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Standard Specification for Glass Westergren Tube, Reusable[1]

This standard is issued under the fixed designation E923; 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 describes requirements for a tube that measures the erythrocyte sedimentation rate (ESR). ESR is the suspension stability of red cells in diluted, anti-coagulated human blood.

1.1.1 The use of the term "rate" is, strictly speaking, not correct. The test measures the amount of settling of red cells after a specified time.

1.2 The tubes are used together with a special rack to ensure they remain in a vertical position during the test.

1.3 This specification includes many dimensional requirements that are, for the most part, in agreement with the British Standards Institution, German Standards Institute, International Committee for Standardization in Haematology, and the National Committee for Clinical Laboratory Standards publications on Westergren tubes. The clinical procedure using the tube described in this specification is known as the "Westergren Method."

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

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

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. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *reusable*—capable of being used again.

3.1.2 *tube*—the word "tube" rather than "pipet" is used to describe this instrument. The word "pipet" should be reserved for volume-measuring instruments thus designated. A tube used for measurements of blood sedimentation rate is not a volume measuring instrument. In this connection, misunderstanding can occur when a Westergren "tube" is described as a "pipet."

3.1.3 *Westergren*—The surname of the individual responsible for the design of the Westergren tube and the method of use.

4. Classification

4.1 This specification covers a tube that is intended to be used until it is no longer considered functional for the purpose intended. The specification is specifically written for a reusable item and is not to be confused with a disposable tube that is described in other published standards.

5. Materials

5.1 The tubes made to this specification shall be fabricated from borosilicate glass, Type I, Class B; or soda lime glass, Type II, in accordance with Specification E438.

6. Dimensions, Mass, and Permissible Variations

6.1 *Design*—The Westergren tube shall be made of thick-walled glass tubing. It shall be of one-piece construction, straight and with uniform bore. The ends of the tube shall be ground flat, perpendicular to the tube axis and beveled as specified in Fig. 1.

6.2 *Dimensions*—The tube shall be made of tubing with an outside diameter (OD) of 6.5 ± 0.5 mm with an inside diameter (ID) of 2.55 mm ± 0.15 mm. The uniformity of the

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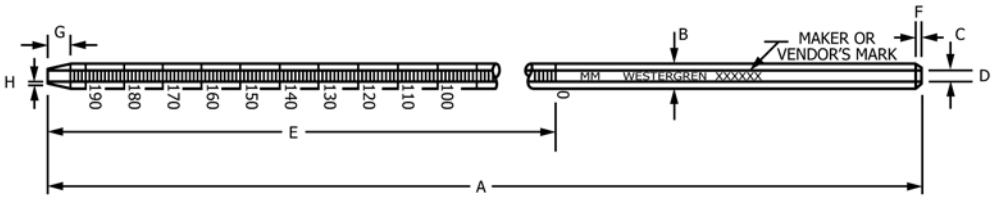
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.



	FEATURE	DIMENSIONS WITH TOLERANCES IN MILLIMETERS
A	OVERALL LENGTH	300. ± 1
B	O.D.	6.5 ± 0.5
C	I.D.	2.55 ± 0.15
D	UNIFORMITY OF BORE (THROUGH OUT)	± 0.1
E	SCALE LENGTH	200. ± 0.35
F	GROUND TOP (LENGTH OF TAPERED PORTION)	1.0 – 2.0
G	GROUND TIP (LENGTH OF TAPERED PORTION, (FORMING JET)	2.0 – 8.0
H	WALL THICKNESS AT TIP ORIFICE	MIN. 0.5

(NOT TO SCALE)

FIG. 1 Westergren Tube

bore shall be ± 0.1 mm throughout the tube. The tube shall be 300± 1 mm long and ground and *beveled* at each end. The tube shall have an inscribed graduated scale extending over the lower 200 ± 0.35 mm of the tube. The tube should contain approximately 1 mL of blood when filled and adjusted to the 200 mm line. The word "Westergren" must be inscribed on the top portion of the tube together with the maker's or vendor's name or mark.

6.3 *Graduation Lines*—The graduation lines shall be of uniform thickness with a maximum thickness of 0.25 mm for etched and filled lines and 0.4 mm for amber stain lines that are fired into the glass tube. They shall lie in planes at right angles to the axis of the tube and with a maximum tolerance between two adjacent markings of 0.2 mm. Maximum tolerance for the total 200 mm scale shall not exceed 0.35 mm.

6.4 *Graduation Line Numbering*—The tube shall be graduated in millimetres with a scale of 200 mm from the tip of the tube. The scale shall be numbered every ten or twenty graduation lines starting with a numerical zero (0) and downward to a maximum value of 190 mm. The numerical markings shall appear at the right side of the graduated scale when held vertically with the scale facing the viewer.

6.5 *Length of Graduation Lines*—The top graduation line and every other tenth- or twentieth-numbered line shall encircle, or near encircle the tube or be a minimum of 6 mm long. The medium (every fifth) line shall be a minimum of 4 mm long. The short (intermediate) lines shall be a minimum of 2.5 mm long.

6.6 *Marking Permanency*—Inscriptions, graduation lines, and numerals shall be either etched and filled with a permanent pigment, or an amber stain fired into the glass tube. The color depth of the markings on the tube shall be adequate to permit routine functional use of the tube without creating a difficulty in setting a meniscus or reading the separation of blood cells from plasma. The permanency of the markings shall meet the requirements of the test described in 7.1.

6.7 *Grinding Bevel*—The grinding bevel at the Westergren tube tip has an allowance of 2 to 8 mm in length. To minimize the incidence of chipping, it is recommended the minimum wall thickness at the orifice of 0.5 mm be applicable for a grinding bevel length of 2 to 5 mm and a minimum of 0.7 mm wall thickness at the orifice for a grinding bevel of 5 to 8 mm.

7. Workmanship, Finish, and Appearance

7.1 *Workmanship*—The tube shall be as free as possible from visible defects that would detract from its appearance or impair its serviceability when viewed by the human eye under normal room lighting. The tube shall be free of ring strain and if present, any longitudinal strain shall be faint and highly diffused.

8. Test Method

8.1 *Pigmentation and Amber Stain Test*—Freshly prepare a chromic acid cleaning solution by combining 200 g of sodium dichromate ($Na_2 Cr_2 O_7 \cdot 2H_2 O$), 1000 mL of distilled water, and 1500 mL of sulfuric acid ($H_2 SO_4$, ACS Reagent 95 to 98 %). Immerse the tube in the chromic acid solution. Let stand at room temperature (20 to 25 °C) for 15 min. Remove the tube from the solution and thoroughly rinse in distilled water. Dry the tube by rubbing vigorously, 5 to 10 strokes, with a laboratory cloth or tissue. The appearance of the markings should be the same as before the test, when judged by the eye under normal room lighting.

8.2 For additional sampling and testing data, see Specification E1157.

9. Packaging

9.1 For packaging, select from either Specification E920, E921, or Practice E1133.

10. Keywords

10.1 blood; glass; reusable; sedimentation rate; westergren