



Standard Specification for Laboratory Glass Micropipets¹

This standard is issued under the fixed designation E193; 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 several micropipets useful in measuring microlitre quantities of liquids.

NOTE 1—This specification was originally developed by the Committee on Microchemical Apparatus, Division of Analytical Chemistry, American Chemical Society.^{2,3, 4}

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

2. Referenced Documents

2.1 *ASTM Standards*:⁵

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. Nomenclature

3.1 The pipets specified in Figs. 1-3, and Fig. 4 are classified as micropipets, whereas those in Figs. 5 and 6 are classified as

microlitre pipets in order to differentiate among the various pipets, not on a technical basis, but rather on the basis of usage. This is done to prevent confusion that might result from the fact that the pipets shown in Figs. 1 and 2, and Fig. 3 are listed in trade catalogs as micropipets designed especially for use in the fields of biological and clinical chemistry, and the pipets shown in Fig. 4 are listed as micropipets, density-type, designed for use as microweighing pipets, or pycnometers.

4. Micropipets, Measuring-Type (“to deliver”)

4.1 The measuring-type micropipets^{2,6} are specified in five capacities and shall conform to the requirements shown in Fig. 1. The narrow, elongated delivery stem of the pipets can reach to the bottom of microvolumetric flasks,^{2,5} permitting almost complete withdrawal of the contents of the flask. Quantitative delivery of the entire volume of the pipets is obtained by touching off the last drop.

5. Micropipets, Folin-Type (“to contain”)

5.1 The Folin-type^{4,6,7} micropipets are specified in two capacities and shall conform to the requirements shown in Fig. 2. Complete delivery of the volume indicated by the graduation mark on these pipets is ensured by washing out several times any solution adhering to the inner surface with wash liquid drawn up from the tip.

6. Micro Washout Pipets, Pregl-Type (“to contain”)

6.1 The micro washout pipets, Pregl-type^{4,6,8} are specified in four capacities and shall conform to the requirements shown in Fig. 3. Quantitative delivery of the volume indicated by the graduation mark on the pipets is obtained by rinsing out the contents with wash liquid added from the top of the pipet.

7. Micro Weighing Pipets, Density-Type (Pycnometers) (“to contain”)

7.1 The micro weighing pipets, density-type (pycnometers),^{4,6,9} with ground-glass caps, are specified in three capacities

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² Committee on Microchemical Apparatus, Division of Analytical Chemistry, American Chemical Society. “Report on Recommended Specifications for Microchemical Apparatus, Volumetric Glassware, Flasks, Pipets, and Centrifuge Tubes,” *Analytical Chemistry*, Vol 28, 1956, p. 1993.

³ Committee on Microchemical Apparatus, Division of Analytical Chemistry, American Chemical Society. “Report on Recommended Specifications for Microchemical Apparatus, Volumetric Glassware, Microlitre Pipets,” *Analytical Chemistry*, Vol 30, 1958, p. 1702.

⁴ Committee on Microchemical Apparatus, Division of Analytical Chemistry, American Chemical Society. “Report on Recommended Specifications for Microchemical Apparatus, Volumetric Glassware, Micropipets,” *Analytical Chemistry*, Vol 32, 1960, p. 1045.

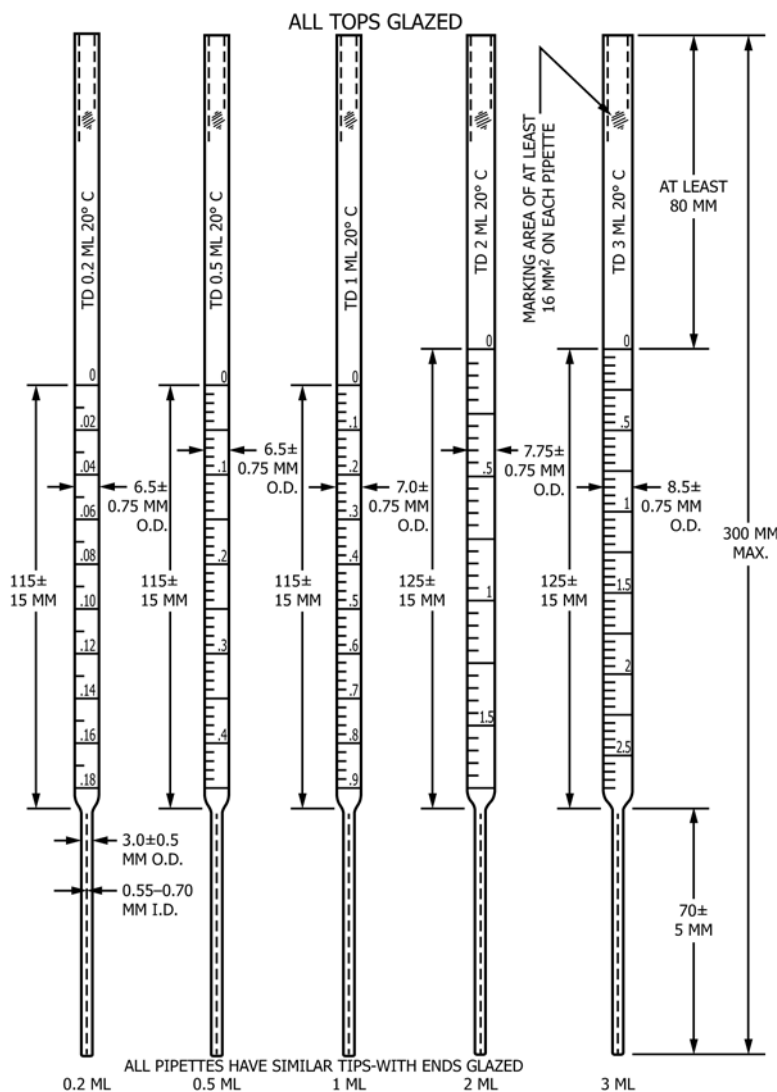
⁵ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

⁶ Steyermark, A., *Quantitative Organic Microanalysis*, 2nd Ed., Academic Press, New York, NY, 1961.

⁷ Folin, O., *Journal of Biological Chemistry*, Vol 77, 1928, p. 421.

⁸ Grant, J., *Quantitative Organic Microanalysis Based on Methods of Fritz Pregl*, 5th Ed., Blakiston Co., Philadelphia, PA 1951, p. 34.

⁹ Alber, H. K., *Industrial and Engineering Chemistry, Analytical Edition*, Vol 12, 1940, p. 764.



Capacity, mL	Subdivision, mL	Interval Graduated, mL	Lining		Number at 0 and Each mL	Tolerance, \pm , mL
			Ring at Each, mL	Half Ring at Each, mL		
0.2	0.01	0 to 0.18	0.02	0.01	0.02	0.005
0.5	0.01	0 to 0.45	0.05	0.01	0.1	0.01
1	0.02	0 to 0.90	0.1	0.02	0.1	0.02
2	0.05	0 to 1.75	0.25	0.05	0.5	0.04
3	0.05	0 to 2.70	0.25	0.05	0.5	0.06

Notes:

1. No graduations shall appear in tapered portion.
2. Tip may be tapered at junction with body, but outside diameter at this point may not exceed 4.5 mm.
3. Tip outlet shall be glazed, with least possible constriction.
4. Calibrated to deliver at 20°C, touching off last drop.

FIG. 1 Micropipets with Cylindrical Tip

and shall conform to the requirements shown in Fig. 4. These pipets are designed for density determinations on small amounts of volatile, viscous or hygroscopic liquids. The decigram size has a capacity of 100 μ L and is especially suitable for highly viscous liquids. The centigram size has a capacity of 40 to 80 μ L and the milligram size has a capacity of 10 to 30 μ L. The centigram and milligram sizes are graduated in 1-mm divisions, and can be used even when the total amount of sample available is less than the maximum

capacity of the micropipet. The sample may occupy any portion of the graduated stem, thereby eliminating the necessity of making a precise adjustment to a fixed calibration mark.

8. Microlitre Pipets ("to contain")

8.1 The microlitre pipets^{3, 6} are specified in 25 capacities and shall conform to the requirements shown in Fig. 5 (1 to 5- μ L capacities) and Fig. 6 (5 to 1000- μ L capacities). The dimensions of these pipets are such that they may be used with

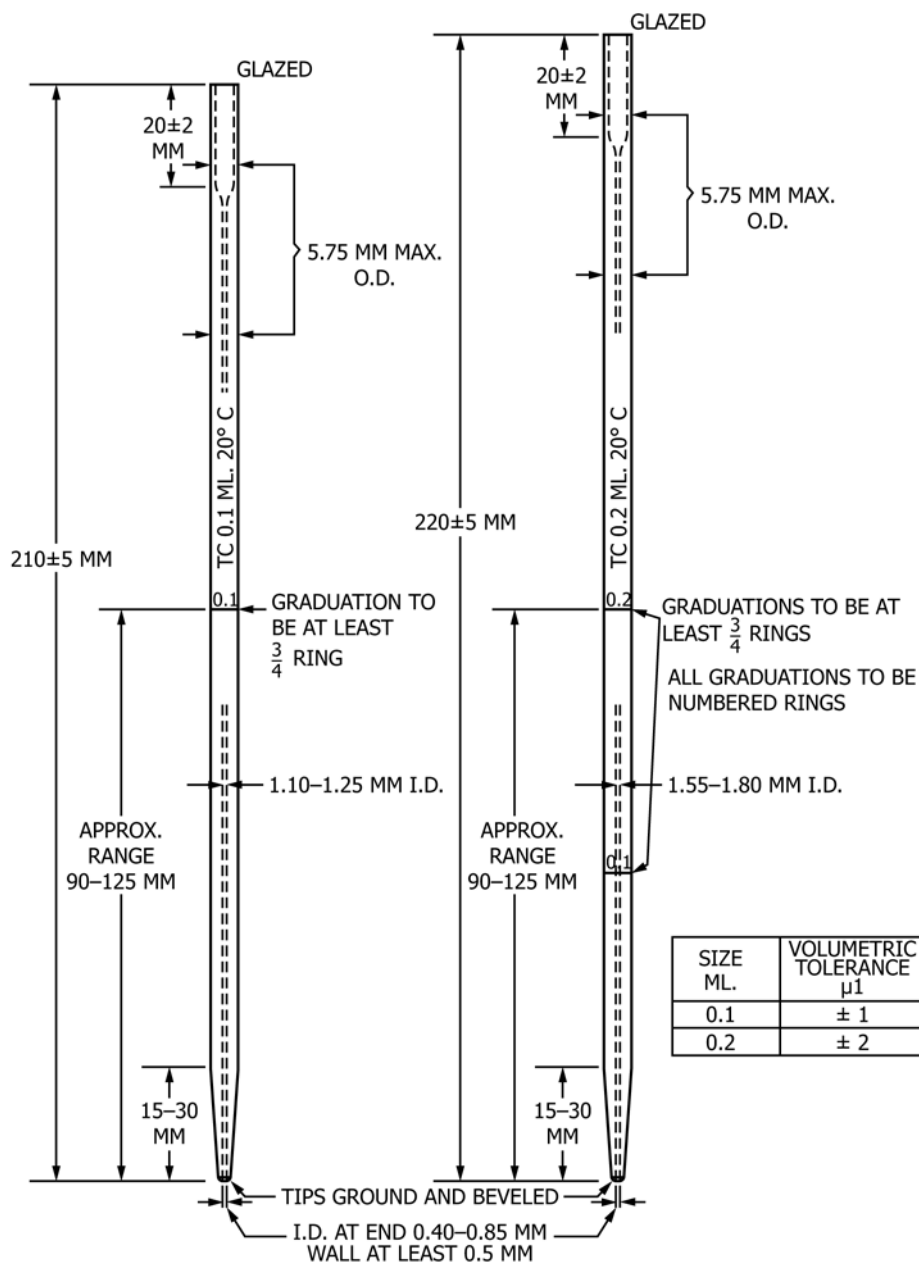


FIG. 2 Micropipets, Folio-Type

micro volumetric flasks.^{2,5} Complete delivery of the volume indicated by the graduation mark on the pipets is obtained by rinsing out several times any solution adhering to the inner surface with wash liquid drawn up from the tip.

9. Sampling and Testing

9.1 Refer to Specification E1157.

10. Packaging

10.1 Select from Specification E920, E921, or E1133.

11. Keywords

11.1 glass; micropipets

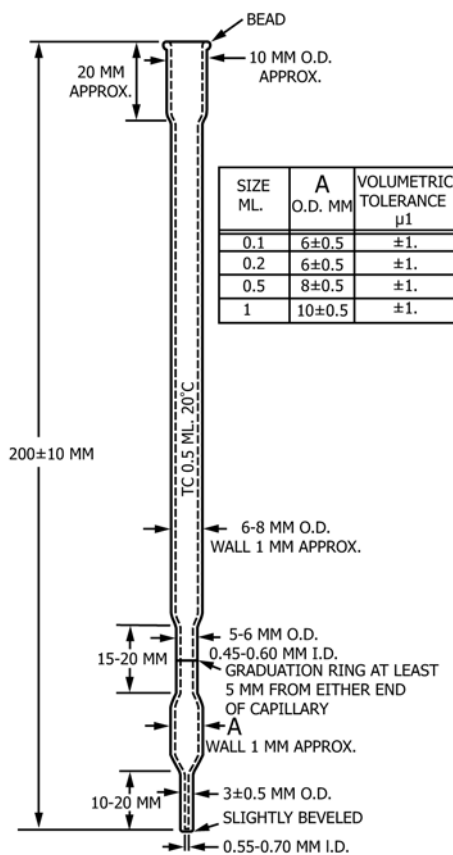


FIG. 3 Micro Washout Pipets, Pregl-Type

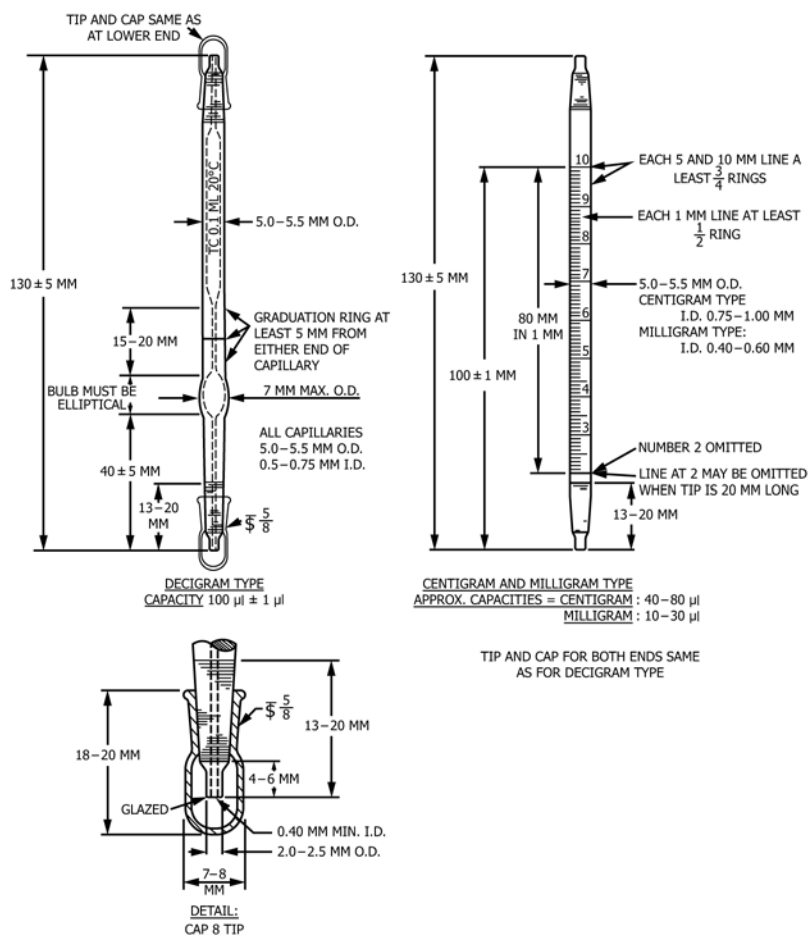
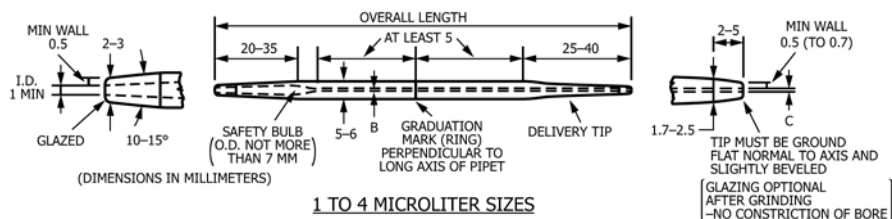


FIG. 4 Micro Weighing Pipets, Density-Type (Pycnometers)

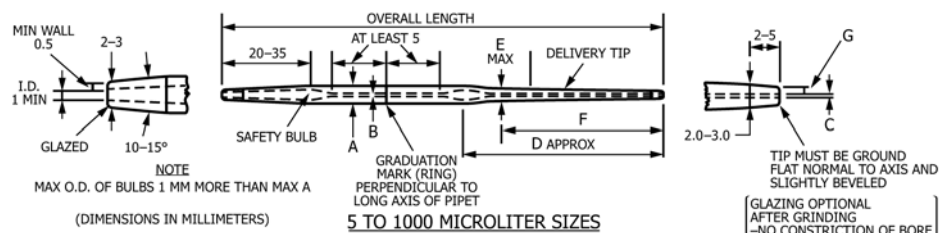


Capacity, μ L ^A	Over-all Length, mm	ID Tubing, mm ^B	D at End, mm ^C	Min Capacity Safety Bulb, μ L	Volume Tol-erance, ^B \pm %
1	140 \pm 5	0.12 to 0.16	0.10 to 0.20	50	1
2	140 \pm 5	0.16 to 0.25	0.15 to 0.25	50	1
3	140 \pm 5	0.20 to 0.28	0.15 to 0.25	50	1
4	140 \pm 5	0.24 to 0.32	0.15 to 0.25	50	1

^A Calibrated to contain.

^B Closer volumetric standardization shall be carried out by the operator with substances under actual conditions of use.

FIG. 5 Microlitre Pipets (1 to 4- μ L Capacities)



Capacity, μL^A	Over-all Length, mm	OD Tubing, mm A	ID Tubing, mm B	Delivery System					Min Capacity Safety Bulb, μL	Volume Tolerance, $\pm \%$ ^B
				ID at End, mm C	Approximate Length, mm D	Max OD, mm E	Min Length, mm F	Wall at End, mm G		
5	140 \pm 5	5 to 6	0.18 to 0.25	0.15 to 0.25	6	4	55	0.5 to 0.7	50	0.5
6	140 \pm 5	5 to 6	0.18 to 0.25	0.15 to 0.25	65	4	55	0.5 to 0.7	50	0.5
7	140 \pm 5	5 to 6	0.18 to 0.25	0.15 to 0.25	65	4	55	0.5 to 0.7	50	0.5
8	140 \pm 5	5 to 6	0.18 to 0.25	0.15 to 0.25	65	4	55	0.5 to 0.7	50	0.5
9	140 \pm 5	5 to 6	0.18 to 0.25	0.15 to 0.25	65	4	55	0.5 to 0.7	50	0.5
10	140 \pm 5	5 to 6	0.20 to 0.35	0.15 to 0.25	65	4	55	0.5 to 0.7	50	0.5
15	140 \pm 5	5 to 6	0.25 to 0.40	0.15 to 0.25	65	4	55	0.5 to 0.7	50	0.5
20	140 \pm 5	5 to 6	0.35 to 0.50	0.25 to 0.50	65	4	55	0.5 to 0.7	50	0.5
25	140 \pm 5	5 to 6	0.35 to 0.50	0.25 to 0.50	65	4	55	0.5 to 0.7	50	0.5
35	140 \pm 5	5 to 6	0.35 to 0.50	0.25 to 0.50	65	4	55	0.5 to 0.7	50	0.3
50	140 \pm 5	5 to 6	0.35 to 0.50	0.25 to 0.50	65	4	55	0.5 to 0.7	50	0.3
60	140 \pm 5	5 to 6	0.40 to 0.55	0.30 to 0.50	65	4	55	0.5 to 0.7	50	0.3
75	140 \pm 5	5 to 6	0.40 to 0.60	0.30 to 0.50	65	4	55	0.5 to 0.7	75	0.3
100	140 \pm 5	5 to 6	0.50 to 0.75	0.30 to 0.50	65	4	55	0.5 to 0.7	75	0.3
150	140 \pm 5	5 to 6	0.75 to 1.00	0.40 to 0.60	65	4	55	0.5 to 0.7	100	0.3
200	145 \pm 10	5 to 6	0.75 to 1.00	0.40 to 0.60	65	4	55	0.6 to 0.8	100	0.2
250	145 \pm 10	5 to 6	0.75 to 1.00	0.40 to 0.60	65	4	55	0.6 to 0.8	100	0.2
300	145 \pm 10	5 to 6	0.75 to 1.00	0.40 to 0.70	65	4	55	0.6 to 0.8	200	0.2
400	150 \pm 10	6 to 7	1.00 to 1.25	0.40 to 0.70	70	6	60	0.6 to 0.8	200	0.2
500	160 \pm 10	6 to 7	1.25 to 1.50	0.40 to 0.70	70	6	60	0.6 to 0.8	200	0.2
1000	170 \pm 10	7 to 8	2.00 to 2.25	0.40 to 0.70	80	7	60	0.6 to 0.8	300	0.2

^A Calibrated to contain.

^B Closer volumetric standardization shall be carried out by the operator with substances under actual conditions of use.

FIG. 6 Microlitre Pipets (5 to 1000- μL Capacities)

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