



## DESIGN BENEFITS

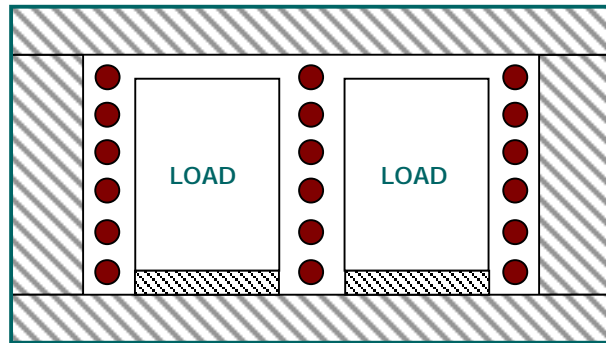
- Energy efficient and durable ceramic fiber insulation system
- Exceptional temperature uniformity for dense loads
- Precise control of heating and cooling rates throughout load
- Cars on wheels and rail to facilitate loading and unloading
- Smooth, trouble-free electromechanical elevator mechanism
- Automatic damper system for venting process volatiles
- Forced air venting and convective cooling system included
- Highly reliable automatic process control system
- Ease of operation and maintenance
- Built-to-order sizes and configurations are also available

## Keith 1500°C *FastHeat* Bottom Loading Furnace Model KECG (2-10) 14 14 2750

Revision 7.6.05

Keith multi-stack furnaces provide exceptional temperature uniformity during heating and cooling for processes that require precise temperature control to 1500°C/2750°F.

The load is divided into multiple stacks separated by heating elements in the furnace chamber. This design has proven to be highly effective for firing advanced ceramics, electronic components, nanomaterials, and a wide range of temperature-sensitive products.



## This furnace is available from stock

This document contains the complete technical description for a Keith bottom loading FastHeat furnace suitable for operation to 1500°C in an air atmosphere. This furnace system is shipped ready for installation and connection to the purchaser's utilities.

## FURNACE DIMENSIONS

### Usable Work Space

2 adjacent hearths 10" wide x 14" high x 14" deep

### Chamber Size

36" wide x 18" high x 18" deep

### Outside Dimensions

50" wide x 92" high x 36" deep

### Footprint with track

110" wide x 40" deep



## CONSTRUCTION

### Furnace Structure

An outer sheet metal shell encloses an inner framework that supports the fiber refractories. The shell is an integral part of the main floor standing support frame. A space between the outer shell and the refractory lining ensures comfortable outer skin temperatures. The perforated roof is removable, as are the side panels of the steel shell, providing easy access to the refractory fiber lining and the electric heating elements.

### Insulation System

The furnace lining features a 4-inch thick high purity, lightweight, Rath brand alumina fiberboard construction designed for maximum energy efficiency and thermal performance. *Keith's* proprietary fiber design allows for the thermal expansion and contraction that the fiber undergoes at elevated temperatures and during cooling. This special construction insures minimum bending stresses for the material while reducing the otherwise destructive cracking of the walls. This means that this durable lining will last longer and need little maintenance.

### Hearth Plug

The hearth plug is a fiber platform mounted on a wheeled car assembly above the lifting mechanism. The platform is lined with the same materials as the heating chamber. The refractory fiber lining forms a plug which projects into the furnace creating an effective heat-seal. The customer is to supply all furniture above the fiber floor.



### Loading Car

One loading car is supplied with this furnace. Track that extends to either the right or left of the furnace to facilitate loading and unloading is also provided.

### Lifting Mechanism and Frame

The hearth platform is moved up and down by means of a motor driven electrically operated lifting mechanism. Fully automatic operation of the elevator hearth system is achieved through the use of push buttons and limit switches. The lifting mechanism frame also serves as a stand for the furnace. The hearth pedestal is accessible from all four sides of the frame.

## HEATING SYSTEM

### Heating Elements

This furnace is heated using silicon carbide heating rods in three vertical columns of 6 elements per column that divide the loading space into two sections. A total of 18 heating elements are used. This heating system arrangement provides maximum temperature uniformity throughout the load. Element connections are made from the front and back of the furnace.

### Heating Power

The maximum heating power rating of this furnace is 18 kW, which will enable a 175-pound load to be heated to 1400°C at 2-3°C per minute.

## EXHAUST AND COOLING SYSTEMS

### Automatic Damper

A three-inch diameter exhaust hole in the center of the roof is covered with a motorized damper plug assembly. The damper operates through an event in the temperature controller. It can be used to open the damper automatically for venting of process volatiles or faster cooling.

### Forced Air Cooling

Four air injection ports introduce cooling air into the heating chamber. These ports receive forced air from a supplied blower through a manifold with manually adjustable valves. The blower is activated using the same event as the automatic damper.

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## TEMPERATURE CONTROL SYSTEM

### Control Panel

All control equipment is installed in a ventilated space beneath the furnace chamber. Instrumentation and all control switches are placed for convenient viewing and are well labeled for ease of operation. The electrical installation of the furnace involves little more than connecting the main electrical service to the furnace power leads because all other internal wiring is provided fully connected.

### Temperature Control

A West model 4400 Programmable Controller is supplied as the standard programmer for these furnaces. The 4400 features 8 totally independent programs each with 16 segments. Programs can be joined to create longer programs with more segments.



### High-Limit Protection

A West model 6700 controller provides furnace over-temperature protection in order to prevent possible damage to the furnace or your process caused by exceeding a user definable maximum temperature rating. In the event of an overtemperature condition, a power contactor will shut off the furnace heating power.

### Thermocouple

One (1) type R platinum-rhodium duplex thermocouple is supplied. One leg of the thermocouple is used for temperature control; the other leg is for high-limit protection.

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## ELECTRICAL POWER

### Power Control System

Power is controlled through three phase-angle fired SCRs with current limiting and power feedback. The power feedback feature automatically compensates for the aging of the silicon carbide heating elements, ensuring the most consistent firing results possible. This system also eliminates the need for a tap-changing transformer.

### Electrical Requirements

The complete furnace is wired for connection to a 480 Volt, 60 Hertz, 3-phase power source. Only one electrical connection is necessary for all power and temperature controls.

## TESTING AND DOCUMENTATION

### Testing

The furnace undergoes comprehensive functional testing prior to shipment. No heat is applied to the furnace during these tests to prevent embrittlement of the insulation. A simulated electrical load is used to setup and test the power control system.

### Documentation

One complete Operating and Service Manual including installation instructions, drawings of the electrical system, a troubleshooting guide, and a detailed list of replacement parts is provided.

## INSTALLATION AND MAINTENANCE

### Installation

Simply position the furnace where desired on a good level surface and ensure that the circuit breaker is suitable for the electrical load. Install the heating elements and thermocouple, which are packaged separately to avoid shipping damage. A single electrical connection is made from your circuit breaker to the furnace.

### Maintenance

This furnace has been designed to simplify and minimize maintenance. Repair parts for this furnace are always available – even a complete refractory lining kit should you need one after many years of satisfactory operation. A complete list of spare parts is included in the Operating Manual for future use. We suggest you include spare heating elements and thermocouples with your furnace order.

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