Thermally Conductive Epoxy Encapsulating & Potting Compound 832TC Technical Data Sheet

Description

The 832TC Thermally Conductive Epoxy, Encapsulating and Potting Compound, is an electric grade epoxy. It uses high purity aluminum oxide to provide excellent thermal conductivity at reasonable costs. This two parts black epoxy provides superior shock insulation and impact protection value; it is near 100% solids.

The 832TC epoxy provides very strong electrical insulation, and protects against static discharges, shocks, vibrations, mechanical impacts, environmental humidity, salt water, and many harsh chemicals.

Applications & Usages

Regular epoxies are thermally insulating and can trap heat within electronics assemblies, affecting the performance of temperature sensitive parts. The 832TC protects circuits by reducing the risk of heat buildup; it should be used to pot or encapsulate printed circuit assemblies where thermal management is a concern. The cured 832TC 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 and aviation; communication, instrumentation; medical equipment and devices; and industrial control equipment industries.

Benefits

- **Extreme protection against heat build up** in electronic equipment compared to normal epoxies
- **Excellent thermal conductor**
- **Pigmented black for optimal radiative cooling**
- **Ideal 1A:1B mix ratio** compatible with all dispensing equipment
- **Two hour working time** suitable for large production runs
- **Strong chemical resistance** to brine, acids, bases, and aliphatic hydrocarbons
- **Opaque and very difficult to remove material** providing high security for proprietary designs
- **Superb protection against** corrosion, fungus, thermal shock, physical impact, water, and static

Curing & Work Schedule

Properties	*Value*
Working Life[a)]	2 hour
Shelf Life	≥3 year
Full Cure (at 20 °C [68 °F])	96 hour
Full Cure (at 45 °C [113 °F])	8 hour
Full Cure (at 55 °C [131 °F])	4 hour
Full Cure (at 65 °C [149 °F])	2 hour
Storage Temperature of Unmixed Parts	16 to 27 °C [60 to 80 °F]

Note: Life and cure values are for 100 g and room temperature unless stated otherwise.

a) A 10 °C increase can decreases the pot life and cure times by half.

Temperature Service Range

Properties	*Value*
Constant Service Temp.	-30 °C to 140 °C [-22 to 284 °F]
Maximum Withstand Temperature[b)]	225 °C [437 °F]

b) The maximum withstand or service temperature can be maintained for short periods of time only.

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Principal Components

Name	***CAS Number***
Part A: Bis-F Epoxide Resin	*28064-14-4*
Aluminum Oxides	*1344-28-1*
Part B: Curing Polyamide	*68071-65-8*
Triethylene tetramine	*112-24-3*
Aluminum Oxides	*1344-28-1*

Properties of Cured 832TC

Physical Properties	***Method***	***Value***[a)]	
Color	Visual	Black	
Density (at 26 °C)		1.83 g/cm^3	
Hardness	(Shore D durometer)	82D	
Tensile Strength	ASTM D 638	18.85 N/mm^2	[2,734 lb/in^2]
Elongation	"	1.87%	
Lap Shear Strength	ASTM D 1002	22.2 N/mm^2	[3224 lb/in^2]
Izod Impact[b)]	ASTM D 256	1.7 kJ/m^2	[0.80 ft·lb/in]
Compression Strength	ASTM D 695	28.19 N/mm^2	[4,088 lb/in^2]
Flexural Strength	ASTM D 790	113.76 N/mm^2	[5,352 lb/in^2]

Electric Properties	***Method***	***Value***	
Breakdown Voltage @ 3.118 mm	ASTM D 149	45.7 kV	
Dielectric Strength	"	14.7 kV/mm [373 V/mil]	
Breakdown Voltage @3.175 mm [1/8”]	Reference fit[c)]	46.2 kV	
Dielectric Strength	"	14.6 kV/mm [370 V/mil]	
Volume Resistivity	ASTM D 257	2.58 x10^{15} Ω·cm	
Surface Resistance[d)]	"	3.16 x10^{16} Ω/sq	
Comparative Tracking Index	ASTM D 3628	Not established	
Dielectric Dissipation & Constant @1 MHz	ASTM D 150-98	*dissipation, D* 0.011	*constant, k’* 4.41

Thermal Properties	***Method***	***Value***
Thermal Conductivity		0.682 W/(m·K)
Thermal Diffusivity		0.38 mm^2/s
Volumetric Specific Heat		1.9 MJ/(m^3·K)
CTE (prior T_g) [e]	ASTM E 831	66.2 ppm/°C
CTE (after T_g) [e]	ASTM E 831	166.9 ppm/°C
Overall CTE (-40 to 250 °C) [e]	ASTM E 831	148.3 ppm/°C
Glass Transition Temperature (T_g)	ASTM D 3418	25.4 °C [77.7 °F]
Heat Deflection Temperature	ASTM D 648	35.4 °C [95.6 °F]

a) N/mm^2 = mPa; lb/in^2 = psi
b) Cantilever beam impact
c) To allow comparison between products, the Tautschter equation was fitted to 5 experimental dielectric strengths and extrapolated to a standard reference thickness of 1/8” (3.175 mm).
d) The surface (sheet) resistivity unit is commonly referred to as “Ohm per square”
e) Coefficient of Thermal Expansion (CTE) units are in ppm/°C = in/in/°C × 10^{-6} = unit/unit/°C × 10^{-6}

Properties of Uncured 832TC

Physical Property	*Mixture (2A:1B)*
Color	Black
Viscosity at 20 °C [73 °F][a]	38,000 cP to 40,000 cP [38 Pa·s to 40 Pa·s]
Density	1.616 g/mL
Mix Ratio by Volume (A:B)	1.0:1.0
Mix Ratio by Weight (A:B)	1.2:1.0
Solids Content (w/w)	~100%

Physical Property	*Part A*	*Part B*
Color	Black	Black
Viscosity at 24°C [73 °F] [a]	17,900 cP [17.9 Pa·s]	23,100 cP [23.1 Pa·s]
Density	1.802 g/mL	1.504 g/mL
Flash Point	190 °C [374 °F]	93 °C [199 °F]
Odor	Slight Odor	Slight Odor

a) Brookfield viscometer at 20 RPM for Part A and 10 RPM Part B with spindle LV4

Compatibility

Adhesion—As seen in the substrate adhesion table, the 832TC 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

Physical Properties	*Adhesion*
Aluminum	Stronger
Steel	
Fiberglass	
Wood	
Glass	
Polycarbonate	
Acrylic	
Polypropylene[a)]	Weaker

a) Does not bond to 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

Physical Properties	*Weight Change 3 days*
Water	~0 %
Isopropyl Alcohol	~0%
Mineral Spirits	~0 %
Iso Hexanes	~0 %
Hydrochloric Acid	0.5 %
Ethyl Lactate	1 %
Xylene	2 %
Acetone	3 %

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 832TC **Material Safety Data Sheet** (MSDS) parts A and B for more details on transportation, storage, handling and other security guidelines.

Health and Safety: The 832TC 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.

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

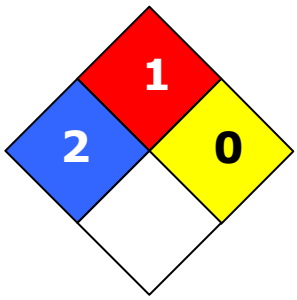
The cured epoxy resin presents no known hazard.

Part A

HMIS® RATING

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

NFPA® 704 CODES

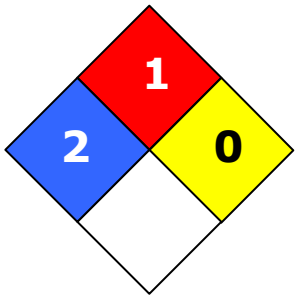


Part B

HMIS® RATING

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

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

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

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.

TIP: Due to the high viscosity and abrasiveness of the aluminum oxide filler, you may preheat parts A and part B with temperature jacket to increase the flow and improve air release. This will help reduce the wear on the mixing equipment, but it will shorten the working life.

To room temperature cure the 832TC epoxy

Let stand for 24 hours.

To heat cure the 832TC epoxy

Put in oven at 45 °C [113 °F] for 8 hour.

–OR–

Put in oven at 55 °C [131 °F] for 4 hour.

–OR–

Put in oven at 65 °C [149 °F] for 2 hour.

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

Product Availability

Cat. No.	*Form*	*Net Volume*		*Net Weight*		*Shipping Weight*	
832TC-450ML	Liquid	0.455 L	16 oz	0.75 kg	1.7 lb	1.1 kg	2.5 lb
832TC-2L	Liquid	2.0 L	0.5 gal	2.57 kg	5.7 lb	3.6 kg	8 lb
832TC-8L	Liquid	7.6 L	2.1 gal	12.6 kg	27.7 lb	14 kg	31 lb
832TC-40L	Liquid	40.5 L	10 gal	67.0 kg	148 lb	70 kg	154 lb

Supporting Products

- 8328 Epoxy and Adhesive Cleaner
- 8329 Epoxy Mold Release (for temperature cures ≤85 °C)

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 Ext. 130 (Canada, Mexico & USA)
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Warranty

M.G. Chemicals Ltd. warranties 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.

Disclaimer

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