ASTM INTERNATIONAL

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Standard Test Method for
Linear Density of Elastomeric Yarns (Short Length Specimens)[1]

This standard is issued under the fixed designation D2591; 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 linear density of short lengths of "as produced" elastomeric yarns made from rubber, spandex or other elastomers.

NOTE 1—For the determination of linear density of elastomeric yarns using skeins, refer to Test Method D6717.

1.2 This test method is not applicable to covered, wrapped, or core-spun yarns, or yarns spun from elastomeric staple, or elastomeric yarns removed from fabrics.

1.3 This test method is applicable to elastomeric yarns having a range of 40 to 3200 dtex (36 to 2900 denier).

1.4 The values stated in either SI units or U.S. Customary units are to be regarded separately as standard. Within the test the US Customary units are in parentheses. The values stated in each system are not exact equivalents; therefore, each system shall be used independently of the other.

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:*[2]
D123 Terminology Relating to Textiles
D2258 Practice for Sampling Yarn for Testing
D6717 Test Method for Linear Density of Elastomeric Yarns (Skein Specimens)
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: denier, elastomeric yarn, linear density, tex.

3.2 For all other terminology related to textiles, refer to Terminology D123.

4. Summary of Test Method

4.1 A pre-relaxed specimen is fastened in vertically mounted apparatus under a specified tension. A specified length is cut from the specimen and weighed, and the linear density calculated.

5. Significance and Use

5.1 This test method is considered satisfactory for acceptance testing of commercial shipments because current estimates of between-laboratory precision are acceptable and the method is used extensively in the trade for acceptance testing.

5.1.1 If there are differences of practical significance between reported test results for two laboratories (or more), comparative tests should be performed to determine if there is a statistical bias between them, using competent statistical assistance. As a minimum, use samples for such comparative tests that are as homogeneous as possible, drawn from the same lot of material as the samples that resulted in disparate results during initial testing, and randomly assigned in equal numbers to each laboratory. The test results from the laboratories involved should be compared using a statistical test for unpaired data, at a probability level chosen prior to the testing series. If bias is found, either its cause must be found and corrected, or future test results for that material must be adjusted in consideration of the known bias.

5.2 Linear density of elastomeric yarns is used in some calculations for tensile and elastic properties.

5.3 The test method is based on elastomeric yarns in lthe "as-produced" condition, but may be used for treated elastomeric yarns provided the treatment is specified. The method

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[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.

does not cover the removal of finish for the determination of linear density of "finish-free" elastomeric yarns.

6. Apparatus[3]

6.1 *Specimen Boards,* with short pile or plush surfaces of black or contrasting color, for storing specimens during relaxation period.

6.2 *Linear Density Apparatus,* mounted vertically on a wall or in a sturdy, stable vertical support and containing the essential parts listed below. See Fig. 1 and Annex A1 for general construction details of suitable apparatus.

6.2.1 *Steel Plate,* about 100 mm (4 in.) wide and 1.3 m (1.4 yd) long.

6.2.2 *Clamps,* three toggle-action type with rubber tips.

6.2.3 *Brass Plates,* two, with slots at right angles to be used for controlling the alignment and length of the specimen.

6.2.3.1 The slots are positioned such that the distance between the slot midlines provides a gage length of 1000 mm when using the tex system or 900 mm when using the denier system. If necessary, the two gage lengths can be obtained by having the upper slot assembly adjustable, or by having two separate test apparatuses.

6.3 *Tensioning Weights,* with varioius masses from 10 mg to 3 g as required, to pretension the specimens to 1.0 ± 0.1 cN/tex (0.9 ± 0.09 gf/d) tension based on the nominal linear density of the yarn.
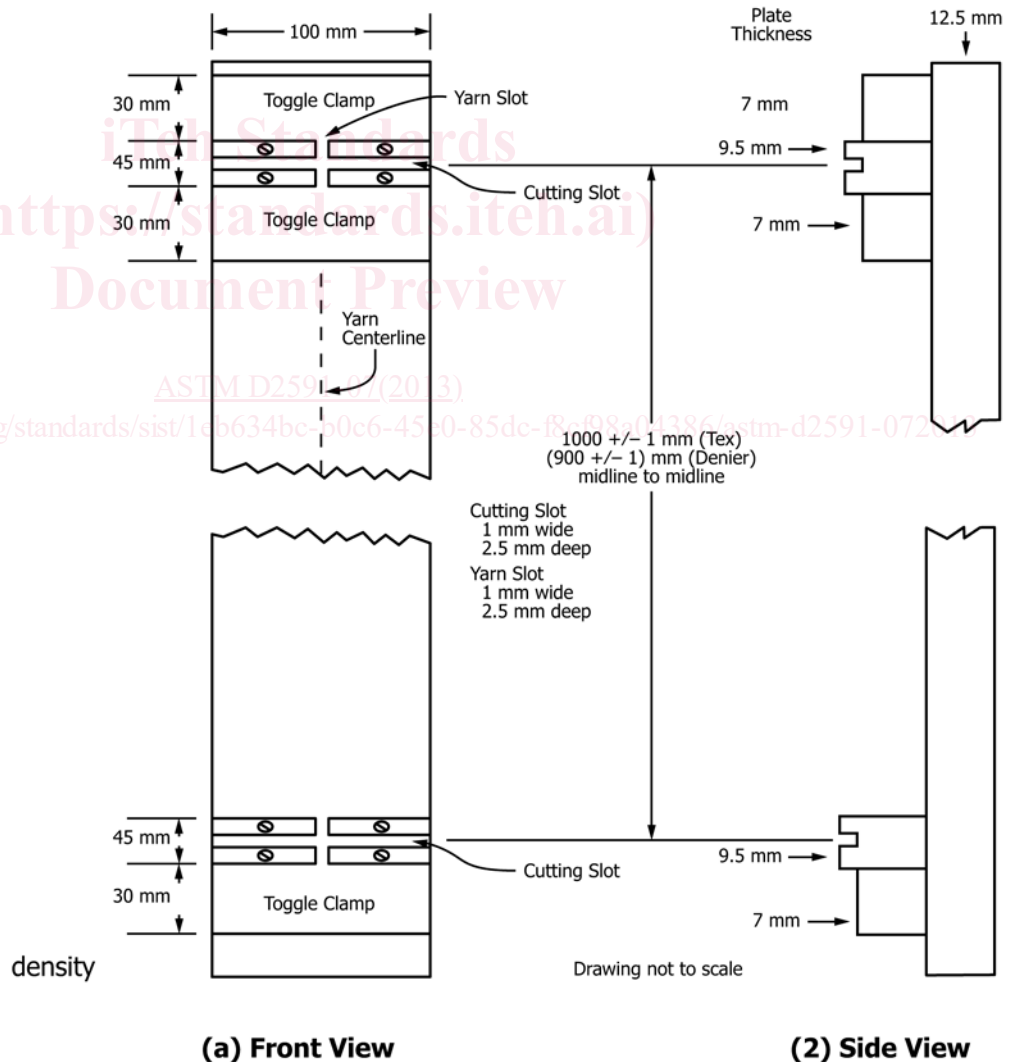
6.4 *Razor Blades,* safety single-edge, or wood-carving type knife.

6.5 *Balance,* with an accuracy of $\pm 0.1\%$ of the expected mass of the specimens.

7. Sampling, Test Specimens, and Test Units

7.1 *Lot Sample*—As a lot sample for acceptance testing, take a random number of shipping units directed in an applicable

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[3] Components are commercially available.

Note 1—Drawing not to scale. For conversion to U.S. customary units, divide mm by 25.4 to obtain inches
FIG. 1 Linear Density Apparatus