



Standard Test Method for Bulk Properties of Textured Yarns¹

This standard is issued under the fixed designation D 4031; 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 the measurement of the change in length of a tensioned skein of textured yarn due to change in crimp characteristics brought about by exposure to wet or dry heat. The change in length, depending on procedure, is a measure of skein shrinkage, crimp contraction, bulk shrinkage, or crimp recovery.

1.2 This test method applies to crimped, continuous multifilament yarns ranging from 1.7 to 88.9 tex (15 to 800 denier).

1.3 Three conditions are provided for crimp development mediums, and loading routines are provided to be used on the yarn skeins to allow determination of yarn bulk by several different procedures.

1.4 The values stated in either SI units or inch-pound units are to be regarded as standard. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalent; therefore, each system shall be used independently of the other. Combining values from the two systems may result in nonconformance with the specification.

1.5 *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 1059 Test Method for Yarn Number Based on Short-Length Specimens²

D 1776 Practice for Conditioning and Testing Textiles²

D 1907 Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method²

D 2258 Practice for Sampling Yarn for Testing²

3. Terminology

3.1 Definitions:

3.1.1 *bulk shrinkage, n*—a measure of potential stretch and power of stretch yarns or a measure of bulk of textured-set yarns.

3.1.2 *crimp contraction, n*—an indicator of crimp capacity or a characterization of a yarn's ability to contract under tension.

3.1.3 *crimp development medium, n*—for testing of textured yarn, an environment that allows the temporary set of fiber crimp to be overcome and that allows the filaments to assume their permanently set configuration.

3.1.4 *crimp recovery, n*—a measure of the ability of a yarn to return to its original crimped state after being subjected to tension.

3.1.5 *skein shrinkage, n*—a measure of true or intrinsic yarn shrinkage not including crimp contraction.

3.1.6 For definitions of other textile terms used in these methods, refer to Terminology D 123.

4. Summary of Test Method

4.1 A skein of yarn of a prescribed size (linear density) is subjected to a crimp development medium using a specified loading routine. As the crimp is developed or shrinkage occurs in the yarn, the skein changes in length. The lengths of the skein under specified tension forces are used to calculate the value of bulk shrinkage, crimp contraction, skein shrinkage, or crimp recovery.

4.2 The test method offers three options for loading routine of the yarn skeins. Loading routines consist of using low-tension forces (light loads of 0.04 to 0.98 mN/tex (0.5 to 11 mgf/den)) that extend without removing crimp, and high-tension forces (heavy loads of 8.8 mN/tex (100 mgf/den)) that remove crimp without elongating the yarn. A list of weights to be used is given in Table 1. Weight option combinations are detailed in Table 2.

5. Significance and Use

5.1 The values obtained by this test method should not be used to predict similar properties in fabricated structures except in narrow well-defined comparisons, such as 16.7 tex (150-denier) polyester from the same feed yarn merge and textured on the same machine type. Attempts to relate yarn performance to fabric performance might result in poor correlations unless other factors affecting bulk such as yarn shrinkage and fabric finishing are eliminated.

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

Current edition approved Sept. 10, 2001. Published December 2001.. Originally published as D 4031 – 81. Last previous edition D 4031 – 95a.

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