



Designation: D3106 – 07 (Reapproved 2012)

Standard Test Method for Permanent Deformation of Elastomeric Yarns¹

This standard is issued under the fixed designation D3106; 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 permanent deformation of bare, continuous elastomeric monofilaments and filament yarns made from rubber, spandex, anidex, or other elastomers subjected to prolonged periods of tension. This test method is applicable to elastomeric yarns having a linear density in the range from 4 to 320 tex (36 to 2900 den.).

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

1.3 This test method was developed using yarns in the “as-received” condition, but may be used for treated yarns provided the treatment is specified.

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

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](#)

[D2433 Test Methods for Rubber Thread](#) (Withdrawn 2012)³

[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: breaking force, elastomeric yarn, elongation, elongation at

break, extension, force, linear density, length distribution, permanent deformation, velveteen.

3.2 For all other terminology related to textiles, refer to Terminology [D123](#).

4. Summary of Test Method

4.1 The nominal linear density of the sample is known or determined and the elongation at the breaking force is determined from representative specimens.

4.2 A specimen from the sample is placed in a pair of line-contact clamps and held at a selected elongation for a specified period of time. The permanent deformation or non-recoverable stretch is measured after a specified recovery period.

5. Significance and Use

5.1 Test Method D3106 for testing permanent deformation of elastomeric yarns is considered satisfactory for acceptance testing of commercial shipments when there is prior agreement as to the exact value of elongation to be used for testing, since current estimates of between-laboratory precision are acceptable.

5.1.1 If there are differences or 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, test samples that are as homogeneous as possible, drawn from the material from which the disparate test results were obtained, and randomly assigned in equal numbers to each laboratory for testing. The test results from the two laboratories 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 Yarns are subjected to long periods of tension resulting in an appreciable amount of stretch during normal use. A portion of the induced stretch may be permanent. The amount of permanent deformation is influenced by the amount of tension, the time the yarn is under tension and the time available for recovery between successive uses.

5.3 For optimum processing of elastomeric yarns, the permanent deformation value should be low or zero.

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 August 2012. Originally approved in 1972. Last previous edition approved in 2007 as D3106 – 07. DOI: 10.1520/D3106-07R12.

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

6. Apparatus

6.1 *Line-Contact Clamps*, with one fixed clamp and one movable clamp, assembled as directed in **Appendix X1**, and as shown in **Fig. 1**.

6.2 *Tensioning Weights*, 10 mg to 3 g, to pretension the specimens before final clamping.

NOTE 1—Aluminum foil has been found to be suitable for use as tensioning weights; the foil may be attached to the yarn by folding it over the yarn.

6.3 *Stop Watch or Timer*.

7. Sampling

7.1 *Lot Sample*—As a lot sample for acceptance testing, take at random the number of shipping cartons of elastomeric yarn

as directed in the applicable material specification or other agreement between the purchaser and supplier. Consider the material shipping carton to be the primary sampling unit.

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

NOTE 2—An adequate specification or other agreement between the purchaser and the supplier requires taking into account the variability between shipping cartons, and the variability of the material within the shipping carton, to provide a sampling plan with a meaningful producer's

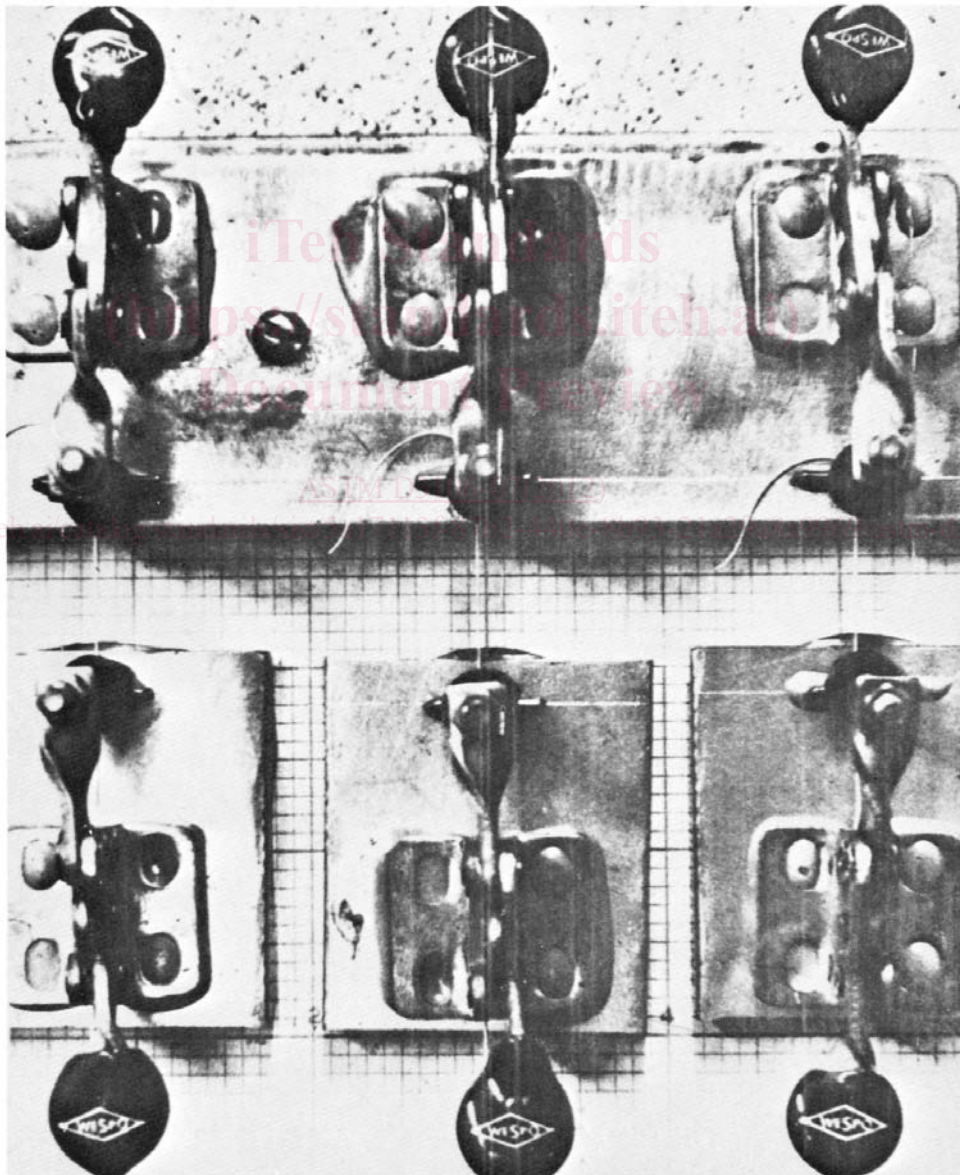


FIG. 1 Test Apparatus for Permanent Set