Cast-Coat inc.

CC3-450

ALUMINUM FILLED, HEAT SINK BONDING RESIN

CC3-450 is a medium viscosity, aluminum filled, bonding resin that has gained wide-spread acceptance as the primary bonding resin used in the assembly of heat sink components and the attachment of heat sinks to sources of heat or cold. This resin system is the most widely used bonding agent in the heat sink industry with a history of many varied applications over the last thirty years. There is real industry acceptance for this product at all of the major heat sink suppliers for their bonded heat sink requirements.

In the typical bonded fin heat sink the contribution of the bonded fin joint to the overall thermal resistance of the full heat sink is from 1 to 3%. The primary contribution to the thermal resistance of bonded heat sinks is the convective contribution between the air and the finned surface. The second most significant factor is the base spreading conductive resistance and the fin conductive resistance. Good joint design and clean, rough surfaces produce superior joints that generally exceed the mechanical requirements of the application while remaining an insignificant contributor to the overall thermal resistance of the bonded fin heat sink.

SUGGESTED APPLICATIONS:

Fin-to Base: High thermal conductivity at the joint. The slot depth should be three times the fin thickness with a top chamfer of 20/25% of the slot depth. The slot width should be fin thickness plus 0.005/0.010". For maximum bond strength, vapor blast the slot and the fin edge followed by a proper degreasing process. Fins should be 1100H14 aluminum alloy and bases 6063T5 for maximum conductivity. This design, properly cured, will produce a bond strength that exceeds the shear strength of the fin in a typical tensile test.

Folded Fin Set-To-Base: High thermal conductivity for all minimum bond line joints. This is accomplished by setting weights on the fin sets or clamping the crested ends. Fin sets are best ordered with the flat crested ends. This insures the maximum contact area with the base for optimum heat transfer. The fins sets should fit into a recess (.025/.035" deep) to secure their position during cure.

Bent Wire Pin Fin Set to Base: Complex shapes and very high omni-directional performance heat sinks can be assembled from pin fin segments bonded to the base with this high thermal conductivity filled epoxy system. The same rules of cleanliness, surface preparation and clamping are also required in this application.

Cold Plate Tube-To-Extruded Base: The thermal joint between a cold plate and the extruded aluminum base is the single major source of overall thermal resistance of this style of design. Careful attention to tube design and crimping details to minimize the glue line can make a large difference in the thermal performance of this economical cold plate design.

High Performance Cold Plate Tube to Base: The glue line joint is the most important contributor in cold plate design. Therefore, it is essential to minimize the glue line, which is accomplished by pressing the tubes into the mechanical aluminum plates. There are two basic design types, tubes-up to face the heat load for the very best performance and tubes-down to spread the cooling over the entire heat sink surface. Optimum thermal conductivity is an absolute necessity for this application.

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ELECTRICAL AND PHYSICAL PROPERTIES:

Specific Gravity @ 25’ C	1.79
Viscosity @ 75’ C, cps (uncatalyzed)	6,500 to 7,000
Viscosity @ 30’ C, cps (catalyzed)	6,500 to 7,000
Thermal Conductivity: W/m’C	4.54 to 200*
Thermal Conductivity: BTU/ft^2/hr/'F/in	31.5
Tensile Strength @ 25’ C, psi	8,900
Izod Impact: ft lbs/in of notch	0.49
Coefficient of Thermal Expansion: in/in/’C x 10^{-6}	28
Heat Distortion: ‘C	65
Water Absorption: %, 7 days @ 25’ C	0.1
Linear Shrinkage: in/in	0.003
Service Temperature, ‘C continuous	-70 to +195
Standard Color	Metallic Aluminum

(Typical properties when cured with H-7 Hardener)

* The thermal conductivity of CC3-450 cured with H-7 Hardener is 4.54 W/m’C. However, the thermal conductivity of an assembled heat sink can approach the thermal conductivity of the basic metal depending upon design and construction.

CHOICE OF HARDENERS:

H-1 Hardener:	Rigid, good dimensional stability, fast cure.
H-7 Hardener:	Resilient, excellent mechanical and thermal shock, low viscosity, good air release, fast cure.
Ancamine Z:	Resilient, excellent mechanical and thermal shock, plus high heat distortion, long pot life.
H-10LV Hardener:	Variable hardness, excellent impact properties, long pot life

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HARDENER	PARTS BY WEIGHT PER 100 PARTS OF RESIN	POT LIFE 100 GRAM 25'C (77'F)	CURE TIME 25' C (77'F)	CURE TIME 65' C (149' F)	CURE TIME 125 ' C (257 ' F)
H-1 Hardener	4.9	30 min.	8 hrs.	30 min.	15 min.
H-7 Hardener	10.4	45 min.	16 hrs.	45 min.	20 min.
Ancamine Z	7.1	4 hrs.	- - -	16 hrs.	2 hrs.
H-10LV Hardener	rigid 13	3 hrs.	24 hrs.	3 hrs.	- - -
H-10LV Hardener	semi-flex 30	3 hrs.	24 hrs.	3 hrs.	- - -
H-10LV Hardener	flexible 45	3 hrs.	24 hrs.	3 hrs.	- - -

ROOM TEMPERATURE CURE:

H-1 Hardener: Cures overnight at room temperature or 30 min. at 65' C. Do not heat cure if the mass exceeds 2 pounds.

H-7 Hardener: Cures overnight at room temperature or 45 min. at 65' C.

H-10LV Hardener: Cures overnight at room temperature or 3 hrs at 65' C.

HEAT CURE:

Ancamine Z: Cures overnight at 65' C or 2 hrs at 125' C. For best physical and electrical properties, a slow cure for 16 hours at 65' C followed by a post cure for 3 hours at 125' C is recommended.

MIXING INSTRUCTIONS:

Mix CC3-450 thoroughly in it's shipping container to insure a uniform consistency. Weigh out the desired amount of resin in a clean container. Add the hardener accurately by weight in the proper proportion as specified above. (ie. 4.9 grams of H-1 Hardener and 100 grams of CC3-450 for a total mix of 104.9 grams) Mix thoroughly. Use in a well ventilated area and avoid contact with eyes and skin.