Process Insights™
Premium Insights Into Process

REAL-TIME GAS ANALYZERS

PRODUCT BROCHURE

VeraSpec™ APIMS

Trace Atmospheric Pressure Ionization Mass Spectrometer

Continuous monitoring of UHP bulk gas purity in semiconductor fabrication

The VeraSpec APIMS combines Atmospheric Pressure Ionization (API) technology with a high-performance mass spectrometer optimized over five decades in industrial gas analysis.

- Confident supply of UHP production gases
- One analyzer for all contaminants
- Fully automated, real-time contamination alerts
- Reliable 24-7 process protection
- Maximized wafer yields

VeraSpec APIMS combine speed, sensitivity, and ease-of-use to continuously monitor nitrogen, argon, helium, oxygen, and hydrogen supply streams, and rapidly report ppt-level contamination to protect the electronics fabrication process.

Protect your semiconductor production with our VeraSpec APIMS

Ultra-pure gases are a necessity for semiconductor device fabrication and the continuous monitoring of bulk gas purity can ensure maximum production. Contamination is costly: Semiconductor manufacturers need the ability to continuously verify the purity of process gases in real-time and detect trace contamination at concentrations in the low parts-per-trillion (ppt).

The best way to achieve these low detection limits is with the application of Atmospheric Pressure Ionization Mass Spectrometry (APIMS). For more than 20 years, APIMS has been the research and industrial standard for on-line detection of low-level components of gas mixtures.

Our quadrupole-based VeraSpec APIMS system can monitor a wide range of gases and gas mixtures with the stability that provides the long-term repeatability required in most applications. We are the only mass spectrometer manufacturer in the world that utilizes a 19mm, tri-filter quadrupole mass filter in semiconductor gas analysis for the very best performance, reliability, and uptime.

Fabrication Environment and Process Tools

VeraSpecs APIMS for Continuous Semiconductor Bulk Gas Purity Verification

Get the benefits of APIMS technology

VeraSpec APIMS make the analytical difference through intuitive, low-maintenance operation.

- Easy-change Corona Discharge Needle
- Dual Source (API/EI) ionization functionality
- All-metal system and fittings design
- Dry, oil-free pumping configuration (single backing pump setup)
- 1-500 amu standard configuration (multiple mass ranges available)
- Pulse-counting electron multiplier
- Analog and Digital I/O included
- Simple maintenance (<1/year)

Fast, accurate ultra-trace analytical technology

Atmospheric pressure ionization is a technique that gives a mass spectrometer the very highest sensitivity for trace gas analysis in UHP samples.

A corona discharge needle is used to ionize the molecules of the bulk gas sample (Figure 1). These ions readily transfer this charge to contaminant molecules with lower ionization potentials. The approach yields ionization efficiencies approaching 100%, ensuring exceptional detection limits (Table 1).

While APIMS allows for high ion currents, resulting in low detection limits, the technique is limited to species whose ionization energy is less than that of the bulk gas, or components with sufficient proton affinity to be ionized. The VeraSpec APIMS system combines both EI and API ionization sources. Having two ionization techniques allows for the complete analysis of all components in the pure gas sample with one system.

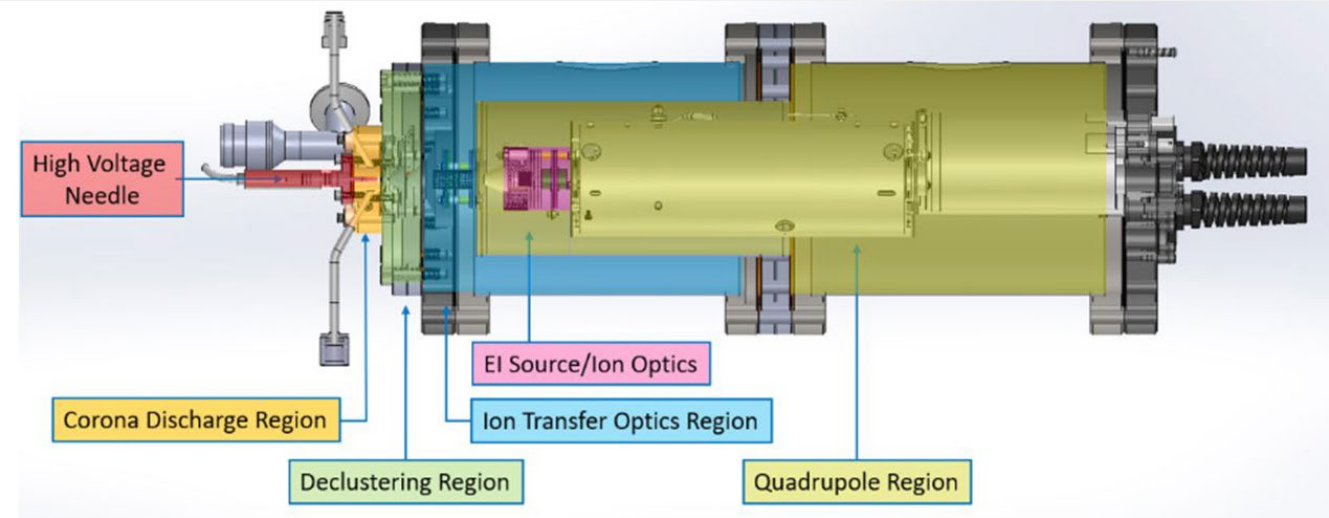


Figure 1. The critical components of APIMS

Table 1. Typical VeraSpec APIMS Low Detection Limits by Contaminant and Bulk Gas

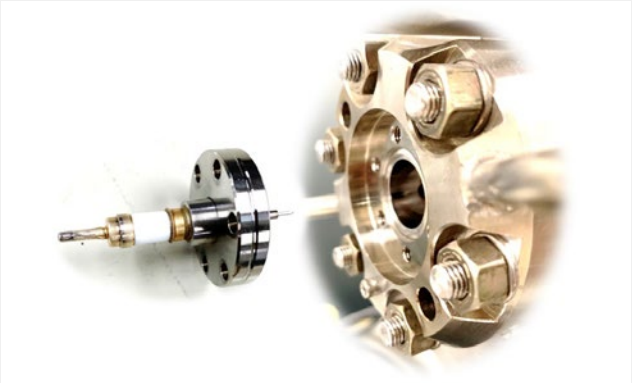
Trace Impurity*	Bulk Gas				
	N2	Ar	He	H_2	0_2**
Hydrogen (H_2)	800 ppt	100 ppt	1 ppb	n/a	500 ppb
Oxygen (O_2)	10 ppt	10 ppt	10 ppt	10 ppt	n/a
Methane (CH_4)	10 ppt	10 ppt	10 ppt	10 ppt	100 ppb
Water (H_2O)	10 ppt	10 ppt	10 ppt	10 ppt	100 ppb
Carbon Monoxide (CO)	50 ppt	10 ppt	10 ppt	50 ppt	100 ppb
Carbon Dioxide (CO_2)	10 ppt	10 ppt	10 ppt	10 ppt	100 ppb
Nitrogen (N_2)	n/a	200 ppb	10 ppt	150 ppt	100 ppb
Argon (Ar)	200 ppb	n/a	10 ppt	50 ppt	75 ppb

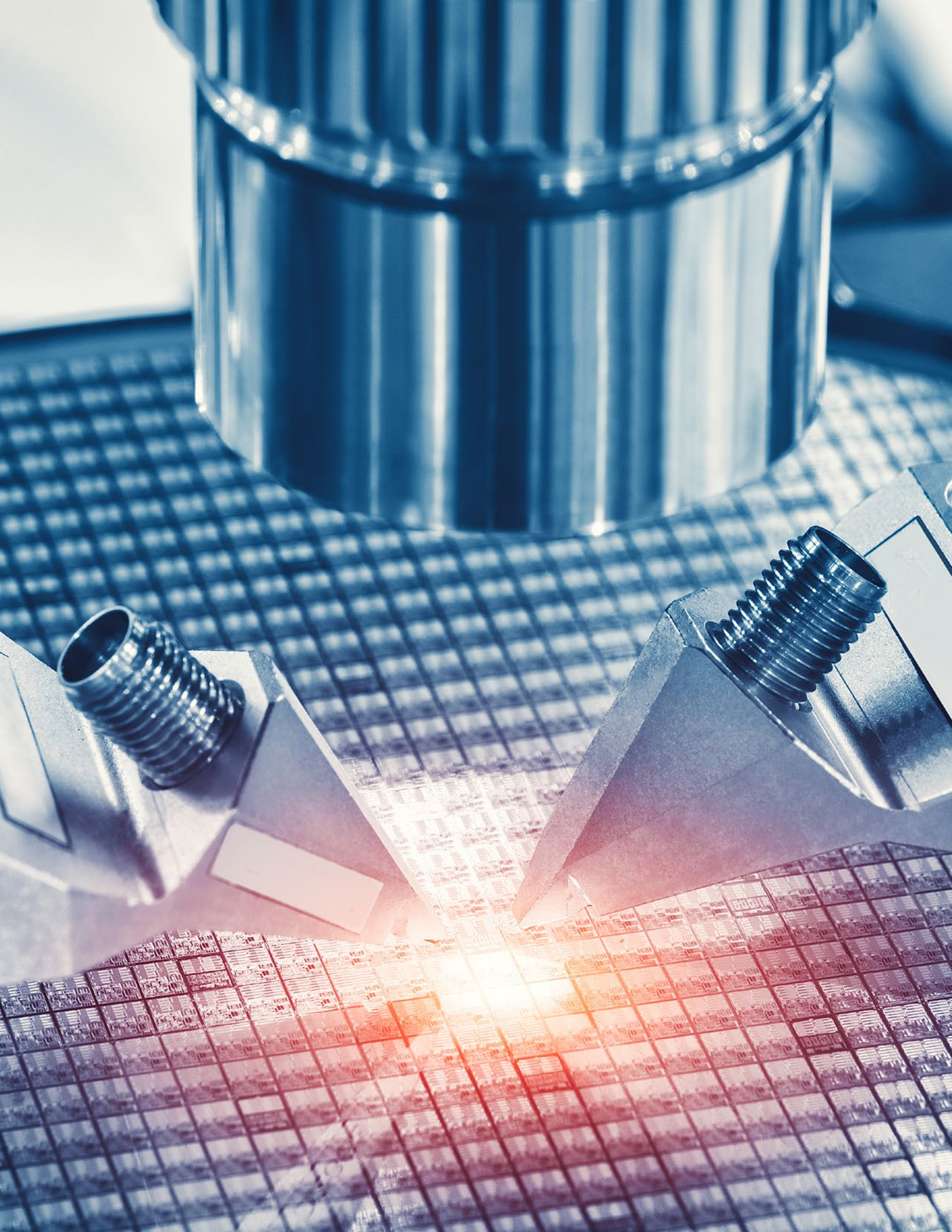
*Additional contaminants are available, i.e. argon, nitrogen, etc. Testing is currently underway to measure these specific LDLs. Further details are available upon request.

Simple to operate and maintain

The innovative design of the VeraSpec APIMS makes it easy to use and maintain for maximum uptime and utility.

- Easy-change needle replacement flange
- Single, dry backing pump eliminates the need to maintain messy oil pumps
- Questor5 software enables automated, continuous industrial gas analysis
- Inclusion of an additional Electron Ionization (EI) source allows the analyzer to be used for full sample characterization, leak checking, and looking for unexpected compounds at concentrations up to 100%.
- 19mm, tri-filter, quadrupole mass filter transmits more sample ions to the detector than a smaller quadrupole can, enabling greater precision, less cleaning, and better long-term stability.

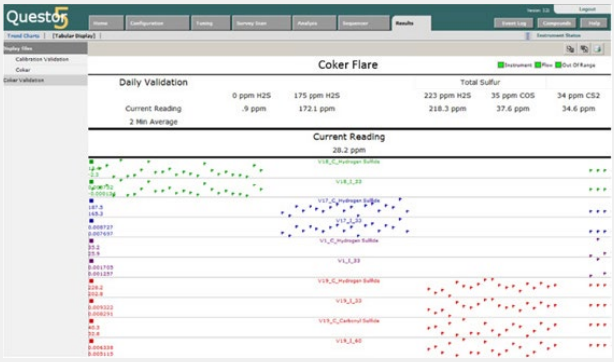




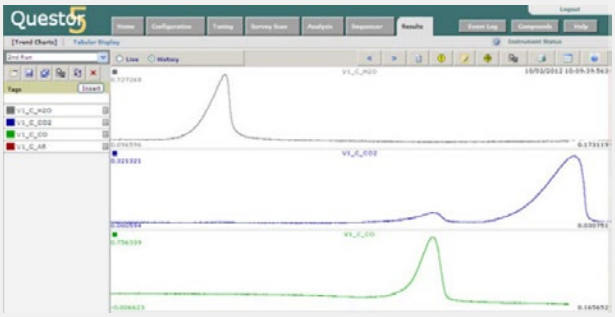
Questor5 Process Control Software

The Questor5 process control software that drives the VeraSpec APIMS System is designed for continuous gas monitoring in a process environment.

The intuitive web-based interface allows the user to check instrument status, review data, or run an acquisition from anywhere on the network, while maintaining government and industry security standards for login and electronic record keeping.



Analysis routines and data displays are fully customizable



Simultaneously trend high precision measurements of multiple contaminants

Questor 5 Software Features

- Manual or automated calibration
- Automated sample selector options available
- Unlimited configurable data tags and alarms
- Analysis can be triggered by external devices
- Automatic removal of spectral overlap
- Full Network Accessibility
- Security: 21 CFR Part 11
- Security levels: Administrator, User, Viewer
- Comprehensive spectral library included – NIST MS database and spectrum matching software upgrade, optional
- External communications – Ethernet, Modbus serial, digital I/O, analog I/O, OPC

Analyzer Specifications

Dual Ionization Source	Atmospheric Pressure Ionization (API) / Electron Ionization (EI)
API Source Background	Less than 1 ppt
Mass Range Options	1-500 amu
Quadrupole Tri-Filter Rod Diameter	19 mm
Detector	Pulse Counting Electron Multiplier
Detection Noise	< 3 counts in 10^6
Detection Limit	< 5 ppt (component dependent)
Analysis Time	< 1 Second per Component
Sample Switching Time	15 Minutes to < 1 ppb
Bulk Gas Suitability	H_2, N_2, He, O_2, Ar
Impurities Monitored	CO, CO_2, H_2O, O_2, CH_4, Kr, NH_3, Xe (other impurities available)
Dimensions	73" (H) x 28" (W) x 36" (D) (1.8 m x 0.7 m x 0.8 m)
Maximum Number of Components	Unlimited
Maximum Number of Peaks	Unlimited
Maximum Number of Derived Values	Unlimited
Maximum Number of Alarms	Unlimited
Maximum Number of Methods	Unlimited
Maximum Number of Sequences	Unlimited
Maximum Number of Analog I/O	20 (standard) Unlimited available
Maximum Number of Digital I/O	16 (standard) Unlimited available
Maximum Number of Trend Windows	Unlimited
Communication Protocols	Modbus, Profibus, OPC

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REAL-TIME GAS ANALYZERS

GAIN REAL-TIME INSIGHT INTO YOUR PROCESS

Process Insights manufactures and delivers premium sensors, monitors, detectors, analyzers, instrumentation, and software that are mission-critical to keep your operations, personnel, and the environment safe – every day across the globe.

Get the most reliable, precision analytical technologies available on the market today. We will work to match your needs and budget, and provide the optimal, and most stable process analysis solution for your application.

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