Designation: D6587 – 12ε1

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.

ε[1] NOTE—The units statement was updated editorially in October 2013.

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

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.

6.1.1 *ACW (Automatic Cut and Weigh) Yarn Tester,*[3] Series T for textile yarns, Series BCF for bulked continuous filament

[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.

Current edition approved July 1, 2012. Published October 2012. Originally approved in 2000. Last previous edition approved in 2006 as D6587–00(2006)ε1. DOI: 10.1520/D6587-12.

[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.

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

(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.

11. Calculation

11.1 *Direct Yarn Numbering Systems:*

[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.

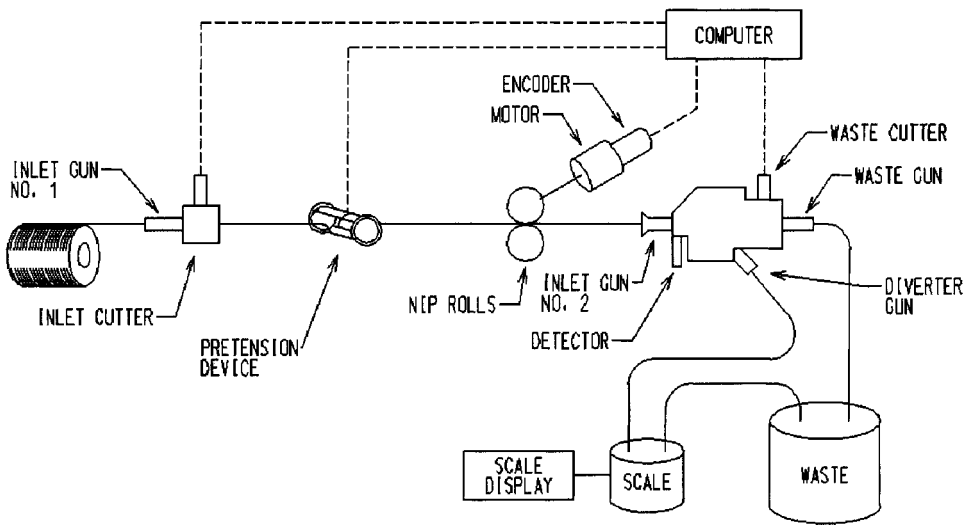

FIG. 1 Yarn String-up Diagram for ACW (Automatic-Cut-and-Weigh) Tester

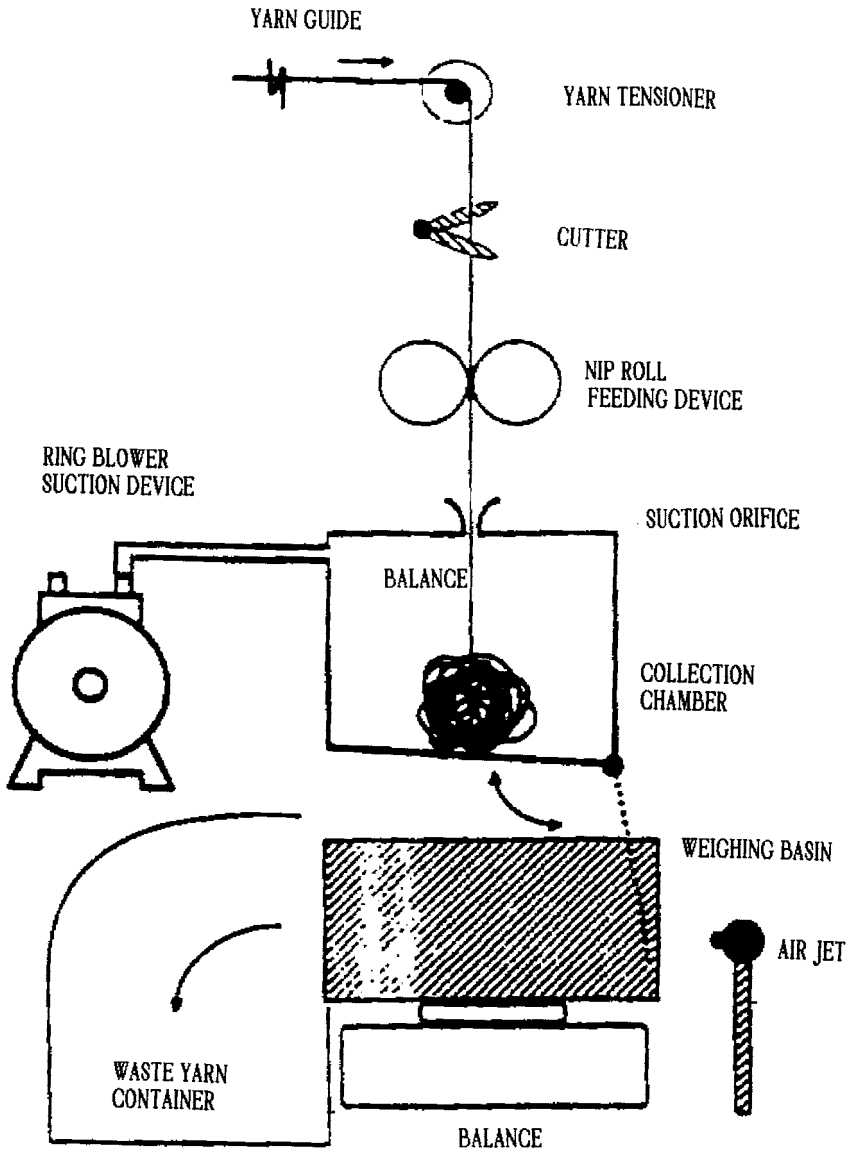

FIG. 2 Yarn String-up Diagram for Autocount C

11.1.1 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

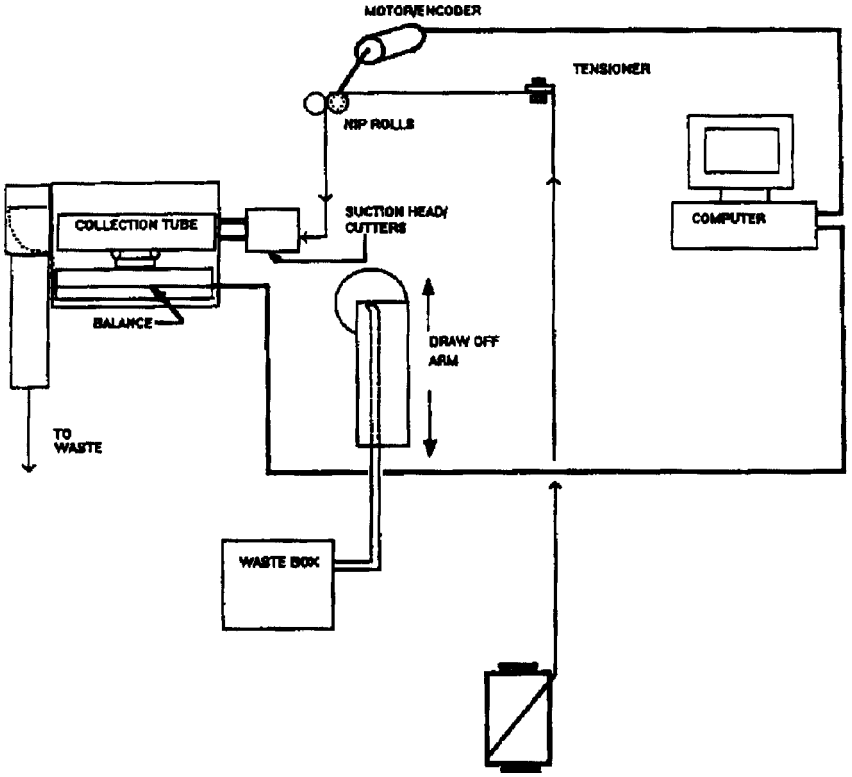

FIG. 3 Yarn String-up Diagram for Autocount Tester

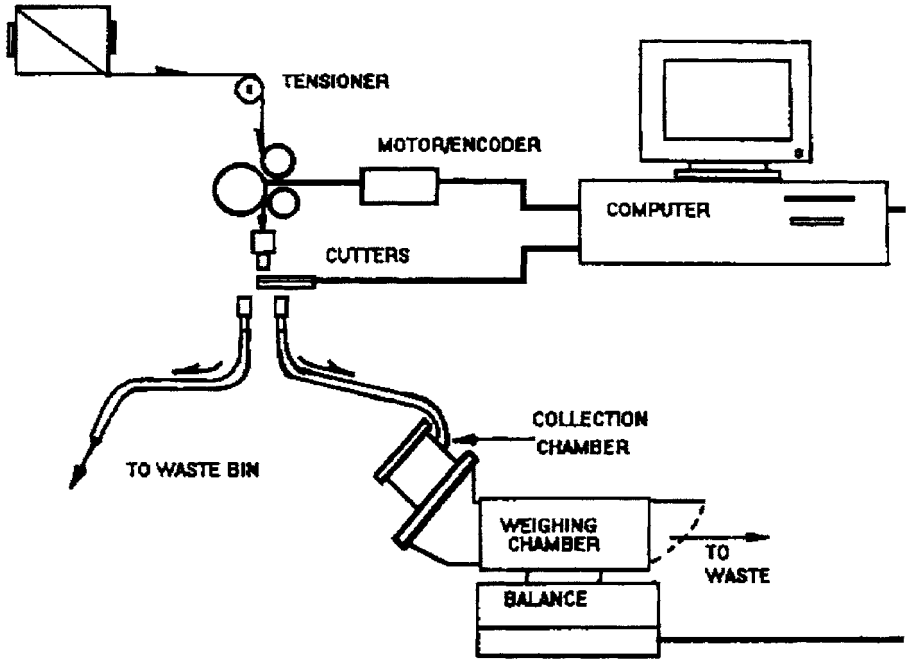

FIG. 4 Yarn String-up for Yarn Count Analyzer (YCA)

computer is the average of the five observations made on the package.

11.2.2 Calculate the yarn number for the lot.

11.3 Calculate the standard deviation for the lot.

TABLE 1 Specimen Lengths

Yarn Number			Length, m
dtex	Denier	Cotton Count	
≤564	≤510	≥10.4	90
>564	>510	<10.4	9

12. Report

12.1 State that the yarn was tested as directed in Test Method D6587. Describe the material or product sampled and the method of sampling.

12.2 Report the following information:

12.2.1 The yarn number for each laboratory sampling unit and for the lot,

12.2.2 The standard deviation for the lot,

12.2.3 The instrument used, and

12.2.4 Any modification in the test method.

13. Precision and Bias

13.1 *Bias*—The values for yarn numbers can be defined only in terms of a test method. Within this limitation, Test Method D6587 has no known bias.

14. Keywords

14.1 linear density; yarn; yarn number

APPENDIXES

(Nonmandatory Information)

X1. ACW (AUTOMATIC-CUT-AND-WEIGH) TESTER

X1.1 Preparation and Calibration

X1.1.1 Turn on the motor and allow the tester to warm up for at least 30 min before calibrating the scale.

X1.1.2 Enter the computer command for automatic zeroing and calibration

X1.1.3 To eliminate errors due to long-term drift, set the tester to automatically tare the balance after each set of 20 tests.

X1.1.4 Make other periodic checks and inspection of the tester as noted in the manufacturer's manual.

X1.2 Operation

X1.2.1 Set ACW for operation in Mode 2 (Textile 10 to 520 denier). For heavy denier use Mode 3 (550 to 1200 denier).

X1.2.2 Sampling and specimen information is input to the computer in response to prompts. The following sections describe the subsequent operation of the instrument. (A test can be aborted at any time by pressing the STOP button, which initiates a cleaning cycle.)

X1.2.3 The end of the yarn is held near the inlet jet (tube). When a photocell senses the hand or yarn end or the START button is pressed, Inlet Jets 1 and 2 and the waste gun are turned on and Yarn I transported under tension straight through the tester to the waste container. When the yarn is sensed on exit from Inlet Jet 2, Inlet Jet 1 is turned off, the nip rolls closed, and yarn is stripped from the package for a specified time.

X1.2.4 The yarn is then cut ahead of the waste gun, and, simultaneously, the Inlet Jet 2 and the waste gun are shut off. The divert gun is turned on and the yarn specimen is blown onto the balance. When the specified specimen length is obtained, the inlet cutter cuts the yarn. After 3-s dwell, the balance weighs the specimen over a 2-s interval and the average dtex (denier) of the yarn is calculated.

X1.2.5 An air jet then blows the specimen off the balance into the waste container.

X1.3 Other Information

X1.3.1 Computer commands and prompts, error messages, diagnostic test commands, and trouble shooting information are given in the manufacturer's manual.

X2. TEXTECHNO AUTOCOUNT

X2.1 Preparation and Calibration

X2.1.1 Switch the tester on and allow the tester to warm up for at least 30 min before calibrating the balance.

X2.1.2 Zero the balance by pressing its "T" or "Tare" key. Use the automatic calibration function of the balance or put desired calibration weight on and check the calibration. Refer to the manufacturer's operation manual for calibration details.

X2.1.3 During operation the balance will tare automatically before each new test or before each new package (as selected in the software).

X2.2 Operation of the Autocount TTA (Statimat Tensile Tester Insert)

X2.2.1 The yarn travels through the yarn tension guides on the top rear of the tensile tester.

X2.2.2 The collection chamber is lowered onto the balance and it tares the weight of the chamber from the balance. After taring the weight of the chamber, it is lifted into the receiving position.

X2.2.3 The feed arm grabs the yarn and pulls it into the nip rolls. The draw-off arm places the yarn in the suction head and

the cutters cut the yarn to have a well-defined beginning. The nip rolls reel off (skein) a specified length of yarn into the suction head and are aspirated into the collection chamber, on the balance.

X2.2.4 After the specified length has been collected, the suction head cutters cut the yarn. Any slight variation in the set test length is compensated for in the calculation.

X2.2.5 The collection chamber is lowered onto the balance and the weight is recorded and sent to the computer and software, for conversion to the specified count system. If the yarn number of twisted yarn is measured, but yarn number of untwisted material is required, a calibration curve shall be used. The untwisted data must be obtained as directed in Test Method D1907. The sample is then ejected from the collection chamber and the chamber is again lowered onto the balance to tare the weight of the chamber.

X2.2.6 If tensile tests were required and specified in the software, the Statimat performs the tensile tests, and, after the last break, the yarn is cut and the magazine moves the next yarn into position to be tested.

X2.3 Operation of the Autocount C Model

X2.3.1 The yarn passes through a tension device and into the tester from the top. A cutter cuts the yarn end in order to have a well-defined beginning of the section to be tested. A nip roll feeding device reels (skeins) the yarn into the collection chamber by means of an aspirator.

X2.3.2 After the programmed length has been collected in the chamber, the cutter cuts the yarn end. A flap at the bottom of the collection chamber opens and the yarn sample will fall onto the balance. While the sample is being weighed, the next sample is being collected in the collection chamber (continuous operation).

X2.3.3 After weighing the sample, an air jet blows the sample from the balance and into a waste container.

X2.3.4 The version for combined use with another tester, such as the Dynafil, is equipped with a yarn switch instead of a cutter and nip roll feeding device. Knots or splices at the beginning of a new yarn sample are automatically cut off and blown into the waste chamber. The length of the yarn is measured by the intake godet of the Dynafil.

X3. YARN COUNT ANALYZER (YCA) TESTER

X3.1 Operation

X3.1.1 The balance tares the chamber.

X3.1.2 The yarn enters the tester from the left. A rapier arm pulls the yarn into place, passing it through an adjustable pretensioning device. The yarn is then cut and the beginning end is suctioned into the waste container. As the waste is removed, the nip rolls start and transport a measured length of yarn from the package to the collection chamber. This specimen is cut at the end coming from the package.

X3.1.3 The chamber with the specimen is lowered onto the balance and the mass recorded after the balance has stabilized. The yarn number is calculated and the specimen is ejected from the balance to a waste container by an air jet.

X3.1.4 The tester is designed to run continuously. The collected specimen is transferred from the collection chamber to a balance chamber. Then, while a specimen on the balance is being weighed, the next specimen is being collected.