Designation: ~~D5374 – 13~~ D5374 – 22

Standard Test Methods for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation[1]

This standard is issued under the fixed designation D5374; 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 procedures for evaluating the characteristics of forced-convection ventilated electrically-heated ovens, operating over all or part of the temperature range from ~~20°C~~20 °C above the ambient temperature to ~~500°C~~500 °C and used for thermal endurance evaluation of electrical insulating materials.

1.2 These test methods are based on IEC Publication ~~216-4-1,~~60216-4-1, and are technically identical to it. This compilation of test methods and an associated specification, D5423, have replaced Specification D2436.

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~~ safety, health, and ~~health~~environmental practices and determine the applicability of regulatory limitations prior to use.*

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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2436 Specification for Forced-Convection Laboratory Ovens for Electrical Insulation (Withdrawn 1994)[3]

D5423 Specification for Forced-Convection Laboratory Ovens for Evaluation of Electrical Insulation

2.2 *Other Document:*

IEC Publication ~~216-4-1~~60216-4-1 Guide for the Determination of Thermal Endurance Properties of Electrical Insulating Materials, Part 4—Aging Ovens, Section 1—Single-Chamber Ovens[4]

3. Terminology

3.1 Refer to the terminology section of Specification D5423.

4. Significance and Use

4.1 Ovens used for thermal evaluation of insulating materials are to be capable of maintaining uniform conditions of temperature

[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 D09.17 on Fire and Thermal ~~Characteristics~~Properties.

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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.

[4] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY ~~10036.~~10036, http://www.ansi.org.

and air circulation over the extended periods of time that are required for conducting these tests. Specification D5423 specifies the permissible ~~deviations~~variations from absolute uniformity that have been ~~generally~~ accepted internationally for these ovens. These test methods include procedures for measuring these ~~deviations~~variations and other specified characteristics of the ovens.

5. Apparatus

5.1 *Multi-Point Recording Potentiometer,* having provisions for at least nine iron-constantan or chromel-alumel thermocouples, with scale readings to ~~0.1°C~~0.1 °C or less. Use of a data processor or a data logger is helpful in reducing the number of calculations required.

5.2 *Calibrated Iron-Constantan or Chromel-Alumel Thermocouples,* using 0.5-mm diameter or smaller wire and having a junction size not over 2.5 mm long.

5.2.1 If calibrated thermocouples are not available, use thermocouples made from a single spool of thermocouple wire that gives values for temperature that do not differ from each other by more than ~~0.2°C~~0.2 °C when placed within 10 mm of each other without touching inside an oven chamber at ~~200°C.~~200 °C.

5.3 It is acceptable to use a temperature measuring system other than thermocouples and a potentiometer, provided that the sensitivity, accuracy, and response time are equivalent to that of the equipment described above, and that the objectives of 6.2.3 relative to minimization of heat conduction effects are met.

5.4 *Thermal Lag Time Specimen,* consisting of a solid brass cylinder, 10 mm in diameter and 55 mm long, with one junction of a differential thermocouple soldered to the surface midway between the ends. The other junction of the thermocouple must be capable of being moved at least 80 mm away from the brass cylinder. An appropriate temperature indicator (as in 5.1, or other) must be provided for indication of temperature differences to the nearest ~~0.1°C~~0.1 °C as measured by the differential thermocouple.

5.5 *Watt-Hour Meter,* of the appropriate voltage and phase, capable of reading to the nearest ~~1.0 Wh~~ 1.0 Wh or less.

6. Procedures

6.1 *Rate of Ventilation:*

6.1.1 *Summary of Test Method*—The rate of ventilation is calculated using determinations of (*1*) the average power required to maintain the oven at a given temperature with its ports open and (*2*) the average power required to maintain the oven at the same temperature with its ports closed. The test is conducted at 100°C and at the maximum temperature at which the oven is used.

6.1.2 Seal all openings into the oven, including, but not necessarily limited to, the vent ports, door, thermometer ports, and the space around the blower shaft (if the blower motor is mounted externally).

6.1.3 Install a watt-hour meter, as described in 5.5, in the oven electrical supply line.

6.1.4 Install a temperature sensor, such as a thermometer, 2 m to 3 m away from the oven, at least 1 m away from any solid object, and approximately level with the oven air intake. Use the oven temperature indicator to measure the internal temperature of the oven.

6.1.5 Raise the oven temperature to ~~100~~100 ± ~~2°C.~~2 °C. When the temperature of the oven has stabilized, measure the consumption of power over a measured period of 30 to 40 min. Begin and end the measuring period at corresponding points of the cyclic temperature fluctuation; for example, the moment when the heaters are switched on by the thermostat in the case of an "on/off" control. Measure and record the room temperature, which must not vary by more than ~~2°C~~2 °C during the test.

6.1.6 Remove the seals to restore the oven to its normal operating condition. If necessary, adjust the vents and dampers to positions estimated to provide the specified rate of ventilation.

6.1.7 Repeat 6.1.5. The average ambient air temperature must be within ~~2°C~~2 °C of the average ambient temperature measured in 6.1.5.

6.1.8 Calculate the rate of ventilation in the oven using the following equation: