

## Module Moisture Protection

Moisture protection or Anti-corrosion Protection (ACP) of thermoelectric module proposes a prevention of corrosion process flow in solder junctions under moisture influence, the latter condenses from the environment at positive temperatures below dew point. Besides destructive impact of corrosion phenomena accumulated water creates thermal bridges between ceramic substrates leading to reduction of module efficiency.

Our Research and Development team has elaborated the following methods of TE module moisture protection different in terms of efficiency and production expenditures.

### 1. Method of internal protection (Coating)

Coating as internal protection method is recommended for TE elements that operate at negative and short time positive temperatures below dew point.

Coating is introduced to cover all parts inside the cooler protecting specially pellet-pad solder junctions. Long-term examinations in different environments of modules coated with Varnish ACP show that such type of protection can be used in wide temperature range of TE cooler operation: from **- 50° C to + 140°C**. Furthermore coating does not reduce cooler's efficiency due to the absence of strong thermal bridge.

Coating is considered as the initial moisture protecting method for most TE module application cases. **If Coating is chosen as moisture protection option suffix "C" should be added to the module marking while specifying the type.**

### 2. Method of external protection (Sealing)

Sealing as the external protection method is performed along the perimeter of thermoelectric element with application of Epoxy or Silicone materials.

Silicone type of protection can be used within the following temperature range of TE cooler operation: from **- 40°C to + 180°**. Silicone sealant due to its good elastic properties is preferable for cycling applications and low temperature condition.

Epoxy sealant provides module exploitation in a mode with intensive vapor condensation and can be applied within the following temperature range of Pelter cooler operation: from **- 50°C to + 150°C**.

**IMPORTANT:** presence of Silicone and Epoxy sealants is estimated to reduce efficiency of thermoelectric module by approximately 4%.

**If Silicone sealing is chosen as moisture protection option suffix "S" should be added to the module marking while specifying the type. If Epoxy sealing is chosen as moisture protection option suffix "X" should be added to the module marking while specifying the type.**

Most of the ACP sealants used in thermoelectric industry have good adhesion to the Coating varnish and can be applied as an additional protecting barrier. Upon customer special request NORD is ready to proceed with double ACP: Coating plus Silicone or Epoxy sealants.

**If combined method is chosen as moisture protection option suffix "CS" or "CX" should be added to the module marking while specifying the type.**

**IMPORTANT:** in order to avoid future misunderstandings or possible quality claims it is strongly recommended to choose appropriate moisture protection method on answer-question basis by providing NORD's specialists with additional information regarding final product application conditions and/or thermoelectric cooler operation modes.