



Designation: F712 – 06 (Reapproved 2011)

Standard Test Methods and Specifications for Electrically Insulating Plastic Guard Equipment for Protection of Workers¹

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1. Scope

1.1 These test methods cover three electrical tests on plastic guards and assembled guard systems. They are:

1.1.1 *Method A*—Withstand voltage proof test,

1.1.2 *Method B*—Flashover voltage, and

1.1.3 *Method C*—Leakage current.

1.1.4 This specification covers plastic guard equipment and guard systems used by workers for temporary insulation on electric power circuits.

1.1.5 Plastic guard equipment covered by this specification is rated for momentary, or brush contact only. Maximum-use voltages are covered in [Table 1](#) and [Table 2](#).

1.2 These test methods cover, but are not limited to, the following typical guards:

1.2.1 *Conductor Guards and Connecting Covers as follows:*

1.2.1.1 Line guards,

1.2.1.2 Line guard connectors,

1.2.1.3 Insulator covers,

1.2.1.4 Dead-end covers,

1.2.1.5 Bus guards, and

1.2.1.6 Bus “T” guards.

1.2.2 *Structure and Apparatus Covers as follows:*

1.2.2.1 Pole guards,

1.2.2.2 Ridge pin covers,

1.2.2.3 Switch blade covers,

1.2.2.4 Arm guards,

1.2.2.5 Cutout covers,

1.2.2.6 Structural barriers, and

1.2.2.7 Cross arm guard.

1.3 It is common practice for the user of this equipment to prepare instructions for the correct use and maintenance.

1.4 The use and maintenance of this equipment is beyond the scope of these test methods.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the*

¹ These test methods are under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and are the direct responsibility of Subcommittee F18.25 on Insulating Cover-Up Equipment.

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responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1.6 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.

2. Referenced Documents

2.1 *ASTM Standards:*²

D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

D256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

D570 Test Method for Water Absorption of Plastics

2.2 *IEEE Standard:*³

IEEE 978 Guide for In-Service Maintenance and Electrical Testing for Live-Line Tools

2.3 *ANSI Standard:*⁴

C39.5 Safety Requirements for Electrical and Electronic Measuring and Controlling Instrumentation

2.4 *UL Standard:*⁵

94 Tests for Flammability of Plastic Materials for Parts in Devices and Appliances

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *insulating plastic guards*—devices for temporary installation on structures or energized electric power circuits for electrical protection of personnel or equipment, or both.

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 Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331, <http://www.ieee.org>.

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

⁵ Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

TABLE 1 Withstand Voltage Proof Test^A

Class	Rating, kV	Max Use 60 Hz	Proof Test Withstand Voltage (in-service testing)		Duration, min	Criteria
	0-0 ^A	0-Ground	0-Ground 60 Hz	0-Ground DC		
2	14.6	8.4	13.0	18	1	No flashover other than momentary as a result of too-close spacing of electrode
3	26.4	15.3	24.0	34	1	
4	36.6	21.1	32.0	45	1	
5	48.3	27.0	42.0	60	0.5	
6	72.5	41.8	64.0	91	0.25	

^A Cover-up materials are tested at values greater than the maximum use phase to ground values. The maximum use phase to phase values relate to guarded phase to guarded phase. The units are not rated for bare phase to guarded phase potentials.

TABLE 2 Minimum Flashover Test^A

	Rating, kV	Max Use 60 Hz	Min Flashover Voltage Test ϕ -Ground kV		Criteria
	0-0 ^A	0-Ground	60 Hz	DC	
2	14.6	8.4	14.0	20	No flashover other than momentary as a result of too-close spacing of electrode
3	26.4	15.3	25.0	35	
4	36.6	21.1	34.0	48	
5	48.3	27.0	43.0	61	
6	72.5	41.8	67.0	95	

^A Cover-up materials are tested at values greater than the maximum use phase to ground values. The maximum use phase to phase values relate to guarded phase to guarded phase. The units are not rated for bare phase to guarded phase potentials.

3.1.2 *self extinguishing*—relates to a property of a plastic material compounded so as to cease combustion on removal of the source that caused ignition.

4. Significance and Use

4.1 All three tests may be used for product design qualification.

4.2 This specification covers the minimum electrical, chemical, and physical properties designated by the manufacturer and the detailed procedures by which such properties are to be determined. The purchaser has the option to perform or have performed any of these tests and may reject equipment that fails to meet the standard criteria. Claims concerning failure to meet the specification are subject to verification by the manufacturer.

4.3 Plastic guard equipment is used for protection against accidental brush contact by the worker. A margin of safety shall be provided between the maximum voltage at which they are used and the proof-test voltage at which they are tested. This relationship is shown in [Table 1](#) and [Table 2](#). The equipment is designed only for phase-to-ground or covered phase-to-covered-phase exposure.

NOTE 1—Rubber insulating equipment is realistically limited to Class 4 material in the design specification standards. Plastic guard equipment has been designed to go beyond these voltages and provide a satisfactory degree of worker protection. Major differences exist in use criteria between the rubber and the plastic guard equipment. Each glove, sleeve, or other article of rubber insulating equipment has a given safety factor for the phase to phase voltage on which it may be used and the class or proof

voltage at which it is tested. Plastic guard equipment, however, is designed to provide a satisfactory safety factor only when used in a phase-to-ground exposure. If exposure is phase-to-phase, then a satisfactory safety factor is only provided if the exposure is covered-phase-to-covered-phase.

4.4 Work practices vary from user to user, dependent upon many factors. These may include, but are not limited to, operating system voltages, construction design, work procedure techniques, weather conditions, etc. Therefore, except for the restrictions set forth in this specification because of design limitations, the use and maintenance of this equipment is beyond the scope of this specification.

4.5 It is common practice and the responsibility of the user of this type of protective equipment to prepare complete instructions and regulations to govern in detail the correct and safe use of such equipment.

5. Apparatus

5.1 *Voltage Source and Test Techniques*—See Test Method [D149](#). The test equipment shall have adequate power and provide relatively stepless variable test voltage that can be raised at a rate of approximately 1000 V/s ac or 3000 V/s dc.

5.2 *Energized Inner Electrodes*, in accordance with [Table 3](#) and [Table 4](#). The length should be sufficient to extend past the ends of the guard or guard assemblies where appropriate.

5.3 *Outer Ground Electrode*—A conductive material with size and location as indicated in [Table 3](#).

5.4 *Shielded Cable*—To reduce the “room influence” when conducting ac leakage tests, the cable from the pickup electrode to the current-measuring device should be a shielded cable with the cable shield grounded.

6. Sampling

6.1 Design tests of each product model shall be conducted to verify that the requirements of [Table 1](#) and [Table 2](#) are met.

6.2 *Design Tests*—Samples shall consist of sufficient specimens of each product used in a specific guard system to form one of each assembly intended for field use.

6.2.1 The design tests will be used to qualify a specific product model and normally will not be repeated during production.

6.2.2 *Acceptance Tests*—A test sample shall consist of one or more specimens dependent on the percentage of the lot being tested.

6.2.3 A lot is represented either by all the guards produced in one production run or in one shipment.

6.2.4 Lots of new or unused guards shall have test specimens selected at random.

7. Classification

7.1 Guards are furnished in three types of materials specified in [Section 9](#) and explained as follows:

7.1.1 Type I guards are constructed of plastic material having mechanical impact properties suitable for cold weather service.

7.1.2 Type II guards have self-extinguishing plastic construction.