



Vision 1000-C™

RGAs FOR CVD PROCESSES

The MKS, Spectra™ Products Vision 1000-C™ is designed to track levels of various gas species during chamber clean, passivation sequences, 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 CVD (ALD) & atomic layer epitaxy
- MOCVD
- Tungsten and tungsten silicide

Features & Benefits

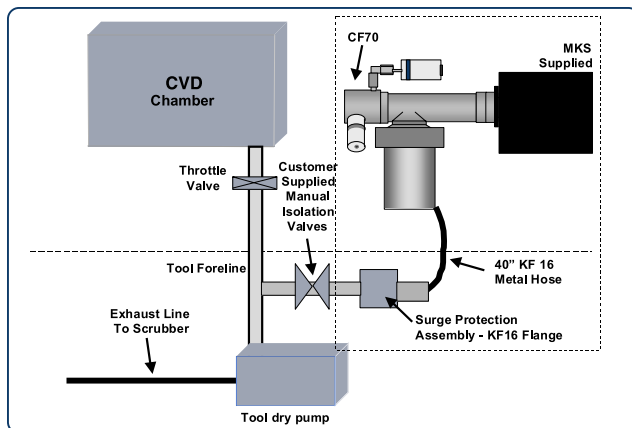
- Application-specific RGA designed for continuous *in situ* monitoring of chemical vapor deposition (CVD) processes
 - *In situ* monitoring during chamber clean, passivation and deposition to detect subtle changes in low concentration species and high mass species decay with respect to time
 - Ideal for qualification of new CVD process tools or process sequences
 - Decreases time to production and time to ramp
- Baseline monitoring of CVD chambers for air leaks and background contamination levels
- Vacuum troubleshooting for fast PM recovery
- Can be integrated with a wide variety of CVD tools
- Remote Vacuum Controller (RVC) for fail-safe vacuum operation
- PC-based operation and control
- Includes Spectra™ Process Eye Professional™ software for
 - Data acquisition
 - Data interpretation and data recall
 - Intelligent alarming of process excursions



Description

The Vision 1000-C™ consists of “smart head” RGA technology 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 process cycle, from base vacuum to process pressures of up to 700 Torr. By maximizing the ratio between CVD chamber gas signals and the gas background in the differentially pumped Vision 1000-C 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 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 1000-C 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, bakeout, etc.) from the system PC. The compact, remotely-mounted rack module includes the RVC, turbo control unit, heater controls, 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 foot (9 m) cables are included as standard so that the probe assembly can be located in a remote position.

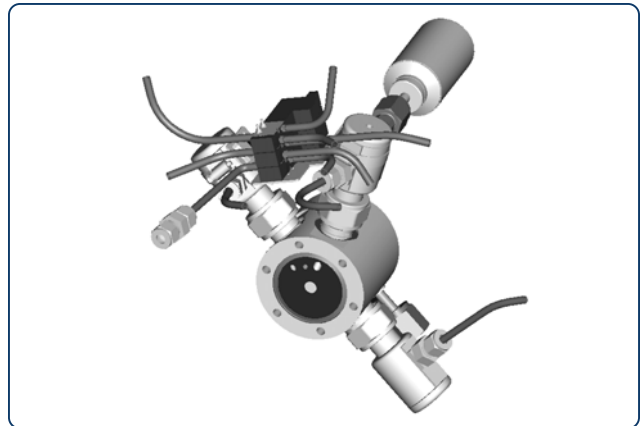


Typical Installation

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 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 bakeout, reducing initial startup time and residual background recovery time. For sampling up to 10 Torr, a special 4-valve UniBloc is available for higher process pressures for bypass pumping to facilitate the 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 pressure sensor in the UniBloc inlet.

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 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.



UniBloc Inlet Valve



Process Eye Professional™ Control Platform

The Vision 1000-C includes Process Eye Professional, a highly flexible, 32-bit modular application operating under Microsoft® Windows® NT® 4.0, 98, Millennium, 2000 or XP. Designed with a “client/server” structure, Process Eye Professional includes 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 pre-set levels. The Process Eye Professional recipes also specify the way in which the Vision 1000-C 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 1000-C 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 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

Specifications

Analyzer

Mass Range	1-300 amu standard
Ion Source	High conductance closed ion source
Filaments	Independently replaceable twin Tungsten filaments
Mass Filter	Double filter (1-inch "RF only" pre-filter with 4-inch main filter)
Detector System	Dual (Faraday and Secondary Electron Multiplier)
Maximum Analyzer Operating Pressure	1×10^{-3} Torr at the ion source inlet (standard), higher pressure optional
Minimum Detectable Partial Pressure	$<2 \times 10^{-11}$ Torr
Minimum Detectable Concentration	<200 ppb for non-interfering species
Mass Stability	Better than ± 0.1 amu over 8 hours assuming stable ambient temperature
Resolution	Better than 10% valley between peaks of equal height throughout the mass range

Vacuum System

Mounting Flange	DN35CF (70mm/2.75" OD) Conflat® flange. Custom adapters can be provided.
Inlet Pressures	Base range: 10^{-8} to 10^{-3} Torr Process pressures up to 0.1, 0.5, 1.5*, 5*, 10*, 40, 100, or 700 Torr *Optional gas acceleration for ranges <10 Torr available
Vacuum Hardware	60 l/s turbomolecular pump with high conductance analyzer housing, inlet system, UniBloc™ inlet, automated vacuum control (RVC) completely interlocked and integrated
Backing Vacuum System	Connected to the tool foreline pump via SurgeProtect assembly Requires <2 Torr at 20 sccm
Base Pressure	Better than 5×10^{-9} Torr after bakeout
Bakeout Temperature & Bakeout Jacket	Included for 200°C bakeout
Operating Temperature	70°C
Total Weight	33 lbs. (15 kg) to bolt on Process System
Mechanical Support	Optional stands and brackets are available
Purge Gas	2 psig, Process quality N ₂ or Argon
Pneumatics	60-80 psig CDA



Specifications (cont'd) and Ordering Information

Control Unit/PC

Control Module Weight	2.1 kg
Power	90-120 VAC, 50/60 Hz, 400 Watts , 100 - 240 VAC, 50/60 Hz, 400 Watts
Maximum Ambient Operating Temperature	35°C, 80% RH (non-condensing)
LED Status Indication	Filament 1, filament 2, SEM, power and communications
I/O Capability	4 analog inputs (1 for external gauge reading). Optional support for a large number of both analog and digital inputs and outputs, including relay control
Other Facilities	Leak check headset socket with audio adjustment, external filament trip socket, instrument reset
Software	Process Eye Professional fully network compatible control platform generating under Microsoft® Windows® NT® 4.0, 98, Me, 2000* or XP* (*recommended)
Communications (baud rate & max. distance)	RS232C [9600 baud, 15m (50 ft.)], RS422 [115,000 baud, 1.2 km (4000 ft.)]
Minimum PC Specification Required	Intel® Pentium III® 450-800 MHz, 64-256 MB RAM, 6-12 GB hard drive, dependent upon total number of sensors on the computer. Multi-Sensor installation may require higher specifications.
Simultaneous Multi-Sensor	Process Eye Professional client/server configuration offers flexible multi-sensor operation where each server module can accommodate "intelligent com cards" with up to 32 serial ports

RGA Controller to Vacuum System Cables

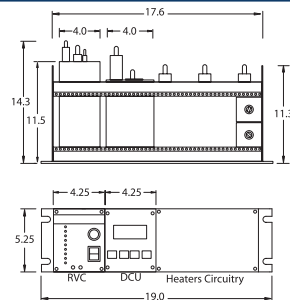
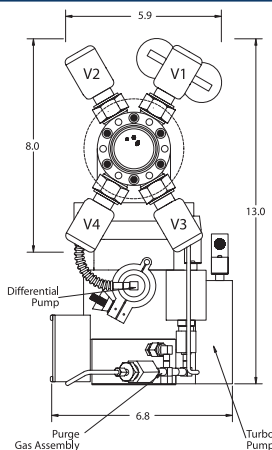
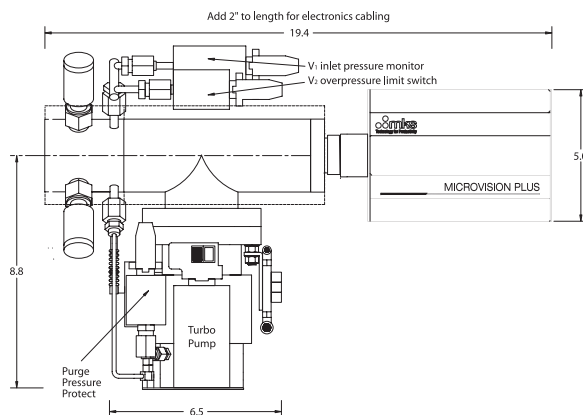
Length	30' (9 m) standard. Other lengths available dependent upon process system and customer requirements
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Pressure Ranges

Base Pressure Ranges	At or below 10 mTorr	At or below 10 Torr
	At or below 100 mTorr	At or below 40 Torr
Process Pressure Ranges	At or below 100 mTorr	At or below 10 Torr
	At or below 500 mTorr	At or below 40 Torr
	At or below 1.5 Torr	At or below 100 Torr
	At or below 5 Torr	At or below 700 Torr

For other inlet and process pressure ranges, please consult the factory.

Please contact your local MKS office for price and availability information.



Dimensional Drawing —

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



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