

ProTemp "PRO"

Semiconductor Diffusion Furnaces

- **PRO 150:** 4-stack furnace system for wafers to 150 mm
- **PRO 200:** 3-stack furnace system for wafers to 200 mm
- **PRO 300:** 2-stack furnace system for wafers to 300 mm



- **Compact**—only 44 square feet with 24 square feet in clean room
- **PC-controlled** for functional capability and ease of operation
- **Configurable** for atmospheric, LPCVD and PECVD processes
- **Film uniformities** on many processes comparable with vertical furnaces, at less than 1/3 the cost

PROTEMP

PRO diffusion systems – complete, compact, configurable



PRO 150 4-stack furnace

Compact

- Complete four-stack system occupies only 44 square feet, with only 24 square feet in the clean room
- Low top-tube centerline. The 68" centerline PRO 150 is the lowest large bore four-stack in the industry

Fully equipped

- Individual transformers and SCR Power Paks for each zone
- Redundant over-temperature system for each zone and cabinet temperature. These systems are independent of the PC control system



Class 10-compatible load station

Complete diffusion systems

Three models are offered:

- PRO 150:** four stacks for 6" (150 mm) wafers
- PRO 200:** three stacks for 8" (200 mm) wafers
- PRO 300:** two stacks for 12" (300 mm) wafers

All PRO furnace systems feature:

- Horizontal laminar load station
- An automatic cantilever loader for each tube
- Source cabinet with plumbing and MFC controlled gas systems
- Class 10-compatible stainless steel scavenger and load station
- PC-based process/temperature control system with host computer



Rear tube-pull source cabinet with vertical gas panels

Configuration versatility

- Left hand or right hand
- Stand-alone or through wall
- All standard atmospheric processes
- All standard LPCVD processes
- A wide range of PECVD processes

Horizontal vs. vertical furnaces

Users of horizontal furnaces offered ten or more years ago have been forced to push the limits of their equipment to keep pace with sub-micron processing technology, a task these furnaces were not designed for.

Although vertical furnaces may achieve tight process and particulate control, they carry penalties of high price, lower utilization of factory space, and low productivity when comparing load sizes with today's horizontal furnaces.

The mission at **ProTemp** is to provide equipment with state-of-the-art processing capability at a fraction of the cost of vertical furnaces.

PRO diffusion systems – PC controlled for functional capability

Local process control via host computer

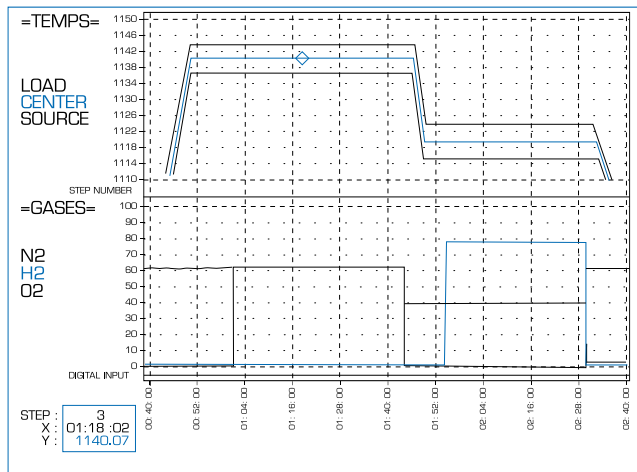
All PRO diffusion systems include local PC control; however, control systems are furnished in different configurations to match specific application requirements. Following is a general description of our standard control system capabilities.

The PRO control system comprises a host PC and multiple built-in microprocessor furnace controllers, one per tube. The system provides local recipe management and data acquisition.

The system automatically captures process control information during all runs. You can display this information in an easy-to-read graph, either during capture or from a history file. The graph shows absolute engineering values versus time. Two plots can be shown at the same time, so you may compare a run with a recipe or two runs with each other. Axes can be magnified to study specific process problems, such as furnace recovery after product loading.

An event log, maintained in both a rolling and a permanent file, keeps track of all processes and user events. You can sort the log by as many as ten criteria to display information in the most useful way.

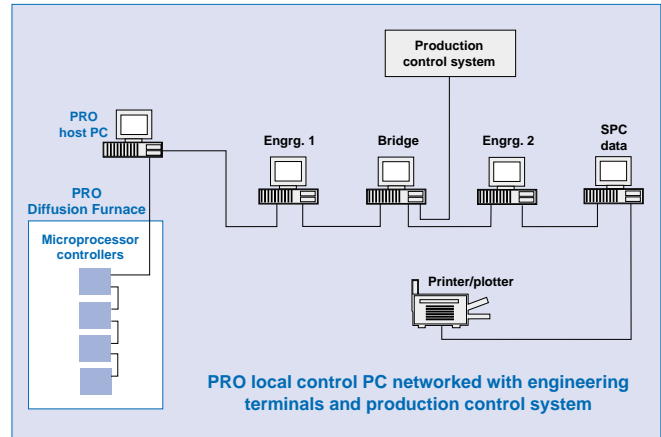
The system includes four levels of secured access.



Data capture graph for a completed oxidation process – displays spike temperatures and process gas flows vs. time.

PRO connections to engineering and production control

A network option lets you connect one or more furnaces to remote engineering terminals. Process and equipment engineers can then access tube status, recipes, data capture files, and event logs from PCs in their offices. Local recipe edits can be backed up automatically on remote terminals.



Host controller provides local recipe management and data acquisition, plus optional connection to engineering terminals and production control system.

Integrated furnace controllers

The PRO control system includes a controller for each tube, mounted at tube level in the load station.

Associated temperature I/O modules are mounted in the source cabinet base.

12-bit D/A and A/D converters are located within two feet of each MFC, minimizing cable length and number of connections for optimum reliability. The D/A and A/D converters and MFCs use a common power supply, eliminating reference voltage problems associated with multiple power supplies. The result is exceptionally precise MFC control.

The temperature I/O modules provide high-resolution (0.05°C), 1500-volt isolation between thermocouples plus individual cold-junction compensation for each TC. Each module also contains local digital conversion and optical isolation. This entirely solid-state temperature and power driver package provides accurate and dependable temperature control.

The PRO host PC can interface with your production control system using a bridge PC with appropriate communications software. As a batch of wafers enters a furnace step, the production control system sends a message to the bridge PC to download the production recipe to the selected tube.

PRO furnaces – specifications and facilities planning

Specifications

Element

Standard: Heavy gauge, vacuum molded, low voltage.
Optional: Fastemp™ low thermal mass;
Sirius™ high temperature (1400°C);
UltraPure™ ceramic lined.

Temperature range

200°C to 1400°C with flat zones up to 40" (1016 mm).

Long-term temperature stability

Within $\pm 0.5^\circ\text{C}$ over flat zone for 72 hours.

Power supplies

Individual transformers and SCR Power Paks for each zone; 24 VDC is supplied with system. No external power is required for solenoids.

Over-temperature redundancy

Redundant over-temperature system for each zone plus cabinet temperature. This is independent of the control system over-temperature alarm.

Construction

Structural steel tubing frame with concealed-hinge lift-off panels for accessibility. All units self-align and bolt together.

Surfaces

Class 10-compatible polished stainless steel scavenger and load station work surfaces.

Cantilever loaders

Twin-rod cantilevers supplied standard on each tube. Paddle-style cantilever systems optional.

Furnace control

Direct digital control of process variables through per-tube microprocessors and included PC host computer. Auto profiling and event logging is standard. Production control system interfaces are available.

Gas modules

Mass flow controlled gas panels are included in the standard configuration. LPCVD, PECVD, and custom designs are available.

Facilities planning

Power

200, 300 and 400 VAC, 50 or 60 Hz available.

Gas services

Down feed with face seal connection inside cabinet. Up feed optional.

Exhaust

Through furnace: 1500 cfm, to be connected to facility exhaust or recirculated to room. Furnace is equipped with fans and a high efficiency water/air heat exchanger. (2–4 gpm water flow at 50–60°F, 60 psig, is required.)

Source cabinet: 6" (152 mm) diameter connection; requires 200 cfm to facility/exhaust scrubber.

Furnace scavenger: 4" (101 mm) diameter connection; requires 200 cfm negative to facility/exhaust scrubber.

Clean dry air (CDA)

One 1/4" compression fitting is provided at top of cabinet. 80 psi required.

Backed by experience

ProTemp Products has been in the business of supplying high-quality elements, furnace retrofit items, and complete diffusion furnace systems for over three decades.

ProTemp is dedicated to customer service. Due to our continued commitment to customer satisfaction, excellence in quality, reliable products, service, competitive pricing, and outstanding technical support, we are an established supplier to many of the major semiconductor manufacturers worldwide.

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