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 D 2591; 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 D 6717.

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:*
D 123 Terminology Relating to Textiles[2]
D 1776 Practice for Conditioning and Testing Textiles[2]
D 2258 Practice for Sampling Yarn for Testing[2]
D 6717 Test Method for Linear Density of Elastomeric Yarns (Skein Specimens)[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *denier*, *n*—the unit of linear density, equal to the mass in grams per 9000 m of fiber, yarn, or other textile strand that is used in a direct yarn numbering system.

3.1.2 *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.

3.1.3 *linear density*, *n*—*for fiber and yarn,* the mass per unit length.

3.1.4 *tex*, *n*—the unit of linear density, equal to the mass in grams of 1000 metres of fiber, yarn or other textile strand, that is used in a direct yarn numbering system.

3.1.5 For definitions of other terms related to textiles used in this standard, refer to Terminology D 123.

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

6. Apparatus [4]

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

[4] Components are commercially available.

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.

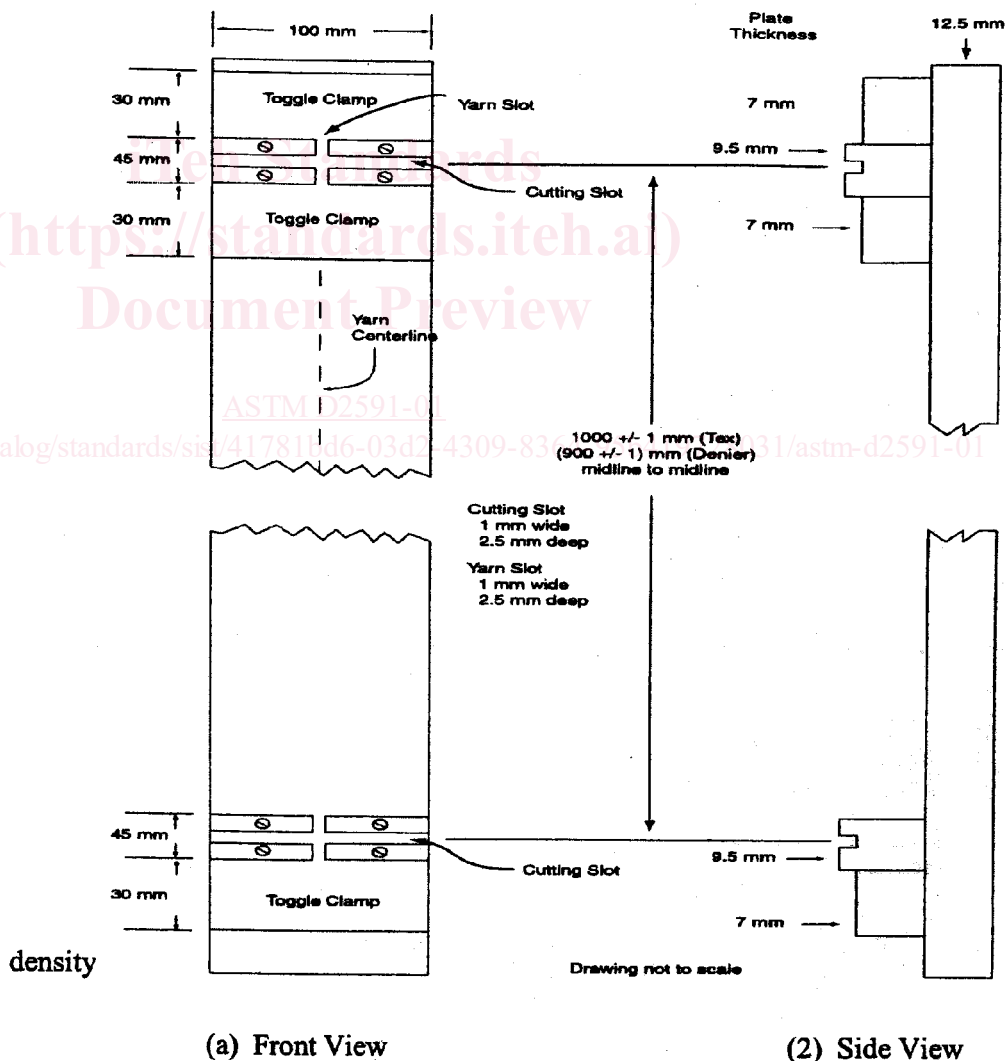6.2.2 *Clamps*, three toggle-action type with rubber tips.

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.

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