



Scotchcast™ Electrical Resin MR283F075

Two-Part, Oven-Curing, Electrical Grade, Semiflexible, Filled, Epoxy Liquid Resin

Data Sheet

Product Description

3M™ Scotchcast™ Electrical Resin™ MR283F075 is a filled, epoxy resin system offering excellent physical, electrical and thermal properties. The filler used in Scotchcast™ Electrical Resin MR283F075 minimizes shrinkage and stresses, and provides increased thermal conductivity and thermal shock resistance. Applications include impregnation and encapsulation of coils, transformers, motors and other electrical and electronic components.

- Thermal shock resistant
- Hydrolytically stable
- Temperature rating - Class B or F
- MIL-I-16923G approved

Handling Properties

Mix Ratio (A:B)	Wt 5 : 1	
	Vol (%) 36.3 : 10	
Viscosity @ 23°C (73°F)	A = 40,000 cps	
	B = 150 cps	
	Mixed = 6,800 cps	
Mixed Viscosity after 18hrs @ 25°C	69,000 cps	
Specific Gravity @ 25°C	Part A	1.59
	Part B	1.16
Gel Time	30 min. @ 121°C	
Flash Point	> 150°C	
	Part A or B	
Curing Guide	75°C	36-48 hrs
	95°C	8-10 hrs
	120°C	3-4 hrs

Typical Data/Physical Properties

Property	Value	
Hardness (Shore D)	80	
Specific Gravity (Cured) ³	1.55	
Glass Transition Temp (Tg)	22°C	
Tensile Strength ⁵	3700 psi	
Elongation (% at break) ⁵	12	
Tensile Modulus	240 x 10 ³ psi	
Compressive Strength ⁶	5,500 psi @ 10%	
Flexural Strength ⁷	3,500 psi @ 5%	
Cure Shrinkage (120°C Cure) ⁸	1.25%	
Linear Thermal Expansion (LTE) ⁹ (length/unit length/°C)	< Tg	.57 x 10 ⁻⁴
	> Tg	1.65 x 10 ⁻⁴
	Thermal Shock ¹	
10 cycles 155 to -65°C 1/8" (3.175 mm) Olyphant Insert	Pass	
Thermal Shock ¹		
10 cycles 130 to -55°C 1/4" (6.35 mm) Olyphant Insert	Fail	
Thermal Shock (MIL-I-16923G) ²		
10 cycles 130 to -55°C	Pass	
Thermal Conductivity ¹ (Cal • cm/cm ² • sec • °C)		11.1 x 10 ⁻⁴
	(Watt/m • K @ 29°C)	0.463
Flame Retardancy ²	Self-Extinguishing	
Fungus Resistance ¹⁰	Funginert	

Test Methods

¹ 3M Test Method	⁸ MIL-I-22266C
² MIL-I-16923G	⁹ ASTM D 696
³ ASTM D 792	¹⁰ ASTM G 21-70
⁴ ASTM D 2440	¹¹ ASTM D 149
⁵ ASTM D 638	¹² ASTM D 150
⁶ ASTM D 695	¹³ ASTM D 257
⁷ ASTM D 790	

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

Electrical Properties

Product Index F075

Dielectric Strength ¹¹		372 V/mil	
1/8" (3.175 mm) sample			
Dissipation Factor (%) ¹²	Frequency →	100	1K
__@ 23°C		1.9 <D.F.> 3.3	1.6 >D.F.< 3.1
__@ 55°C		4.2 <D.F.> 5.8	3.5 >D.F.< 4.6
__@ 75°C		6.1 <D.F.> 14.3	4.6 >D.F.< 5.9
__@ 100°C		16 <D.F.> 66	6.2 >D.F.< 12.7
__@ 125°C		50 <D.F.> —	9.6 >D.F.< —
__@ 155°C		— —	30 > —

Dielectric Constant ¹²		100	1K
__@ 23°C		4.0	3.9
__@ 55°C		4.7	4.5
__@ 75°C		5.2	4.8
__@ 100°C		6.4	5.2
__@ 125°C		7.5	5.7
__@ 155°C		—	6.9

Volume Resistivity (ohm-cm) ¹³		
__@ 23°C		1.2 x 10 ¹⁵
__@ 55°C		6.4 x 10 ¹²
__@ 75°C		1.3 x 10 ¹¹
__@ 100°C		3.9 x 10 ¹⁰
__@ 125°C		6.7 x 10 ⁹
__@ 155°C		2.2 x 10 ⁹

Properties after Thermal Aging for 1000 hours

Product Index F075

% Weight Loss	@ 136°C	0.95
	@ 155°C	3.43
	@ 180°C	4.56
Hardness Change	@ 136°C	4
	@ 155°C	6
	@ 180°C	8
Dissipation Factor (100 Hz)		
	@ 136°C	0.0186
	@ 155°C	0.0151
	@ 180°C	0.0153
Dielectric Constant (100 Hz)		
	@ 136°C	3.93
	@ 155°C	4.15
	@ 180°C	4.28
Temperature Class 130° to		155°C

Note: All electricals improved during thermal aging.

MIL-I-16923G Qualification Data

Product Index F075

Reversion		80
(Shore D after 120 days @ 71°C and 95% R.H.)		
Volume Resistivity		2.0 x 10 ¹²
(ohm-cm after 120 days @ 71°C and 95% R.H.)		
Moisture Absorption (%)		0.15
24 hr immersion @ 23°C		
Mechanical Shock		>7.75
(lbs. to break)		
IZOD Impact		0.478
No Toss (ft-lb) / in		
		0.287
With Toss (ft-lb) / in		

Usage Information

Mixing

The following steps must be taken to insure the proper use and to obtain the optimum inherent properties of this 3M™ Scotchcast™ Electrical Resin system.

- 1.0 The part A may be preheated to 50-60°C to aid in mixing. Do not heat above these temperatures for long periods as this can cause a tacky surface.
- 2.0 The part A must be thoroughly mixed to insure that no separation of filler or other ingredients has occurred.
- 3.0 Combine parts in the proper ratio to $\pm 2\%$ by weight or volume.
- 4.0 Mix the combined parts thoroughly using a high speed and high shear mixer (100 to 1600 rpm). Mixing should continue for 4-6 minutes with power mixer. Mixing may be done by hand, but the results may not be consistent.

Mixing is the most important part of getting the most out of the resin system. Most problems are due to incomplete mixing and failure to scrape the sides and bottom of the mixing container. The sides and bottom should be scraped and forced into the bulk of the mixture several times during the mixing process. If this is not done the units filled with resin from this portion of the container will have soft spots and sticky areas. Incomplete mixing can result in physical failures and less than maximum electrical properties.

Deaerating

Air introduced during mixing can be removed by evacuating for 5 to 15 minutes at 5 to 10 mm of mercury (Hg) absolute pressure (above 29.5 inches on typical dial gauge). Warming the resin to 60°C (140°F) aids air removal. The container sidewalls should be four times the height of the liquid resin to contain the foaming that takes place under vacuum.

Casting and Impregnating

For best results, both the resin and the part should be preheated to 50-100°C. Heating the resin and part aids in impregnation by reducing the viscosity significantly. For maximum impregnation, evacuate for 5 to 15 minutes at 5 to 10 mm of mercury (Hg) absolute pressure (above 29.5 inches on typical dial gauge), or pour in vacuum and hold for several minutes before releasing vacuum.

Curing

Where minimum stress and maximum shock resistance are required, the lower temperature cure cycle is suggested. Time should be added to the cure cycle times to allow the resin to reach the curing temperature. An additional post cure of 8-16 hours at 110-120°C will optimize physical and electrical properties regardless of the initial cure 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 found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use.

3M and Scotchcast are trademarks of 3M Company.

Important Notice

All statements, technical information, and recommendations related to 3M's products are based on information believed to be reliable, but the accuracy or completeness is not guaranteed. Before using this product, you must evaluate it and determine if it is suitable for your intended application. You assume all risks and liability associated with such use. Any statements related to the product which are not contained in 3M's current publications, or any contrary statements contained on your purchase order shall have no force or effect unless expressly agreed upon, in writing, by an authorized officer of 3M.

Warranty; Limited Remedy; Limited Liability. This product will be free from defects in material and manufacture for a period of one (1) year from the date of purchase. **3M MAKES NO OTHER WARRANTIES INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.** If this product is defective within the warranty period stated above, your exclusive remedy shall be, at 3M's option, to replace or repair the 3M product or refund the purchase price of the 3M product. Except where prohibited by law, **3M will not be liable for any loss or damage arising from this 3M product, whether direct, indirect, special, incidental or consequential regardless of the legal theory asserted.**

3M

Electrical Markets Division

6801 River Place Blvd.
Austin, TX 78726-9000
800/676-8381
Fax: 800/828-9329
www.3M.com/electrical/oem



*Printed on 50% recycled paper
with 10% post-consumer*

Litho in USA
© 3M 2004 78-8124-5593-5-B