Designation: D6587 – 12 (Reapproved 2018)

Standard Test Method for Yarn Number Using Automatic Tester[1]

This standard is issued under the fixed designation D6587; 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 yarn number of filament and spun yarns using automated testers. Some of the instruments are stand-alone and others are optional modules for instruments that perform additional tests.

1.1.1 The instruments are capable of measuring yarn numbers up to 4000 dtex (3600 denier).

NOTE 1—For determination of yarn number by use of reel and balance, refer to Test Method D1907.

1.2 The values stated in SI units are to be regarded as standard.

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *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]

D123 Terminology Relating to Textiles
D1776 Practice for Conditioning and Testing Textiles
D1907 Test Method for Linear Density of Yarn (Yarn Number) by the Skein Method
D2258 Practice for Sampling Yarn for Testing
D4849 Terminology Related to Yarns and Fibers

3. Terminology

3.1 For all terminology relating to D13.58, Yarns and Fibers, refer to Terminology D4849.

3.1.1 The following terms are relevant to this standard: cotton count, denier, linear density, tex, yarn number, yarn numbering system.

3.2 For all other textile terms used in this test method, see Terminology D123.

4. Summary of Test Method

4.1 A specified length of yarn (specimen) is automatically stripped directly from the package, cut, and weighed. The yarn number is calculated by an interfaced computer, displayed on a monitor, and may be printed. The yarn number can be reported in tex, denier, or cotton count units.

5. Significance and Use

5.1 This test method for yarn number is satisfactory for acceptance of commercial shipments and is used in the trade.

5.1.1 In case of a dispute arising from differences in reported test results when using this Test Method for acceptance testing of commercial shipments, the purchaser and the supplier should either use the referee Test Method D1907 for yarn number or conduct comparative tests to determine if there is a statistical bias between their laboratories. Competent statistical assistance is recommended for the investigation of bias. As a minimum, the two parties should take a group of test specimens that are as homogeneous as possible and that are from a lot of material of the type in question. The test specimens should then be randomly assigned in equal numbers to each laboratory for testing. The average results from the two laboratories should be compared using appropriate statistical analysis and a probability level chosen by the two parties before the testing is begun. If a bias is found, either its cause must be found and corrected or the purchaser and the supplier must agree to interpret future test results with consideration to the known bias.

5.2 This test method is also used for the quality control for both filament and spun yarns.

6. Apparatus

6.1 *Automatic Yarn Numbering Instrument,* with interfaced computer.

[1] This test method 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.

6.1.1 *ACW (Automatic Cut and Weigh) Yarn Tester,*[3] Series T for textile yarns, Series BCF for bulked continuous filament (BCF) carpet yarns, and Series I for industrial yarns. See Fig. 1. The different series testers have different systems for tensioning yarns and different yarn running speeds.

6.1.2 *Autocount C*[4]—See Fig. 2.

6.1.3 *Autocount TTA*[4]—See Fig. 3.

6.1.4 *Yarn Count Analyzer (YCA)*[5]—See Fig. 4.

6.2 *Calibration Weights*—Two grams and others as needed to cover the dtex (denier) ranges of interest.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping units directed in an applicable material specification or other agreement between the purchaser and the supplier, such as an agreement to use Practice D2258. Consider shipping cases or other shipping units to be the primary sampling units.

NOTE 2—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping units, between packages or ends within a shipping unit, and between specimens from a single package to provide a sampling plan with a meaningful producer's risk, consumer's risk, acceptable quality level, and limiting quality level.

7.2 *Laboratory Sample*—As a laboratory sample for acceptance testing, take at random from each shipping unit in the lot sample the number of packages directed in an applicable material specification or other agreement between the purchaser and the supplier such as an agreement to use Practice D2258. Preferably, the same number of packages should be taken from each shipping unit in the lot sample. If differing numbers of packages are to be taken from shipping units in the lot sample, determine at random which shipping units are to have each number of packages drawn.

7.3 *Test Specimen*—Test one specimen from each package of filament yarn and five specimens from each package of spun yarn. See Table 1 for the length of yarn in a specimen.

8. Conditioning

8.1 Precondition and condition the specimens, as directed in Practice D1776.

9. Preparation and Calibration of Apparatus

9.1 Set up and calibrate the tester using the manufacturer's manual and the appropriate appendix of this test method.

10. Procedure

10.1 Check each package for cleanliness, overthrown ends, and any package formation which might interfere with the free-running of the yarn from the package.

10.2 Position packages to be tested with the thread line passing in a straight line from the package to the inlet tube without snags or additional tension added. Packages may be beneath or above the inlet jet or tube, as position does not affect the results.

10.2.1 If the instrument uses a package changer, place the package in a creel and string up the yarn in a manner to prevent snagging or tangling of the ends and excessive tension on the yarn.

10.2.2 Prestripping packages is not necessary because the instruments can be set to prestrip for a specified time before testing.

10.3 String up the yarns, input sample, and specimen information and test the specimens as directed in the manufacturer's manual. See the appendixes for general information specific to the instrument.

10.4 Test all specimens in the standard atmosphere for testing as directed in Practice D1776.

[3] Available from W. Fritz Mezger, Inc., 155 Hall St., Spartanburg, SC 29302-1523 and Lenzing Technik GrmbH & Co KG, 4860 Lenzing, Austria.

[4] Available from Lawson Hemphill Sales, PO Drawer 6388, Spartanburg, SC 29304 and Textechno, Dohrweg 65, D41066, Monchengladbach, Germany.

[5] Available from Lawson Hemphill Sales, P.O. Drawer 6388, Spartanburg, SC 29304.

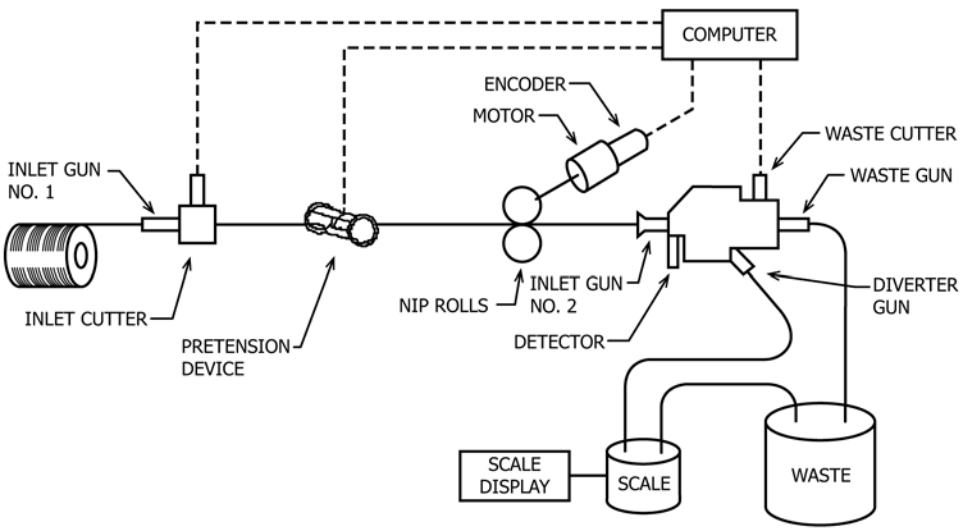

FIG. 1 Yarn String-up Diagram for ACW (Automatic-Cut-and-Weigh) Tester

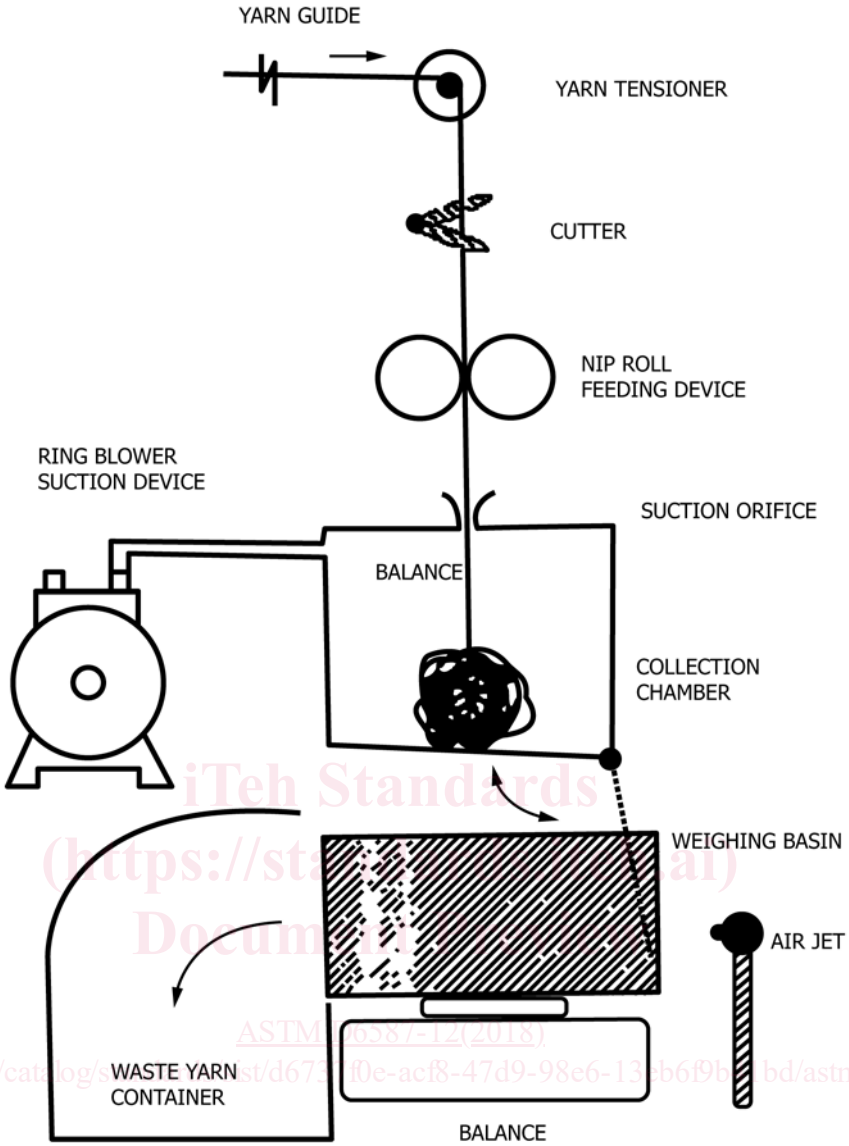

FIG. 2 Yarn String-up Diagram for Autocount C

11. Calculation

11.1 *Direct Yarn Numbering Systems:*

11.1.1 The calculation for yarn number as dtex (denier) is based on Eq 1.

$$N = \frac{K \cdot M}{L} \quad (1)$$

where:

N = yarn number, dtex (denier),
K = constant depending on numbering system, 10000 (9000) ,
M = mass of specimen, g, and
L = length of specimen, m.

11.1.2 Calculate the yarn number for the lot.

11.2 *Indirect Yarn Numbering System:*

11.2.1 The calculation for cotton count N is based on Eq 2, Eq 3, or Eq 4 as follows:

$$N = \frac{K \cdot M}{L} \quad (2)$$

$$N = \frac{5905.41}{T} \quad (3)$$

$$N = \frac{5314.87}{D} \quad (4)$$

where:

N = cotton count,
K = constant for cotton yarn number 0.590541,
L = length of specimen, m,
M = mass of specimen, g,
T = linear density, dtex, and
D = linear density, denier.

NOTE 3—With the ACW instrument, the yarn number recorded by the computer is the average of the five observations made on the package.

11.2.2 Calculate the yarn number for the lot.