



Black Epoxy Encapsulating & Potting Compound 832B Technical Data Sheet

Description

The 832B *Black Epoxy Encapsulating and Potting Compound* is an electric grade epoxy. It is simple to mix and easy to use. This two parts black epoxy provides great insulation and protection value.

It protects against static discharges, shocks, vibrations, and mechanical impacts. It insulates against heat and conductivity. It is extremely resistant to environmental humidity, salt water, and many harsh chemicals.

Applications & Usages

The 832B epoxy is used to pot or encapsulate printed circuit assemblies in protective blocks. The cured epoxy improves reliability, operational range, and lengthens the life of electrical and electronic parts. It also helps hide and restrict access to proprietary design elements.

Its primary applications are in the automobile, marine, aerospace, aviation, communication, instrumentation, and industrial control equipment.

Benefits and Features

- **Extreme impact resistance** (contains a form of nylon)
- **Extreme resistance to water and humidity** allowing submersion if needed
- **Strong chemical resistance** to brine, acids, bases, and aliphatic hydrocarbons
- **Opaque and extremely difficult to remove material** providing high security for proprietary designs
- **Good protection of electronics against** corrosion, fungus, thermal shock, and static discharges
- **Easy 2A:1B mix ratio** compatible with most dispensing equipment
- **Negligible Volatile Organic Content (VOC)**
- **RoHS Compliant**

Curing & Work Schedule

| <i>Properties</i> | <i>Value</i> |
|--------------------------------------|---------------------------|
| Working Life ^{a)} | 60 min |
| Shelf Life | ≥3 y |
| Full Cure @22 °C [72 °F] | 24 h |
| Full Cure @65 °C [149 °F] | 60 min |
| Full Cure @80 °C [176 °F] | 45 min |
| Full Cure @100 °C [212 °F] | 35 min |
| Storage Temperature of Unmixed Parts | 16 to 27 °C [60 to 80 °F] |

a) Working life assumes 100 g and room temperature. A 10 °C increase can decrease the pot life by half.

Temperature Service Ranges

| <i>Properties</i> | <i>Value</i> |
|--|----------------------------------|
| Constant Service Temperature | -30 °C to 140 °C [-22 to 284 °F] |
| Maximum Intermittent Temperature ^{b)} | 175 °C [347 °F] |

b) The maximum intermittent temperature provides temperature extremes that can be withstood without damage for short periods of time only.



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Principal Components

| Name | CAS Number |
|------------------------------------|------------|
| Part A: Bis-A Epoxide Resin | 25068-38-6 |
| Alkyl Glycidyl Ether Epoxide Resin | 68609-97-2 |
| Part B: Curing Polyamide | 68082-29-1 |
| Curing Aliphatic amine | 112-24-3 |

Properties of Cured 832B

| <i>Physical Properties</i> | <i>Method</i> | <i>Value</i> ^{a)} |
|------------------------------------|-----------------------------|--|
| Color | Visual | Black |
| Density @26 °C [79 °F] | ASTM D 792 | 1.11 g/cm ³ |
| Hardness | (Shore D durometer) | 80D |
| Tensile Strength | ASTM D 638 | 56.9 N/mm ² [8 250 lb/in ²] |
| Elongation | " | 3.3% |
| Lap Shear Strength (SS 304) | ASTM D 1002 | 4.2 N/mm ² [606 lb/in ²] |
| Izod Impact ^{b)} | ASTM D 256 | 0.932 kJ/m ² [0.443 ft·lb/in] |
| Compressive Strength | ASTM D 695 | 155 N/mm ² [22 400 lb/in ²] |
| Flexural Strength | ASTM D 790 | 114 N/mm ² [16 500 lb/in ²] |
| <i>Electric Properties</i> | <i>Method</i> | <i>Value</i> |
| Breakdown Voltage @2.79 mm | ASTM D 149 | 51.9 kV |
| Dielectric Strength | " | 472 V/mil [18.6 kV/mm] |
| Breakdown Voltage @3.175 mm [1/8"] | Reference fit ^{d)} | 55.3 kV |
| Dielectric Strength | | 442 V/mil [17.4 kV/mm] |
| Volume Resistivity @0.95" | ASTM D 257 | 5.3 x10 ¹² Ω·cm |
| Comparative Tracking Index | ASTM D 3628 | Not established |
| Dielectric Dissipation & Constant | ASTM D 150-98 | <i>dissipation, D</i> <i>constant, k'</i> |
| @1 kHz | " | 0.008 2.95 |
| @10 kHz | " | 0.013 2.89 |
| @100 kHz | " | 0.018 2.83 |
| @1 MHz | " | 0.017 2.77 |

a) N/mm² = mPa; lb/in² = psi;

b) Sample thickness 0.259"

c) The surface (sheet) resistivity unit is commonly referred to as "Ohm per square"

d) To allow comparison between products, the Tautscher equation was fitted to the experimental dielectric strengths and interpolated to a standard reference thickness of 1/8" (3.175 mm).



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| <i>Thermal Properties</i> | <i>Method</i> | <i>Value</i> |
|--|---------------|----------------|
| Glass Transition Temperature (T _g) | ASTM D 3418 | 49 °C [120 °F] |
| Heat Deflection Temperature (HDT) ^{b)} | ASTM D 648 | 47 °C [116 °F] |
| Coefficient of Thermal Expansion (CTE) ^{a)} | ASTM E 831 | |
| Before T _g | | 79 ppm/°C |
| After T _g | | 196 ppm/°C |
| Thermal Conductivity @25 °C [77 °F] | ASTM E 1461 | 0.259 W/(m·K) |
| @50 °C [122 °F] | " | 0.264 W/(m·K) |
| @100 °C [212 °F] | " | 0.302 W/(m·K) |

a) ppm/°C = in/in/°C × 10⁻⁶ = unit/unit/°C × 10⁻⁶

b) HDT under 1820 kPa [264 lb/in²] load

Properties of Uncured 832B


| <i>Physical Property</i> | <i>Mixture (2A:1B)</i> | |
|--|------------------------|---------------------|
| Color | Black | |
| Viscosity ^{a)} at 20 °C [73 °F] | 3 300 cP [3.3 Pa·s] | |
| Density | 1.08 g/mL | |
| Mix Ratio by volume (A:B) | 2.0:1.0 | |
| Mix Ratio by weight (A:B) | 2.3:1.0 | |
| Solids Content (w/w) | 99% | |
| <i>Physical Property</i> | <i>Part A</i> | <i>Part B</i> |
| Color | Black | Clear, Amber Tint |
| Viscosity* at 24°C [73 °F] | 2 200 cP [2.2 Pa·s] | 5 800 cP [5.8 Pa·s] |
| Density | 1.13 g/mL | 0.96 g/mL |
| Flash Point | >150 °C [302 °F] | >122 °C [>252 °F] |
| Odor | Mild | Musty |

a) Brookfield viscometer at 50 RPM with spindle #4

Compatibility

Adhesion—As seen in the substrate adhesion table, the 832B 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> |
|----------------------------|---|
| Aluminum | Stronger  Weaker |
| Steel | |
| Fiberglass | |
| Wood | |
| Glass | |
| Polycarbonate | |
| Acrylic | |
| Polypropylene | |

Chemical Resistance—The chemical solvent resistance table presents the percent weight change over the indicated period. The results show low water absorption and a high chemical resistance to water and most ionic species. Softening and swelling occurs for aggressive organic solvents.

Chemical Solvent Resistance

| <i>Physical Properties</i> | <i>Weight Change 3 days</i> | <i>Weight Change 45 days</i> |
|----------------------------|---------------------------------|----------------------------------|
| Water | <0.0 % | <1% |
| Hydrochloric Acid | <0.0 % | <1% |
| Isopropyl alcohol | 0.3% | <1% |
| Mineral spirits | 0.3 % | 0.3 % |
| Xylene | 2 % | 9 % |
| Ethyl Lactate | 3 % | 7 % |
| Iso hexanes | 5 % | 8% |
| Acetone | 7 % | destroyed |

Storage

Store between 16 and 27 °C [60 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 832B **Safety Data Sheet** (SDS) parts A and B for more details on transportation, storage, handling and other security guidelines.

Environmental Impact: By EPA standards, the VOC is 2.0% (23 g/L) for part A and 12.1% (120 g/L) part B. The low vapor pressure of <0.001 kPa at 20 °C in part B is considered 0% VOC in Europe and Canada, and part B is a LVP-VOC exempted in California for consumer products. Note that the VOC in Part B is a reactive component. Reactive components become part of the cured epoxy solid and are therefore non-longer VOCs in their final form.

Health and Safety: The 832 parts can ignite if the liquid is heated.

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 is black and will not wash off once cured: wear protective work clothing. Wash hands thoroughly after use or if skin contact occurs. Do not ingest.

While the product has low volatility and moderate odor, use in well-ventilated area.

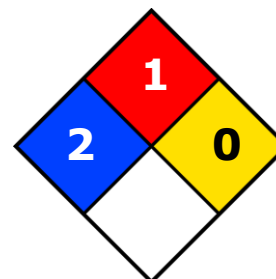
The cured epoxy resin presents no known hazard.

Part A

HMIS® RATING

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

NFPA® 704 CODES

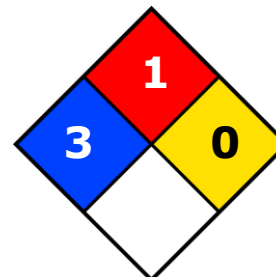


Part B

HMIS® RATING

| | |
|-----------------------------|------------|
| HEALTH: | * 3 |
| 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. If you have little or no experience with the 832B epoxy, please follow the long instructions instead. The short instructions provided here are not suitable for first time users.

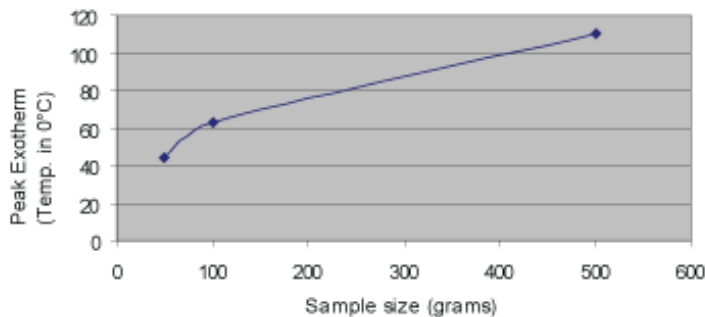
To prepare 2:1 (A:B) epoxy mixture

- Scrape any settled material in the **Part A** container; and stir and fold material until homogenous.
- Scrape any settled material in the **Part B** container; and stir and fold material until homogenous.
- Measure **two** parts by volume of the pre-stirred **A**, and pour in the mixing container.
- Measure **one** part by volume of the pre-stirred **B**, and slowly pour in the mixing container while stirring.
- Let sit for 30 minutes to de-air.
—OR—
Put in a vacuum chamber, bring to 25 inHg pressure, and wait for 2 minutes to de-air.
- If bubbles are present at top, use the mixing paddle to gently break them.
- Pour mixture into the mold or container containing the components to be encapsulated.

ATTENTION! If the parts have clumped (crystallized), pre-heat at 50 °C [122 °F] until fully re-liquefied. Let cool to room temperature before use.

ATTENTION! Mixing >500 g [0.4 L] of Part B at a time into A decreases working life and promotes flash cure. Use of epoxy mixing machines with static stirrer recommended for large volumes. Limit size of hand-mixed batches.

Peak Exotherm Temperature



To room temperature cure the 832B epoxy

Let stand for 24 hours.



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To heat cure the 832B epoxy

Put in oven at 65 °C [149 °F] for 60 minutes.

–OR–

Put in oven at 80 °C [176 °F] for 45 minutes.

–OR–

Put in oven at 100 °C [212 °F] for 35 minutes.

ATTENTION!

Due to exothermic reaction, heat cure temperatures should be at least 25% below the maximum temperature tolerated by the most fragile PCB component. For larger potting blocks, reduce heat cure temperature by greater margins.

Packaging and Supporting Products

| <i>Cat. No.</i> | <i>Form</i> | <i>Net Volume</i> | | <i>Net Weight</i> | | <i>Package Weight</i> | |
|-------------------|-------------|-------------------|------------|-------------------|---------|-----------------------|--------|
| 832B-375ML | Liquid | 375 mL | 12.6 fl oz | 403 g | 0.89 lb | 0.7 kg | 1.5 lb |
| 832B-3L | Liquid | 2.55 L | 0.68 gal | 2.74 kg | 6.04 lb | 2.6 kg | 5.8 lb |
| 832B-12L | Liquid | 10.8 L | 2.88 gal | 11.6 kg | 25.6 lb | 14 kg | 31 lb |
| 832B-60L | Liquid | 60 L | 16 gal | 64.5 kg | 142 lb | 70 kg | 155 lb |

Note: Package weight is an estimate: it may vary due to the use of different boxes and packing material

Supporting Products

- *Epoxy and Adhesive Cleaner*: Cat. No. 8328-500ML, 8328-20L
- *Epoxy Mold Release (for temperature cures ≤85 °C)*: Cat. No. 8329-350G



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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.

Email: support@mgchemicals.com

Phone: 1-800-340-0772 (Canada, Mexico & USA)

1-905-331-1396 (International)

Fax: 1-905-331-2862 or 1-800-340-0773

Mailing address: **Manufacturing & Support**
1210 Corporate Drive
Burlington, Ontario, Canada
L7L 5R6

Head Office
9347-193rd Street
Surrey, British Columbia, Canada
V4N 4E7

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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