One-part Epoxy, Thermally Conductive Adhesive, High T_g

Description

9460 is a thermally conductive, one-part epoxy adhesive. It is smooth, thixotropic, non-sagging, and bonds well to a wide variety of substances. It has an unlimited working life at room temperature and does not require frozen storage.

This product is used to bond heat sinks, LEDs, and other heat-generating components in electronic assemblies. It does not require mixing and can be readily used in manual, pneumatic and robotic dispensing processes.

Features and Benefits

- *Thermal conductivity of 0.76 W/(m·K)*
- *Minimum cure temperature of 100 °C [212 °F]*
- *Unlimited working life*
- *Shelf life: 9 months at room temperature*
- *Provides strong electrical insulation*
- *T_g of 117 °C [243 °F]*
- *Strong resistance to humidity, salt water, acids, bases, and aliphatic hydrocarbons*

Usage Parameters

Properties	Value
Working life @22 °C [72 °F]	Unlimited
Shelf life @22 °C [72 °F]	9 months
Full cure @22 °C [72 °F]	Heat cure only
Full cure @100 °C [212 °F]	45 min
Full cure @130 °C [266 °F]	20 min

Temperature Ranges

Properties	Value
Constant service temperature	-55 to 140 °C [-67 to 284 °F]
Storage temperature	-10 to 27 °C [14 to 81 °F]

Cured Properties

Physical Properties	Method	Value [a]
Color	Visual	Black
Density @25 °C [77 °F]	ASTM D 1475	1.83 g/mL
Hardness	Shore D Durometer	90D
Tensile strength	ASTM D 638	5.8 N/mm^2 [840 lb/in^2]
Compressive strength	ASTM D 695	64 N/mm^2 [9 300 lb/in^2]
Lap shear strength (stainless steel)	ASTM D 1002	11 N/mm^2 [1 600 lb/in^2]
Lap shear strength (aluminum)	ASTM D 1002	4.2 N/mm^2 [600 lb/in^2]
Lap shear strength (copper)	ASTM D 1002	7.6 N/mm^2 [1 100 lb/in^2]
Lap shear strength (brass)	ASTM D 1002	6.9 N/mm^2 [1 000 lb/in^2]
Lap shear strength (polycarbonate)	ASTM D 1002	0.9 N/mm^2 [140 lb/in^2]
Electrical Properties	**Method**	**Value**
Breakdown voltage @3.0 mm	ASTM D 149	24 800 V [24.8 kV]
Dielectric strength @3.0 mm	ASTM D 149	210 V/mil [8.4 kV/mm]
Breakdown voltage @3.175 mm [1/8”]	Reference fit [b]	25 800 V [25.8 kV]
Dielectric strength @3.175 mm [1/8”]	Reference fit [b]	200 V/mil [8.1 kV/mm]
Volume resistivity	ASTM D 257	8.1 x 10^{12} Ω·cm
Volume conductivity	ASTM D 257	1.2 x 10^{-13} S/cm

Note: Specifications are for epoxy samples cured at 100 °C for 45 min and conditioned at ambient temperature and humidity.

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

Cured Properties

Thermal Properties	Method	Value
Glass transition temperature (T_g)	ASTM E 831	117 °C [243 °F]
CTE [a] prior T_g after T_g	ASTM E 831 ASTM E 831	57 ppm/°C [135 ppm/°F] 134 ppm/°C [273 ppm/°F]
Thermal conductivity @25 °C [77 °F] @50 °C [222 °F] @100 °C [212 °F]	ASTM E 1461 92 ASTM E 1461 92 ASTM E 1461 92	0.76 W/(m·K) 0.77 W/(m·K) 0.77 W/(m·K)
Thermal diffusivity @25 °C [77 °F]	ASTM E 1461 92	0.4 mm^2/s
Specific heat capacity @25 °C [77 °F]	ASTM E 1269 01	0.7 J/(g·K)

Note: Specifications are for epoxy samples cured at 100 °C for 45 min and conditioned at ambient temperature and humidity.

a) Coefficient of Thermal Expansion (CTE) units are in ppm/°C = in/in/°C × 10^{-6} = unit/unit/°C × 10^{-6}

Uncured Properties

Physical Properties	Method	Value
Color	Visual	Black
Viscosity @25 °C [77 °F]	IPC TM-650 Method 2.4.34.4	2 300 000 cP [2 300 Pa·s] [a]
Density	ASTM D 1475	2.15 g/mL

a) Brookfield viscometer at 3 rpm with spindle RV F96

Compatibility

Adhesion—9460 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.

For substrates with weak adhesion strength, surface preparation (such as sanding, or pre-coating with a suitable primer) may improve adhesion.

Chemical—The cured epoxy adhesive is inert under normal conditions. It can tolerate short-term exposure to fuels or similar non-polar organic solvents, but it may not be suitable for prolonged exposure. Avoid using with strong acids, strong bases, or strong oxidizers.

Storage

Store between -10 and 27 °C [14 and 81 °F] in a dry area, away from sunlight. Some of the components are sensitive to air. To maximize shelf life, always recap product firmly when not in use.

Health and Safety

Please see the 9460 Safety Data Sheet (SDS) for further details on transportation, storage, handling, safety guidelines, and regulatory compliance.

Application Instructions

For best results, follow the procedure below. This product does not require mixing prior to use, and can be applied with a spatula, trowel, or automated dispensing machine.

Syringe or cartridge:

1. For 10 mL size, twist and remove the cap from the syringe. Do not discard the cap.
2. For the 300 mL size, cut the end of the cartridge tip.
   a. Screw the tip on the cartridge.
   b. Insert the cartridge in a caulking gun.
3. Dispense the adhesive evenly to both surfaces.
4. To stop the flow, pull back on the plunger.
5. Clean nozzle to prevent contamination and material buildup.
6. Replace the cap on the cartridge or syringe.

Cure Instructions

Room temperature cure:
Do NOT cure at room temperature. This product will only cure at elevated temperatures.

Heat cure:

- Put in oven at 100 °C [212 °F] for 45 min.
  —OR—
- Put in oven at 130 °C [266 °F] for 20 min.

Dispensing Accessories

9460-300ML cartridges are compatible with caulking guns that are readily available for purchase at local hardware stores.

Packaging and Supporting Products

Cat. No.	Packaging	Net Weight	Packaged Weight
9460-10ML	Syringe	21.5 g [0.75 oz]	0.05 kg [0.12 lb]
9460-300ML	Cartridge	644 g [1.42 lb]	0.8 kg [1.75 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.

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