



Standard Specification for Ozone-Resisting Silicone Rubber Insulation for Wire and Cable¹

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1. Scope

1.1 This specification covers an ozone-resisting crosslinked silicone rubber insulating compound for electrical wires and cables.

1.2 This type of insulation is considered suitable for continuous operation at conductor temperatures up through 125°C for power cable applications. It is considered suitable for conductor sizes up to and including 1000 kcmil (507 mm²) at a maximum of 5000 V for both single-and-multiple-conductor cables. Minimum conductor sizes and insulation thicknesses are given in Table 1.

1.3 The values stated in inch-pound units are the standard, except in cases where SI units are more appropriate. The values in parentheses are for information only.

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

2. Referenced Documents

2.1 ASTM Standards:

D 470 Test Methods for Crosslinked Insulations and Jackets for Wire and Cable²

2.2 ICEA Standard:

T-24-380 Guide for Partial-Discharge Procedure³

3. Terminology

3.1 Definition of Term Specific to This Standard:

3.1.1 *aging, n*—exposure of material to air at 200 ± 2°C for 168 h.

4. Physical Requirements

4.1 The crosslinked insulation shall conform to the requirements for physical properties listed in Table 2.

¹ This specification is under the jurisdiction of ASTM Committee D-9 on Electrical and Electronic Insulating Materials and is the direct responsibility of Subcommittee D09.18 on Solid Insulations, Nonmetallic Sheildings, and Coverings for Electrical and Telecommunications Wires and Cables.

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

³ Available from Insulated Cable Engineers Association, PO Box 440, South Yarmouth, MA 02664.

5. Electrical Requirements

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

5.2 *Partial-Discharge (Corona) Extinction Level*—When tested in accordance with ICEA T-24-380 as modified in Methods D 470, each length of completed power cable rated for service at 2001 to 5000 V with insulation shielding on the individual conductors shall have a partial discharge (corona) extinction level of 4.0 kV for an insulation level of 100 % (grounded neutral) and 5.0 kV for an insulation level of 133 % (ungrounded neutral).

5.3 *AC Voltage Test*—Each insulated conductor in the completed cable shall withstand for 5 min the ac test voltage specified in Table 1. Unless otherwise specified, omit this test if the dc voltage test described in 5.5 is to be performed.

5.4 *Insulation Resistance*—The insulated conductor shall have an insulation-resistance value equal to or greater than that corresponding to a constant of 4000 (1000 ft or 305 m basis) at 60°F (15.6°C). When the temperature of the water in which the insulation is tested differs from 60°F, apply a correction factor. Table 2, “Temperature Correction Factors for Insulation Resistance at 60°F,” of Test Methods D 470 contains the correction factors. Each insulation manufacturer can furnish the 1°F coefficient for the insulation material by using the procedure given in Test Methods D 470. Multiply the measured value by the correction factor to obtain the insulation resistance value corrected to 60°F.

5.4.1 Where a nonconducting separator is applied between the conductor and insulation, or where an insulated conductor is covered with a nonmetallic sheath so that the insulation resistance can be measured only on the completed assembly, the required insulation resistance shall be at least 60 % of that required for the primary insulation based on the thickness of that insulation.

5.5 *DC Voltage Test*—Upon completion of the insulation resistance test, each insulated conductor in the completed cable shall withstand for 5 min the dc test voltage specified in Table 1. Unless otherwise specified, omit this test if the ac voltage test described in 5.3 has been performed.

6. Ozone Resistance

6.1 The insulation shall show no cracks after exposure for 3

TABLE 1 Minimum Conductor Size and Insulation Thicknesses

Rated Circuit Voltage, Phase to Phase, V	Size, AWG or kcmil (mm ²)	100 % Insulation Level, Grounded Neutral or 133 % Insulation Level, Ungrounded Neutral			
		mils	mm	A-C Test Voltage, kV	D-C Test Voltage, kV
0 to 600	18 to 16 (0.823 to 1.31)	30	0.76	1.0	
	14 to 9 (2.08 to 6.63)	45	1.14	4.5	13.5
	8 to 2 (8.37 to 33.6)	60	1.52	6.0	18.0
	1 to 4/0 (42.4 to 107)	80	2.03	7.5	22.5
	225 to 500 (114 to 253)	95	2.41	8.5	25.5
601 to 1000	525 to 1000 (266 to 507)	110	2.79	10.0	30.0
	14 to 8 (2.08 to 8.37)	60	1.52	6.0	18.0
	7 to 2 (10.6 to 33.6)	80	2.03	7.5	22.5
	1 to 4/0 (42.4 to 107)	95	2.41	8.5	25.5
	225 to 500 (114 to 253)	110	2.79	10.0	30.0
1001 to 2000	525 to 1000 (266 to 507)	125	3.18	11.5	34.5
	14 to 8 (2.08 to 8.37)	80	2.03	7.5	22.5
	7 to 2 (10.6 to 33.6)	95	2.41	8.5	25.5
	1 to 4/0 (42.4 to 107)	110	2.79	10.0	30.0
	225 to 500 (114 to 253)	125	3.18	11.5	34.5
2001 to 5000	525 to 1000 (266 to 507)	140	3.66	11.5	34.5
	8 to 4/0 (8.37 to 107)	155	3.94	13.0	35.0
	225 to 1000 (114 to 507)	170	4.32	13.0	35.0

TABLE 2 Requirements for Physical Properties

<i>Unaged Requirements:</i>	
Tensile strength, min, psi (MPa)	800 (5.5)
Elongation at rupture, min, %	250
<i>Aged Requirements:</i>	
After air oven test at 200 ± 2°C for 168 h:	
Tensile strength, min, psi (MPa)	500 (3.4)
Elongation at rupture, min, %	125

TABLE 3 Accelerated Water Absorption Requirements

<i>Electrical Method:</i>	
Increase in capacitance, max %	
From 1 to 14 days	10.0
From 7 to 14 days	3.0
<i>Gravimetric Method:</i>	
Water absorption, max, mg/in. ² (g/m ²)	15.0 (23.3)

h to an ozone concentration not less than 0.025 nor more than 0.030 volume %.

7. Accelerated Water Absorption

7.1 The insulation shall conform to the requirements for accelerated water absorption, specified in Table 3. Maintain the water at 75 ± 1°C in the Electrical Method and 70 ± 1°C in the Gravimetric Method.

8. Sampling

8.1 Unless otherwise instructed, sample the insulation in accordance with Test Methods D 470.

9. Test Methods

9.1 Unless otherwise instructed, test the insulation in accordance with Test Methods D 470.

10. Keywords

10.1 ozone-resisting; silicone-rubber insulation

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