Designation: D3389 – 15

Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader)[1]

This standard is issued under the fixed designation D3389; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This test method covers the determination of the wear resistance of fabrics coated with rubber or plastics to abrasion. The abrasion is measured by mass loss or number of cycles required to wear through the coating to initially expose the base fabric.

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

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]

D618 Practice for Conditioning Plastics for Testing

D1566 Terminology Relating to Rubber

E177 Practice for Use of the Terms Precision and Bias in ASTM Test Methods

E691 Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

G195 Guide for Conducting Wear Tests Using a Rotary Platform Abraser

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *abrader, n*—a wear testing instrument, also referred to as a rotary platform tester or abraser.

3.1.2 *abrasion cycle, n*—in abrasion testing, one or more movements of the abradant across a material surface, or the material surface across the abradant, that permits a return to its starting position.

3.1.2.1 *Discussion*—In the case of the rotary platform test method, it consists of one complete rotation of the specimen.

3.1.3 *resurface, v*—the preparation of an abrasive wheel on a resurfacing disc or diamond tool wheel refacer, prior to use or during testing.

3.2 For definitions of other terms used in this test method, refer to Terminology D1566.

4. Summary of Test Method

4.1 Abrasion resistance of fabrics coated with rubber or plastics is measured by subjecting the specimen to the rotary-rubbing action of two abrasive wheels under controlled conditions of pressure by the use of the rotary platform abrader. The test specimen, mounted on a turntable platform, turns on a vertical axis against the sliding rotation of two abrading wheels. One abrading wheel rubs the specimen outward toward the periphery and the other, inward toward the center. The resulting abrasion marks form a circular pattern of crossed arcs over an area of approximately 30 cm^2. Resistance to abrasion is evaluated by average mass loss, wear index (average mass loss per revolution) or cycles required to wear through the coating to expose the yarn in the base fabric.

5. Significance and Use

5.1 Abrasion resistance tests are intended to measure the wear resistance properties of a material. This may be correlated to expected end use performance.

5.2 The resistance of coated fabrics to abrasion, as measured on a testing machine in the laboratory, is generally only one of several factors contributing to wear performance or durability as experienced in the actual use of the material. While abrasion resistance (often stated in terms of the number of abrasion cycles) and durability are frequently related, the relationship varies with different end uses and different factors may be necessary in any calculation of predicted durability from specific abrasion data. This test method provides a comparative

[1] This test method is under the jurisdiction of ASTM Committee D11 on Rubber and is the direct responsibility of Subcommittee D11.15 on Degradation Tests.

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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.

***A Summary of Changes section appears at the end of this standard**

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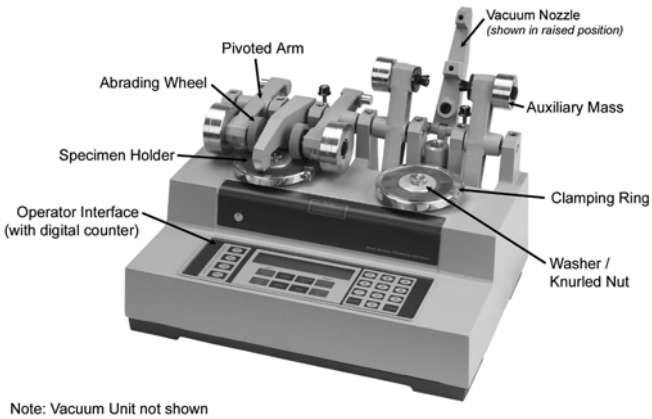

FIG. 1 Rotary Platform Abrader

ranking of material performance, which can be used as an indication of relative end-use performance.

5.3 The resistance of coated fabrics to abrasion may be affected by factors including test conditions, type of abradant, pressure between the specimen and abradant, mounting or tension of the specimen, and type, kind, or amount of finishing materials.

5.4 The measurement of the relative amount of abrasion may also be affected by the method of evaluation and may be influenced by the judgment of the operator.

6. Apparatus

6.1 *Abrasion Apparatus,*[3] as described in Guide G195 and, comprised of a removable flat circular specimen holder turntable, a pair of pivoted arms to which the abrasive wheels are attached, a motor for rotating the specimen holder, a vacuum unit and nozzle for removal of abraded particles during test, and a counter for indicating the revolutions of the specimen holder. See Fig. 1.

6.1.1 The specimen holder turntable shall be mounted to produce a circular surface travel of an essentially flat specimen in the plane of its surface at a uniform angular velocity. The speed of rotation of the turntable shall be 7.5 ± 0.21 rad/s (72 ± 2 rpm) for 110 V/60 Hz or 6.9 ± 0.21 rad/s (60 ± 2 rpm) for 230 V/50 Hz operation.

6.1.2 A clamping ring, washer and knurled nut shall be used to secure the specimen to the specimen holder.

6.1.3 The abrasive wheels, which are attached to the free end of independently pivoted arms, shall rotate and have, when resting on the specimen, a peripheral engagement with the surface of the specimen, the direction of travel of the periphery of the wheels and of the specimen at the contacting portions being at acute angles, and the angle of travel of one wheel periphery being opposite to that of the other. Motion of the abrasive wheels, in opposite directions, shall be provided by rotation of the specimen and the associated friction therefrom.

6.1.4 The apparatus shall be provided with a vertical-force adjustment (auxiliary masses) for varying the vertical force of the abrader wheels on the specimen. The pivoted abrader arms without auxiliary masses or counterweights shall apply a vertical force against the specimen of 2.45 N (250 gf) per wheel. Auxiliary masses may be used to apply a vertical force against the specimen of 4.9 N (500 gf) per wheel or 9.8 N (1000 gf) per wheel. Vertical force references are per arm (not combined), and include the mass of the pivoted arm but not the mass of the abrading wheel.

6.2 *Abrasive Wheels*[3]—A wheel that is 13 mm (0.5 in.) thick and approximately 50 mm (2 in.), but no less than 44.4 mm (1.75 in.) in diameter, which is manufactured in different grades of abrasive quality. The abrasive wheels are either resilient or vitrified based, with both types of wheels consisting of hard particles embedded in a binder material.

6.3 *Auxiliary Apparatus*—Refacing discs such as type S-11[3] or equivalent are required for the resurfacing of resilient-type wheels. A diamond tool wheel refacer is recommended for resurfacing vitrified wheels, and correcting out-of-round wheel conditions.

6.4 *Balance,* suitable for weighing to the nearest 1 mg.

7. Test Specimens

7.1 Unless otherwise specified, make five tests on each sample of coated fabrics.

7.2 Cut circular test specimens approximately 110 mm (4½ in.) in diameter. Punch or drill a 6-mm (¼-in.) hole in the center of the specimen. Take care in cutting out specimens. Use the best portion of the sample to be tested. It should be free of holes, blisters, or other imperfections.

7.3 For thin flexible materials, adhere the specimen to a suitable substrate; use of a cardboard mounting card such as S-36-1[3] has been found to be satisfactory.

NOTE 1—When adhesives are used to adhere the specimen, ensure that it does not have any adverse effect on the specimen. If a solvent-based system is used, allow the assembly to condition a minimum of 12 h or until the assembly maintains constant mass.

8. Conditioning

8.1 Condition the specimens in accordance with Practice D618.

9. Procedure

9.1 Install the wheels on their respective flanged holders. Selection of abrasive wheels to be made by the interested parties. If no wheel is specified, the H-18 vitrified wheel or equivalent is recommended.

NOTE 2—Abrasion tests utilizing the rotary platform abrader may be subject to variation due to the changes in the abradant during the course of the test. Depending on abradant type and test specimen, the abrading wheel surface may change (that is, become clogged) due to the pick-up of worn materials from test specimens. To reduce this variation, the abrading wheels should be resurfaced according to the manufacturer's recommendations.

[3] The sole source of supply of the apparatus known to the committee at this time is Taber Industries, 455 Bryant Street, North Tonawanda, NY 14120. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

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