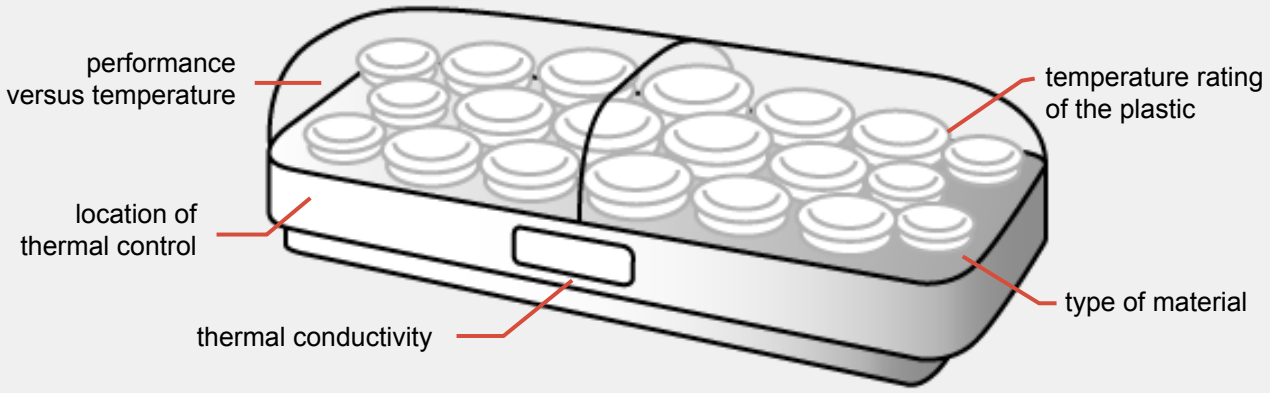
Design Considerations for Thermal Controls



Customization is key to optimum performance

The ambient environment surrounding a thermal control can have a big effect on how the device operates. No two application environments are exactly alike, even though the applications may share a similar function. The materials used for an appliance as well as many other design considerations vary from product to product. These variations greatly effect the operating environment of many products. So how can you expect the same thermal control to act in precisely the same manner in two different operating environments? By customizing the performance characteristics of our thermal controls to the exact needs of your application, we help create products that are safer, more reliable and less expensive to produce. This is the reason Portage Electric Products Inc. (Pepi®) has continued to invest our engineering resources to develop affordable customization options for our growing line of creep action, snap action and disc type thermal controls. There are many things to consider when selecting what you think is the best thermal control for your particular application. With our advanced capabilities in engineering, materials, production and prototyping, you might want to get a Pepi sales engineer involved early in the process.

The key is to think of the application as a whole. A thermal control device needs to be harmoniously integrated into your application. Consideration must be given to how and where your application will be used. What is the input voltage for your application? Is the applied voltage AC or DC? Is the current load resistive or inductive? All of these factors not only effect how a consumer uses your product but they also need to be considered when determining the function and operating characteristics of the thermal control. Does your application require a regulating thermostat or a high limit safety control? Do you need a device to open on temperature rise or close on temperature rise? What will the operating temperature range be for your application? Each of these variables influences the materials and components to be specified for your application.

Evaluating the desired design parameters for your application and at the ambient environment influencing the operation of the thermal control and the type of electrical load being applied will then serve as a starting point to maximizing performance through customization of our devices to meet your exact performance requirements. Customization enables to you to incorporate improved safety, better reliability, and enhanced performance into your application. You man even be able to reduce the cost of other materials and components used in manufacturing your products by using the right thermal control. The key is to think of the application as a whole.

Determining factors in selecting a thermal control

There are a number of determining factors that needs to be considered when selecting the right thermal control for your application. The first deals with the actual application itself. Based on the actual application various world wide safety agencies have determined a specific set of operating specifications to protect the end consumer. It is necessary to first select a thermal control that has been evaluated for use in the end application.

Once you examine the design parameters of your particular application, you can then determine the operating characteristics for the thermal control device. Almost each type of control comes in a variety of operating configurations from which you can choose. Do you need the device to open or close a circuit upon increases in the ambient temperature? Do you need an automatic reset device or a manual reset device or do you need a device that really does not reset at all? Or do you need a device which is called a self-hold thermal control which once it breaks the electrical circuit, an integrated heat source prevents the device from resetting until the power supply to the application is removed. There are thermal controls which meet the operating requirements of each application.

Once you select the desired performance parameters for the thermal control in your application, one must consider the applied voltage and operating current. Is the current load resistive or inductive? Will the thermal control be used to break or make the full electrical load or will it be used only to monitor the operating temperature. These factors aid in the selection process to determine the precise operating characteristics of the thermal control that is required to optimize the performance of the end product.

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Creep action thermal controls are a single bimetallic element that generally carries the circuit current in the application. These devices obtain their name by the slow break and make movement of the bimetallic element. These devices are excellent for use in temperature controlling applications. These devices have minimal differential between their break and make points which makes them excellent for use on low voltage DC applications and applications up to 125 VAC.

Snap action thermal controls also derive their name from the manner in which they operate. These devices normally utilize a specially formed single bimetallic element which increases the amount of temperature differential between their break and make points. The devices actually make a faint snapping sound when the bimetallic element activates due to increases or decreases in temperature. Because of their faster acting bimetallic elements this family of thermal controls is excellent for use in higher voltage and current applications, both on resistive and inductive type loads.

Disc type thermal controls derive their name from the actual form of the bimetallic element utilized in these devices. These devices are part of the Snap Action family of thermal controls in that they also use a specially formed bimetal member that reacts to increases or decreases in the operating temperature. However the bimetal member is a small round disc shape typically ½" in diameter. Some may be smaller or up to 1" in diameter but the overwhelming majority is the ½" disc type. In these devices the bimetallic element is normally electrically isolated from the circuit current so they are excellent for use in applications with the highest of all voltage and current requirements.

Once you determine the operating characteristics you require and what function the thermal control will perform, the next step is to determine how you are going to integrate the thermal control into your application. What is the operating environment of the application? What are the temperature limitations of any components and materials in the end application? It may be possible that based maintaining or limiting the operating temperatures of the whole application, you may be able to utilize other components or materials that enables you to reduce your costs. There is real value of selecting the proper thermal control device.

The importance of placement

Placement is an often overlooked but important consideration. The most obvious place to mount a thermal control would seem to be where the heat is being generated. However often this is not always the case. For example, if you are designing an oil-filled heater, you don't want to place the thermal device so close to the heat source that it barely allows the appliance to function. But you don't want it mounted so far away that the oil in the heater boils creating a potentially hazardous situation for the consumer. Determining the proper placement of the thermal control ensures that the end application performs to the intended performance criteria.

Customizing sensitivity

In many consumer products the primary function of a thermal control device is to limit the operating temperature in an application. In these applications, the main objective is to avoid catastrophe without rendering the appliance useless so the sensitivity of the thermal control is vital. The speed which a thermal control reacts (the sensitivity) can be customized to the application with relative ease.

Let's start with the bimetallic element which is the heart of the thermal control. There are many different bimetals which are available. Based on the type of materials used in the production of the bimetal, the operating characteristics of the thermal control can be tailored to match the specific design parameters of your particular application. This operating feature is especially important when a thermal control is being used as a high limit safety on inductive type loads. Increasing or decreasing the resistivity of the bimetallic element enables you to select a thermal control that maximizes the operating performance of the application while insuring a high level of safety to the consumer.

Benefits of customized controls (Getting what you want)

Now that you have selected a thermal control that optimizes the performance of your application, you can continue the customization process. You can select from a wide variety of options that enables you to receive a customized thermal control. You can choose the length of the lead wires and the type of insulation for the wire. Do you require an insulating sleeve to electrically isolate the thermal control? No problem, we can provide many different options. Tell us what you require and we will work with you to provide you with an engineered product that helps you reduce your costs.

Get us involved from the start

There's a lot of engineering knowledge and design experience packed into the tiny dimensions of our thermal controls. Unless you are thinking about thermal controls day and night, you might miss an opportunity to maximize safety and functionality and minimize cost. When you involve us as your partner early in the design process, we can help guide you through the various aspects of the selecting the proper thermal control to meet he needs of your application. We can perform our own in-house engineering evaluation of your application to assist you any placement issues. And our Sales Engineers can provide you with the details as to how we can customize our thermal controls to your specifications, not someone else's. Think of us as your engineering resource, not just as a supplier.

We come through when the heat is on®

Pepi®

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