Designation: E714 – 94 (Reapproved 2021)

Standard Specification for Disposable Glass Serological Pipets[1]

This standard is issued under the fixed designation E714; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers disposable glass serological pipets, calibrated "to deliver," used in measuring volumes of liquids.

1.2 *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:*[2]

E438 Specification for Glasses in Laboratory Apparatus

E542 Practice for Calibration of Laboratory Volumetric Apparatus

E920 Specification for Commercially Packaged Laboratory Apparatus

E921 Specification for Export Packaged Laboratory Apparatus

E1133 Practice for Performance Testing of Packaged Laboratory Apparatus for United States Government Procurements

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

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

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

3.1.3 *disposable pipets*—in accordance with this specification and the expected product performance expressed in this specification, those serological pipets which are to be used one time only. *Any institution or individual who reuses a disposable pipet must bear full responsibility for its safety and effectiveness.*

4. Materials and Manufacture

4.1 The pipets shall be fabricated from borosilicate glass, Type I, Class A or B; or soda-lime glass, Type II, as defined in Specification E438.

5. Design

5.1 *Shape*—Pipets shall be straight and of one-piece construction. Any cross section of a pipet taken in a plane perpendicular to the longitudinal axis shall be circular.

5.2 *Delivery Tips*—Delivery tips shall be made with a gradual taper of 10 to 25 mm for capacities up to 2 cm^3 inclusive, and 15 to 30 mm for the 5 cm^3 and 10 cm^3 size(s). The tip end shall be reasonably perpendicular to the longitudinal axis of the pipet and shall be firepolished.

5.3 *Top End*—The 10 cm^3 and 25 cm^3 pipet shall have a top end tooled to a diameter of 7 to 9 mm and shall have an overall length of 15 to 25 mm from the top. The top end shall be suitable for plugging with filtering material. All top ends shall be reasonably perpendicular to the longitudinal axis of the pipet, and shall be firepolished.

5.4 *Dimensions and Outflow Times*—The limiting dimensions and outflow times shall be as shown in Table 1. Outflow times shall be determined on unplugged pipets, using distilled water at 25 ± 5 °C, and by means of a stopwatch.

6. Markings

6.1 *Graduation Markings*—Graduation lines shall be between 0.2 and 0.5 mm in width, and in a plane perpendicular to the longitudinal axis of the pipet and parallel to each other. A main graduation line shall extend at least three-fifths of the way around the pipet. The values of all main graduation lines shall be in Arabic numerals directly above the line referenced. Intermediate graduation lines shall extend at least one-fifth of the way around the pipet, and least graduation lines shall extend at least one-seventh of the distance around the pipet. The 0 graduation line shall be at least 90 mm below the top of the pipet on all sizes.

6.2 *Identification Markings*—Each pipet shall be marked with the manufacturer's or vendor's name or trademark, its

[1] 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.

Current edition approved Jan. 1, 2021. Published February 2021. Originally approved in 1980. Last previous edition approved in 2015 as E714 – 94(2015). DOI: 10.1520/E0714-94R21.

[2] 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.

TABLE 1 Dimensions and Outflow Times

Capacity, cm ^{3}	Least Value	Main Numbered	Graduated 0 to At Least	Outside Diameter of Graduated Portion, mm	Outflow Time, s		Wall Thickness, min, mm
					min	max	
0.1	0.01	0.01	0.09	3.5 to 4.0	0.5	3	1.0
0.2	0.01	0.02	0.18	3.5 to 4.5	0.5	3	1.0
0.2	0.01	0.05	0.18	3.5 to 4.5	0.5	3	1.0
0.5	0.01	0.1	0.40	4.25 to 4.75	0.5	3	0.8
1.0	0.01	0.1	0.90	4.25 to 4.75	0.5	5	0.8
1.0	0.1	0.1	0.9	4.25 to 4.75	0.5	5	0.8
2.0	0.01	0.1	1.9	5.5 to 6.0	0.5	5	0.8
5.0	0.1	1.0	4.5	7.5 to 8.25	3.0	10	0.8
10.0	0.1	1.0	9.0	9.5 to 11.25	4.5	15	0.8
25.0	0.2	1.0	23.0	15.0 to 16.0	10.0	30	0.85

capacity, the symbols “TD” (for “to deliver”) and “20 °C,” and either a wide band or two narrow bands on the mouthpiece end to signify that the last drop must be blown out to achieve full delivery.

6.3 *Capacity*—The pipet capacity, expressed in cubic centimetres or millilitres, shall be stated on the package. The expected deviation from the stated capacity shall be based on unplugged pipets and expressed as accuracy and coefficient of variation. Pipets shall be calibrated for delivery at 20 °C (see Section 7).

7. Determination of Accuracy and Coefficient of Variation

7.1 Randomly select a minimum of 30 pipets and test gravimetrically, using distilled water.

7.1.1 *Accuracy*—The accuracy shall be within the limits of Table 2 and shall be determined as follows:

$$A = \left(\bar{X} - V_1\right)/V_1 \times 100 \quad (1)$$

TABLE 2 Accuracy and Coefficient of Variation of Stated Capacity

Capacity, cm^3	Accuracy, %[A]	Coefficient of Variation, %[A]
0.1	±7	≤2.5
0.2	±6	≤2.0
0.5	±3	≤1.5
1.0	±3	≤1.5
2.0	±3	≤1.5
5.0	±3	≤1.5
10.0	±3	≤1.5
25.0	±3	≤1.5

[A] Applies only to the stated capacity.

where:

A = accuracy, %,
$\bar{X}$ = mean of sample measurements, cm^3, and
$\bar{V}_1$ = stated capacity of pipet, cm^3.

7.1.2 *Coefficient of Variation*—The coefficient of variation shall be within the limits of Table 2 and shall be determined as follows:

$$CV = \frac{100\,S}{\bar{X}} \quad (2)$$

$$S = \sqrt{\left[\left(\sum\left(X - \bar{X}\right)^2\right)/(n-1)\right]} \quad (3)$$

where:

CV = coefficient of variation, %,
S = standard deviation,
X = individual sample measurement, cm^3,
$\bar{X}$ = mean of sample measurements, cm^3, and
n = number of pipets measured.

8. Workmanship, Finish, and Appearance

8.1 Pipets shall be free of defects that may impair their serviceability, such as significant foreign matter or chips that affect the bore.

9. Packaging Requirements

9.1 For packaging refer to either Specification E920 or E921.

10. Keywords

10.1 disposable; glass; pipets; serological