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# Thermocoax Pressurizer Heaters

## From the Nuclear Parts Center

### Achieve improved efficiency through superior design

## Challenge

During plant upgrades or pressurizer heater replacements, utilities need equipment that is reliable and durable. The challenge is to implement an efficient pressurizer heater solution while maintaining superior reliability.

## Solution

Framatome and Thermocoax have teamed together to provide technologically superior pressurizer heaters. Thermocoax has applied their extensive mineral-insulated cable and heater manufacturing experience for an enhanced design. Add in the manufacturing expertise, industry-leading nuclear engineering and ASME code design of Framatome, and the results are second to none.

## Superior Heat Transfer and Efficiency

Exceptional heat transfer characteristics are achieved by our design. It features a heating element wound helically on a copper core, ensuring uniform heating along the length of the heater. Our design also features a cold section with a monel core. The entire assembly is inserted into a stainless steel sheath and swaged to ensure outstanding thermal transfer and durability. The heaters employ a thinner layer of insulation of magnesium oxide (MgO), which in turn increases heat transfer. This compact insulation is rated to withstand high-heat flow with outstanding integrity, easily accommodating the system's maximum heat flow.

The heaters are more efficient because they reduce the temperature difference between the resistance wire and the external tubing. Computer analysis shows a temperature variation between the resistance wire and the external tube of less than 300°F for specific power with much less variation than conventional systems.


## Customer benefits

- Rugged construction
- Qualified 1E according to IEEE Std 323
- Superior temperature uniformity
- Reduced MgO content
- Double barrier to MgO
- Not sensitive to primary water stress corrosion cracking (PWSCC)
- No swelling; easily removed if necessary
- Higher wattage heaters may allow fewer nozzle penetrations

**Your performance**
is **our** everyday **commitment**

## Increased Reliability and Durability

Our heaters provide increased reliability compared to conventional pressurizer heaters. When subjected to demanding aging tests (1E qualification process according to IEEE Std 323) that simulate temperature, vibration and radiation stresses over a 60-year lifespan, as well as seismic tests and loss of coolant accident (LOCA) tests, these pressurizer heaters suffered no failures.

Superior durability is achieved by our design and manufacturing processes. Our heaters are designed, welded, inspected and ASME code marked under Framatome's ASME Code Program. Framatome also supplies all ASME code materials to Thermocoax for use in addition to their high-quality materials for the heater internals in their ISO and NQA-1 certified manufacturing facility.

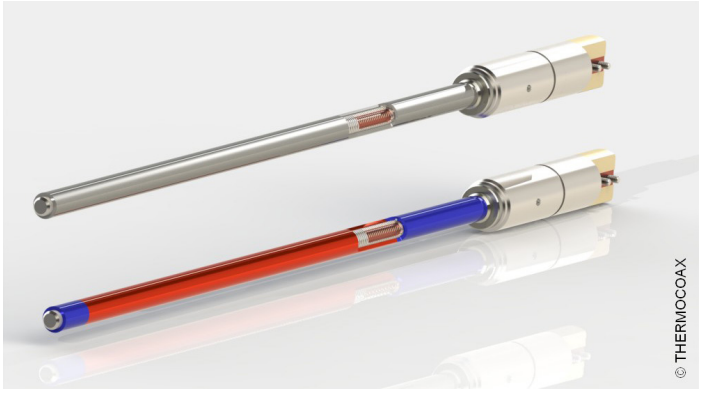
Our design adds a special, thermally-treated outer stainless steel sheath and a secondary sheath over the heating element. These two barriers between the primary system and the MgO, as well as the reduced amount of MgO, ensure our heaters do not swell in the unlikely event of water ingress. The Framatome material and stress-relieving process have been employed on all heaters supplied since the mid-1980s, and there have been no industry reports of heater sheath failures.

Since the mid-1980s, Framatome has supplied more than 1,000 replacement pressurizer heaters to U.S. nuclear power plants of various designs. Framatome has recently fabricated and supplied ten horizontal pressurizer heater bundles with 39 heaters per bundle for nuclear power plants in the U.S. In their 60+ years of experience, Thermocoax has supplied more than 12,000 pressurizer heaters worldwide.

## The Nuclear Parts Center Advantage

**In-stock Parts 24/7/365**

- Manufacturing, engineering and ASME code design expertise
- Technologically superior pressurizer heater product
- Manufacturers audited and approved by Framatome
- ISO 9001 and 18001 certified
- ASME code parts and equipment




## Technical Design Features and Options

- Available as single- or three-phase with power ratings from 12.5 kW to 50 kW
- Connector configurations available to accommodate high-temperature environment and existing plant cabling
- Optional engineering support can help you implement design changes or provide welding services for field installation of replacement pressurizer heaters
- Applicable for all PWR designs
- Can be designed and manufactured as replacements for installed heaters — with the same electrical and mechanical interface
- Can be provided as part of a plant upgrade or pressurizer replacement

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