



EPOXY ENCAPSULATING & POTTING COMPOUNDS



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WHO IS MG CHEMICALS

MG Chemicals is a manufacturer and wholesaler of chemical products for the electronics industry. Our chemical products include dusters and circuit coolers, electronic cleaners, flux removers, contact cleaners, protective coatings, epoxies, adhesives, RTV silicones, lubricants, EMI/RFI shielding coatings, thermal management products, prototyping supplies, solders, and more. We also distribute related non-chemical products such as wipes, swabs, brushes, desoldering braids, and copper clad boards.

MG SERVICE

MG Chemicals recognizes that setting up production comes with various challenges. Our service team offers a wide variety of experience in material production, equipment, and technical issues you may encounter during planning, pilot studies, and production runs. To overcome these challenges, we offer professional services.

As a service, MG Chemicals can

- Provide advice on equipment and materials
- Assist with setup and troubleshooting
- Review your proposed application processes
- Suggest ways of optimizing and customizing processes to best meet your needs
- Offer training on the proper use of our epoxy products.

Quality Assurance

Since 1955, MG Chemicals has provided the North American electronics industry with a full line of high performance chemicals and accessories. The MG Chemicals manufacturing facility operates under the ISO 9001 Quality System Standard. All products undergo MG Chemicals' design process including the testing and analysis of each product to maximize performance, user safety, environmental safeguards and market desirability.

Customer Care

Customer care is what separates MG Chemicals from the rest. Our commitment to all of these principles focus on getting you the quality product and support you deserve.



COMPARISON CHART - SOLVENT FREE EPOXY SYSTEMS

Typical Properties	Standards	832B	832C	832TC	832HT	8322	833FRB	834FRB	834ATH
Color	Black	Translucent	Black	Black	Clear	Optically clear	Black	Black	Black
Viscosity Part A (cP)		2,500	2,500	17,900	54,800	2,500	4,000	1,600	4,600
Viscosity Part B (cP)		11,000	11,000	23,100	11,000	20	14,000	3,600	12,900
Mix Viscosity (cP)	3,300	3,300	40,000	40,000	–	–	3,800	2,600	5,900
Mix Ratio (by volume)		2:1	2:1	1:1	2:1	4:1	2:1	2:1	2:1
Working Time (h)	1	1	2	1	2	2	1	1	2
Curing Schedule (h): Room Temp.		24	24	96	24	–	24	24	24
Elevated Temp.		1 @ 65°C	1 @ 65°C	2 @ 65°C	1 @ 65°C	4 @ 65°C	1 @ 65°C	1 @ 65°C	1 @ 65°C
Flammability Test UL 94V-0	N/A	N/A	N/A	N/A	N/A	UL 94V-0	UL 94V-0	UL 94V-0	UL 94V-0
Optical Transmission Loss @ 25µm (1 mil)		N/A	N/E	N/A	N/A	< 4.5%	N/A	N/A	–
Physical Properties									
Tensile Strength (PSI)	ASTM D 638	8,250	8,080	2,734	7,864	N/E	9,774	6,401	4,100
Elongation Percentage (%)	ASTM D 638	3.3	6.4	1.9	3.4	N/E	N/E	N/E	6.2
Compressive Strength (PSI)	ASTM D 695	14,675	26,500	4,088	11,870	–	18,632	N/E	14,500
Flexural Strength in (PSI)	ASTM D 790	22,400	5,549	5,352	14,600	–	5,830	9,490	7,400
Lap Shear Strength in (PSI)	ASTM D 1002	606	641	N/A	1,794	–	843	N/E	2,160
Hardness (Shore D)	80 D	82 D	85 D	82 D	80 D	86D	83-84 D	83-84 D	86 D
Comprative Tracking Index (V)	ASTM 3638	N/E	N/E	N/E	N/E	N/E	322	100	–
Electrical Properties									
Surface Resistivity (ohms/sq)	ASTM D 257	N/E	N/E	2.58 x 10 ¹⁵	5.3 x 10 ¹³	–	2.0 x 10 ¹⁵	N/E	–
Volume Resistivity (ohms·cm)	ASTM D 257	5.3 x 10 ¹²	1.22 x 10 ¹⁶	3.16 x 10 ¹⁶	9.3 x 10 ¹⁵	–	2.71 x 10 ¹⁵	1.35 x 10 ¹⁵	7.0 x 10 ¹⁴
Dielectric Strength (V/mil) @ 1/8"	ASTM D 149	472	425	373	454	TBD	384	344	380
Dielectric Constant (@ 100 KHz)	ASTM D 150	2.83	3.19	4.41	2.83	–	3.25	N/E	–
Breakdown Voltage (kV)	ASTM D 149	51.9	N/A	45.7	56.8	–	43.5	43.0	47.0
Comparative Tracking Index (V)	ASTM D 3628	N/E	N/E	N/E	N/E	N/E	322	100	7500
Thermal Properties									
Glass Transition Temp. (°C)	ASTM D 3418	–	–	–	68	109	56	56	51
Heat Deflection Temp. (°C)	ASTM D 648	46.6	43.5	35.4	53.9	–	51.9	49.7	53.7
Constant Service Temp. (°C)		-30 to +140	-30 to +140	-30 to +140	-30 to +250	-40 to +80	-30 to +140	-30 to +175	30 to +175
Maximum Withstanding Temp. (°C)		225	225	225	275	100	225	225	225
Thermal Conductivity W/(m·K)	ASTM E 1530-99	N/E	N/E	0.682	0.21	N/E	N/E	0.24	–
Thermal Diffusivity (mm ² /s)		N/E	N/E	0.38	1.33 x 10 ¹³	N/E	N/E	N/E	–
Coefficient of Thermal Expansion before/after Tg (ppm)	ASTM E 831	104	104	66/167	76/154	–	N/E	N/E	–

* When cured at room temperature and operated at or below 65 °C [149 °F]

MG EPOXIES POTTING RECOMMENDATION

How to hand mix the MG epoxies potting compound

The procedure outlined here is for manual processing of MG epoxies. For product specific details, see the technical data sheets or product specific instruction guides. We have based our procedure on our experience and industry best practices.

All suggestions must be critically reviewed, and if necessary, altered or substituted in accordance to the specification and operating constraints of your printed circuit assembly. The component application and geometry do affect the recommendations. Further, equipment availability, automation capabilities, and production facility requirements also affect recommendations.

REQUIRED EQUIPMENT:

- Wiping cloth or paper towel - for cleaning tools and equipment
- Gloves and personal protective clothing
- 3 × 12" stainless steel stirring spatula for 1L kits —OR— 2 × 48" paddles for 20 L [5.2 gal] pail kits *(label paddles A, B, and Mix respectively)*
- A volume or mass measurement or dispensing devices
- 1 mixing container - sufficiently large to hold both epoxy parts while leaving room for stirring
- Oven - set at 65 °C [149 °F] *(optional)*
- Vacuum chamber - for de-airing *(optional)*
- Ethyl lactate solvent (Cat. No. 8328-500ML) for cleaning uncured epoxy spills *(optional)*

1. STIRRING OF INDIVIDUAL EPOXY PARTS

Thorough stirring of individual parts is required prior to jointly mixing each part.

Additional Requirement

- Requires strong upper body strength to stir pail size containers well.

To stir part A:

1. With a part A paddle, scrape the walls and bottom of a part A pail to lift, break up, and re-incorporate all settled material into solution.
2. Stir slowly, in one circular direction only; fold the material from the bottom onto the top.
3. Continue stirring until the solution is homogenous. The material should show uniform color and consistency without color tint variations or visible chunks.
4. If material sits for more than an hour, re-stir back to homogeneity prior to processing.

To stir part B:

Follow instructions for part A, but substitute part B in text. (Do NOT use the same paddle as for A.)

As long as parts are not cross-contaminated, the shelf-life of each part is generally about ≤5 years. Between processing, put the pail cover back on unused parts A or B to avoid contamination from dust, humidity, or other foreign materials.

WARNING!

Failure to properly stir individual parts before mixing them together can cause surface defects, degrade the cured properties, or even cause cure failures. Further, improper pre-stirring of parts can create irrecoverable off-ratio conditions that renders the remainder of the stock material unusable.

CAUTION!

Do not cross contaminate. To avoid premature curing, use different stirring tools for parts A & B.

CAUTION!

Quickly reversing mixing direction or using a whipping action can trap air in mixture leading to bubble problems.

2. MIXING PARTS A + B OF MG EPOXIES

Estimate the part A and B volumes that will be needed for your potting application prior to mixing. To avoid waste, mix the needed epoxy amounts only when you are ready to encapsulate components. The pot life for the mixed epoxy is about one hour at room temperature.

Additional Requirement

- Requires strong upper body strength for proper mixing in pails size containers.

To creating potting mixture

1. Measure a volume of pre-stirred A, and pour in the mixing container.
2. By the given ratio, measure the corresponding volume of pre-stirred B, and slowly pour in the mixing container while stirring.
3. With a Mix paddle, scrape the walls and bottom of the mixing container.
4. For 3 minutes, stir slowly in a circular unidirectional motion while folding the material from the bottom onto the top to create a homogeneous mixture.
5. Let sit for 30 minutes to de-air. —OR— Put in a vacuum chamber, bring to 25 Hg/in pressure, and wait for 2 minutes to de-air.
6. If bubbles are present at top, use the mixing paddle to break them.

The potting mixture is ready to use. At room temperature, the pot life of the mixture is 1 hour after first initial mixing. Higher temperatures lower viscosity of the mixture and allows for faster de-airing; however, greater than room temperature shortens the pot life. Similarly, lowering the mixture temperature increases pot life but increases viscosity.

3. POTTING COMPONENTS WITH MG EPOXIES

The printed circuit board (PCB) may now be covered or embedded in epoxy. Ensure the cleanliness and dryness of the assembly and components prior to potting.

To pot assembly

1. Slowly pour de-aired epoxy mix in the PCB-component box or enclosure.
2. Let the product level before inserting additional components within enclosure. This avoids trapping air.
3. If geometry contributes to air entrapment, use injection, vacuum, or suitable method to help displace any air pockets.

NOTE

Spills of uncured epoxy mix can be wiped with a dry cloth or a paper towel. For better cleaning, moisten the cloth or paper toil with ethyl lactate. Ethyl lactate is an excellent solvent for removing uncured epoxies. All cleaning should be done before the epoxy is cured.

CAUTION!

Follow the mix ratio as closely as possible. Deviations of ≥10% are not acceptable.

CAUTION!

Without stirring, mixing >500 g (0.4 L) of Part B at a time into A can promote flash cure.

NOTE

Our epoxy products do not require kit matching. You are free to use Part A and Part B with different batch numbers without affecting the cured product properties.

4. CURING MG EPOXIES

Heat accelerated cures not only shorten cures from days to minutes or hours, but typically give better properties.

To room temperature cure the MG epoxies

Let stand for 24 hours.

To heat cure the MG epoxies

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.

After the initial curing, the epoxy properties should continue to improve with time until it reaches its optimum properties.

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.

BLACK EPOXY

Cat. No. 832B

Protects sensitive electronic components from impact, shock, vibration, heat, conductivity, moisture, chemicals, and visual inspection.

- Non-porous, water and chemical resistant
- Extremely impact resistant (contains a form of nylon)
- Colored black, to prevent visual inspection
- Affords high security, once cured, extremely difficult to remove
- Non-conductive, an electrical insulator
- Low toxicity
- Suitable for explosion proof components (spark arresting)
- Easy and simple to mix
- Long pot life
- Can be cured in one hour at 65°C (150°F)
- This product is RoHS compliant



CHARTS & SCHEDULES

Curing & Work Schedule

Working Life		60 minutes
Shelf Life		≥ 3 years
Full Cure	at 20 °C [68 °F]	24 hours
	at 65 °C [149 °F]	60 minutes
	at 80 °C [176 °F]	45 minutes
	at 100 °C [212 °F]	35 minutes
Storage Temperature of Unmixed Parts		16 to 27 °C [60 to 80 °F]
Constant Service Temp.		-30 °C to 140 °C [-22 to 284 °F]
Service Temperature		<-30 to +145 °C [<-22 to +294 °F]

Cured Properties - Physical

	Test Method	
Color	Visual	Black
Density (at 26 °C)	ASTM D 792	1.12 g/cm ³
Hardness	(Shore D durometer)	80D to 82D
Tensile Strength	ASTM D 638	56.9 N/mm ² [8,250 lb/in ²]
Elongation	ASTM D 638	3.3%
Lap Shear Strength	ASTM D 1002	4.2 N/mm ² [606 lb/in ²]
Izod Impact	ASTM D 256	0.932 kJ/m ² [0.443 ft·lb/in ²]
Compression Strength	ASTM D 695	155 N/mm ² [22,400 lb/in ²]
		Modulus
Flexural Strength	ASTM D 790	113.76 N/mm ² [16,500 lb/in ²]
		Modulus

CHARTS & SCHEDULES

Cured Properties: Electrical

	Test Method		
Breakdown Voltage	ASTM D 149	51.9 kV @ avg. of 2.79 mm	
Dielectric Strength	ASTM D 149	472 V/mil [18.6 kV/mm]	
Volume Resistivity	ASTM D 257	5.3 ×10 ¹² ohm · cm	
Surface Resistivity	ASTM D 257	N/E	
Comparative Tracking Index	ASTM D 3628	Not established	
Dielectric Dissipation & Constant	ASTM D 150-98	dissipation, D constant, k'	
		@ 60Hz	0.007, 3.90
		@1 kHz	0.008, 2.95
		@10 kHz	0.013, 2.89
		@100 kHz	0.018, 2.83
@1 MHz	0.017, 2.77		

Cured Properties: Thermal

	Test Method	
Coefficient of Thermal Expansion (CTE)	ASTM E 831	104 ppm/°C
Glass Transition Temperature (T _g)	ASTM D 3418	Not established
Heat Deflection Temperature (HDT)	ASTM D 648	46.6 °C [115.6 °F]

Uncured Properties: Physical

	Part A	Part B	Mixture (2A:1B)
Color	Black	Clear, Amber Tint	Black
Viscosity at 24°C [73 °F]	2,500 cP [2.5 Pa·s]	11,000 cP [11.0 Pa·s]	3,300 cP [3.3 Pa·s]
Density	1.127 g/mL	0.967 g/mL	1.058 g/mL
Flash Point	154 °C [309 °F]	110 °C [230 °F]	
Odor	Mild	Musty	
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%

Chemical Solvent Resistance

	Weight Change in 3 days	Weight Change in 45 days
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

CATALOG NUMBER SIZES AVAILABLE DESCRIPTION

832B-375ML	375ml (12 oz)	Liquid
832B-3L	3L (0.8 gal)	Liquid
832B-12L	12L (3.2 gal)	Liquid
832B-60L	60L (16 gal)	Liquid

TRANSLUCENT EPOXY



Cat. No. 832C

For high voltage applications. Protects sensitive electronic components from impact, shock, vibration, heat, conductivity, moisture, chemicals. Allows visual inspection.



- Non-porous, water and chemical resistant
- Extremely impact resistant (contains a form of nylon)
- Affords total security, once cast it can not be removed
- Excellent machining properties
- Non-conductive, an electrical insulator
- Low toxicity
- Suitable for explosion proof components (spark arresting)
- Easy and simple to mix
- Long pot life
- Can be cured in one hour at 65°C (150°F)
- This product is RoHS compliant

CHARTS & SCHEDULES

Curing & Work Schedule

Working Life		60 minutes
Full Cure	at 20 °C [68 °F]	24 hours
	at 65 °C [149 °F]	60 minutes
	at 80 °C [176 °F]	45 minutes
	at 100 °C [212 °F]	35 minutes
Storage Temperature of Unmixed Parts		16 to 27 °C [60 to 80 °F]
Constant Service Temp.		-30 °C to 140 °C [-22 to 284 °F]
Service Temperature		<-30 to +145 °C [<-22 to +294 °F]

Cured Properties - Physical		
	Test Method	
Color	Visual	Translucent, Yellow
Density (at 26 °C)	ASTM D 792	1.12 g/cm ³
Hardness	(Shore D durometer)	85D
Tensile Strength	ASTM D 638	55.7 N/mm ² [8,080 lb/in ²]
Elongation	ASTM D 638	6.4%
Lap Shear Strength	ASTM D 1002	4.42 N/mm ² [641 lb/in ²]
Izod Impact	ASTM D 256	1.47 kJ/m ² [0.700 ft-lb/in]
Compression Strength	ASTM D 695	182 N/mm ² [26,500 lb/in ²]
		Modulu
Flexural Strength	ASTM D 790	38.26 N/mm ² [5,549 lb/in ²]
		Modulu

CHARTS & SCHEDULES

Cured Properties: Electrical		
	Test Method	
Breakdown Voltage @0.114"	ASTM D 149	48.5 kV @ avg. of 2.90 mm
Dielectric Strength	ASTM D 149	425 V/mil [16.7 kV/mm]
Breakdown Voltage @1/8"	calculated	50.7 kV @ 3.175 mm
Dielectric Strength	calculated	406 V/mil [15.7 kV/mm]
Volume Resistivity	ASTM D 257	1.22 x 10 ¹⁶ ohm · cm
Surface Resistivity	ASTM D 257	N/E
Dielectric Constant	ASTM D 150	3.85 @60Hz
	ASTM D 150	3.19 @1 kHz
	ASTM D 150	2.99 @1 MHz

Cured Properties: Thermal		
	Test Method	
Coefficient of Thermal Expansion (CTE)	ASTM E 831	72 ppm/°C
Heat Deflection Temperature (HDT)	ASTM D 648	43.5 °C (92.2 °F)

Uncured Properties: Physical			
	Part A	Part B	Mixture (2A:1B)
Color	Translucent, Amber Tint	Clear, Amber Tint	Translucent, Amber Tint
Viscosity at 24°C [73 °F]	2,500 cP [2.5 Pa·s]	11,000 cP [11.0 Pa·s]	3,300 cP [3.3 Pa·s]
Density	1.127 g/mL	0.967 g/mL	1.058 g/mL
Flash Point	154 °C [309 °F]	110 °C [230 °F]	
Odor	Mild	Musty	
Mix Ratio by Volume (A:B)			2.0:1.0
Mix Ratio by Weight (A:B)			2.3:1.0
Solids Content (w/w)			100 %

Chemical Solvent Resistance		
	Weight Change in 3 days	Weight Change in 45 days
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

CATALOG NUMBER	SIZES AVAILABLE	DESCRIPTION
832C-375ML	375 ml (12 oz)	Liquid
832C-3L	3 L (0.8 gal)	Liquid
832C-60L	60 L (16 gal)	Liquid

OPTICALLY CLEAR EPOXY



Cat. No. 8322

Our 8322 Optically Clear Epoxy offers a very strong and UV-resistant finish. This two part coating is simple to mix and use: it does not require special or costly equipment to apply.

The 8322 epoxy 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.



- Excellent Chemical
- Extreme resistance to water and humidity
- Optically Clear: Transmission @25 μm [1 mil] <4.5% loss in optical range
- UV light stable: non yellowing

CHARTS & SCHEDULES

Curing & Work Schedule

Working Life		2 hours
Full Cure	at 20 °C [68 °F]	4 hours
	at 80 °C [176 °F]	2 hours
Storage Temperature of Unmixed Parts		25 °C [77°F]
Constant Service Temp.		-30 °C to 140 °C [-22 to 284 °F]

Service Ranges

Service Temperature	-40 to +80 °C [-40 to +176 °F]
Max Withstand Temperature	+100 °C [+212 °F]

Uncured Properties - Physical

	Test Method	
Color	Visual	Clear
Density (at 26 °C)	ASTM D 792	TBD
Hardness	(Shore D durometer)	86D
Optical Transmission Loss @ 25 μm (1 mil)	UV-Vis Spectrophotometer	<4.5%

CHARTS & SCHEDULES

Uncured Properties: Electrical

	Test Method	
Dielectric Strength (dry)	ASTM D149	To be determined

Uncured Properties: Thermal

	Test Method	
Glass Transition Temperature	ASTM D 115	109 °C
Thermal Cycling Stability Thermal	-40 to 200 °C	Passed
Stability 24 h @ 80 °C on Cu/Al substrates		No yellowing
Thermal Stability 96 h @ 100 °C on Cu/Al substrates		Slight yellowing

Uncured Properties: Chemical Solvent Resistance

	Weight Change in 3 days	Weight Change in 45 days
Water	—	Good
Acid (10% sulfuric acid)	—	Excellent
Alkali (1% sodium hydroxide)	—	Excellent
Salt water	—	Excellent
Copper corrosion	—	None expected

Cured Properties: Physical

	Part A	Part B	Mixture (2A:1B)
Color	Colorless	Colorless	Colorless
Viscosity at 24°C [73 °F]	2,500 cP [2.5 Pa·s]	20 cP [0.020 Pa·s]	TBD
Density	1.09 g/mL	0.92 g/mL	TBD
Flash Point	115 °C [239 °F]	112 °C [234 °F]	
Odor	Odorless	Ammonia like	
Mix Ratio by Volume (A:B)			5:1
Mix Ratio by Weight (A:B)			4:1
Solids Content (w/w)	100%	100%	

CATALOG NUMBER SIZES AVAILABLE DESCRIPTION

8322-1	1125 ml (38 fl. oz)	Liquid
8322-2	4.5 L (1.2 gal)	Liquid
8322-3	18.9 L (10.7 gal)	Liquid

THERMALLY CONDUCTIVE EPOXY

Cat. No. 832TC

100% solids. Formulated with undiluted Bis F resin for superior physical properties, and pigmented with high purity aluminum oxide pigment to provide excellent thermal conductivity at reasonable cost. Pigmented black for excellent thermal absorption and emission.

- Provides superior protection from impact, shock, conductivity, moisture, abuse, chemicals, and analysis
- Two part epoxy, with a 1 to 1 mixing ratio by volume
- Two hour working time
- Suitable for large production runs
- Excellent machining properties



CHARTS & SCHEDULES

Uncured Properties

	Resin - Part A	Hardener - Part B
Viscosity at 25 °C (77 °F), 30 RPM	17,920 cP	23,070 cP
Specific Gravity	1.802	1.504
Color	Black	Black

Cured Properties: Physical

	Test Method	
Mixed Viscosity at 25 °C (77 °F), 10 RPM		38,000 - 40,000 cP
Mixed Specific Gravity		1.616
Volume Mix Ratio (resin:hardener)		1:1
Working time (100 g)		120 min
Cure Time (150 g)	96 h at 20 °C	
	8 h at 45 °C	
	4 h at 55 °C	
	2 h at 65 °C	
Shore Hardness		82 D
Tensile strength	ASTM D 638	18.85 N/mm ² [2734 psi]
Elongation	ASTM D 638	1.87%
Compressive Strength	ASTM D 695	28.19 N/mm ² [4,088 psi]
Flexural Strength	ASTM D 790	1/3.76 N/mm ² [5,352 psi]
Cantilever Beam (IZOD) Impact	ASTM D 256	1.7 kJ/mm ²
Shear Strength	ASTM E 83	22.2 N/mm ² [3,224 psi]

CHARTS & SCHEDULES

Cured Properties: Temperature

	Test Method	
Constant Service Temperature		200 – 225 °C (392 – 437 °F)
Heat Deflection Temperature	ASTM D 648	35.35 °C (95.6 °F)
Maximum Withstand Temperature		250 °C (482°F)

Cured Properties: Electrical

	Test Method	
Dielectric Constant	ASTM D 150	4.41
Dissipation Factor	ASTM D 150	0.0113
Volume Resistivity	ASTM D 257	2.58 × 10 ¹⁵ ohm · cm
Surface Resistivity	ASTM D 257	3.16 × 10 ¹⁶ ohm/sq

Cured Properties: Thermal

	Test Method	
Thermal Conductivity		0.682 W/(m·K) [4.73 Btu·in/(h·ft ² ·°F)]
Thermal Diffusivity		0.38 mm ² /s
Volumetric Specific Heat		1.9 MJ/m ³ ·K
Thermal Expansion	ASTM E 831	148.3 ppm/°C

Chemical and Solvent Resistance

	Change after 3 days:
Isopropyl Alcohol	~ 0 %
Iso hexanes	~ 0 %
Mineral spirits	~ 0 %
Hydrochloric Acid	< 0.50 %
Ethyl Lactate	< 1 %
Xylene	< 2 %
Acetone	< 3 %



CATALOG NUMBER	SIZES AVAILABLE	DESCRIPTION
832TC-450ML	450 mL kit (16 oz)	Liquid
832TC-2L	2 L kit (0.5 gal)	Liquid
832TC-8L	8 L kit (2.1 gal)	Liquid
832TC-40L	40 L kit (10 gal)	Liquid

HIGH TEMPERATURE EPOXY

Cat. No. 832HT

For encapsulating and potting electronics in high temperature environments, aggressive chemical environments, or where improved technology protection is desired. Bonds to a wide variety of substrates, including metals, glass, ceramics and many plastics.

- Extreme physical strength and chemical resistance
- Suitable for extreme environments, such as submersion in salt water, acids, bases, fuels, and alcohols
- Protects against strong vibrations, abrasions, and direct physical impact
- Extremely difficult to remove granting incredible technology protection
- Maximum service temperature of 250°C (482°F)



CHARTS & SCHEDULES

Cured Properties: Physical

	Part A	Part B	Mixed
Viscosity at 23 °C (73 °F)	54,800 cP	11,000 cP	40,000 cP
Specific Gravity @ 23 °C	1.23	0.98	1.12
	Test Method	Result	
Mixing Ratio by Volume (Part A: Part B)		2 : 1	
Mixing Ratio by Mass (Part A: Part B)		1.63 : 1.00	
Maximum Service Temperature		250 °C (482 °F)	
Color		Black	
Maximum Intermittent Temperature		275 °C (527 °F)	
Working Time (100 gram sample)		1 hour	
Hardness, Shore D		80 D	
Tensile Strength	ASTM D 638-02a	54.22 N/mm ² [7,861 PSI]	
Elongation	ASTM D 638-02a	3.38%	
Compressive Strength	ASTM-D 695 02a	81.842 N/mm ² [11,870 PSI]	
Flexural Strength	ASTM D 790-03	100.66 N/mm ² [14,600 PSI]	
Flexural Modulus	ASTM D 790-03	2,751 N/mm ² [399,000 PSI]	
Lap Shear Strength	ASTM D 1002-01	12.37 N/mm ² [1,794 PSI]	

CHARTS & SCHEDULES

Cured Properties: Thermal	Test Method	Result
Coefficient of Thermal Expansion	ASTM D 648-01	
-40 °C to 50 °C		75.7 ppm/°C
+100 °C to +250 °C		154.0 ppm/°C
-40 °C to +250 °C		125.3 ppm/°C
+25 °C to + 250 °C		140.2 ppm/°C
Heat Deflection Temperature (HDT)	ASTM D 648	53.9 °C (129.02 °F)
Thermal Conductivity	ASTM E 1530	0.210 W/m·K
Thermal Conductivity @ 25 °C (77 °F)	ASTM E 1461	0.218 W/m·K (1.51 Btu·in/(h·ft ² ·°F))
Glass Transition Temperature (T _g)	ASTM D 3418	68 °C
Thermal Diffusivity @ 25 °C (77 °F)	ASTM E 1461	1.33 x 10 ⁻¹³ /s
Specific Heat Capacity @ 25 °C (77 °F)	ASTM E 1269	1419 J/kg·°K
Curing Time (100 g)		
@ room temp.		24 h
@ 65°C		60 min
@ 80°C		45 min
@ 100°C		35 min
@ 130°C		25 min
@ 160°C		15 min
@ 200°C		10 min
Cured Properties: Electrical	Test Method	Result
Dissipation Factor	ASTM D 150	dissipation, D
@ 1KHz		0.007
@ 10KHz		0.011
@ 100KHz		0.014
@ 1MKHz		0.014
Dielectric Constant	ASTM D 150	
@ 60Hz		4.24
@ 1KHz		2.96
@ 10KHz		2.81
@ 00KHz		2.83
@ 1MKHz		2.83
Dissipation Factor	ASTM D 150	0.0018 @ 60 Hz
Volume Resistivity	ASTM D 257	9.3 x 10 ¹⁵ ohm·cm
Surface Resistivity	ASTM D 257	5.3 x 10 ¹³ ohm
Dielectric Strength	ASTM D 149	454 V/mill @ 1/8"
Breakdown Voltage	ASTM D 149	56.8 kV

CATALOG NUMBER SIZES AVAILABLE DESCRIPTION

832HT-375ML	375ml (12 oz)	Liquid
832HT-3L	3L (0.8 gal)	Liquid

FLAME RETARDANT EPOXY

Cat. No. 833FRB

The 833FRB Flame Retardant Epoxy Encapsulating and Potting Compound is a UL 94V-0 recognized electric grade epoxy in the QMFZ2 category. This two parts epoxy provides a black and self-extinguishing finish with great insulation and protection value.

- UL Recognized, Flame Class 94V-0, category QMFZ2 (File # E334302)
- Specifications verified as per UL746A
- Mix ratio 2A:1B compatible with most dispensing equipment
- Extreme resistance to water and humidity allowing submersion if needed
- Protects electronics from moisture, corrosion, fungus, thermal shock, and static discharges
- Strong chemical resistance to brine, acids, bases, and aliphatic hydrocarbons
- Free of solvents



CHARTS & SCHEDULES

Curing & Work Schedule

Working Life	60 minutes
Shelf Life	≥3 years
Full Cure at 20 °C [68 °F]	24 hours
Full Cure at 65 °C [149 °F]	60 minutes
Full Cure at 80 °C [176 °F]	45 minutes
Full Cure at 100 °C [212 °F]	35 minutes
Storage Temperature of Unmixed Parts	16 to 27 °C [60 to 80 °F]

Service Ranges

Service Temperature	-40 to +175 °C [-40 to +347 °F]
Max Withstand Temperature	-65 °C to +225 °C [-85 °F to +437 °F]
Constant Service Temperature	175 °C [347 °F]

Cured Properties - Physical	Test Method	
Color	Visual	Black
Flammability	94V	94V-0
Density (at 26 °C)	ASTM D 792	1.35 g/cm ³
Compression Strength	ASTM D 695	128.46 N/mm ² [18,632 lb/in ²]
Lap Shear Strength	ASTM D 1002	5.81 N/mm ² [843 lb/in ²]
Flexural Strength	ASTM D 790	40.19 N/mm ² [5,829 lb/in ²]
Tensile Strength	ASTM D 638	20.54 kJ/m ² [9.774 ft·lbf/in ²]
Izod Impact	ASTM D 256	1.10 kJ/m ² [0.522 ft·lbf/in ²]
Hardness	(Shore D durometer)	83D to 84D
Outgasing (Total Mass Loss)	ASTM D 638	1.45 %
Ash Content	ASTM D 695	1.27 %

CHARTS & SCHEDULES

Cured Properties: Electrical

	Test Method	
Breakdown Voltage	ASTM D 149	32.1 kV @ avg. of 1.736 mm
Dielectric Strength	ASTM D 149	18.5 kV/mm [471 V/mil]
Breakdown Voltage @3.175 mm [1/8"]	ASTM D 257	43.5 kV
Dielectric Strength	ASTM D 149	13.7 kV/mm [348 V/mil]
Volume Resistivity	ASTM D 257	2.71 × 10 ¹⁵ ohm · cm
Surface Resistivity	ASTM D 257	2 × 10 ¹⁵ ohm
Comparative Tracking Index	ASTM D 3628	322 V
Dielectric Dissipation & Constant	ASTM D 150-98	dissipation, D constant, k'
@ 60Hz		0.018, 3.45
@1 kHz		0.012, 3.40
@10 kHz		0.013, 3.31
@100 kHz		0.014, 3.25
@1 MHz		0.014, 3.18
Hot Wire Ignition		52.83 s
High-Current Arc Ignition		94.80 arc
High Voltage Arc Tracking Rate		48.07 mm/min
High Voltage, Low Current, Dry Arc Resistance	ASTM D 495	37.62 s
High Voltage Arc Resist. to Ignition	ASTM D 495	4.67 s

Cured Properties: Thermal	Test Method	
Coefficient of Thermal Expansion		not established
Thermal Conductivity @ 25 °C	ASTM E 831	0.235 W/(m·K) [1.63 Btu·in/(h·ft ² ·°F)]
Glass Transition Temperature (Tg)	ASTM D 3418	56 °C
Heat Deflection Temperature (HDT)	ASTM D 648	51.9 °C

Uncured Properties: Physical

	Part A	Part B	Mixture (2A:1B)
Color	Dark Grey	Black	Black
Viscosity at 24°C [73 °F]	4,000 cP [4.0 Pa·s]	14,000 cP [14.0 Pa·s]	11,500 cP [11.5 Pa·s]
Density	1.34 g/mL	1.17 g/mL	1.28 g/mL
Flash Point	190 °C [374 °F]	105 °C [221 °F]	
Odor	Musty	Mild	
Mix Ratio by Volume (A:B)			2.0:1.0
Mix Ratio by Weight (A:B)			1.9:1.0
Solids Content (w/w)			~96 %



CATALOG NUMBER	SIZES AVAILABLE	DESCRIPTION
833FRB-375ML	375 mL (12 oz)	Liquid
833FRB-3L	3 L (0.8 gal)	Liquid
833FRB-60L	60 L (16 gal)	Liquid

FLAME RETARDANT EPOXY - REACH



Cat. No. 834FRB

The 834FRB Flame Retardant Epoxy Encapsulating and Potting Compound is a UL 94V-0 recognized electric grade epoxy in the QMFZ2 category. This two part self-extinguishing epoxy provides a black finish with 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.

- Certified UL 94V-0 (File # E334302)
- Specification verified as per UL 746A
- Mix ratio 2A:1B compatible with most dispensing equipment
- Extreme resistance to water and humidity allowing submersion if needed
- Protects electronics from moisture, corrosion, fungus, thermal shock, and static discharges
- Strong chemical resistance to brine, acids, bases, and aliphatic hydrocarbons
- Free of solvents

Especially formulated REACH Compliant formula for the European market.

CHARTS & SCHEDULES

Curing & Work Schedule

Working Life	60 minutes
Shelf Life	≥ 3 years
Full Cure at 20 °C [68 °F]	24 hours
Full Cure at 65 °C [149 °F]	60 minutes
Full Cure at 80 °C [176 °F]	45 minutes
Full Cure at 100 °C [212 °F]	35 minutes
Storage Temperature of Unmixed Parts	16 to 27 °C [60 to 80 °F]
Service Ranges	
Service Temperature	-40 to +175 °C [-40 to +347 °F]
Max Withstand Temp	-65 °C to +225 °C [-85 °F to +437 °F]
Constant Service Temp.	175 °C [347 °F]

CHARTS & SCHEDULES

Cured Properties - Physical	Test Method	
Color	Visual	Black
Flammability	94V	94V-0
Density (at 26 °C)	ASTM D 792	1.39 g/cm ³
Hardness	(Shore D durometer)	83D to 84D
Flexural Strength	ASTM D 1002	65.4 N/mm ² [9,490 lb/in ²]
Tensile Strength	ASTM D 790	44.13 N/mm ² [6,401 lb/in ²]
Tensile Impact	ASTM D 1822	16.38 kJ/m ² [7.793 ft·lb/in ²]
Izod Impact	ASTM D 256	2.394 kJ/m ² [1.138 ft·lb/in ²]
Outgassing (Total Mass Loss) @ 24h		1.88 %

Cured Properties: Electrical	Test Method	
Breakdown Voltage	ASTM D 149	27.4 kV @ avg. of 1.289 mm
Dielectric Strength	ASTM D 149	21.3 kV/mm [540 V/mil]
Breakdown Voltage @3.175 mm [1/8"]	Reference fit	43.0 kV
Dielectric Strength	ASTM D 149	13.7 kV/mm [348 V/mil]
Volume Resistivity	ASTM D 257	1.35 x 10 ¹⁵ ohm·cm
Comparative Tracking Index	ASTM D 3628	100 V
Hot Wire Ignition		45.24 s
High-Current Arc Ignition		139.40 arc
High Voltage Arc Tracking Rate		24.58 mm/min
High Voltage, Low Current, Dry Arc Resistance	ASTM D 495	69.24 s
High Voltage Arc Resist. to Ignition	ASTM D 495	27.33 s

Cured Properties: Thermal	Test Method	
Coefficient of Thermal Expansion		not established
Thermal Conductivity @ 25 °C	ASTM E 831	0.24 W/(m·K) [1.63 Btu·in/(h·ft ² ·°F)]
Glass Transition Temperature (T _g)	ASTM D 3418	~ 56 °C
Heat Deflection Temperature	ASTM D 648	49.7 °C

Uncured Properties: Physical	Part A	Part B	Mixture (2A:1B)
Color	Dark Grey	Black	Black
Viscosity at 24°C [73 °F]	1,600 cP [1.6 Pa·s]	3,600 cP [3.6 Pa·s]	2,600 cP [2.6 Pa·s]
Density	1.402 g/mL	1.158 g/mL	1.156 g/mL
Flash Point	150 °C [302 °F]	148 °C [221 °F]	
Odor	Musty	Mild	
Mix Ratio by Volume (A:B)			2.0:1.0
Mix Ratio by Weight (A:B)			1.9:1.0
Solids Content (w/w)			~96 %

CATALOG NUMBER	SIZES AVAILABLE	DESCRIPTION
834FRB-375ML	375 mL (12 oz)	Liquid
834FRB-3L	3 L (0.8 gal)	Liquid
834FRB-60L	60 L (16 gal)	Liquid

ATH FLAME RETARDANT EPOXY



Cat. No. 834ATH

The 834ATH Flame Retardant Epoxy Encapsulating and Potting Compound is a two-part, economical, electronic-grade, self-extinguishing, flame retardant epoxy that provides excellent physical, chemical, and electrical protection and offers a degree of thermal conductivity.

It protects against static discharges, shocks, vibrations, and mechanical impacts. It is extremely resistant to environmental humidity, salt water, and harsh chemicals. It also helps hide and restrict access to intellectual property, and it much harder to remove than standard epoxy encapsulating compounds.

- Certified UL 94V-0 (File # E334302)
- Specification Verified as per UL 746A
- Cost effective
- Increased thermal conductivity
- Mix ratio 2A:1B compatible with most dispensing equipment
- Resistance to water and humidity allowing submersion if needed
- Protects electronics from moisture, corrosion, fungus, thermal shock, and static discharges
- Free of solvents



CHARTS & SCHEDULES

Curing & Work Schedule

Working Life	2 hours
Shelf Life	5 years
Full Cure at 20 °C [68 °F]	24 hours
Full Cure at 80 °C [176 °F]	60 minutes
Full Cure at 100 °C [212 °F]	45 minutes
Storage Temperature of Unmixed Parts	16 to 27 °C [60 to 80 °F]

Service Ranges

Service Temperature	-30 to +175 °C [-22 to +347 °F]
Max Withstand Temp	-40 to +200 °C [-40 to 392 °F]

Cured Properties - Physical	Test Method	
Color	Visual	Black
Density (25 °C [77 °C])		~1.4 g/cm ³
Hardness	(Shore D durometer)	85D
Tensile Elongation	ASTM D 638	6.2%
Tensile Strength	ASTM D 638	28 N/mm ² [4,100 lb/in ²]
Compression Strength	ASTM D 695	99.8 N/mm ² [14,500 lb/in ²]

CHARTS & SCHEDULES

Cured Properties - Physical	Test Method		
Tensile Impact	ASTM D 1822	8.4 kJ/m ² [4.0 ft·lb/in ²]	
Izod Impact	ASTM D 256	20 J/m	
Lap Shear Strength (Al alloy 5052)	ASTM D 1002	14.9 N/mm ² [2,160 lb/in ²]	
Flexural Strength	ASTM D 790	51 N/mm ² [7,400 lb/in ²]	
Water Absorption (WAB)		0.15%	
Linear Dimension Change @after 168 h in water	ASTM D1042	0.0037%	
Cured Properties: Electrical	Test Method		
Breakdown Voltage	ASTM D 149	33 kV	
Dielectric Strength	ASTM D 149	22 kV/mm [550 V/mil]	
Breakdown Voltage @3.175 mm [1/8"]	Reference fit	43.0 kV	
Dielectric Strength	ASTM D 149	13.7 kV/mm [348 V/mil]	
Volume Resistivity @23 °C & 50% RH	ASTM D 257	7 x10 ¹⁴ Ω·cm	
Volume Resistivity @35 °C & 90% RH	ASTM D 257	2 x10 ¹⁴ Ω·cm	
Comparative Tracking Index (CTI)	ASTM D 3628	400 V to 599 V	
		Performance Level Class (PCL) = I	
Hot Wire Ignition (HWI)	ASTM D3874	120 s	
High Voltage Arc Tracking Rate (HVTR)		121 mm/min	
High Voltage Arc Resistance to Ignition (HVAR)		300 s	
High Voltage, Low Current, Dry Arc Resistance	ASTM D 495	127 s	
High-Current Arc Ignition (HAI)	CSA C22.2	+150 arc	
Cured Properties: Thermal	Test Method		
Coefficient of Thermal Expansion			
Below Tg	ASTM E 831	84 ppm/°C	
Above Tg	ASTM E 831	178 ppm/°C	
Thermal Conductivity @ 25 °C [77 °C]	ASTM E 1461 92	0.37 W/m K	
Thermal Diffusivity @25 °C [77 °C]	ASTM E 1461 92	2.1 x 10 ⁻⁷ m ² /s	
Specific Heat Capacity @25 °C [77 °C]	ASTM E 1269 01	1.2 J/(kg·K)	
Glass Transition Temperature (Tg)	ASTM D 3418	51 °C [124 °F]	
Heat Deflection Temperature	ASTM D 648	53.7 °C [129 °F]	
Uncured Properties: Physical	Part A	Part B	Mixture (2A:1B)
Color	Black	Black	Black
Viscosity at 24°C [73 °F]	4,600 cP [4.6 Pa·s]	12,900 cP [12.9 Pa·s]	5,900 cP [5.9 Pa·s]
Density	1.40 g/mL	1.26 g/mL	1.39 g/mL
Flash Point	150 °C [302 °F]	185 °C [365 °F]	
Odor	Mild aromatic	Ammonia like	
Mix Ratio by Volume (A:B)			2.25:1.00
Mix Ratio by Weight (A:B)			2:1
Solids Content (w/w)	~98%	100%	

CATALOG NUMBER	SIZES AVAILABLE	DESCRIPTION
834ATH-375ML	375 mL (12 oz)	Liquid
834ATH-3L	3 L (0.8 gal)	Liquid
834ATH-60L	60 L (16 gal)	Liquid

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