



Designation: D 2102 – 02

## Standard Test Method for Shrinkage of Textile Fibers (Bundle Test)<sup>1</sup>

This standard is issued under the fixed designation D 2102; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 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 Textiles<sup>2</sup>
- D 1577 Test Methods for Linear Density of Textile Fibers<sup>2</sup>
- D 1776 Practice for Conditioning and Testing Textiles<sup>2</sup>
- D 2258 Practice for Sampling Yarn for Testing<sup>2</sup>
- D 3333 Practice for Sampling Manufactured Staple Fibers, Sliver, or Tow for Testing<sup>3</sup>
- D 4849 Terminology Relating to Fibers and Yarns<sup>3</sup>
- D 5104 Test Method for Shrinkage for Textile Fibers (Single-Fiber Test)<sup>3</sup>

### 3. Terminology

#### 3.1 Definitions:

<sup>1</sup> This test method is under the jurisdiction of the ASTM Committee D13 on Textiles and is the direct responsibility of Subcommittee D13.58 on Yarn Test Methods, General.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 07.01.

<sup>3</sup> Annual Book of ASTM Standards, Vol 07.02.

3.1.1 For the definition of shrinkage used in this test method, refer to Terminology D 4849. For other textile terms used in this test method, refer to Terminology D 123 and Terminology D 4849.

### 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. If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, use the samples for such a comparative tests that are as homogeneous as possible, drawn from the same lot of material as the samples that resulted in disparate results during initial testing and randomly assigned in equal numbers to each laboratory. The test results from the laboratories involved should be compared using a statistical test for unpaired data, a probability level chosen prior to the testing series. If a bias is found, either its cause must be found and corrected, or future test results for that material must be adjusted in consideration of the known bias.