

# Technical data sheet



Product: 93-500

Manufacturer: DOWSIL

Product group: KLEBSTOFF

Article group: 2-K SILIKON

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## DOWSIL™ 93-500 SPACE GRADE ENCAPSULANT

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## DOWSIL™ 93-500 Space Grade Encapsulant

Transparent space grade encapsulant.

### Features & Benefits

- 10:1 mix ratio
- Flowable
- Low levels of volatile condensable materials
- Rapid, versatile cure processing controlled by temperature
- High transparency allows easy inspection of components
- Proven for space-grade applications

### Composition

- Two-part
- 10:1 mix ratio
- Polydimethylsiloxane encapsulant

### Typical Properties

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

Property	Unit	Result
Viscosity (Mixed)	cP	8100
	mPa-sec	8100
	Pa-sec	8.1
Working Time @ 25°C (Pot Life-hours)	hours	2.75
Cure Time @ 25°C	hours	24
Heat Cure Time @ 100°C	minutes	10
Heat Cure Time @ 125°C	minutes	7
Heat Cure Time @ 150°C	minutes	4
Specific Gravity (Cured)		1.03
Durometer Shore A		43
Tensile Strength	psi	970
	MPa	6.7
	kg/cm <sup>2</sup>	67
Elongation	%	165
Tear Strength (Die B)	ppi	15
	N/cm	11

## Typical Properties (Cont.)

Property	Unit	Result
Primed Adhesion - Lap Shear on Aluminum	psi	470
	MPa	3.2
	N/cm <sup>2</sup>	32.3
Dielectric Strength	volts/mil	475
	kV/mm	19
Dielectric Constant at 100 Hz		2.6
Dielectric Constant at 100 kHz		2.59
Volume Resistivity	ohm*cm	1.06 E+15
Dissipation Factor at 100 Hz		0.00105
Dissipation Factor at 100 kHz		0.00019
Hardening Transition by DSC	°F	-184
	°C	-120
Volatile Condensable Material (ASTM <sup>1</sup> E595)	%	0.01
Total Mass Loss (ASTM E595)	%	0.14
Refractive Index		1.41
Shelf Life at 25°C	months	24
Linear CTE (by TMA)	ppm/°C	300

1. ASTM: American Society for Testing and Materials.

### Description

Dow silicone encapsulants such as DOWSIL™ 93-500 Space Grade Encapsulant 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 and PCB system assembly applications. Dow silicone encapsulants cure without exotherm at a constant rate regardless of sectional thickness or degree of confinement. Dow silicone elastomers 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. Underwriters Laboratory (UL) 94 recognition is based on minimum thickness requirements. Please consult the UL Online Certifications Directory for the most accurate certification information.

### Mixing and De-airing

The 10:1 mix ratio these products are supplied in gives one latitude to tune the modulus and hardness for specific application needs and production lines. In most cases de-airing is not required.

### Preparing Surfaces

In applications requiring adhesion, priming will be required for many of the silicone encapsulants. See the Primer Selection Guide for the correct primer to use with a given product. 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 encapsulant 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. However, complete cure will not occur in thin coatings of less than 0.25 mm unless confined or covered. 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. 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 adhesives. 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 and PCB assembly 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, any repairs or changes accomplished, and the repaired area repotted in place with additional product.

**Repairability  
(Cont.)**

To remove silicone elastomers, simply cut with a sharp blade or knife and tear and remove unwanted material from the area to be repaired. 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.

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. 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 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.

**Packaging  
Information**

DOWSIL™ 93-500 Space Grade Encapsulant is supplied in a 0.49 Kg kit or 110 g kit.

**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, [dow.com](http://dow.com) or consult your local Dow representative.

**Disposal  
Considerations**

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

## **Product Stewardship**

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## **Customer Notice**

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

## **How Can We Help You Today?**

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

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

To discuss how we could work together to address your specific needs, go to **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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