



Designation: D2130 – 22

Standard Test Method for Diameter of Wool and Other Animal Fibers by Microprojection¹

This standard is issued under the fixed designation D2130; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This test method covers a procedure, using the microprojector, for the determination of the average fiber diameter and the fiber diameter variation on wool and other animal fibers, such as mohair, cashmere, alpaca, camel's hair, etc. (**Note 1**) in their various forms.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

NOTE 1—This test method may also be applied to any fibers having a round cross section and accordingly may be used many times for melt-spun man-made fibers such as polyamides, polyesters, and glass; also it may be applied to a limited number of polyacrylics and regenerated cellulose type fibers. The values given in **Appendix X1** for density and correction factors, however, apply only to wool and should not be used for other fibers. For suitable values for the density of other fibers, see Table 5 in Test Methods **D629**, Quantitative Analysis of Textiles.

NOTE 2—In subsequent sections of this test method, the term “wool” also signifies mohair or other fibers if the circumstances are applicable.

NOTE 3—For fineness specifications for wool, wool top, mohair, mohair top, alpaca, and cashmere, refer to Specifications **D3991** and **D3992**, Specification **D2252**, Test Method **D2816**.

1.3 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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.*

¹ This test method is under the jurisdiction of ASTM Committee **D13** on Textiles and is the direct responsibility of Subcommittee **D13.13** on Wool and Felt.

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2. Referenced Documents

2.1 ASTM Standards:²

- D123** Terminology Relating to Textiles
- D584** Test Method for Wool Content of Raw Wool—Laboratory Scale
- D629** Test Methods for Quantitative Analysis of Textiles
- D1060** Practice for Core Sampling of Raw Wool in Packages for Determination of Percentage of Clean Wool Fiber Present
- D1776** Practice for Conditioning and Testing Textiles
- D2252** Specification for Fineness of Types of Alpaca
- D2258** Practice for Sampling Yarn for Testing
- D2816** Test Method for Cashmere Coarse-Hair Content in Cashmere
- D2968** Test Method for Med and Kemp Fibers in Wool and Other Animal Fibers by Microprojection
- D3992** Specifications for Fineness of Wool Top or Mohair Top and Assignment of Grade (Withdrawn 2021)³
- D4845** Terminology Relating to Wool
- E380** Practice for Use of the International System of Units (SI) (the Modernized Metric System) (Withdrawn 1997)³

2.2 Other Standards:

- Federal Standard, Official Standard of the United States for Grades of Wool, Section 31.0, Measurement Method for Determining Grade of Wool, Section 31.204⁴
- IWTO-8-66(E) Method of Determining Wool Fiber Diameter by the Projection Microscope⁵

3. Terminology

3.1 For all terminology related to D13.13, Wool and Felt, see Terminology **D4845**.

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.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ *Service and Regulatory Announcement*, No. 135, U. S. Department of Agriculture, C & MS, April 1966.

⁵ International Wool Textile Organization, International Wool Secretariat, Raw Wool Services, Valley Drive, Ilkley, Yorkshire LS29 8PB, England.

3.1.1 The following terms are relevant to this standard: average fiber diameter, grade.

3.2 For definitions of all other textile terms see Terminology D123.

4. Summary of Test Method

4.1 This test method describes procedures for sampling various forms of wool and other animal fibers, the reduction of the sample to small test specimens, and the measurement, at high magnification, of the diameter of a number of fibers from the test specimens. From the observed data, computations are made to obtain the average fiber diameter, a measure of variation of fiber diameter and the percentage of medullated and kemp fibers, if present, as directed in Test Method D2968.

5. Significance and Use

5.1 This test method specifies a sampling and testing procedure for the measurement of average fiber diameter and variation in diameter of animal fibers as required in Test Method D2968.

5.2 Test Method D2130 for testing wool and other animal fibers for average fiber diameter is considered satisfactory for acceptance testing of commercial shipments since current estimates of between-laboratory precision are acceptable and the method has been used extensively in the trade for acceptance testing. In cases of disagreement arising from differences in values reported by the purchaser and the seller when using this method for acceptance testing, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the seller should be determined with each comparison being based on the testing of specimens randomly drawn from one sample of material of the type being evaluated.

6. Apparatus and Material

6.1 *Microprojector*⁶—The microscope shall be equipped with a fixed body tube, a focusable stage responsive to coarse and fine adjustments, a focusable substage with condenser and iris diaphragm, and a vertically installed adequate light source to give a precise magnification of 500×, that is, a 12.5× eyepiece and a 21×, 0.50 numerical aperture objective.

6.2 *Stage Micrometer*,⁷—calibrated in intervals of 0.01 mm for accurate setting and control of the magnification.

6.3 *Fiber Sectioning Apparatus:*

6.3.1 *Heavy-Duty Sectioning Device*⁸—An instrument comprised of a metal plate with slot and compressing key and equipped with a propulsion mechanism by which the fiber bundle may be extruded for sectioning. The instrument (Fig. 1) is designed to hold a sliver of top or equivalent bulk of fibers, yarn, or fabric.

6.3.2 *Safety Razor Blades*—Single-edge or double-edge blades (if used with blade holder).

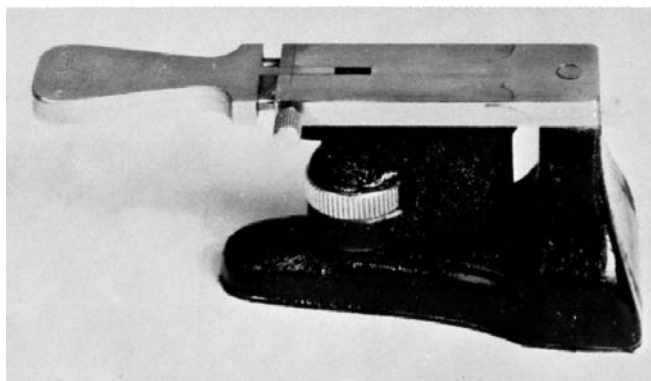


FIG. 1 Heavy-Duty Cross-Section Device

6.3.3 *FRL Fiber Cutter*⁹—A device comprised of two razor blades, a threaded pin and an assemblage that will hold the blades rigidly in position. The device (Fig. 2), which is operated by applying pressure vertically downward, cuts fibers approximately 250 μm (Note 4) in length.

NOTE 4—A description of the Swiss Fiber Cutting device described in earlier editions can be found in Part 25 of the *Annual Book of ASTM Standards*, issued in 1971 and previous volumes.

6.4 *Microscope Slides*, 1 in. by 3 in. (25 mm by 75 mm).

6.5 *Cover Glasses*, No. 1 thickness, 7/8 in. by 2 in. (22 mm by 50 mm).

6.6 *Mounting Medium*¹⁰—Colorless immersion oil with a refractive index of 1.480 ± 0.005 at 68 °F (20 °C), and a viscosity of 78.81 SUS at 100 °F (37.8 °C).

6.7 *Wedge Scale*¹¹—Strips of heavy paper or Bristol board, imprinted with a wedge for use at a magnification of 500× (Fig. 3).

6.8 *Box for Compressing Loose Fibers*—A box 12 in. by 6 in. by 15 in. (300 mm by 150 mm by 375 mm) deep, inside dimensions, equipped with a floating top which has 16 randomly spaced holes 0.75 in. (20 mm) in diameter over its area. The wool may be firmly compressed by applying pressure on the top. The top is held in place by two rods extending through holes in the side of the box and over the top. The coring tube is thrust through the holes in the top to sample the wool.

6.9 *Pressure Coring Tube*¹²—A 1/2 in. (13 mm) inside-diameter metal tube, approximately 30 in. (760 mm) long, reamed and tapped on one end to hold a sharp 3/8 in. or 1/2 in. (10 mm or 13 mm) cutting tip. The tube is fitted with a “T” cross bar about 20 in. (500 mm) long.

6.10 *Core Extruder*—A 0.25 in. (6 mm) wood dowel or aluminum rod slightly longer than the coring tube to extrude wool from tube.

⁶ Obtainable from R and B Instruments, Leeds, Wortly, Low Mills, 318 Whitehall Rd., Leeds LS12 4RJ England.

⁷ Obtainable from most scientific laboratory instrument supply companies.

⁸ Obtainable from Joe Opheikens, 426 Adams, Ogden, UT 84404 and MICO Instruments, 1944 Main St. P.O. Box 451, Marshfield Hills, MA 02051-0451.

⁹ Obtainable from Albany International Research Co., 1000 Providence Highway, Dedham, MA 02026.

¹⁰ Obtainable from YoCOM-McColl Testing Laboratories, Inc., 540 West Elk Place, Denver, CO 80216.

¹¹ Obtainable from E. J. Powers Press, 201 South St., Boston, MA 02111 and Visual Inspection Products, 50 High St., Lynn, MA 01902.

¹² Obtainable from YoCOM-McColl Testing Laboratories, Inc., 540 W. Elk Place, Denver, CO 80216 and Aero Associates, Inc., 163 Merrimac St., Woburn, MA 01801.