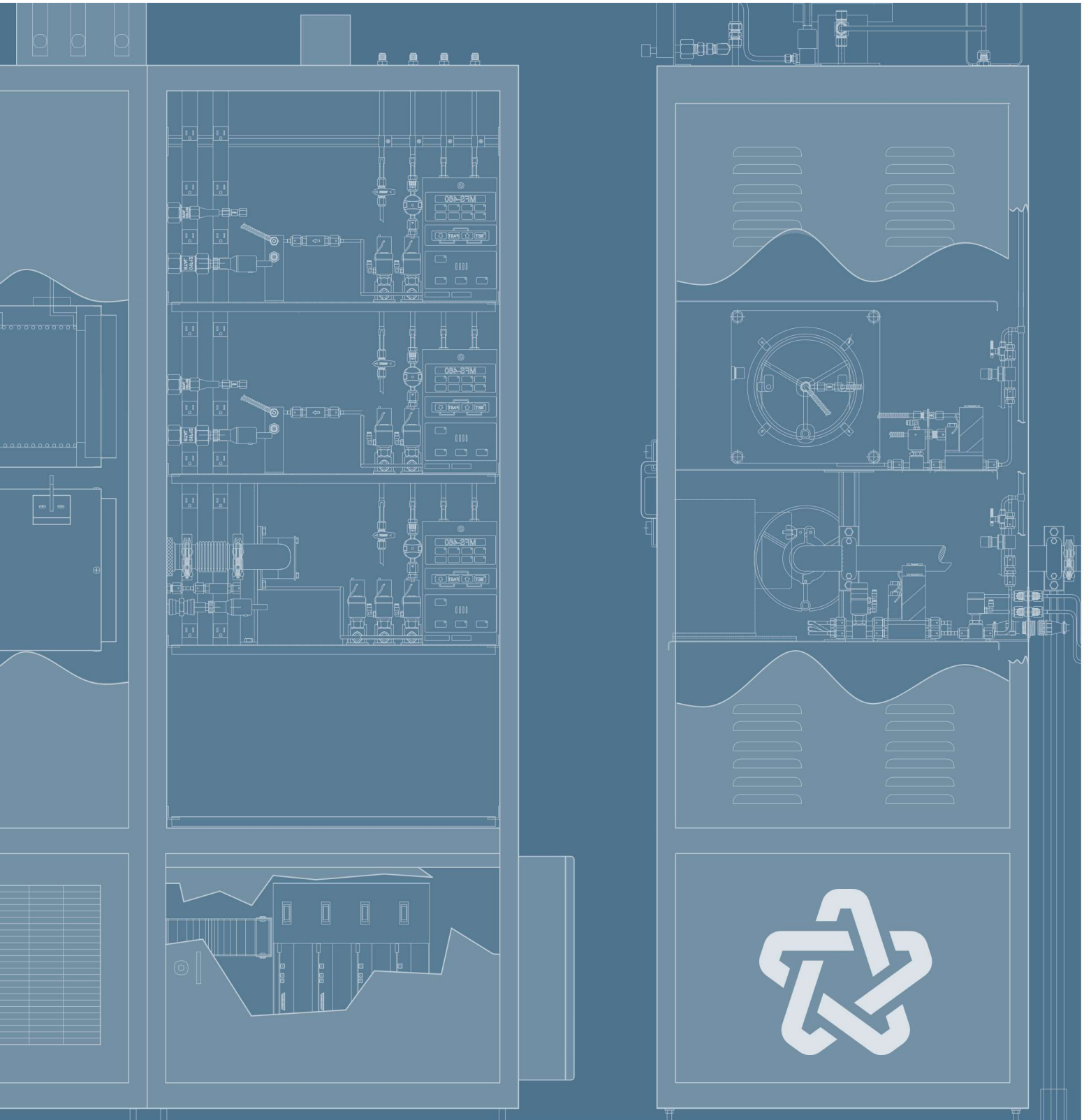


# TYSTAR CORPORATE CATALOG 2019





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## Service and Repairs

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The complexity of modern semiconductor process equipment and the scarcity and high cost of knowledgeable, experienced service engineers make a service contract with Tystar an intelligent choice. Drastically reduced equipment downtime, fast, efficient service by factory trained service engineers, protection from unexpected repairs, upgraded software packages, etc. are some of the benefits of a Tystar Service Contract.

Repair and maintenance service for Tystar's furnace and CVD equipment is provided by our field service engineers, strategically located in different parts of the world. We provide assistance in equipment start up and process technology, equipment trouble shooting and repair at the customer facility.

Tystar has a complete repair, test and calibration facility at its headquarters. All electronic circuit boards, process controllers, gas control equipment, temperature controllers, vacuum components, etc. can be repaired, calibrated and tested to the original equipment specifications.

## Spare Parts Inventory

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Tystar maintains a well stocked inventory of major spare parts at its facility in Garden Grove, CA. Minimum stock of critical parts is maintained. Spare parts or direct replacements for all Tytan furnaces and PVD 1000 installed systems are available. Tystar guarantees the availability of identical or equivalent-in-function spare parts for a minimum of 10 years from date of equipment purchase.

## Remote Service

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Tystar offers Remote Monitoring & Diagnostics Service (RMDS) plans that take advantage of the most up-to-date Internet technology. A majority of the system problems may be resolved over an Internet connection, eliminating the need for travel time and expense. The customer can purchase a service plan and get immediate attention from our technical staff for any system malfunction. Should there arise a need for repair or service, our staff can remotely monitor and diagnose the system. RDMS is a new way the customer can cut down on the cost of service while enabling quick actions on the system.

## Training and Seminar Classes

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Tystar offers complete training for all of our systems and components, either at our headquarters or at the customer site.

The objective of Tystar's Tytan Furnace System Training Seminar Classes is to make buyer representatives familiar with the design, operation, service and maintenance of the Tytan Furnace System. Specific items discussed in detail are installation, set-up, operation, troubleshooting and repair of the entire furnace system and its subassemblies, electronic controls, assemblies and printed circuit boards. Printed seminar materials and notes will be provided to participants at no cost.

This seminar provides participants an opportunity to gain in-depth knowledge into the theoretical and practical aspects of Tystar equipment. The material presented will be in a logical, step-by-step sequence through lectures, demonstrations and practical "hands-on" exercises.

A person wearing a blue protective suit and white gloves is working with industrial machinery. The person is leaning over a large, circular opening in a machine, possibly a washing or drying drum. The machinery is metallic and complex, with various components and pipes. The scene is set in an industrial or laboratory environment.

**Tystar Corporation for  
Robustness, Reliability and Expediency**

## Count On Tystar

Have you ever experienced an abrupt malfunction of your CVD furnace? You are only a few days away from an important deadline but your equipment company is slow to respond to your emergency call. Or as the production manager, you receive a report on the erratic behavior of your CVD equipment but the supplier company says you have to wait two weeks just to get a technician to arrive at your site.

Rest assured! This will never happen with Tystar's equipment. Tystar thermal reactors are extremely robust and reliable. Even in the event of a malfunction, our engineers will walk you through a manual operation mode so that system operations can continue until we get there. This is only one of the 33 reasons why you should buy Tystar products.

Our engineering team, with over 30 years of experience, is quick to respond, highly experienced, and will never give up until the issues are completely resolved. Tystar's mission is to meet the semiconductor/MEMS industries' needs with quality products and service.

As the CEO of Tystar Corporation, I personally guarantee your full satisfaction. I hope this catalog will enlighten you with the most up-to-date information on Tystar products and help you make the best choice for your R&D or production needs.

Sincerely,

Wayne H. Choe, PhD  
President & CEO  
Tystar Corporation





**Tystar Value**

## High Return on Investment

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Tystar's proprietary isothermal system design enables:

- Very affordable price, beating any leading manufacturer.
- A small footprint, saving expensive clean room space.
- High efficiency through reducing gas and electricity use by >50%.

## Advanced Features

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- Each process tube (chamber) has its own monitor control computer.
- The computer has multiple recipes stored.
- The computer will retain its memory for 30 days in the event of a brown or black out.
- The Temperature Controller has a dual algorithm with Feedforward as well as PID functions.
- Sliding PCB drawers and swivel control consoles are used for ease of maintenance.
- All software used in the system is SECS II compatible.
- There are power-on diagnostics.
- Gas control panels and scavenger exhausts are designed with low particle generation in mind.

## Excellent Post-Sales Support

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- 24 hour response to any inquiry or service request even after the warranty expires.
- Unlimited process and system support for the entire lifetime of the equipment.
- Process data support utilizing the largest library of process data gathered over 30 years.

## Robust & Reliable

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- Auto/manual switching in the event of an unexpected controller failure.
- Sophisticated and high speed controls.
- Rigorously tested and certified parts.
- Individual tube control for failure independence from tube to tube.
- EPROM established safety controls.
- A multi-step abort sequence to prevent damage to the process or equipment in the event of an emergency shut down.

## 33 Reasons To Make Tystar Your Furnace of Choice

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- 1. Layout Flexibility:** Tystar furnace layouts can be configured specifically to fit into a customer's clean room floor plan.
- 2. Autonomous Control of Tubes:** Each individual tube has its own control computer which can run autonomously without affecting other tubes in case of computer failure.
- 3. Auto/Manual Switching:** Gas, boat loader, and temperature controls can run in the manual mode should there be a failure of the tube computer.
- 4. Isothermal Chamber:** Our patented isothermal chamber design results in outstanding process control which guarantees superior uniformities and low operation costs.
- 5. Multiple Recipe Loading:** The tube computer can accommodate multiple recipes so no downloading is required when changing recipes.
- 6. Battery Backup:** Each tube computer has a battery backup to retain the configurations and recipes for 30 days and no downloading is required when a power failure occurs.
- 7. Multi-Step Abort Sequence:** A multi-step abort sequence is utilized to protect the product and equipment in case the process cannot be salvaged.
- 8. Auto/Manual Display & Control:** In the event all computer controls fail, it is still possible to monitor and control the gas panel in the manual mode.
- 9. PID Closed Loop Pressure Control:** Tystar's MFS-460 gas controllers do not require external set points for closed loop pressure control.
- 10. Local TCU Control/Diagnostics:** In the event all computer controls fail, the temperature controller runs in the manual mode.
- 11. Flat Temperature Ramping:** An algorithm is built into the TCU logic for synchronizing each temperature zone.
- 12. Recipe Guarantee:** Tystar offers starter recipes for every process utilizing its extensive library of process recipes with guaranteed process verification.
- 13. Small footprint:** Tystar's patented isothermal design creates the smallest footprint furnaces, which utilize less clean room space.
- 14. High Efficiencies:** Tystar's patented isothermal design creates low gas and electricity usage.
- 15. Maintenance Friendly:** All Tystar furnaces are designed for easy access to all parts for ease of maintenance. We designed easily removable back panels for hard-to-reach parts. Electronic and electrical components are placed in sliding drawers, along with a slide-out interface plate. All other components are very easily accessed.
- 16. Adaptable Quartz Boat Design:** The Tytan furnace systems can accept all wafer sizes from chips to 2-8" wafers and still maintain excellent uniformity by just changing the wafer boat. No equipment changes are necessary.





**17. Rigorously Tested Parts:** All parts used on Tystan furnace systems are name brand and certifiable. They have been rigorously tested over an extended period of time.

**18. Proven Supplier Record:** Tystar has a large worldwide installation base with over 1200 tubes installed. We can supply excellent customer references.

**19. Strong Customer Network:** Tystar's customer network is comprised of prestigious universities, laboratories and corporations, including: National Institute of Standards and Technology, Harvard University, Jet Propulsion Lab, Communication Research of Canada, National Research Council of Canada (NINT), University of Alberta, UC Berkeley, Georgia Tech., Stanford University, University of Texas, Dallas and Arlington, UCLA, USC, UCSB, Princeton University and many more.

**20. Rapid Response (24 Hour):** Tystar will respond to any service or support request within 24 business hours.

**21. Lifetime Support:** Complete process and technical support for the entire lifetime of the equipment.

**22. Dedicated Team:** Tystar's primary engineers have worked together for over 25 years.

**23. Top-Rated Performance:** Tystar has affordable pricing for top-rated equipment performance and technical support.

**24. Support on Peripherals:** Other vendor clean room fab peripherals can be purchased through Tystar.

**25. SCE II Protocol:** Each control component has Semiconductor SECS II protocol embedded in the software.

**26. Multiple Safety Features:** Examples include: door must be closed to continue processing, gas flows must be accurate and mixed properly, proper pressure must be present before processing and many more. Customer designed safety features can be included.

**27. Dual T/C:** Temperature is controlled by a profile T/C, using spike T/Cs as backup and power measurements as tertiary backup so no wafer load is lost due to T/C failure.

**28. Power On Diagnostics:** Each process tube has extensive Power On diagnostics.

**29. Remote Access Diagnostics:** Available for quick analysis and rectification from Tystar's facility.

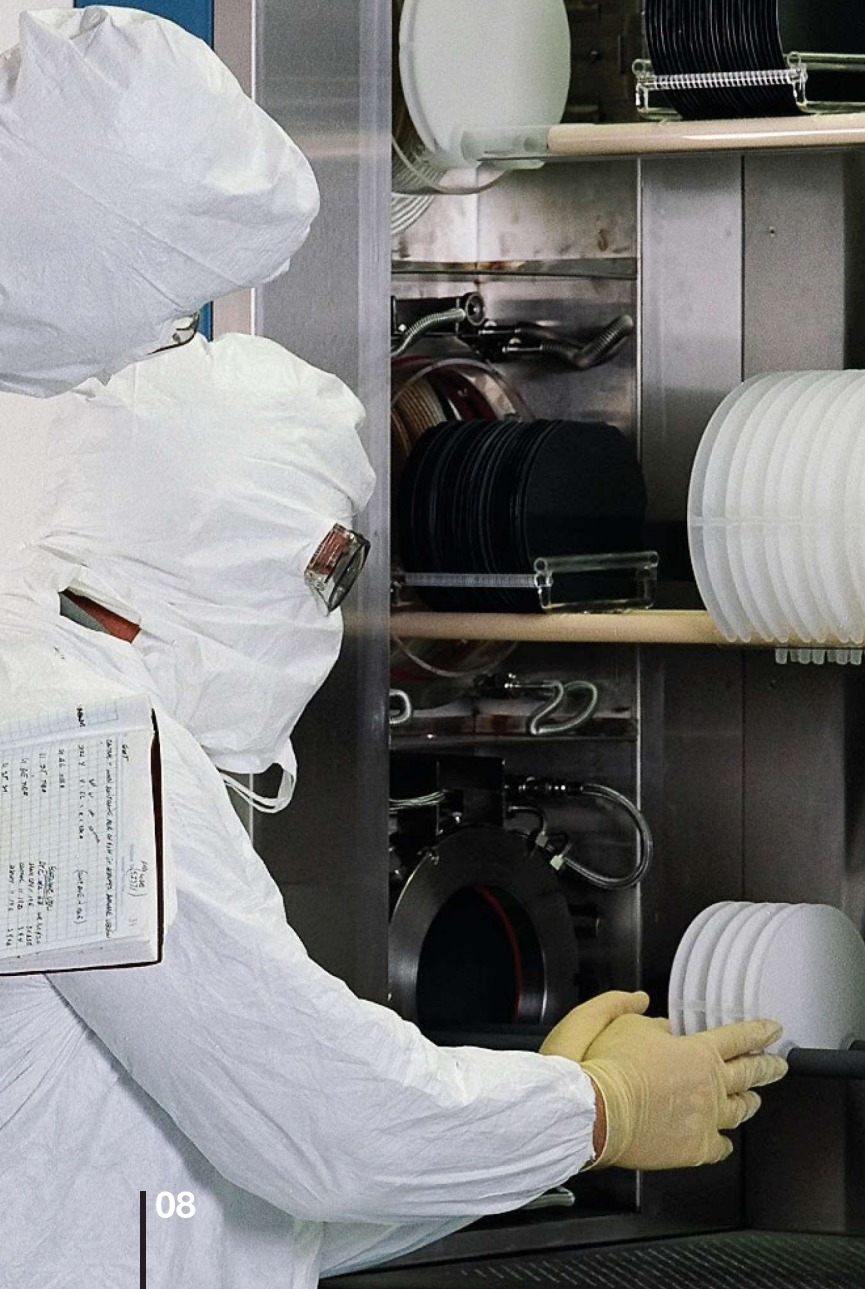
**30. Clean Exhaust:** A unique proprietary exhaust system for Silicon Nitride has been developed, with the help of UC Berkeley, to lower maintenance and prevent hazing on wafers.

**31. Built In Door Torque Down Logic:** Tystar's boat loader has a built in torque down routine which assures a good, tight door seal.

**32. No Particle Generation:** Tystar thermal reactors are specifically designed to eliminate the possibility of particle generation.

**33. Dedicated Engineering Support Team:** Tystar's engineering team has a proven record of excellence in furnace design.

# Tytan Furnaces





Tytan Standard Series 8300

## Tytan Standard Series

The Tytan Standard Systems are designed for diffusion, oxidation and LPCVD applications. The systems are compact and suitable for use in manufacturing and/or R&D environments. The Standard series have been well accepted as dependable process tools both in the industry and in the R&D community. They offer superior performance and process uniformities. The design incorporates several of the most advanced concepts required for high performance wafer processing tools.

### STANDARD SERIES

FURNACE MODEL	2000	8300
WAFER SIZE	6" / 152.4 mm	8" / 203.2 mm
TUBES (UP TO)	≤ 4 TUBES	≤ 3 TUBES
WAFERS PER TUBE	200 ATM 100 LPCVD	200 ATM 100 LPCVD
FLAT ZONE	34" / 863.6 mm	34" / 863.6 mm
DIMENSIONS (LENGTH, HEIGHT, DEPTH)	L 164" / 4165.6 mm H 82" / 2082.8 mm D 30" / 762 mm	L 164" / 4165.6 mm H 82" / 2082.8 mm D 30" / 762 mm
MAXIMUM POWER	54 KVA	75 KVA

### SOLAR SERIES

FURNACE MODEL	8342	8442
WAFER SIZE	8" / 203.2 mm	8" / 203.2 mm
TUBES (UP TO)	≤ 3 TUBES	≤ 4 TUBES
WAFERS PER TUBE	500 ATM N/A	500 ATM N/A
FLAT ZONE	42" / 1066.8 mm	42" / 1066.8 mm
DIMENSIONS (LENGTH, HEIGHT, DEPTH)	L 182" / 4622.8 mm H 82" / 2082.8 mm D 30" / 762 mm	L 182" / 4622.8 mm H 102" / 2590.8 mm D 30" / 762 mm
MAXIMUM POWER	87 KVA	113 KVA

Dimensions do not include leveler feet, blower module, control console, electrical box, or other peripherals.



Tytan Solar Series 8442

## Tytan Mini Series

The Tytan Mini Furnace Systems are designed for diffusion, oxidation and LPCVD applications. The systems require considerably less floor space and electrical power than conventional furnaces of equal capacity. The Mini tools are used both in the semiconductor/MEMS industry and in the R&D community. They offer superior performance and process uniformities. The design incorporates several of the most advanced concepts required for high performance wafer processing tools.

### MINI SERIES

FURNACE MODEL	1600	1800	3600	3800	4600
WAFER SIZE	6" / 152.4 mm	8" / 203.2 mm	6" / 152.4 mm	8" / 203.2 mm	6" / 152.4 mm
TUBES (UP TO)	1 TUBE	1 TUBE	≤ 3 TUBES	≤ 3 TUBES	≤ 4 TUBES
WAFERS PER TUBE	100 ATM 50 LPCVD	100 ATM 50 LPCVD	100 ATM 50 LPCVD	100 ATM 50 LPCVD	100 ATM 50 LPCVD
FLAT ZONE	18" / 457.2 mm	18" / 457.2 mm	18" / 457.2 mm	18" / 457.2 mm	18" / 457.2 mm
DIMENSIONS (LENGTH, HEIGHT, DEPTH)	L 74" / 1879.6 mm H 54" / 1371.6 mm D 30" / 762 mm	L 74" / 1879.6 mm H 54" / 1371.6 mm D 30" / 762 mm	L 126" / 3200.4 mm H 69" / 1752.6 mm D 30" / 762 mm	L 126" / 3200.4 mm H 82" / 2082.8 mm D 30" / 762 mm	L 126" / 3200.4 mm H 82" / 2082.8 mm D 30" / 762 mm
MAXIMUM POWER	12 KVA	19 KVA	37 KVA	45 KVA	46 KVA



Tytan Mini Series 4600



Tytan Tabletop Series 1020

## Tytan Tabletop Series

The Tytan Tabletop Systems are designed to provide high-quality resistance-heated thermal processing on a budget. The systems provide phenomenal performance and are repeatable with tight control. The interface and trace data/status display/recipe management software all provide seamless usability on the user's end, and the systems are very safe and durable.

### TABLETOP SERIES

### NANO SERIES

FURNACE MODEL	1020	1060	1080	120	160
WAFER SIZE	2" / 50.8 mm	6" / 152.4 mm	8" / 203.2 mm	2" / 50.8 mm	6" / 152.4 mm
TUBES (UP TO)	1 TUBE	1 TUBE	1 TUBE	1 TUBE	1 TUBE
FLAT ZONE	10" / 254 mm	8" / 203.2 mm	8" / 203.2 mm	12" / 304.8 mm	12" / 304.8 mm
HEATER ZONES	3	5	5	3	3
MAXIMUM POWER	5 KVA	12 KVA	18 KVA	16 KVA	18 KVA

Dimensions do not include leveler feet, blower module, control console, electrical box, or other peripherals.



Tytan Nano Series 160



## Photo-Enhanced CVD Reactors

The Tystar PVD 1000 Photo-Enhanced CVD Reactor uses ultraviolet light as an energy source for activating process gases for the deposition of dielectric films at low temperatures (<150°C). Films of silicon dioxide (SiO<sub>2</sub>), silicon nitride (Si<sub>3</sub>N<sub>4</sub>), silicon oxy-nitride (SiON) and others can be deposited. Minimal stress is observed in these films due to the low deposition temperature. Since the UV photon energy used does not ionize the process gases, no radiation damage from charged particles has been observed.

The PVD 1000 deposited films offer excellent step coverage. The PVD 1000 system is available with single- or dual-process chambers. The PVD 1000 reactor is used in a variety of applications for film deposition on "III/V" materials, such as gallium arsenide, indium antimonide and other materials that cannot tolerate higher deposition temperatures.

### PVD 1000 Process Data

	Si <sub>3</sub> N <sub>4</sub>	SiO <sub>2</sub>
Thickness Uniformity Across Substrate	< ±8%	< ±5%
Thickness Repeatability	< ±5%	< ±3%
Deposition Rate (150°C, 1 Torr)	60 Å/min.	120 Å/min.
Cycle Time (1500Å)	55 min.	45 min.
Substrate Temperature	50 - 250°C	50 - 250°C
Reactor Pressure	0.3 - 0.5 Torr	0.3 - 1 Torr

### PVD 1000 Film Characteristics (TYPICAL DATA)

	Si <sub>3</sub> N <sub>4</sub>	SiO <sub>2</sub>
Film Density	1.8 - 2.4 g/cm <sup>3</sup>	2.10 g/cm <sup>3</sup>
Refractive Index	1.8 - 2.0	1.45 - 1.48
Dielectric Constant	5.5	3.9
Dielectric Strength	4 x 10 <sup>6</sup> V/cm	6 x 10 <sup>6</sup> V/cm
Particle Density	< 10/cm <sup>2</sup>	< 10/cm <sup>2</sup>
Film Adhesion (Tension)	7 x 10 <sup>6</sup> Pa	70 x 10 <sup>6</sup> Pa
Etch Rate	60 - 100 Å/sec. 1) 1) 1:10HF	90 Å/sec. 2) 2) B.O.E.

### PVD 1000 REACTOR SPECIFICATIONS

#### Dimension / Weight

Height	46 in. / 1168 mm
Depth	28 in. / 711 mm
Width	81 in. / 2057 mm
Weight	970 lbs. / 427 kg

#### Electrical Power

<b>Input Power</b>	208 / 220 VAC, 3 Phase, 40 A, 60 Hz
	220 / 380 VAC 3 Phase, 25 A, 50 Hz

#### Gas Supplies

##### Reactant Gases

Fittings: 1/4" Metal Face Seals (VCR)

SiH <sub>4</sub>	20 sccm / 15 psi
NH <sub>3</sub>	200 sccm / 20 psi
N <sub>2</sub> O	200 sccm / 20 psi

**Dimensions do not include leveler feet, blower module, control console, electrical box, or other peripherals.**



## Gas Control Systems

Tystar's gas control equipment provides precise control and mixing of industrial process gases used not only in the semiconductor but also in many other industries. The gas panels use compact, modular designs and are fabricated from 316 stainless steel with orbitally-welded joints and connections. They are leak tested to  $10^{-8}$  cm<sup>3</sup>/s with helium.

### MFS 460 Electronic Gas Controller

The Tystar MFS 460 Electronic Gas Controller directs the process gas flows of up to six individual mass flow controllers. In either manual or automatic mode, the MFS 460 monitors gas flows, provides flow error bands, and displays set points and actual gas flows. For low-pressure CVD applications, the unit provides reactor pressure readout and closed-loop pressure control. The MFS 460 also stores gas interlocks, gas ratio controls and error bands in an EPROM, guaranteeing safe handling of all process gases. It interfaces (via an RS 232 serial communication data link) with the master controller, such as the Tystar FCS 10. The MFS 460 Electronic Gas Controller provides safety interlocks and other critical gas control features.

#### Interface

Mass Flow Controllers	For All Standard Models
Set Point Out	0...5 VDC
Analog Singal	0...+5 VDC
Output Impedance	6 Ohms
Input Impedance	25 Ohms
Digital Input	On/Off TTL Level with 4.7 kOhm Pullup Resistor
Gas Flow Loops	Up to Six
Shut-off Valve	+24VDC Out Output open collector
Thermocouple Input	Type R, 300 - 1375° C Range
Serial Communication	RS 232C Maximum Cable Length 25 ft./8m
Parallel Remote Control	0-5 VDC, Contact Closure, Input/Output
Keyboard	Membrane Switch 4x4 Matrix
Alphanumeric Display	10 Digit, 14 Segment Vacuum Fluorescent

#### Electrical

Power	85 to 264 VAC ±10%, 47/63 Hz
Power Consumption	153 W max
Power Supply	
Regulated: (< 0.5% variation)	+5VDC/15A, +15VDC/2A, -15VDC/2A, 24VDC/3A
Unregulated:	5VAC/0.48A

#### Environmental

Ambient Operating Temperature	5°C to 43°C (40°F to 110°F)
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#### Dimensions

Height	10.8 in. / 275 mm
Width	6.0 in. / 152 mm
Depth	ATM 8.5 in. / 216 mm LPCVD 9.75 in. / 248 mm
Weight	MAX 7.9 lbs / 3.6 kg



## CAL-STAR 400 Mass Flow Calibrator

The Tystar CAL-STAR 400 Mass Flow Calibrator is a portable, secondary standard test instrument designed for easy field calibration of all commercially available mass flow meters and mass flow controllers with standard pin configuration.

The CAL-STAR 400 includes four precision Mass Flow Meters (Flow Standards) with selected ranges from 0 to 10 slpm as reference units. The reference Mass Flow Meters are calibrated with traceability to NIST Standards.

The CAL-STAR 400 comes with an optional Windows-based data collection software which inputs data obtained in real-time to a built-in spreadsheet program. The data can be represented in graphical form for further analysis and evaluation. For each flow calibration, a graph is created which compares the test unit with the standard readout. The test data are transferred to a word processor where a calibration document is generated. The CAL-STAR 400 data collection software has a user friendly menu for easy access to new and previously saved calibration data.

### Controls & Functions

ON/OFF Power Switch	Set Point Selection Digital Switch
Flow Standard/Test Unit Display Switch	Test Unit Electrical Connection
Flow Standard Selection Switch	Gas Inlet/Outlet Fittings
Auto-Zero Switch	5-Digital Set Point/Flow Digital Display Meter

### Performance

Standard Ranges:	0 - 200 sccm
	0 - 1 slpm
	0 - 5 slpm
	0 - 10 slpm
	Other ranges at request

**Accuracy** +/-1.0% of full scale

**Repeatability** +/-0.2% of full scale

**Settling Time** <1.5 seconds

**Linearity** +/-0.5% of full scale

**Gas Pressure** 10-60 psig (69-413 kPa)

**Temperature** 0 ... 50°C

### Electrical

Input Power:	115 VAC/.77 A or
	230 VAC/1.2 A

### Mechanical

Gas Fittings:	1/4" Face Seal (VCR) inlet and outlet
Gas Tubing:	316L SS/15u in. Ra
Leak Integrity:	<10 <sup>-9</sup> atm cm <sup>3</sup> /sec He

### Dimensions

Height:	7.0" / 185 mm
Width:	16.5" / 420 mm
Depth:	12.6" / 320 mm
Weight:	43 lbs / 19 kg





## Mass Flow Device Tester (MFC Tester)

### Specifications

Display	0.4"/1.2 mm, Backlit LCD
Switch Positions	Off, Control, Output, Valve, Zener Diode, $\pm 15$ V
Maximum Voltage Range	$\pm 20$ VDC
Accuracy	$\pm 0.02\%$ Full Scale
Sampling Rate	2.5 per second
Supply Voltage	+5.00 VDC, (Regulated from MFC Power Supply)
Supply Current	37 mA
Input Independence	1 M $\Omega$
Over-range Indication	Yes
Operating Temperature	0-50° C
Size	3.8" x 2.4" x 1.0" (96 x 61 x 25 mm)
Weight	3.5 oz (100 g)

The Tystar MFC Tester is an inexpensive, hand held, lightweight instrument for the testing of most commercial Mass Flow Controllers and Mass Flow Meters (MFC's) with a standard 20-pin card edge connector. The data are displayed on a large backlit LCD. A miniature rotary switch is used to select different test points of the Mass Flow Devices. At the back of the instrument is a Printed Circuit Board, PCB, with test points for manual purge or closing the valve of the MFC. It can be used remotely at some distance from the gas control panel, which is sometimes hard to reach. The MFC Tester can measure a number of the following voltages (Set Point, Flow Output, Valve, Zener, and Supply Voltages).

## Tystar Standard Processes

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### Thermal Processes

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#### Atmospheric Processes:

- **Anneal Processes:**
  - High Temperature Anneal
  - Metal Anneal
- **Oxidation:**
  - Wet Oxidation:
    - Bubbler
    - Pyrogenic
    - Drip Feed Flash Vaporization
  - Dry Oxidation
- **Doping Processes:**
  - Solid Source Doping:
    - p-Type
    - n-Type
  - Liquid Source Doping:
    - $\text{POCl}_3$
    - $\text{BBr}_3$
- **Sintering Processes**
- **Nano Carbon Material Processes:**
  - Carbon Nano Tubes:
    - Vertically Aligned
    - Horizontally Aligned
  - Graphenes
- **Optical Fiber Preform Processes (MCVD)**

#### Low Pressure Chemical Vapor Deposition (LPCVD):

- **Silicon Nitride:**
  - Low-Stress
  - Stoichiometric
- **High Temperature Oxide (HTO)**
- **Low Temperature Oxide (LTO)**
- **Poly Silicon:**
  - Doped
  - Undoped
- **Glass:**
  - PSG
  - BPSG
- **Silicon Nano Wires**
- **TEOS**
- **Polycrystalline SiGe**
- **Nano Carbon Material Processes:**
  - Carbon Nano Tubes:
    - Single-Walled
    - Multi-Walled
  - Graphenes:
    - Single-Layered
    - Multi-Layered

## Non Thermal Processes

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### Photo-Enhanced:

- Silicon Nitride
- Silicon Oxide
- Silicon Oxy Nitride

### Plasma-Enhanced:

- Carbon Nano Materials:
  - Carbon Nano Tubes
  - Graphenes
- Ultra Nano Crystalline Diamond (UNCD)
- Nano Crystalline Diamond (NCD)
- Micro Crystalline Diamond (MCD)
- Single Crystalline Diamond (SCD)

## Accessories

### Quartzware:

- Thermal Process Tubes
- Boats
- Plugs
- Baffles
- Sheaths For Rods And Thermocouples
- Torches

### Thermocouples:

- R-Type Profile
- R-Type Spike
- K-Type Spike

### Valves:

- Manual Diaphragm
- Pneumatic
- Gate Vaves

### Instruments:

- MFC Calibrator (CAL 400)
- MFC Tester

### Heater Elements:

- Low Mass
- Standard A-1 Kanthal
- High Temperature APM

### Tystar Tool Box:

- Standard
- Pro

### Sealing Components:

- O Rings
- Gaskets

### UV Lamps And Spares For PVD-1000

