



Designation: D 2594 – 99a

Standard Test Method for Stretch Properties of Knitted Fabrics Having Low Power¹

This standard is issued under the fixed designation D 2594; 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 fabric stretch and fabric growth of knitted fabrics intended for applications requiring low-power stretch properties.

1.2 This test method includes procedures for fabric growth and stretch and can be used individually when required by individual specifications.

1.3 This test method is not applicable to fabrics intended for support or other applications requiring high-power stretch properties.

NOTE 1—For information on testing high-power stretch fabrics, refer to Test Method D 1775.

1.4 The values stated in either SI or inch-pound units are to be regarded separately as the standard. Within the text, the inch-pound units are shown in parentheses. The values stated in each system are not exact equivalents; 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 1775 Test Method for Tension and Elongation of Wide Elastic Fabrics²

D 1776 Practice for Conditioning and Testing Textiles²

D 2904 Practice for Interlaboratory Testing of a Textile Test Method That Produces Normally Distributed Data²

D 2906 Practice for Statements on Precision and Bias for Textiles²

¹ This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.59 on Fabric Test Methods, General.

Current edition approved Dec. 10, 1999. Published January 2000. Originally published as D 2594 – 69 T. Discontinued November 1997 and reinstated as D 2594 – 99. Last previous edition D 2594 – 99

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

D 4848 Terminology of Force, Deformation, and Related Properties of Textiles³

3. Terminology

3.1 Definitions:

3.1.1 *bench marks, n*—marks placed on a specimen to define gage length, that is, the portion of the specimen that will be evaluated in a specific test.

3.1.2 *fabric stretch, n*—the increase in length of a specimen of fabric resulting from a tension force applied under specified conditions.

3.1.2.1 *Discussion*—The difference usually is expressed as a percentage of the initial length of the fabric specimen. Fabric stretch differs from fabric elongation in that the latter (up to the point of rupture) reflects the instantaneously existing amount of stretch under a constantly increasing tension force.

3.1.3 *fabric growth, n*—the difference between the original length of a specimen and its length after the application of a specified tension for a prescribed time and the subsequent removal of the tension.

3.1.3.1 *Discussion*—Fabric growth usually is expressed as a percentage of the length of the specimen prior to application of the tension (see also *permanent deformation*).

3.1.4 *low-power stretch, n*—that property of a fabric whereby it exhibits high fabric stretch and good recovery from low tension.

3.1.5 *tension, n*—a uniaxial force tending to cause the extension of a body or the balancing force within that body resisting the extension

3.1.6 For definitions of other textile terms used in this test method, refer to Terminologies D 123 and D 4848.

4. Summary of Test Method

4.1 *Fabric Growth*—Bench marks of a known distance are made on a fabric specimen. A specified tension is applied to a fabric specimen by a prescribed cycling technique. The tension is removed and after several specific recovery times under zero tension, the distance between the bench marks is remeasured after each time interval. The fabric growth is calculated from

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

the length difference between the bench marks prior to application of the tension and after each respective recovery time interval.

4.2 *Fabric Stretch*—Bench marks of a known distance are made on a fabric specimen. A specified tension is applied to a fabric specimen by a prescribed cycling technique and the resulting distance between the bench marks measured. The fabric stretch is calculated from the length difference between the bench marks prior to application of the tension and under while under the tension.

5. Significance and Use

5.1 This test method specifies test conditions for measuring the fabric growth and fabric stretch of knitted fabrics intended for use in swimwear, anchored slacks, and other form-fitting apparel (also commonly known as semi-support apparel) applications, as well as test conditions for measuring the fabric growth of knitted fabrics intended for use in sportswear and other loose-fitting apparel (also commonly known as comfort stretch apparel) applications. The applicability of this test method to the measurement of fabric growth and fabric stretch of knitted fabrics intended for use in slacks, sport coats, and suits has not been determined.

5.2 This test method is not recommended for acceptance testing of commercial shipment because the between-laboratory precision is known to be poor.

5.2.1 If there are differences or 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, the test samples should be used that are as homogeneous as possible, that are drawn from the material from which the disparate test results are obtained, and that are assigned randomly in equal numbers to each laboratory for testing. Other materials with established test values may be used for this purpose. The test results from the two laboratories should be compared using a statistical test for unpaired data, at 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 must be adjusted in consideration of the known bias.

6. Apparatus

6.1 *Frame*⁴, suitable for supporting the hanger assembly illustrated in Fig. 1 and tension forces applied during testing.

6.2 *Hanger Assembly*⁴, consisting of hangers, hanger rods, and chain.

6.3 *Lightweight Rule*⁴, fitted with a pin hook at the zero point of the scale for attachment to the specimen, graduated either in units of percent of original gage length of 125 mm (5 in.) or in units of 1 mm ($\frac{1}{16}$ in.).

6.4 *Tensiometer or Weights*⁴, that can be attached to the bottom hanger of the hanger assembly, capable of providing total tensions of 2.27 kgf (5 lbf) and 4.54 kgf (10 lbf) to the specimen, $\pm 1\%$.

6.5 *Turnbuckle*⁴, or equivalent, having a length of 25 to 75 mm (1 to 3 in.).

6.6 *Sanforized Marker*, to establish bench marks on the specimen.

6.7 *Timer*, with increments of at least 1 min.

7. Sampling and Test Specs

7.1 *Primary Sampling Unit*—Consider rolls of fabric or fabric components of fabricated systems to be the primary sampling unit, as applicable.

7.2 *Laboratory Sampling Unit*—As a laboratory sampling unit take from rolls at least one full-width piece of fabric that is 2 m (2 yd) in length along the selvage (machine direction), after removing a first 1 mm (1 yd) length. For fabric components of fabricated systems use the entire system.

7.3 *Test Specimens*—From each laboratory sampling unit, cut 5 wale-wise (lengthwise) and 5 course-wise (widthwise) test specimens 125 ± 3 mm (5 ± 0.1 in.) by 500 ± 10 mm (15.5 ± 0.3 in.). Cut the long dimension of the wale-wise specimens parallel to the wale direction and the course-wise specimens parallel to the course direction. Take specimens representing a broad distribution from different positions diagonally across the width of the laboratory sampling unit. Consider the long direction as the direction of test. Label to maintain specimen identity.

⁴ This equipment is available commercially.

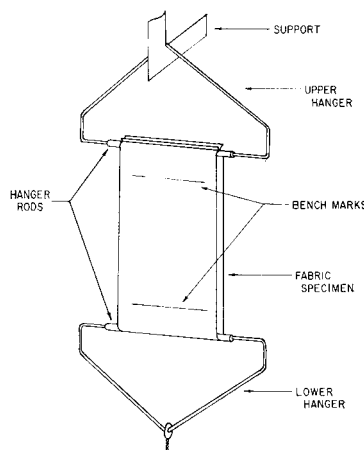


FIG. 1 Hanger Assembly