

Description

The 8331S *Silver Conductive Epoxy Adhesive: Slow Cure / High Conductivity* is an economical electronic grade epoxy that combines long working time and good conductivity with ease of use. It has a convenient 1-to-1 mix ratio and 4–5 hours pot life, which once mixed behaves essentially like a 1-part adhesive for the duration of a work shift. However, unlike 1-part adhesives that often require high heat (130–170 °C), it will cure at 65 °C in less than 2 hours. The cured conductive adhesive bonds very well to most substrates used in electronic assemblies; resists thermal and mechanical shocks; and provides the low resistivity needed for many operating conditions. The 8331S epoxy adhesive is great for forming conductivity seals, bonding, and repairing of electronic devices.

Applications & Usages

The 8331S epoxy has many uses in the production, repair and assembly of electronics in microelectronics and optoelectronics. It has been designed for production environments as a replacement for one part silver conductive epoxy systems when high cure temperatures can potentially damage heat sensitive components, or where frozen storage requirements or shelf life of one part epoxies are a concern. Like all conductive epoxies, it operates as a lead free replacement for metal solder, and it excels at bonding heat-sensitive electronic components. It also provides excellent EMI/RFI shielding and is very effective at filling seams between metal plates.

Benefits and Features

- **Good 0.0060 Ω·cm electrical resistivity and 0.95 W/(m·K) thermal conductivity**
- **Easy 1:1 mix ratio and long working time**—may be mixed once and then used as a 1-part epoxy for a four hour production shift
- **Optimal cure temperature of only 65 °C**—lower than most 1-part epoxies and suitable for use on heat sensitive components
- **Stores and ships at room temperature**—no freezing or dry ice required
- **Very long shelf life of at least two years**—even when stored at room temperature
- **Strong water and chemical resistance** to brine, acids, bases, and aliphatic hydrocarbons
- **Room temperature cure is possible** (96 hours)
- **Excellent adhesion to most electronic substrates**

ENVIRONMENT

- ✓ RoHS
- ✓ REACH compliant

Curing & Work Schedule

| Properties | Value |
|--|--------|
| Working Life ^{a)} | 4–5 h |
| Shelf Life | ≥3 y |
| Full Cure @25 °C [77 °F] ^{b)} | 96 h |
| Full Cure @65 °C [149 °F] | 2 h |
| Full Cure @80 °C [176 °F] | 60 min |
| Full Cure @100 °C [212 °F] | 50 min |

a) Cure and life values 5 g and room temperature unless stated otherwise.

b) Minimal service cure; for full cure, wait 24 h

Temperature Service Range

| Properties | Value |
|--------------------------------------|--|
| Constant Service Temp. | -40 °C to 150 °C [-40 °F to 302 °F] |
| Storage Temperature of Unmixed Parts | 22 to 27 °C [72 to 80 °F] |

Properties of Cured 8331S

| <i>Physical Properties</i> | <i>Method</i> | <i>Value^a</i> |
|--|----------------------------------|--|
| Color | Visual | Silvery Beige |
| Density @ 25 °C [77 °C] | | 2.191 g/cm ³ |
| Hardness | (Shore D durometer) | 73D |
| Tensile Strength | ASTM D 638 | 13.5 N/mm ² [1,960 lb/in ²] |
| Elongation | " | 5.3% |
| Compression Strength | ASTM D 695 | 64.6 N/mm ² [9,370 lb/in ²] |
| Lap Shear Strength (Stainless Steel 304) | ASTM D 1002 | 1.0 N/mm ² [160 lb/in ²] |
| Lap Shear Strength (Aluminum 5052) | " | 4.8 N/mm ² [690 lb/in ²] |
| Water absorption | | 0.12% |
| Outgassing (Total Mass Loss) @ 24 h | ASTM E 595 | 0.43% |
| Water vapor release (WVR) | " | 0.27% |
| Collectable Volatile Condensable Material | " | 0.04% |
| Solderable | | No |
| <i>Electric Properties^{b)}</i> | <i>Method</i> | <i>Value</i> |
| Volume Resistivity After 65 °C [149 °F] cure | Method 5011.5 in MIL-STD-883H | 0.0060 Ω·cm |
| Surface Resistance After 25 °C [149 °F] cure after 96 h | Square Probe | ~0.35 Ω/sq |
| After 65 °C [149 °F] cure after 1 h | Square Probe | 0.25–0.40 Ω/sq |
| After 80 °C [176 °F] cure | Square Probe | 0.15–0.20 Ω/sq |
| After 100 °C [212 °F] cure | Square Probe | 0.11–0.15 Ω/sq |
| <i>Thermal Properties</i> | <i>Method</i> | <i>Value</i> |
| Thermal Conductivity @25 °C | ASTM E 1461 | 0.946 W/(m·K) |
| @50 °C | " | 0.911 W/(m·K) |
| @100 °C | " | 0.877 W/(m·K) |
| Glass Transition Temperature (T _g) | ASTM D 3418 | 34 °C [93 °F] |
| CTE ^{c)} prior T _g | ASTM E 831 | 78 ppm/°C |
| CTE ^{c)} after T _g | ASTM E 831 | 158 ppm/°C |
| Specific Heat @25 °C [77 °F] | | 0.961 J/(g·K) |

Note: Specifications are for epoxy samples that were cured at 65 °C for 1 hour. Additional curing time at room temperature was given to allow for optimum curing. Samples were conditioned at 23 °C and 50% RH prior to most tests.

a) N/mm² = mPa; lb/in² = psi

b) The uncured epoxy mixture does not conduct electricity well and can have high resistance. To attain stated resistivity, ensure that the mix ratio is followed and that the product is fully cured by heat curing. Room temperature cures may give higher resistivity.

c) Coefficient of Thermal Expansion (CTE) units are in ppm/°C = in/in/°C × 10⁻⁶ = unit/unit/°C × 10⁻⁶

d) To be determined



ISO 9001 Registered Quality System.
Burlington, Ontario, Canada QMI File # 004008

Silver Conductive Epoxy Adhesive

Slow Cure / High Conductivity

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Properties of Uncured 8331S

| <i>Physical Property</i> | <i>Mixture (1A:1B)</i> | |
|---------------------------------|------------------------|------------------------|
| Color | Silver Grey | |
| Density ^{a)} | 2.43 g/mL | |
| Mix Ratio by volume (A:B) | 1:00:1.00 | |
| Mix Ratio by weight (A:B) | 1.17:1.00 | |
| Solids Content (w/w) | 100% | |
| | | |
| <i>Physical Property</i> | <i>Part A</i> | <i>Part B</i> |
| Color | Silver Grey | Silver Grey |
| Density | 2.61 g/mL | 2.25 g/mL |
| Flash Point | >127 °C [261 °F] | >93 °C [200 °F] |
| Resistivity of uncured material | Off-scale (no reading) | Off-scale (no reading) |

a) Calculated value based on measures densities of each part

Principal Components

| Name | CAS Number |
|--------------------------|---|
| Part A: Epoxide Resin | 28768-32-3 + 17557-23-3 |
| Metallic Silver | 7440-22-4 |
| Part B: Aliphatic Amines | 68082-29-1, 112-24-3, 68541-13-9, 4246-51-9 |
| Metallic Silver | 7440-22-4 |

Compatibility

Adhesion—As seen in the substrate adhesion table, the 8331S epoxy adheres to most materials found on printed circuit assemblies; however, it is not compatible with contaminants like water, oil, and greasy flux residues that may affect adhesion. If contamination is present, clean the printed circuit assembly with electronic cleaner such as MG Chemicals 4050 Safety Wash, 406B Superwash, or 824 Isopropyl Alcohol.

Substrate Adhesion in Decreasing Order

| <i>Physical Properties</i> | <i>Adhesion</i> |
|-----------------------------|------------------------|
| Steel | Stronger Weaker |
| Aluminum | |
| Fiberglass | |
| Wood | |
| Paper, Fiber | |
| Glass | |
| Rubber | |
| Polycarbonate | |
| Acrylic | |
| Polypropylene ^{a)} | |

a) Does not bond to polypropylene

Storage

Store between 22 and 27 °C [72 and 80 °F] in dry area away from sunlight. Prolonged storage or storage at or near freezing temperatures can result in crystallization. If crystallization occurs, reconstitute the component to its original state by temporarily warming it to 50 to 60 °C [122 to 140 °F]. To ensure full homogeneity, stir thoroughly the warm component, reincorporating all settled material. Re-secure container lid and let cool down before use.

Health, Safety, and Environmental Awareness

Please see the 8331S **Material Safety Data Sheet** (MSDS) parts A and B for more details on transportation, storage, handling and other security guidelines.

Health and Safety: The 8331S parts can ignite if the liquid is both heated and exposed to flames or sparks.

Wear safety glasses or goggles and disposable polyvinyl chloride, neoprene, or nitrile gloves while handling liquids. Part B in particular causes skin burns and may cause sensitization if exposed over a long period of time. The epoxy will not wash off once cured: wear protective work clothing. Wash hands thoroughly after use or if skin contact occurs. Do not ingest.

Use in well-ventilated area since vapors may cause irritation of the respiratory tract and cause respiratory sensitization in susceptible individuals.

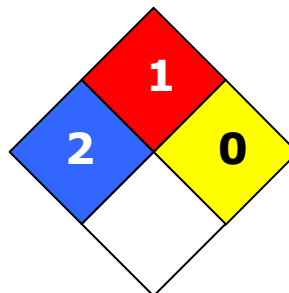
The cured epoxy resin presents no known hazard.

Part A

HMIS® RATING

| | |
|-----------------------------|----------|
| HEALTH: | 2 |
| FLAMMABILITY: | 1 |
| PHYSICAL HAZARD: | 0 |
| PERSONAL PROTECTION: | |

NFPA® 704 CODES

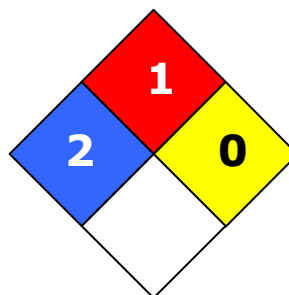


Part B

HMIS® RATING

| | |
|-----------------------------|----------|
| HEALTH: | 2 |
| FLAMMABILITY: | 1 |
| PHYSICAL HAZARD: | 0 |
| PERSONAL PROTECTION: | |

NFPA® 704 CODES



Approximate HMIS and NFPA Risk Ratings Legend:

0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Application Instructions

Follow the procedure below for best results. For mixing quantities that are less than 1 mL size or for stricter stoichiometry control, mix by weight ratio instead (requires a high precision balance). Heat cure is recommended to get the best possible conductivity.

To prepare the epoxy mixture by volume (1:1—A:B ratio)

1. Remove cap or cover.
2. Measure **one** part by volume of **A**.
3. Measure **one** part by volume of **B**.
4. Thoroughly mix the parts together with a stir stick until homogeneous.
5. Apply to with an appropriate sized stick for the application area.

NOTE: Remember to recap the syringe or container promptly after use.

TIP: Due to the high viscosity and abrasiveness of the silver filler, you may preheat part A and part B to increase the flow and improve air release.

To heat cure the 8331S epoxy

Put in oven at 65 °C [149 °F] for 120 minutes or above.

–OR–

Put in oven at 80 °C [176 °F] for 60 minutes or above.

–OR–

Put in oven at 100 °C [176 °F] for 50 minutes.

TIP: Hair dryers are normally rated not to exceed 60 °C, so they can generally be used to accelerate the cure.

ATTENTION: Keep the curing temperature well below temperature limit of heat sensitive components that may be present. As a guideline, remember that commercial grade devices normally can be safely operated up to 70 °C, industrial grade up to 85 °C, and military grade up to 175 °C.

ATTENTION: Heat guns can easily exceed the temperature limits for your assembly: they should not be used.

To room temperature cure the 8331S epoxy

Let stand for 96 hours or more.

TIP: While the product can be cured at room temperature, the best conductivity is achieved with the application of heat.



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Packaging and Supporting Products

Product Availability

| <i>Cat. No.</i> | <i>Form</i> | <i>Net Volume</i> | | <i>Net Weight</i> | | <i>Shipping Weight</i> | |
|-------------------|-------------|-------------------|------------|-------------------|---------|------------------------|--------|
| 8331S-15G | Liquid | 6 mL | 0.20 fl oz | 15 g | 0.48 oz | 32 g | 1.0 oz |
| 8331S-40G | Liquid | 16 mL | 0.55 fl oz | 40 g | 1.30 oz | 75 g | 0.2 lb |
| 8331S-459G | Liquid | 184 mL | 6.22 fl oz | 459 g | 1.01 lb | 0.9 kg | 2.0 lb |

Technical Support

Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

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Warranty

M.G. Chemicals Ltd. warrants this product for 12 months from the date of purchase by the end user. *M.G. Chemicals Ltd.* makes no claims as to shelf life of this product for the warranty. The liability of *M.G. Chemicals Ltd.* whether based on its warranty, contracts, or otherwise shall in no case include incidental or consequential damage.

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