

## Procedure For Assembling Lapped Modules To Heat Exchangers

**IMPORTANT:** When two or more thermoelectric modules (TEMs) are mounted between a common heat exchanger base, the TEMs thickness tolerance should not vary more than  $\pm 0.025$  mm. Contact our sales engineer for more information on tolerance lapping requirements for TEMs in an array.

**Step 1.** Prepare cold plate and heat sink surfaces as follows:

- A) Grind or lap flat to within  $\pm 0.025$  mm in module area.
- B) Locate mounting holes as close as possible to opposite edges of module (3.18 mm clearance recommended, 12.7 mm maximum), in the same plane line as the heat exchanger fins. This orientation utilizes the additional structural strength of the fins to prevent bowing. Drill clearance holes on one surface and drill and tap opposite surface accordingly (see sketch in Assembly Tips). If a spacer block is used to increase distance between surfaces, performance is greater if the spacer block is on the cold side of system.
- C) Remove all burrs, chips and foreign matter from thermoelectric module mounting area.

**Step 2.** Thoroughly clean and degrease thermoelectric module, heat exchanger and cold surface.

**Step 3.** Apply a thin continuous film of thermal grease (Laird Technologies grease type 1500) to module hot side surface and to module area on heat exchanger.

**Step 4.** Locate module on heat exchanger, hot side down.

**Step 5.** Gently oscillate module back and forth, exerting uniform downward pressure, noting efflux of thermal compound around edges of module. Continue motion until resistance is felt.

**Step 6.** Repeat Step #3 for cold side surface and cold plate.

**Step 7.** Position cold plate on module.

**Step 8.** Repeat Step #5, sliding cold plate instead of module. Be particularly careful to maintain uniform pressure. Keep the module centered between the screws, or uneven compression will result.

**Step 9.** Before bolting, best results are obtained by preloading in compression the cold plate/heat exchanger/module assembly, applying a light load in line with center of module, using clamp or weights. For two-module assemblies, use three screws located on module center line, with middle screw located between modules. To preload, torque middle screw first. Bolt carefully, by applying torque in small increments, alternating between screws. Use a torque limiting screw driver. The recommended compression for a

thermoelectric assembly is 10 to 21 kilograms per square centimeter (150 - 300 PSI) of module surface area. Using the following equation you can solve for torque per screw:

$$T = (C \times D \times P \times m^2) / (\# \text{ of screws})$$

T = torque per screw (N-m)

C = torque coefficient (0.20 as received, 0.15 lubricated)

D = nominal screw size (M3 = 0.003, M4 = 0.004, M5 = 0.005)

P = Force (N-m<sup>2</sup>)

m<sup>2</sup> = Module surface area (length x width)

Check torque after one hour and retighten if necessary.

**Use Stainless Steel Screws, fiber insulating shoulder washers, and steel spring (Belleville or split lock type) washers (see sketch in Assembly Tips).**

### CAUTION

1. To ensure good thermal grease performance, there should be no bowing of either surface due to torquing. To prevent bowing, apply less torque if one or both surfaces are less than 3.18 mm thick copper or 6.35 mm thick aluminum.
2. Lead wires are soldered to module tabs with bismuth/tin solder (138°C). If lead wire replacement is necessary, use bismuth/tin solder.

**DO NOT** use lead / tin solder (180°C) to replace leads.