



Standard Test Method for Shrinkage of Textile Fiber Bundle Test¹

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1. Scope

1.1 This test method covers the measurement of the unrestrained shrinkage of a bundle of crimped or uncrimped fibers from exposure to some environment, for instance, boiling water for 15 min.

1.1.1 This test method may be used on fibers from tow and fibers removed from spun or continuous filament yarn.

NOTE 1—For measurement of shrinkage of single fibers, refer to Test Method D 5104.

1.2 The values stated in either inch-pound or SI units are to be regarded separately as the standard. The values stated in each system are not exact equivalents, therefore, each system must be used independently of the other.

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 1577 Test Methods for Linear Density of Textile Fibers²

D 1776 Practice for Conditioning Textiles for Testing²

D 2258 Practice for Sampling Yarn for Testing²

D 3333 Practice for Sampling Man-Made Staple Fibers, Sliver, or Tow for Testing²

D 5104 Test Method for Shrinkage for Textile Fibers (Single-Fiber Test)³

3. Terminology

3.1 *Definitions:*

3.1.1 *shrinkage, n*—a decrease in one or more dimensions of an object or material.

3.1.1.1 *Discussion*—In this method, shrinkage means a decrease in length. The shrinkage is calculated as a percentage of the original specimen length. In some cases, there is an increase in length rather than a decrease. This is referred to as

a negative shrinkage or stretch.

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

4. Summary of Test Method

4.1 A uniform bundle of conditioned parallel fibers is lightly loaded between clamps and the nip to nip length measured. Without being removed from the clamps, the bundle specimen is then exposed to the test environment, typically, boiling water for 15 min. After reconditioning, the bundle length is remeasured under the same light loading.

NOTE 2—Due to the very high variability of the shrinkage of individual fibers of high shrinkage types, to obtain a reliable average value would require an excessive number of determinations, each rather tedious. The bundle method does not give the true average value, but rather a weighted value approaching the highest shrinkage fiber in the bundle. Since the weighted value more closely approximates the properties found in a high bulk yarn made from such fibers, the weighted value would seem to be more appropriate.

5. Significance and Use

5.1 Limited accuracy in measuring the change in length produces errors in estimating values for shrinkage below 10 %. However, this test is being used for low level shrinkage fibers because the results give have been found to give an adequate indication of average shrinkage at the lower levels. The test is not adequate for determining variability in average shrinkage at low levels.

5.2 This test method for testing the shrinkage of fibers is not recommended for acceptance testing of commercial shipments of fibers because only a limited amount of data is available. See Section 14.

5.2.1 In case of dispute arising from differences in reported test results when using this test method for acceptance testing of commercial shipments, the purchaser and supplier should conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of samples that are as homogeneous as possible and that are from a lot of material of the type in question. These samples should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using appropriate statistical analysis and an acceptable probability level chosen by the two parties before testing is begun. If a bias is found, either the cause must be found and

¹ This test method is under the jurisdiction of the ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.57 on Fiber Test Methods, General.

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² *Annual Book of ASTM Standards*, Vol 07.01.

³ *Annual Book of ASTM Standards*, Vol 07.02.