Designation: D2148 – 22

Standard Test Methods for Bondable Silicone Rubber Tapes Used for Electrical Insulation[1]

This standard is issued under the fixed designation D2148; 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 These test methods cover tests for bondable silicone rubber tapes which form a sealed structure either with the application of heat (and pressure if needed) or by the process of auto-adhesion (self-fusing).

1.2 These test methods appear in the following sections:

Test Method	Section
Adhesion	3 – 10
Bond Strength	11 – 18
Dielectric Breakdown Voltage	19 – 26
Hardness	41
Length	33 and 34
Thickness	27 – 32
Width	36 – 40

1.3 *Units*—The values stated in SI units are the standard. The inch-pound units in parentheses are for information only. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.4 *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.* For a specific hazard statement see 23.1.1.

1.5 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

D374/D374M Test Methods for Thickness of Solid Electrical Insulation

D618 Practice for Conditioning Plastics for Testing

D1000 Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

D1458 Test Methods for Fully Cured Silicone Rubber-Coated Glass Fabric and Tapes for Electrical Insulation (Withdrawn 2019)[3]

D2240 Test Method for Rubber Property—Durometer Hardness

ADHESION

3. Scope

3.1 This test method covers the determination of the self-adhesion of unsupported, self-fusing silicone rubber rectangular and taper-edge (Note 1) tape designed for use as electrical insulation.

NOTE 1—Taper-edge tape includes such cross sections as triangular, lens, etc.

4. Hazards

4.1 *High Voltage:*

4.1.1 Lethal voltages are a potential hazard during the performance of this test. It is essential that the test apparatus, and all associated equipment electrically connected to it, be properly designed and installed for safe operation.

[1] These test methods are under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and are the direct responsibility of Subcommittee D09.07 on Electrical Insulating Materials.

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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.

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

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

4.1.2 Solidly ground all electrically conductive parts which it is possible for a person to contact during the test.

4.1.3 Provide means for use at the completion of any test to ground any parts which were at high voltage during the test or have the potential for acquiring an induced charge during the test or retaining a charge even after disconnection of the voltage source.

4.1.4 Thoroughly instruct all operators as to the correct procedures for performing tests safely.

4.1.5 When making high voltage tests, particularly in compressed gas or in oil, it is possible for the energy released at breakdown to be sufficient to result in fire, explosion, or rupture of the test chamber. Design test equipment, test chambers, and test specimens so as to minimize the possibility of such occurrences and to eliminate the possibility of personal injury. If the potential for fire exists, have fire suppression equipment available. See 23.1

5. Significance and Use

5.1 Self-adhesion is a primary initial property since it affects layer-to-layer bonding. The integrity of the bond can significantly affect the electrical and physical performance of the insulation system. Therefore, the degree of self-adhesion is directly related to apparatus performance.

5.2 A high degree of self-adhesion is desirable for most electrical applications. In this test, a short unwinding length indicates a high degree of self-adhesion.

5.3 This test method has been found useful as a quality control test for lot acceptance.

6. Apparatus

6.1 *Inclined Mandrel Tack Test Fixture*—A suggested fixture is shown in Fig. 1. Tack tester assembly and details are included as Appendix X1. The mandrel shall consist of a 16 mm (0.625 in.) diameter aluminum rod mounted in low-friction bearings. Good alignment of bearings is necessary for accurate results. When properly assembled, the mandrel shall turn freely when loaded with a 28 g (1-oz) weight suspended from a cotton thread wound in a single layer at the center of the mandrel.

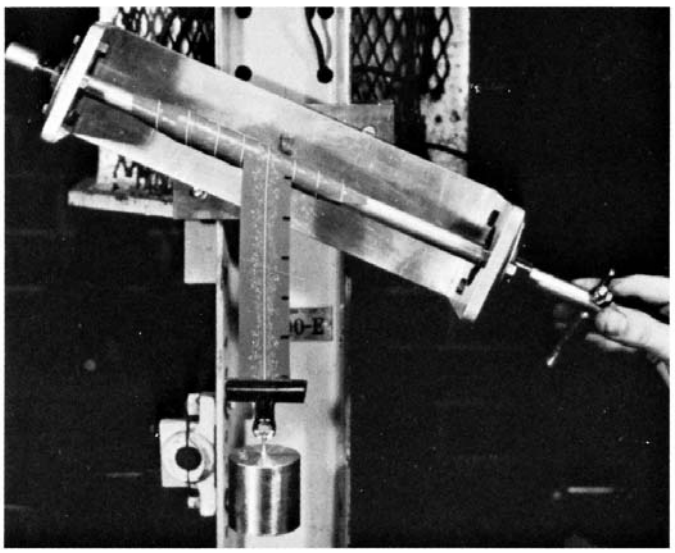

FIG. 1 Inclined Mandrel Tack Test Fixture

6.2 *Weights,* as specified in Section 8 and means for attachment.

6.3 Calibrated stopwatch capable of measuring accurately to one second.

7. Test Specimen

7.1 A test specimen shall consist of two pieces of tape 305 mm to 380 mm (12 to 15 in.) long. Divisions spaced 25 mm (1 in.) apart shall be marked off on one piece of tape. If tapes contain an interliner, the interliner shall be removed just prior to wrapping the mandrel. Dirt and other forms of contamination shall be avoided.

8. Procedure

8.1 *Winding*—Half lap the unmarked specimen perfectly on the mandrel of the test fixture, using the suggested weight as shown in Table 1. These weights are not critical. However, they are necessary to get intimate contact and conformability of the tape. To obtain perfect half lapping, tilt the tack tester at an appropriate angle as shown in Fig. 1. Wrap the tape on the mandrel at a speed of approximately 460 mm (18 in.)/min. Using the winding procedure and weights just described, half lap the marked tape sample on the mandrel over the first piece of tape. With the winding weight attached, return the test fixture to a horizontal position and allow the tape to bond for 1 min. Remove the winding weight from the tape and the handle from the fixture and proceed with the unwinding test.

8.2 *Unwinding*—After the tape has bonded for 1 min, attach a load of 600 g (21 oz)/25 mm (in.) of the original tape width (Note 2). Attach the weight to the free end of the tape by means of a bulldog paper clamp or other suitable device. Release the weight and record the length of tape unwound in 3 min. Although the original 25 mm (1 in.) dimensions will elongate due to the unwind weight, consider each division as one unit. While the winding weights are not critical, the use of proper unwinding weights is mandatory. Consistent and comparable results depend upon accurate width measurements and the use of the proper unwinding weight.

NOTE 2—Commercial tapes are usually made to a ±1.6 mm (±0.06 in.)

TABLE 1 Suggested Winding Weights for 1-in. Wide Tapes

Note—Winding weights are based on cross-sectional area and have been selected to produce approximately the same unit stress on all cross-sections. For tapes of dimensions not listed, use a winding weight of approximately 300 g (10.5 oz)/6 mm^2 (0.01 $in.^2$).

Tape Thickness, mm (in.)		Weight, g (oz)
Triangular	Rectangular	
0.50 (0.020)	0.25 (0.010)	300 (10.5)
0.75 (0.030)	0.4 (0.015)	450 (15.8)
1.02 (0.040)	0.5 (0.02)	600 (21.0)
1.27 (0.050)	0.64 (0.025)	750 (26.4)
1.52 (0.060)	0.76 (0.030)	900 (31.7)
1.78 (0.070)	...	1050 (37.0)
2.03 (0.080)	...	1200 (42.3)