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Technical Data Sheet

# DOWSIL™ RSN-0997 Resin

## FEATURES & BENEFITS

- Easy to use
- Excellent electrical properties
- Good bond strength retention
- Moisture resistance
- Designed to meet MIL-I-24092B

Silicone Resin in solvent

## APPLICATIONS

Impregnant and coating material for various electrical coils including:

- Transformers
- Motors
- Generators

## DESCRIPTION

DOWSIL™ RSN-0997 Resin is a dark-brown silicone impregnating resin that offers processing ease and versatility, and features good dielectric properties and moisture resistance. In service, it exhibits good retention of bond strength. Its reliability has been proved by years of extensive use throughout the electrical equipment industry.

Other features of DOWSIL RSN-0997 Resin include:

- Long service life – reliable even at 220°C (428°F) hottest spot temperature
- Ease of use – resin is readily thinned to meet specific application requirements
- Little tendency to bubble during cure
- Flexible cure schedules
- Designed to meet requirements of MIL-I-24092B

DOWSIL RSN-0997 Resin is typically used as an electrical insulating impregnant for a variety of insulation systems such as motor stator coils, generator coils, solenoids and transformer windings.

## HOW TO USE

Prior to impregnation with DOWSIL RSN-0997 Resin, equipment should be thoroughly cleaned and prebaked at 150-200°C (302-392°F) to drive out moisture and to cure new insulating components.

After prebaking, the equipment should be allowed to cool to 80°C (176°F). It should then be dipped in DOWSIL RSN-0997 Resin for 3 to 5 minutes (or until most of the bubbling stops). *Immersion time should be no longer than 10 minutes.*

The first coat of resin must be air dried, partially cured and then cooled to about 80°C (176°F) before any further impregnation. Two dips will usually give sufficient build-up of resin.

### Thinning

Several solvents are satisfactory for DOWSIL RSN-0997 Resin. Any thinner used to reduce the viscosity of DOWSIL RSN-0997 Resin should meet the following requirements:

- Kauri-Butanol Value – greater than 50
- Initial Boiling Point – higher than 104°C (220°F)
- Final Boiling Point – lower than 169°C (335°F)
- Corrosion – none

When using thinning solvents, follow handling instructions noted on solvent container label. Always provide adequate ventilation.

### Maintaining Proper Viscosity

If the viscosity of DOWSIL RSN-0997 Resin is allowed to exceed 200 centistokes, the resin may not penetrate the windings, and air spaces (voids) may be left.

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## TYPICAL PROPERTIES

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

| CTM[1] | Property | Unit | Result | |
|---|---|---|---|---|
| | **As Supplied** | | | |
| 0176 | Color | | Dark brown | |
| 0208 | Nonvolatile Content after 3 hrs at 135°C (275°F) | % | 50 | |
| 0001A | Specific Gravity at 25°C (77°F) | | 1.00 | |
| 0050 | Viscosity at 25°C (77°F) | cPs | 90-120 | |
| 0021A | Flash Point, closed cup | °C (°F) | 27 (80) | |
| | Drying Time at 200°C (392°F) | hrs | 3 | |
| | Solvent | | Xylene | |
| | **As Cured – 6 Hours at 200°C (392°F)** | | **Condition A[2]** | **Condition D[2]** |
| 0114 | Dielectric Strength, 2" electrodes | volts/mil | 2000 | 1500 |
| 0112 | Dissipation Factor at 25°C (77°F) | | | |
| | tested at 100 Hz | Hz | 0.010 | 0.020 |
| | tested at 100 kHz | kHz | 0.007 | 0.010 |
| 0112 | Dielectric Constant at 25°C (77°F) | | | |
| | tested at 100 Hz | Hz | 3.10 | 3.20 |
| | tested at 100 kHz | kHz | 2.98 | 3.10 |
| 0249 | Surface Resistivity | ohms | $1 \times 10^{14}$ | $1 \times 10^{13}$ ($C^1$) |
| 0249 | Volume Resistivity | ohm-cm | $2 \times 10^{14}$ | $1 \times 10^{14}$ ($C^1$) |
| | Weight Loss[3], after 3 hrs at 250°C (482°F) | % | 6.4 | |
| 0224 | Thermal Conductivity, cal/sec (cm) | °C (°F) | $0.35 \times 10^{-3}$ | |
| | Moisture Vapor Transmission | $g/m^2/day$ | 4.6 | |
| 0226 | Thermal Life, curved electrodes method[4] | | | |
| | 300°C (572°F) | hours | 350 | |
| | 275°C (527°F) | hours | 1500 | |
| | 250°C (482°F) | hours | 4000 | |

[1]CTM: Corporate Test Method.
[2]Condition A – as supplied; Condition D – after 24 hrs immersion in distilled water; Condition C – after 96 hrs at 23°C (73°F) and 96 percent RH.
[3]Solventless resin
[4]Hours aging necessary to reduce the dielectric strength of glass cloth impregnated with DOWSIL RSN-0997 Resin to 300 volts per mil when the resin film is elongated 2 percent.

Excessive resin build-up may lead to crazing. If the resin in the dip tank becomes too thick, deterioration may occur and the resin should be discarded.

### Curing

Curing time and temperature vary with the size and complexity of the equipment, the properties desired in the resin film and the characteristics of the curing oven. Typical curing schedules, which should be suitable for motors and transformers varying widely in size and weight, are described in Table 1. Curing time should be measured from the time both the oven and the impregnated equipment reach the curing temperature. When establishing curing schedules for specific equipment, follow these general rules:

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1. Final cure temperature should be at least 20°C (68°F) above the maximum operating temperature of the impregnated equipment.
2. When maximum bond strength is required, equipment should be given a final cure at 250°C (482°F) for at least 6 hours. The effect of curing temperature and heat aging on bond strength is illustrated in Table 2.
3. Equipment impregnated with DOWSIL RSN-0997 Resin can usually be placed in ovens at temperatures between 150-200°C (302-392°F) without the appearance of bubbles in the resin film. Equipment that is to be cured at 250°C (482°F), however, should be given an initial bake of 2 to 4 hours at 150-200°C (302-392°F). Small or complex equipment that will be cured at temperatures above 150°C (302°F) should be given a preliminary bake of 1 hour at 100-150°C (212-302°F).
4. Immersion time must be kept to a minimum to prevent solvent damage to insulating components.

**Maintaining Cleanliness**
If dirt is allowed to accumulate in the dip tank, it can seriously affect the dielectric properties of DOWSIL RSN-0997 Resin. Dip tanks should be of welded black iron and fitted with tight covers to exclude dust and minimize evaporation. Tanks with soldered joints are not recommended because silicone resin has a tendency to gel after contact with solder or soldering flux. Dip tanks should be cleaned at least twice a year. Drain the resin from the tank into a clean container. Remove sludge or dirt by straining the resin through several layers of cheese cloth before it is returned to the tank. Check viscosity of the resin and add thinner if necessary.

**Rewinds**
Electrical equipment should be thoroughly cleaned before it is rewound. Motors baked overnight at 540-650°C (1004-1202°F) in "roasting out" ovens are more easily stripped and cleaned. Sandblasting and vapor-cleaning tanks are also effective methods to clean stripped electrical machines.

## HANDLING PRECAUTIONS

**Caution**
DOWSIL RSN-0997 Resin contains xylene, a flammable solvent. Keep away from heat and open flame. Avoid prolonged breathing of vapor. Avoid prolonged or repeated skin contact and avoid eye contact.

Ovens: In curing ovens, the solvent evaporates rapidly and explosive vapor concentrations may accumulate in the absence of proper ventilation. Use only a well-ventilated air-circulating oven. Air should be changed 3 times per minute in ovens of 20 cubic feet inside volume, and once or twice per minute in ovens of 250 cubic feet inside volume.

**Flammability**
When cured, DOWSIL RSN-0997 Resin meets or exceeds Underwriters Laboratories (UL) 94 V-O flammability tests as tested. This does not imply UL recognition.

Also, DOWSIL RSN-0997 Resin has a rating of 39 when coated over Arimid Paper and tested in accordance with ASTM[1] D 2863 – limited oxygen index test (39 percent oxygen atmosphere necessary to maintain combustion).

[1]American Society for Testing and Materials.

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## USABLE LIFE AND STORAGE

When stored at or below 25°C (77°F) in the original, unopened containers, this product has a usable life of 36 months from the date of production.

**Attention!** Containers will have vapor and/or product residues when emptied. All hazard precautions on labels must be observed when handling empty containers. **DO NOT CUT OR WELD CONTAINERS. DO NOT REUSE CONTAINERS.**

## LIMITATIONS

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

## SHIPPING LIMITATIONS

DOT Classification: Flammable.

## 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.

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**Figure 1: Effect of temperature on the viscosity of DOWSIL RSN-0997 Resin**

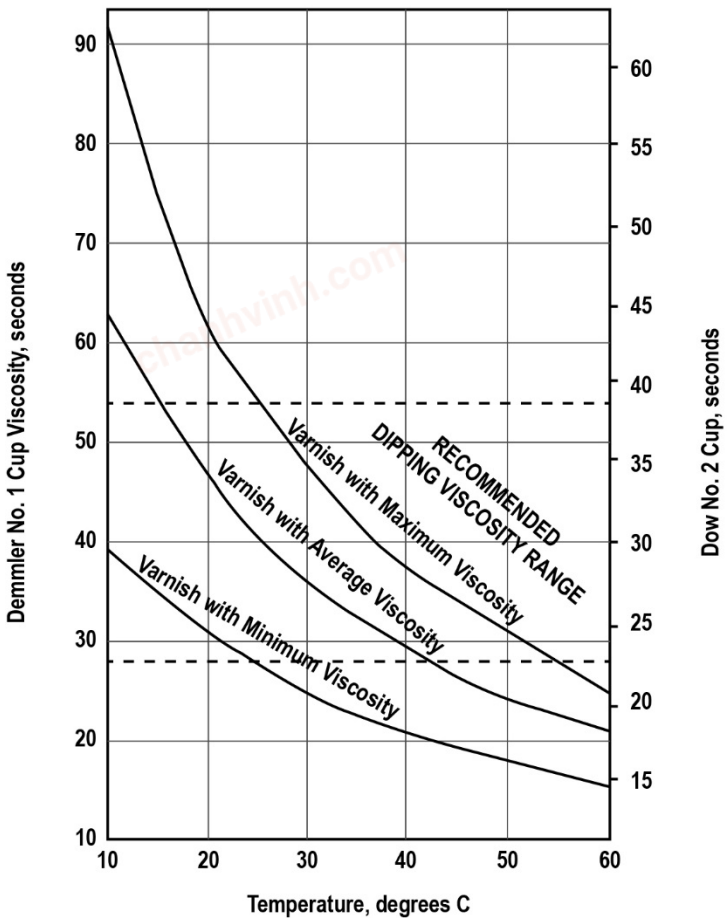



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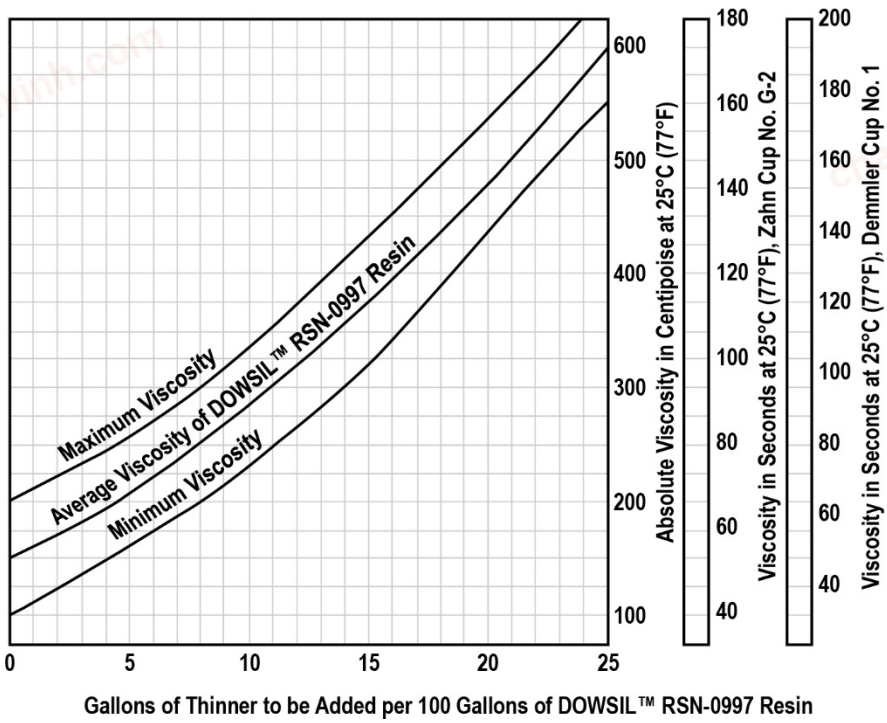
**Figure 2: Gallons of thinner to be added per 100 gallons of DOWSIL RSN-0997 Resin to maintain proper dipping consistency**




The following schedule was developed for impregnating and curing a 5-horsepower, 3-phase induction motor wound on a 254 frame. This schedule should be suitable for motors and transformers varying widely in size and weight. Some modifications may be desirable to accommodate very small or very large equipment, or equipment with components unable to withstand cure temperatures above 180°C (356°F).

**Table 1: Typical Curing Schedule**

1. Prebake 4 hours at 175°C (347°F) to drive out moisture and cure all components.
2. Cool to about 80°C (176°F). Dip in DOWSIL RSN-0997 Resin until most bubbling stops (about 3 minutes). Drain and air-dry for 30 minutes.
3. Bake for 2 hours at 200°C (392°F).
4. Cool to 80°C (176°F). Dip in DOWSIL RSN-0997 Resin for 1 minute. Drain and air-dry for 30 minutes.
5. Any of the following final cures may be used:
   A. 4 to 8 hours at 200°C (392°F).
   B. 2 hours at 200°C (392°F), followed by 3 to 7 hours at 225°C (437°F).
   C. 2 hours at 200°C (392°F), followed by 2 to 6 hours at 250°C (482°F).

**Table 2: Effect of Cure Temperature and Heat Aging on Bond Strength**

Helical wound coils of No. 18 AWG aluminum wire were impregnated with DOWSIL RSN-0997 Resin. The bond strength was determined as the number of pounds required to break this coil as a simple beam. This test is a functional measure of the resin film strength.

| Cure, 6 hrs at: | Bond Strength, lbs when tested at 25°C (77°F) | Bond Strength, aged coils, when tested at 25°C (77°F)[1] |
|---|---|---|
| 150°C (302°F) | 9 | 22.0 |
| 200°C (392°F) | 16 | 22.4 |
| 250°C (482°F) | 25 | 22.2 |

[1]Coils aged 20 weeks at 250°C (482°F).

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