



VAC AERO
INTERNATIONAL INC.

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Furnace Manufacturing Division
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VACUUM GAS QUENCH FURNACES VACUUM FURNACE SPECIFICATION



VAV Series Vertical Bottom-loading Vacuum Furnaces

STANDARD OPERATING TEMPERATURE RANGE: 1000°F - 2400°F
TEMPERATURE UNIFORMITY: Meets or exceeds requirements of AMS 2750.

The standard VAV Series Vertical, Bottom-loading, Vacuum Heat Treating and Brazing Furnace can be customized to suit unique applications such as high pressure gas quenching, high temperature heat treating, ultra-clean processing and more. The furnace is designed to have fast heating rates to very uniform temperatures at high vacuum levels. Standard units are equipped with a gas quench system capable of cooling the load rapidly from processing temperatures at quench pressures up to two bar.

Advanced microprocessor controls are used exclusively to ensure precise control and repeatability. VAC AERO control systems can be integrated with internal networks and offer extensive data collection capabilities. VAC AERO also manufactures auxiliary equipment for quench gas storage and furnace cooling requirements.

HOT-ZONE

VAC AERO hot zones have unitized construction for easy removal and maintenance. Lightweight design with low thermal mass and inertia for faster quenching and long life.

Work Load Size: Standard sizes from small laboratory units up to 54" wide x 54" high x 72" deep. Larger models are also available.

Heating Elements: Customer's choice of lightweight curved graphite, pure or lanthanated molybdenum strip.

Hearth: Constructed with quickly removable hearth rails of pure molybdenum designed to support uniformly distributed loads up to 4000 lbs at 2400°F.

Vertical Bottom-loading Models

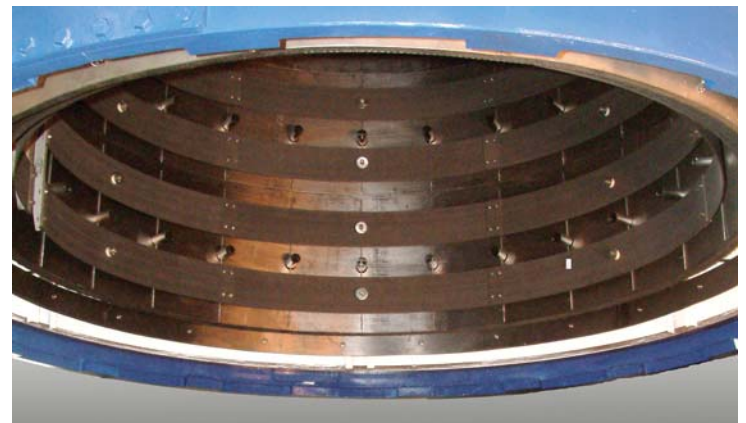
Model	Diameter	Height
VAV 3436	34" (865mm)	36" (915mm)
VAV 3636	36" (915mm)	36" (915mm)
VAV 4848	48" (1220mm)	48" (1220mm)
VAV 4854	48" (1220mm)	54" (1370mm)
VAV 4860	48" (1220mm)	60" (1525mm)
VAV 5448	54" (1370mm)	48" (1220mm)
VAV 6060	60" (1525mm)	60" (1525mm)
VAV 6072	60" (1525mm)	72" (1830mm)
VAV 6098	60" (1525mm)	98" (2490mm)
VAV 6660	66" (1675mm)	60" (1525mm)
VAV 7260	72" (1830mm)	60" (1525mm)
VAV 7272	72" (1830mm)	72" (1830mm)
VAV 8484	84" (2135mm)	84" (2135mm)

Radiation Shields (Graphite-based Construction):

The standard graphite-based insulation package consists of three layers of carbon felt with a inner facing of graphite foil bonded carbon composite for added protection and enhanced reflectivity. The heat shield package is supported by a stainless steel assembly that also acts as a manifold to distribute the quenching gas uniformly throughout the workload.

Radiation Shields (All-Metal Construction):

For ultra-clean processing applications, VAC AERO also offers an all-metal hot zone construction. The standard all-metal insulation package consists of two layers of pure molybdenum sheet backed by three layers of stainless steel sheet. The heat shield package is supported by a stainless steel assembly that also acts as a manifold to distribute the quenching gas uniformly throughout the workload.





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FURNACE CHAMBER

The chamber and heads are a double-wall water-cooled design, primed and painted the customer's choice of colour. The chamber is equipped with all necessary thermocouple jacks, gauge ports, pumping ports and gas quench entries conveniently located for easy access. The tank assembly is vertically aligned with a bottom opening load head. The bottom head and the load are raised and lowered smoothly by a constant speed, ball screw driven lifting jack. Once lowered, the bottom head rolls out from beneath the furnace by means of a powered drive assembly to allow 360° access to the load. The tank is equipped with a powered rotary clamping system to secure the bottom head during processing. A "ground fault" system is used to detect if the load or fixtures touch the heating elements during loading or unloading and will stop the elevator to prevent damage.

VACUUM PUMPING SYSTEM:

The vacuum pumpdown is automatic and interlocked. The VAC AERO design uses a holding pump to maintain a low pressure on the diffusion pump foreline at all times. This feature, combined with proper timed sequencing of vacuum valves, virtually eliminates backstreaming of pump oils.

Mechanical Pump: Roughing Pump and Booster combination appropriately sized for furnace volume.

Diffusion Pump: Varian series complete with charge of Dow Corning fluid.

Holding Pump: Rotary vane pump.

Main, Roughing and Foreline Valves: Right angle poppet valve with electro-pneumatic operation.

Partial Pressure Capabilities: The furnace can be operated at partial pressures up to 1 torr (1000 microns) of inert gas (argon or nitrogen, whichever is used for quenching). Failsafe hydrogen partial pressure systems are also available.

GAS QUENCH SYSTEM:

External recirculating inert gas quenching system distributes quench gas through circumferentially located internal nozzles for rapid, uniform cooling of the work load. The system includes:

- Quench blower powered by electric motor with soft start.
- Special high efficiency tube/fin heat exchanger.
- Complete quench piping.
- Selectable operating pressure.

Please see IG Series Quench Gas Storage Systems for details.

FURNACE COOLING SYSTEM:

Furnace water system consists of a compact manifold containing all necessary pressure regulators, valves, pressure switches and flow regulators with supply and drain hoses and fittings. *Please see Dual Loop Furnace Cooling system for additional details.*

CONTROLS:

Process Control with SCADA:

The VAC AERO control system is programmable and logic based. The design philosophy of VAC AERO is to simplify control by using the program capabilities to perform as many functions as possible, thereby reducing operator dependence.

VAC AERO has also chosen proven hardware components, suitably hardened for an "industrial shop" environment. The system uses a state-of-the-art hybrid controller to control the machine functions and furnace temperature. The controller integrates with software running on a personal computer to provide Supervisory Control and Data Acquisition (SCADA). Operator interface is provided through an LCD touch-screen mounted in a control panel. An extensive range of standard displays is available.

The key benefits of this system are:

- Compatible with plant wide SCADA and network integration.
- Process cycle validation.
- Extensive alarm and event management and reporting.
- Temperature control using advanced algorithms, auto tuning, and multiple PID loops.
- Operator sign-on/sign-off security provides up to 255 control levels to limit operator control of individual items of plant and equipment.
- Enhanced maintenance and troubleshooting management and trending.

Vacuum Instrumentation:

A Vacuum Gauge Controller with 2 station, thermocouple gauge and 1 station Penning (cold cathode) gauge is used to monitor the chamber and the pumping system. This instrument is integrated with the process controller to provide dedicated setpoints that control all critical vacuum-related process functions.

Overtemperature Safety Controller: Digital manual set 0°F - 3100°F, Type S.

Power Supply: The heating element power is supplied by an A.C. water cooled power supply containing single phase VRT assemblies. Each VRT has a 0 – 100% trim control for optimum temperature uniformity in the hot zone.

INSTALLATION AND START UP ASSISTANCE:

The system is shipped complete, tested and ready for installation. VAC AERO offers installation supervision or complete installation services. After installation, a qualified VAC AERO technician will visit the site to commission the equipment and provide instruction in furnace operation. As part of every furnace contract, VAC AERO also provides pre-delivery training in heat treating processes furnace operation and maintenance.