



Designation: D4970/D4970M – 22

Standard Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Martindale Tester¹

This standard is issued under the fixed designation D4970/D4970M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope

1.1 This test method covers the determination of the resistance to the formation of pills and other related surface changes on textile fabrics using the Martindale tester.

NOTE 1—For other methods, if testing the pilling resistance of textiles, refer to Test Methods [D3511/D3511M](#), [D3512/D3512M](#), and [D3514](#).

1.2 This test method is generally applicable to knit, woven, and nonwoven fabrics; however, material thickness may limit suitability for testing due to specimen holder capacity.

1.3 The fabric may be laundered or dry cleaned before testing as agreed upon among interested parties.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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

1.6 *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.*

¹ This test method is under the jurisdiction of ASTM Committee [D13](#) on Textiles and is the direct responsibility of Subcommittee [D13.60](#) on Fabric Physical Test Methods B.

Current edition approved Nov. 1, 2022. Published December 2022. Originally approved in 1999. Last previous edition approved in 2016 as D4970/D4970M – 16 ϵ 3. DOI: 10.1520/D4970_D4970M-22.

2. Referenced Documents

2.1 *ASTM Standards*:²

[D123 Terminology Relating to Textiles](#)

[D1776 Practice for Conditioning and Testing Textiles](#)

[D3511/D3511M Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Brush Pilling Tester](#)

[D3512/D3512M Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Random Tumble Pilling Tester](#)

[D3514 Test Method for Pilling Resistance and Other Related Surface Changes of Textile Fabrics: Elastomeric Pad](#)

[D4850 Terminology Relating to Fabrics and Fabric Test Methods](#)

2.2 *ASTM Adjuncts*:³

[ADJD3512 Set of 5 Photographic Standards for Random Tumble Pilling Test](#)

3. Terminology

3.1 For all terminology relating to D13.59, Fabric Test Methods, General, refer to Terminology [D4850](#).

3.1.1 The following terms are relevant to this standard: *fuzz*, *Lissajous figure*, *movement*, *pilling resistance*, *pills*.

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

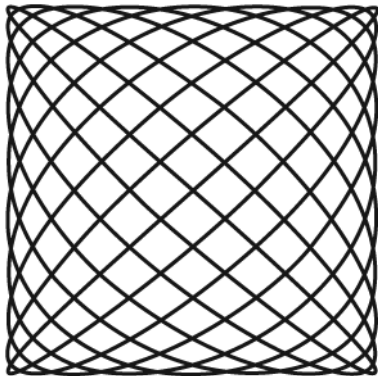
3.3 *fuzz*, *n*—fiber ends that protrude from the surface of a yarn or fabric.

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 ASTM International Headquarters. Order Adjunct No. [ADJD3512](#).

3.4 *Lissajous figure, n*—any of an infinite variety of curves formed by combining two mutually perpendicular simple harmonic motions, commonly exhibited by the oscilloscope, and used in studying frequency, amplitude, and phase relations of harmonic variables.

3.4.1 *Discussion—as related to the Martindale Tester*, geometric figure comprised of 16 arcs that start as a straight line, then become a widening ellipse and narrow to again become a straight line.



3.5 *movement, n—as related to the Martindale Tester*, one rotation of the outer gearing of the Martindale tester, creating one of the 16 arcs that form a Lissajous figure.

3.6 *pills, n*—bunches or balls of tangled fibers which are held to the surface of a fabric by one or more fibers. (Compare fuzz.)

4. Summary of Test Method

4.1 Pilling and other changes in the surface appearance, such as fuzzing, that occur in normal wear are simulated on a laboratory testing machine. Fabrics are mounted on the Martindale Tester, and the face of the test specimen is rubbed against the face of the same mounted fabric in the form of a geometric figure, that is, a straight line, which becomes a gradually widening ellipse, until it forms another straight line in the opposite direction and traces the same figure again under light pressure for a specific number of movements. The degree of fabric pilling or surface appearance change produced by this action is evaluated by comparison of the tested specimen with visual standards that may be actual fabrics, or photographs of fabrics, showing a range of pilling resistance. The observed resistance to pilling is reported using an arbitrary rating scale.

5. Significance and Use

5.1 *Acceptance Testing*—This method of testing fabrics resistance to pilling is not recommended for acceptance testing. If it is used for acceptance testing, it should be used with caution because interlaboratory data are not available. In some cases the purchaser or supplier may have to test a commercial shipment of one or more specific materials by the best available method even though the method has not been recommended for acceptance testing. Although this test method is not recommended for acceptance testing, it is useful because it is used widely outside the United States.

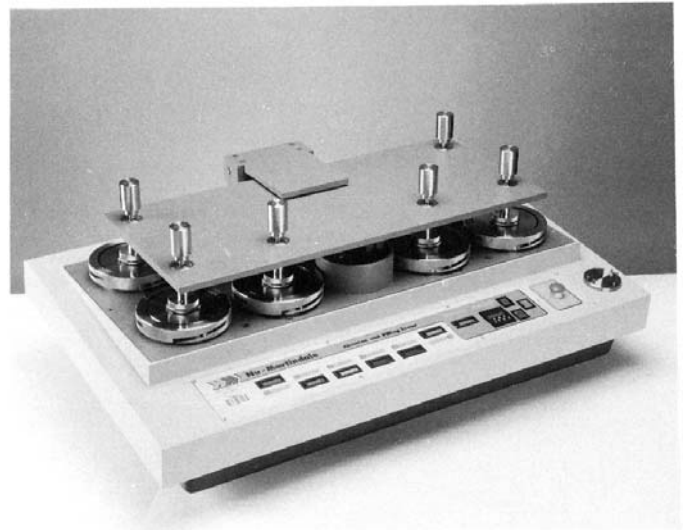


FIG. 1 Martindale Tester

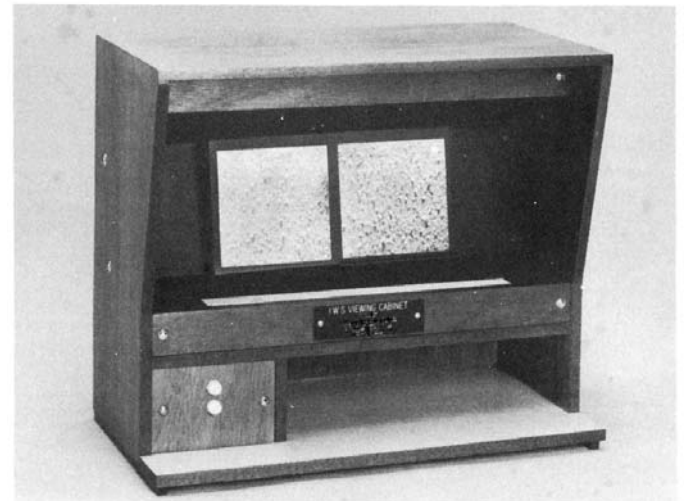


FIG. 2 Apparatus for Fabric Evaluation

5.2 If there is a disagreement arising from differences in values reported by the purchaser and the supplier when using this test method, the statistical bias, if any, between the laboratory of the purchaser and the laboratory of the supplier should be determined with comparison being based on testing specimens randomly drawn from one sample of material of the type being evaluated. Competent statistical assistance is recommended for the investigation of bias. A minimum of two parties should take a group of test specimens, which are as homogeneous as possible and which are from a lot of material of the type in question. The test specimens then should be assigned randomly in equal numbers to each laboratory for testing. The average test results from the two laboratories should be compared using an acceptable statistical protocol and probability level chosen by the two parties before the testing is started. Appropriate statistical disciplines for comparing data must be used when the purchaser and supplier cannot agree. If a bias is found, either its cause must be found and corrected, or