Designation: D5682 – 08

StandardTest Methods for Electrical Resistivity of Liquid Paint and Related Materials[1]

This standard is issued under the fixed designation D5682; 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 the determination of specific resistance (resistivity) of liquid paints, solvents, and other fluids in the range of 0.6 to 2640 MΩ-cm.

1.2 Test Method A describes a procedure for making resistance tests with a commonly used paint application test assembly (Fig. 1 and Fig. 2).

1.3 Test Method B describes a procedure for making resistance tests with a conductivity meter (Fig. 3).

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this 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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Terminology

2.1 *Definitions:*

2.1.1 *specific resistance (resistivity), n*— the ratio of the d-c potential gradient in volts per centimetre paralleling the current flow within the specimen to the current density in amperes per square centimetre at a given instant of time and under prescribed conditions.

2.1.1.1 *Discussion*—This is numerically equal to the resistance between opposite faces of a centimetre cube of the liquid. The units are ohm centimetres (or megohm centimetres).

2.2 *Definitions of Terms Specific to This Standard:*

2.2.1 *kilohm (KΩ), n*—resistance value equal to 1000 Ω (10^3).

2.2.2 *megohm (MΩ), n*—resistance value equal to 1 000 000 Ω (10^6).

2.2.3 *ohm-centimetre (or megohm-centimetre), n*—unit of specific resistance (resistivity).

3. Summary of Test Methods

3.1 Test Methods A and B measure direct current through concentric cylinder electrodes immersed in a liquid paint specimen.

4. Significance and Use

4.1 These tests are suitable for testing paints adjusted for compatibility with various electrostatic spray coating applications, and by their use, spray performance can be optimized.

5. Interferences

5.1 Contamination of the specimen is the most likely cause of error. Very small amounts of water, acids, or polar solvents will lower the resistance of high resistivity solvents and paints.

5.2 High humidity is not known to interfere with the test itself but can lead to water pickup by the specimen. For repeatable results, tests should be made under the same atmospheric conditions and specimens should be stored and handled so as to keep water pickup to a minimum.

5.3 Resistivity varies with temperature. A standard test temperature of 25°C is recommended. Other temperatures are possible on agreement between the producer and the user.

5.4 Electrification time must be the same for every test due to ion migrations that cause current flow to decrease with time. Variations with time of electrification can result in appreciable variation in the test results.

5.5 Devices described in Test Methods A and B apply different test voltages (45 V and 15 V, respectively). Because of this, some variation in results may be expected.

6. Reagents and Materials

6.1 *Low Resistivity Cell Constant Standards* (see Appendix X1 for cell constant determination method).

6.1.1 *Potassium Chloride,* 1000 μΩ/cm.[2]

6.2 *Cleaning Solvents and Solutions*—It is essential to thoroughly clean the probe before and after tests. The cleaning solvent should be chosen on the basis of the paint tested. Due care must be exercised in cleaning to ensure all cleaning

[1] These test methods are under the jurisdiction of ASTM Committee D01 on Paint and Related Coatings, Materials, and Applications and are the direct responsibility of Subcommittee D01.24 on Physical Properties of Liquid Paints and Paint Materials.

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[2] 1000 μΩ/cm test solutions are available from scientific supply companies.

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

FIG. 1 Analog Paint Application Test Assembly

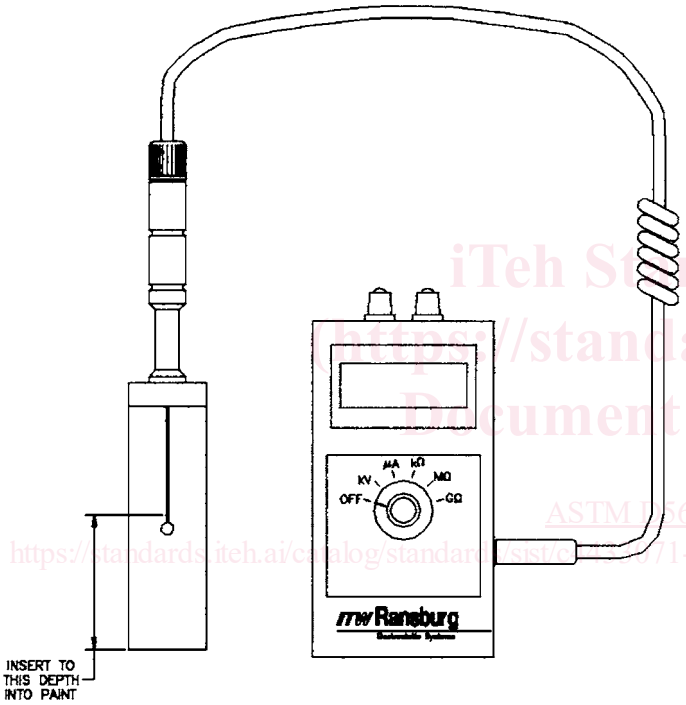

FIG. 2 Diagram of Digital Application Test Assembly

FIG. 3 Conductivity Meter

solvents are removed from the probe before reusing. The probe must be dry and free from contaminates or results will vary.

TEST METHOD A

7. Apparatus

7.1 *Paint Application Test Assembly*—designed to provide measurement of the electrical resistance of paint formulations for all electrostatic applications. To provide greater accuracy in measuring low resistance paints, the meter is equipped with dual range selection. Range "A" is .005 to 1 MΩ , Range "B" is .05 to 20 MΩ. The original version of this device was an analog instrument with a pointer and scale as shown in Fig. 1 and many such instruments are in use. It has been replaced by a digital version, a diagram of which is in Fig. 2.

8. Standardization

8.1 For maximum accuracy, the probe should be standardized to determine the exact cell constant. For routine measurements a cell constant (*K*) of 132 may be used (see Appendix X1).

8.2 The electronic-resistance measuring assembly may be checked by use of a standard-resistance decade box (½ % accuracy or better).

9. Procedure

9.1 Prior to tests, make sure that the probe is thoroughly cleaned (see 6.2).

9.2 Insert the paint test probe into the jack in the lower right side of the meter case.

9.3 Set the scale select switch (top center) to the Scale B position.

9.4 Move the mode select switch (top right) to the Zero Adjust position and rotate the zero adjust knob (top left) until the dial indicator needle centers on the adjust position (far right). Maximum accuracy will be realized with the meter lying flat, meter face up.

NOTE 1—If the needle will not adjust to zero, replace the battery.

9.5 Move the mode select switch to the Paint Test position.

9.6 Immerse the probe vertically into a well-mixed, visually uniform specimen of the subject material until the holes at the bottom of the slots in the probe sleeve are submerged.