

How does a TEC Controller work

There are numerous systems like Optical telecommunication, electronics, biomedical and networking where TEC is used to maintain optical components, bio samples, or the laser diodes at a constant temperature to achieve the reliability and the performance of whole system directly.

TEC stands for “Thermoelectric Cooler” that can produce both heating and cooling based on the Peltier effect. TEC can transport heat from one of its surfaces to another and the heating and cooling direction and the magnitude depends on the direction and magnitude of the electric current that flows through it. A TEC is consisted of two ceramic plates sandwiched with Peltier elements which are connected in serial and terminated with 2 leads. When A DC voltage is applied to the 2 leads, a current is generated and goes through all the Peltier elements, each element generates cold on one end and hot on the other end. All the cold power generated by each element adds up at one of the ceramic plates and all the hot adds up as well at the other plate. Thus, one plate becomes hot and the other plate gets cold.

Closed loop control and compensation network

Temperature controllers are used to keep stability in given temperature. These controllers are used when an object is required to be heated, cooled or both and to stay on a targeted temperature, despite of the changes in the environment around it. There are two types of controllers: open loop and close loop. Open loop applies continues heating or cooling without considering the actual temperature output. Closed loop controller is more complex than open loop; the output temperature is measured constantly and modified to maintain a steady output at the given temperature. TEC controller compares the current temperature of an object to the desire value and provides the thermoelectric element with the fair amount of current.

A close loop control system would be instable if its phase and magnitude is not compensated properly. The circuit compensating the phase and the magnitude is called compensation network. Analog Technologies designs and manufactures TEC controllers and integrates some compensation network inside the TEC controllers. For detail application information about these TEC controllers and their compensation networks is given here:

<http://www.analogtechnologies.com/tec-controller.html>

What are the main advantages a TEC?

TEC can generate both cold and heat. Thus, it can stabilizes a thermal load temperature in a short time. It does not have a moving part, therefore, TEC has no noise, no wearing, a long life time, and high reliability. It also has a small size. The disadvantage of the TEC: to cool down a large thermal load, Freon compressor based cooling system might have a higher power efficiency.