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Standard Specification for Glass Measuring Pipets[1]

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1. Scope

1.1 This specification covers requirements for glass measuring pipets of precision and general purpose grades, used in measuring volumes of liquids.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E438 Specification for Glasses in Laboratory Apparatus

E542 Practice for Calibration of Laboratory Volumetric Apparatus

E671 Specification for Maximum Permissible Thermal Residual Stress in Annealed Glass Laboratory Apparatus

E694 Specification for Laboratory Glass 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

E1157 Specification for Sampling and Testing of Reusable Laboratory Glassware

E1273 Specification for Color Coding of Reusable Laboratory Pipets

3. Classification

3.1 *Style, Class and Capacity*—Pipets covered by this specification shall be of the following styles, classes, and capacities:

3.1.1 *Style 1*—Standard taper tip.

3.1.1.1 *Class A*—Each pipet of precision grade shall be marked with the letter "A" to signify compliance with applicable construction and accuracy requirements in Table 1. Each pipet may be marked with a permanent serial number at the option of the manufacturer.

3.1.1.2 *Class B*—General purpose pipets are of the same basic design as Class A pipets. Volumetric tolerances for Class B pipets shall be within twice the specified range allowed for Class A pipets. These pipets need not be marked with their class designation or serial number. See Table 1 for tolerances and dimensional requirements.

3.1.2 *Style 2*—Long taper tip (Class B only).

3.1.3 *Capacities, (mL)*—0.1, 0.2, 0.5, 1, 2, 5, 10, 25, and 50.

4. Design

4.1 *Shape*—The 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.

4.2 *Delivery Tips*—Delivery tips of Style 1 pipets shall be made with a gradual taper of 15 to 30 mm for capacities up to 5 mL inclusive, and 20 to 40 mm for 10 to 50 mL capacity pipets. Style 2 pipets shall have a taper at a distance of 50 to 65 mm from the tip end. The end of the tip shall be perpendicular to the longitudinal axis of the pipet. A sudden constriction at the orifice shall not be acceptable. The outside edge of the tip shall be beveled slightly at the end, and the bevel shall be ground or firepolished.

4.3 *Zero Graduation Line Position*— The distance from the top end to the top graduation of all pipets (except for 0.5 mL pipets) shall be not less than 90 mm; for 0.5 mL pipets this distance shall be not less than 80 mm.

4.4 *Dimensions and Outflow Times*—The limiting dimensions and outflow times are 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. Outflow time shall be determined by the unrestricted outflow of the water from the zero mark to base mark and until the water has ceased to flow.

4.5 *Markings*—All markings shall be permanent and legible.

4.5.1 *Graduation Markings*—Graduation lines shall not exceed 0.4 mm in thickness and shall be in a plane perpendicular to the vertical axis of the pipet. The lines and other markings shall be applied by one of the following methods: etched and filled with a permanent pigment; etched through a vertical colored stripe fused into the glass; by application of a stain

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[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 Requirements for Glass Measuring Pipets

Capacity mL	Capacity Tolerance± mL		Graduations, mL		Outside Diameter of Grad. Portion min, mm	Outflow Time Seconds				Color Coding Band
	Class A	Class B	Least value	Main numbered		Class A		Class B		
						min	max	min	max	
0.1	...	0.005	0.01	0.01	5.5	...	...	0.5	10	White
0.1[A]	...	0.005	0.001	0.01	5.5	...	...	0.5	10	2-Green
0.2	...	0.008	0.01	0.02	5.5	...	...	0.5	8	Black
0.2[A]	...	0.008	0.001	0.02	5.5	...	...	0.5	8	2-Blue
0.5[A]	...	0.01	0.01	0.10	6.0	...	...	2	6	2-Yellow
1.0	0.01	0.02	0.10	0.10	6.0	20	60	3	22	Red
1.0	0.01	0.02	0.01	0.10	6.0	20	60	3	22	Yellow
2.0	0.01	0.02	0.10	0.20	7.0	20	60	3	22	Green
2.0[A]	...	0.02	0.01	0.20	7.0	...	...	3	22	2-White
5.0	0.02	0.04	0.10	1.0	7.5	30	60	8	20	Blue
10.0	0.03	0.06	0.10	1.0	9.5	30	60	8	30	Orange
25.0[B]	0.05	0.10	0.10	1.0	12.0	40	70	15	35	White
50.0[B]	...	0.16	0.20	2.0	16.0	...	...	20	40	Black

[A] Style 2 only.
[B] Style 1 only.

fired into the glass without etching; or by application of an enamel fired onto the glass without etching.

4.5.1.1 *Style 1, Class A pipets*—Shall comply with the lengths of lines, numbering and Graduation Pattern 1 specified in Specification E694.

4.5.1.2 *Style 1, Class B and Style 2 pipets*—Main graduations shall extend a minimum of ¾ of the way around the pipet; intermediate graduations shall extend a minimum of ⅕ of the way around the pipet, and the least graduation markings shall extend a minimum of ⅐ of the way around the pipet. The value of all main graduations shall be inscribed in Arabic numerals directly above the line referenced.

4.5.2 *Color Coding*—Each pipet shall be marked with one or two color bands as specified in Table 1. For color code data see Specification E1273. Color bands do not have to be continuous but may be broken as long as they cover 40 % of the circumference of the pipet. Colors must be bright and distinct.

4.5.3 *Identification Markings*—Each pipet, marked by one of the methods given in 4.5.1, shall show the manufacturer's name or trademark, the nominal capacity, the temperature of calibration, 20°C, and the word "delivers" or any of the following symbols: TD, TD-EX, TD (EX), EX-TD, EX (TD) or EX.

5. Workmanship, Finish and Appearance

5.1 Pipets shall be free of defects which may distort the appearance of the liquid surface or may impair their serviceability.

6. General Requirements

6.1 *Borosilicate Glass*—Borosilicate glass for pipets shall conform to the glass requirements of Type 1, Class A or B of Specification E438.

6.2 *Annealing*—The maximum residual thermal stress shall conform to Specification E671, except that tempered tips or tempered tops, or both, may be supplied at the option of the manufacturer. The tempered tip, when examined in index oil that matches the refractive index of the glass being used, shall have a temper between 75 and 220 nm for Style 1 tips, and between 40 and 200 nm for Style 2 tips.

6.3 *Calibration*—Pipets shall be calibrated in accordance with Practice E542, to deliver (TD) the intended capacity at 20°C.

7. Sampling and Testing

7.1 For sampling and testing refer to Specification E1157.

8. Packaging

8.1 For packaging select from Specifications E920, E921, or Practice E1133.

9. Keywords

9.1 glass; measuring; pipets