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Standard Specification for Ozone-Resistant Thermoplastic Elastomer Insulation For Wire and Cable, ~~90°C Dry/75°C~~ 90 °C Dry/75 °C Wet Operation[1]

This standard is issued under the fixed designation D4245; 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 This specification covers an ozone-resistant insulating compound for electrical wire and cables 14 AWG and larger. This compound consists substantially of a thermoplastic elastomer.

1.2 This type of insulation is suitable for continuous operation at conductor temperatures not exceeding ~~90°C~~90 °C in dry locations and ~~75°C~~ 75 °C in wet locations. Operating voltages are not to exceed 2000 V. The minimum installation temperature ~~is −40°C.~~is −40 °C.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 In many instances the insulation material cannot be tested unless it has been formed around a conductor or cable. Therefore, tests are done on insulated wire or cable in this document solely to determine the relevant property of the insulation material and not to test the conductor or completed cable.

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]

D470 Test Methods for Crosslinked Insulations and Jackets for Wire and Cable
D1711 Terminology Relating to Electrical Insulation
D2633 Test Methods for Thermoplastic Insulations and Jackets for Wire and Cable

3. Terminology

~~3.1 *Definitions:* For definitions of terms used in this specification refer to Terminology D1711.~~

[1] This specification is under the jurisdiction of ASTM Committee D09 on Electrical and Electronic Insulating Materials and is 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.

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

3.1 *Definitions:*

3.1.1 For definitions of terms used in this specification refer to Terminology D1711.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *aging, n*—exposure of materials to air at 121 °C for 168 h.

4. Physical Properties

4.1 Requirements for physical properties are listed in Table 1.

4.2 *Thickness of Insulation*—Table 1A (Conductor Sizes, Insulation Thicknesses, and AC Test Voltages for Rubber Insulations) of Test Methods D470 lists the minimum average thickness for the insulation. The required minimum thickness is 90 % of the specified average thickness.

5. Electrical Requirements

5.1 *Order of Testing*—Perform the ac voltage withstand test, insulation resistance, and dc voltage withstand test in that order when any of these tests are specified. The sequence of other testing is not specified.

5.2 *AC Voltage Withstand Test*—Unless otherwise specified, omit this test if the dc voltage withstand test described in 5.4 is to be performed. Test each insulated conductor for 5 min at the ac withstand voltage given in Table 1A (Conductor Sizes, Insulation Thicknesses, and AC Test Voltages for Rubber Insulations) of Test Methods D470 under the columns labeled "Ozone-Resisting Insulation."

5.3 *Insulation Resistance*

5.3.1 The insulated conductor shall have an insulation resistance value of at least that corresponding to a constant of 10 000 at ~~60°F (15.6°C).~~60 °F (15.6 °C).

5.3.2 If the water temperature at the time measurement was made differs from ~~60°F (15.6°C),~~ 60 °F (15.6 °C), correct the insulation resistance to ~~60°F.~~ 60 °F. Table 2, (Temperature Correction Factors for Insulation Resistance at ~~60°F),~~ 60 °F), of Test Methods D470, contains the correction factors. Use the procedure given in Test Methods D470 to determine the ~~1°F~~ 1 °F coefficient for the insulation material. Multiply the measured value by the correction factor to obtain the insulation resistance value corrected to ~~60°F.~~60 °F.

5.3.3 If the insulated conductor is covered with a non-metallic sheath so that the insulation resistance can be measured only on the completed assembly, the required insulation resistance shall be not less than 60 % of that required for the primary insulation based on the thickness of that insulation.

5.4 *DC Voltage Withstand Test*—Unless otherwise specified, omit this test if the ac voltage withstand test described in 5.2 has been performed. After completion of the insulation resistance test, test each insulated conductor for 5 min at the dc withstand voltage given in Table 1B (Conductor Sizes, and DC Test Voltages for Rubber Insulations) of Test Methods D470 under the columns labeled "Ozone-Resisting Insulations."

TABLE 1 Requirements for Physical Properties

Unaged Requirements:	
Tensile strength, min, psi (MPa)	1000 (6.9)
Elongation at rupture, min, %	300
Aged Requirements:	
After air-oven test at 121 ± 1 °C for 168 h:	
Tensile strength and elongation at rupture, min, % of unaged value	75
~~*Heat Distortion* (At 150 ± 1°C, max, % of unaged value):~~	
Heat Deformation (At 150 ± 1 °C, max, % of unaged value):	
4/0 AWG (107 mm^2) and smaller (insulation on cable)	50
Larger than 4/0 AWG (107 mm^2) (buffed sample of insulation)	50

TABLE 2 Accelerated Water Absorption Test Requirements

Electrical Method:	
Permittivity after 1 day, max	6.0
Increase in capacitance, max, %:	
From 1 to 14 days	5.0
From 7 to 14 days	3.0
Stability factor after 14 days, max	1.0
Alternative, stability factor difference:	
1 to 14 days, max	0.5

6. Cold Bend

6.1 The insulation shall not show any cracks when tested at a temperature ~~of – 55°C~~ of – 55 °C in accordance with the procedure and Table ~~number~~ 7 (Mandrel Diameters for Cold Bend Test) in Test Methods D470.

7. Ozone

7.1 The insulation shall show no cracking or surface checking visible to the unaided eye after exposure to an ozone concentration of not less than 0.025 nor more than 0.030 % by volume, when tested in accordance with Test Methods D470.

8. Heat ~~Distortion~~Deformation

8.1 The insulation shall meet the requirements in Table 1 when tested in accordance with the procedure in Methods D2633.

9. Accelerated Water Absorption

9.1 The insulated conductor shall meet the requirements in Table 2 when tested in accordance with the procedure in Test Methods D470. Conduct the electrical method test at 60 Hz with the water temperature at 75 ± ~~1°C.~~1 °C.

10. Sampling

10.1 Unless otherwise instructed, sample the insulation in accordance with Test Methods D470.

11. Test Methods

11.1 Unless otherwise instructed, test the insulation in accordance with Test Methods D470.

12. Keywords

12.1 ~~accelerated water absorption; 90 °C dry/75 °C wet insulation;~~ ac voltage test; accelerated water absorption; dc voltage test; insulation; insulation resistance; ~~90°C dry/75°C wet insulation;~~ ozone-resistant; thermoplastic elastomer; thermoplastic elastomer insulation

SUMMARY OF CHANGES

Committee D09 has identified the location of selected changes to this ~~specification~~standard since the last ~~issue,~~ issue (~~D4245 – 02~~D4245 – 08 (2013)~~.~~) that may impact the use of this ~~specification.~~standard. (Approved Jan. 1, 2021~~November 1, 2008~~).)

~~*(1)* Revised Sections 4 and 5.~~

(1) Changed “heat distortion” to “heat deformation” in Table 1 and Section 8.