



Designation: D 6466 – 99

Standard Test Method for Diameter of Wool and Other Animal Fibers By Sirolan- Laserscan Fiber Diameter Analyser¹

This standard is issued under the fixed designation D 6466; 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 test method covers a procedure, using the Sirolan-Laserscan, for the determination of the average fiber diameter and the fiber diameter variation in wool and other animal fibers in their various forms.

1.2 The values stated in SI units are to be regarded as the standard.

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

2. Referenced Documents

2.1 ASTM Standards:

- D 123 Terminology Relating to Textiles²
- D 584 Test Method for Wool Content of Raw Wool—Laboratory Scale²
- D 1060 Practice for Core Sampling of Raw Wool in Packages for Determination of Percentage of Clean Wool Fiber Present²
- D 1776 Practice for Conditioning Textiles for Testing²
- D 2130 Test Method for Diameter of Wool and Other Animal Fibers by Microprojection²
- D 2252 Specification for Fineness of Types of Alpaca²
- D 2816 Test Method for Cashmere Coarse-Hair Content in Cashmere²
- D 3991 Specifications for Fineness of Wool or Mohair and Assignment of Grade³
- D 3992 Specifications for Fineness of Wool Top or Mohair Top and Assignment of Grade³
- E 126 Test Method for Inspection and Verification of Hydrometers⁴
- E 1750 Guide for Use of Water Triple Point Cells⁴

2.2 Federal Standards:

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

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² Annual Book of ASTM Standards, Vol 07.01.

³ Annual Book of ASTM Standards, Vol 07.02.

⁴ Annual Book of ASTM Standards, Vol 14.03.

Official Standards of the United States for Grades of Wool, Section 31.0⁵

Measurement Method for Determining Grade of Wool, Section 31.204⁵

Official Standards of the United States for Grades of Wool Top, Section 31.1⁶

Measurement Method for Determining Grade of Wool Top, Section 31.301⁶

IWTO-8 Method of Determining Wool Fiber Diameter by the Projection Microscope⁷

IWTO-12 Measurement of the Mean and Distribution of Fibre Diameter Using the Sirolan-Laserscan Fibre Diameter Analyser⁷

3. Terminology

3.1 Definitions:

3.1.1 *average fiber diameter, n*—the arithmetic width of a group of fibers.

3.1.1.1 *Discussion*—In wool and other animal fibers, all animal fibers, regardless of species, can be measured using the Sirolan-Laserscan to determine average fiber diameter.

3.1.2 *grade, n*—in wool and mohair, a numerical designation used in classification of fibers in their raw, semi-processed and processed forms based on average fiber diameter and variation of fiber diameter.

3.1.3 *snippet, n*—a wool or other animal fiber which has been cut to a specified length.

3.1.4 For definitions of other textile terms used in this test method, refer to Terminology D 123.

4. Summary of Test Method

4.1 This test method describes procedures for sampling various forms of wool, the reduction of the sample to small test specimens, and measurement of the diameter of a number of fibers from the test specimens using the Laserscan. Snippets cut from the various forms of wool are cleaned where required, and dispersed in a mixture of isopropanol and water. The suspension of snippets is transported through a measuring cell

⁵ Federal Register, Vol 30, No. 161, Aug. 20, 1965, pp. 10829–10833.

⁶ Federal Register, Vol 33, No. 248, Dec. 21, 1968, pp. 19073–19076.

⁷ International Wool Textile Organization, International Wool Secretariat, Commercial Development Department, Valley Drive, Ilkley, LS298PB, England.

which is positioned in a beam of laser light. The reduction in intensity of the laser beam as the individual snippets pass through the beam of light, approximately 500 μm in diameter, is sensed by a detector and transformed, using a calibration look-up table, into a diameter in micrometres. Each diameter measurement is allocated to a diameter class, and when the specified number of fibers has been measured, the class contents are statistically analysed to produce the mean and standard deviation of fiber diameter for the specimen. Full distribution data are also available in the form of a printed histogram.

5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing of commercial shipments of wool and other animal fibers in raw and sliver form because current estimates of between-laboratory precision are acceptable. In cases of disagreement arising from differences in values reported by the purchaser and the supplier when using this test method for acceptance testing, Test Method D 2130 shall be used as a referee method.

5.2 This test method may be used for determining compliance with average fiber diameter and diameter variation to assign grades when determining conformance of shipments to material specifications given in Specifications D 2252, D 2816, D 3991, and D 3992.

5.3 The procedures for determining mean fiber diameter and standard deviation of fiber diameter provided in this test method and in IWTO Method 12-93 are in essential agreement.

6. Apparatus and Materials

6.1 *Fiber Diameter Analyser*⁷—Fig. 1, consisting of the following:

6.1.1 A means of transporting fiber snippets in an isopropanol/water mixture through a laser beam.

6.1.2 A means of measuring the reduction of light intensity of the beam due to the passage of a snippet and converting this to digital form.

6.1.3 A system for discrimination against the measurement of fibers that do not properly intersect the beam and contaminants such as fiber fragments, dirt, and vegetable matter particles.

6.1.4 A computing system to transform and collate results.

6.2 *Fiber Sectioning Device*—One or more of the following:

6.2.1 *Guillotine*⁸—Fig. 2, having two parallel cutting edges between 1.8 and 2.0 mm apart.

6.2.2 *Minicore*⁸—Fig. 3, a cylindrical sample holder, designed for large samples, in which a sample is manually packed and a coring head which is driven pneumatically into the sample. The sample is compacted by a spring-loaded platen and 6 minicore tubes with 2-mm diameter tips pass through perforations in the platen when the force supplied by the pneumatic cylinder exceeds the force (300 N) from the preloaded spring. At the end of the stroke, the cutting tips have penetrated to within 0.5 mm of the base of the sample holder. The sample collected by the minicore tubes is automatically expelled into a collection device upon retraction of the coring head.

6.2.3 *Heavy-Duty Sectioning Device*⁹—Fig. 4, 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 device is designed to hold a sliver of top or equivalent bulk of fibers.

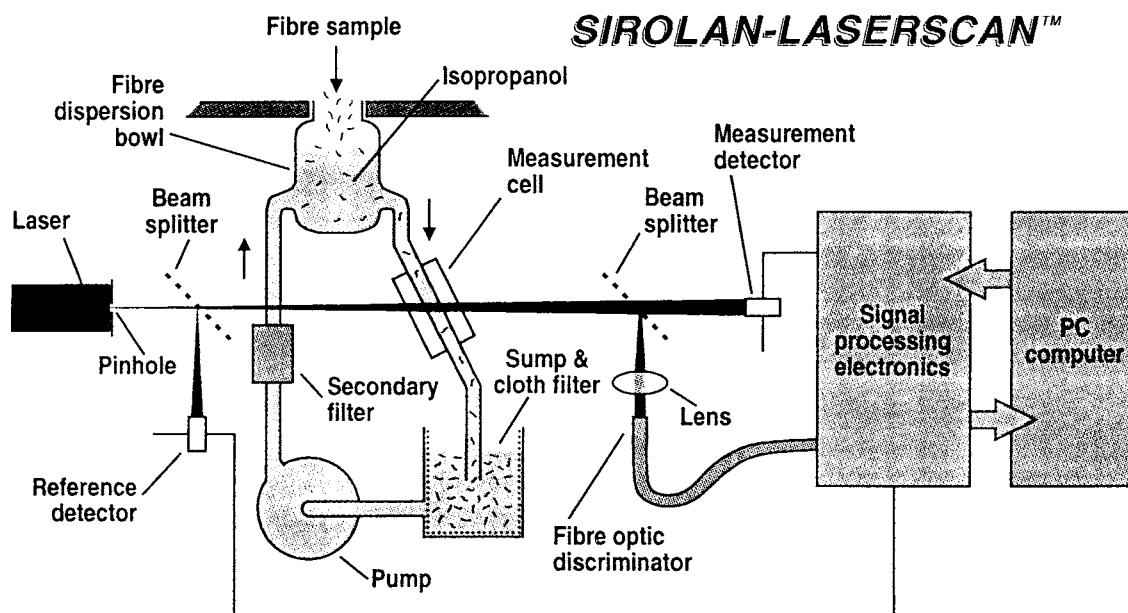


FIG. 1 Block Diagram of Laserscan System

⁸ Sirolan-Laserscan analyser, minicorer, and guillotine obtainable from Loptex S.r.l., Via L. Leoni 20, 2210 0 COMO (Italia). Tel: 39 31 273502; Fax: 39 1 273255.

⁹ Obtainable from MICO Instruments, 1944 Main St., P.O. Box 451, Marshfield Hills, MA 02051-0451.

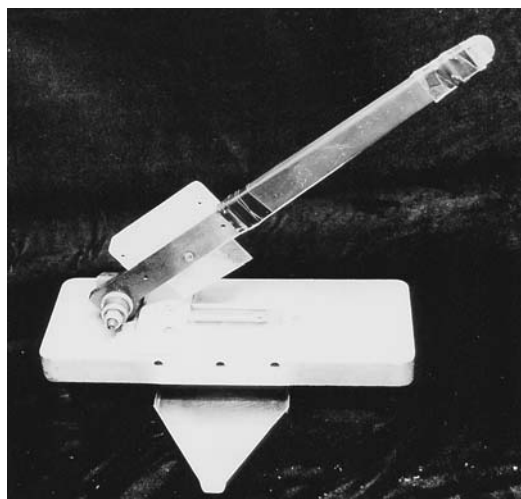


FIG. 2 Guillotine

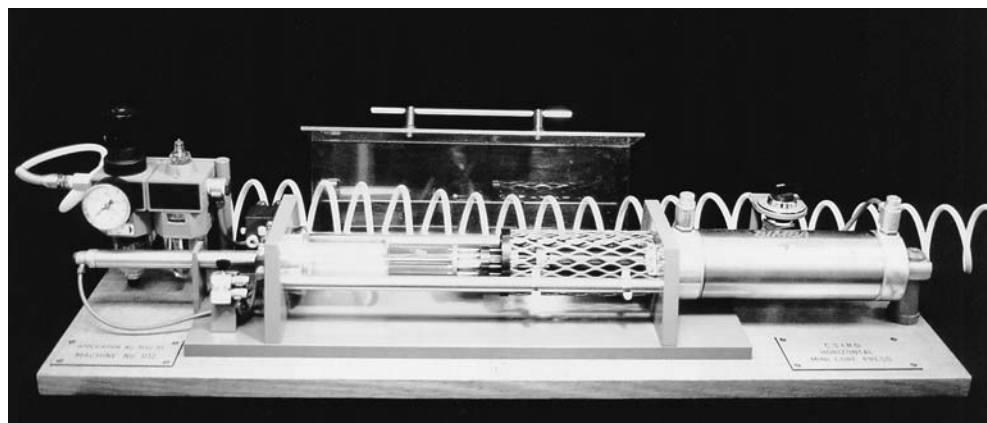


FIG. 3 Minicorer

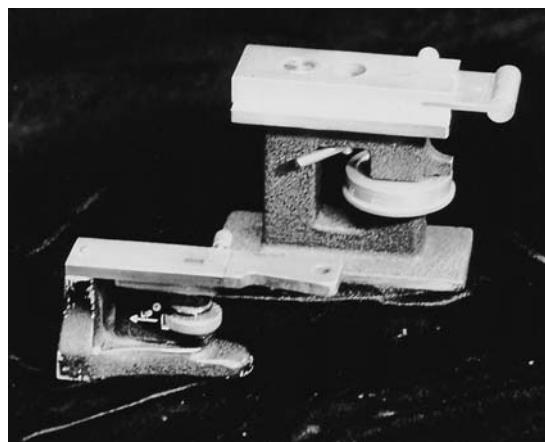


FIG. 4 Heavy Duty Sectioning Device

6.3 *Box for Compressing Loose Fibers*—A box, 300 by 150 by 375 mm deep in inside dimensions, equipped with floating top which has 16 randomly spaced holes 20 mm in diameter over its area. The sample 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 obtain a sample.