



Designation: D 3217 – 01

Standard Test Methods for Breaking Tenacity of Manufactured Textile Fibers in Loop or Knot Configurations¹

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1. Scope

1.1 These test methods cover the measurement of the breaking tenacity of manufactured textile fibers taken from filament yarns, staple, or tow fiber, either crimped or uncrimped, and tested in either a double loop or as a strand formed into a single overhand knot.

1.2 Methods for measuring the breaking tenacity of conditioned and wet (immersed) fibers in loop and knot form are included.

1.3 Elongation in loop or knot tests has no known significance, and is usually not recorded.

1.4 The basic distinction between the procedures described in these test methods and those included in Test Methods D 2101 is the configuration of the specimen, that is, either as a double loop or in the configuration of a single overhand knot.

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 76 Specification for Tensile Testing Machines for Textiles²

D 123 Terminology Relating to Textiles²

D 1577 Test Methods for Linear Density of Textile Fibers²

D 1776 Practice for Conditioning and Testing Textiles²

D 2258 Practice for Sampling Yarn for Testing²

D 3333 Practice for Sampling Man-Made Staple Fibers, Sliver, or Tow for Testing³

D 3822 Test Method for Tensile Properties of Single Textile Fibers³

D 4848 Terminology of Force and Related Properties³

3. Terminology

3.1 Definitions:

¹ These test methods are under the jurisdiction of ASTM Committee D13 on Textiles and are the direct responsibility of Subcommittee D13.58 on Yarn and Fiber Test Methods.

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

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

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

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

3.1.2 *breaking tenacity, n*—the tenacity at the breaking force.

3.1.2.1 *Discussion*—Breaking tenacity is commonly expressed as grams-force per tex (gf/tex), grams-force per denier (gf/den), millinewtons per tex (mN/tex), or grams-force per denier (gf/den). Millinewtons are numerically equal to grams-force times 9.81.

3.1.2.2 *Discussion*—The breaking tenacity is calculated from the breaking force and the linear density of the unstrained specimen, or obtained directly from tensile testing machines which can be suitably adjusted to indicate tenacity instead of breaking force, for specimens of known linear density.

3.1.3 *linear density, n*—mass per unit length.

3.1.3.1 *Discussion*—The preferred units of measurement are grams and metres, or multiples or submultiples of these. The tex unit, grams per kilometre, is recommended for yarns.

3.1.4 *manufactured staple fiber, n*—fiber of spinnable length manufactured directly or by cutting filaments.

3.1.4.1 *Discussion*—Man-made staple fiber does not include cut waste.

3.1.5 *tenacity, n—in a tensile test*, the force exerted on the specimen based on the linear density of the unstrained material.

3.1.5.1 *Discussion*—Tenacity is commonly expressed as grams-force per tex (gf/tex), grams-force per denier (gf/den), millinewtons per tex (mN/tex), or grams-force per denier (gf/den).

3.1.6 For definitions of other textile terms used in these test methods, refer to Terminology D 123. For definitions of other terms related to force and deformation in textiles, refer to Terminology D 4848.

4. Summary of Test Methods

4.1 Single-fiber specimens in the form of a loop as described in 9.4.1 are broken on a constant-rate-of-extension type testing machine at a predetermined rate of elongation and the breaking force is determined.

4.2 Single-fiber specimens in the form of a knot as described in 9.4.2 are broken on a constant-rate-of-extension type testing machine at a predetermined rate of elongation, and the