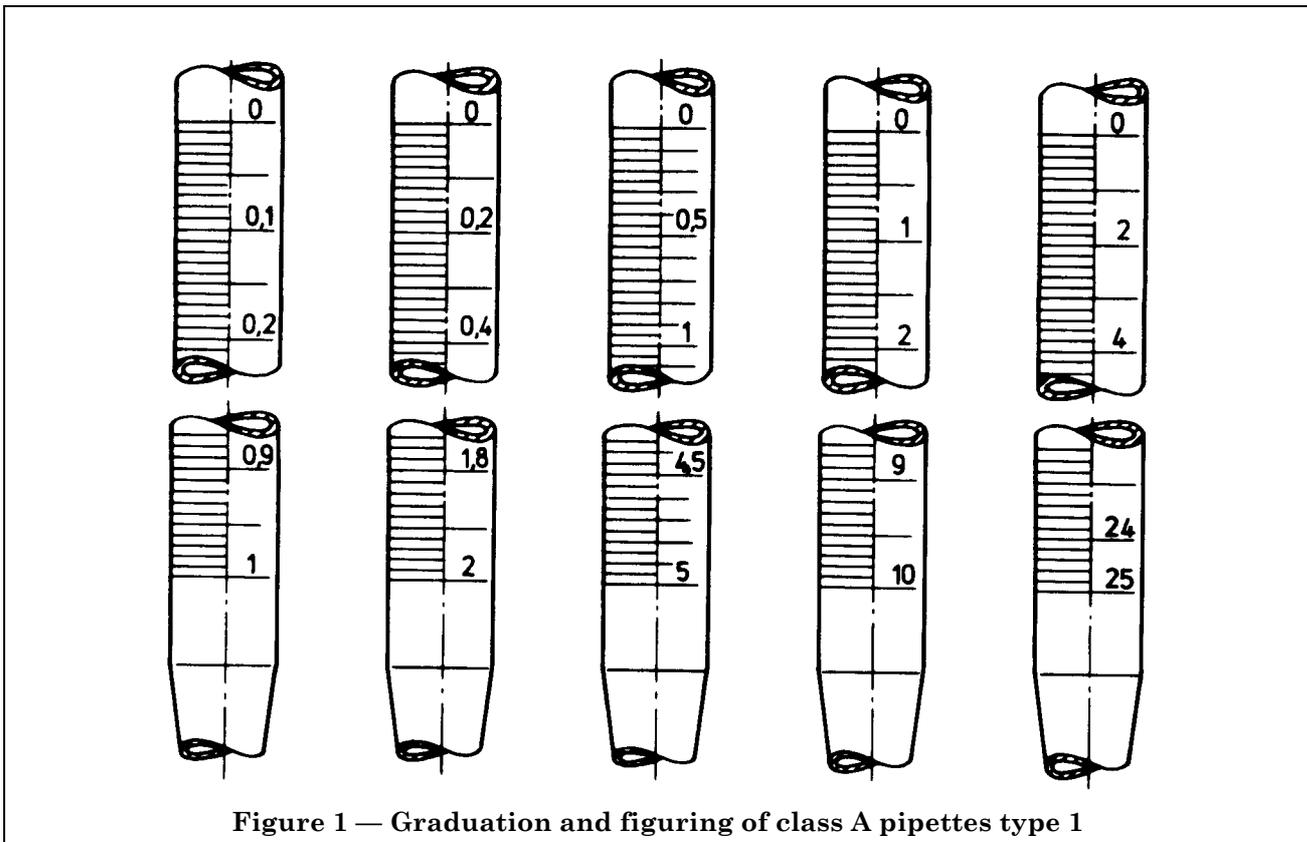
NOTE These figures are calculated taking into account the requirement that 10 mm of uniform bore shall lie below lowest graduation line.

### 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.
	s	s
1	2	10
2	2	12
5	5	14
10	5	17
25	9	21



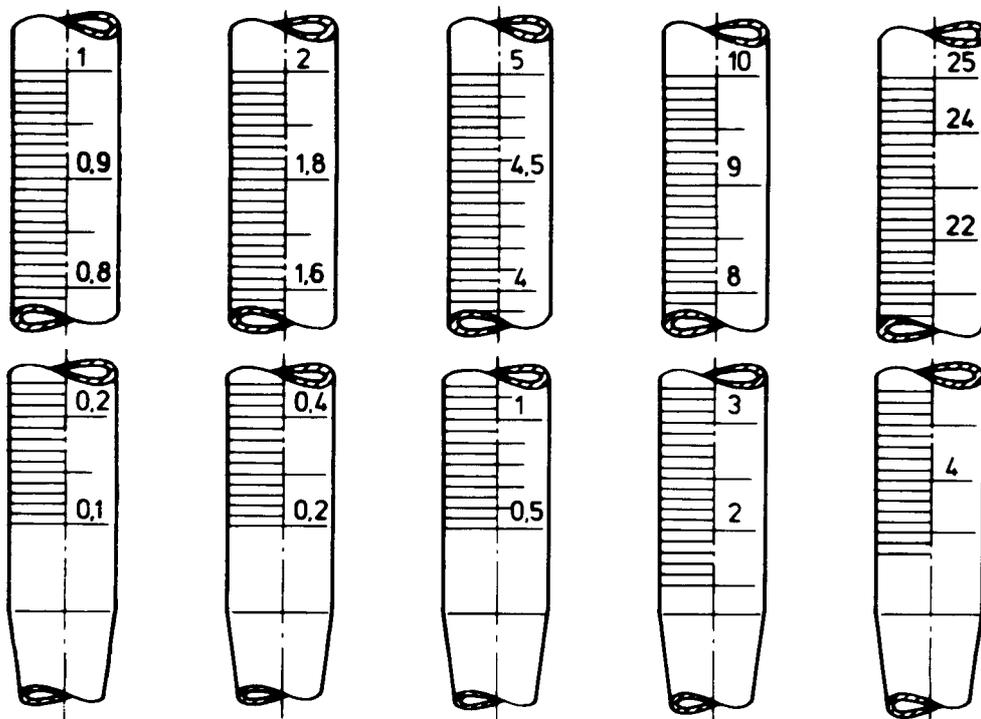


Figure 3 — Graduation and figuring of class A pipettes type 2

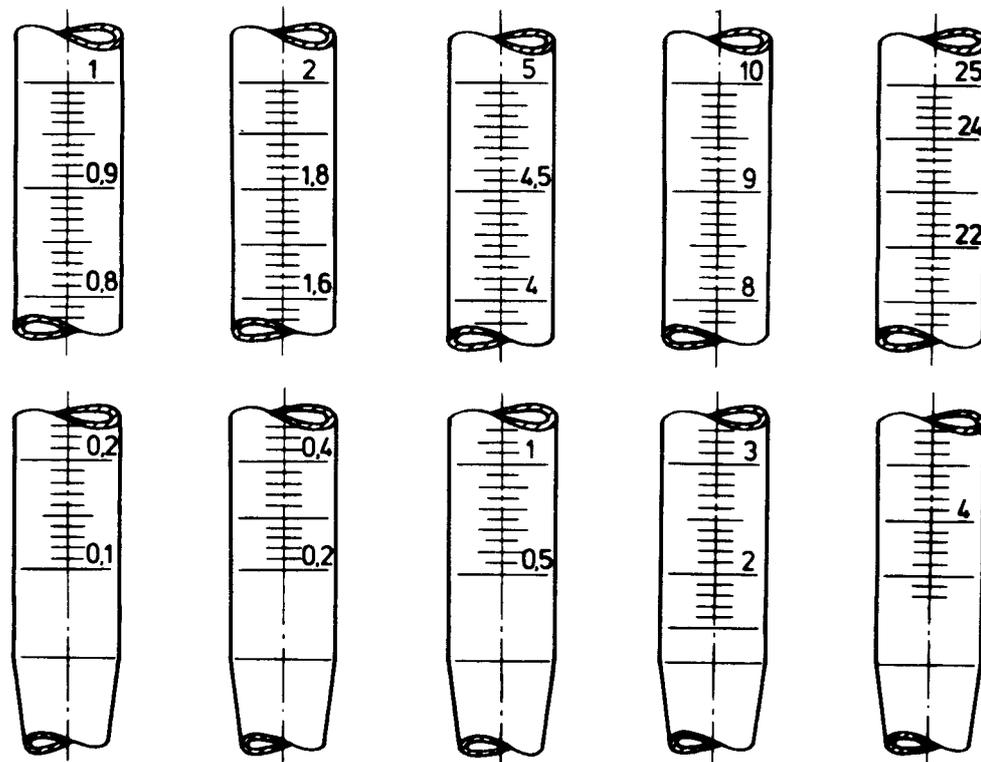
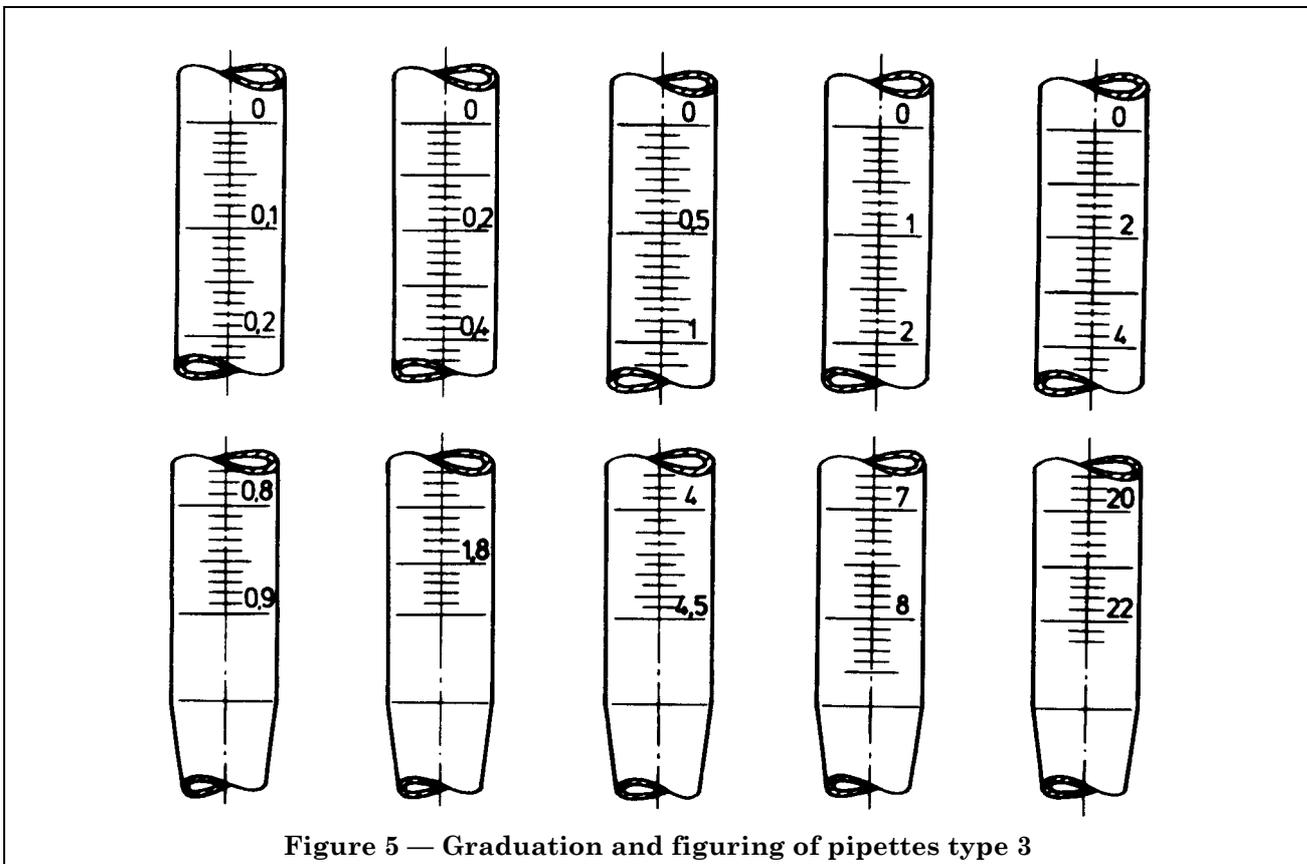


Figure 4 — Graduation and figuring of class B pipettes type 2



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## Publications referred to

See national foreword.

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