



FurnaSure

WHITE PAPER | 1290°C FURNACE INSULATION

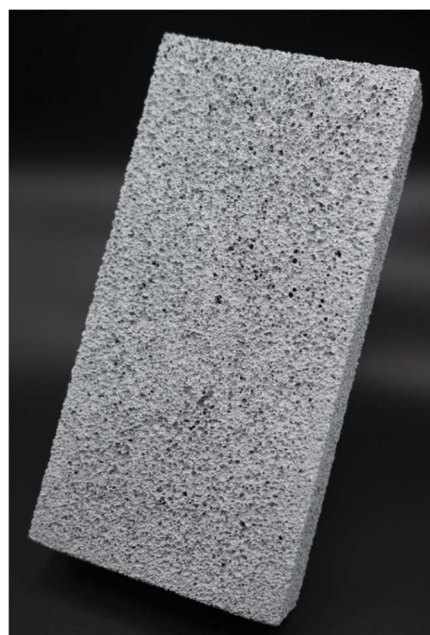
Low-mass, machinable insulation for compact, fast- cycling furnace systems

For furnace users and furnace makers who need a lighter, cleaner, more responsive alternative to commodity insulating firebrick in thermal systems.

Built around the useful hot zone.

FurnaSure(TM) is a white-coated ceramic foam insulation product for 600°C to 1290°C furnace applications. Its value is not only in reaching temperature, but in making the furnace around the work zone smaller, lighter, cleaner, and faster to cycle.

The material combines very low density, low thermal conductivity, high electrical insulation, easy machining, strong cement bonding, cryogenic stability, and severe thermal-shock tolerance in a rigid ceramic format.



White-coated ceramic foam: rigid, low-mass, and cleanly machinable.

0.15-0.20 g/cc	0.05 W/m-K	1290°C
density	thermal conductivity	maximum operating temperature
1000°C/sec	white coated	machinable
thermal-shock tolerance	cleaner working surface	holes, curves, edges

Cryogenic Applications

FurnaSure is also stable down to liquid nitrogen temperatures. It is ready to use -200°C to 1290°C

A one-cubic-foot active-zone comparison

K23 insulating firebrick is a familiar, economical benchmark. FurnaSure is not trying to replace K23 everywhere. Its best use is where the oven builder cares about the whole system: shell size, door weight, heat-up time, cool-down time, removable liners, custom shapes, and clean handling.

In this design-screening model, a 12 in. x 12 in. x 12 in. chamber is insulated either with 4.5 in. of representative K23 or with 1.0 in. of FurnaSure. The wall packs have roughly comparable conductive thermal resistance, but the FurnaSure build uses far less insulation volume and stores far less heat.

Design item	K23 IFB build	FurnaSure build
Active hot zone	1.0 ft ³ cube 12 in. cube	1.0 ft ³ cube 12 in. cube
Illustrative wall thickness	4.5 in.	1.0 in.
Approx. conductive resistance	0.48 m ² -K/W	0.51 m ² -K/W 7% higher
Outer furnace envelope	21 in. cube 5.36 ft ³ outside volume	14 in. cube 1.59 ft ³ outside volume
Insulation volume	4.36 ft ³	0.59 ft ³ 86% less
Estimated insulation weight	~140 lb	~7 lb 95% less
Stored heat to reach 1100°C	~68 MJ	~2.7 MJ 25x less
3 kW insulation heat-up burden	~6.3 hours	~15 minutes
Cycle implication	High thermal inertia; cycle often slowed by brick package.	Low thermal inertia; cycle driven more by load and controls.

Design takeaway

FurnaSure lets a furnace maker trade "more brick" for a much smaller thermal package. Less dead thermal mass means the furnace can respond more quickly, the enclosure can be smaller, and removable pieces such as doors, plugs, roofs, and liners can be dramatically lighter.

Calculation note: Comparison is a design-screening model, not a furnace warranty. Assumptions include a cubic 1 ft³ active zone; representative K23 thermal conductivity of 0.24 W/m-K at 1100°C and density of 0.513 g/cc; FurnaSure thermal conductivity of 0.05 W/m-K and representative density of 0.18 g/cc; specific heat of 1.0 kJ/kg-K for K23 and 0.85 kJ/kg-K for FurnaSure. Final suitability must be validated in the customer's furnace, atmosphere, duty cycle, and acceptance framework.

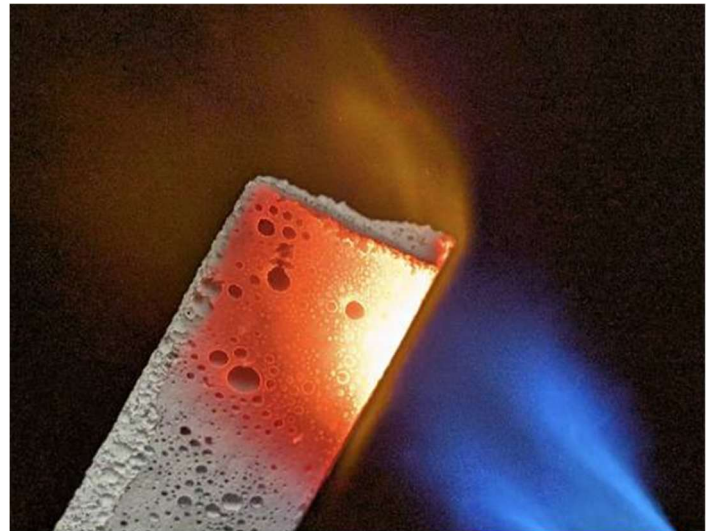
FurnaSure

Shock tolerant | machinable | electrically insulating

Thermal-shock tolerance for induction furnaces

FurnaSure is not only a low-mass insulator; it is a shock-tolerant one. The material can withstand temperature shocks of approximately 1000°C per second, helping it tolerate rapid heat-up, cold-to-hot transitions, and localized thermal gradients that would be risky for many rigid ceramics and friable insulation boards.

That matters in induction furnaces, where the workpiece, susceptor, or local fixture can heat much faster than the surrounding insulation. A material that survives fast, uneven heating gives furnace designers more freedom to place insulation close to the hot work and use tighter, more useful geometry.



Designed for aggressive thermal transitions, not just steady-state insulation.

MACHINABILITY + BONDING

FurnaSure can be machined in its final fired state using saws, drills, CNC tools, lathes, and hand tools with appropriate dust protection. It holds sharp edges unusually well for a highly insulating ceramic foam, making small holes, curved cutouts, element clearances, thermocouple ports, gas passages, interlocks, and replacement liners practical.

It also bonds well with a wide range of normal high-temperature oven cements and refractory cements when the joint is properly designed and applied.

CLEAN, STABLE HARDWARE

FurnaSure is designed as a chemically stable, electrically insulating ceramic foam for long-duration service up to 1290°C in appropriate furnace environments. It is also stable down to liquid-nitrogen temperatures, making it useful where parts see cryogenic handling, cold-side exposure, or large temperature swings before returning to heat.

BEST-FIT PARTS

- Furnace liners, door plugs, access panels, and tube-furnace plugs
- Removable insulation inserts, baffles, shields, sleeves, and covers
- Low-load shelves, setters, spacers, sample holders, and custom fixtures

SUGGESTED EVALUATION PATH

Start with one removable part: a door plug, observation-port block, sidewall insert, baffle, cover, induction-furnace shield, or sample fixture. Track shell temperature, heat-up and cool-down time, energy per cycle, visible shedding, cement-bond integrity, dimensional stability, and handling durability after repeated cycles.

Bottom line: FurnaSure gives furnace makers a practical option between commodity insulating firebrick and very expensive specialty refractory boards - compact, clean, custom, and responsive up to 1290°C.