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Emerson & Cuming
a National Starch & Chemical Company

STYCAST® 1090

Low Density, Syntactic Foam, Epoxy Encapsulant

Key Feature:	Benefit:
• Low density syntactic foam	• Less added weight for final assemblies
• Low coefficient of thermal expansion	• Low stress on embedded components
• Low dielectric constant	• Minimizes effect on circuit operation

Product Description:

STYCAST 1090 is a low density, syntactic foam epoxy encapsulant. It features low cure shrinkage, low coefficient of thermal expansion and low dielectric constant. STYCAST 1090 is completely unicellular so moisture absorption is negligible.

Applications:

STYCAST 1090 is designed for encapsulation and potting of electronic assemblies that require lower weight such as aerospace applications.

Instructions For Use:

Thoroughly read the information concerning health and safety contained in this bulletin before using. Observe all precautionary statements that appear on the product label and/or contained in individual Material Safety Data Sheets (MSDS).

To ensure the long term performance of the potted or encapsulated electrical / electronic assembly, complete cleaning of components and substrates should be performed to remove contamination such as dust, moisture, salt, and oils which can cause electrical failure, poor adhesion or corrosion in an embedded part.

Some filler settling is common during shipping and storage. For this reason, it is recommended that the contents of the shipping container be thoroughly mixed prior to use. Power mixing is preferred to ensure a homogeneous product.

Accurately weigh resin and hardener into a clean container in the recommended ratio. Weighing apparatus having an accuracy in proportion to the amounts being weighed should be used.

Blend components by hand, using a kneading motion, for 2-3 minutes. Scrape the bottom and sides of the mixing container frequently to produce a uniform mixture. If possible, power mix for an additional 2-3 minutes. Avoid high mixing speeds which could entrap excessive amounts of air or cause overheating of the mixture resulting in reduced working life.

To ensure a void-free embedment, vacuum deairing or degassing should be performed to remove any entrapped air introduced during the mixing operation. Pump-down or pull vacuum on the mixture to achieve an ultimate vacuum or absolute pressure of 1- 5 torr or mm Hg. The foam will rise several times the liquid height and then subside. Continue vacuum deairing until most of the bubbling has ceased. This usually requires 3-10 minutes.

To facilitate deairing in difficult to deair materials, add 1-3 drops of an air release agent, such as ANTIFOAM 88, into 100 grams of mixture. Gentle warming will also help, but working life will be shortened.

Pour mixture into cavity or mold. Gentle warming of the mold or assembly reduces the viscosity. This improves the flow of the material into the unit having intricate shapes or tightly packed coils or components. Further vacuum deairing in the mold may be required for critical applications.

Properties of Material As Supplied:

Property	Test Method	Unit	Value
Chemical Type			Epoxy
Appearance	Visual		Black Liquid
Density	TP-13	g/cm^3	0.85
Brookfield Viscosity	TP-10 or TP-11 10 rpm # 7	Pa.s cP	135 135,000

Choice of Curing Agents			
Curing agent	Catalyst 9	Catalyst 11	Catalyst 23 LV
Description	General purpose with good chemical resistance and physical strength.	Long pot life, excellent chemical resistance, good physical and chemical properties at elevated temperatures.	Low color, low viscosity, long pot life. Excellent, thermal shock and impact resistance. Excellent low temperature properties and adhesion to glass.
Type of cure	Room	Heat	Room
Viscosity Pa.s cP	0.080 to 0.105 80 to 105	0.035 to 0.060 @ 65 °C 35 to 60 @ 65 °C	0.020 to 0.030 20 to 30

Properties of Material As Mixed:

Property	Test Method	Unit	Value		
			Catalyst 9	Catalyst 11	Catalyst 23 LV
Mix Ratio - Amount of Catalyst per 100 parts of STYCAST 1090		By Weight By Volume	9 7	10.5 7.5	18.5 14.5
Working Life (100 g @ 25°C)	ERF 13-70		45 minutes	>4 hours	60 minutes
Density	TP-13	g/cm^3	0.79	0.80	0.81
Brookfield Viscosity	TP-10 or TP-11	Pa.s cP	30 30,000	29 29,000	5 5,000

"Our service engineers are available to help purchasers obtain best results from our products, and recommendations are based on tests and information believed to be reliable. However, we have no control over the conditions under which our products are transported to, stored, handled, or used by purchasers and, in any event, all recommendations and sales are made on condition that we will not be held liable for any damages resulting from their use. No representative of ours has any authority to waive or change this provision. We also expect purchasers to use our products in accordance with the guiding principles of the Chemical Manufacturers Association's Responsible Care® program."

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Cure Schedule:

Cure at any one of the recommended cure schedules. For optimum performance, follow the initial cure with a post cure of 2 - 4 hours at the highest expected use temperature. Alternate cure schedules may also be possible. Contact your Emerson & Cuming Technical Representative for further information.

Temperature	Cure Time		
°C	Catalyst 9	Catalyst 11	Catalyst 23 LV
25	16-24 hrs		24 hrs
45	4-6 hrs		4-6 hrs
65	1-2 hrs		1-2 hrs
80		8-16 hrs	
100		2-4 hrs	
120		30-60 min	

Properties of Material After Application:

Property	Test Method	Unit	Value		
			Catalyst 9	Catalyst 11	Catalyst 23 LV
Hardness	TP-311	Shore D	80	82	75
Flexural Strength	ASTM-D-790	mPa psi	48 7,000	44 6,400	47 6,900
Compressive Strength	TP-207	mPa psi	83 12,000	83 12,000	61 8,900
Tensile Strength	TP-239	mPa psi	21 3,000	32 4,700	27 3,900
Linear Shrinkage	TP-320	cm/cm	0.001	0.002	0.001
Water Absorption	24 hour boil	%	0.55	0.05	0.35
Coefficient of Thermal Expansion	TMA	10^{-6}/°C		40	
Thermal Conductivity	ASTM-D-2214	W/m.K Btu-in/hr-ft^2-°F	0.19 1.3	0.19 1.3	0.19 1.3
Temperature Range of Use		°C	-40 to +130	-55 to +155	-65 to +105
Outgassing[1] TML CVCM	NASA OUTGASSING	 % %	 0.46 0.06	 0.38 0.04	
Dielectric Strength	TP-297	kV/mm V/mil		14.8 375	
Dielectric Constant @ 1 mHz	TP-184	-	2.70	2.73	2.75
Dissipation Factor @ 1 mHz	TP-184	-	0.05	0.05	0.05
Volume Resistivity @ 25°C	TP-183	Ohm-cm	$>10^{13}$	$>10^{13}$	$>10^{13}$

TPs are internal test procedures typically derived from ASTM or other norms. Copies of these test procedures can be obtained upon request.

[1] per NASA Reference Publication 1124. CATALYST 9 cured sample was cured for 30 days @ 25°C. CATALYST 11 cured sample was cured for 3 hours @ 95°C plus 3 hours @ 150°C.

Storage and Handling:

The shelf life of STYCAST 1090 is 12 months at 25°C. For best results, store in original, tightly covered containers. Storage in cool, clean and dry areas is recommended. Usable shelf life may vary depending on method of application and storage conditions. Certain resins and hardeners are prone to crystallization. If crystallization does occur, warm the contents of the shipping container to 50-60°C until all crystals have dissolved. Be sure the shipping container is loosely covered during the warming stage to prevent any pressure build-up. Allow contents to cool to room temperature before continuing.

Health and Safety:

The STYCAST 1090, like most epoxy compounds, possesses the ability to cause skin and eye irritation upon contact. Certain individuals may also develop an allergic reaction after exposure (skin contact, inhalation of vapors, etc.) which may manifest itself in a number of ways including skin rashes and an itching sensation. Handling this product at levated temperatures may also generate vapors irritating to the respiratory system.

Good industrial hygiene and safety practices should be followed when handling this product. Proper eye protection and appropriate chemical resistant clothing should be worn to minimize direct contact. Consult the Material Safety Data Sheet (MSDS) for detailed recommendations on the use of engineering controls and personal protective equipment.

This information is only a brief summary of the available safety and health data. Thoroughly review the MSDS for more complete information before using this product.

Attention Specification Writers:

The values contained herein are considered typical properties only and are not intended to be used as specification limits.

Medical Implantable Disclaimer

"In the event this product is intended by you for use in implantation in the human body, you are hereby advised that National Starch (or Emerson & Cuming) has not performed clinical testing of these materials for implantation in the human body nor has National Starch (Emerson & Cuming) sought, nor received, approval from the FDA for the use of these material in implantation in the human body. It is YOUR responsibility, as a manufacturer of any such device, to ensure that all materials and processes relating to the manufacture of any medical device fully comply with all applicable federal, state and local laws, rules, regulations and requirements as well as any such laws, rules, regulations, directives or other orders of any foreign country where such product is sold. If you have not undertaken the necessary investigations to ensure compliance you are advised NOT TO USE this product in the manufacture of any device which is to be implanted in the human body. No representative of ours has any authority to change the foregoing provisions."

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