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Standard Specification for Glass Volumetric (Transfer) Pipets[1]

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1. Scope

1.1 This specification covers volumetric pipets of two classes. Class A, Precision Pipet and Class B, General Purpose.

NOTE 1—Specifications for micropipets are given in Specification E193.

1.2 Product with a stated capacity not listed in this standard may be specified class A tolerance when product conforms to the tolerance range of the next smaller volumetric standard product listed in Table 1.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

E193 Specification for Laboratory Glass Micropipets
E438 Specification for Glasses in Laboratory 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

3. General Requirements

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

3.2 *Calibration*—Pipets shall be calibrated to deliver (symbol TD) the intended capacity at 20°C. The pipet shall be filled about 20 mm above the capacity line. The water is lowered slowly to the capacity line. Delivery of the contents into a receiving vessel is made with the tip in contact with the wall of the vessel and no after-drainage period is allowed. Accuracy shall be within the limits specified in Table 1.

4. Design

4.1 *Shape*—The pipets shall consist in general of a suction tube and a delivery tube separated by a bulb; all three parts shall be permanently attached together. Any cross-section of the pipet taken in a plane perpendicular to the longitudinal axis shall be circular. The shape shall permit complete emptying and thorough cleaning.

4.1.1 *Bulb*—The shape shall permit complete emptying without any hold up, and easy cleaning.

4.2 *Dimensions*—The length of the suction tube shall be 150 to 190 mm and the minimum wall thickness of both suction and delivery tubes shall be 0.90 mm. Pipets must comply with the essential dimensions given in Table 1.

4.3 *Delivery Tips*—Delivery tips shall be made with a gradual taper of 1.5 to 3 cm. The end of the tip shall be perpendicular to the longitudinal axis of the tip. The outside edge of the tip may be bevelled slightly and the end and the bevel shall be ground or fire-polished. Sudden constriction at the orifice would impair smooth flow characteristics of the delivery stream and is not acceptable.

4.3.1 *Tempered Tips*—May be supplied at option of manufacturer. The tempered tip, when tested in index oil which matches the refractive index of the glass being used, shall have a temper between 75 and 220 nm (millimicrons).

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

4.4.1 *Capacity Line*—The capacity line shall be a sharply defined line of uniform width (maximum 0.6 mm) in a plane perpendicular to the vertical axis of the pipet. The line 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 fired into the glass without etching; or by application of an enamel fired onto the glass without etching. The line shall completely encircle the tube except when the line is a stain fired into the glass without etching. If so stained, the line shall extend a minimum of 90 % of the way around the tube.

4.4.2 *Color Coding*—Each pipet shall be marked with one or two color bands as specified in Table 1. The single band should be 6 to 10 mm wide, while the double color bands

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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 Volumetric (Transfer) Pipet

Nominal Capacity, mL	Capacity Tolerance, mL		Length of Delivery Tube, mm		Inside Diameter at Capacity Mark, mm		Maximum Distance Between Bulb and Graduation Mark, mm	Minimum Outflow Time, s[A]		Color-Coding Band
	Class A	Class B	min	max	min	max		Class A	Class B	
0.5	±0.006	±0.012	100	140	1.3	4	60	5	3	black (2)
1	±0.006	±0.012	100	140	2	4	60	8	3	blue
2	±0.006	±0.012	120	150	2	4	60	8	3	orange
3	±0.01	±0.02	130	170	2	4	60	8	5	black
4	±0.01	±0.02	130	170	2	4	60	8	5	red (2)
5	±0.01	±0.02	130	170	2	4	60	8	8	white
6	±0.01	±0.03	150	190	2	4	60	10	8	orange (2)
7	±0.01	±0.03	150	190	2	4	60	10	8	green (2)
8	±0.02	±0.04	150	190	2	4	60	10	8	blue
9	±0.02	±0.04	150	190	2	4	60	10	8	black
10	±0.02	±0.04	150	190	2	4	70	15	8	red
15	±0.03	±0.06	180	220	3.5	5.5	70	25	10	green
20	±0.03	±0.06	230	260	3.5	5.5	70	25	10	yellow
25	±0.03	±0.06	230	260	3.5	5.5	70	25	15	blue
30	±0.03	...	230	260	3.5	5.5	70	25	...	black
40	±0.05	...	230	260	4	6	70	25	...	white
50	±0.05	±0.10	230	260	4	6	70	25	15	red
100	±0.08	±0.16	230	260	5	7	80	30	20	yellow

[A]Maximum outflow time for A or B shall be 60 s.

should each be 3 to 5 mm wide and separated by a clear space of 2 to 3 mm. 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.

4.4.3 *Identification Markings*—Each pipet marked by one of the methods given in 4.4.1 shall show the manufacturer's name or trademark, the nominal capacity, the word "delivers" or the symbol "TD," the temperature of calibration, 20°C. The letter "A" symbolizing Class A accuracy to appear on all Class A pipets. Class A pipets may be optionally serialized.

4.5 *Workmanship*—Pipets shall be free of defects which may distort the appearance of the liquid surface or may impair the serviceability.

5. Sampling and Testing

5.1 For sampling refer to Specification E1157.

6. Packaging

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

7. Keywords

7.1 glass; pipets; volumetric