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Designation: ~~D4882 – 05 (Reapproved 2012)~~ D4882 – 17

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

This standard is issued under the fixed designation D4882; 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~~ Scope*

1.1 This test method covers the determination of the bond strength of an electrical insulating varnish when applied to a twisted coil of film-insulated magnet wire. The use of a particular type of film-insulated wire will show the values for that combination of film coating and varnish.

1.2 The values stated in inch-pound units are the standard. The values given in parentheses are for information only.

NOTE 1—Although this standard and Method C of IEC 61033 differ in approach or detail, data obtained using either are technically equivalent.

1.3 *This standard does not purport to address ~~all, if any,~~ 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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.* A specific precautionary statement is given in Section 7.

1.4 *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.*

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2. Referenced Documents

2.1 *ASTM Standards:*[2]

D115 Test Methods for Testing Solvent Containing Varnishes Used for Electrical Insulation

D1711 Terminology Relating to Electrical Insulation

D2519 Test Method for Bond Strength of Electrical Insulating Varnishes by the Helical Coil Test

D6054 Practice for Conditioning Electrical Insulating Materials for Testing (Withdrawn 2012)[3]

2.2 *IEC Standard:*

IEC 61033 Test Methods for the Determination of Bond Strength of Impregnating Agents to an Enamelled Wire Substrate[4]

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3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

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

3.2 Refer to Terminology D1711 for definitions of other terms.

4. Summary of Test Method

4.1 Flexural strength tests are made on twisted coils to determine the force required to break the coils under specific conditions.

5. Significance and Use

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

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

Current edition approved ~~Jan. 1, 2012~~Nov. 1, 2017. Published ~~January 2012~~November 2017. Originally approved in 1988. Last previous edition approved in ~~2005~~2012 as ~~D4882 – 05.~~D4882 – 05 (2012). DOI: ~~10.1520/D4882-05R12.~~10.1520/D4882-17.

[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.

[4] Available from American National Standards Institute, 25 W. 43rd St., 4th Floor, New York, NY 10036.

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

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6. Apparatus

6.1 Coil winder as shown in Fig. 1 and Fig. 2.

6.2 Coil Twister as shown in Fig. 3.

6.3 Test apparatus as described in Test Method D2519.

7. Safety Precautions

7.1 It is unsafe to use varnish at temperatures above the flash point without adequate ventilation, especially if the possibility exists that flames or sparks are present. Store varnish in sealed containers.

8. Test Specimen Preparation

8.1 The test specimen is a wound coil made from film-insulated magnet wire, 28 AWG (0.320 mm). The coil shall be made by means of suitable winding equipment as shown in Fig. 1. To prevent opening of the coil after removal from the winding equipment, each end of the magnet wire, or short pieces of film-insulated wire, ~~may be~~ are wrapped around the coil two or three times. For this purpose the winding equipment is provided with appropriate notches as shown in Fig. 2. For winding the coil the following dimensions apply:

~~Winding diameter~~	~~2.25 ± 0.05 in. (57 ± 1 mm)~~
Winding diameter	2.25 ± 0.05 in. (57.2 ± 1 mm)
~~Width of slot~~	~~.25 ± 0.05 in. (6 ± 1 mm)~~
Width of slot	.25 ± 0.05 in. (6.4 ± 1 mm)
Number of turns	100 (See Note 2)
Nominal wire diameter	28 AWG (0.320 mm)

NOTE 2—Instead of 100 turns of a single wire, 50 turns of two parallel wires ~~may be used~~ are allowable to provide a bifilar winding.

8.1.1 After the coil has been wound, remove it from the winding equipment and stretch into an oval shape as shown in Fig. 4. Twist the coil two full turns around its longitudinal axis by means of a twisting device as shown in Fig. 3. The twisted coil formed is about 0.28 in. (~~7~~7.1 mm) in diameter and 3.25 to 3.5 in. (~~85~~82.6 to ~~90 mm)~~ 88.9 mm) in length and serves as a substrate for the varnish.

8.2 The type of magnet wire and test conditions shall be mutually agreed upon between all involved parties.

8.3 Prepare six or more specimens for each condition to be investigated.

8.4 For solvent-containing varnishes, adjust the viscosity of the varnish by trial, to produce a dry film build of 0.0017 to 0.0021 in. (.043 to .053 mm) on a double-coated copper panel coated in accordance with Test Methods D115.

8.5 Do not adjust solventless varnishes.

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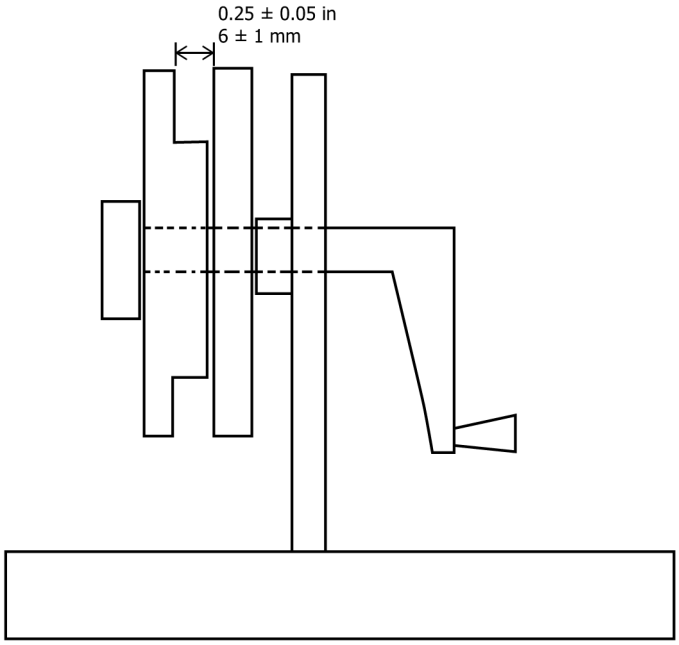

FIG. 1 Coil Winder