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Standard Terminology Related to Yarns and Fibers¹

This standard is issued under the fixed designation D4849; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

^{ε1} NOTE—Terms were added editorially in September 2014.

^{ε2} NOTE—A definition for “shrinkage” was added editorially in September 2016.

^{ε3} NOTE—Terms were added editorially in August 2017.

1. Scope

1.1 This standard is a compilation of terminology developed by Committee D13.58 on Yarns and Fibers.

1.1.1 This terminology, mostly definitions, is unique to fibers and yarns used in the textile industry. Terms that are generally understood or adequately defined in other readily available sources are not included.

1.1.2 Subcommittee D13.58 has jurisdictional responsibility for every item in this standard. The standards in which the terms and definitions are used are listed by number after the definition. The wording of an entry cannot be changed without the approval of D13.58 subcommittee. Any changes approved by the subcommittee and main committee are then directed to subcommittee D13.92 on Terminology for subsequent changes or additions to Terminology **D123**.

1.1.3 This terminology standard is not all inclusive of the terms under the jurisdiction of Subcommittee D13.58. Other terminology standards under the jurisdiction of Subcommittee D13.58 are **D3888**, **D4466**, and **D4848**.

1.2 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

D76 Specification for Tensile Testing Machines for Textiles

D123 Terminology Relating to Textiles

D861 Practice for Use of the Tex System to Designate Linear Density of Fibers, Yarn Intermediates, and Yarns

D204 Test Methods for Sewing Threads

D1059 Test Method for Yarn Number Based on Short-Length Specimens

D1230 Test Method for Flammability of Apparel Textiles

D1244 Practice for Designation of Yarn Construction

D1422 Test Method for Twist in Single Spun Yarns by the Untwist-Retwist Method

D1423 Test Method for Twist in Yarns by Direct-Counting

D1425 Test Method for Unevenness of Textile Strands Using Capacitance Testing Equipment

D1577 Test Methods for Linear Density of Textile Fibers

D1578 Test Method for Breaking Strength of Yarn in Skein Form

D1907 Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method

D2102 Test Method for Shrinkage of Textile Fibers (Bundle Test)

D2255 Test Method for Grading Spun Yarns for Appearance

D2258 Practice for Sampling Yarn for Testing

D2259 Test Method for Shrinkage of Yarns

D2260 Tables of Conversion Factors and Equivalent Yarn Numbers Measured in Various Numbering Systems

D2402 Test Method for Water Retention of Textile Fibers (Centrifuge Procedure)

D2612 Test Method for Fiber Cohesion in Sliver and Top (Static Tests)

¹ This terminology is under the jurisdiction of ASTM Committee **D13** on Textiles and is the direct responsibility of Subcommittee **D13.58** on Yarns and Fibers.

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

D2494 Test Method for Commercial Mass of a Shipment of Yarn or Manufactured Staple Fiber or Tow
 D2645 Tolerances for Yarns Spun on the Cotton or Worsted Systems
 D2644 Tolerances for Yarns Spun on the Woolen System
 D3106 Test Method for Permanent Deformation of Elastomeric Yarns
 D3108 Test Method for Coefficient of Friction, Yarn to Solid Material
 D3128 Specification for 2-Methoxyethanol
 D3217 Test Methods for Breaking Tenacity of Manufactured Textile Fibers in Loop or Knot Configurations
 D3218 Specification for Polyolefin Monofilaments
 D3333 Practice for Sampling Manufactured Staple Fibers, Sliver, or Tow for Testing
 D3334 Test Method for Fabrics Woven from Polyolefin Monofilaments (Withdrawn 1989)³
 D3412 Test Method for Coefficient of Friction, Yarn to Yarn
 D3513 Test Method for Overlength Fiber Content of Manufactured Staple Fiber
 D3693 Specification for Labeled Length per Holder of Sewing Thread
 D3822 Test Method for Tensile Properties of Single Textile Fibers
 D3823 Practice for Determining Ticket Numbers for Sewing Threads
 D3888 Terminology for Yarn Spinning Systems
 D3937 Test Method for Crimp Frequency of Manufactured Staple Fibers
 D3990 Terminology Relating to Fabric Defects
 D4031 Test Method for Bulk Properties of Textured Yarns
 D4120 Test Method for Fiber Cohesion in Roving, Sliver, and Top in Dynamic Tests
 D4238 Test Method for Electrostatic Propensity of Textiles (Withdrawn 1996)³
 D4466 Terminology Related to Multicomponent Textile Fibers
 D4724 Test Method for Entanglements in Untwisted Filament Yarns by Needle Insertion
 D4848 Terminology Related to Force, Deformation and Related Properties of Textiles
 D4849 Terminology Related to Yarns and Fibers
 D4911 Tolerances for Yarns Made of Man-Made Fibers and Spun on the Parallel Worsted or Modified Worsted System (Withdrawn 2000)³
 D5103 Test Method for Length and Length Distribution of Manufactured Staple Fibers (Single-Fiber Test)
 D5104 Test Method for Shrinkage of Textile Fibers (Single-Fiber Test)
 D5332 Test Method for Fiber Length and Length Distribution of Cotton Fibers (Withdrawn 2006)³
 D5344 Test Method for Extension Force of Partially Oriented Yarn
 D5647 Guide for Measuring Hairiness of Yarns by the Photo-Electric Apparatus
 D6197 Test Method for Classifying and Counting Faults in Spun Yarns in Electronic Tests
 D6587 Test Method for Yarn Number Using Automatic Tester
 D6612 Test Method for Yarn Number and Yarn Number Variability Using Automated Tester
 D6774 Test Method for Crimp and Shrinkage Properties for Textured Yarns Using a Dynamic Textured Yarn Tester

3. Terminology

3.1 Alphabetical listings of terms with subcommittee 13.58 jurisdiction and attribution for each term.

American grain count, *n*—a direct yarn numbering system for expressing linear density, equal to the mass in grains per 120 yards of sliver or roving. **D2260**

bad/good test (%BGT), *n*—an index value which shows the total spread, or greatest variation, for the test; mathematically, the difference between the highest and lowest mass readings determined in the test, expressed as a percentage of the average mass. **D6612**

beam, *n*—*in textiles*, a large spool containing many ends of yarn wound parallel, and used for such purposes as weaving or warp knitting. **D2258**

beam set, *n*—*in textiles*, one or more beams of yarn in a single shipment to be further processed together for a specific end use. **D2258**

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. **D76**

boundary friction, *n*—friction at low sliding speeds (0.02 m/min or less) where lubrication occurs under thin-film lubricant conditions. **D3412**

³ The last approved version of this historical standard is referenced on www.astm.org.

- broken filament**, *n*—*in multifilament yarn*, breaks in one or more filaments. **D3990**
- bulk sample**, *n*—*in the sampling of bulk material*, one or more portions which (1) are taken from material that does not consist of separately identifiable units and (2) can be identified after sampling as separate or composited units. **D2258**
- bulk shrinkage**, *n*—a measure of potential stretch and power of stretch yarns or a measure of bulk of textured-set yarns. **D4031**
- bunch**, *n*—a defect in a yarn characterized by a segment not over 6 mm (¼ in.) in length that shows an abrupt increase in diameter caused by more fibers matted in this particular place. (See **slug**, **slub**.) **D2255**
- cable twist**, *n*—the construction of cabled yarn, cord, or rope in which each successive twist is in the opposite direction to the preceding twist; an S/Z/S or Z/S/Z construction. **D1423**
- calibrate**, *v*—to determine and record the relationship between a set of standard units of measure and the output of an instrument or test procedure.

DISCUSSION—

This term is also commonly used to describe the checking of previously marked instruments, an operation more properly described as a description of verification. **D76**

- capacity**, *n*—*for tensile testing machines*, the maximum force for which the machine is designed.

DISCUSSION—

Capacity is the maximum force the tester-frame and the drive system can exercise on the specimen without inadmissible deformations of the tester-frame, etc. Within its capacity, there are available load-cells with different full-scale ranges which may be chosen to select an appropriate full-scale range for a special test. **D76**

- case**, *n*—*in textiles*, a shipping unit, usually a carton, box, bale, or other container holding a number of yarn packages. **D2258**
- clamp**, *n*—that part of a testing machine used to grip the specimen by means of suitable jaws. **D76**
- cockles**, *n*—*in yarns*, irregular, thick, uneven lumps. **D2255**
- coefficient of friction**, *n*—the ratio of the tangential force that is needed to maintain uniform relative motion between two contacting surfaces to the perpendicular force holding them in contact. **D3108, D3412**
- coefficient of variation unevenness**, *n*—*in textiles*, the standard deviation of the linear densities over which unevenness is measured expressed as a percentage of the average linear density for the total length within which unevenness is measured. (See also **unevenness** and **mean deviation unevenness**.) **D1425**
- cohesive force**, *n*—*in a textile strand*, the force required to overcome fiber cohesion as the strand is being reduced in linear density.

DISCUSSION—

In dynamic tests, cohesive force is the force required to maintain drafting in a roving, silver, or top. In static tests, cohesive force is measured while a test specimen is held in a fixed position between two slowly separating clamps. **D2612, D4120**

- colorfastness**, *n*—the resistance of a material to change in any of its color characteristics, to transfer its colorant(s) to adjacent materials, or both, as the result of exposure of the material to any real or simulated environment that might be encountered during processing, storage, use or testing of the material. **D204**
- commercial allowance**, *n*—an arbitrary value equal to the commercial moisture regain plus a specified allowance for finish, used with the mass of scoured, oven-dried yarn, to compute (1) yarn linear density, (2) the commercial or legal mass of a shipment or delivery of any specific textile material (see also **commercial moisture regain**) or (3) the mass of a specific component in the analysis of fiber blends **D1907, D2494**
- commercial mass**, *n*—billed mass as determined by a generally accepted method or as agreed upon between the purchaser and supplier.

DISCUSSION—

The basis for determining the commercial mass of a shipment of yarn or manufactured fibers is generally one of the following: (1) *CAS Basis (commercial allowance with scoured material)*—the mass of oven-dry fiber or yarn after scouring by definite prescribed methods plus the mass corresponding to its *commercial allowance*, (2) *CMRS Basis (commercial moisture regain with scoured material)*—the mass of oven-dry fiber or yarn

after scouring by definite prescribed methods plus the mass corresponding to its *commercial moisture regain*. (3) *CMRU Basis (commercial regain with unscoured material)*—the mass of unscoured oven-dry fiber or yarn plus the mass corresponding to its *commercial regain*. (4) *UN Basis (unadjusted net)*—the mass of the unscoured fiber or yarn with no adjustment for the amount of moisture or finish, or both. **D2494**

component, n—as used with textile fiber polymers, a polymer with distinguishable properties. **D4466**

cone, n—in textiles, (1) a yarn holder or bobbin of conical shape used as a core for a yarn package of conical form, also called a cone core. (2) the yarn package obtained when yarn is wound upon a cone core. **D2258**

constant-rate-of-extension type tensile testing machine (CRE), n—in tensile testing, an apparatus in which the pulling clamp moves at a uniform rate, and the force-measuring mechanism moves a negligible distance with increasing force, less than 0.13 mm (0.005 in.) **D76**

constant-rate-of-load tensile testing machine (CRL), n—in tensile testing, an apparatus in which the rate of increase of the force is uniform with time after the first 3 s and the specimen is free to elongate, this elongation dependent on the extension characteristics of the specimen at any applied force. **D76**

constant-rate-of-traverse tensile testing machine (CR), n—a testing machine in which the pulling clamp moves at a uniform rate and the force is applied through the other clamp which moves appreciably to actuate a force-measuring mechanism, producing a rate of increase of force or extension that is usually not constant and is dependent upon the extension characteristics of the specimen. **D76**

container, n—a receptacle designed to hold a material, or to give integrity to the material.

DISCUSSION—

The term container in textiles may include bales, cartons and other shipping containers. **D3333**

coefficient of variation (CV), n—a measure of the dispersion of observed values equal to the standard deviation for the values divided by the average of the values; may be expressed as a percentage of the average (%CV). **D6612**

core-spun yarn, n—a compound structure in which a filament or strand serves as an axis around which a cover of either loose fiber or a yarn is wound.

DISCUSSION—

(1) *General*—in yarn testing, when the core and cover in this type of compound structure need to be separated, for testing of either component, the methods used should not compromise the physical properties of the component to be evaluated: and (2) *Specific*—as a sewing thread, the means by which this compound structure is made will not allow the core and cover to be readily separated without compromising the physical attributes of each component. Hence, the sewing thread should be evaluated as a compound structure. **D204**

cotton count, n—an indirect yarn numbering system generally used in the cotton system equal to the number of 840-yd lengths of yarn per pound. **D1059, D2260, D6587, D6612**

cotton system, n—a spinning system adapted to fibers less than 65 mm (2.5 in.) in length.

DISCUSSION—

This system usually employs flat-top cards and may use roll and other drafting assemblies on intermediate processes and spinning machines. **D2645**

cover, n—in yarns, the outside layer of fibers that form the surface of a yarn. **D2255**

covered yarn, n—a compound structure which contains distinguishable inner and outer fibrous elements which can be different. **D204**

CRE—abbreviation for constant-rate-of-extension. **D76**

crimp, n—in a textile strand, the undulations, waviness, or succession of bend, curls, or waves in the strand induced either naturally, mechanically, or chemically.

DISCUSSION—

Crimp has many characteristics, among which are its amplitude, frequency, index, and type. In Test Method **D3937**, crimp is characterized by a change in the directional rotation of a line tangent to the fiber as the point of tangent progresses along the fiber. Two changes in rotation constitutes one unit of crimp. **D3937**

crimp, *n*—*in a yarn*, the undulations, waviness, or succession of bends, curls, or waves in the yarn induced either naturally, mechanically, thermally, or chemically. **D6774**

crimp contraction, *n*—an indicator of crimp capacity or a characterization of a yarn’s ability to contract under tension. **D4031, D6774**

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. **D4031**

crimp frequency, *n*—*in manufactured staple fibers*, the number of crimps or waves per unit length of extended or straightened fiber. **D3937**

crimp index, *n*—an indirect measure of the amplitude of the crimp.

DISCUSSION—

Crimp index is calculated as the difference in distance between two points on the fiber as it lies in an unstretched condition in one plane and the distance between the same two points when the fiber is straightened under a specified tension expressed as a percentage of the unstretched distance. To improve reproducibility, the unstretched distance may be measured under a specified, very low tension to align the fiber in one plane. **D3937**

crimp recovery, *n*—a measure of the ability of a yarn to return to its original crimped state after being subjected to tension. **D4031**

CRL—abbreviation for constant-rate-of-loading. **D76**

CRT—abbreviation for constant-rate-of-traverse. **D76**

cut, *n*—*in asbestos and glass yarns*, the number of 100-yd lengths of yarn per pound; an indirect yarn numbering system. **D1059, D2260**

cut, *n*—*in wool yarns*, the number of 300-yd lengths of yarn per pound; an indirect yarn numbering system. **D1059, D2260**

denier, *n*—the unit of linear density, equal to the mass in grams of 9000 m of fiber, yarn, or other textile strand that is used in a direct yarn numbering system. (See also **linear density**) **D1059, D2260, D6587, D6612**

density frequency variability (DFV), *n*—an index of the spacing of irregularities; mathematically, the number of times the measured mass crosses over the mean mass line from higher-to-lower values or lower-to-higher values divided by the distance over which the count is made. **D6612**

density spread (%DS), *n*—a value which indicates the degree to which the mass varies from its average; mathematically, the average of the differences between the maximum and minimum values within specified subsections, expressed as a percent based on an overall average. **D6612**

direct cabling technology, *n*—a single-step manufacturing systems that produces a twist-balanced cabled yarn (2 fold) from twistless single yarns.

DISCUSSION—

Direct cabling of yarn is carried out in a one-step twisting operation as compared to conventional cabling of yarn that is carried out in multiple twist operations. **D1423**

direct yarn numbering system, *n*—a system that expresses the linear density of yarn in mass per unit length.

DISCUSSION—

The preferred units of measurements for the direct yarn measuring system are grams and meters. Tex (weight in grams for 1000 metres) and Denier (weight in grams for 9000 metres) are recommended to show linear density in the direct numbering system. These can be calculated by dividing the mass of a yarn by its length. Conversion factors to convert between direct and indirect numbering systems can be found in Standard Tables **D2260**. **D1059, D1907, D2260**

direction of twist, *n*—the right or left direction of the helix formed in a twisted strand as indicated by superimposition of the capital letter “S” or “Z.”

DISCUSSION—

Yarn has an S twist if when the yarn is held in a vertical position, the visible spirals or helices around the central axis conform in direction of slope to the central portion of the letter “S” and Z twist if the invisible spirals or helices conform in direction of slope to the central portion of the letter

“Z”. When two or more yarns, either single or plied are twisted together, the letters “S” and “Z” are used in a similar manner to indicate the direction of the last twist inserted. D1422, D1423



draw ratio (DR), *n*—the relation of the final length per unit mass to original length per unit mass of a material resulting from drawing. D3218, D5344

draw texturing, *n*—for processing thermoplastic fibers, the simultaneous or sequential process of drawing and imparting crimp, thus producing increased molecular orientation and increased bulk.

DISCUSSION—

The drawing and texturing stages may occur in separate, usually consecutive, zones of a machine (sequential draw texturing) or together in the same zone (simultaneous draw texturing). D5344

drawing, *n*—in textile processing, the process of stretching or attenuating a material to increase the length per unit mass.

DISCUSSION—

This process orients the molecular chains in the length direction of a monofilament or partially oriented yarn. D3218, D5344

effective carriage mass, *n*—in CRL-type tensile testing machine, the force actually applied to a specimen by the mass of the carriage, plus any added masses. D76

effective fiber length, *n*—in vibroscope test for linear density, that portion of the fiber free to vibrate between fixed supports or holders. D1577

effective gage length, *n*—in tensile testing, the estimated length of the specimen subjected to a strain equal to that observed for the true gage length.

[ASTM D4849-13e3](https://standards.iteh.ai/catalog/standards/sist/f4e3b6d3-65ef-41a0-85be-8a7304890dba/astm-d4849-13e3)

<https://standards.iteh.ai/catalog/standards/sist/f4e3b6d3-65ef-41a0-85be-8a7304890dba/astm-d4849-13e3>

DISCUSSION—

The effective gage length can be calculated using the following equation:

$$G_E = G_N \times E_N / E_T \quad (1)$$

where:

G_E = effective gage length

G_N = nominal gage length

E_N = percent elongation based on the nominal gage length, and

E_T = percent elongation based on the true gage length.

D76

elastomeric yarn, *n*—a nontextured yarn which can be stretched repeatedly at room temperature to at least twice its original length and which after removal of the tensile force will immediately and forcibly return to approximately its original length.

DISCUSSION—

The elastic properties of yarn are produced by the use of filaments, or a core, made from polymers having a special chemical composition or molecular structure, for example, filaments made from spandex or from cut or extruded rubber. D3106

electric constant, *n*—in textile capacitance testing, the change in the electrical field as measured by the sensors (capacitors) of an evenness instrument when a non-conductive textile strand travels between capacitor plates.

DISCUSSION—