Flokal® & conventional processes in semiconductor industry!

Issue 15-March 2004

Flokal® & conventional processes in semiconductor industry!

- Basic processes;
- General overview of reactor's processes;
- Flokal's products & services for conventional processes.

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ABOUT US

FLOKAL® - the ultimate resource for:

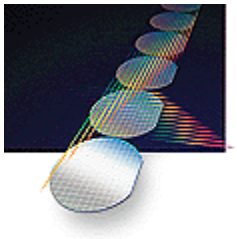
- **MFC's** accessories - **Valves** & Accessories - **Gas-systems** & Accessories;
- **Thermo-elements** (spike and profile)
- Gas/Liquid Filtration and Purification & Accessories
- **Vacuum** measure and control devices

We are ISO 9001: 2000 certified

Basic processes

Many ingredients and dozens of steps are needed to make a semiconductor device. Main two steps of them are preparation and fabrication.

Preparation



Silicon Wafers cut from an ingot of pure silicon, are used to make semiconductor devices. Silicon, the primary ingredient of beach sand, is a semiconductor of electricity. Semiconductors are materials that can be altered to be either a conductor or an insulator.

Chemicals and gases are used throughout the chip-making process. Some, like hexamethyl-disilazane, are complex and difficult to pronounce. Others, such as boron, are simple elements found in the Periodic Table of the Elements.

Metals, such as aluminum and copper, are used to conduct the electricity throughout the semiconductor device.

Ultraviolet (UV) Light has very short wavelengths and is just beyond the violet end of the visible spectrum. UV light is used to expose patterns on the layers of the microprocessor in a process much like photography.

Masks used in the chip-making process are like stencils. When used with UV light, masks create the various circuit patterns on each layer of the semiconductor device.

Fabrication

Semiconductor devices are built in layers on a silicon wafer through various processes using chemicals, gases, and light.

On the wafer, the first layer of silicon dioxide is grown by exposing it to extreme heat and gas. This growth is similar to the way rust grows on metal when exposed to water. The silicon dioxide on the wafer, however, grows much faster and is too thin to be seen by the naked eye.

The wafer is then coated with a substance called photoresist. Photoresist becomes soluble when exposed to ultraviolet light.

Layering

In a process called photolithography, ultraviolet light is then passed through a

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patterned mask, or stencil, onto the silicon wafer. The mask protects parts of the wafer from the light. The light turns the exposed areas into a gooey layer of photoresist. Each layer on the microprocessor uses a mask with a different pattern.

- **Etching**

The gooey photoresist is completely dissolved by a solvent. This reveals a pattern of photoresist made by the mask on the silicon dioxide. The revealed silicon dioxide is etched away with chemicals. The rest of the photoresist is removed. This process leaves ridges of silicon dioxide on the silicon wafer base.

- **Layers**

To begin another layer, a second, thinner layer of silicon dioxide is grown over the ridges and etched areas of the wafer base. Then, a layer of polysilicon and another layer of photoresist are applied. Ultraviolet light is then passed through a second mask, exposing a new pattern on the photoresist. The photoresist is dissolved with solvent to expose the polysilicon and silicon dioxide, which are then etched away with chemicals. The remaining photoresist is removed, leaving ridges of polysilicon and silicon dioxide.

- **Ion Implantation**

Through a process called ion implantation (also called doping), the exposed areas of the silicon wafer are bombarded with various chemical impurities called **ions**. Ions are implanted in the silicon wafer to alter the way silicon in these areas conducts electricity.

- **Layers upon Layers**

The layering and masking processes are repeated, creating windows that allow for connections to be made between the layers. Atoms of metal are deposited on the wafer, filling the windows. Another masking and etching stage leaves strips of the metal that make the electrical connections.

In modern semiconductor technology there are three main directions of layering processes development.

- **Oxidation of wafer silicon (ATM processes):**

Wafer silicon reacts with oxygen or a gaseous compound containing oxygen to form a thin layer of silicon dioxide on the surface of the wafer. Since silicon of the wafer is converted to silicon dioxide, the silicon is consumed in the process. The dioxide layer grows into the wafer.

- **Low pressure chemical vapor deposition:**

A thin layer of material is deposited on the wafer surface. Chemicals containing the elements required in the final layer material are introduced into the reactor. Upon mixing of the vaporous reagents a chemical reaction occurs in which the layer compound is formed and deposited on the surface of the wafer. High temperatures (energy) are required to make the chemical reactions possible. Chemical deposition at atmospheric pressures is possible, but lowering the pressure allows lowering of the temperature and increases layer uniformity.

- **Heat treatment:**

A third type of process that can be performed is heat treatment. Heat treatments are operations in which the wafers are heated to a specific temperature. No additional material is added and no chemical reactions take place.

Heat treatments may be performed to achieve specific results. A special heat treatment is called annealing.

- **General overview of reactor's process**

As can be seen from the description of the two basic layering processes the conditions as to pressure of the operations may be very different.

Oxidation reactions are carried out at atmospheric pressure and very high temperatures, whereas low pressure deposition processes are performed at very low pressures and in a somewhat lower temperature range.

The same applies to the difference in reaction temperatures of the two kinds of processes:

- Atmospheric Pressure or ATM reactors;
- Low Pressure Chemical Vapor Deposition or LPCVD reactors.

Chemical Vapor Deposition (CVD) is one of the efficient ways of implementing vapor phase deposition in a manufacturing environment. Among its many applications are the synthesis of silicon in the wafer production industry, for implanting dopants in wafers, for depositing metallic interconnects between devices in integrated circuits, for creating compound semiconductor lasers and for synthesizing the high thermal conductivity diamond needed for high circuit density multichip modules. It is also the key technology for producing flat panel displays, creating efficient photovoltaic devises, synthesizing high temperature superconductors or ferroelectric materials. Still other applications include the fiber coating, metal matrices for titanium matrix composites, thermal barrier oxide coatings for aircraft engine components, infrared detectors based on Vanadium Oxides and perovskites.

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While much progressing in improving the efficiency and reliability of CVD technology has been achieved, it is still a rather costly process, especially when one needs to obtain the high quality required in many of the above applications. Among the serious problems encountered is the minimization of defects in the production process.

We offer variety of units, which are used in different types of semiconductor producing systems. We also offer a row of services for providing these systems and equipment work on high level of productivity.

Semiconductor systems must be equipped with high precise units. Amongst of these units: valves, mass flow controllers, pressure transducers, evaporators and bubblers, filters, traps etc.

Flokal offers a wide row of such equipment and related services. We focus on product and service excellence!

Flokal's products & services for conventional processes

- **Valves**

We offer:

- Springless ultra-clean diaphragm valves cover up to 20slm and provide extremely low dead volume;
- Injection Valve: to help get the film deposition as thin as possible, our remote controlled injection valves provide fast response time (9.4 msec), long life span (10,000,000 cycles) and low flow;
- High Flow Valves: with an extremely low internal volume, they provide a high flow coefficient (Cv:0.45);
- Medium Temperature: these valves are recommended for temperatures going up to 160°C;
- 1" 1/8 C-seal diaphragm valve: this valve helps your gas systems remain compact. Standard semi;
- Manifold: designed for purge or vent functions into gas panels;
- Bellows Shut-Off valves: F-series: Available in 2, 3 and 4 ways port configuration, with manual toggle or 1/4 turn and pneumatic normally open or closed. The bellows valves cover flow rates up to 50slm;
- High Temperature valves: for processes using ambiant or gas temperature up to 240°C;
- High Flow valves: withstand flow rates up to 400slm using the same housing as the standard flow valves;
- High Temperature & High Flow: recommended for temperature up to 240°C and flows up to 400slm;
- Mutiways valves: monobloc with multi-actuators, they keep your gas systems very compact;
- Metering and vernier metering valves for manual and very accurate gas flows adjustment.

- **Mass flow controllers**

We offer a variety of equipment from world leaders.

Our specialist will chose the best fit for you mfc from wide range of available mass flow controllers/meters. All your specific demands will are taken into account: we will provide you with equipment, which will most fully satisfy your requirements.


Bronkhorst High-Tech B.V.


Brooks Instrument


Celerity


Qualiflow


Mykrolis Corporation


Sensirion


Beijing Sevenstar Huachuang Electronic Co Ltd


Lintec Co., LTD


HoribaStec

We can supply and service more then 100 types of mass flow controllers from different brands. We can satisfy the most demanding customer!

Calibration, clean and repair etc. – we can do everything for your mfc productivity work!

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MFC calibration service

We are an independent organization specialized in the service of Mass Flow Control devices. The service we provide is cleaning, repair, changing gas medium, flow range, calibration and leak checking

Ten (10) good reasons to choose FLOKAL

1. More then 10 years experience in MFC service
2. Familiar with almost all manufacturer / models
3. Independent and certified organization
4. High quality calibration-standards with different calibration gasses
5. Spare parts in stock
6. Clean-room facility
7. Each calibration is provided with a calibration certificate
8. Fast turn around
9. 24-hours service possible
10. Fair, competitive prices

Specifications:

All calibrations and repairs are carried out in a conditioned area:
Particle class 10.000 (Fed.std.209C)
Temperature: 21± 1 єC
Relative humidity: 35-55 %

Pressure transducers

We offer 7 types of pressure transducers from Mykrolis corporation and some kinds of pressure transducers from Bronkhorst BV.

Amongst them:

Conventional Pressure Transducers

SPT and HPT model pressure transducers are the ultimate in high purity and accuracy for pressure monitoring. Cleaned and packaged in a Class 10 environment, the SPT and HPT meet the most rigid semiconductor high purity specifications. With accuracy of better than 0.25% of full scale, the SPT and HPT transducers will provide years of reliable pressure monitoring for most semiconductor applications. The SPT and HPT models have one of the smallest footprints in the industry for quick and easy installation in the tightest areas.

LR050/LR051/LR052 Series Pressure Transducer Displays

Local display of process pressure improves safety and quality control of the gas delivery systems. The LR050 allows a 4-20mA sensor to digitally display its pressure and send its signal to a final destination. The sensor, such as a 204 series pressure transducer, connects to either the back or bottom of the LR-050 with a 4-pin, Bendix® connector. The LR050 connects to the loop through either a 2-wire, pigtail cable or a 4-pin male Bendix connector. The LR050 offers a real time reading. It is loop powered, single channeled, and can swivel around the transducer so the viewing angle can be adjusted. The display has red LED backlighting for easy reading in low ambient light. The LR051 has one adjustable alarm setpoint. The LR052 has two adjustable alarm setpoints.

SolidSense® 1.5" Surface Mount Pressure Transducers

SolidSense SL 1.5" surface mount

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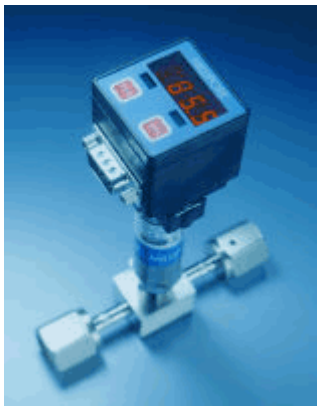
transducers are manufactured using a patented pressure sensing technology. SolidSense SL 1.5" surface mount transducers combine the superior performance of thin film technology with the manufacturing advantages of semiconductor processes. Using a Plasma Enhanced Chemical Vapor Deposition (PECVD) process, we have created a repeatable, reliable method of molecularly bonding sensing elements to metal substrates. Furthermore, by using statistical process control on our automated batch processing of pressure sensors, Mykrolis has reduced process variance. This unique manufacturing process minimizes operator handling of components and delivers a cleaner and more accurate device. SolidSense SL 1.5" surface mount transducers consume the least amount of space on gas panels comparted to standard inline designs, while reducing parts inventories and variations. SolidSense SL 1.5" surface mount transducers are available in both C-Seal and W-seal interfaces. You can rely on SolidSense SL 1.5" surface mount transducers for accurate and precise pressure monitoring in ultra-high purity environments. SolidSense SL 1.5" surface mount transducers are backed by a global support network unlike that offered by any other supplier of components for the microelectronics industry.

SolidSense® TF Thin Film Pressure Transducers

SolidSense TF transducers are manufactured using a patented pressure sensing technology. SolidSense TF transducers combine the superior performance of thin film technology with the manufacturing advantages of semiconductor processes. Using a Plasma Enhanced Chemical Vapor Deposition (PECVD) process, we have created a repeatable, reliable method of molecularly bonding sensing elements to metal substrates. Furthermore, by using statistical process control on our automated batch processing of pressure sensors, Mykrolis hasreduced process variance. This unique manufacturing process minimizes operator handling of components and delivers a cleaner and more accurate device. You can rely on SolidSense TF transducers for accurate and precise pressure monitoring in ultra-high purity environments. SolidSense TF transducers are backed by a global support network unlike that offered by any other supplier of components for the microelectronics industry.

SureView DR Dual Range Transducer Display



The SureView DR Display is a miniture in-line display featuring two units of measure per range. The standard units are PSI and MPa. Local display of process pressure improves safety and quality control of the gas delivery systems. Local dual range and dual units of measure enable reduction of OEM part numbers and inventory requirements along with simplifying the documentation and configuration requirements for products targeted for global markets. The standard SureView DR Display is designed to interface to transducers with 100 PSI or 250 PSI full scale outputs. Together, the Millipore pressure transducer and SureView DR Display provide the most accurate, reliable and easy to use pressure measurement and display system in the industry.

ThruTube Pressure Transducers

The continuous flow design of the NTT and HTT series pressure transducers are perfect for high purity requirements of the semiconductor industry. The NTT and HTT are true flow through devices having zero dead volume and come in a variety of pressure ranges, outputs and process connections. With a small footprint and replaceable electronics, the NTT and HTT are easy to install and maintain for years of service.

We also offer units, which combine in itself functions of pressure transducers & mass flow controllers & mass flow meters.

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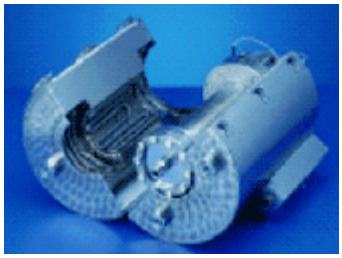
EL-PRESS Electronic Pressure Transducers/Controllers

The EL-PRESS series electronic pressure transducers and controllers for gases and liquids have a well-proven compact thru-flow design. The instruments include a diaphragm type piezo-resistive pressure sensor for pressure measurement/control from: lowest ranges 2 ... 100 mbar absolute, gauge or differential; up to highest ranges 8 ... 400 bar absolute or gauge; differential pressure transducers have a max. range of 0,3 ... 15 bar dif.

In some kinds of CVD processes we need to evaporate reactive mixture into the gas. In such cases we offer evaporator and bubblers system, which are making vapor of the reactive gas and carrier gas and stream this mixture into reactor.

Evaporators and bubblers

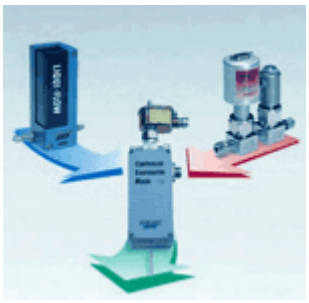
Flokal Jipelec



The Jipelec Inject system has been specially developed for low vapor pressure precursors. It allows pure liquid precursors, liquid and solid precursors dissolved in earner liquid (organic solvent) to be used tor CVD and MOCVD processes.

The Jipelec Inject provides repeatable performance characteristics which are primarily based on a contactless flash evaporation of the precursor materials. The source container remains at room temperature and prevents decomposition of thermally unstable precursors.

Mixing Chambers/Evaporators (Liquid Delivery System with Vapour Control)



The CEM-System (Controlled Evaporation and Mixing) is an innovative Liquid Delivery System (LDS) that can be applied for atmospheric or vacuum processes. It consists of a liquid flow controller, an MFC for carrier gas and a temperature controlled mixing and evaporation device. The system is suitable for mixing liquid flows of 0,25-1000 g/h resulting in saturated vapour flows of 5 sccm to 20 slm. This CEM-system can replace bubblers. New opportunities created with the CEM-system: mixtures can be evaporated and even solids, dissolved in solvents can be vaporised successfully.The process is fast, accurate, highly repeatable and efficient.

One of the main concerns facing the semiconductor industry is the need for high purity process fluids, gases and water at every stages of its manufacturing processes. For the purification and filtration of gases, fluids and water, Flokal supplies a wide range of filters brands such as Mykrolis-Millipore, Pall, Cuno and others.

Filters

ChamberGard™ Fast Vent Diffusers

The choice to reliably increase system throughput by minimizing load lock vent cycle time. The ChamberGard Fast Vent Diffusers provide RAPID venting to atmosphere without disturbing or adding particles to wafers in the chamber.

Gasketgard™ Inline Gasket Filters

The Gasketgard filter is a compact, all-metal filter that fits in place of standard 1/4" VCR gaskets in gas distribution systems. These compact filters protect sensitive gas components, such as mass flow controllers, regulators and valves from particle damage. The Gasket filters are an economical safegard against contamination that can have an adverse effect on these critical components.

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Linegard™ Micro Inline Gas Filters

The Linegard Micro is a compact inline gas filter which is made of 100% SUS316L. It removes 0.2 µm particles. These filters protect sensitive gas components, such as mass flow controllers, regulators and valves from particle damage. The Linegard Micro filter is an economical safegard against contamination that can have an adverse effect on these critical components.

Unigard™ Inline Gas Filters

The Unigard filter is an all-in-one union and filter designed to fit in placed of standard 1/4" gasket seal fittings in the gas distribution line. These filters protect sensitive gas components, such as mass flow controllers, regulators and valves from particle damage. The Unigard filter is an economical safegard against contamination that can have an adverse effect on these critical components. The Unigard filter has an all-metal construction, making it ideal for use in applications with high temperature and dynamic pressure requirements. The all-metal construction also eliminates outgassing and is corrosionresistant.

Wafergard® GN Gas Filter Gun

Wafergard GN gas filter gun is designed for the point-of-use filtration of compressed gas. With its Wafergard GN filter element, an exclusive Mykrolis design, the Wafergard gas filter gun offers these significant advantages: Superior Durapore Membrane, High Effective Filtration Area, Reliable Performance, Corrosion Resistant.

Wafergard® II F-6 In-Line Gas Filter

Wafergard II F-6 in-line gas filters are the filters of choice for ultra-high purity gas system filtration. These filters have excellent compatibility with all classes of semi-conductor gases and offer high efficiency filtration with optimal flow differential performance.

Wafergard II F Micro Inline Gas Filters

For ultra-high-purity gas systems, your best choice is the Wafergard II F micro inline gas filter. Recommended for inert and reactive gases, this device offers excellent compatibility with all classes of semiconductor process gases. Its compact diameter of 19.05 mm (0.75") enables easy installation in space-restrictive gas panels and cabinets.

Wafergard® II F Mini XL Inline Gas Filters

Wafergard II F Mini XL in-line gas filters are the filters of choice for ultra-high purity gas system filtration. Recommended for filtering inert and reactive gases, these filters offer excellent compatibility with all classes of semiconductor process gases. Use them in gas panels and gas cabinets where ultra-high purity is required for wafer processing.

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Wafergard® II SF Mini & Mini XLIn-Line Gas Filters

Wafergard II SF gas filters are the filter of choice for high purity gas systems when all-stainless steel construction is preferred. A state-of-the-art housing assembly eliminates outgassing by minimizing weld area. The all-metal construction is ideal for high temperature and dynamic pressure applications. Its compact size and flexible choice of fittings provides ultimate design efficiency and minimizes engineering costs.

Wafergard® III NF-750 Gas Filters

Wafergard III nickel filters are the cleanest, most efficient all-metal filters available. The patented nickel filter membrane (U.S. Patent No. Re 36,249) offers superior corrosion resistance and excellent compatibility with inert and corrosive gases. The innovative housing design eliminates outgassing and reduces drydown time. The Wafergard III NF-750 provides the strength of Millipore metal membrane with the pressure drop and compact size of Teflon fluoropolymer filters.

Wafergard® GT Plus In-Line Gas Filters

Designed to remove particles from inert gases for flow rates up to 30 slpm (1 scfm).

Wafergard® II F-40 Inline Gas Filters

Wafergard II F-40 in-line gas filters are the filters of choice for ultra-high purity gas system filtration. These filters have excellent compatibility with all classes of semi-conductor gases and offer high efficiency filtration with optimal flow differential performance.

Wafergard® III NF-30 Gas Filters

Wafergard nickel filters are the cleanest, most efficient all-metal filters available. The patented nickel filter membrane offers superior corrosion resistance and excellent compatibility with inert and reactive gases. A state-of-the-art housing assembly eliminates outgassing by minimizing weld area. The all-metal construction is ideal for high temperature and dynamic pressure applications. Its compact size and flexible choice of fittings provides ultimate design efficiency and minimizes engineering costs.

Wafergard® III NF-75 In-Line Gas Filters

Wafergard III nickel filters are the cleanest, most efficient all-metal filters available. The patented nickel filter membrane offers superior corrosion resistance and excellent compatibility with inert and reactive gases. A state-of-the- art housing assembly eliminates outgassing by minimizing weld area. The all-metal construction is

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ideal for high temperature and dynamic pressure applications. Its compact size and flexible choice of fittings provides ultimate design efficiency and minimizes engineering costs.

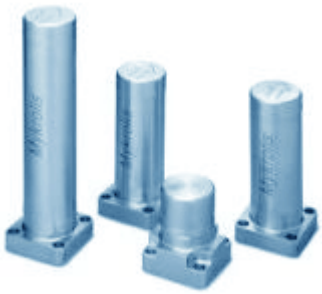
- **Wafergard® III NF Micro In-Line Gas Filters**

Wafergard III nickel filters are the cleanest, most efficient all-metal filters available. The patented nickel filter membrane offers superior corrosion resistance and excellent compatibility with inert and reactive gases. A state-of-the- art housing assembly eliminates outgassing by minimizing weld area. The all-metal construction is ideal for high temperature and dynamic pressure applications. Its compact size and flexible choice of fittings provides ultimate design efficiency and minimizes engineering costs.

- **Wafergard® MAX In-Line Teflon® Gas Filters**

Wafergard MAX Inline Teflon Filters provide the industry's best filters for ultra-high purity gas systems. Available in Bronze and Silver performance levels, the MAX series is specifically designed for high flow and low delta-pressure applications. The Wafergard product line provides ultimate process protection. Whatever your precess needs, the Wafergard family of filter provides ultimate purity, superior corrosion resistance, and excellent compatibility with all gases. Wafergard MAX is suitable for facility hook-up, valve manifold boxes, and point of use gas panel applications. The high surface area membrane provides minimal pressure drop for low vapor pressure gases.

- **Wafergard® SL 1.125" C-Seal Gas Filter**



Wafergard SL 1.125" C-Seal Filters combine the industry's best filters with the industry's smallest surface-mount design. The Wafergard product line provides ultimate process protection. Whatever your process needs, the Wafergard family of filter provides ultimate purity, superior corrosion resistance, and excellent compatibility with a full range of gases. Mykrolis's SurfaceLine filters consume the least amount of space on gas panels compared to standard inline designs, while reducing parts inventories and variations.

- **Wafergard® T-Line Gas Filter Units**

Designed and manufactured for the removal of particles in non-toxic and non-flammable inert gas applications. Fitted with the appropriate Wafergard filter cartridges, the system effectively retains particles of 0.003µm size and above.

- **Wafergard® W-Seal Mini Filters**

Wafergard W-Seal Mini Filters provide the industry's best filters in a surface-mount design. Available with stainless steel or nickel filter elements, the Wafergard product line provides ultimate process protection. Whatever your process needs, the Wafergard family of filter provides ultimate purity, superior corrosion resistance, and excellent compatibility with inert, hydride and reactive gases. Surface mount gas filter designs consume less space on gas panels than standard inline designs, while reducing parts inventories and variations.

Processes in CVD systems require stabile and precise heating mode. That's why question of choice of the heating system and measuring of temperature inside in reactor is so important.

Flokal offers custom heating systems and custom temperature measuring systems.

- **Heating systems**

We supply heating elements for e variety of processes for low, middle and high temperature applications. We manufacture our Products custom designed.

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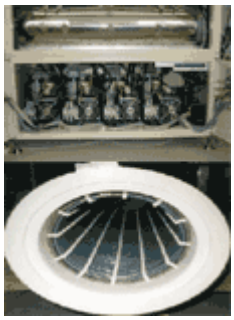

Applications:

Fast response for low temperature (LPCVD) and diffusion up to 1100^{0}C.
High velocity cooling element systems provide rapid furnace cooling to improve cycle time and process integrity, while Maintaining a controlled atmosphere during temperature ramp segments.
Vertical heating elements for processes with increased reliability, minimal wear and improved processes performance. Heavy duty, heating elements provide excellent processes results of atmospheric and LPCVD applications. These Products provide precise process temperature control, ranging from 200^{0}C to 1350^{0}C, as well as consistent, day- in and day-out perfomance that reduces Maintenance time and replacement expenses over the life of the furnace system.

- **Temperature measuring systems (Thermocouples)**

From your simple drawing, we produce high quality and customized TC. PROFILE THERMOCOUPLES. Reliable temperature measurement is of paramount importance in efficient wafer fabrication. Flokal with a history deeply rooted in servicing semiconductor wafer fabrication has become a perfect partner in the supply of highly reliable profiling thermocouples.

- Multipoint profiling sensor

- Probe type: Single Piece Ceramic Insulator with Fused Quartz Sheath
Thermocouple: Pt/Pt 10% Rh (type S)
Pt/Pt 13% Rh (type R)
Pt 6% Rh/Pt 30% Rh (type B)
Quartz elbow handle
Ball-joint connection

(Choice of Connectors)

- SPIKE THERMOCOUPLES. Flokal has become a renowned supplier of custom - made Spike profiling thermocouples in both simplex and duplex configurations. We supply custom-designed thermocouples, with any combination of ceramic and lead length.

Spike thermocouples

- REFURBISHING. Flokal offers a unique cost saving service for customers. In many cases the valuable metals determining the majority of the TC price, can be refurbished. The refurbished TC's have the same performance.

- PREVENTIVE MAINTENANCE. For our demanding customers we have a consignment stock of critical custom designed TC's in place. In this way there are no unpleasant surprises in the delivery of critical items during a scheduled shut down.

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We invite you into the world of our services!

We provide Products and services for the front end Semiconductor Market (Diffusion/ LPCVD / APCVD / PECVD / MOCVD and epitaxial processes), for Fiber Optical Manufacturing and for various processes in the petrochemical and chemical industry. We focus on product and service excellence. We offer:

For the semiconductor industry

- Diffusion-oxidation systems
- LPCVD-PECVD-systems
- RTP & RTA - Systems
- System Upgrades
- Wet-benches
- Spin-coater
- Hot-plates
- Temperature controller
- Clean room equipment
- Dry &Wet etch & clean
- Photochemical filtration and dispense systems
- Thermal control systems
- Gas systems
- MFC's & Valves
- Pressure and Vacuum measurement & control
- Gas flow standards
- Gas/Liquid purification and filtration
- Vacuum products
- Vacuum inlet and waste gas collision traps
- Chemical blending and delivery modules
- Power supply/readout
- Accredited calibrations (flow, temperature, pressure, geometry)
- Cleaning, repair and maintenance
- Automation and Software
- Humidity sensors
- Specialty gases, liquids, solids
- Heating elements
- Thermocouples
- Precursor delivery technology
- Process Analysis
- Quartz; Tungsten; Molybdenum; Tantalum; Graphite; Platinum; Others

For the process industry

- Gas / liquid flow measurement & display
- Temperature measurement & display
- Pressure measurement & display
- Valve positioners & control valves
- Level measurement & display
- Turbidity measurement & display
- Humidity measurement & display
- Accredited calibrations (flow, temperature, pressure, level)
- Process Analytical solutions
- Automation and Software
- Flow meters

For the pharmaceutical industry

- Cryotechnology
- Gas / liquid flow measurement & display
- Temperature measurement & display
- Pressure measurement & display
- Accredited calibrations (flow, temperature, pressure, level)
- In-line particle analyzers
- Fluid dispensers & metering pumps
- Filter and separation systems
- Process Analytical solutions
- Automation and Software

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