Thermally Conductive Epoxy, Encapsulating & Potting Compound

Description

832TC *potting and encapsulating compound* is a thermally conductive, black, two-part epoxy that offers extreme environmental, mechanical and physical protection for printed circuit boards and electronic assemblies.

This product is designed for applications where thermal management is a concern. Due to its high thermal conductivity, it protects circuits, by reducing the risk of heat buildup. It also provides excellent electrical insulation and protects components from static discharges, vibration, abrasion, thermal shock, environmental humidity, salt water, fungus, and many harsh chemicals.

This epoxy has a convenient 1:1 volume mix ratio, making it compatible with most dispensing equipment. 832TC can be cured at room temperature or higher.

Features and Benefits

- *Thermal conductivity of 0.68 W/(m·K)*
- *Low exotherm*
- *Convenient 1A:1B volume mix ratio*
- *High compressive and tensile strength*
- *Excellent adhesion to a wide variety of substrates including metals, composites, glass, ceramics, and many plastics*
- *Excellent electrical insulating characteristics*
- *Extreme resistance to water and humidity (allows for submersion where needed)*
- *Solvent-free*

Usage Parameters

Properties	Value
Working life @22 °C [72 °F]	2 h
Shelf life	5 y
Full cure @22 °C [72 °F]	96 h
Full cure @65 °C [149 °F]	2 h
Full cure @80 °C [176 °F]	1 h
Full cure @100 °C [212 °F]	45 min

Temperature Ranges

Properties	Value
Constant service temperature	-30 to 175 °C [-22 to 347 °F]
Maximum intermittent temperature [a)]	200 °C [392 °F]
Storage temperature of unmixed parts	16 to 27 °C [61 to 81 °F]

a) Temperature that can be withstood for short periods without sustaining damage.

Cured Properties

Physical Properties	Method	Value [a)]
Color	Visual	Black
Density @26 °C [79 °F]	ASTM D 1475	1.73 g/mL
Hardness	Shore D Durometer	82D
Tensile strength	ASTM D 638	18 N/mm^2 [2 700 lb/in^2]
Elongation %	ASTM D 638	1.9%
Shear strength	ASTM D 732	22 N/mm^2 [3 200 lb/in^2]
Lap shear strength (stainless steel)	ASTM D 1002	13 N/mm^2 [1 800 lb/in^2]
Lap shear strength (aluminum)	ASTM D 1002	16 N/mm^2 [2 400 lb/in^2]
Lap shear strength (copper)	ASTM D 1002	12 N/mm^2 [1 800 lb/in^2]
Lap shear strength (brass)	ASTM D 1002	15 N/mm^2 [2 100 lb/in^2]
Lap shear strength (ABS)	ASTM D 1002	1.8 N/mm^2 [260 lb/in^2]
Lap shear strength (polycarbonate)	ASTM D 1002	1.8 N/mm^2 [260 lb/in^2]
Izod impact	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]

Note: Specifications are for epoxy samples cured at 65 °C for 2 h and conditioned at ambient temperature and humidity.

a) N/mm^2 = mPa; lb/in^2 = psi

Cured Properties

Electrical Properties	Method	Value
Breakdown voltage @3.1 mm	ASTM D 149	45 700 V [45.7 kV]
Dielectric strength @3.1 mm	ASTM D 149	373 V/mil [14.7 kV/mm]
Breakdown voltage @3.175 mm [1/8"]	Reference fit [a)]	46 200 V [46.2 kV]
Dielectric strength @3.175 mm [1/8"]	Reference fit [a)]	370 V/mil [14.6 kV/mm]
Resistivity	ASTM D 257	2.6×10^{15} Ω·cm
Conductivity	ASTM D 257	3.9×10^{-16} S/cm
Surface resistivity	ASTM D 257	3.2×10^{16} Ω/sq
Dielectric dissipation, D @1 MHz	ASTM D 150-98	0.011
Dielectric constant, k' @1 MHz	ASTM D 150-98	4.41
Thermal Properties	**Method**	**Value**
Glass transition temperature (T_g)	ASTM D 3418	25 °C [77 °F]
CTE [b)] prior T_g after T_g	ASTM E 831 ASTM E 831	66 ppm/°C [151 ppm/°F] 167 ppm/°C [333 ppm/°F]
Thermal conductivity	—	0.68 W/(m·K)
Thermal diffusivity	—	0.38 mm^2/s
Volumetric specific heat	—	1.9 MJ/(m^3·K)
Heat deflection temperature	ASTM D 648	35 °C [96 °F]

Note: Specifications are for epoxy samples cured at 65 °C for 2 h and conditioned at ambient temperature and humidity.

a) To allow comparison between products, the dielectric strength was recalculated with the Tautscher equation fitted to 5 experimental values and extrapolated to a standard thickness of 1/8" (3.175 mm).
b) Coefficient of Thermal Expansion (CTE) units are in ppm/°C = in/in/°C × 10^{-6} = unit/unit/°C × 10^{-6}

Uncured Properties

Physical Properties	Mixture (A:B)
Color	Black
Viscosity @20 °C [68 °F]	18 000 cP [18 Pa·s] [a)]
Density	1.67 g/mL
Mix ratio by volume	1:1
Mix ratio by weight	1.1:1
Solids content (w/w)	~100%

Physical Properties	Part A	Part B
Color	Black	Black
Viscosity @24 °C [75 °F]	36 000 cP [36 Pa·s] [a)]	14 000 cP [14 Pa·s] [a)]
Density	1.73 g/mL	1.61 g/mL
Odor	Mild	Mild

a) Brookfield viscometer at 100 rpm with spindle RV S07

Compatibility

Adhesion—As seen in the substrate adhesion table, 832TC epoxy adheres to most plastics and metals used to house printed circuit assemblies; however, it is not compatible with contaminants like water, oil, or greasy flux residues that may affect adhesion. If contamination is present, first clean the surface to be coated with MG Chemicals 824 Isopropyl Alcohol.

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.

Substrate Adhesion (In Decreasing Order)

Physical Properties	Adhesion
Aluminum	Stronger
Steel	↓
Fiberglass	
Wood	
Glass	
Polycarbonate	
Acrylic	Weaker
Polypropylene	Does not bond

Chemical Solvent Resistance

Physical Properties	Weight change 3 days
Water	~0.0%
Isopropyl alcohol	~0.0%
Mineral spirits	~0.0%
Isohexanes	~0.0%
Hydrochloric acid	0.5%
Ethyl lactate	1%
Xylene	2%
Acetone	3%

Storage

Store between 16 and 27 °C [61 and 81 °F] in a dry area, away from sunlight. Storage below 16 °C [61 °F] can result in crystallization.

If crystallization occurs, reconstitute the product to its original state by temporarily warming it to between 50 and 60 °C [122 and 140 °F]. To ensure full homogeneity, stir the warm product thoroughly. Make sure to reincorporate all settled material, close the lid, and then let cool before use.

Health and Safety

Please see the 832TC Safety Data Sheet (SDS) parts A and B for further details on transportation, storage, handling, safety guidelines, and regulatory compliance.

Application Instructions

For best results, follow the procedure below.

Manual mixing:

1. Scrape settled material free from the bottom and sides of the part A container; stir contents until homogenous.
2. Scrape settled material free from the bottom and sides of the part B container; stir contents until homogenous.
3. Measure 1 part by volume of the pre-stirred part A, and pour into the mixing container. Ensure all contents are transferred by scraping the container.
4. Measure 1 part by volume of the pre-stirred part B, and pour slowly into the mixing container while stirring. Ensure all contents are transferred by scraping the container.
5. Thoroughly mix parts A and B together.
6. Let sit for 15 minutes to de-air.
   —OR—
   Put in a vacuum chamber at 25 inHg for 2 minutes to de-air.
7. If bubbles are present at the top, break and stir them gently with the mixing paddle.
8. Pour the mixture into a container holding the components to be protected.
9. Close the part A and B containers tightly between uses to prevent skinning.

Attention!

Mixing >3 kg at a time decreases working life and can lead to a flash cure. Limit the size of hand-mixed batches. For large production volumes, contact MG Chemicals Technical Support for assistance.

Cure Instructions

Room temperature cure:
- Let cure at room temperature for 96 h.

Heat cure:
- Put in oven at 65 °C [149 °F] for 2 h.
  —OR—
- Put in oven at 80 °C [176 °F] for 1 h.
  —OR—
- Put in oven at 100 °C [212 °F] for 45 min.

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

Packaging and Supporting Products

Cat. No.	Packaging	Net Volume	Net Weight	Packaged Weight
832TC-450ML	2 Bottle kit	450 mL [15.2 fl oz]	751 g [1.65 lb]	910 g [2.01 lb]
832TC-2L	2 Can kit	1.7 L [1.8 qt]	2.83 kg [6.25 lb]	4.5 kg [10 lb]
832TC-8L	2 Can kit	7.2 L [1.92 gal]	12.0 kg [26.5 lb]	16 kg [35 lb]
832TC-40L	2 Pail kit	40 L [10.6 gal]	66.8 kg [147 lb]	85 kg [187 lb]

Technical Support

Please contact us regarding any questions, suggestions for improvements, 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)
+(44) 1663 362888 (UK & Europe)
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

Disclaimer

This information is believed to be accurate. It is intended for professional end users who have the skills required 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.