Designation: D 2519 – 96

An American National Standard

Standard Test Method for Bond Strength of Electrical Insulating Varnishes by the Helical Coil Test[1]

This standard is issued under the fixed designation D 2519; 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 Department of Defense.

1. Scope

1.1 This test method covers determination of the bond strength of an electrical insulating varnish when applied to a helical coil. The helical coil can be made from bare aluminum or copper wire or from film or fiber-insulated magnet wire. Helical coils made from bare aluminum or bare copper wire will yield values of bond strength for the varnish when applied to bare metal conductors. The use of film or fiber-insulated magnet wire will show values for that particular combination of insulation and varnish.

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.* See Section 7.

2. Referenced Documents

2.1 *ASTM Standards:*

D 115 Test Methods for Testing Solvent Containing Varnishes Used for Electrical Insulation[2]

D 618 Practice for Conditioning Plastics and Electrical Insulating Materials for Testing[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *bond strength*—a measure of the force required to separate surfaces which have been bonded together.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *event time*—the time between initial application of a physical or electrical stress and failure of the specimen under test.

3.2.2 *response time*—the time required for an indicating or recording device to react to change in stress on a specimen under test.

4. Summary of Test Method

4.1 Flexural strength tests are made on varnish-treated helical coils to determine the force required to break the coil under specified conditions.

5. Significance and Use

5.1 Values obtained by flexural tests can provide information with regard to the bond strength of the particular varnish, in combination with a particular wire, when measured under conditions described in this test method.

6. Apparatus

6.1 *Tensile Testing Machine*—An adjustable-speed drive and a suitable instrument for measuring force should be used in breaking the specimen. This may be in the form of one of the generally available tensile testing machines, or may be simply an accurate spring gage and a separate adjustable-speed drive.[4] To cover the range of load strength values which are commonly encountered it is recommended that a multirange tester be used.

6.1.1 It has been found that gages rated 5, 25, 150, and 500 N or (1, 5, 30, and 100 lbf) are adequate to cover the range of varnishes.

6.2 *Test Fixture*—The test fixture shall consist essentially of two rollers, attached to a common frame, to be pulled in one direction, and a 90° V-block to be pulled in the opposite direction. There shall be no friction contact which will affect this movement. The general shape and the relative position of these parts is shown in Fig. 1. The rollers shall have a diameter of 9.5 mm (0.375 in.) at the center and shall be parallel having a center-to-center distance of 44.5 mm (1.75 in.). The 90° V-block shall have a radius at the apex of 0.8 mm (0.03 in.).

6.3 *Test Fixture Enclosure*—For tests at other than room temperature, an insulated heat-resistant enclosure, designed to fit around the test fixture and into the tension testing machine, should be used. This enclosure should permit a frictionless

[1] This test method is under the jurisdiction of ASTM Committee D-9 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.01 on Electrical Insulating Varnishes, Powders, and Encapsulating Compounds.

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[2] *Annual Book of ASTM Standards*, Vol 10.01.

[3] *Annual Book of ASTM Standards*, Vol 08.01.

[4] Spring gages from John Chattilon and Sons, 83-30 Kew Gardens Road, Kew Gardens, NY 11415 or from Hunter Spring Co., One Spring Avenue, Hatfield, PA 19440, or its equivalent, have been found satisfactory for this purpose.