



Standard Test Method for Tensile Properties of Yarns by the Single-Strand Method¹

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1. Scope

1.1 This test method covers the determination of tensile properties of monofilament, multifilament, and spun yarns, either single, plied, or cabled with the exception of yarns that stretch more than 5.0 % when tension is increased from 0.05 to 1.0 cN/tex (0.5 to 1.0 gf/tex).

1.2 This test method covers the measurement of breaking force and elongation of yarns and includes directions for the calculation of breaking tenacity, initial modulus, chord modulus, and breaking toughness.

1.2.1 Options are included for the testing of specimens in: (A) straight, (B) knotted, and (C) looped form.

1.2.2 Conditions of test are included for the testing of specimens that are: (1) conditioned air, (2) wet, not immersed, (3) wet, immersed, (4) oven-dried, (5) exposed to elevated temperature, or (6) exposed to low temperature.

NOTE 1—Special methods for testing yarns made from specific fibers; namely, glass, flax, hemp, ramie, and kraft paper and for specific products; namely, tire cords and rope, have been published: Test Method D 885, and Specification D 578.

NOTE 2—For directions covering the determination of breaking force of yarn by the skein method refer to Test Method D 1578.

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 76 Specifications for Tensile Testing Machines for Textiles²

D 123 Terminology Relating to Textiles²

D 578 Specification for Glass Fiber Yarns²

D 885 Test Methods for Tire Cords, Tire Cord Fabrics, and Industrial Filament Yarns Made from Manufactured Organic-Base Fibers²

D 1578 Test Method for Breaking Strength of Yarn in Skein Form²

D 1776 Practice for Conditioning and Testing Textiles²

D 2258 Practice for Sampling Yarn for Testing²

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

D 3822 Test Method for Tensile Properties of Single Textile Fibers³

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

D 4849 Terminology Relating to Yarns and Fibers³

E 178 Practice for Dealing with Outlying Observations⁴

3. Terminology

3.1 Definitions:

3.1.1 Refer to Terminology D 4848 for definitions of the following terms used in this standard: breaking force, breaking strength, breaking tenacity, breaking toughness, chord modulus, elongation, elongation at break, elongation at rupture, initial modulus, knot-breaking force, knot breaking strength, linear density, loop breaking force, loop-breaking strength, single-strand breaking force, single-strand breaking strength, strength and tenacity.

3.1.2 Refer to Terminology D 123 and Terminology D 4849 and for definitions of other terms used in this standard.

4. Summary of Test Method

4.1 Single-strand yarn specimens are broken on a tension testing machine at a predetermined elongation rate and the breaking force and the elongation at break are determined. Elongation at a specified force or the force or tenacity at a specified elongation may also be obtained. Breaking force, breaking tenacity, elongation, initial and chord modulus, and breaking toughness of the test specimen, in terms of linear density, may be calculated from machine scales, dials, recording charts, or by an interfaced computer.

4.2 This test method offers the following three physical configurations of the specimen:

4.2.1 *Configuration A*, straight.

4.2.2 *Configuration B*, knotted.

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.

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² Annual Book of ASTM Standards, Vol 07.01.

³ Annual Book of ASTM Standards, Vol 07.02.

⁴ Annual Book of ASTM Standards, Vol 14.02.