



Designation: E1092 – 91 (Reapproved 2022)

## Standard Specification for Glass Micro Folin Pipet, Disposable<sup>1</sup>

This standard is issued under the fixed designation E1092; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers a glass disposable micro Folin pipet suitable for use in micro techniques for estimation of blood sugar by the Folin method.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.3 The following precautionary statement pertains only to the test method portion, Section 8, of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

### 2. Referenced Documents

- 2.1 *ASTM Standards*:<sup>2</sup>  
E438 Specification for Glasses in Laboratory Apparatus
- 2.2 *ISO Standard*:  
1769 Laboratory Glassware—Pipettes—Color Coding<sup>3</sup>

### 3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *accuracy, n*—the expected distribution of mean volumes around the stated volume.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E41 on Laboratory Apparatus and is the direct responsibility of Subcommittee E41.01 on Laboratory Ware and Supplies.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from International Organization for Standardization (ISO), 1, ch. de la Voie-Creuse, Case postale 56, CH-1211, Geneva 20, Switzerland, http://www.iso.ch.

3.1.2 *coefficient of variation, n*—the expected distribution of individual volumes around the mean volume.

3.1.3 *disposable, n*—micro Folin pipets that are intended to be used once only and then discarded.

NOTE 1—Such pipets will only be expected to provide their specified performance during the original operation.

### 4. Classification

4.1 This specification covers only one glass pipet as illustrated in Fig. X1.1.

### 5. Materials and Manufacture

5.1 The pipet shall be made of borosilicate glass, Type 1, Class B, or soda lime glass, Type 2, in accordance with Specification E438.

### 6. Physical Properties

6.1 *Design*—The micro Folin pipet shall be made of one piece construction glass tubing that is straight and uniform bore with a point pulled on one end to the dimensions as specified in Fig. X1.1.

6.2 *Dimensions*—The pipet shall be made of tubing with an outside diameter (o.d.) of  $2.5 \pm 0.1$  mm with an inside diameter (i.d.) of  $1.8 \pm 0.1$  mm. The uniformity of the bore shall be  $\pm 0.05$  mm throughout the straight portion of the pipet. The pipet shall be  $183 \pm 1$  mm long with all dimensions and tolerances as shown in Fig. X1.1.

6.3 *Capacity*—The pipet shall be calibrated “to contain” (T.C.) 0.1 and 0.2 mL at 20 °C. Marking shall be as specified in 6.5.

6.3.1 *Accuracy* (see 3.1.1)—The accuracy from stated volume shall be  $\pm 1.0$  % for the 0.1 and 0.2-mL capacity and shall be determined as specified in 8.1.

6.3.2 *Coefficient of Variation* (see 3.1.2)—The coefficient of variation from stated volume for the 0.1 and 0.2-mL capacity shall not exceed 1.25 % and shall be determined as specified in 8.1.

6.4 *Graduation Lines*—The pipet shall be calibrated and marked with graduation lines at 0.1 and 0.2 mL from the tip of the pipet. The graduation lines shall be  $0.3 \pm 0.1$  mm and shall completely encircle the tube.

6.5 *Pipet Nomenclature*—The pipet shall be marked with 0.1 and 0.2-mL markings slightly above the graduation lines. The pipet may be marked with the inscription TC 20°C, or the manufacturer’s or vendor’s name or trademark, or both.

6.6 *Color Coding*—The pipet shall be color coded for capacity as specified in ISO Standard 1769 with an “orange” color band that is  $6 \pm 2$  mm wide and located  $16 \pm 2$  mm from the top of the pipet as shown in Fig. X1.1.

6.7 *Marking Permanency*—Graduation lines, inscriptions, and numerical markings on the pipet (other than the color code band) shall be black in color. All markings may not be of permanent nature but must possess sufficient stability to endure normal transportation and its expected one-time use and must meet the test requirements as specified in 8.5.

6.8 *Lot Control*—A lot or control number shall be indicated on the pipet container package. This lot or control number shall be traceable to the origin and purchase order of raw material glass tubing.

## 7. Workmanship, Finish, and Appearance

7.1 The pipet shall be as free as possible of visible defects that would detract from its appearance or impair its serviceability when viewed by the human eye under normal room lighting.

## 8. Test Method

### 8.1 Capacity:

8.1.1 *Weighing Volume, Using Water*—Allow a small vessel (5-mL beaker) and a container of distilled water to stand at room temperature of 20 to 25 °C for 2 h. Weigh the dry pipet, record the weight, and set aside. Weigh the dry vessel and record the weight. Fill the pipet with water and adjust to the calibration line. Deliver the contents of the pipet in the prescribed manner into the vessel. Reweigh the vessel with water content and record the weight.

8.1.2 Immediately reweigh the wet pipet and record the weight. Record the room temperature. Subtract the recorded weight of the dry vessel from the recorded weight of the water containing vessel to obtain the apparent mass of the contained water. Subtract the recorded weight of the dry pipet from that of the wet pipet to obtain the apparent mass of the water still contained within the pipet. Add the apparent mass within the vessel to that within the pipet to get the total apparent mass contained within the filled pipet. Calculate the volume,  $v$ , in accordance with the appendix.

NOTE 2—To accurately perform this test method, the reliability of the weighing instrument used should be confirmed against a known standard and the weighing instrument should possess a minimum sensitivity of 0.01 mg.

8.2 *Calculation*—Calculate the volume,  $v$ , of a micropipet from the weighings, in air, as follows:

$$v = W \times Z \quad (1)$$

where:

$W$  = apparent mass of liquid (water), weighed in air, and  
 $Z$  = apparent specific volume of liquid (water).

Values of  $Z$  for water are given in the appendix.

8.3 *Capacity Deviation* (single pipet)—In accordance with the methods outlined, capacity deviation is the difference between the stated capacity and the observed capacity of the pipet as follows:

$$\text{Capacity deviations, \%} = (V_c - V_1) \times 100/V_1 \quad (2)$$

$$V_c = V_1 + a(t - 20^\circ\text{C}) \quad (3)$$

where:

$V_t$  = observed volumetric capacity at  $t^\circ\text{C}$ , uL,  
 $V_c$  = corrected volumetric capacity at 20 °C, uL,  
 $a$  = coefficient of cubical expansion of pipet glass equals 0.000010/°C for Type 1, Class A (borosilicate); 0.000015/°C for Type 1, Class B (noncorrosive borosilicate); and 0.000025/°C for Type 2 (soda-lime),  
 $V_1$  = stated capacity of pipet, uL, and  
 $t$  = temperature, °C.

8.4 *Capacity Deviation* (number of pipets)—Test a minimum of 30 pipets taken at random from a completed manufactured production lot. Calculate the volumetric deviation for the 30 pipets as follows:

### 8.4.1 Accuracy:

$$\text{Accuracy, \%} = 100(\bar{x} - V_1)/V_1 \quad (4)$$

where:

$\bar{x}$  = mean of sample measurements, and  
 $V_1$  = stated capacity of pipet.

### 8.4.2 Coefficient of Variation:

$$\text{Coefficient of variation, \%} = 100s/\bar{x} \quad s = \sqrt{(x - \bar{x})^2/n - 1} \quad (5)$$

where:

$x$  = individual sample measurement,  
 $\bar{x}$  = mean of sample measurements, and  
 $n$  = number of pipets measured.

8.5 *Pipet Marking Permanency Test*—Immerse the tube in distilled water for 30 s. Using a soft paper tissue, wipe the marked portion of the pipet lightly with ten complete strokes (five up and five down). When judged by the naked eye under normal room lighting the pipet markings should appear as before the test with only possible lightening of the markings or minor removal of the markings, or both, that would not effect the pipet’s serviceability.

## 9. Keywords

9.1 disposable; glass; micro Folin; pipet