

Vision 2000-C™ and Vision 2000-E™

Residual Gas Analyzers

RGA For CVD And ETCH Processes



The Vision 2000-C™ and Vision 2000-E™ are designed to track levels of various gas species during etch, chamber clean, and passivation processes, and deposition steps for various CVD processes including:

- Titanium nitride (from TDMAT)
- Tantalum oxide (from tantalum precursor)
- Copper (from CupraSelect®)
- HDP of low-k dielectric films
- Atomic Layer Chemical Vapor Deposition (ALCVD) & atomic layer epitaxy
- Metal-Organic Chemical Vapor Deposition (MOCVD)
- Tungsten and tungsten silicide
- Reactive ion etching (RIE)
- Plasma etching
 - Metal
 - Oxide
 - Poly
- High density plasma etching
- Microwave etching

Product Features

- Application-specific RGA designed for continuous in situ monitoring of chemical vapor deposition (CVD) and etching processes
 - In situ monitoring during chamber clean, passivation and deposition to detect subtle changes in low concentration species and high mass species decay with respect to time
 - Ideal for qualification of new CVD or Etch process tools or process sequences
 - Enables precision end-point characterization and process optimization
 - Provides insight into etch rate variations
 - Decreases time to production and time to ramp
- Baseline monitoring of CVD or Etch chambers for air leaks and background contamination levels
- Includes Process Eye™ Professional software for
 - Data acquisition
 - Data interpretation and data recall
 - Intelligent alarming of process excursions



Key Benefits

- Vacuum troubleshooting for fast PM recovery
- Can be integrated with a wide variety of CVD and Etch tools
- Remote Vacuum Controller (RVC) for fail-safe vacuum operation
- PC-based operation and control

The Vision 2000-C and Vision 2000-E incorporate the “smart head” RGA technology of the Microvision 2 with a closed ion source and close-coupled inlet. This state-of-the-art RGA technology is integrated with Process Eye Professional control platform, a recipe based, user-configurable software program. The combination of closed ion source and automated inlet allows seamless monitoring of the complete CVD or Etch process cycle, from base vacuum to process pressures of up to 700 Torr. By maximizing the ratio between CVD or Etch chamber gas signals and the gas background in the differentially pumped Vision 2000-C and Vision 2000-E analyzer housing, the closed ion source enables ppm-level detection for trace contaminants in the process gas. The closed ion source analyzer is manufactured from vacuum prepared stainless steel and high density alumina ceramics, and features independently replaceable twin filaments to provide built-in backup in the event of a filament failure. The standard system includes a double filter analyzer for increased sensitivity of higher mass species, contamination resistance and enhanced long-term stability.

Each Vision 2000-C and Vision 2000-E system incorporates a Remote Vacuum Controller (RVC) module that provides fail-safe protection for both the process tool and the RGA. It allows full operation and control of RGA system components (filaments, pumps, inlet valves, bake-out, etc.) from the system PC. The compact, remotely-mounted rack module includes the RVC and power supplies. The unit is easily mounted onto any standard 19” tool rack for mounting on a process chamber or other compatible location. Thirty three foot (10 m) cables are included as standard so that the probe assembly can be located in a remote position.

Mobile RGA Platform

Any Vision 2000-C or Vision 2000-E can be mounted on a mobile RGA platform with the convenience of being able to move the RGA easily between chambers as the need arises. The mobile platform has an integrated laptop table and mounts the electronics on the trolley. Using a standard ten foot (3m) cable loom the platform can be conveniently located away from the RGA mounting point on the tool chamber.

UniBloc™ Inlet Valve

The exclusive fast response UniBloc™ inlet valve allows sampling at both background and process pressure through orifices selected for the pressures to be encountered. When not sampling, both the valve and analyzer are automatically isolated



UniBloc™ Inlet Valve

from the process chamber and purged with inert gas. Purging is done through the mass spectrometer pumping systems, not through the process chamber. Purging is also used during bake-out, reducing initial startup time and residual background recovery time. For sampling up to 10 Torr, a special 4-valve UniBloc is available for bypass pumping to facilitate the faster transfer of sample gas to the inlet, thereby optimizing inlet response time. Above 10 Torr, the 4-valve configuration is always used. The inlet valve is operated by integrated electronics and controlled via recipes from Process Eye Professional. The required valve selection is made automatically by a gas independent pressure sensor in the UniBloc inlet which also provides a readout of the process chamber total pressure in the Process Eye Professional software.

Computer-aided design was utilized to engineer the Unibloc to have minimal internal volumes and surface areas. The internal seals are Kel-F® for compatibility with CVD and Etch process gases. The external seals are all metal. A conformal heating jacket provides temperature control to minimize deposition within the valve and to maintain mobility of sticky/polar gases through the inlet.

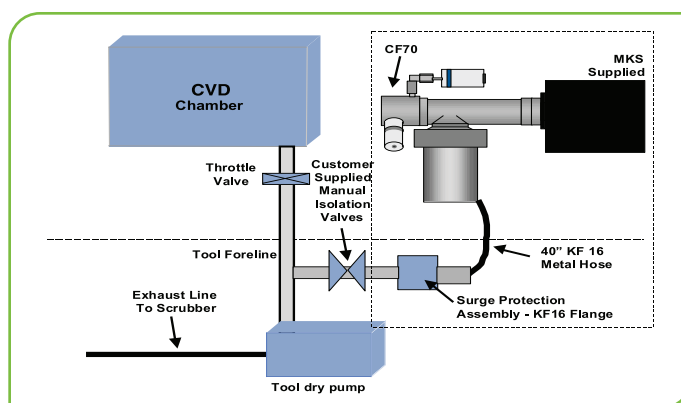
Process Eye™ Professional Control Platform

The Vision 2000-C/E analyzer uses Process Eye Professional, a highly flexible, modular application operating under 32bit or 64bit Windows XP, Vista, Server 2008 or Windows 7. Designed with a “client/server” structure, Process Eye Professional incorporates TCP/IP protocol for full network compatibility.

Creating process recipes is made easy by the Recipe Wizard function, which allows customized warnings and alarm levels, triggered whenever the process exceeds preset levels. The Process Eye Professional recipes also specify the way in which the Vision 2000-C or Vision 2000-E acquires, displays and stores data. Other key parameters, such as ion source settings, can be set via the Process Eye Professional recipe. This allows the user to optimize settings for each phase of the process independently. For example, ideal settings for baseline can be set up in the baseline recipe, ideal settings for process monitoring can be set in the process recipe, etc. Process Eye Professional enhances the Vision 2000-C and Vision 2000-E by providing:

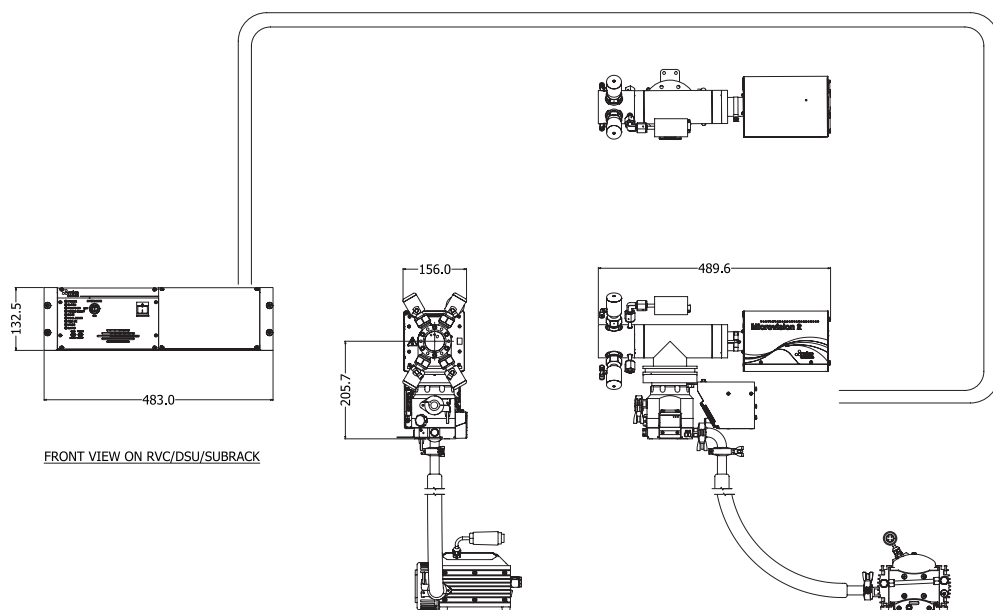
- Automated and intelligent operation of MKS Spectra RGAs with fully customizable controls and alarms
- Recipes for automated calibration
- Flexible scanning
 - “Bar Chart”, “Analog” and “Peak Jump” scanning modes which can be mixed and associated with data trend displays

- Intelligent, user defined warnings and alarms
 - Can include a suggested diagnosis of the fault condition and a recommendation for its solution
- Data displays in relevant units, such as Torr, mbar or Pa in the process chamber
- Optional ability to read data from other sensors using analog inputs and external events by digital inputs
- Data buffer for quick on-line review of recent data
- Full storage of all data for subsequent review and analysis



Typical Installation

Dimensional Drawing



Note: Unless otherwise specified, dimensions are nominal values in millimeters.

Analyzer	
Mass Range Options	<ul style="list-style-type: none"> Vision 2000-C: 1-300 amu Vision 2000-E: 1-200 amu
Ion Source	High conductance closed ion source
Filaments	Independently replaceable twin Tungsten filaments
Mass Filter	Double filter (1" "RF only" pre-filter with 4" main filter)
Detector System	Dual (Faraday and secondary electron multiplier)
Maximum Analyzer Operating Pressure	1e-3 Torr at the ion source inlet (standard), higher pressure optional
Minimum Detectable Partial Pressure	<2e-11 Torr (for total pressures <1e-4 Torr on baseline inlet)
Minimum Detectable Concentration	<200 ppb of highest pressure gas for non-interfering species
Mass Stability	Better than ± 0.1 amu over 8 hours
Resolution	Better than 10% valley between peaks of equal height throughout the mass range
Vacuum System Pressure Ranges	
Base Pressure Ranges	Ion source at maximum pressure at 1 mTorr, 10 mTorr or 100 mTorr
Process Pressure Ranges	Ion source at maximum pressure at 10 mTorr, 100 mTorr, 500 mTorr, 1.5 Torr, 5 Torr, 10 Torr, 40 Torr, 100 Torr or 700 Torr (*Optional gas acceleration for ranges <10 Torr available. For other inlet and process pressure ranges, please consult the factory).
Mounting Flange	DN35CF (70mm/2.75" OD) Conflat® flange. Custom adapters can be provided.
Vacuum Hardware	60 l/s turbomolecular pump with high conductance analyzer housing, inlet system, UniBloc inlet, automated vacuum control (RVC) completely interlocked and integrated
Standard Backing Vacuum System	Connected to the tool foreline pump via Surge Protect assembly with a KF16 fitting
Optional Backing Vacuum System	Independent chemically resistant, dry diaphragm pump with KF16 fitting for connecting the exhaust to a suitable scrubber system
Base Pressure	Better than 5e-9 Torr after bakeout
Bakeout Temperature and Bakeout Jacket	Included for 180°C bakeout
Operating Temperature	90°C (controlled to $\pm 1^\circ\text{C}$)
Total Weight	33 lbs. (15 kg) to bolt on process system
Mechanical Support	Optional stands and brackets are available
Mobile RGA Platform	Optional RGA trolley to improve versatility (footprint 18 x 24", 455 x 604 mm)
Pneumatics	60-80 psig CDA
Control Unit/PC	
Control Module Weight	1.7 kg
Power	88-264 VAC, 47/63 Hz, 600 Watts
Maximum Operating Conditions	Electronics: 10-40°C, 80% RH (non-condensing)
LED Status Indication	Interlock status, filament emission, SEM, power and communications
I/O Capability	4 analog inputs and 2 outputs (plus 1 dedicated gauge input). Optional support for a large number of both analog and digital inputs and outputs, including relay control
Other Facilities	Leak check headset socket, external filament trip socket, instrument reset
Software (*recommended)	Process Eye Professional fully network compatible control platform generating under 32bit or 64bit Microsoft® Windows® XP, Vista, Server 2008 or Windows 7*
Communications	Ethernet CAT-5e
Minimum PC Specification Required	Intel® Pentium IV® or AMD Athlon XP 1.2GHz, 1GB RAM, 120 GB hard drive, dependent upon total number of sensors on the computer and the operating system in use. Multi-sensor installation may require higher specifications.
Simultaneous Multi-Sensor	Process Eye Professional client/server configuration offers flexible multi-sensor operation.
Compliance	CE
RGA Controller to Vacuum System Cables	
Length	33' (10 m) standard RGA and 10' (3m) with mobile RGA platform. Other lengths available dependent upon process system and customer requirements
Total Shipping Weight	44 lbs (20 Kg) may vary depending upon backing pump and instrument rack requirements