



Standard Test Method for Length and Length Uniformity of Cotton Fibers by Fibrograph Measurement¹

This standard is issued under the fixed designation D 1447; 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.

^{ε1} NOTE—Editorial changes were made throughout in February 1994.

1. Scope

1.1 This test method covers the measurement of the length and length uniformity of cotton fibers by use of the Fibrograph. The test method is applicable to fibers taken from raw or partially processed cotton or some types of cotton waste, but not to fibers from blends of cotton with other fibers or to fibers recovered from cotton yarns or fabrics.

1.2 This test method covers procedures for all models of the Digital Fibrograph, hereafter referred to as Fibrograph.

NOTE 1—Instructions for the use of Manual and Servo Fibrograph Models were included in the text of Test Method D 1447 in 1971 and previous editions.

NOTE 2—For other methods covering the measurement of the length of cotton fibers refer to Test Method D 1440.

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 1440 Test Method for Length and Length Distribution of Cotton Fibers (Array Method)²
- D 1441 Practice for Sampling Cotton Fibers for Testing²
- D 3025 Practice for Standardizing Cotton Fiber Test Results by Use of Calibration Cotton Standards²

3. Terminology

3.1 Definitions:

3.1.1 *amount, n*—in cotton length testing with the Fibrograph, *n*—a measure of the thickness, or optical density, of the test beard, proportional to the number of fibers present at various distances from the comb(s).

3.1.2 *fibrogram, n*—in testing cotton fibers for length, the curve representing the second cumulation of the length distribution of the fibers sensed by the length measuring instrument in scanning the fiber board.

3.1.3 *span length (Fibrograph), n*—the distance spanned by a specified percentage of the fibers in the test beard, taking the amount reading at the starting point of the scanning as 100 %.

3.1.4 *test beard, n*—in length testing of cotton, the portion of the test specimen that has been combed and brushed into a “beard” which protrudes from the outside of the comb(s) or the clamp(s).

3.1.5 *test specimen (Fibrograph), n*—the cotton fibers placed randomly on a Fibrograph comb(s) for fiber length measurements.

3.1.6 *uniformity ratio, n*—in cotton length testing with the Fibrograph, the ratio between two span lengths expressed as a percentage of the longer length.

3.1.6.1 *Discussion*—various span lengths and measures of length uniformity may be calculated from the results of the measured points, but the 2.5 and 50 % span lengths and the 50/2.5 uniformity ratio are usually used.

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

4. Summary of Test Method

4.1 Fibers are placed on comb(s) in such a way that they are caught at random points along their lengths to form a beard. The beard is scanned photoelectrically from base to tip, the amount of light passing through the beard being used as a measure of the number of fibers that extend various distances from the comb(s).

4.2 The Fibrograph shows the amount and the length readings from the Fibrogram being sensed on separate dials. The instrument can show percent, the distance spanned by predetermined percentages of the cotton fibers in the beard.

5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing when the levels of the laboratories are controlled by the use of the same reference standard cotton samples because the current estimates of between-laboratory precision are acceptable under these conditions. In case of dispute, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the seller should be determined with each

¹ This test method is under the jurisdiction of ASTM Committee D-13 on Textiles, and is the direct responsibility of Subcommittee D13.11 on Cotton Fibers. Current edition approved June 30, 1989. Published August 1989. Originally published as D 1447 – 55. Last previous edition D 1447 – 83.

² Annual Book of ASTM Standards, Vol 07.01.



FIG. 1 Digital Fibrograph, Model 530

comparison being based on testing randomized specimens from one sample of material.

5.2 Fibrograph measurements provide a relatively fast method for determining the length and length uniformity of the fibers in a sample of cotton in a reproducible manner.

5.3 Results of the Fibrograph length tests do not necessarily agree with those obtained by other methods for measuring lengths of cotton fibers because of the effect of fiber crimp and other factors.

5.4 Fibrograph tests are more objective than commercial staple length classifications and also provide additional information on fiber length uniformity of cotton fibers. The cotton quality information provided by these results is used in research studies and quality surveys, in checking commercial staple length classifications, in assembling bales of cotton into uniform lots, and for other purposes.

5.5 Fibrograph measurements are based on the assumptions that a fiber is caught on the comb in proportion to its length as compared to total length of all fibers in the sample and that the point of catch for a fiber is at random along its length.

6. Apparatus

6.1 *Fibrograph*,³ Digital model, with accessory equipment as shown in Fig. 1.

6.2 *Fibrosampler*, for the preparation of test specimens (optional) as shown in Fig. 2.

7. Sampling

7.1 *Division into Lots*—For acceptance testing purposes, the

purchaser and the supplier shall agree on what material constitutes a lot.

7.2 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping containers directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D 1441.

7.3 *Laboratory Sample*—As a laboratory sample for acceptance testing, select and prepare a 30 to 225 g (1 to 8 oz) subsample from each of the shipping containers in the lot sample, proceeding as directed in Practice D 1441 using either the blended sample procedure or the subsample procedure as agreed between the purchaser and the supplier.

7.4 *Test Specimens*—As directed in Section 10, prepare either two or four specimens from each subsample in the laboratory sample. For acceptance testing, test either two or four specimens from each subsample in the laboratory sample as agreed between the purchaser and the supplier.

8. Preparation and Adjustment of Apparatus

8.1 Set up the Fibrograph and adjust it as directed in the manufacturer's instructions for the model being used.

8.2 Set up and adjust the Fibrosampler as directed in the manufacturer's instructions.

8.3 Before making Fibrograph length tests, allow the instrument to warm up until it is electronically stable, then carefully check it both electronically and mechanically by using the methods listed in 8.3.1-8.3.4 for specific items.

8.3.1 Check the length and sensitivity controls according to the manufacturer's instructions and recommendations for the model being used. Compare the instrument measurement of the length of a card or similar item to its known length to check the

³ Instruments and accessories meeting these requirements may be obtained from Zellweger Uster, Inc., 456 Troy Circle, P. O. Box 51270, Knoxville, TN 37919-1270.