



Designation: D1051 – 23

Standard Specification for Rubber Insulating Sleeves¹

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1. Scope

1.1 This specification covers manufacturing and testing of rubber insulating sleeves for protection of workers from electrical shock.

1.2 Two types of sleeves are provided and are designated as Type I, nonresistant to ozone, and Type II, resistant to ozone.

1.3 Five classes of sleeves, differing in electrical characteristics, are provided and are designated as Class 0, Class 1, Class 2, Class 3, and Class 4.

1.4 Two styles of sleeves, differing in configuration, are provided and are designated as Style A, straight taper, and Style B, curved elbow.

1.5 The values stated in SI units are to be regarded as the standard. See [IEEE/ASTM SI 10](#).

1.6 The following safety hazards caveat pertains only to the test methods portion, Sections 16 – 19, of this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.* Specific safety hazards statements are given in 18.2.

1.7 *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

¹ This specification is under the jurisdiction of ASTM Committee F18 on Electrical Protective Equipment for Workers and is the direct responsibility of Subcommittee F18.15 on Worker Personal Equipment. This standard replaces ANSI Standard J6.5, which is no longer available.

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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.

- [D149 Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies](#)
- [D297 Test Methods for Rubber Products—Chemical Analysis](#)
- [D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension](#)
- [D570 Test Method for Water Absorption of Plastics](#)
- [D573 Test Method for Rubber—Deterioration in an Air Oven](#)
- [D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers](#)
- [D1415 Test Method for Rubber Property—International Hardness](#)
- [D2240 Test Method for Rubber Property—Durometer Hardness](#)
- [F819 Terminology Relating to Electrical Protective Equipment for Workers](#)
- [IEEE/ASTM SI 10 American National Standard for Metric Practice](#)

3. Terminology

3.1 Definitions:

3.1.1 *color splash, n*—a splash, smear, or streak of contrasting color evident on the inside or outside of the sleeves that was deposited during the dripping operation and is vulcanized into the sleeve as part of the homogeneous compound.

3.1.2 *halogenation treatment, n*—exposure of the entire sleeve surface area to a halogen for the purpose of reducing surface friction.

3.1.3 *user, n*—the employer or entity purchasing the equipment to be utilized by workers for their protection; in the absence of such an employer or entity, the individual purchasing and utilizing the protective equipment.

3.1.4 For definitions of other terms, refer to Terminology F819.

4. Significance and Use

4.1 This specification covers the minimum electrical, chemical, and physical properties guaranteed by the manufacturer and the detailed procedures by which such properties are to be determined. The purchaser at his option may perform or have performed any of these tests in order to verify the

guarantee. Claims for failure to meet the specification are subject to verification by the manufacturer.

4.2 Sleeves are used for personal protection; therefore, when authorizing their use, a margin of safety shall be allowed between the maximum voltage on which they are used and the proof-test voltage at which they are tested. The relationship between proof-test voltage and the maximum voltage at which the sleeves shall be used is shown in **Table 1**.

4.3 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, and so forth. 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.

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

5. Classification

5.1 Sleeves covered under this specification shall be designated as Type I or Type II; Class 0, Class 1, Class 2, Class 3, and Class 4; and Style A or Style B.

5.1.1 *Type I*, nonresistant to ozone, made from a high-grade *cis*-1,4-polyisoprene rubber compound of natural or synthetic origin, properly vulcanized.

5.1.2 *Type II*, resistant to ozone, made of any elastomer or combination of elastomeric compounds.

5.1.3 The class designation shall be based on the electrical properties as shown in **Table 1**.

5.1.4 *Style A*, straight taper design.

5.1.5 *Style B*, curved elbow design.

6. Ordering Information

6.1 Orders for sleeves under this specification should include the following information:

- 6.1.1 Type,
- 6.1.2 Class,
- 6.1.3 Style,
- 6.1.4 Size,
- 6.1.5 Color, and
- 6.1.6 With or without halogenation treatment.

6.2 The listing of types, classes, styles, sizes, and colors is not intended to mean that all shall necessarily be available from manufacturers; it signifies only that, if made, they shall conform to the details of this specification.

7. Manufacture and Marking

7.1 The sleeves shall be produced by a seamless process.

7.2 Sleeves shall have a smooth finish and self-reinforced edges.

7.3 The holes provided in sleeves for the purposes of strap or harness attachments shall have non-metallic reinforced edges and shall be nominally 8 mm ($\frac{5}{16}$ in.) in diameter.

7.4 Each sleeve shall be marked clearly and permanently with the name of the manufacturer or supplier, ASTM D1051, type, class, size, and right or left. All such marking shall be confined to the shoulder flap area and shall be nonconducting and applied in such a manner as to not impair the required properties of the sleeves.

7.4.1 A label shall be used to identify the voltage class: Class 0—red, Class 1—white, Class 2—yellow, Class 3—green, and Class 4—orange. The other required information in 7.4 may be placed on the label or molded directly into the sleeve.

7.4.2 To minimize problems of marking and identification, the following standard abbreviations may be used: Small (Sm), Regular (Rg), Large (Lg), Extra Large (XLg), and Class 1 (1), Class 2 (2), and so forth. Right or left shall not be abbreviated.

7.4.3 At the request of the user, the sleeves may be given a halogenation treatment to reduce surface friction. This treatment shall have no detrimental effect upon the electrical, chemical or physical properties of the sleeves.

8. Chemical and Physical Requirements

8.1 Sleeve test material taken from sample sleeves selected in accordance with 13.2 shall conform to the physical requirements in **Table 2** and the accelerated aging in 19.2.5.

8.2 In the event of a dispute, the identification of the rubber polymer in Type I sleeves shall be performed in accordance with 19.1.1.

8.3 The Type II sleeve material shall show no visible effects from ozone when tested in accordance with 18.7. Any visible signs of ozone deterioration of the sleeve material such as checking, cracking, breaks, pitting, and so forth, shall be considered as evidence of failure to meet the requirements of Type II sleeves.

9. Electrical Requirements

9.1 Each sleeve shall be given a proof test and shall withstand the 60 Hz ac proof-test voltage (rms value) or the dc proof-test voltage (average value) specified in **Table 1**. The

TABLE 1 Proof Test/Use Voltage Relationship

Class of Sleeve	AC Proof-Test Voltage rms V	DC Proof-Test Voltage avg, V	Maximum Use Voltage ac (rms), V	Maximum Use Voltage, DC, avg, V
0	5 000	20 000	1 000	1 500
1	10 000	40 000	7 500	11 250
2	20 000	50 000	17 000	25 500
3	30 000	60 000	26 500	39 750
4	40 000	70 000	36 000	54 000