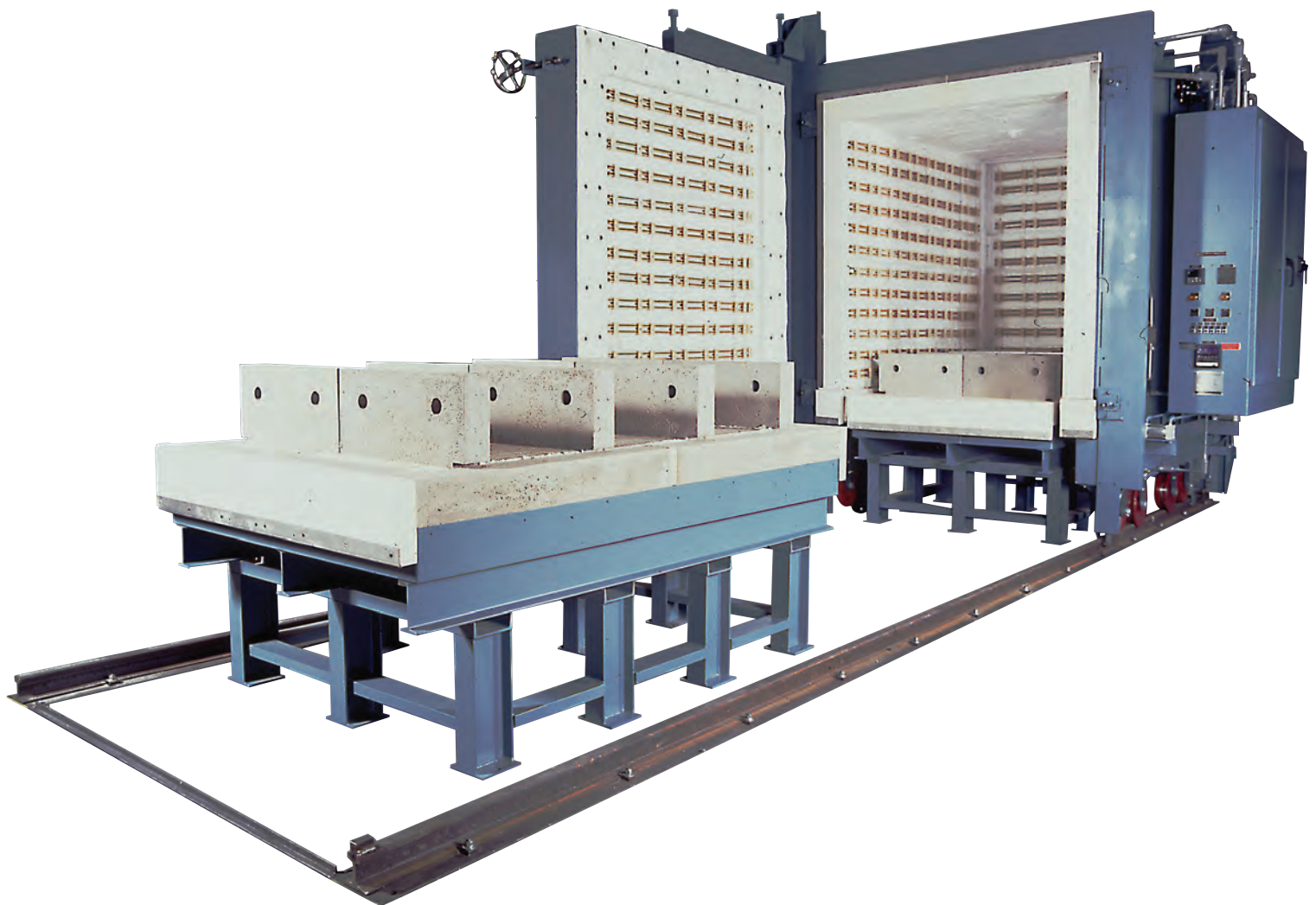


SHUTTLE / ENVELOPE KILN (MOVING KILNS WITH FIXED BASES) 2,200°F (1,200°C)

APPLICATIONS

The FS Series Shuttle Envelope Kilns are primarily designed for the firing of ceramic ware. Each furnace includes two fixed stationary bases and a moving kiln that "shuttles" between the two bases. The stationary bases provide a stable platform for loading delicate ceramics. The base is easy to load because it can be loaded from all four sides once the kiln is shuttled out of the way. Normally, the kiln is removed from the fired ware at a fairly high temperature for fast cooldown in the slowest part of the cooling curve. This greatly enhances the efficiency of the whole system. The entire kiln is built for heavy-duty daily production and easy in-house maintenance.



FEATURES

SHUTTLE CASE DESIGN

The case is a heavy-duty fabrication that is carefully built to prevent bowing in (which can be a problem with having no bottom structure in the case). Two bases and a complete track system are included with the furnace. Stops are built into the track system to prevent overtravel. The entire case, bases and car are primed with 800°F silicone paint and finished in machine enamel.

GEARED KILN MOVER

The kiln is moved by one man with a geared manual turnwheel located on the side of the kiln. This is geared for easy movement. The kiln moves on railroad-type flanged wheels. In addition, there are horizontally mounted roller bearings that maintain a horizontal pressure on the track system to retain the squareness of the kiln and prevent potential tipping.

CERAMIC FIBER INSULATION

The kiln sides and roof are typically lined with 10" of 10-pound density 2,300°F ceramic fiber insulation blocks. This provides a highly efficient insulation that has low heat storage of 2,635 BTU per square foot, heat loss of 209 BTU/square foot/hour and case temperature of 176°F when operating at 2,200°F. This results in about a 30% energy savings over standard firebrick construction.

LAP-TYPE BASE/KILN JOINTS

The seal between the kiln and the bases consists of a close tolerance lap joint. This effectively prevents radiation transfer of heat. The slight air gap (less than 1/2") allows for an air inlet when using the optional venturi cooling system. The seal surfaces are both dimensionally stable castable refractory.

CASTABLE BOTTOM AND VESTIBULES

The bases have 8" of poured castable refractory. The material chosen is a special, extremely lightweight castable that still retains great mechanical strength while being reasonably energy efficient. The door vestibules and base seals are also made of the same castable refractory. They are poured in replaceable sections that bolt onto the furnace frame.

HEAVY-DUTY POWER GRADED ELEMENTS

The elements are located on the sides and two doors. These are made of coiled heavy gauge iron-aluminum-chrome alloy wire (Kanthal A1 or equivalent). They are mounted on alumina rods (not subject to sag, like cheaper mullite rods), which in turn are mounted on heavy ceramic blocks along the walls. The alumina rods allow the coiled elements to be completely exposed to the air. This helps maintain cool element temperature, which is critical at these high temperatures. The wattage of the elements is graded top to bottom to promote good temperature uniformity.

HORIZONTAL DOORS

There is a door at either end of the kiln. Both doors are opened while

the kiln is being moved. The doors are on heavy-duty single pivoted hinges. The door seal consists of folded ceramic fiber blanket that compresses against the hard castable refractory vestibule surrounding the door. Two mechanical latches close the door.

ZONED POWER CONTROL

The element circuits are separated into four heating zones (end-top, end-bottom, sides-top, sides-bottom). This promotes temperature uniformity in the kiln. Each of these zones is typically controlled with percentage timers that control time on and time off for the elements. Optional SCR power controls are digitally biased. A separate four-loop PID control is also available.

DIGITAL PID CONTROL AND HIGH LIMIT SYSTEM

The standard control is a Honeywell UDC 2500 digital PID 3 mode tuning control. All fuses, transformers, contactors and controls are located in a NEMA 12 panel with a panel mounted fused disconnect switch. Power control is normally solid-state contactors. The thermocouple type is typically type R. Thermocouple break protection is included. Limit switches shut off furnace power if the car is lowered. Control voltage is transformed to 120 volts. A Honeywell UDC 1200 digital high limit back up control with manual reset, backup contactors and separate thermocouple is standard. The control circuit and each power branch circuit are fully fused. Includes single point power connection. Meets National Electrical Code.

TESTING AND INSTRUCTIONS

The furnace is power tested to ensure circuit integrity. A complete instruction manual includes easy startup instructions, theory of operation, maintenance instructions, general dimension and layout drawings, assembly drawings, parts list, and a detailed troubleshooting guide. A ladder logic diagram and panel layout are prepared on CAD for easy readability.

WARRANTY

The furnace is warranted for one year except for elements and thermocouples, which are warranted for six months.

OPTIONS

- **RAMP/SOAK PROGRAM CONTROLS**
- **MULTI-ZONE CONTROL:** Honeywell HC 900 multi-zone control with up to 6 PID loops with separate SCR power controls for high uniformity.
- **JIC ELECTRICAL:** Control panel is NEMA 12 and includes a fused disconnect switch.
- **AUTOMATIC KILN MOVING:** Includes electric vertical doors, electric car drive and logic control for automatically moving kiln.
- **POWERED VENTURI VENT:** Motor-operated venturi vent and pneumatic dampers can be programmed.

SPECIFICATIONS

Model Number	Working Dimensions			Inside Dimensions			Outside Dimensions			Total Length	Work Cubic FT	K.W.	Load Weight	Ship Weight
	W	H	D	W	H	D	W	H	D					
FS 224	30	48	48	38	54	56	88	92	80	196	40	86	750	7,400
FS 246	30	48	72	38	54	80	88	92	104	244	60	113	1,125	9,300
FS 2412	30	48	144	38	54	152	88	92	176	388	120	192	2,250	15,300
FS 2424	30	48	288	38	54	296	88	92	320	676	240	351	4,500	27,200
FS 4512	48	60	144	56	66	152	106	104	176	388	240	267	3,600	19,600
FS 4524	48	60	288	56	66	296	106	104	320	676	480	478	7,200	34,800

NOTES: Dimensions are in inches, weight in pounds. Other sizes are available. Total length is for one kiln with two bases. Gas fired units are available. Inside dimensions increase for the same load size. All voltages are available. Hearth height is 24" from the floor. Specifications are subject to change without notice.

20 Kent Road • PO Box 2129 • Aston, PA 19014 T: 610.459.9216 • F: 610.459.3689 • lffurnace.com • sales@lffurnace.com