Technical Data Sheet

DOWSIL™ EE-3200 Low Stress Encapsulant

Two-part, 1 to 1 mix ratio, low viscosity encapsulant

Features & Benefits

- Soft, low durometer
- Low viscosity
- Room temperature or accelerated heat cure
- Good thermal conductivity
- Mix ratio 1 to 1
- Low internal stress during thermal cycling
- Highly flowable for filling small gaps and fast processing
- Good heat dissipation
- Prevents water ingress
- Electrically insulative
- Low total cost of ownership
- Approved for railways standard EN45545-2: R22/R23/R24/R25/R26 – HL3

Composition

- Two-part
- Polydimethylsiloxane

Applications

DOWSIL™ EE-3200 Low Stress Encapsulant has a very low hardness and viscosity to minimize internal stress generation, fill small gaps, and improve manufacturing speed for complex and high volume devices. Excellent flame resistance and protection against water ingress that improve the safety and reliability under harsh outdoor environments such as:

- Power Conversion Devices (Inverters, Converters)
- Junction Boxes
- Automotive PCB Modules
- Railways PCB Systems Applications

Form No. 11-3138-01 D

Typical Properties

Specification Writers: These values are not intended for use in preparing specifications.

Property	Unit	Result
Color		
Part A		Off-White
Part B		Black
Mixed		Dark Grey to Black
Viscosity[1] (Part A)	cP	1400
Viscosity[2] (Part B)	cP	2000
Mixed Viscosity[3]	cP	1700
Specific Gravity[4] (Part A)		1.48
Specific Gravity[5] (Part B)		1.46
Working Time at 25°C (Pot Life)	minutes	30
Gel Time[6] at 22°C	minutes	50
Gel Time[7] at 50°C	minutes	6
Cure Time[8] at 25°C	hours	3
Cure Time[9] at 50°C	minutes	20
Durometer[10]	Type 000	43
Thermal Conductivity[11]	W/mK	0.5
Tensile Strength	psi	33
	MPa	0.2
Elongation	%	340
Secant Modulus (at 100% Elongation)	psi	8
	MPa	0.06
Young's Modulus	psi	12.7
	MPa	0.09
Water Absorption[12]	%	0.13
Cured Specific Gravity	gm/cm^3	1.48
Linear CTE	µm/m°C	360
Glass Transition Temperature	°C	-114
Peel Adhesion to FR-4[13]	lbf/in	0.3
Peel Adhesion to Aluminum[14]	lbf/in	0.6
Primed Peel Adhesion to FR-4[15]	lbf/in	0.8
Primed Peel Adhesion to Aluminum[16]	lbf/in	0.8

1, 2, 3: ASTM D4287. HBDV-III ultra, Spindle No. 3,100 RPM.
4, 5: ASTM D792.
6, 7: CTM 0674A. GT-6 Techne Gelation Timer.
8, 9: Parallel Plate Rheometer, 10 rad/sec, 1% strain. Full cure defined as 90% of final modulus.
10: ASTM D2240. 10 mm thickness, cure schedule 50°C for 60 min.
11: Measured via Hot Disk.
12: ASTM D570. 24 hr result.
13, 14: ASTM D 903. Aluminum Q-panel Mil Finish. Standard FR-4 for PCB Assemblies.
15, 16: ASTM D 903. Primed with DOWSIL™ 92-023 Primer.

Typical Properties (Cont.)

Property	Unit	Result
UL Certifications		
Flame Class		V-0
HWI		4
HAI		1
CTI		0
RTI Elec	°C	150
RTI Imp	°C	150
RTI Str	°C	150
Dielectric Strength	volts/mil	350
	kV/mm	14
Volume Resistivity	ohm*cm	1E+15
Dissipation Factor at 100 Hz		0.006
Dissipation Factor at 100 kHz		0.0008
Dissipation Factor at 1 MHz		0.0007
Dielectric Constant at 100 Hz		2.7
Dielectric Constant at 100 kHz		2.7
Dielectric Constant at 1 MHz		2.7
EN 45545-2 Certifications		
R22 – R23 – R24 – R25 – R26		HL3

Description

Dow silicone encapsulants are supplied as two-part liquid component kits. When liquid components are thoroughly mixed, the mixture cures to a flexible elastomer, which is well suited for the protection of electrical/PCB system applications. Dow silicone encapsulants cure without exotherm at a constant rate regardless of sectional thickness or degree of confinement. Dow silicone encapsulants require no post cure and can be placed in service immediately following the completion of the cure schedule. Standard silicone encapsulants require a surface treatment with a primer in addition to good cleaning for adhesion while primerless silicone encapsulants require only good cleaning.

Mixing and De-Airing

These products are supplied in a 1 to 1 mix ratio, which is very robust in manufacturing environments and allows for some process and dispense equipment variation. In most cases de-airing is not required.

Preparing Surfaces

In applications requiring adhesion, priming will be required for many of the silicone encapsulants. For best results, the primer should be applied in a very thin, uniform coating and then wiped off after application. After application, it should be thoroughly cured prior to application of the silicone elastomer. Additional instructions for primer usage can be found in the information sheets specific to the individual primers.

Processing/Curing

Thoroughly mixed Dow silicone encapsulants may be poured/dispensed directly into the container in which it is to be cured. Care should be taken to minimize air entrapment. When practical, pouring/dispensing should be done under vacuum, particularly if the component being potted or encapsulated has many small voids. If this technique cannot be used, the unit should be evacuated after the silicone encapsulant has been poured/ dispensed. Dow silicone encapsulants may be either room temperature (25°C/77°F) or heat cured. Room temperature cure encapsulants may also be heat accelerated for faster cure. Ideal cure conditions for each product are given in the product selection table. Two-part condensation cure encapsulants should not be heat accelerated above 60°C (140°F).

Pot Life and Cure Rate

Cure reaction begins with the mixing process. Initially, cure is evidenced by a gradual increase in viscosity, followed by gelation and conversion to a solid elastomer. Pot life is defined as the time required for viscosity to double after Parts A and B (base and curing agent) are mixed and is highly temperature and application dependent. Please refer to the data table.

Useful Temperature Ranges

For most uses, silicone elastomers should be operational over a temperature range of -45 to 200°C (-49 to 392°F) for long periods of time. However, at both the low- and high temperature ends of the spectrum, behavior of the materials and performance in particular applications can become more complex and require additional considerations and should be adequately tested for the particular end use environment. For low-temperature performance, thermal cycling to conditions such as -55°C (-67°F) may be possible but performance should be verified for your parts or assemblies. Factors that may influence performance are configuration and stress sensitivity of components, cooling rates and hold times, and prior temperature history. At the high-temperature end, the durability of the cured silicone elastomer is time and temperature dependent. As expected, the higher the temperature, the shorter the time the material will remain useable.

Compatibility

Certain materials, chemicals, curing agents and plasticizers can inhibit the cure of addition cure gels. Most notable of these include: organotin and other organometallic compounds, silicone rubber containing organotin catalyst, sulfur, polysulfides, polysulfones or other sulfur containing materials, unsaturated hydrocarbon plasticizers, and some solder flux residues. If a substrate or material is questionable with respect to potentially causing inhibition of cure, it is recommended that a small scale compatibility test be run to ascertain suitability in a given application. The presence of liquid or uncured product at the interface between the questionable substrate and the cured gel indicates incompatibility and inhibition of cure.

Repairability

In the manufacture of electrical/PCB system devices it is often desirable to salvage or reclaim damaged or defective units. With most non-silicone rigid potting/encapsulating materials, removal or entry is difficult or impossible without causing excessive damage to internal circuitry. Dow silicone encapsulants can be selectively removed with relative ease, depending on the chosen remove method and technique and repairs or changes accomplished, and the repaired area repotted in place with additional product. To remove silicone elastomers, simply cut with a sharp blade or knife and tear and remove unwanted material from the area to be repaired.

Repairability (Cont.)

Sections of the adhered elastomer are best removed from substrates and circuitry by mechanical action such as scraping or rubbing and can be assisted by applying Dow OS Fluids to swell the elastomer. Before applying additional encapsulant to a repaired device, roughen the exposed surfaces of the cured encapsulant with an abrasive paper and rinse with a suitable solvent and dry. This will enhance adhesion and permit the repaired material to become an integral matrix with the existing encapsulant. Silicone prime coats are not recommended for adhering products to themselves.

Handling Precautions

PRODUCT SAFETY INFORMATION REQUIRED FOR SAFE USE IS NOT INCLUDED IN THIS DOCUMENT. BEFORE HANDLING, READ PRODUCT AND SAFETY DATA SHEETS AND CONTAINER LABELS FOR SAFE USE, PHYSICAL AND HEALTH HAZARD INFORMATION. THE SAFETY DATA SHEET IS AVAILABLE ON THE DOW WEBSITE AT CONSUMER.DOW.COM, OR FROM YOUR DOW SALES APPLICATION ENGINEER, OR DISTRIBUTOR, OR BY CALLING DOW CUSTOMER SERVICE.

Usable Life and Storage

Shelf life is indicated by the “Use Before” date found on the product label. Refer to the product label for storage temperature requirements. Special precautions must be taken to prevent moisture from contacting these materials. Containers should be kept tightly closed and head or air space minimized. Partially filled containers should be purged with dry air or other gases, such as nitrogen. Exposure to moisture could reduce adhesion and cause bubbles to form. Encapsulant materials which contain higher levels of fillers that have been stored for long periods of time should typically be agitated or rolled prior to mixing to prevent separation and settle-out.

Packaging Information

Multiple packaging sizes are available for this product. Please contact your local distributor or Dow representative for information on packaging size and availability.

Limitations

This product is neither tested nor represented as suitable for medical or pharmaceutical uses.

Health And Environmental Information

To support customers in their product safety needs, Dow has an extensive Product Stewardship organization and a team of product safety and regulatory compliance specialists available in each area.

For further information, please see our website, consumer.dow.com or consult your local Dow representative.

How Can We Help You Today?

Tell us about your performance, design, and manufacturing challenges. Let us put our silicon-based materials expertise, application knowledge, and processing experience to work for you.

For more information about our materials and capabilities, visit consumer.dow.com.

To discuss how we could work together to meet your specific needs, go to consumer.dow.com for a contact close to your location. Dow has customer service teams, science and technology centers, application support teams, sales offices, and manufacturing sites around the globe.

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The information contained herein is offered in good faith and is believed to be accurate. However, because conditions and methods of use of our products are beyond our control, this information should not be used in substitution for customer's tests to ensure that our products are safe, effective, and fully satisfactory for the intended end use. Suggestions of use shall not be taken as inducements to infringe any patent.

Dow's sole warranty is that our products will meet the sales specifications in effect at the time of shipment.

Your exclusive remedy for breach of such warranty is limited to refund of purchase price or replacement of any product shown to be other than as warranted.

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