The *Salamander* News

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Thermocouple Options

Thermocouple usage with ceramic heating elements continues to be a question of world wide concern. Having two manufacturing locations and selling our product to over 40 countries around the world, gives us an insight into our customer's thermocouple knowledge, preference and usage. One thing that everyone seems to have in common is "confusion" over what they need, what is available, and what they will get. To help in clarifying this, I have put together a chart to not only help in thermocouple selection, but also help in matching need with the price and performance of what is offered. This understanding will also be of help in evaluating the changes and improvements that are inevitable with the continuing development of the thermocouple.

Keep in mind that a thermocouple, as used in the ceramic heater industry, is a basic tool used to measure as closely as possible, the actual temperature reached inside the heat source. This temperature is then used as a guide to control or maintain the actual process temperature. A "thermoelectric couple" gets its name from using two conductors of different metals joined at the ends which produce a thermoelectric current when there is a difference in temperature between the ends. The industry has shortened the name to "thermocouple".

Thermocouples may be inserted into any heat source in different ways. Their placement, position, and method of securement, all have an effect on their accuracy and performance. Due to the solidity of ceramics and high temperature kiln firing needed to get it to that state, thermocouple usage has always been a challenge.

The initial approach, and still the most elementary, was to drill a hole (thermowell) into the tower of the element after it was completed, insert the thermocouple, and "pot" it in using a "potting" or ceramic material. The difference is, that this potting is not kiln fired. It merely dries, giving a loose placement to the thermocouple which may later crumble and cause the thermocouple to fall out. Placement is also difficult and often inconsistent. It is impossible to know just how close it comes to the surface of the element.

Several ceramic heater manufacturers decided to improve on this system by actually "casting in" the thermocouple at the same time they are manufacturing the element. This method assured secure positioning and accurate placement. The problem comes in the tolerance of the wire to the two, sometimes three, intense kiln firings. High heat can cause the fragile thermocouple wire to become brittle and break off easily, creating a high failure rate in manufacturing and a limited lifespan in the field.

Infrared Internationale is, to date, the only manufacturer to offer a third possibility in our creation of the springform, interchangeable, thermocouple. This concept relies on the use of the drilled in thermocouple well, but provides a secure fitting and the ability to remove or replace the thermocouple as needed. Placing wells in all of our elements, gives the potential for all *Salamander* elements to have a temperature sensor installed.

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Unfortunately, none of these types are perfect. We are still in the process of researching a more tolerant wire for the cast in, fast response thermocouple, but even when that problem is resolved, the FRK will never offer the accessibility that the interchangeable thermocouple can offer.

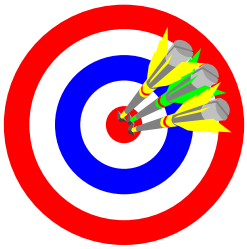
The chart below is devised to help you discover the current thermocouple option that is best for each of your specific applications. This chart should be used for each temperature sensing need and no one option should ever be selected as "standard".

	Potted-in	**Cast-in "FRK"**	**Interchangeable**
Price	Low	Average	High
Accuracy	Not Consistent	Consistent	Consistent
Stability	Low	Moderate	High
Flexibility	None	None	Very
Availability	Made to Order	Made to Order	Stock
Responsiveness	Slow	Very Fast	Slow
Type J	Yes	No	Yes
Type K	Yes	Yes	Yes
Vibration Tolerance	Low	Moderate	High
Heat Tolerance	Low	High	High

Application Quiz #1

Test Your Skill

How would you quote the application below with the use of *Salamander* ceramic infrared emitters? The answer will be printed next month.



The owner of a small printing shop calls and would like information on a way to dry his product. He prints with a water soluable ink on a 4' X 4" canvas material. He can allow 30 seconds for drying the ink before the product is rolled. He produces the product one at a time. The product weighs 1.2 lbs. when dry and 1.6 lbs when wet. He has access to 240V, single phase. What would you suggest?

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