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Technical datasheet

Scotch® 70

Self-Fusing Silicone Rubber Electrical Tape

1. 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.

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

2. 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) temperatures are encountered i.e., silicone rubber cables.
- As splice overwrap on spacer cable operating at 15 kV and above.

3. Typical properties

Physical properties	Typical value
Colour	Munsell 5BG7.0/0.4 Sky Blue Grey
Thickness ASTM D1000-76	0,3 mm
Tensile Strength ASTM D1000-76	21,02 N/10 mm
Elongation at Break ASTM D1000-76	450%

Electrical properties	Typical value
Dielectrical Strength ASTM D1000-76	34 kV/mm
Arc Resistance ASTM D1000-76	1 min. (minimum)

Properties measured at room temperature 23 °C unless otherwise stated.

3.1. Characteristics and Test Data

Dissipation Factor:
Table 1 shows the dissipation factor versus temperature of 70 Tape. This test was run according to ASTM D150-68 at a stress of 2 kV/mm and a frequency of 60 cycles per second.

Temperature (°C)	Dissipation Factor (%)
23	1,3
90	1,1
130	0,5
150	0,7

Dielectrical Constant:
Table 2 shows the dielectric constant versus temperature of 70 Tape. This test was run according to ASTM D150-68 at a stress of 2 kV/mm and a frequency of 60 cycles per second.

Temperature (°C)	Dissipation Factor (%)
23	3,03
90	2,89
130	2,60
150	2,51

3.2 Performance Tests

Termination Tracking Test:
Reduced-dimension terminations are prepared according to 3M print 2047-B-16 (See Figure 1). Each specimen consists of 2,44 m of 15 kV cable and two terminations.
The contaminant employed in this test is the formula called out in ASTM Dust and Fog Test D2132, as shown below:

Flint (SiO2 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 19 mm 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.

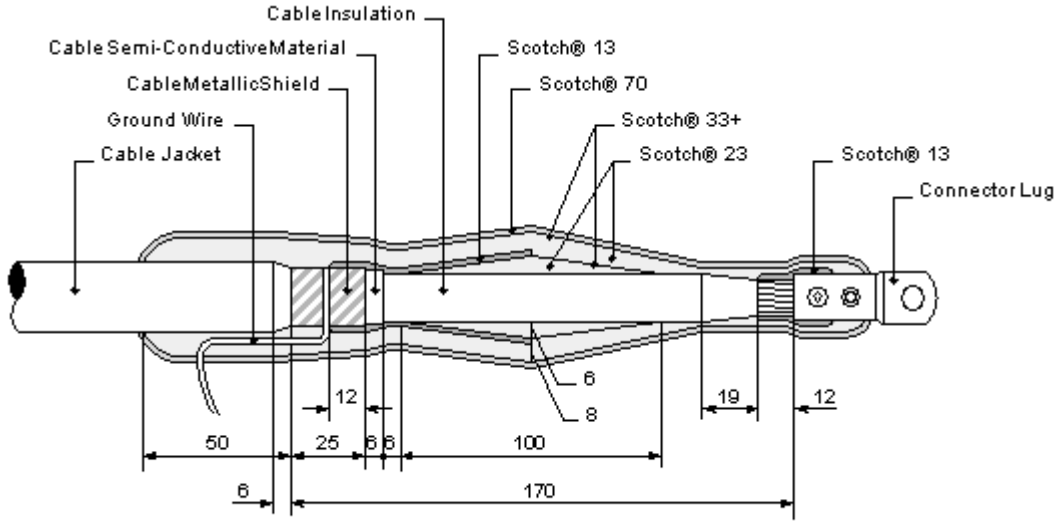

Figure 1

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 1,15 grams per 6,5 cm² of surface.
The terminations are then tested in a contamination building. All terminations are mounted vertically. The uniform fog rate called out in ASTM D2132 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 6,5 cm² 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 re-contaminated 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 self-fusing	400 hrs.

4. User information

4.1 Specifications

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). The tape must be compatible with all synthetic cable insulations as well as cable splicing compounds.

4.2 Engineering/Architectural Specification

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, but not exceeding 180°C, shall use Scotch® 70 Silicone Rubber Electrical Tape as the primary insulating material.

4.3 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.

4.4 Storage

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 21°C and 40 to 50% relative humidity. Prolonged exposure to temperatures in excess of 49°C can cause a loss of fusion in the tape. Proper stock rotation is recommended.

4.5 Availability

Please contact your local distributor.

5. Additional information

To request additional product information, see address below.

Important notice

All statements, technical information and recommendations contained in this document are based upon tests or experience that 3M believes are reliable. However, many factors beyond 3M's control can affect the use and performance of a 3M product in a particular application, including the conditions under which the product is used and the time and environmental conditions in which the product is expected to perform. Since these factors are uniquely within the user's knowledge and control, it is essential that the user evaluates the 3M product to determine whether it is fit for a particular purpose and suitable for the user's method or application.

Values presented have been determined by standard test methods and are average values not meant to be used for specification purposes.

All questions of warranty and liability relating to 3M products are governed by the terms of the respective sale subject, where applicable, to the prevailing law.

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