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 black, two-part epoxy provides superior shock insulation and impact protection value.

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/aviation, communication, instrumentation, medical equipment and devices, and industrial control equipment industries.

Benefits and Features

- **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 by volume** 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

Usage Parameters

Properties	*Value*
Working Life [a)]	2 h
Shelf Life	≥3 y
Full Cure @22 °C [72 °F]	96 h
Full Cure @45 °C [113 °F]	8 h
Full Cure @55 °C [131 °F]	4 h
Full Cure @65 °C [149 °F]	2 h
Full Cure @100 °C [212 °F]	20 min
Full Cure @120 °C [248 °F]	10 min

a) Values assume 100 g and room temperature unless stated otherwise. A 10 °C increase can decrease the pot life and cure times by half.

Temperature Ranges

Properties	*Value*
Constant Service Temperature	-30 to 175 °C [-22 to 347 °F]
Maximum Intermittent Temperature [b)]	200 °C [392 °F]
Storage Temperature of Unmixed Parts	16 to 27 °C [60 to 80 °F]

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

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 @26 °C [79 °F]		1.83 g/cm^3	
Hardness	(Shore D durometer)	82D	
Tensile Strength	ASTM D 638	18 N/mm^2	[2 700 lb/in^2]
Elongation	"	1.9%	
Shear Strength	ASTM D 732	22 N/mm^2	[3 200 lb/in^2]
Lap Shear Strength (Stainless Steel)	ASTM D 1002	12.6 N/mm^2	[1 830 lb/in^2]
Lap Shear Strength (Aluminum)	"	16.4 N/mm^2	[2 380 lb/in^2]
Lap Shear Strength (Copper)	"	12.1 N/mm^2	[1 750 lb/in^2]
Lap Shear Strength (Brass)	"	14.6 N/mm^2	[2 120 lb/in^2]
Lap Shear Strength (ABS)	"	1.8 N/mm^2	[260 lb/in^2]
Lap Shear Strength (Polycarbonate)	"	1.8 N/mm^2	[255 lb/in^2]
Izod Impact [b)]	ASTM D 256	1.7 kJ/m^2	[0.80 ft·lb/in]
Compressive Strength	ASTM D 695	29 N/mm^2	[4 100 lb/in^2]
Flexural Strength	ASTM D 790	37 N/mm^2	[5 300 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	2.6×10^{15} Ω·cm
Surface Resistivity [d]	"	3.2×10^{16} Ω
Comparative Tracking Index	ASTM D 3628	Not established
Dielectric Dissipation & Constant		*dissipation, D* *constant, k’*
@1 MHz	ASTM D 150-98	0.011 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 ppm/°C
CTE (after T_g) [e]	ASTM E 831	167 ppm/°C
Glass Transition Temperature (T_g)	ASTM D 3418	25 °C [77 °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 (1A:1B)
Color	Black
Viscosity @20 °C [68 °F] [a]	18 000 cP [18 Pa·s]
Density	1.67 g/mL
Mix Ratio by volume (A:B)	1.0:1.0
Mix Ratio by weight (A:B)	1.1:1.0
Solids Content (w/w)	~100%

Physical Property	Part A	Part B
Color	Black	Black
Viscosity @24 °C [75 °F] [a]	36 000 cP [36 Pa·s]	14 000 cP [14 Pa·s]
Density	1.73 g/mL	1.61 g/mL
Flash Point	190 °C [374 °F]	93 °C [199 °F]
Odor	Slight Odor	Slight Odor

a) Brookfield viscometer at 100 RPM for Part A and Part B with spindle RV7

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 Steel Fiberglass Wood Glass Polycarbonate Acrylic Polypropylene [a)]	Stronger ↓ 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 and Safety

Please see the 832TC **Safety Data Sheet** (SDS) 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.

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

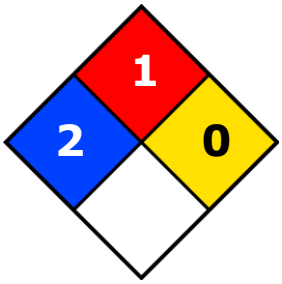
The cured epoxy resin presents no known hazard.

Part A

HMIS® RATING

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

NFPA® 704 CODES

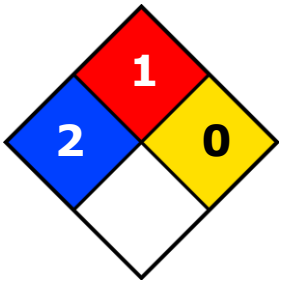


Part B

HMIS® RATING

HEALTH:	* 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 scrape 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. 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.
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 hours.

–OR–

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

–OR–

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

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

Cat. No.	*Form*	*Net Volume*		*Net Weight*		*Shipping Weight*	
832TC-450ML	Liquid	450 mL	15.2 fl oz	752 g	1.66 lb	910 g	2.01 lb
832TC-2L	Liquid	1.7 L	0.45 gal	2.84 kg	6.26 lb	3.60 kg	8.00 lb
832TC-8L	Liquid	7.2 L	1.92 gal	12.0 kg	26.5 lb	14.0 kg	31.0 lb
832TC-40L	Liquid	40 L	10.7 gal	66.8 kg	147 lb	70.0 kg	154 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

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. 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

This information is believed to be accurate. It is intended for professional end users having the skills to evaluate and use the data properly. *M.G. Chemicals Ltd.* does not guarantee the accuracy of the data and assumes no liability in connection with damages incurred while using it.