3M Data Sheet

Scotch™ 23

All-Voltage Splicing Tape

1. Product Description

Scotch™ 23 Tape is a highly conformable, self-fusing EPR (Ethylene Propylene Rubber) based high-voltage splicing tape. It is a non-vulcanizing, shelf stable tape, with excellent electrical properties. Scotch™ 23 Tape can be used as an insulation for low-voltage applications as well as an insulation for splices up to 69,000 volts.

Tape Features:

- Can be used to splice and terminate cables whose emergency overload temperatures can reach 130°C
- Based on Ethylene Propylene Rubber (EPR)
- Physical and electrical properties are unaffected by the degree of stretch
- Self-fusing tape
- Excellent electrical properties
- A special polyester liner which will not stick to the tape upon unwind
- Compatible with all solid electric cable insulation
  1. Polyethylene (high and low density)
  2. Cross-linked polyethylene (XLP)
  3. Polyvinyl chloride (PVC)
  4. Butyl rubber
  5. Ethylene Propylene Rubber (PVC)
  6. Oil-based rubber

2. Applications

- Primary electrical insulation for splicing cable from 600 volts through 69,000 volts on all solid electric cables
- Primary insulation for building stress cones on cables up to 35,000 volts on all solid electric cables.
- Jacketing on high-voltage splices and terminations
- Moisture sealing electrical connections
- Bus bar insulations
- End sealing high-voltage cables

3. Typical Properties*

Color	Black
Thickness[1]	0.76 mm
Tensile Strength[1]	14 N/10 mm
Ultimate Elongation[1]	1000%
Operating Temperature	90°C
Emergency Operating Temperature	130°C
Fusion[2]	Passes
Thermal Conductivity	0.208 W/mK
Modulus at 130°C	See Section 5
Ozone Resistance[2]	Passes
Electric Strength[3] After 96 hrs at 96% RH	31 kV/mm >90% Std Condition Value
Insulation Resistance[4]	>1x10^6 MΩ
Dissipation Factor[5]	See Section 5
Electric Constant[5]	See Section 5
Electric Strength at elevated Temperature	See Section 5

*There are typical properties and should not be used for specification purposes.

[1] IEC 60454-2
[2] ASTM D-4388
[3] IEC 60243
[4] IEC 60426
[5] VDE 0303-4

4. Specification

Product
The high-voltage corona-resistant tape must be based on ethylene propylene rubber and be capable of operation at the emergency cable temperature of 130°C. The tape must be capable of being applied in either the stretched or unstretched condition without any resulting loss in either physical or electrical properties.
The tape must not split, crack, slip or flag when exposed to various environment (indoor or outdoor. The tape must be compatible with all synthetic cable insulation. The tape must have a dissipation factor of less than 5% at 130°C and must have a shelf life at 5 years

Engineering / Architectural Specification
Splicing and terminating solid electric cables shall be done in accordance with drawings engineered by the splice material manufacturer such as the 2047 series available from 3M Company. All splices and terminations shall be insulated using Scotch™ 23 Tape.

5. Characteristics and Test Data

Modulus at 130°C
A high-voltage splicing tape must constantly maintain a rubber-like consistency throughout the life of a splice. One method of determining a rubber material consistency is by measuring the modulus of the material. The modulus of a material is the stress required to elongate the material to a given elongation.

Figure 1 shows the 100% modulus (stress required to elongate Scotch™ 23 Tape to 100% elongation) after heat aging the samples at 130°C for a varying number of days. The results indicate a very stable product with excellent "body" or elasticity after oven aging at 130°C.

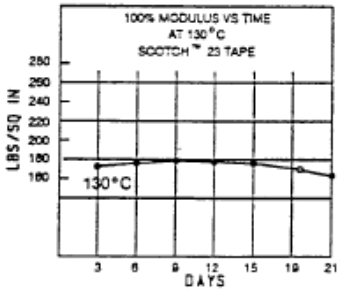

Figure 1

Dissipation Factor
Figure 2 shows the dissipation of Scotch™ 23 Tape. This test was run according to ASTM D-150 at a stress of 2.0 kV/mm and a frequency of 60 cycles per second.

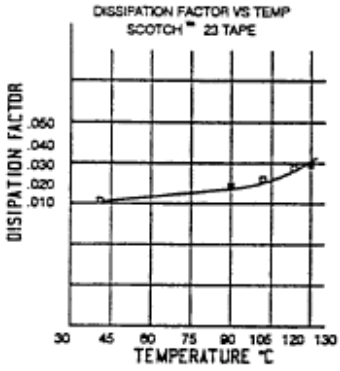

Figure 2

Dielectric Constant
Figure 3 shows the dielectric constant versus temperature of Scotch™ 23 Tape. This test was run according to ASTM D-150 at a stress of 2.0 kV/mm and a frequency of 60 cycles per second.

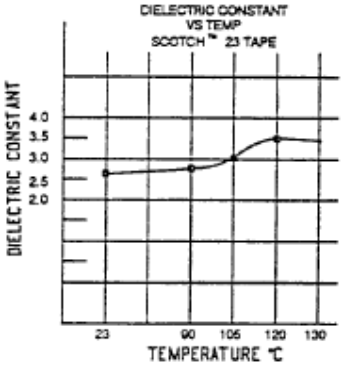

Figure 3

Electric Strength at Elevated Temperatures

A high-voltage splice must not only have a high electric strength at room temperature, but it must also have good values at the temperature at which it is expected to operate. *Figure 4* shows a plot of dielectric strength versus temperature. This test was run according to ASTM-1000.

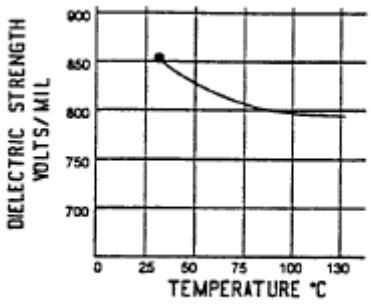

Figure 4

Electric Strength Versus Thickness

Figure 5 shows a plot of electric strength in volts per mil versus thickness. As can be seen by the curve, the dielectric strength in the original thickness of 0.76 mm is 31.5 kV/mm. However, the dielectric strength of a 0.51 mm thickness of Scotch™ 23 Tape is 47.2 kV/mm. This test was run according to ASTM-1000

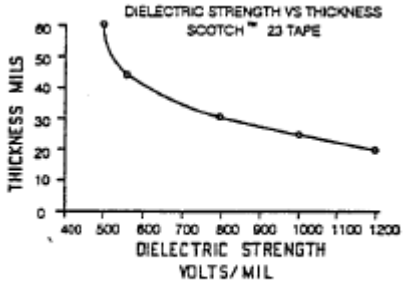

Figure 5

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