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3M

Scotchcast™ Electrical Resin 235

Two-Part, Oven-Curing, Class B, Semiflexible, Unfilled Epoxy Liquid Resin

Data Sheet

Product Description

3M™ Scotchcast™ Electrical Resin 235 system has permanent semiflexibility, thermal shock and impact resistance, good electrical and adhesion properties. This low-viscosity resin is well suited to a variety of general purpose, Class B (130ºC) applications. Its low viscosity and good wetting characteristics allow complete impregnation of even small coils, and it has the mechanical strength and flexibility needed for high-quality insulation of large castings, such as motors, transformers and coils.

- Low viscosity
- Class B (130ºC)
- Good flexibility

Handling Properties

Mix Ratio (A:B)	Wt 1:2
	Vol (%) 31:69
Viscosity	A = 13,000 cps
	B = 1,000 cps
	Mixed = 1,500 cps
Density	A = 1.15 kg/l (9.60 lbs/gal)
	B = 1.02 kg/l (8.51 lbs/gal)
Flash Point	A = 205°C (400°F)
	B = 177°C (351°F)
Gel Time	18 min. at 120°C
Curing Guide	75°C (167°F) 15-20 hrs
	95°C (203°F) 6-8 hrs
	120°C (248°F) 2-3 hrs

Test Methods

[1]3M Test Method
[2]MIL-I-16923E
[3]Fed. Std. No. 406, Method 1021
[4]Fed. Std. No. 406, Method 1011
[5]Fed. Std. No. 406, Method 1031
[6]Fed. Std. No. 406, Method 4021
[7]Fed. Std. No. 406, Method 4041

Typical Data/Physical Properties

Property	Value
Color	Brown
Hardness (Shore D)	55
Specific Gravity (cured)	1.10
Compressive Strength[3]	1300 psi
10% Compression	(91 kg/cm²)
Tensile Strength[4]	1300 psi
(1/8" x 1/2" Sample)	(91 kg/cm²)
Elongation[4] (% at break)	75
Flexural Strength[5]	3200 psi
(1/2" x 1/2" Sample)	(225 kg/cm²)
Thermal Conductivity[2]	4.0×10^{-4}
(Cal/sec/cm²/°C/cm)	
Coefficient of Linear Thermal Expansion[2]	
(23°C to 113°C) (length/unit length/°C)	16×10^{-5}
Electric Strength[2]	325 volts/mil
(1/8" [3.175 mm] Sample)	12,800 volts/mm
Thermal Shock[1]	Pass
10 Cycles -55°C to 130°C 1/8" (3.175 mm) Olyphant Insert	
Thermal Shock[2]	Pass
Mechanical Shock Resistance[2]	7.8
(Weight in lbs. of ball causing fracture)	
Moisture Absorption[2]	.92
% weight increase, 240 hrs. @ 96% R.H.	
Water Immersion	
(sample cured 3 hrs. @ 120°C, 1000 hrs. @ 23°C) % weight gain	1.3
Thermal Aging	
(2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs. at 130°C) % weight loss	4.4
Hardness Change (Shore D)	+6
Dielectric Constant[6] (100 cycles @ 23°C)	4.25
Dissipation Factor[6] (100 cycles @ 23°C)	.07
Volume Resistivity[7] (ohm-cm @ 23°C)	2.9×10^{14}
Thermal Aging	
(2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs. at 155°C) % weight loss	18.7
Hardness Change (Shore D)	+33
Dielectric Constant[6] (100 cycles @ 23°C)	4.75
Dissipation Factor[6] (100 cycles @ 23°C)	.05
Volume Resistivity[7] (ohm-cm @ 23°C)	3.2×10^{14}

Note: These are typical values and should not be used for specification purposes.

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Usage Information

Mixing
Mix the separate parts before removing them from their containers. They may be warmed to 60ºC (140ºF) to aid mixing. Weigh the correct proportions of the separate parts to within 2% accuracy and combine them. Thoroughly blend the mixture until the color is absolutely uniform or a homogeneous mixture is obtained.

Deaerating
Entrapped air can be removed by evacuating for 5 to 15 minutes at 5 to 10 mm of mercury (Hg) absolute pressure. Warming the 3M™ Scotchcast™ Electrical Resin to 60ºC (140ºF) facilitates this process. Container side walls should be four times the height of liquid resin to contain the foaming that takes place under vacuum.

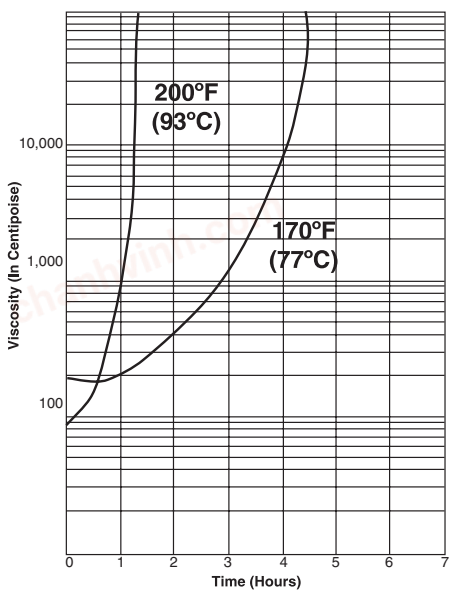
Casting and Impregnating
Pour the warm resin into the preheated 100ºC mold. If no mold is used, dip the preheated part into the resin. Heating the resin and mold aids impregnation. For maximum impregnation, evacuate for 5 to 15 minutes at 5 mm of mercury (Hg) absolute pressure, or pour under vacuum and hold for several minutes before releasing.

Curing
Where minimum stress and maximum thermal shock resistance are required, the lower temperature cure cycle is recommended. (See "Curing Guide" of **Handling Properties** section). Time should be added to the cure cycle to allow the resin to reach the curing temperature.

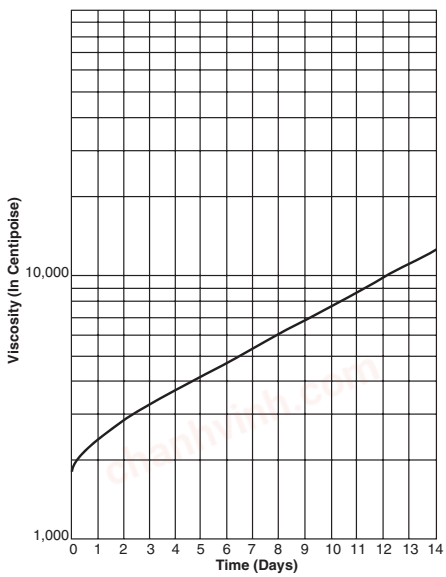
Storage
Both parts of this resin system should be stored at temperatures between 20 to 30 degrees Celsius, and 30% to 60% relative humidity. When not in use, containers should be kept tightly closed. Storage at conditions outside those suggested may compromise the performance of the resin.

Handling and Safety Precautions

Read all Health Hazard, Precautionary and First Aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use.



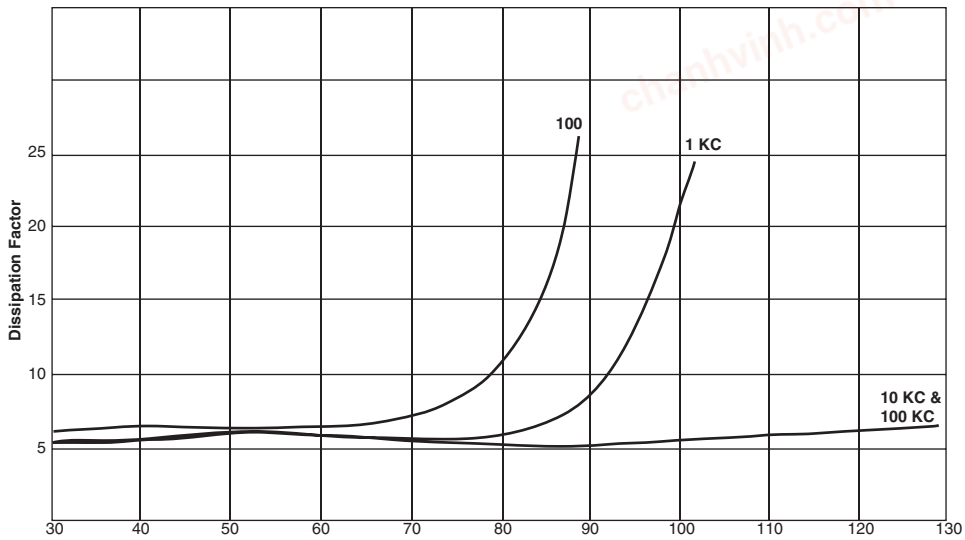
Brookfield Viscosity vs Time @170˚F (77˚C) and 200˚F (93˚C)



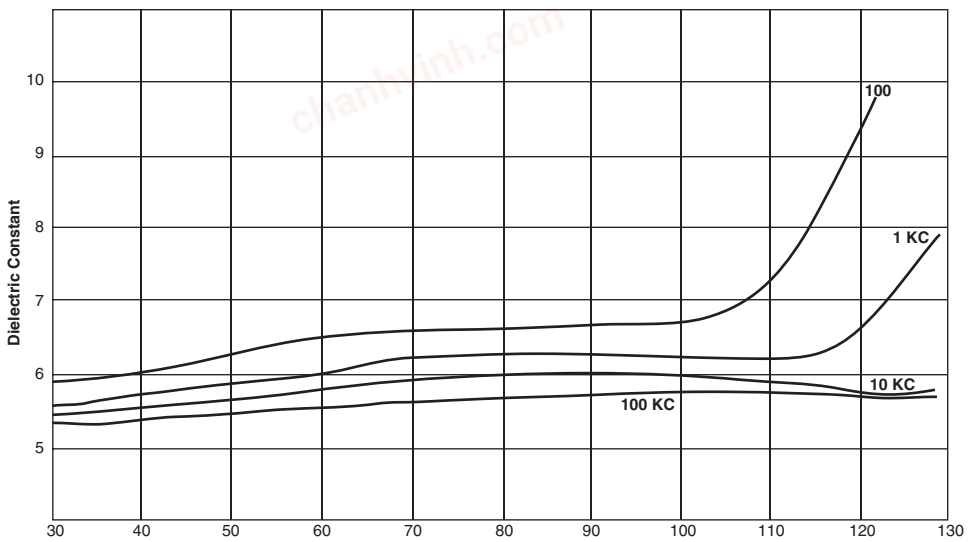
Brookfield Viscosity vs Time @ 73˚F (23˚C)

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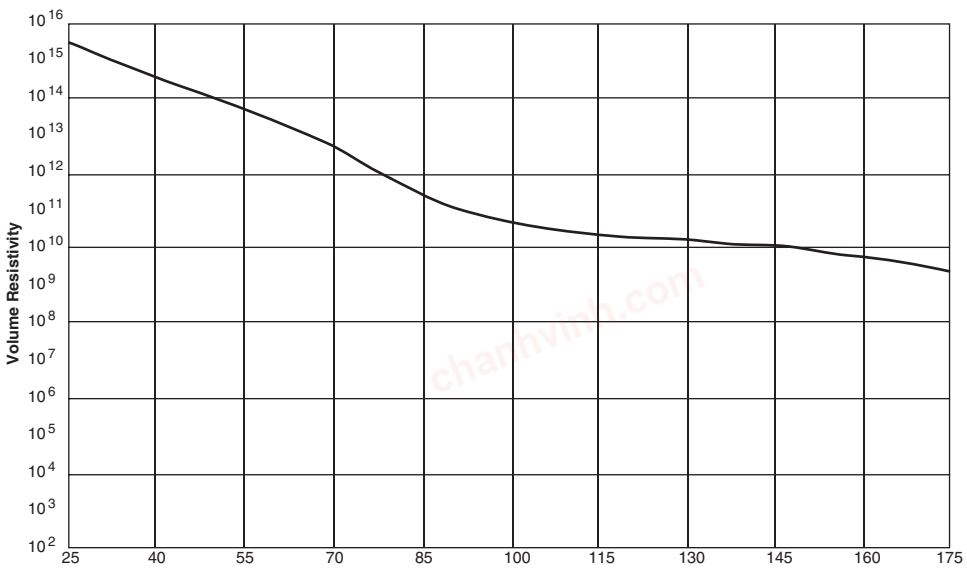
Dissipation Factor
Fed. Std. No. 406, Method 4021
(Test Frequencies in Hertz)



Dielectric Constant
Fed. Std. No. 406, Method 4021
(Test Frequencies in Hertz)



Volume Resistivity (ohm-cm)
Fed. Std. No. 406, Method 4041



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