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An American National Standard

Standard Specification for Poly(Vinyl Chloride) Insulation for Wire and Cable, 75°C Operation[1]

This standard is issued under the fixed designation D 2220; 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 a thermoplastic insulation of poly(vinyl chloride) or the copolymer of vinyl chloride and vinyl acetate. This insulation is recommended for use at conductor temperatures not in excess of 75°C in dry locations at a maximum voltage rating of 300 V for power and control circuits with an insulation thickness of 15 mils (0.38 mm) and is recommended at conductor temperatures not in excess of 75°C in wet or dry locations at a maximum voltage of 600 V for power and control circuits.

1.2 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.

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

2. Referenced Documents

2.1 *ASTM Standards:*

D 1711 Terminology Relating to Electrical Insulation[2]

D 2633 Methods of Testing Thermoplastic Insulations and Jackets for Wire and Cable[3]

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this specification, refer to Terminology D 1711.

3.2 *Definition of Term Specific to This Standard:*

3.2.1 *aging (act of), n*—exposure of materials to air or oil at a temperature and a time as specified in Table 1.

4. Physical Properties

4.1 The insulation shall conform to the requirements for physical properties prescribed in Table 1.

TABLE 1 Physical Properties Requirements for Insulation

Physical properties requirements:	
Tensile strength, min, psi (MPa)	2000 (13.8)
Elongation at rupture, min, %	150
Air Oven Aging Requirements:	
After air oven test at 121± 1°C for 168 h:	
Tubular Specimens—up to size AWG 6 (13.3 mm^2)	
Tensile strength, min, % of unaged value	80
Elongation, min, % of unaged value	75
Buffed die-cut Specimens—sizes AWG 6 and larger	
Tensile strength, min, % of unaged value	50
Elongation, min, % of unaged value	75
Heat shock, 121 ± 1°C	no cracks
Heat distortion, 121 ± 1°C, max, % decrease	25
Vertical flame test, max burning time after five 15-s applications	passes
Oil resistance test:	
After oil immersion at 70± 1°C for 4 h:	
Tubular Specimens—up to size AWG 6 (13.3 mm^2)	
Tensile strength, min, % of unaged value	85
Elongation, min, % of unaged value	85
Buffed die-cut Specimens—sizes AWG 6 and larger	
Tensile strength, min, % of unaged value	80
Elongation, min, % of unaged value	60
Cold bend test, −30 ± 1°C for 1 h	no cracks

5. Electrical Requirements

5.1 Perform the ac voltage, insulation resistance, and dc voltage tests in that order when any of these tests are required. The sequence for other testing is not specified.

5.2 *AC Voltage Test*—Test the insulated conductor at the ac withstand voltage as specified in Table 2. This test may be omitted if the dc withstand voltage test described in 5.4 is performed.

5.3 *Insulation Resistance*:

5.3.1 Insulated conductors in sizes AWG 14 (1.63 mm) and larger shall have an insulation resistance of at least that corresponding to a constant of 2000 at 60°F (15.6°C).

5.3.2 If the temperature at the time measurement was made differs from 60°F (15.6°C), correct the insulation resistance to 60°F by multiplying the measured value by the proper correction factor from Table 1, Temperature Correction Factors for Insulation Resistance at 60°F, of Methods D 2633.

5.4 *DC Voltage Test*—Upon completion of the insulation resistance test, test each non-shielded insulated conductor for 5 min at a dc withstand voltage which is three times the ac test voltage specified in Table 2. This test may be omitted if the ac withstand voltage test described in 5.2 is performed.

5.5 *Accelerated Water Absorption*—The insulation shall meet the requirements in Table 3.

[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 Shieldings, and Coverings for Electrical and Telecommunications Wires and Cables.

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

[3] *Annual Book of ASTM Standards*, Vol 10.02.

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