



## Standard Test Method for Breaking Strength of Yarn in Skein Form<sup>1</sup>

This standard is issued under the fixed designation D 1578; 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 determination of the breaking strength of yarn in skein form. The observed breaking strength is expressed in units of force, and equations are provided to convert breaking strength to skein breaking tenacity and to skein break factor.

NOTE 1—For the determination of the breaking strength and elongation of yarn by the single strand method, refer to Test Method D 2256.

1.2 This test method is applicable to spun yarns, either single or plied, composed of any fiber or blend of fibers, but is not suitable for yarns which stretch more than 5 % when the tension is increased from 2.5 to 7.5 mN/tex or 0.03 to 0.08 gf/denier.

1.3 This test method provides three options based on the perimeter of the reel, the number of wraps in the skein, and the machine speed or time-to-break.

1.3.1 *Option 1*—Eighty, forty, or twenty turns on a 1.50-m or 1.5-yd reel, broken at 300 mm/min or 12 in./min.

1.3.2 *Option 2*—Fifty turns on a 1.00-m or 1-yd reel, broken at 300 mm/min or 12 in./min.

1.3.3 *Option 3*—Fifty turns on a 1-m reel, broken in 20 s.

NOTE 2—Option 1 is in general use in the United States, Option 2 is used for woolen yarns, and Option 3 has been proposed in the International Standards Organization (ISO) for international use.

NOTE 3—Metric reels are available with 1 and 1.125-m circumferences. Data from the two reels will be about 1 % different (see 5.6). ISO uses a 1-m circumference reel.

1.4 This test method is frequently combined with the determination of linear density carried out on the same skeins. Special precautions for reeling such skeins are noted.

1.5 Where appropriate, this test method states all requirements in SI units. The traditional units are inch-pound and are exact values.

1.6 *This standard does not purport to address all of the safety problems, 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 Specification for Tensile Testing Machines for Textiles<sup>2</sup>

D 123 Terminology Relating to Textiles<sup>2</sup>

D 1776 Practice for Conditioning Textiles for Testing<sup>2</sup>

D 1907 Test Method for Yarn Number by the Skein Method<sup>2</sup>

D 2256 Test Method for Tensile Properties of Yarns by the Single-Strand Method<sup>2</sup>

D 2258 Practice for Sampling Yarn for Testing<sup>2</sup>

D 2904 Practice for Interlaboratory Testing of a Textile Test Method that Produces Normally Distributed Data<sup>2</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *breaking force, n*—the maximum force applied to a material in a tensile test carried to rupture.

3.1.1.1 *Discussion*—Force is commonly expressed as millinewtons (mN), newtons (N), grams-force (gf), or pounds-force (lbf).

3.1.2 *force, n*—a physical influence exerted by one body on another which produces acceleration of bodies that are free to move and deformation of bodies that are not free to move. (Compare *strength*).

3.1.3 *skein break factor, n*—the comparative breaking strength of a skein of yarn adjusted for the linear density of the yarn expressed in an indirect system; the product of the breaking strength of the skein and the yarn number expressed in an indirect system. (Syn. count-strength product)

3.1.3.1 *Discussion*—A statement of the break factor of the skein must indicate the number of wraps in the skein if this is not otherwise apparent; without information on the number of wraps, a statement of the break factor is meaningless. Break factor is frequently given other designations such as lea count constant, lea product, and breaking ratio.

3.1.4 *skein, n*—a continuous strand of yarn in the form of a flexible coil having a large circumference in proportion to its thickness.

3.1.5 *skein breaking tenacity, n*—the skein breaking strength divided by the product of the yarn number in a direct numbering system and the number of strands placed under tension.

<sup>1</sup> This test method is under the jurisdiction of ASTM Committee D-13 on Textiles and is the direct responsibility of Subcommittee D13.58 on Yarn Test Methods, General.

Current edition approved July 15, 1993. Published September 1993. Originally published as D 1578 – 58 T. Last previous edition D 1578 – 88.

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