Choosing and appropriate module

TE module is a device suitable for operating in various number of different working conditions nevertheless most of the applications imply the following most popular operating modes as described below.

The mode of maximum energy efficiency is characterized by minimum energy expenses necessary to receive targeted portion of cold, i.e. the maximum value of Coefficient of Performance (COP);

The mode of maximum cooling capacity is of the utmost interest. On base of it the method of required module selection is built on the module operation in mode of maximum cooling capacity.

There are two necessary parameters for proper selection TE cooler:

1. According to thermal load onto a module
2. According to temperature difference at which heat is taken from an object to be cooled.

The total heat load consists of a power dissipation of the object to be cooled and various kinds of inflow heat from environment due to convection, radiation and thermal conductivity of mounting elements.

The temperature difference is determined as a difference between the temperature at which heat dissipation takes place and the temperature of the object to be cooled.

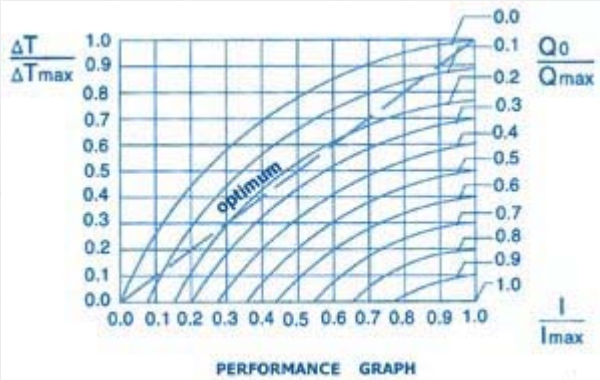
Using the below-stated table select the minimum number of stages to meet the required temperature difference:

ΔTmax in a vacuum, °C	Number of Stages
72	1
94	2
110	3
117	4

If the required temperature difference does not exceed 50°C, the number of stages more than one is reasonable to apply.

A proper selection thermoelectric module:

Using a ratio of operating parameter results to maximum values together with the performance graph one can determine parameters of selected cooler.



The diagonal optimum Q_o/Q_{max} line corresponds to maximum cooling capacity to be obtained by selected TE cooler. On the performance graph the point of intersection of the horizontal line corresponding $\mathbf{\Delta}T/\mathbf{\Delta}T_{max}$ and the diagonal optimum Q_o/Q_{max} line is the optimum value of Q_o/Q_{max}. The point of intersection of the horizontal line and the vertical axis is the maximum value of Q_o/Q_{max}

To determine optimum and maximum values of cooling capacity for needed cooler divide value of calculated total heat load by corresponding relative values from the performance graph. Using General Specification select a thermoelectric cooler with a Q_{max} greater than the maximum Q_{max}, but less than the optimum Q_{max}. It is necessary to know that the selected module with a Q_{max} close to the optimum Q_{max} will provide maximum efficiency and a cooler with a Q_{max} close to the maximum Q_{max} will be less expensive but at the same time with smaller cooling capacity yield.