

Analyzers for Ultra-high Purity Gas Quality Control

For Semiconductor Manufacture

Benefit from Trace Oxygen, Moisture, and Impurities Measurements with High-precision Analyzers and Gas Chromatographs

The speciality gases used in manufacturing semiconductors must be high purity because of the detailed precision of the process. Even the presence of trace impurities measured in parts per trillion will result in the loss of whole batches of wafers. We offer reliable, repeatable measurements of key parameters with lower detection limits down to <100 ppt.

Expertise in Products for Semiconductor Manufacture

Our oxygen and moisture analyzers and sensors, together with process gas chromatographs, provide a complete solution to monitor and control the purity of specialty gases and toxic gases such as: nitrogen, helium, argon, hydrogen, tungsten hexafluoride, octafluorocyclobutane, silane, germane, nitrous oxide and nitrogen trifluoride.

Measurement Parameters

- Trace Moisture – LDL of 1 ppbv with Pura
- Trace O₂ – LDL <100 ppt
- Trace Gases – LDL down to <100 ppt with MultiDetek3 and LD8000 Plus

Benefits

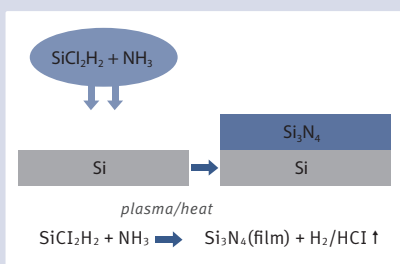
- Reliable measurements of trace impurities down to parts per trillion
- A complete measurement and analysis solution from a single supplier
- Multiple trace impurity measurements possible with a single analyzer system

Selected Served Applications

- Monitoring oxygen and moisture contamination of UHP gases
- Confirming the purity of UHP speciality gases such as in plasma etching of silicon wafers for LCD production
- Heat treating silicon wafers
- Trace N₂ for quality control
- Cleaning processes in chemical vapor deposition chambers
- Ambient monitoring for personnel safety

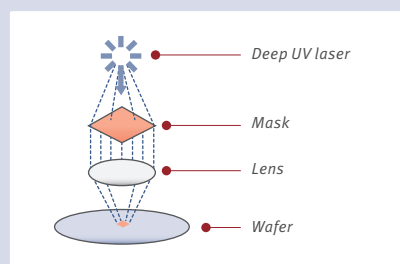
Semiconductor Processes

Deposition



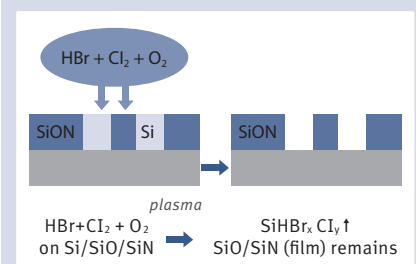
- Nitrogen gases:** NH₃, N₂O
Silicon gases: SiH₄, Si₂H₆, TCS, HCDS, TMS
Oxygen: O₂
Tungsten hexafluoride: WF₆
Germane: GeH₄

Lithography



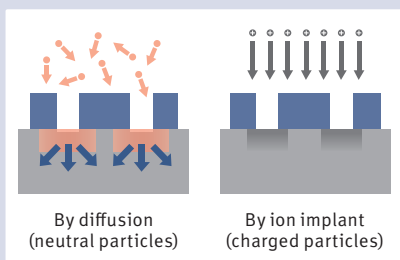
- Laser gases:** 95+ % Ne, with Ar, Kr, F₂
Carbon dioxide: CO₂
Hydrogen: H₂

Etching



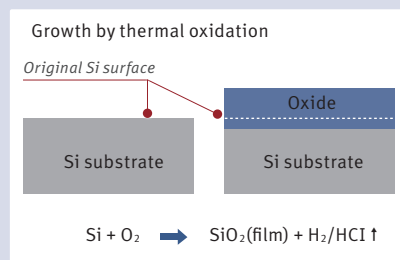
- Fluorocarbons:** C_xH_yF_z CF₄, C₂F₆, C₃F₈, C₅F₈, C₄F₆, CHF₃, CH₂F₂, CH₃F, C₂HF₅
Sulfur hexafluoride: SF₆
Halides: HCl, Cl₂, HF, F₂, HBr, ClF₃, XeF₂
Oxygen: O₂

Doping



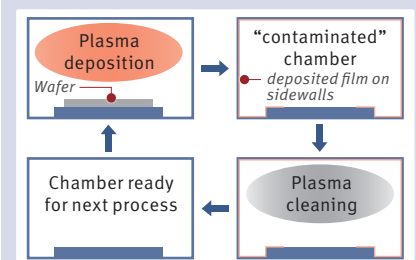
- Hydrides:** AsH₃, BF₃, B₂H₆, PH₃, GeH₄, Ge₂H₆

Annealing



- Oxygen:** O₂
Hydrogen: H₂
Argon: Ar

Chamber Cleaning



- Nitrogen trifluoride:** NF₃
Other fluoride gases: CF₄, C₂F₆, C₄F₈, ClF₃, SF₆
Chloride gases: HCl, Cl₂
Fluorine: F₂

Product Selector

Application/Service	Measurement Range	Measured Gas / Background Gas	Recommended Product
Monitoring oxygen contamination of UHP gases	0...100 ppb O ₂ LDL <100 ppt	N ₂ , H ₂ , Ar	<ul style="list-style-type: none"> PI2-MS
Monitoring moisture contamination of UHP and speciality carrier gases	0...100 ppb _v H ₂ O, 0...10 ppm _v H ₂ O 50 ppm _v H ₂ O 100 ppm _v H ₂ O LDL 1 ppb _v (Pura) -120...-40 °C dew point	Fully fluorinated compounds (FFCs), N ₂ , H ₂ , Ar etc	<ul style="list-style-type: none"> QMA401 Pura-TX-2W Pura-AOL2 S8000 RS
Non-invasive leak detection in UHP gas distribution systems with mobile cart to less than 100 ppb O ₂	0...100 ppb O ₂ 0...100 ppb _v H ₂ O 0...10 ppm _v H ₂ O 50 ppm _v H ₂ O 100 ppm _v H ₂ O -120...-40 °C dew point	N ₂ , H ₂ , Ar	<ul style="list-style-type: none"> PI2-MS Pura-TX-2W Pura-AOL2 QMA401
Monitoring oxygen contamination of UHP H ₂ scavenger gases used in atmosphere soldering and annealing copper films	0...100 ppb O ₂	N ₂ , H ₂ , Ar	
Confirming the purity of UHP speciality gases	0...100 ppb LDL 0.1...0.5 ppb	Impurities: H ₂ ,Ar,N ₂ ,CH ₄ ,CO,CO ₂ ,NMHC Background: He,Ar,O ₂ ,H ₂ ,N ₂ ,CO ₂ ,Si-H ₄ ,B ₂ H ₆ ,GeH ₄	<ul style="list-style-type: none"> MultiDetek3
Heat treating silicon wafers – Monitoring trace oxygen in wafer oxidation furnaces	0...10 ppm O ₂	N ₂ , H ₂	<ul style="list-style-type: none"> GPR-1600 GPR-1200
Inerting in solder reflow ovens and wafer fabrication	<10 ppm O ₂	N ₂	<ul style="list-style-type: none"> Microx 231
Cleaning processes in chemical vapor deposition chambers – monitoring moisture levels after purging with high purity nitrogen	0...100 ppb _v H ₂ O 0...10 ppm _v H ₂ O 50 ppm _v H ₂ O 100 ppm _v H ₂ O -120...-40 °C dew point	N ₂	<ul style="list-style-type: none"> Pura-TX-2W Pura-AOL2 QMA401
Ambient monitoring for personnel safety – personnel protection against O ₂ deficiency in confined spaces	<19.5...20.0 %O ₂	Air, N ₂	<ul style="list-style-type: none"> GasSenz
Trace N ₂ for quality control	0...50 ppb, 0...500 ppb, 0...1000 ppb LDL <100 ppt	Ar, He	<ul style="list-style-type: none"> LD8000 Plus

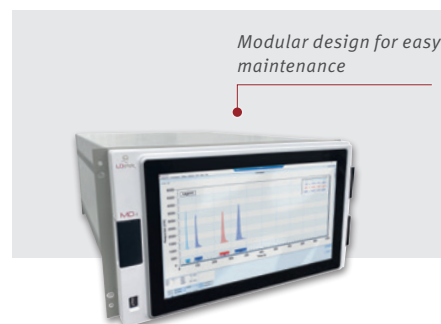
Trace Impurities Detection in Specialty Gases

A good analytical tool is essential to ensure the quality of the UHP gases used in semi-conductor manufacture. LDetek’s ranges of gas chromatograph analyzers allow impurity detection down to sub-ppb levels.

LDetek MultiDetek3 – Modular Process Gas Chromatograph

This compact gas chromatograph combines the functionality of two GCs in one and has the ability to provide online measurements of moisture and O₂.

- Sub ppb trace measurements
- A single analyzer for trace measurement of multiple impurities
- Temperature controlled to ensure maximum accuracy and stability
- Sophisticated data management software and planning platform



LDetek L8000 Plus – Online PPB Trace Nitrogen in Argon/Helium Analyzer

The LD8000+ is designed with the plasma emission detector (patented PED) maintained in an optimized controlled vacuum equilibrium to offer an extended collision energy level. The PED arrangement is designed with a valve network that allow to balance between 3 excitation sources. From each of the excitation source, an algorithm measures the PED response delta to convert that signal into a fast and drift free nitrogen reading. This unique design makes the LD8000+ analyser top of the technology to measure trace nitrogen in sub ppb/ppt.

- Self canceling effect from gas line contamination & surface absorption
- Fast response time
- Interference free
- Reduce the temperature drifting to minimum value
- Improve the limit of detection down to 0.1ppb trace nitrogen

LDetek LDGSS – High Purity Gas Stream Selector

Based on high purity connections with a unique diaphragm valve and no dead volume, its unique design brings an easy way to provide clean gas to any process GC and on-line process analyzers.

- Compact design (3U) with 2 to 9 streams configurable
- Connectable to MultiDetek3 for remote control switching and sequence programming
- Options available for high purity or corrosive and toxic gases

LDetek LDGDSA – Automatic Gas Dilution System

The LDGDSA is a user-friendly gas dilution system that offers flexibility to automatically generate the desired gas mixtures. The Windows user interface gives the ability to control and monitor the mixtures, flows, pressures and concentrations remotely.

- Automatic calculation of dilution concentrations
- Broad range of dilution ratios (up to 1000 to 1)
- Integrated heated gas purifier to generate ultra-high purity zero gas reference

Trace Oxygen

A range of galvanic electrochemical or zirconium oxide sensors packaged in a choice of transmitters and analyzers ensures the most appropriate choice per application.

Analytical Industries Inc PI2-MS – Oxygen Analyzer for Ultra-high Purity Gases

Accurate and stable measurements of oxygen down to parts per billion.

- Cost-effective and reliable electrochemical sensors with 12 - 24 months life
- Easy to maintain, simple to operate
- Optional auto calibration system with true zero feature via O₂ scrubber



Low sample consumption



Tested and certified leak proof



Automatic pressure controller



LDL of less than 2.5 ppb

Trace Oxygen

Analytical Industries Inc GPR-1600 – Oxygen Analyzer for Industrial Gas

Monitors oxygen in low parts per million in a variety of background gases.

- Low measurement range 0...10 ppm
- Long sensor life up to 24 months in <1,000 ppm O₂

Analytical Industries Inc GPR-1200 – Portable Trace Oxygen Analyzer

An economical and reliable portable analyzer for accurate measurements of trace oxygen.

- Measurement ranges from 0...10 ppm up to 0...100 %O₂
- Accuracy of better than 2 % of range
- 24 - 32 months sensor life span (in normal use)



Trace Moisture

Trace moisture measurements are essential for quality assurance in semi-conductor manufacture.

Michell Pura – Transmitters and Hygrometers

Rugged, self-contained hygrometer to measure trace moisture content in ultra-high-purity gases.

- Precision measurement from 0.1...2000 ppm_v
- Low maintenance

Michell S8000 RS – High Precision Chilled Mirror Hygrometer

Highly accurate and repeatable measurements of dew point and humidity. A fully automated auxiliary cooling system ensures minimal operator intervention in measurements.

- Precision measurement to -90 °C dew point (100 ppb) with no need for additional cooling
- Sensor head optimized for fast response to low moisture levels
- Ethernet or USB connections with SD card data logging

Michell QMA401 – Self-Calibrating Trace Moisture Analyzer

Quartz crystal microbalance sensing technology provides reliable, fast and highly accurate measurements of trace moisture.

- Precision measurement from 0.1...2000 ppm_v
- Low maintenance



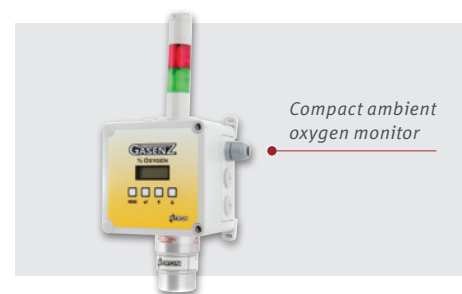
Ambient Monitoring

In confined, enclosed areas where large quantities of gases are used or stored there is a risk that oxygen levels could drop below safe levels for personnel working in the area.

Ntron Gasenz – Ambient Oxygen Analyzer

The Gasenz ambient oxygen monitor is designed for the monitoring of oxygen deficient atmospheres in any work area where the risk of asphyxiation may occur due to the presence of gases like nitrogen, carbon dioxide, argon or helium.

- Long life, low maintenance zirconia, electrochemical or optical sensor technology
- Measurement range: 0...25 %O₂
- Audio/ visual alarm indicator





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ProcessSensing.com

dwyeromega.com

