



# 70 Self-Fusing Silicone Rubber Electrical Tape

## Data Sheet

### 1.0 Product Description

Scotch™ Brand 70 Silicone Rubber Electrical Tape is a high-temperature arc- and track-resistant tape composed of self-fusing, inorganic silicone rubber and easy-tear and easy-strip liner.

#### Tape features:

- Excellent track resistance.
- Excellent arc resistance.
- Excellent ozone resistance.
- High dielectric strength.
- Class “H” material (180°C continuous operation).
- Workable at extremely low temperatures.
- Excellent conformability.
- Excellent instantaneous fusion; does not need to be held down.
- Matches Sky Blue Gray Munsell 5BG7.0/0.4.
- Excellent weathering characteristics.
- AA-59163 Class-I Type-I.

### 2.0 Applications

- As an overwrap for protection of terminating high-voltage cables against arcing and tracking. High-voltage cables with these insulations should be overwrapped:
  - Butyl rubber
  - Oil-base rubber
  - Ethylene propylene rubber
  - P.V.C.
  - Low and high-density polyethylene cross-linked

- As primary insulation where Class “H” (180°C/356°F) temperatures are encountered i.e., silicone rubber cables.
- As splice overwrap on spacer cable operating at 15 kV and above.

### 3.0 Data

Scotch 70 Tape has a thickness of 12 mils and is available in roll size 1 in. wide x 30 ft. long. The core is 1 in. I.D.

### 4.0 Specifications

#### Product

The insulating tape must be composed of self-fusing, inorganic silicone rubber with an easy-tearing and easy-stripping polyester liner. The product must be Sky Blue Gray and conform to Munsell Color No. 5BG7.0/0.4. The tape must be capable of operating continuously at Class H temperatures (180°C/356°F). The tape must be compatible with all synthetic cable insulations as well as cable splicing compounds.

#### Engineering/Architectural Specifications

All tape or tape-like terminations which will be operated either outdoors or in areas subjected to contamination or moisture shall be overwrapped with at least one layer of Scotch 70 Silicone Rubber Electrical Tape.

The exposed cable insulation on the lug side of assembled stress cone kits, which will be

operated either outdoors or in areas subjected to contamination or moisture, shall be overwrapped with at least one layer of Scotch 70 Silicone Rubber Electrical Tape.

All splices on spacer cable operating at 15 kV and above shall be overwrapped with Scotch 70 Silicone Rubber Electrical Tape.

All splices on silicone rubber cables or other cables which can operate at room temperatures in excess of 130°C/266°F, but not exceeding 180°C/266°F, shall use Scotch 70 Silicone Rubber Electrical Tape as the primary insulating material.

## 5.0 Characteristics and Test Data

### Typical Electrical and Physical Properties

#### Physical Properties

|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Color                                 | Munsell 5BG7.0/0.4<br>Sky Blue Gray |
| Thickness<br>ASTM-D-1000-76           | .012 in.                            |
| Tensile Strength<br>ASTM-D-1000-76    | 12 lbs./in.                         |
| Elongation at Break<br>ASTM-D-1000-76 | 450%                                |

#### Electrical Properties

|                                         |                  |
|-----------------------------------------|------------------|
| Dielectrical Strength<br>ASTM-D-1000-76 | 875 V/mil        |
| Arc Resistance<br>ASTM-D-495-71         | 1 min. (minimum) |

#### Dissipation Factor

Table 1 shows the dissipation factor versus temperature of 70 Tape. This test was run according to ASTM-D-150-68 at a stress of 50 V/mil and a frequency of 60 cycles per second.

#### DISSIPATION FACTOR VS. TEMPERATURE, SCOTCH 70 TAPE

| TEMPERATURE<br>(°C/°F) | DISSIPATION<br>FACTOR (%) |
|------------------------|---------------------------|
| 23/73                  | 1.3%                      |
| 90/194                 | 1.1%                      |
| 130/266                | 0.5%                      |
| 150/302                | 0.7%                      |

Table 1

#### Dielectric Constant

Table 2 shows the dielectric constant versus temperature of 70 Tape. This test was run according to ASTM-D-150-68 at a stress of 50 V/mil and a frequency of 60 cycles per second.

#### DIELECTRIC CONSTANT VS. TEMPERATURE, SCOTCH 70 TAPE

| TEMPERATURE<br>(°C/°F) | DIELECTRIC<br>CONSTANT |
|------------------------|------------------------|
| 23/73                  | 3.03                   |
| 90/194                 | 2.89                   |
| 130/266                | 2.60                   |
| 150/302                | 2.51                   |

Table 2

## 6.0 Performance Tests

### Termination Tracking Test

Reduced-dimension terminations are prepared according to 3M print 2047-B-16 (See Figure 1). Each specimen consists of 8 feet of 15 kV cable and two terminations.

The contaminant employed in this test is the formula called out in ASTM Dust and Fog Test D-2132, as shown below:

|                                           |               |
|-------------------------------------------|---------------|
| Flint (SiO <sub>2</sub> floated) 240 mesh | 85 parts      |
| Clay 325 mesh                             | 9 parts       |
| Salt (Na Cl) technical grade              | 3 parts       |
| Paper, filter pulp                        | 3 parts       |
|                                           | all by weight |

This mixture is then ball milled using 3/4-inch diameter ceramic cylinder. The milled dust is then mixed with equal parts by weight of water to make a slurry of paint consistency.

Next, each termination is carefully coated in such a manner as to deposit a uniform and reproducible amount of contamination. The following procedure is used:

1. Mix the slurry thoroughly.
2. Submerge the inverted termination into the slurry.
3. Withdraw the termination from the slurry, taking care not to throw off too much excess slurry in rotating the termination from the inverted to an upright position. The majority of the excess slurry should drain off when the termination is upright.

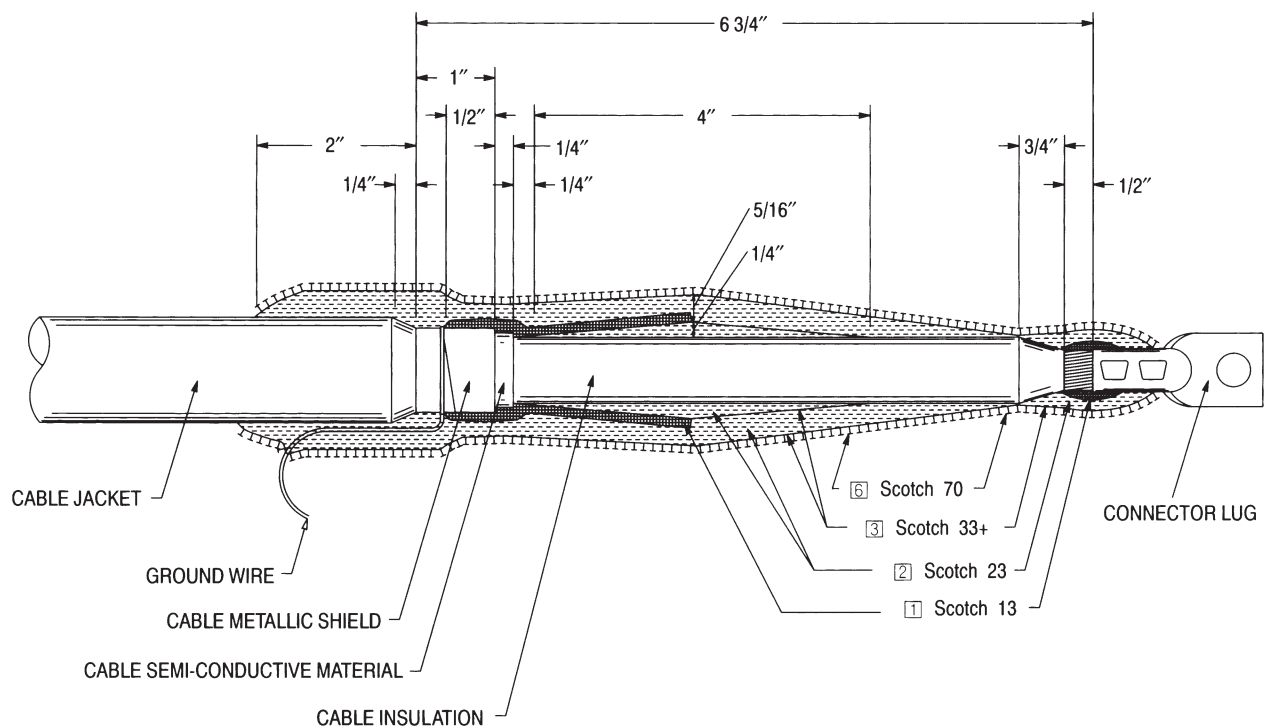


Figure 1

4. Allow the termination to air-dry in the upright position before applying the voltage.

This method, when tested on various surfaces including silicone rubber and glazed porcelain, has repeatedly produced a coating thickness of from 0.12 to 01.15 grams per square inch of surface.

The terminations are then tested in a contamination building. All terminations are mounted vertically. The uniform fog rate called out in ASTM-D-2132 is obtained by the use of special atomizing, wide-angle nozzles.

An on/off cycle is controlled to give a fog rate of 7 to 9 milligrams per square inch per minute.

Each sample is energized at 8.7 kV. The system is set up such that approximately 500 milliamps trip the circuit breaker. All

samples are recontaminated every seven days. The new contaminant is applied over whatever contaminant remains.

The sample is considered to have failed when:

1. 500 milliamps over the surface continuously cause the circuit break to trip.
2. Cable failure occurs.
3. The surface of the termination is severely burned.

The time in hours for each failure is recorded. The results are as follows:

| Tape Termination Protection | Time to Failure |
|-----------------------------|-----------------|
| No protection               | 15 hrs.         |
| Scotch 70 Tape self-fusing  | 400 hrs.        |

## 7.0 Installation Techniques

Scotch 70 Silicone Rubber Electrical Tape should be applied in half-lap layers using moderate tension.

70 Tape should be applied on all tape-like terminations which will be operated either outdoors or in areas subjected to contamination or moisture. The following procedure should be used:

If possible, connect the termination to its final position. Otherwise, take care not to damage the final overwrap of silicone tape during installation. Overwrap the end seal with several half-lapped layers. Overwrap the entire termination with one additional half-lapped layer. For upright termination, begin from one inch on cable jacket and end at the lug. For inverted termination, end taping on the cable jacket. *Wrap with moderate tension (10 to 100% elongation). Apply last lap with zero stretch. Press down to avoid endlifting before fusion takes place.*

70 Tape can also be applied over the exposed cable insulation and/or end seal used in conjunction with molded (slip-on) stress cones.

Techniques for the proper use of 70 Tape are contained in standard and special prints available through the 3M Systems for Splicing and Terminating Program. This material may be obtained through your local 3M Electro-Products Division representative.

## NOTE REGARDING LINER REMOVAL:

To separate the liner from the tape when starting a new roll, simply stretch the liner and tape until the silicone tape breaks. The liner will then separate at this point.

## 8.0 Shelf Life

Scotch 70 Tape has a 5-year shelf life (from the date of manufacture) when stored under the following *recommended* conditions. Store behind present stock in a clean dry place at a temperature of 70°F and 40 to 50% relative humidity. Prolonged exposure to temperatures in excess of 49°C (120°F) can cause a loss of fusion in the tape. Proper stock rotation is recommended.

## 9.0 Availability

Scotch 70 Self-Fusing Silicone Rubber Electrical Tape is available from your electrical distributor in 1-inch by 30-foot rolls.

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### IMPORTANT NOTICE

Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use.

**Warranty; Limited Remedy; Limited Liability.** This product will be free from defects in material and manufacture as of the date of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF**

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