

# International Standard



# 7550

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## Laboratory glassware — Disposable micropipettes

*Verrerie de laboratoire — Micropipettes à usage unique*

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## 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.

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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7550 was prepared by Technical Committee ISO/TC 48, *Laboratory glassware and related apparatus*.

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# Laboratory glassware — Disposable micropipettes

## 1 Scope and field of application

This International Standard specifies requirements for disposable glass micropipettes adjusted to contain, suitable for general laboratory purposes. The details specified are in conformity with ISO 8417.

## 2 References

ISO 719, *Glass — Hydrolytic resistance of glass grains at 98 °C — Method of test and classification*.

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

ISO 3534, *Statistics — Vocabulary and symbols*.

ISO 8417, *Laboratory volumetric instruments — Disposable volumetric articles — Principles of design and construction*.<sup>1)</sup>

## 3 Definitions

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

**3.1 disposable micropipette:** A micropipette 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 micropipette) : The closeness of agreement between the nominal volume and the mean volume, obtained by applying the test procedure specified in clause 9. It is quantified by the inaccuracy of the mean.

**3.3 repeatability** (of a micropipette) : The closeness of agreement between the individual volumes obtained by applying the test procedure specified in clause 9. It is quantified by the imprecision.

NOTE — The definitions for “accuracy” and “reliability” apply only in the cases where the distributions are Gaussian.

## 4 Basis of adjustment

### 4.1 Unit of volume

The unit of volume is the cubic millimetre (mm<sup>3</sup>), for which the name microlitre (μl) may be used.

NOTE — The term microlitre (μl) is commonly used as a special name for the cubic millimetre (mm<sup>3</sup>), 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 contain its nominal volume (nominal capacity), is 20 °C.

NOTE — If 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 value shall be substituted for 20 °C.

## 5 Dimensions, types, series of capacities

### 5.1 Dimensions

The dimensions shall be as shown in tables 1 and 2.

### 5.2 Types

This International Standard specifies two types of pipettes.

— Type I: Disposable glass micropipettes with graduation line and colour code (see figure 1) which contain their volume when filled to the graduation line from the end away from the colour code.

— Type II: Disposable glass micropipettes without markings (see figure 2) which contain their volume when filled completely.

1) At present at the stage of draft.

### 5.3 Series of capacities

**5.3.1** The series of capacities of type I disposable pipettes is as follows:

5 — 10 — 20 — 25 — 50 — 100 — 200  $\mu\text{l}$

If pipettes of other capacities (e.g. 44,7  $\mu\text{l}$ ) are required, they shall comply with the essential provisions of this International Standard.

**5.3.2** The series of capacities of type II disposable pipettes is as follows:

1 — 2 — 3 — 4 — 5 — 10 — 20 — 25 — 50 — 100  $\mu\text{l}$

## 6 Construction

### 6.1 Material

The pipettes shall be made of glass. When tested in accordance with the procedure and using the classification laid down in ISO 719, the glass shall comply with the requirements of class HGB 3 or better.

The glass shall be free from visible defects and from internal stress which would impair the performance of the pipettes.

### 6.2 Graduation line

Pipettes type I shall be provided with a black graduation line having a maximum thickness of 0,5 mm, which shall encircle the pipette completely in a plane perpendicular to its axis and shall be durable at least until the pipette has been used.

### 6.3 Workmanship

**6.3.1** Pipettes shall be of one-piece construction in accordance with figures 1 and 2 for shape, dimensions and permissible variations. Any cross-section of the pipette, taken in a plane perpendicular to the longitudinal axis, shall essentially be circular.

**6.3.2** The pipettes shall be free from foreign matter, loose or embedded lint, from chips that affect the bore and from stains when viewed under normal room lighting.

**6.3.3** "Toe-nails" and "chips" shall not exceed the dimensions shown in figures 1 and 2.

NOTE — Actual manufacturing techniques normally result in toe-nails and chips considerably smaller than those shown in figures 1 and 2.

**6.3.4** The graduation line and colour code on type I pipettes shall be applied to the glass pipettes at the locations specified in figure 1. The graduation line shall be clear and durable to enable the setting of the meniscus and the colour band shall be clear and durable to identify the pipette as to its nominal volume.

## 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** Set the meniscus 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, place a shade of some dark material immediately below and behind the meniscus. This renders the profile of the meniscus dark and clearly visible against a light background.

### 8.2 Type I

Allow a dry pipette and a vessel of distilled water to stand at an ambient temperature of 20 °C for 2 h.

Weigh the pipette and record the mass. Fill the same pipette with water, taking particular care to remove all water from the exterior of the pipette with a dry cloth or gauze.

Adjust it to the graduation line according to the method outlined in 8.1.1. Reweigh the pipette, with water content, and record the mass.

Subtract the recorded mass for the dry pipette from the recorded mass for the pipette filled with distilled water. The difference represents the mass of the contained water.

### 8.3 Type II

Allow a dry pipette and a vessel of distilled water to stand at an ambient temperature of 20 °C for 2 h.

Weigh the pipette and record the mass. Fill the same pipette completely with water by capillary action, taking particular care to remove all water from the exterior of the pipette with a dry cloth or gauze.

Reweigh the pipette, with water content, and record the mass.

Subtract the recorded mass for the dry pipette from the recorded mass for the pipette filled with distilled water. The difference represents the mass of the contained water.

## NOTES

1 The difference obtained in this way represents the mass, uncorrected for air buoyancy and water density. This correction is not necessary in this particular case.

2 In order to carry out accurately the test methods outlined in 8.2 and 8.3, the reliability of the balance used should be confirmed against a known standard and the balance should have the following discrimination:

| Nominal capacity          | Discrimination     |
|---------------------------|--------------------|
| 1 to 10 $\mu\text{l}$     | 0,001 mg or better |
| > 10 to 200 $\mu\text{l}$ | 0,01 mg or better  |

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

## 9 Determination of accuracy and repeatability

Volumetric accuracy and repeatability shall be determined for a single pipette or a minimum of 30 pipettes as follows.

### 9.1 Volumetric capacity deviation (single pipette)

Capacity deviation for a single pipette shall be calculated as follows:

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

where

$V_0$  is the nominal capacity of the pipette;

$V_1$  is the capacity at the reference temperature.

### 9.2 Volumetric capacity deviation (number of pipettes)

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

$$\text{a) Accuracy \%} = \frac{100 (\bar{V} - V_0)}{V_0}$$

where

$\bar{V}$  is the mean of the sample measurements at the reference temperature;

$V_0$  is the nominal capacity of the pipette.

$$\text{b) Coefficient of variation: CV \%} = \frac{100 s}{\bar{V}}$$

where

$$s = \sqrt{\frac{\sum (V_1 - \bar{V})^2}{n - 1}}$$

$\bar{V}$  is the mean of the sample measurements;

$V_1$  is the individual sample measurement at the reference temperature;

$n$  is the number of pipettes measured.

## 10 Inscriptions and markings

### 10.1 Inscriptions

Each package of pipettes shall be clearly marked with the following information:

a) the inscription "20 °C" to indicate the reference temperature;

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

b) the letters "In" to indicate that the pipettes have been adjusted to contain their indicated capacity;

NOTE — On manufacturer's option, these inscriptions may also be marked on type I pipettes themselves.

c) the manufacturer's name and/or mark;

d) the product description, e.g. disposable micropipettes, 100  $\mu\text{l}$ ;

e) the volumetric performance in terms of accuracy and repeatability;

f) the number of pipettes in the package;

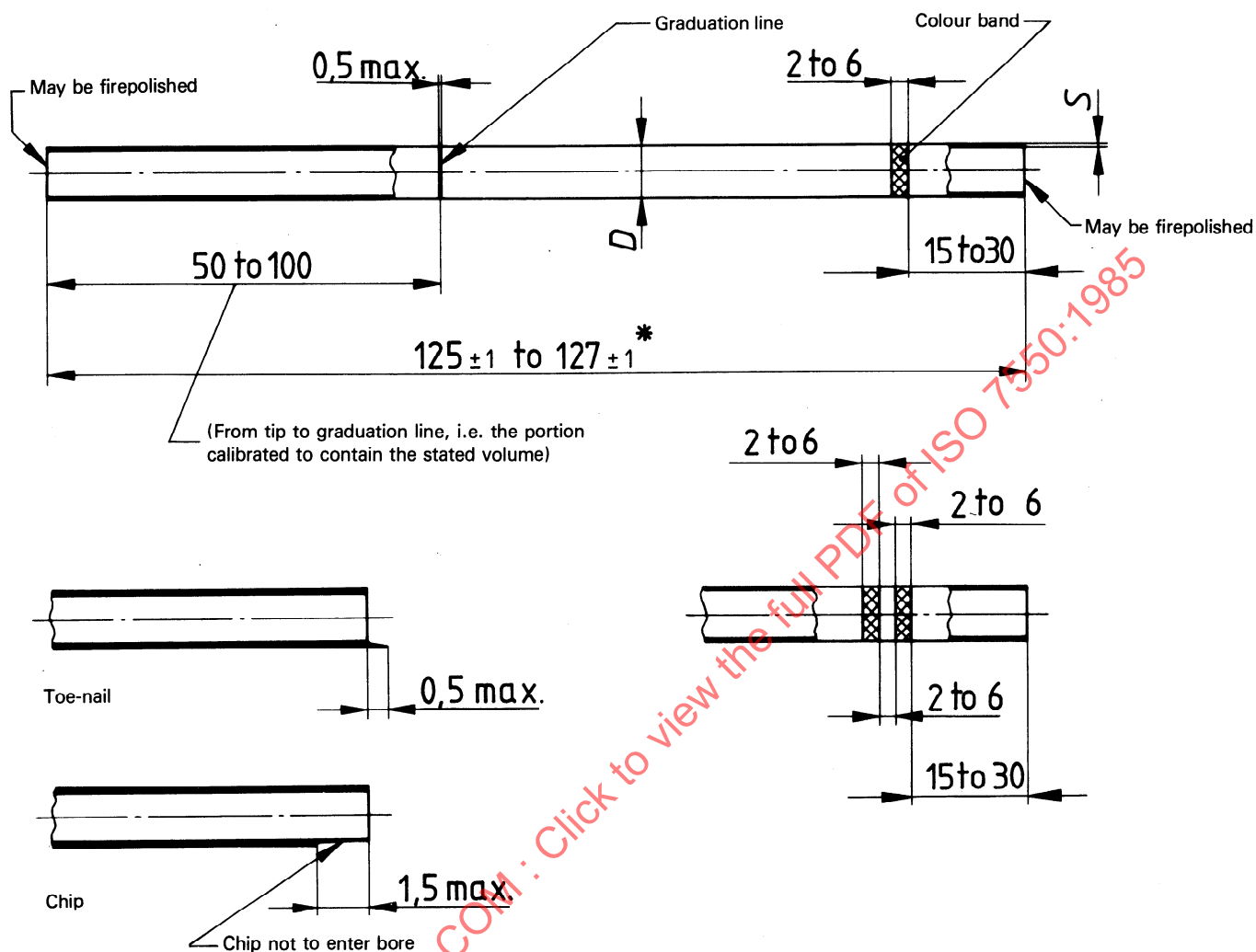
g) the batch number or date of manufacture;

h) the number of this International Standard, i.e. ISO 7550, or the number of the corresponding national standard.

### 10.2 Colour coding

**10.2.1** Pipettes of type I shall be colour coded in accordance with ISO 1769. The dimensions of the colour code bands, however, shall be as shown in figure 1.

**10.2.2** The packages of type II pipettes shall be colour coded in accordance with ISO 1769.



\* Pipettes packed together shall not vary by more than  $\pm 1$  mm length, irrespective of their nominal length.

Figure 1 — Type I pipettes

Table 1 — Requirements for type I pipettes

| Nominal capacity<br>$\mu\text{l}$ | Colour code | Minimum diameter, $D$<br>mm | Minimum wall thickness, $S$<br>mm |
|-----------------------------------|-------------|-----------------------------|-----------------------------------|
| 5                                 | White       | 1,0                         | 0,35                              |
| 10                                | Orange      | 1,0                         | 0,25                              |
| 20                                | Black       | 1,1                         | 0,25                              |
| 25                                | 2 White     | 1,1                         | 0,25                              |
| 50                                | Green       | 1,3                         | 0,20                              |
| 100                               | Blue        | 1,6                         | 0,20                              |
| 200                               | Red         | 2,2                         | 0,20                              |