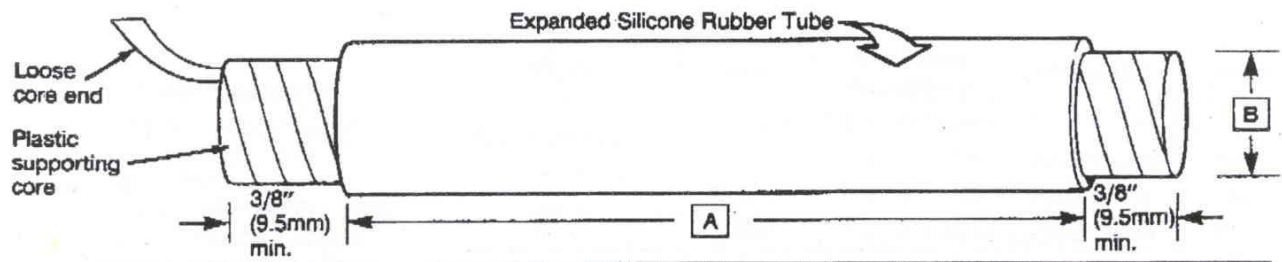


Silicone Rubber Cold Shrink Lug and Connector Insulators 8440 Series

Data Sheet

Product Description

3M Brand 8440 Series Cold Shrink Lug and Connector Insulators are open ended, silicone rubber, tubular sleeves. The sleeves are factory expanded and assembled on a removable supporting plastic core. Each rubber assembly is supplied for field installation in the pre-stretched condition. As the core is unwound, the insulating sleeve shrinks to form a tight seal. Cold Shrink Insulators cover terminal lug barrels and three sizes of Cold Shrink Insulators cover inline connectors. Each insulator type collectively has an application range of 6.86mm to 24.13mm for installations on #6 AWG to 3/0 AWG.



Part Number	Cable Range (mm ²)	Application Range (mm)		Dimensions (mm)	
		Min. Dia.* For Seal	Max. Dia.** Insulator Covers	(A) Length	(B) ID
8443-2	10 - 35	6.86	14.22	29.2 - 39.6	17.3
8443-6.5	10 - 35	6.86	14.22	119 - 140	17.3
8445-2.5	35 - 50	8.89	18.29	30.5 - 48	21.3
8445-7.5	35 - 50	8.89	18.29	132 - 152	21.3
8447-3.2	50 - 70	12.19	24.13	48.3 - 64	27.2
8447-8	50 - 70	12.19	24.13	147 - 175	27.2

* Cable Diameter

** Cable or connector diameter

Features

- Simple installation, requires only workman's hands
- No tools required
- No heat required for installation
- Seals tight, retains its resiliency and pressure even after years of ageing and exposure
- Resists moisture
- Wide range, size accommodation
- Resists acids and alkalis
- Resists ozone and ultraviolet light
- Resists fluid splashes
- Resists fire – will not support flame
- Operating temperature range -55°C to 260°C

Applications

- Primary electrical insulation for all solid dielectric (rubber and plastic) insulated wire and cable splices rated to 1000V
- Electrical Aircraft cables
- For indoor, outdoor, in cable tray for overhead use
- Physical protection and moisture sealing for high voltage, air insulated connectors and lugs
- Insulation of secondary splices, copper and aluminium conductors
- Sheath repairs
- Insulation for inline conductor transition connector

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Physical & Electrical Properties

High Stretch Silicone Rubber

Typical Physical Properties

Test Method	Typical Value
Colour	Grey
100% Modulus	180 psi
ASTM D412-75	(1.24 MPa)
300% Modulus	450 psi
ASTM D4 12075	(3.10 MPa)
Ultimate Tensile	1240 psi
ASTM D412-75	(8.55 MPa)
Die B Tear	185 psi
ASTM D624B-73	(1.28 MPa)
Shore A Hardness ASTM D2240-75	48
Specific Gravity	1.23
Permanent Set 100% strain – 22hrs @ 100°C	7.1%
Dielectric Strength	554V/mil
ASTM D149-75 @ 1.78mm thickness	(21.8 MV/m)
Dielectric Strength 168hrs in H ₂ O @ 90°C	543V/mil (21.4 MV/m)

Performance Tests

Flammability Test

The test for flammability of the 8440 Series Cold Shrink Insulators was conducted with specimens positioned both vertically and horizontally per specification BSS 7230. The silicone rubber insulation passed the Flammability Test of BSS 7230 without supporting the flame.

Humid Environment

Test to ensure electrical integrity through conditions of high humidity were run per Mil Standard 202-Method B. The test duration was for 10 days at 40°C and 95% RH. Typical test values are found in Table 2.

Test	Insulation Resistance	Withstand	Results
Before	3.0×10^{12}	2500 V-rms	Pass
After	2.5×10^{12}	2500 V-rms	Pass

Table 2

Ultraviolet Resistance

After 1000 hours of testing in a Weather-O-Meter according to Specifications ASTM D750 and ASTM G23, the silicone rubber insulation exhibited no crazing, cracking, or change in surface appearance.

Thermal Shock

Assembled units from the fluid resistance test were used for the thermal shock evaluation. The units were subjected to 15 cycles of the following thermal shock sequence:

1. 30 minutes at -55°C.
2. 5 minutes at 23°C.
3. 30 minutes at 260°C.
4. 5 minutes at 23°C.

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The insulation resistance values and results are found in Table 3.

Fluid	Test	Insulation Resistance	Withstand	Result
Monsanto LD	Before	1.5×10^{13} ohms	2500 V-rms	Pass
	After	1.0×10^{12} ohms	2500 V-rms	Pass
Jet A	Before	7.0×10^{12} ohms	2500 V-rms	Pass
	After	1.7×10^{12} ohms	2500 V-rms	Pass
MIL-L-7808	Before	3.5×10^{12} ohms	2500 V-rms	Pass
	After	6.5×10^{12} ohms	2500 V-rms	Pass
MIL-L-23699	Before	8.0×10^{12} ohms	2500 V-rms	Pass
	After	3.5×10^{12} ohms	2500 V-rms	Pass
5% Saline	Before	9.0×10^{12} ohms	2500 V-rms	Pass
	After	6.5×10^{12} ohms	2500 V-rms	Pass

Table 3

Altitude

Electrical integrity at high altitudes was determined by testing to Mil Standard 1344A, Test Method 1004.1. Typical test values are found in Table 4.

Altitude	Insulation Resistance	Withstand	Result
50,000 ft	1.0×10^{11} ohms	2500 V-rms	Pass
70,000 ft	1.8×10^{12} ohms	2500 V-rms	Pass

Table 4

Heat Ageing

Installed silicone rubber insulators were subjected to an eight hour heat ageing test at 260°C. Other units were subjected to 205°C for 30 days. The silicone rubber remained resilient and showed no sign of deterioration.

Fluid Resistance

To determine the affect of a fluid splash on insulated connected assemblies, units were subjected to ten cycles of the following test sequence:

1. One minute fluid soak.
2. 24 hour, 23°C ambient dry.
3. Insulation resistance measurement.
4. 2.4kV-rms withstand.

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Results from the fluid resistance test are found in Table 5.

Fluid	Fluid Splash Test		Insulation Resistance / 2500 V-rms Withstand		
	Monsanto LD	Jet A	MIL-L-7808	MIL-L-23699	5% Saline
Initial	1.5×10^{13} /Pass	7.2×10^{12} /Pass	3.5×10^{12} /Pass	8.0×10^{12} /Pass	9.0×10^{12} /Pass
1	3.0×10^9 /Pass	2.0×10^{12} /Pass	8.0×10^{12} /Pass	2.5×10^{12} /Pass	3.5×10^{12} /Pass
2	1.2×10^9 /Pass	1.2×10^{12} /Pass	2.0×10^{12} /Pass	5.0×10^{12} /Pass	5.0×10^{12} /Pass
3	4.0×10^7 /Pass	1.2×10^{12} /Pass	2.5×10^{12} /Pass	4.0×10^{12} /Pass	3.5×10^{12} /Pass
4	1.8×10^7 /Pass	8.0×10^{11} /Pass	3.0×10^{12} /Pass	3.0×10^{12} /Pass	4.0×10^{12} /Pass
5	8.0×10^6 /Pass	3.0×10^{11} /Pass	2.0×10^{12} /Pass	2.5×10^{12} /Pass	6.0×10^{12} /Pass
6	6.0×10^6 /Pass	2.0×10^{11} /Pass	1.8×10^{12} /Pass	2.0×10^{12} /Pass	7.0×10^{12} /Pass
7	5.0×10^6 /Pass	1.8×10^{11} /Pass	1.0×10^{12} /Pass	2.5×10^{12} /Pass	9.0×10^{12} /Pass
8	4.0×10^6 /Pass	1.0×10^{11} /Pass	1.0×10^{11} /Pass	1.4×10^{12} /Pass	1.6×10^{12} /Pass
9	4.0×10^6 /Pass	1.0×10^{11} /Pass	6.5×10^{11} /Pass	1.0×10^{12} /Pass	3.0×10^{12} /Pass
10	3.5×10^6 /Pass	7.0×10^{10} /Pass	5.0×10^{11} /Pass	1.2×10^{12} /Pass	5.0×10^{12} /Pass

Table 5

Installation Technique

1. Slide Cold Shrink insulator onto cable.
2. Install connector.
3. Remove defects from surface of cable in seal areas.
4. Hold Cold Shrink assembly and cable in proper position in one hand.
5. Unwind core in counter-clockwise direction with the other hand.

Installed unit weight can be found in Table 6.

Approximate Installed Weight			
Terminal Lug Insulators		Inline Connector Insulators	
Part No.	Weight (gm)	Part No.	Weight (gm)
8443-2	3.5	8443-6.5	11.0
8445-2.5	5.4	8445-7.5	16.0
8447-3.2	9.5	8447-8	22.0

Table 6

Maintenance

Components of 3M Brand Silicone PST Cold Shrink Connector Insulators are stable under normal storage conditions for a period of two years from date of manufacture. The Cold Shrink insulators are not impaired by freezing or overheating due to the ambient temperatures found in storage or shipping. Normal storage and stock rotation are recommended.

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