

## MOUNTING THERMOFOIL HEATERS WITH MINCO #15 EPOXY ADHESIVE

Minco #15 adhesive is a blue two-part epoxy with resin and hardener supplied in a ready-to-mix plastic packet, separated by a removable clamp. The adhesive is an electric insulator, with good thermal conductivity; it bonds well to metals, ceramics, glass, and plastics. It meets NASA limits for outgassing in space vacuum, and is listed in NASA-RP-1061. Operating temperature is  $-70$  to  $115^{\circ}\text{C}$  ( $-94$  to  $240^{\circ}\text{F}$ ). Unopened shelf life is at least six months, longer when refrigerated. Coverage is about one square foot, depending on bondline thickness.

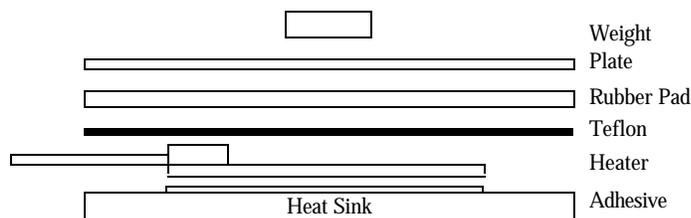
1. Thoroughly clean the bonding surfaces, removing dirt, oil, and other contaminants using a suitable solvent such as acetone. Follow with ethyl or isopropyl alcohol to remove residue. An etched or slightly roughened surface usually permits the best bond.

**Example:** Use five hundred grit sandpaper on both surfaces, then clean with a solvent.

2. Remove the clamp separating the resin from the hardener and mix the components together until the color is a uniform blue. Mixed epoxy should be used within 45 minutes. Clip a corner of the package and squeeze the mixed epoxy onto one of the mounting surfaces (heater or heat sink). Spread epoxy as thin as possible—ideally  $.003''$  to  $.005''$  ( $0.08$  to  $.012\text{mm}$ )—using a straight edge.

**Example:** A razor blade or a plastic putty knife may be used. Avoid marring the heat sink with the straight edge.

3. Gently press heater onto heat sink; avoid air bubbles. Use a rubber roller or equivalent to apply light pressure. Start at the center of the heater and roll to the outer edges to remove entrapped air.
4. While the epoxy is curing, light pressure (less than 10 psi) will keep parts in place. Tape can be used to secure the leadwires. A Teflon sheet or polyethylene bag over the heater will prevent bonding to the clamping device. A resilient rubber pad is recommended for uniform clamping pressure.



**Recommended Clamping Stack-up**

DR: MH 8/2/00  
CHK: BHB 8/2/00  
ENG: JBH 8/2/00  
APP: MP 8/2/00

**MINCO PRODUCTS, INC.**  
7300 Commerce Lane  
Minneapolis, MN 55432 U.S.A.  
Phone: 763-571-3121  
Fax: 763-571-0927

Engineering Instruction 507

ECO 36024 REV. B

Page 1 of 2

5. Eighteen hours at room temperature will accomplish most of the cure, but up to 72 hours is required for complete cure. Accelerated curing can be done by exposing the epoxy to 65°C (150°F) for 2 to 4 hours. If an elevated temperature cure is used, the heater assembly temperature should be increased slowly (approximately 1°C/minute) to allow air and volatiles to escape.
6. Inspect the installed heater for proper adhesion before applying electrical power. There should be no evidence of air bubble entrapment or non-adhesion beneath the heating element portion of the heater. A large bubble under a strand could cause heater failure. Bubbles may be prevented or minimized by careful application and the use of special techniques such as vacuum curing and perforating heaters between strands to allow trapped air to escape.
7. Factory applied aluminum backing on the heater will improve heater reliability by spreading the heat build-up from unavoidable bubbles. Aluminum backing is recommended for all heaters mounted with #15 epoxy and operated at watt densities greater than 20 watts per square inch.

**SAFETY PRECAUTIONS:** Adequate ventilation should be provided in the handling of these components to prevent ingestion. Undue exposure to vapors and skin contact should be avoided. The use of a barrier cream or vinyl gloves is suggested. If accidental skin contact occurs, the exposed area should be washed immediately with mild soap and water. Accidental eye contact requires immediate water flushing and prompt medical attention.

We believe this information to be reliable, but the customer must assume responsibility for heater performance in the intended application. **MINCO accepts no liability beyond our standard warranty for consequences of improper installation and/or heater or adhesive failure.**

If any questions or problems occur, contact your MINCO sales representative or the factory for assistance.