

SIRIUS™

Semiconductor Diffusion Furnace System



PROTEMP

SIRIUS™ diffusion system

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 Products is to provide equipment with state-of-the-art processing capability at a fraction of the cost of vertical furnaces.

The **SIRIUS™** Diffusion Furnace System is based on 35 years of experience and state-of-the-art design upgrades to optimize thru put, minimize down time and assure optimum production capabilities.

These high production state-of-the-art systems incorporate proven technologies used in the semiconductor industries for more than 40 years.

SIRIUS™ diffusion system

LOW COST, HIGH QUALITY PROCESSING

- **Compact - minimal 44ft² with only 24ft² in the clean room**
- **PC-controlled for functional capability and operator friendly operation with full manual back-up**
- **HOST computer with Windows® XP Pro software**
- **May be configured for atmospheric, LPCVD and PECVD processes**
- **Film uniformities on many processes comparable with vertical furnaces, at less than 1/3 the cost**
- **Available for 150mm, 200mm, 300mm & 450mm processing**

SIRIUS™ diffusion system

SIRIUS™ diffusion systems are fully equipped – complete, compact and can be configured to your specific requirements

PRO™ 150: four stack for 6" (150 mm) wafers

PRO™ 200: three or four stack for 8" (200 mm) wafers

PRO™ 300: two or three stack for 12" (300 mm) wafers

Other configurations available

All **SIRIUS™** furnace systems feature:

- Horizontal laminar flow load station
- Automatic cantilever loader for each tube
- Gas cabinet with plumbing and MFC controlled gas systems
- Class 10-compatible stainless steel scavenger and load station work surface
- PC-based process/temperature control system with HOST computer
- Low top-tube centerline. The 68" top tube centerline **PRO™ 150** is the lowest large bore four-stack in the industry

SIRIUS™ diffusion system

Design features to enhance Versatility and Reliability

- System may be configured to include atmospheric, LPCVD or PECVD deposition capabilities in the same or separate furnace banks
- Simple installation and start up, system may be qualified in minimal time
- Horizontal Laminar Flow load station eliminates need for clean room environment. Filtered air flows out over load, ensuring contaminants do not enter process tube
- Product versatility—Up to 300mm dia. wafer processing capabilities
- Easy, computer controlled operation, with manual backup
- Process tube (or liner) may be easily removed thru the front of the system
- Low system height fits thru standard door openings
- Independent cantilever loader per tube level

SIRIUS™ diffusion system

- Independent Microprocessor Controls per tube level
- Windows® XP Pro based HOST computer system
- Compact footprint - Complete system occupies a minimal 44ft² with only 24ft² in the clean room
- Minimal maintenance
- Local and factory support for maximum uptime (specific areas)
- Individual transformers and SCR Power Packs for each zone
- Redundant over-temperature system for each element and cabinet temperature. These systems are independent of the PC control system
- Configuration versatility
 - Left hand or right hand
 - Stand-alone or through wall
 - A wide range of atmospheric, LPCVD and PECVD processes available

SIRIUS™ diffusion system

- Gas cabinet is exhausted for removal of fumes fumes and heat
- Furnace and Load Station pin-aligned together for accurate alignment
- Cantilever Loader controls allow for soft start/stop and speed control
- Air/Water Heat Exchanger minimizes HVAC impact
- Water-cooled LPCVD/PECVD tube flanges optimize O-Ring seal life
- Furnace incorporates a load end scavenger for toxic gas exhaust
- Operation is fully controlled by per-tube microprocessor unit
- System can be operated manually should there be a HOST computer malfunction



SIRIUS™ diffusion system

PC controlled for functional capability with local process control via HOST computer

All SIRIUS™ 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 SIRIUS™ process/temperature control system comprises a HOST computer and microprocessor process/temperature controllers. The microprocessor controller for each tube level is mounted in the gas cabinet along with associated temperature I/O modules.

The system provides local recipe management and data acquisition. The HOST computer 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.

SIRIUS™ diffusion system

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.

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 MFC's 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.

SIRIUS™ diffusion system

The **SIRIUS™** HOST controller provides local recipe management including Download Run Parameters, Viewing Recipe Parameters, Production Management Interface, Remote Operation & Modem Interface, Recipe Storage, Changes & Editing, Plotting & Trending and data acquisition, plus optional connection to engineering terminals and production control system.

The HOST computer may be configured to interface with your production control system using appropriate communications software. As a batch of wafers enters a furnace step, the production control system sends a message to download the production recipe to the selected tube.

SIRIUS™ diffusion system

- Easy match to local power source—system can be supplied with transformer for virtually any specified power source
- Optional multi-tap transformer facilitates relocating system from one power source level to another
- Moderate cooling requirement—2 to 3 GPM (gallons of water per minute)
- Standard compression fitting for connecting water-to-air heat exchanger
- Low system height fits thru standard door openings

SIRIUS™ diffusion system

Element

Sirius™ heavy gauge high temperature (1400°C)

Optional: Fastemp™ low thermal mass

Temperature range

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

Long-term temperature stability

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

Power supplies

Individual transformers and SCR Power Packs 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. Furnace and load station self-align and bolt together.

Surfaces

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

Cantilever loaders

Cantilever loaders supplied standard on each tube.

Furnace control

Direct digital control of process variables through per-tube microprocessors and included PC HOST computer.

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.

SIRIUS™ diffusion system

Facilities planning

Power

200 to 480 VAC, 50 or 60 Hz available.

Gas services

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

Exhaust

Through furnace: 1000 cfm, to be connected to facility exhaust or re-circulated to room. Furnace is equipped with fans and a high efficiency water/air heat exchanger. (2–4 gpm water flow at 20°C, 60 psig, is required.)

Source cabinet: 4" (101 mm) diameter connection; requires 200 cfm to facility/exhaust scrubber.

Furnace scavenger: 4" (101 mm) diameter connection; requires 50 cfm negative to facility/exhaust scrubber.

Clean dry air (CDA)

One 1/4" compression (6.35mm) fitting is provided at top of cabinet. 80 psi required.

SUPPORT

- A complete Facilities Installation Guide detailing facilities requirements and connections included
- Customer may source inspect system prior to shipment
- Optional Start-Up Assistance programs available
- Factory trained service engineers are located in Santa Clara, CA and Wuxi, Beijing and Shanghai China to provide 24/7 support of equipment
- Specific production sensitive replacement parts stocked at our Santa Clara, CA., and Wuxi, China facilities and local distributor sites

SIRIUS™ Diffusion System Summary

OVERVIEW



- Over 35 years experience
- More than 200 furnaces shipped
- Simple, quick installation
- Complete system
- Compact; <math><24\text{ft}^2</math> in clean room
- 300mm wafer processing capabilities
- Per tube PC controls + HOST computer
- Cost effective; <math><1/3</math> cost of vertical furnace
- Atmospheric, LPCVD and PECVD offered
- All system technology is industry-proven

ProTemp Products Can Meet Your Requirements

- **Sirius™ Diffusion Furnace Systems**
- **SolaReactor™ PECVD Anti-Reflective Film and POCl₃ Deposition Systems**
- **Saturn™ Direct Replacement Heating Elements**
- **ProTemp Mass Flow Controllers**
- **Refurbished Diffusion Furnace and PECVD Systems**
- **Mass Flow Controller Sales, Service and Calibration (China)**

ProTemp Products, Inc. is a privately owned U.S. corporation headquartered in Santa Clara, Ca. that has been serving the semiconductor and solar industries since 1973. We take our ability to be flexible seriously as it has proven to be the best way to serve the ever-changing requirements of our industry. Throughout the world, microelectronics and solar cell manufacturers have come to rely on **ProTemp Products** for state-of-the-art equipment, reliable delivery, total support and competitive pricing..

ProTemp Products Furnace Division has supplied over 250 systems worldwide configured as Atmospheric, LPCVD, PECVD, High Temperature and Special Applications in both horizontal and vertical configurations.

ProTemp Products Element Division is a major supplier of heating elements to end-users worldwide as well as many of the furnace manufacturers and rebuilders.

ProTemp Products Solar Equipment Division supplies Anti-Reflective coating and POCl₃ deposition systems used worldwide in the solar cell industry.

ProTemp Products Gas Flow Division offers its Model 6200E & 6400E mass flow controllers that may be configured to accurately control a wide range (0-50 SLM) of many types of gas flow applications.

ProTemp (Wuxi) Electronic Equipment Co., Ltd. is a fully staffed sales and service facility that offers one of the most complete service and calibration facilities for all brands of mass flow controllers in China, all our work is performed using primary standards with traceable accuracy to NISST/ANSI.

ProTemp Products, Inc. (USA)

3511 Thomas Rd., Suite 4
Santa Clara, CA 95054 USA
Tel. (408) 855-8222 Fax (408) 855-8224
Web Page: www.protempproducts.com

ProTemp (Wuxi) Electronic Equipment Co., Ltd.

Room 508, No. 888 Hongqiao Road, Binhu District
Wuxi, Jiangsu, P.R. China, 214072
Tel. 0510-85165422, Fax 0510-85898860
Web Page: www.protempproducts.cn

e-mail: sales@protempproducts.com