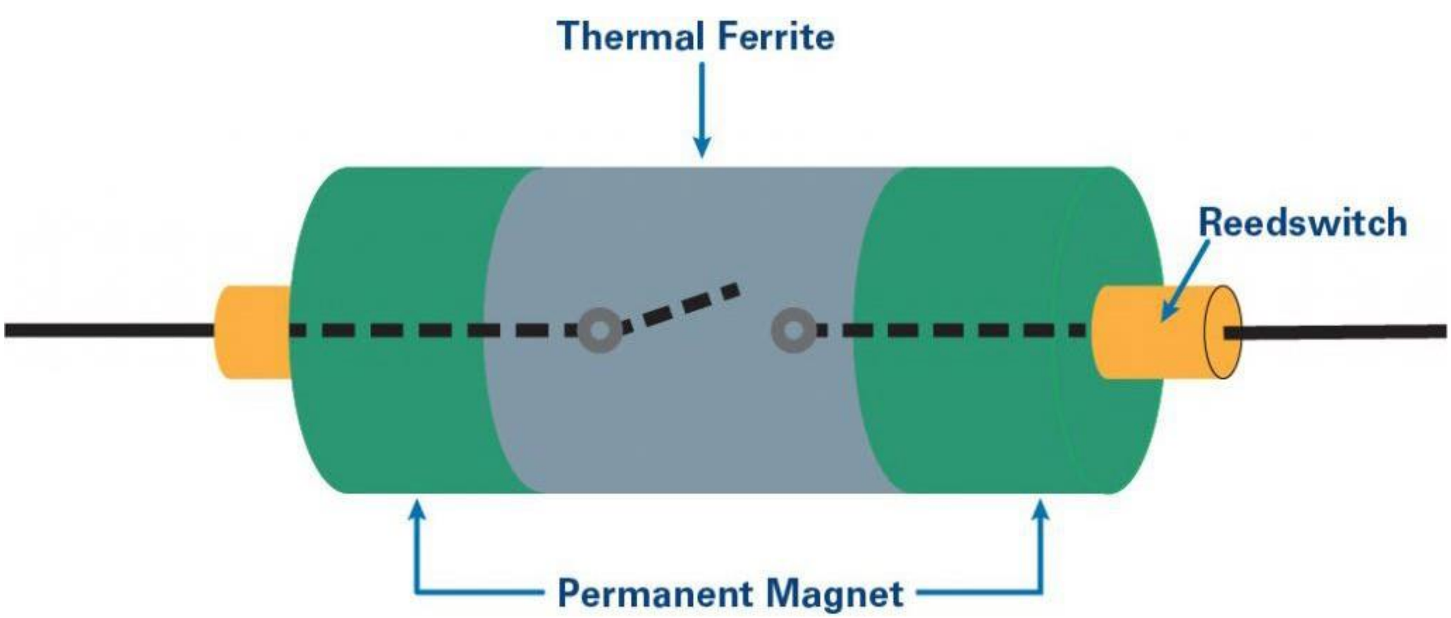
KEMET ENGINEERING CENTER

If it’s not Thermorite®, then it’s thermo-wrong

Introduction

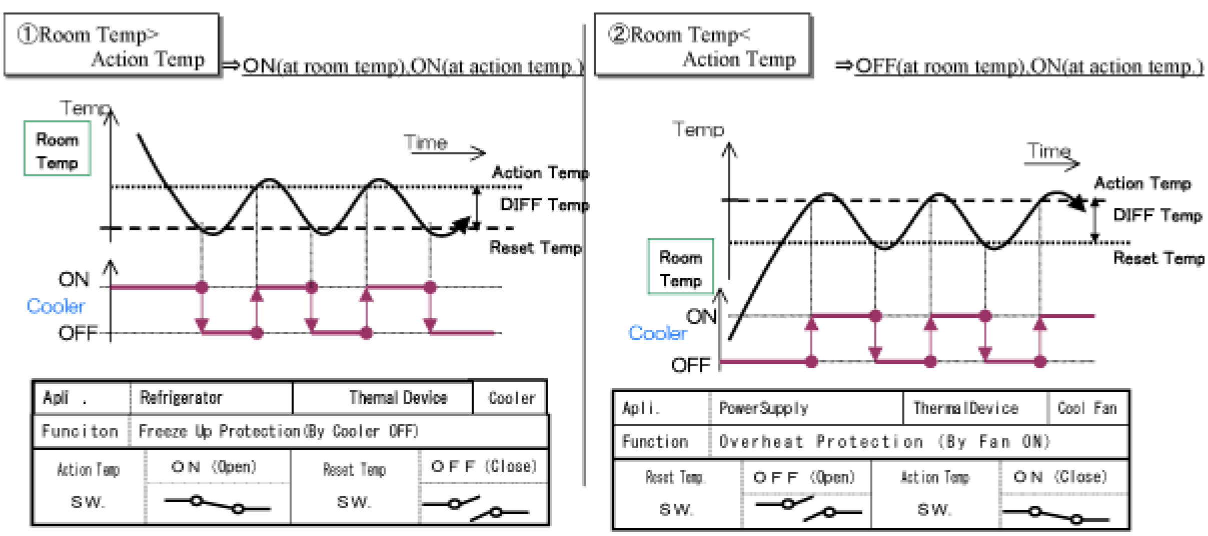
Now that my catchy title has your attention, let’s talk thermal switches. There has been quite a bit of buzz surrounding KEMET lately, particularly with our recent acquisition of the magnetics-centric company, TOKIN. “What do magnetics materials have to do with thermal switches,” you ask. I’m getting to that, impatient-pants!



The Physics

It all goes back to the famous French physicist Pierre Curie (also known for the work he and his wife did on radiation). Curie discovered that at a certain temperature permanent magnets will lose their magnetic properties. This temperature is now the so-called “Curie Point.” Fast-forward about a hundred years or so and enter scientists and engineers at TOKIN. They are a leading expert in manipulating the magnetic properties of materials so that they can be used in electronics. One way of manipulating the Curie temperature of a material is to add a very controlled amount of dopants. Careful control of particle size can also affect a material’s Cure Point. Using techniques such as this, TOKIN has created a material whose Curie Point can be very carefully controlled and adjusted. That material, known as Thermorite®, is now used in creating a thermal switch that opens or closes when that very specific and tightly controlled temperature is reached.

The Engineering



So let’s say that you want to cut off current to a heating coil as soon as a specific temperature is reached or you want to enable a cooling fan when that temperature is reached. Sure you can do that with the typical clap-trappery of a thermistor connected to the A/D input of a microcontroller and then that controls a power FET or a relay (oh yeah, and software).

If your application already has brains then I guess that could work. Thermorite®-based thermal switches can help bring down the overall complexity (cost) of your control system. Simply place the switch in series with the supply powering the element that needs to be shut off and no more current will be sent to it when the temperature reaches the desired level. The switch will then start to conduct again when the temperature falls. In the decades before Thermorite and before microcontrollers were commonplace, this function was accomplished with bimetallic elements. They mechanically deform with temperature in order to actuate contacts. If that sounds like it's prone to mechanical fatigue and failure then you're right.

Thermorite Difference

The thermistor solution or a solution based on bimetallic elements have been around for a very long time and still don't offer quite the same accuracy and overall robustness as a reed switch based on Thermorite. The response time of Thermorite-based thermal switches and relatively low hysteresis are far superior to that of bimetallic options. Admittedly, if you need to constantly need to monitor and log the temperature at any given time, then these are not the sensors for you.

One Last Word

The thermal switches are available in various voltage ratings, form factors, and trip points. They also come in normally open or normally closed configurations. So check out our series of thermal switches and you might find that you don't have to put in a microcontroller (and trust me, I love me some microcontrollers) just to turn on a cooling fan