

Select the Thermal Protection Your Design Deserves

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The addition of thermal protection is one of the most important steps in your design process. Thermal protection selection for high-end industrial, commercial, and power electronic applications, however, should not be an off-the-shelf exercise.

Here is a creative and reliable reference that addresses the correct way to approach the process of building or improving thermal protection for your design. The approach has one goal in mind: to deliver a customized solution that provides reliability, safety and durability. This white paper will review the most important aspects of how selecting the right thermal protection partner actually enables the innovation of a final thermal protection solution that works specifically for your design.

Starting with the End Result

Whether your goal is technical improvement, cost reduction, cost effectiveness, ease of installation/assembly, or simply to evaluate your thermal protection options, solving thermal challenges does not occur by repurposing yesterday's off-the-shelf products. It comes instead with an understanding of the thermal requirements to be achieved, an innovative mindset, and finding the wherewithal and expertise necessary to achieve your thermal goal.

An important aspect of selecting thermal protection in your design is defining and communicating where you want to end up. Is the goal, for example, UL approval, or short-circuit protection plus thermal protection? To begin here – with the end in mind – allows the designer to create a solution that matches exact and unique requirements.

The overriding questions become “what am I trying to achieve overall with this product, or how can I design it so that its life is extended, preventing it from ever getting to the point of catastrophic failure?” The only reasonable answer is to build the solution that you need. This, however, requires a partnership approach—working with a partner that fully comprehends what you are trying to achieve, who can identify the type of thermal protection capable of addressing the application, and that begin to modify what currently exists to end up with exactly what you need.

Finding a Partner-Worthy Guide

When considering thermal protection, there is only one provider that uniquely works with customers by starting at the end and moving to a custom solution that works. Spanning five decades, THERMIK has delivered the most reliable thermal protectors globally. Its unique approach is to, together with its customer, unlock opportunities and solutions that some consider unimaginable.

Holding more patents and intellectual property rights in the field of thermal protectors than all of its competitors combined, THERMIK's innovations include:

- Arc-free thermal protectors
- Round thermal protectors
- Flat thermal protectors

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Produced by:



- Pressure-resistant thermal protectors
- Current-independent thermal protectors
- Temperature-sensitive thermal protectors
- Defined current sensitive thermal protectors
- Self-holding thermal protectors
- Secured insulation caps
- Thermal protectors on the band
- High-temperature thermal protectors
- High-performance thermal protectors
- Hybrid thermal protectors

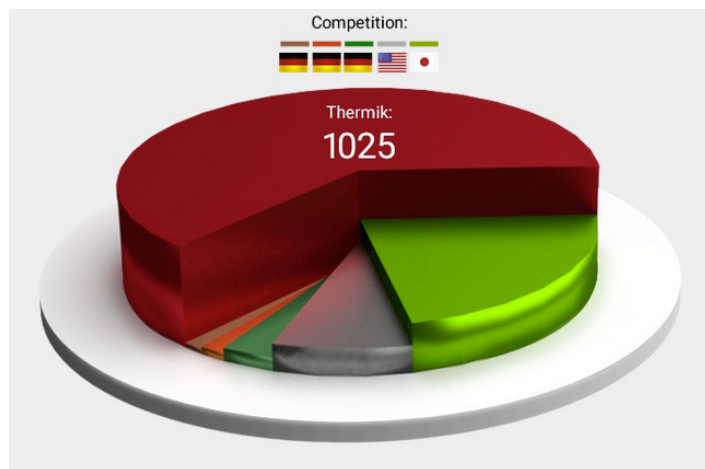


Figure 1: THERMIK holds the largest number of patents and customized thermal protection solutions globally.

More than 18,000 variations available in just the standard product range, and even more in special solutions, showcase THERMIK's unmatched capacity for product modification to meet specific customer requirements.

New THERMIK products and production developments include the design of protectors rated up to 100A, creation of the first-ever arc-free switch on the market, comprehensive third-party approval for products used in DC voltage applications, and intelligent investment in automated production. These advances continue to open up new opportunities.

THERMIK Technology and Advantages

The best way to see modification in action is to compare what exists in the marketplace with how THERMIK approaches thermal protection.

Traditional, simple bimetallic thermal protectors, for example, have engineering functionality and reliability limitations including (1) varying contact pressure, and (2) thermal protectors that do not open as contacts weld together. These factors increase safety assurance risks.

In comparison, THERMIK's patented "snap-action" spring disk mechanism sets it apart from other thermal protector designs. The functionality and reliability of bimetallic

thermal protectors can be significantly improved by snap-action technology. THERMIK's twin-disk design enables the temperature "calibration" to be built into the switch. Given that the bimetal disc is not electrically nor mechanically

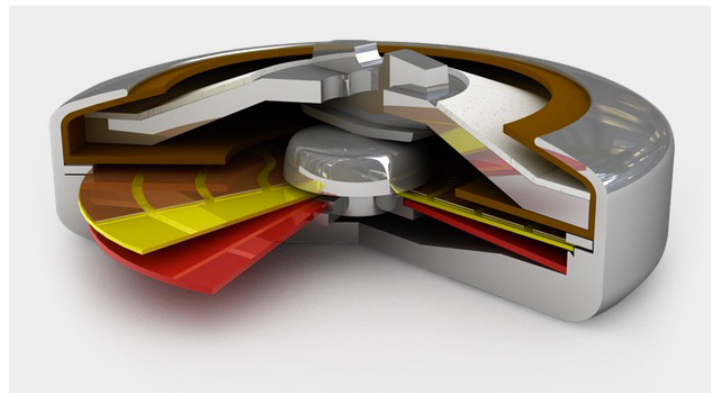


Figure 2: Thermal protection from THERMIK includes spring disks that significantly improve the switching behavior of bimetal thermal protection.

stressed, trip temperature does not drift during the switch life. With less stress and higher current-carrying capacity, there is lower contact erosion and greater service life.

Temperature Selection vs. Traditional Calibration

Traditional calibration methods involve adjusting or preloading internal spring pressure on the bimetal by bending or placing a dimple in the metal switch enclosure. For this method to work, the metal switch housing must be pliable, which introduces instability.

The traditional switch enclosures are typically made of thin metal stampings or extrusions. This leaves the switch sensitive to externally applied pressure that may unexpectedly change the calibrated trip temperature.

By using a twin-disk design, the bimetal disk is free-floating within the switch and only responsive to temperature. Calibration is achieved through a patented design and process. Every switch mechanism goes through a minimum of two complete cycles of 100 percent testing and forced selection. The thermal selection is performed by internally designed and built automated machinery, that identifies the temperature at which each individual bimetal critically alters position, tripping its switch.

The twin disk switching system forced-temperature selection process allows other advantages over traditional switch construction, including:

- THERMIK's Swiss Screw machined housing delivers very precise bearing surfaces for the two disks to bend against. The machined housing delivers a switch that has very strong mechanical characteristics and doesn't easily bend under winding pressure or any other customer-induced mechanical stresses.
- The stability of the switch allows for better seals.
- Over the life of the switch, the repeatability of the switch will always be plus or minus 1° from where it

tests out.

- Given the stability of that switch, it resists pressure. THERMIK's smallest switch, for example, can withstand 100 lbs. of static pressure on the switch without damage or changing the tripping point.
- THERMIK's small size and mass plus favorable heat transfer within the switch to the bimetal disk combine to deliver fast thermal response.
- THERMIK's low-mass moveable contact also minimizes contact bounce and provides shock and vibration resistance to 10g's.

THERMIK's snap-action disk is responsible for holding the contact in its natural position. If the contact is open, it holds it open, and if closed, it holds it closed. The bimetal disk responds to temperature. It is not connected in the current-carrying circuit.

The bimetal disk works in an opposite way from the snap-disk. The beauty of the system is that as the bimetal starts flexing, the snap-action disk is still holding the contact fully closed or fully opened. It is not reducing contact pressure or chattering. If the bimetal finally snaps over, it overpowers the snap disk causing the contact to switch.

When the bimetal is allowed to cool, it will ultimately snap back, and the snap action disk will then reclose or reopen the electrical contact. The benefit of having a separate bimetal disk is that it does not drift over time, but remains constant for the life of the switch and there is a pure response to temperature.

THERMIK selects the bimetal disks based upon their temperature characteristics, assembles the switch and performs thermal testing on 100 percent of the basic switches. These selection parameters can be changed to adjust thermal performance.

Additional THERMIK advantages include:

- Just-in-time manufacturing,
- Continuous refinement of production processes, tests and QA methods,
- The establishment and documentation of new processes,

- Production only follows 100 percent positive testing and quality assurance results.

Simply put, THERMIK builds a total quality process into every product. It takes what it has learned from every custom modification, adding the knowledge to its existing quality control, design, production and fulfillment capabilities. THERMIK innovates the products it sells and manufactures, using custom-designed machinery.

THERMIK's thermal protection is incorporated into such applications as:

- Motors
- Heaters
- Transformers
- Material handling
- Motion control
- Production machinery
- Drive technology
- Refrigeration
- Wind
- Pumping

Customers represent the who's who in their respective industry segments.

The real answer as to how to select the right thermal protection for your design is this: You don't. Instead, you select the right partner and together you build the right thermal protection into your design.

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ABOUT THERMIK

THERMIK is the only company able to walk you through the complete process to identify and implement exactly the thermal protection required for your design. The company's 600 employees on three continents at four production sites provide consistent and constant results. The resulting products that THERMIK creates with you match your exact requirements—no one else's.

Visit us at: www.thermik.de/en