BRITISH STANDARD

BS 1132:1987



## Specification for

# Automatic pipettes

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# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Laboratory Apparatus Standards Committee (LBC/-) to Technical Committee LBC/27, upon which the following bodies were represented:

Association of Clinical Biochemists
British Laboratory Ware Association
Department of Health and Social Security
Department of Trade and Industry (Laboratory of the Government Chemist)
Department of Trade and Industry (National Weights and Measures Laboratory)
Glass Manufacturers' Federation
Institute of Medical Laboratory Sciences
Medical Sterile Products Association
Ministry of Defence
Scientific Glassware Association
Society of Chemical Industry
South Western Regional Health Authority

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
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The following BSI references relate to the work on this standard:
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**Amendments issued since publication**

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# Contents

# Foreword

This British Standard has been prepared under the direction of the Laboratory Apparatus Standards Committee.

This British Standard was first published in 1952 and was revised in 1966. This revision supersedes the 1966 edition which is withdrawn.

In this British Standard the requirements have been aligned with the International Organization for Legal Metrology's draft international document, "Measurement of Volume of Liquids — Glass Delivery Measures (Automatic Pipettes)", as far as they were known at the time.

The principal differences between BS 1132:1966 and this edition are:

a) the extension of the range from 100 mL to 10 L;

b) the omission of recommended dimensions;

c) the omission of the description "Dafert type".

Purchasers ordering to this standard are advised to specify in their purchasing contract that the supplier operates a quality system in compliance with BS 5750-3, to assure themselves that the products claimed to comply with BS 1132:1987 consistently achieve the required level of quality.

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.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

**Summary of pages**

This document comprises a front cover, an inside front cover, pages i and ii, 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.

## 1 Scope

This British Standard specifies the requirements for volumetric accuracy, delivery times, capacities, and construction for a range of automatic pipettes which can be used as primary or secondary standards of volume.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

## 2 Definitions

For the purposes of this British Standard the following definitions apply.

**2.1**
**standard reference temperature**

the temperature at which the automatic pipette is intended to deliver its nominal volume (nominal capacity)

**2.2**
**datum weir**

the plane at the upper end of the overflow jet which defines the maximum capacity of the automatic pipette

**2.3**
**capacity**

the volume, in millilitres or litres, of water, at the standard reference temperature, delivered by the automatic pipette, when determined in accordance with BS 6696, supplemented by the information in Appendix A

**2.4**
**delivery time**

the time occupied by the descent of the water meniscus from the datum weir, with the stopcock in the fully open position, to the point at which it appears to come to rest in the delivery jet

## 3 Basis of adjustment

### 3.1 Units

The unit of volume shall be either the millilitre or the cubic centimetre for automatic pipettes with a capacity of less than 1 L. For other automatic pipettes the unit of volume shall be the litre.

NOTE The millilitre is commonly used as a special name for the cubic centimetre, in accordance with the International System of units (SI).

### 3.2 Reference temperature

The standard reference temperature shall be 20 °C, except when the automatic pipette is required for use in a country that has adopted a standard reference temperature of 27 °C, in which case 27 °C shall be the standard reference temperature.

NOTE 27 °C is the alternative standard reference temperature recommended in BS 5898 for tropical use.

## 4 Series of capacities

The series of nominal capacities of automatic pipettes shall be as given in column 1 of Table 1.

NOTE Capacities other than those specified are outside the scope of this standard. It is recommended that if automatic pipettes of other capacities are required, they be in accordance with clauses **5**, **6** and **7**. However, it should be noted that compliance with this standard cannot be claimed for such automatic pipettes.

**Table 1 — Capacity, tolerances and delivery times**

| Capacity | | Capacity tolerance | Delivery time | |
|---|---|---|---|---|
| mL (or $cm^3$) | L | ± mL (or $cm^3$) | Minimum s | Minimum s |
| 5 | | 0.06 | 10 | 20 |
| 10 | | 0.08 | 15 | 30 |
| 20 | | 0.12 | 15 | 30 |
| 25 | | 0.12 | 20 | 40 |
| 50 | | 0.15 | 30 | 60 |
| 100 | | 0.20 | 30 | 60 |
| 125 | | 0.25 | 30 | 60 |
| 150 | | 0.3 | 30 | 60 |
| 175 | | 0.35 | 30 | 60 |
| 200 | | 0.4 | 30 | 60 |
| 250 | | 0.4 | 50 | 80 |
| 500 | | 0.5 | 60 | 100 |
| | 1 | 1.0 | 60 | 100 |
| | 2 | 1.0 | 80 | 140 |
| | 2.5 | 1.2 | 80 | 140 |
| | 5 | 2.5 | 100 | 150 |
| | 10 | 5.0 | 120 | 180 |

## 5 Tolerances

### 5.1 Tolerance on capacity

The tolerances on the capacities of the automatic pipettes, when determined in accordance with BS 6696, supplemented by Appendix A, shall not exceed the limits shown in column 3 of Table 1.

### 5.2 Tolerance on delivery time

The delivery time, when determined with the automatic pipette in a vertical position and 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, shall be within the limits given in columns 4 and 5 of Table 1.

## 6 Construction

### 6.1 Material

The automatic pipettes shall be manufactured from colourless soda-lime-silica, neutral or borosilicate glass complying with class 3 or better of BS 3473-2.

NOTE The automatic pipettes should be as free as possible from visible defects and reasonably free from internal stress.

### 6.2 General design

The general design of the automatic pipettes shall be as shown in Figure 1 and Figure 2.

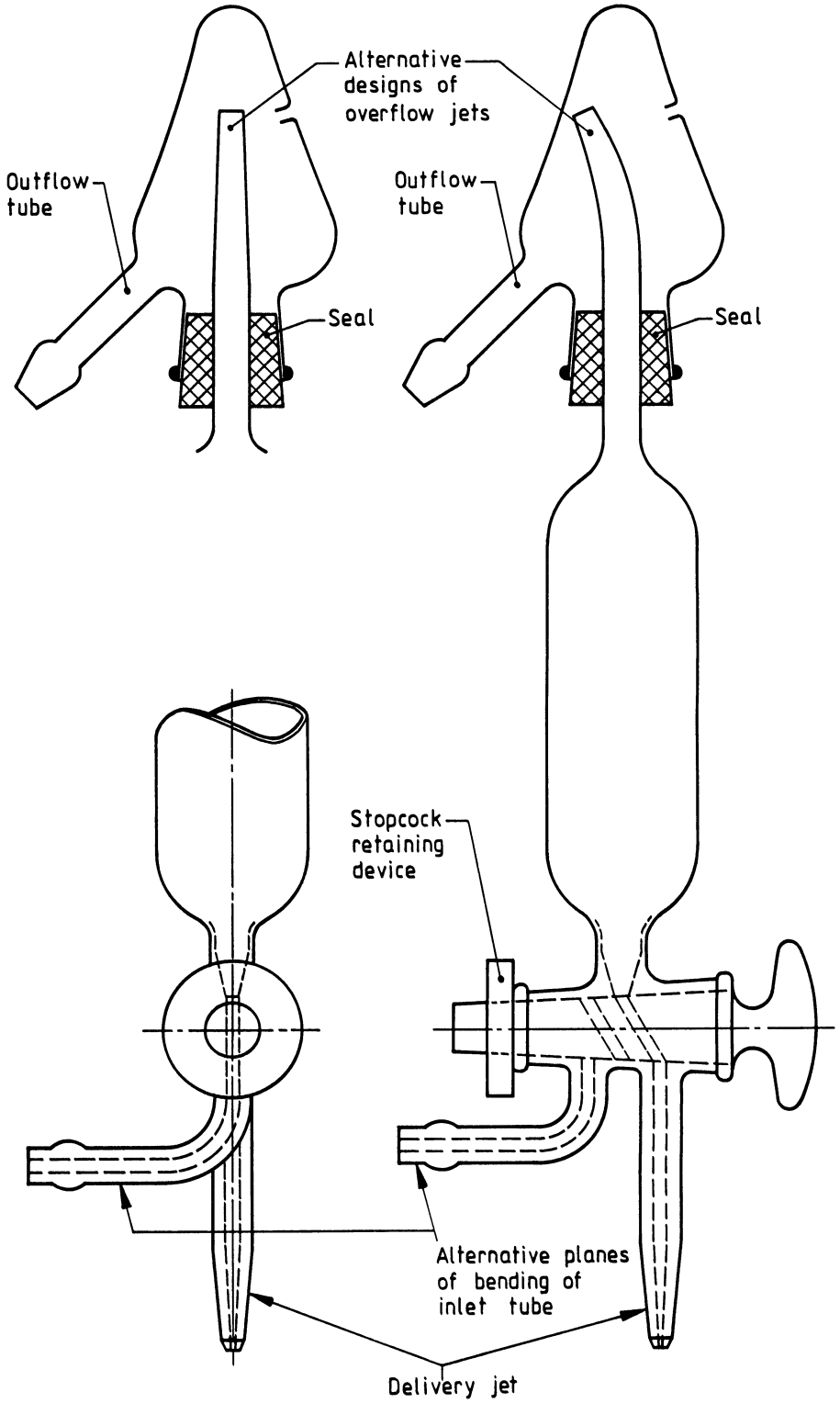


**Figure 1 — Example of design of automatic pipette up to 250 mL**

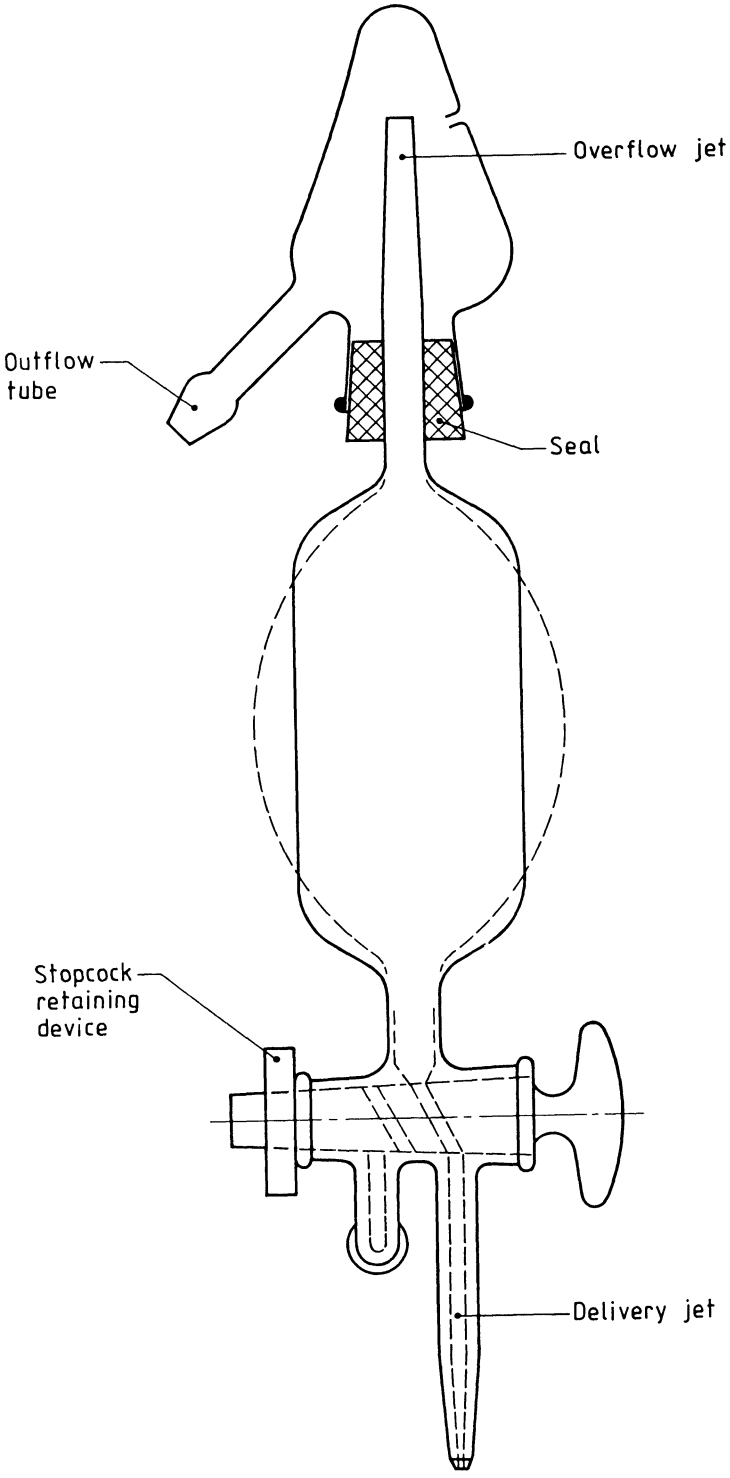


**Figure 2 — Example of alternative designs of automatic pipette over 250 mL**

### 6.3 Bulb

The main body of the bulb of automatic pipettes having a nominal capacity not exceeding 250 mL (or $cm^3$) shall be cylindrical.

The main body of the bulb of automatic pipettes having a nominal capacity exceeding 250 mL (or $cm^3$) shall be either cylindrical or spherical.

The two ends of the bulb shall merge gradually into the overflow and delivery tubes and the junctions shall be tapered to facilitate drainage.

### 6.4 Jets

**6.4.1** Both the overflow and delivery jets shall be constructed with a smooth and gradual taper without a sudden constriction at the orifice.

NOTE The delivery jet should be strongly constructed.

**6.4.2** The ends of the jets shall be finished either:

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

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

NOTE 1 These methods are listed in order of preference.
NOTE 2 A fire-polished finish reduces the danger of chipping in use, but should not result in constriction, as indicated in **6.4.1**, or in undue stress.

**6.4.3** The overflow jet shall be either straight, or bent as shown in Figure 1.

### 6.5 Overflow cup

Each automatic pipette shall be provided with an overflow cup which shall be either:

a) tapered, as shown in Figure 1 and Figure 2; or

b) cylindrical, as shown in Figure 3.

A flanged vent hole as shown in Figure 1 and Figure 2 shall be provided.

The overflow cup shall be fitted to the upper tube by a seal to prevent any leakage from the overflow cup.

An outflow tube shall be positioned below the level of the datum weir (as shown in Figure 1 and Figure 2).

### 6.6 Stopcock

The stopcock shall be of the double oblique bore type and shall allow smooth and precise control of outflow. A stopcock key retaining device shall be fitted.

The stopcock, when tested under a head of 50 cm of water, with the stopcock free from grease but with the barrel and key wet with water and with the key first in one fully shutoff position and then in the other, shall not give a rate of leakage, with the key in either position, in excess of 0.006 mL/min. When similarly tested with the key of the stopcock in the normal delivery position, the head of water being applied to the filling tube, the rate of leakage shall not exceed 0.006 mL/min.

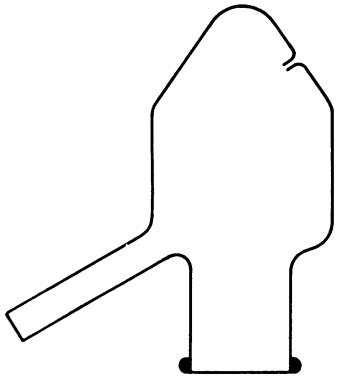

**Figure 3 — Alternative design of overflow cup**

The inlet tube shall be bent at right angles in either of the planes illustrated in Figure 1 and Figure 2.

## 7 Inscriptions

The following inscriptions shall be permanently and legibly marked on all automatic pipettes:

a) a number indicating the nominal capacity, and adjacent or subadjacent to this number, the symbol "$cm^3$", or the symbol "mL", or the symbol "L", to indicate the unit in which the pipette is graduated (see note to **3.1**);

NOTE The limit of volumetric error according to Table 1 may be marked on all pipettes, for example, by the inscription "± ..... ml".

b) the inscription "20 °C" or "27 °C" to indicate the standard reference temperature (see **3.2**);

c) the letters "Ex" to indicate that the pipette has been adjusted to deliver its indicated capacity;

d) the maker's and/or vendor's name or mark;

e) the number and year of publication of this British Standard, i.e. "BS 1132:1987"[1)];

f) an identification mark on both the body of the automatic pipette and the stopcock key.

[1)] Marking BS 1132:1987 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the appropriate authority.

## Appendix A Determination of mean delivered capacity

NOTE Appendix A describes the method of handling the automatic pipette for the determination of delivered capacity given in BS 6696:1986 and replaces paragraph 3 of **10.5.1** of that British Standard.

**A.1** Place the cleaned automatic pipette to be tested, together with an adequate supply of water complying with BS 3978, in the test room at least 10 h before the test, to enable them to stabilize at the test temperature.

**A.2** Mount the automatic pipette in the vertical position. Using a short length of flexible tubing and a clamp, close the outflow tube.

**A.3** Fill the automatic pipette with the temperature-stabilized water until the overflow jet is just submerged. Remove the clamp to allow the excess water to flow away to waste so that the automatic pipette is filled to the datum weir.

**A.4** Empty the automatic pipette through the delivery jet into a 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 and waiting period. The automatic pipette shall be allowed to empty until the meniscus comes to rest in the jet. To ensure that delivery is complete, a waiting period of approximately 3 s shall be observed before removing the receiving vessel.

NOTE The waiting time of 3 s is specified only for the purpose of this test. 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.

The first delivery is rejected in order to prime the automatic pipette.

**A.5** Repeat the filling procedure (see **A.3**) and the delivery procedure (see **A.4**) using a tared glass receiving vessel to collect the water dispensed by the automatic pipette.

**A.6** The mass of water dispensed shall be immediately determined in the same environment.

**A.7** The temperature of the dispensed water shall be determined immediately after the mass has been determined.

**A.8** The mean delivered capacity shall be calculated from five individual determinations.

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# Publications referred to

BS 3473, *Chemical resistance of glass used in the production of laboratory glassware.*
BS 3473-2, *Method for determination of hydrolytic resistance of glass grains at 98 °C.*
BS 3978, *Specification for water for laboratory use.*
BS 5750, *Quality systems.*
BS 5750-3, *Specification for final inspection and test*[2)].
BS 5898, *Specification for principles of design and construction of volumetric glassware for laboratory use.*
BS 6696, *Methods for use and testing of capacity of volumetric glassware.*

[2)] Referred to in the foreword only.

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