

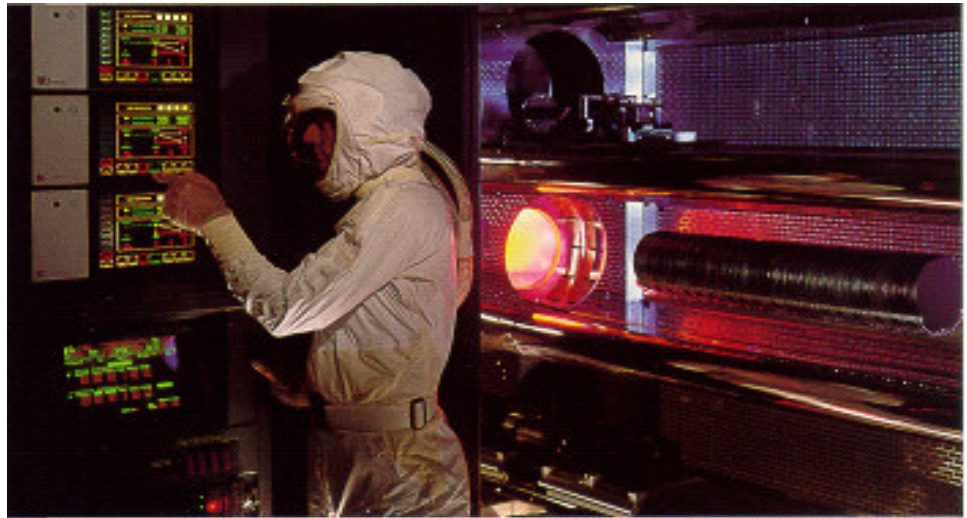


Tetreon Technologies Product Specification for Thermco Horizontal Furnace Systems

PRODUCT SPECIFICATION

Specification
Number: F-HTR62

February 2005



Model **HTR-62** Furnace Predefined Horizontal System

APPLICATION

The Thermco Model 6200 Diffusion Furnace is a four chamber unit used primarily for production facilities. This furnace is designed specifically as an Automation Compatible Furnace Module (ACFM) and incorporates features that reduce to a minimum downtime due to re-characterisation after element, thermocouple or process tube replacement. The Model 6200 furnace can accommodate process tubes of up to 10" (251 mm) outer diameter. The following processes are standard for the 6200 furnace system:

- *Silicon nitride*
- *Ramped temperature poly*
- *Uniform grain poly (flat temp)*
- *TEOS*
- *VLTO*
- *BPSG*
- *High temperature oxide (with or without external torch)*
- *5 or 6 loop pyro with DCE (TCA) or HCL*
- *3 or 4 loop liquid dopant (POCL3 or BBR3)*
- *2 loop forming gas anneal*
- *High temp high flow anneal*
- *Low temp anneals or cure*

CONTROL SYSTEM

The 6200 furnace is controlled by the industry leading Thermco TMX controller, recognised as one of the most flexible and reliable furnace control systems available and with a user installed base of thousands of units. The TMX PC-MUX controller combines the tried and trusted recipe and system control formats of earlier generation TMX products but with reliable PC based hardware. The system comprises one computer per tube and one MUX computer for recipe generation and management in a free-standing console.



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PHYSICAL DESCRIPTION

The frame structure of the furnace module is of unibody style construction where heavy gauge sheet metal is welded into a complete free-standing structure.

Floor space requirement:

Length	84.00 inches (213.36 cm)
Depth	31.00 inches (78.74 cm)
Height	104.25 inches (264.80 cm)

The furnace cabinet incorporates levelling adjustment, the levelling feet structural bars are made of 2" square bar stock with four holes drilled and tapped 3/4 x 10 through in the vertical direction and the adjustment feet have large heavy duty pads. The stud protrudes through the bar inside the unit and incorporates a hex tip so that the feet can be accessed from inside the furnace.

The 6200 furnace features an element mounting structure with locating pins for precision element replacement positioning. Each element has a mounting platform at both ends that is welded to the stainless steel element canister in a precision fixture. This fixture placement assures the exact relationship between the concentric centre of the elements and the platform mounting surface. A mating platform at each furnace tube level is welded into the structure to ensure the positioning of the concentric centre of the element to the tube level when the element canister is placed into the furnace module and bolted down.

The 6200 furnace design allows for precision replacement of the element canister and provides an allowance for thermal expansion of the element when in the heated condition. Each platform on the element includes a 1/2" diameter dowel pin that fits into a mating hole in the furnace platform. At the loading end of the furnace, the mating hole is round and acts as a precision locating device. At the source end of the furnace, the pin fits into a longitudinal slot of the same width as the other hole, but long enough to allow movement due to thermal expansion. The load end is bolted down while the source end is captivated with shoulder bolts having sufficient clearance to allow this thermal-reactive movement.

The detailed engineering provides positive location, depth and orientation of the thermocouple. A precision fixture establishes the optimal location between the desired element windings for precise thermocouple placement. The thermocouples are sheathed to a specific length and flanged with a location flat so that when inserted into their respective permanently installed sheath the junction always has the same location and orientation. The thermocouple is held in place with a spring-loaded bracket that provides constant tension on the thermocouple flange and the thermocouple flange mechanism reduces heat loss from around the thermocouple.

Three individual sliding doors permit easy access to the furnace components. These are secured with a screw-pin locking system and the doors are light enough to be easily removed by a single technician.

The SCR firing cards and miscellaneous electrical controls are mounted on a slide-out panel for easy maintenance access. The power circuit breakers are mounted on stationary brackets, but are easily accessible once the drawer is pulled out.

The furnace employs a cross-flow element cooling system where the cooling air is pulled into the system and across each element through adjustable ports with a common rear plenum. Each element sees a similar heat dissipation condition and this feature reduces the risk of thermal interaction between elements.

Furnace cooling is controlled by silent-running, high-efficiency fans and a water-to-air heat exchanger.

Low heat loss is provided by vestibule blocks with an improved compression seal fabricated of high-purity, low-sodium insulating material.



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PERFORMANCE SPECIFICATIONS

Operating Temperature Range:

200 to 1250°C (1300°C with APM wire heater)
Uniform heated zone with up to 15.0 litres per minute gas flow, depending on wafer load size and shielding/baffling at load end of process tube

For process tubes up to 10.0" (251 mm) OD:
750-1250°C $\pm 0.5^\circ$, 38-42" flat zone
400-750°C $\pm 1^\circ$, 36-40" flat zone

Cold Start Ramp Rate:

Average ramp-up rate is 18°C per minute

Cool Down Rate:

Furnace will cool from 1200 to 900°C at a linear rate of at least 3°C per minute

Long Term Stability:

Furnace temperature will be stable within $\pm 0.25^\circ$ C or better

Recovery:

With a 6000 gram load, typical flat zone recovery at 900°C occurs within 18 minutes

Fast Response:

Step changes of 100° C can be made with no change in control settings and minimal effect in uniform heated zone

Tube Interaction:

No interaction between tubes because of the compensated temperature thermocouple junction and the unique direct convection cooling system

Power System:

Maximum reliability with secondary operated, zero-crossover fired SCR power controllers. SCR devices are specially selected for high overload ratings. Highly efficient direct convection or forced air cooling of all SCRs.

Efficient power transfer and balance by utilising individual three-phase element transformers for each furnace tube. Transformers are rated for 100% duty cycle.

Circuit breakers used throughout system for maximum protection and ease of operation.

FACILITY REQUIREMENTS

Power:

440/460/480 volts, 3 phase, 60 Hz **or**
380/400/415 volts, 3 phase, 50 Hz

Control:

120 volts, 1 phase, 50/60 Hz by customer **or**
optional transformer

Weight:

3500 pounds

Water:

8GPM at 60°F

SERVICEABILITY

- Easy access to all components by simple removal of panels or opening of access doors.
- All internal and control electronics are directly serviced from furnace front.
- Tetreon will issue a spare parts lists for customer logistics planning.
- Unit is completely tested, checked and pre-wired for ease of installation.