



Standard Specification for Poly(Vinyl Chloride) Insulation for Wire and Cable, 90°C Operation¹

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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 90°C.

1.2 Depending on the thickness of the insulation, the maximum voltage used, and whether the location is wet or dry, this insulation may be used for 300 V (dry) and 600 V (wet or dry) power and control circuits.

1.3 This insulation may have low-temperature installation limitations. Consult the manufacturer for specific recommendations for installation.

1.4 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.

1.5 This specification covers an insulating material. In some tests, it is necessary to produce an insulated conductor in order to test the insulation properties. However, in these instances, only the properties of the insulation are being tested, not the completed conductor.

2. Referenced Documents

2.1 ASTM Standards:

D 1711 Terminology Relating to Electrical Insulation²

D 2633 Methods of Testing Thermoplastic Insulations and Jackets for Wire and Cable³

3. Terminology

3.1 *Definitions:* For definitions of terms used in this specification, refer to Terminology D 1711.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *aging (act of), n*—exposure of materials to air or oil at a temperature and for an interval of time as required 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 Requirements for Insulation

Physical requirements:	
Tensile strength, min, psi (MPa)	2000 (13.8)
Elongation at rupture, min, %	150
Heat aging requirements:	
After air oven test at 121 ± 1°C for 168 h:	
Tensile strength, min, percent of unaged value:	70
Elongation at rupture, min, percent of unaged value:	65
Heat shock, 121 ± 1°C	no cracks
Heat distortion, 121 ± 1°C, max, percent decrease	25
Vertical flame test, maximum burning time after 15-s applications:	passes
Oil resistance:	
After oil immersion at 70 ± 1°C for 4 h:	
Tensile strength, min, percent of unaged value	85
Elongation, min, percent of unaged value	85
Cold bend test, +30 ± 1°C for 1 h	no cracks

4.2 For Sizes AWG 6 (13.3 mm²) and larger where buffed die-cut specimens are used, the minimum elongation and tensile strength, as a percentage of unaged values, shall be at least the following:

Elongation after air oven test	45 %
Tensile strength after oil immersion	80 %
Elongation after oil immersion	60 %

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. Unless otherwise specified, omit this test 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 mm²) 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 the 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 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 that is three times the ac test voltage specified in Table 2. Unless otherwise specified, omit this test if the ac withstand voltage test described in 5.2 is performed.

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 Telecommunication 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.