

3MTM ScotchcastTM Electrical Resin 281

Two-Part, Semi-Flexible, Filled, Epoxy Liquid Resin

Data Sheet

May 2008

Product Description

3MTM ScotchcastTM Electrical Resin 281 is characterized by high temperature and electrical stability, and excellent retention of flexibility, even after prolonged heat aging. It can be cured at low temperatures, but the optimum properties are obtained with the higher temperature cure schedules. This resin should be used instead of Scotchcast Resin 241 where greater mechanical strength, higher tensile strength, better thermal shock ad higher thermal conductivity are required.

Resin Features

- High temperature rating (155°C – Class F)
- Low temperature curing
- High thermal conductivity

Applications

Impregnation and encapsulation of coils, transformers, motors and other electrical and electronic components

Handling Properties

Handling Properties	
Mix Ratio (A, B)	Wt 2:3 Vol (%) 37:63
Initial Viscosity @ 23°C (73°F)	A = 320,000 cps B = 38,000 cps Mixed = 75,000 cps
Density	A = 1.53 Kg/l (12.77 lbs/gal) B = 1.35 kg/l (11.26 lbs/gal)
Flash Point	A = 202°C (395°F) B = 188°C (370°F)
Gel Time	21 min. @ 121°C
Curing Guide	75°C (167°F) 24 hrs 95°C (203°F) 6-8 hrs 120°C (248°F) 2-3 hrs



Typical Properties

This data is not to be used for specifications. Values are typical and should not be considered minimum or maximum.

Physical Properties		
Property	Value	Test Method
Color	Cream	
Specific Gravity (Cured)	1.43	
Compressive Strength 10% Compression	3500 psi (245 kg/cm ²)	Fed. Std. N. 406, Method 1021
Tensile Strength (1/8" x 1/2" Sample)	2100 psi 147 kg/cm ²	Fed. Std. N. 406, Method 1011
Elongation ² (% @ break)	45	Fed. Std. N. 406, Method 1011
Flexural Strength (1/2" x 1/2" Sample)	1250 psi 87.5 kg/cm ²	Fed. Std. N. 406, Method 1031
Hardness (Shore D instantaneous)	65	
Thermal Conductivity (Ca./sec/cm ² /°C/cm)	12 x 10 ⁻⁴	Mil-16923
Coefficient of Linear Thermal Expansion (23°C to 113°C) (length/unit length/°C)	15 x 10 ⁻⁵	Fed. Std. N. 406, Method 1011
Thermal Shock ⁵ 10 cycles - 65°C to 130°C 1/4" (6,350 mm) Olyphant Inserts	Pass	3M Test Method
Thermal Shock	Pass	Mil-16923
Moisture Absorption (% weight increase, 240 hrs. @ 96% RH)	.32	Mil-16923
Water Immersion (sample cured 3 hrs. @ 120°C) 100 hrs @ 23°C - % weight gain 500 hrs @ 70°C - % weight gain 200 hrs @ 100°C - % weight gain	0.4 6.2 8.0	
Thermal Aging (2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs @ 130°C) % weight loss Hardness Change (Shore D) Dielectric Constant (100 cycles @ 23°C) Dissipation Factor (100 cycles @ 23°C) Volume Resistivity ⁷ (ohm-cm @ 23°C)	.17 7 3.56 .054 >10 ¹⁵	-- -- -- -- Fed. Std. No. 406, Method 4041
Thermal Aging (2 1/4" x 2 1/4" x 1/8" sample, 100 hrs @ 150°C) % weight loss Hardness Change (Shore D) Dielectric Constant (100 cycles @ 23°C) Dissipation Factor (100 cycles @ 23°C) Volume Resistivity ⁷ (ohm-cm @ 23°C) Urethane (itself)	2.2 15 4.03 .032 >10 ¹⁵	-- -- -- -- Fed. Std. No. 406, Method 4041
Thermal Aging (2 1/4" x 2 1/4" x 1/8" sample, 1000 hrs @ 180°C) % weight loss Hardness Change (Shore D) Dielectric Constant (100 cycles @ 23°C) Dissipation Factor (100 cycles @ 23°C) Volume Resistivity ⁷ (ohm-cm @ 23°C)	3.5 18 4.71 .041 >10 ¹⁵	-- -- -- -- Fed. Std. No. 406, Method 4041

Electrical Properties		
Property	Value	Test Method
Electric Strength 1/8 (3,175 mm) sample	350 V/mil (13,8 kV/mm)	Fed. Std. N. 406, Method 4031
Electric Strength [Volts/mil 1/8" (3,175 mm) sample]	375 (14,800 volts/mm)	Fed. Std. N. 406, Method 1011

Mixing Mix the separate parts before removing them from their containers. They may be warmed to 60°C (140°F) 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 until a homogenous mixture is attained.

De-aerating Air introduced during mixing can be removed by evacuating for 5 to 15 minutes at 5 to 10 mm of mercury absolute pressure. Warming the resin to 60°C (140°F) aids air removal. The container side wall should be four times the height of liquid resin to contain the foaming that takes place under vacuum.

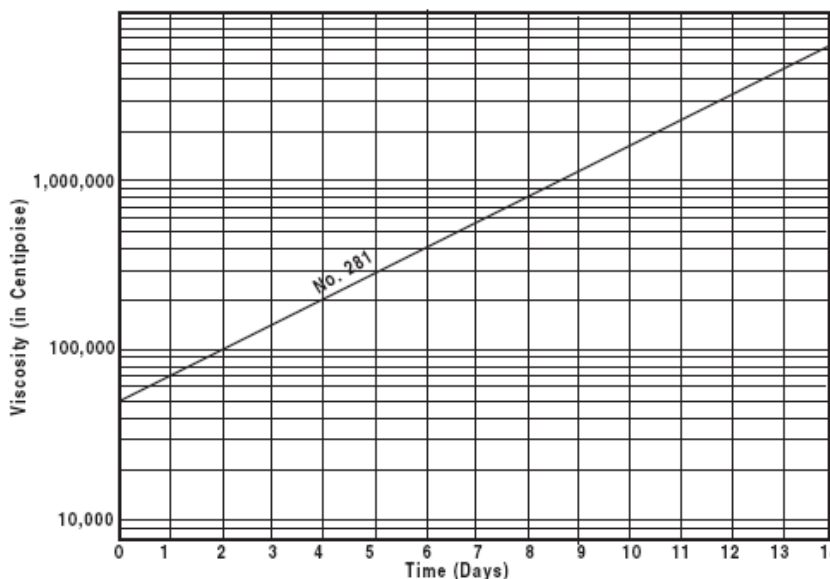
Casting and Impregnating Pour the warm resin into the preheated 100°C mold. If no mold is used, dip the preheated part into the resin. Heating the resin and mold aids impregnation. For maximum impregnation, evacuate for 5 to 15 minutes at 5 mm of mercury absolute pressure, or pour under vacuum and hold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

Curing Where minimum stress and maximum shock resistance are required, the lower temperature cure cycle is recommended. Time should be added to the cure cycle to allow the resin to reach the curing temperature.

Handling & 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.

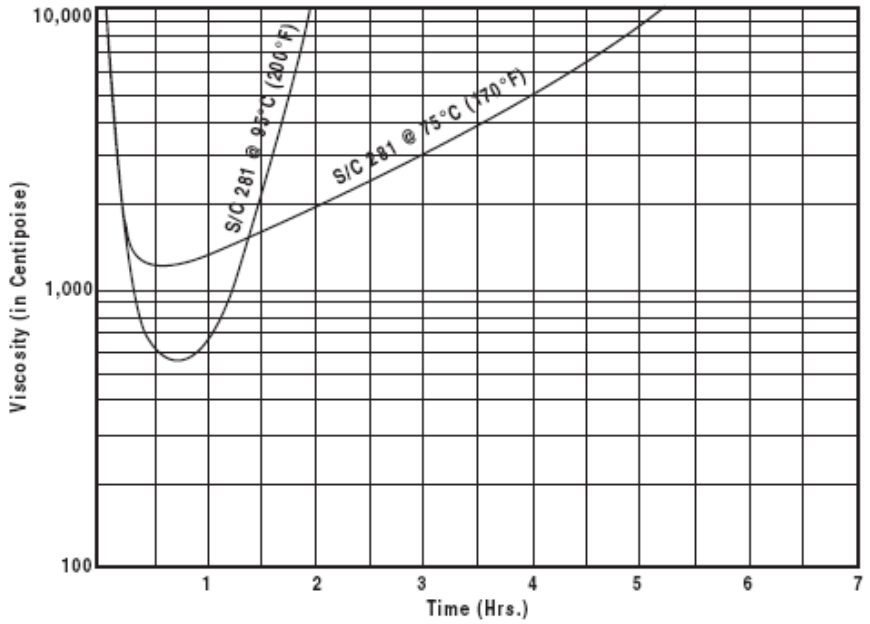
Shelf-Life & Storage This resin system has a shelf life of two years from time of manufacture. Both parts should be stored in a cool, dry place. When not in use, containers should be kept tightly closed.

Brookfield Viscosity vs. Time @ 23°C (73°F)

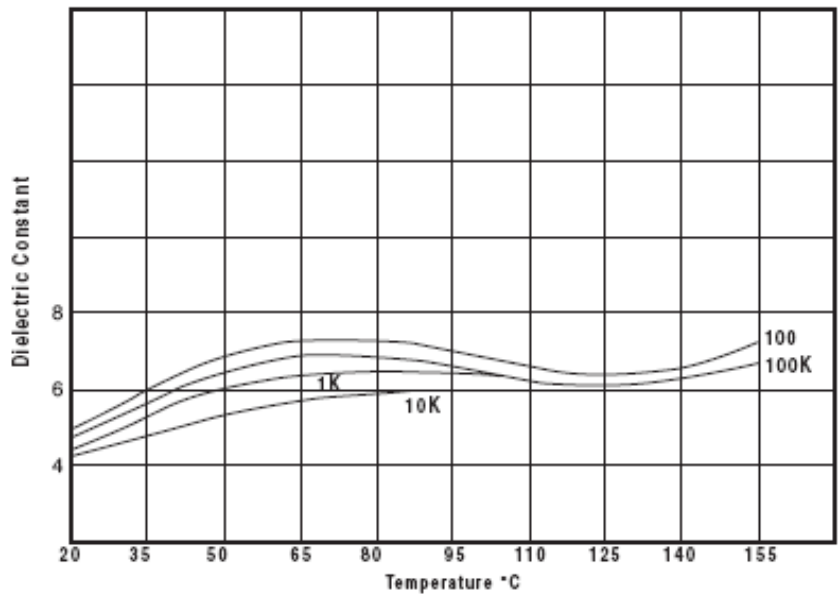


3M™ Scotchcast™ Electrical Resin 281

Brookfield Viscosity vs. Time
@ 75°C (170°F) & 95°C (200°F)

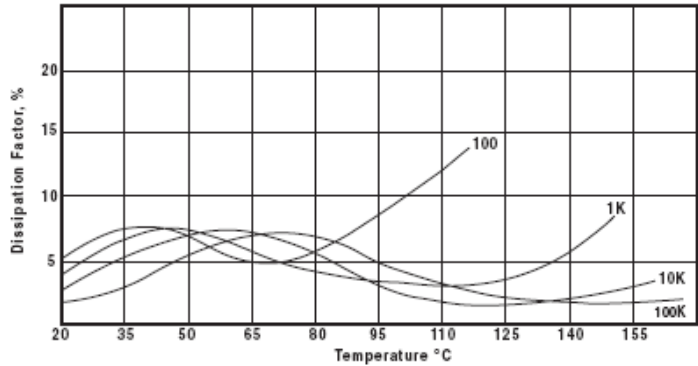


Dielectric Constant
Fed. Std. 406, Method 4021
(Test Frequencies in Hertz)



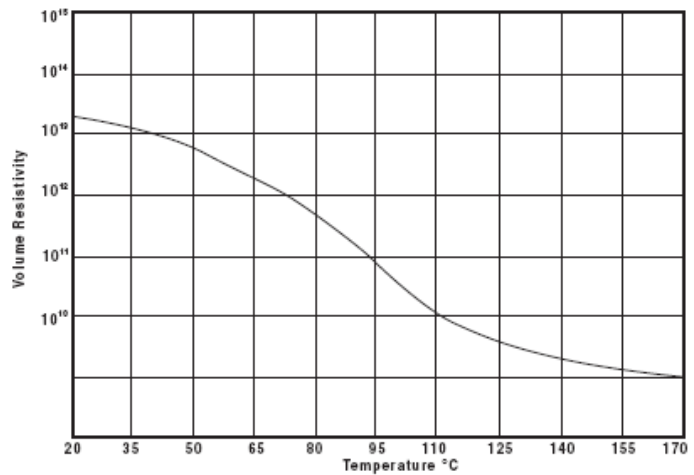
Dissipation Factor

Fed. Std. 406, Method 4021
(Test Frequencies in Hertz)



Volume Resistivity
(OHM-CM)

Fed. Std. 406, Method 4041



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