

HTG SERIES

LARGE HOT ZONE GRAPHITE FURNACES

The HTG Series of high-temperature, large hot zone graphite furnaces includes cylindrical and cubical hot zone models, in both top and bottom loading configurations. Typical applications for these furnaces are sintering, heat treating, melting, and alloying. Operating atmospheres are vacuum, inert, or reducing. The addition of optional muffle tube assemblies to some models also permits working in air or oxidizing atmospheres.

Basic systems include the furnace, support stand, manual power supply, and either a motor driven hearth elevator (bottom loading) or a counter-weighted door (top loading). The graphite hearth in either configuration will support loads weighing up to 300 pounds (136 kg). Among the available accessories are automatic temperature control, programming, and recording; gas control and safety systems; and vacuum pumping systems.

CYLINDRICAL

HOT ZONE MODELS

Listed in Table I are the three models with cylindrical hot zones. Maximum temperature capabilities are based on hot zone and power supply sizes. Standard models feature a vertical hot zone with bottom loading hearth. Special modifications to permit top loading or horizontal operation are available.

Heat up time to maximum temperature is typically less than one hour. With an inert gas flow, cool down from maximum temperature to 100°C can be accomplished in approximately 5 hours.

MODEL	HOT ZONE SIZE	MAXIMUM TEMPERATURE	POWER SUPPLY
HTG-6590-30*	6.5" I.D. x 9" high (165mm x 229mm)	3000°C	64 kVA
HTG-5080-25*	5.0" I.D. x 8" high (127mm x 203mm)	2500°C	40 kVA
HTG-7010-25	7.0" I.D. x 10" high (178mm x 254mm)	2500°C	50 kVA

*Can be equipped with optional aluminum oxide muffle tube assembly. Smaller power supplies are available for lower maximum temperatures and/or reduced heating rates.

CUBICAL

HOT ZONE MODELS

The cubical hot zone models in Table II can be specified for either top or bottom loading. For bottom loading, the hearth elevator is motor driven. For top loading, a counter-balanced, swing-away lid is provided.

At full power maximum temperature can be reached in approximately 2 hours. Cool down time from maximum temperature to 100°C is approximately 8 hours.

MODEL	HOT ZONE SIZE	MAXIMUM TEMPERATURE	POWER SUPPLY
HTG-16-20*	16" x 16" x 16" (406mm x 406mm x 406mm)	2000°C	180 kVA
HTG-14-22*	14" x 14" x 14" (356mm x 356mm x 356mm)	2200°C	180 kVA
HTG-12-25*	12" x 12" x 12" (305mm x 305mm x 305mm)	2500°C	180 kVA

*Add -T suffix to designate top loading
Add -B suffix to designate bottom loading
Smaller power supplies are available for lower maximum temperatures and/or reduced heating rates.

POWER SUPPLY

FURNACE CONSTRUCTION

Heating elements are high-density graphite. In the cylindrical hot zone models insulation is all graphite felt. In cubical models insulation is a combination of graphite felt and carbon powder. Both models have a graphite radiation shield to isolate the insulation from the hot zone and facilitate element replacement.

The furnace shell is of double-wall water-cooled stainless steel construction. Bulkheads are nickel-plated aluminum with integral water cooling channels and O-ring seals. Leak rate of the furnace chamber is certified to be less than 10^{-7} std. cc/sec., by helium mass spectrometer test.

Two radial ports are located at the midpoint of the hot zone. One port is equipped with a 9/16" (14.3mm) diameter-viewing window with anti-fog gas diffuser. The second port is plugged but can be used for a thermocouple or a pyrometer. Mechanical vacuum pumping port with valve, gas inlet and vent ports and a pressure relief valve port are provided on the bulkheads.

The furnace chamber is designed and manufactured for pressure capabilities from vacuum to 15 psig positive pressure, in accordance with all applicable provisions of ASME Code for Boilers and Unfired Pressure Vessels. The chamber can be optionally registered with the National Board of ASME.

The manual power supply includes a silicon controlled rectifier power regulator and a step-down load transformer. Furnace power is activated through panel-mounted push buttons and a magnetic contactor. An ammeter indicates primary current. A safety interlock with warning lamp, audible alarm and operate/reset switch with mode indicating lamp monitors cooling water flow and optional alarm circuits.

Power is manually adjustable from 0-100% by means of a panel mounted, digital set, 10-turn potentiometer. A front panel jack will accept a *ma* or *dc* output from an external temperature controller to automatically control power supply output. Except for the separately enclosed load transformer, all power supply and control components are housed in a floor console to which the standard, modular temperature control accessories can be added.

FACILITY REQUIREMENTS

Electric: 440/480 volt, 60 Hz, 3 phase
or 380 volt, 50 Hz, 3 phase

Water: 8 to 12 gpm at 50 psi differential; 65-85°F
(30 to 45 l/min. at 3.5 kg/sq. cm., 18-30°C)

Space: Max. floor area 10' x 10' (3m x 3m)

Height: 7' (2.1m)

ACCESSORIES

Automatic Temperature Control - 3-mode, current proportioning, digital set point instrument with a millivolt scale.

Temperature Sensors - Recommended are type C with a tungsten-coated moly sheath thermocouple for temperatures to 2000°C, or a radiation pyrometer for temperatures above 2000°C.

Automatic Power Control - Utilizes a power transducer to maintain selected power levels without temperature feedback.

Temperature Programmers - Include curve following and linear ramp models.

Temperature Recorders - Available in single and multi-pen and multi-point models in several chart widths.

Gas Control Systems - Include inert gas controls burn-off systems for combustible gases, and the Model GSS hydrogen gas control and safety system.

Vacuum Systems - Mechanical and diffusion pumped vacuum systems are available with manual or air operated valves. Pumping system options include vacuum gauge controls, and automatic valve control.

Muffle Tube Assemblies - The addition of aluminum oxide muffle tube assemblies to some furnace model permits working in air or oxidizing atmospheres.

Please refer to the appropriate data sheets for complete details of standard accessories.