To maximize efficiency and prevent damage to TEGpro thermoelectric generator modules (TEMs) the installation guidelines must be followed. Our TEMS thermally expand while operating under large temperature differences; specific hardware must be used to to prevent unit damage due to this expansion. To ensure proper mounting, even pressure must be applied on both sides of the module. Please thoroughly read the following notes before attempting an installation.

Hot Side and Cold Side Identification

A TEG module will generate power when a temperature difference, or Δt, is present between the "hot side" of the teg module and the "cold side" of the module. A heat source should be applied to the "hot side" of the module, and a heat sink should be coupled to the "cold side" to create a Δt. The "hot side" of the module can be identified by the "hot side" marking on the face of the module (see figure 1). When heat is applied to the "hot side" and the "cold side" is coupled to a heat sink the positive output will be the red wire and the negative output will be the blackwire (see figure 1).

The hot side of the module is rated for a contiuous temperature up to 330 °C (626 °F) and intermittent temperature up to 400 °C (752 °F). The cold side of the module can not exceed 200 °C (392 °F) or the teg module will degrade and fail. (Custom & Higher Temperature modules can be obtained from Tegpro, call (802) 728-4533 for more details).

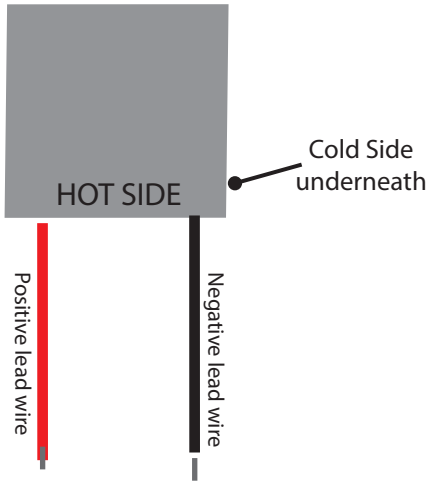

Figure 1. Hot Side Identification

Temperature Limits

Temperature range of the Hot side: -60 °C to 330 °C, Maximum 400 °C

Temperature range of the Cold side: -60 °C to 180 °C, Maximum 200 °C

Thermal Interface

Below is a magnified view of the modules surfaces. They are not truly flat or smooth.

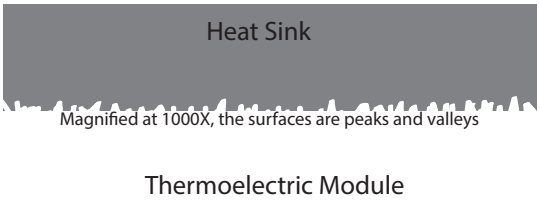

Figure 2. Magnified Thermal Electric Module

When the surfaces are examined under magnification, they consist of "hills", "peaks", and "valleys". When these two surfaces contact each other, only the peaks make contact. The average contact area between the two surfaces is only 5%, the other 95% consists of voids.

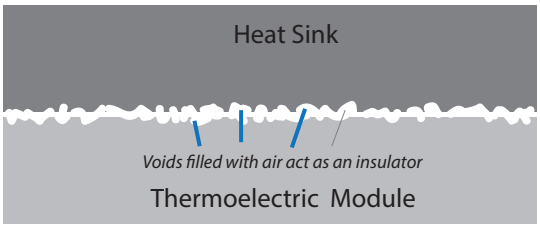

Figure 3. Contact without any Thermal Interface Material (TIM)

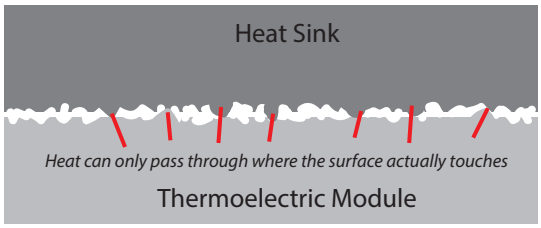

Figure 4. Contact without any TIM

Figure 4 shows how the remaining valleys create voids through which heat energy can barely pass through, in effect creating an insulated area – not the ideal thermal interface. Note the diagrams stating "Contact without any TIM".

Thermal Interface Materials

A thermal interface material or TIM is needed as it's impossible to achieve a smooth surface. The TIM will fill the valleys and gaps with a compressible material that has high thermal conductivity. This allows the entire surface of the interface material to transfer heat instead of just the peaks that were contacting. The following illustration shows how the gaps have been removed.

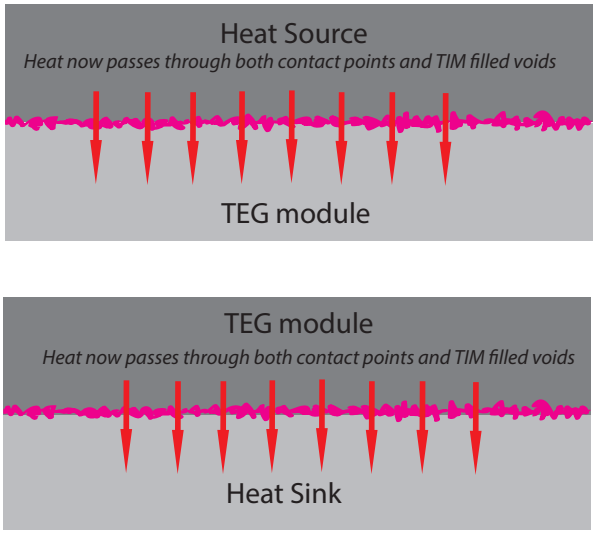

Figure 5. TEG with TIM

All of Tegpro's modules have adhesive graphite sheets as a TIM which can operate up to 400 °C. Our thermoelectric modules include these graphite sheets on both sides of their ceramic plates to provide the lowest thermal resistance possible. You do not need to apply thermal grease or other thermal interface materials when you install this module.

Mounting the TEM

TEMs should be mounted using the compression method. That is, the TEM is compressed between a hot plate and a heat sink (or water block) . The compression or clamping should be implemented with stainless steel machine screws on either side of the TEM. See figure 6 and 7 below. (Note once a TEM is clamped in a TEG installation, and thermally cycled the hot side ceramic plate will detach from the rest of the module. This is because the hot side expands at a great rate than the cold side. These modules are not intended to be taken apart and reinstalled again.)

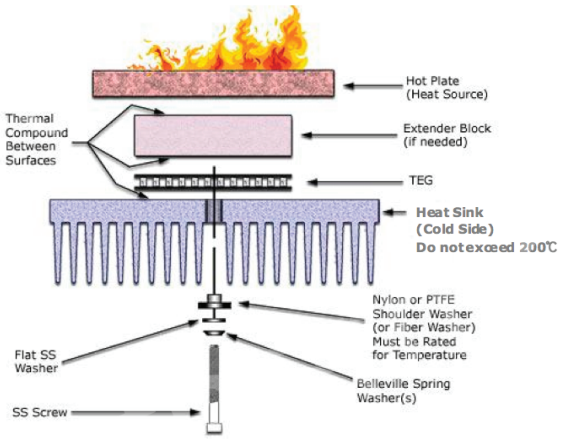

Figure 6. Exploded Mounting View

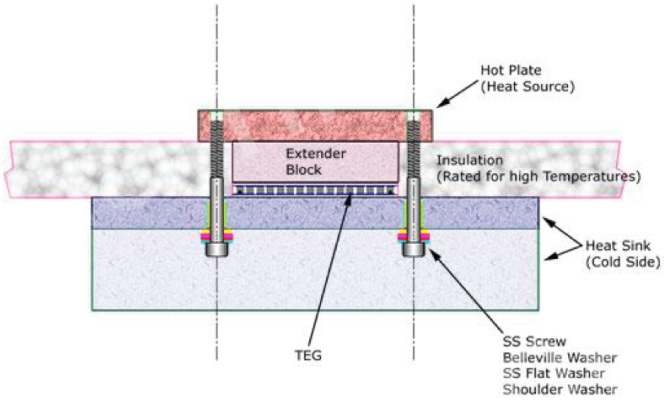

Figure 7. Properly Mounted Unit

Screw Positioning

Locate bolt holes in your assembly such that they are at opposite sides of the center of the TEM between 1.0 mm to 12.7 mm (0.04 to 0.5 inches) from the sides of the TEM. (See Figure 8) The bolt holes should be in the same plane line as the fins to minimize any heat sink bowing (bending) that might occur.

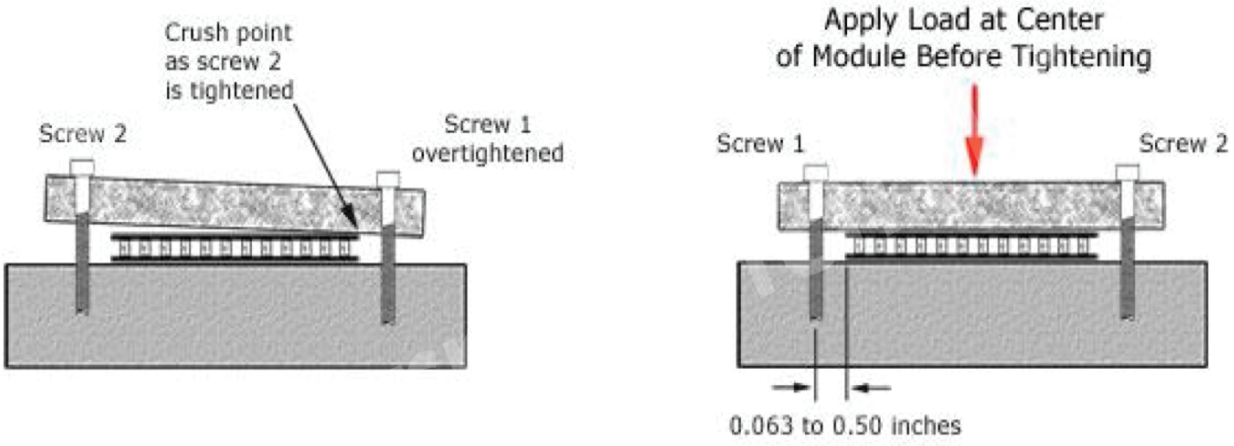

Figure 8. Proper Bolt Location

Clamping Procedure

Before tightening the screws, apply a light load/force in-line with the center of the TEM by using a clamp or weights. Make sure the clamp or weights apply the force evenly and at the center. Bolt carefully by applying torque (tightening the screws) in small increments, and alternating between screws. It is very important that the screws are tightened evenly in small increments back and forth. Over tightening a screw may crush the TEM. Use a torque limiting screwdriver for best accuracy.

Part Number	Size (mm)	Clamping Force	Screw Diameter/Number of Screws / Torque Per Screw
TGPR-6W4V-30S TGPR-5W5V-30S TGPR-4W9V-30S	30 mm × 30 mm	120 Kgs/260 Pounds	4 mm/2/0.072 kg × m
TGPR-8W4V-35S TGPR-5W5V-35S	35 mm × 35 mm	170 kgs/370 Pounds	4 mm/2/0.098 kg × m
TGPR-10W4V-40S TGPR-5W5V-40S TGPR-1W2V-40S	40 mm × 40 mm	230 Kgs/500 Pounds	4 mm/2/0.128 kg × m
TGPR-19W4V-56S TGPR-22W7V-56S TGPR-18W9V-56S	56 mm ×56 mm	430 Kgs/920 Pounds	5 mm/2/0.3 kg × m

TEGpro
802.728.4533 P
802.728.3800 F
info@tegpro.com
www.tegpro.com

TEGpro™
Recycling waste heat for a cooler tomorrow