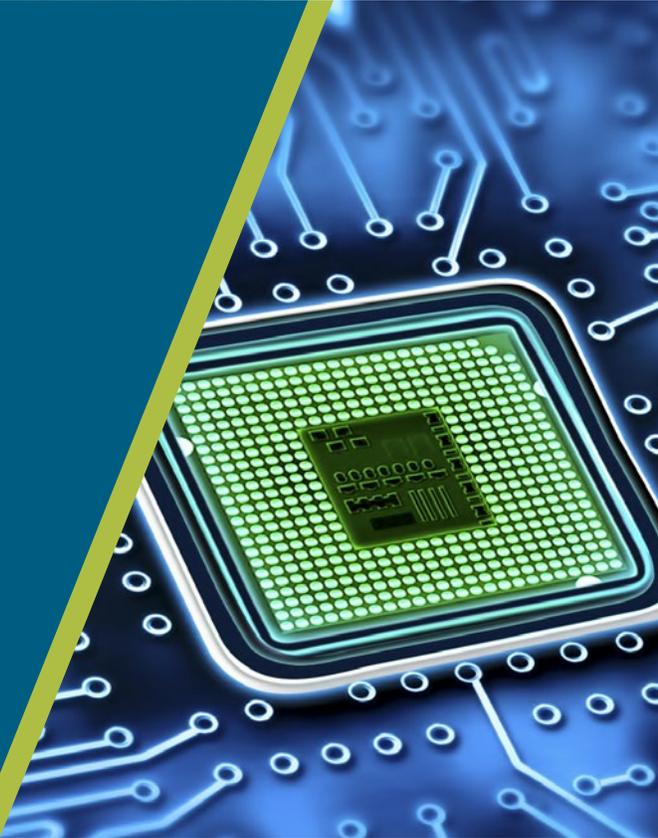


BROCHURE

Integrated Process Solutions



Continuous Quality Control (CQC) and Incoming Quality Control (IQC) for Semiconductor Bulk Gas and Air Separation Unit monitoring:

- Customized real-time monitoring solutions for all bulk gases: N₂, Ar, He, H₂, O₂, XCDA and CO₂
- State-of-the art technologies: Cavity Ring-Down Spectroscopy (CRDS) and Atmospheric Pressure Ionization Mass Spectrometry (APIMS)
- Ideal solution for applications requiring Statistical Process Control (SPC)
- Industry-leading accuracy, precision and detection limits as low as 10 parts per trillion
- Simple installation and operation, up and running in just a couple of hours
- Minimal carrier gases requirements for low operating costs (no Helium required)
- Fully automated systems engineered with **Pneumalogic™** to streamline operations and maximize efficiency

Full System Example: CRDS-Focused Total CQC Solution

This example shows a full rack solution featuring TIGER OPTICS CRDS analyzers. Dedicated systems for each incoming bulk gas allow for continuous purity monitoring without any gaps.



Full System Example: APIMS-Focused Total CQC System

Looking for maximum performance, the TIGER OPTICS VeraSpec APIMS system offers the lowest detection limits on the market at 10 parts per trillion (ppt) for most contaminants. This system allows for the detection of the majority of impurities in the bulk gases* with the APIMS (in N₂, Ar, He and H₂ bulk gases) and a single CRDS rack for measuring the contaminants in O₂.



*Except detections in O₂ and Ar in H₂

Applications: IQC and CQC

To manage today's semiconductor fabrication plants with Statistical Process Control (SPC) real-time, continuous trace impurity monitoring of all gases is required.

IQC- monitoring of gases pre-purification at sub-ppm sensitivity to catch process upsets early.

Trace Impurity	CRDS Product	Bulk Gas						
		N ₂	Ar	He	H ₂	O ₂	CO ₂	CDA
Water (H ₂ O)	HALO 3 H ₂ O	1.2 ppb	0.6 ppb	0.25 ppb	0.1 ppb	0.7 ppb	2 ppb	1.2 ppb
Oxygen (O ₂)	HALO OK in CO ₂	0.2 ppb	0.09 ppb	0.05 ppb	0.15 ppb	n/a	1 ppb	n/a
Methane (CH ₄)	HALO 3 CH ₄	1.6 ppb	1.4 ppb	1.1 ppb	1.6 ppb	1.1 ppb	35 ppb	1.5 ppb
Carbon Monoxide (CO)	HALO 3 CO	40 ppb	30 ppb	35 ppb	50 ppb	35 ppb	n/a	40 ppb
Carbon Dioxide (CO ₂)	HALO 3 CO ₂	8 ppb	8 ppb	8 ppb	n/a	8 ppb	n/a	8 ppb
Hydrogen (H ₂)	HALO H ₂	8 ppb	6 ppb	4 ppb	n/a	15 ppb	2 ppb	80 ppb

CQC- monitoring of purified gases including CO₂ and XCDA at sub-ppb levels for process control

Trace Impurity	CRDS Product	Bulk Gas						
		N ₂	Ar	He	H ₂	O ₂	CO ₂	XCDA
Water (H ₂ O)	HALO KA Max H ₂ O in CO ₂	100 ppt	100 ppt	100 ppt	100 ppt	100 ppt	300 ppt	100 ppt
Oxygen (O ₂)	HALO OK in CO ₂	200 ppt	90 ppt	50 ppt	150 ppt	n/a	1 ppb	n/a
Methane (CH ₄)	HALO KA Max CH ₄	500 ppt	450 ppt	400 ppt	500 ppt	500 ppt	n/a	500 ppt
Carbon Monoxide (CO)	HALO Max QCL CO	200 ppt	150 ppt	130 ppt	200 ppt	170 ppt	n/a	100 ppt
Carbon Dioxide (CO ₂)	HALO Max QCL CO ₂	100 ppt	80 ppt	90 ppt	180 ppt	90 ppt	n/a	100 ppt
Hydrogen (H ₂)	HALO H ₂	300 ppt	130 ppt	100 ppt	n/a	15 ppb	2 ppb	80 ppb

Typical VeraSpec APIMS Low Detection Limits by Contaminant and Bulk Gas

Trace Impurity*	Bulk Gas				
	N ₂	Ar	He	H ₂	O ₂ **
Hydrogen (H ₂)	150 ppt	100 ppt	50 ppt	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 ₂ O)	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	<1 ppb [†]	10 ppt	150 ppt***	100 ppb
Argon (Ar)	<1 ppb [†]	n/a	10 ppt	<1 ppb [†]	75 ppb

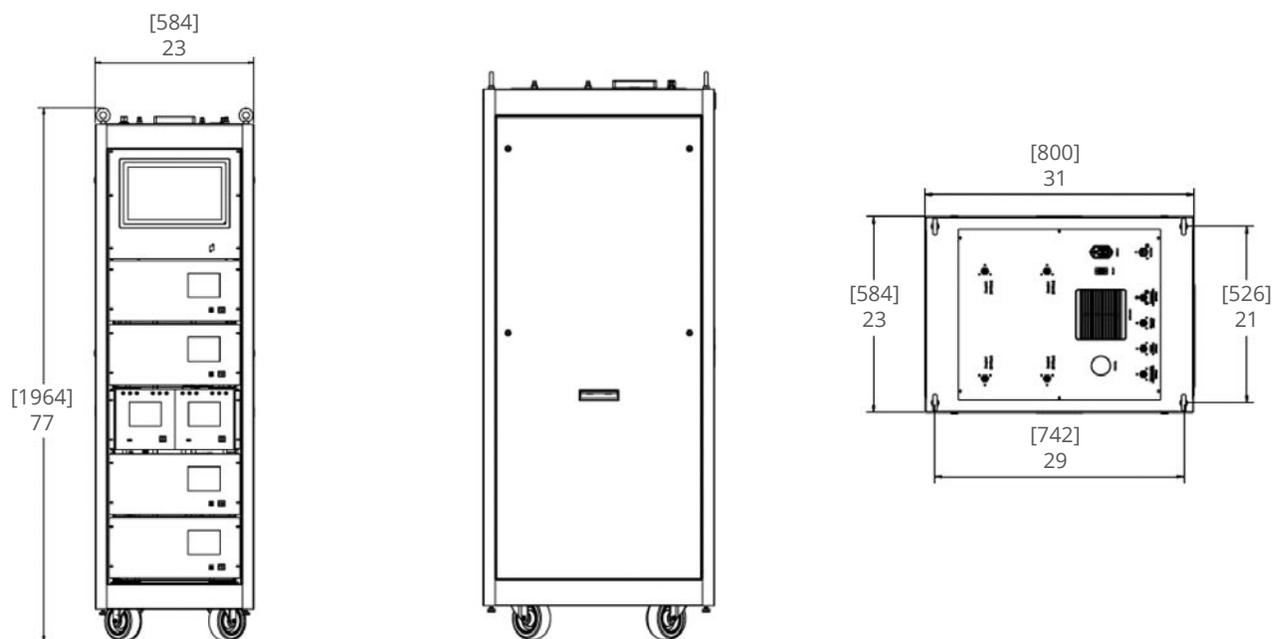
*Additional impurities are available. **Impurities in O₂ are measured using the included EI source. ***Typical reported as a sum of (N₂+CO) concentrations.

[†]Gas purity dependent.

Specifications

Gas Handling System and Conditions	
Sample line	316L Electro-polished Stainless Steel
Sample line connections	¼" VCR
Inlet pressure	20 - 125 psig
Sample flow rate	~10 slpm
Exhaust line connection	1" NPT
Dimensions and Weight	
H x W x D	77 x 23 x 31.5 in (195.6 x 58.4 x 80 cm)
Weight	300 lbs (136 kg)
Operating conditions	10°C to 40°C, 30% to 80% RH (non-condensing)
Storage conditions	-10°C to 50°C
Electrical and Interfaces	
Power requirements	100 – 240 VAC, 50/60 Hz
Power consumption	1200 Watts max.
Signal output	4-20mA
User interface	15.6" LCD touchscreen, 10/100 Base-T Ethernet, USB, RS-232, RS-485, Modbus TCP (optional)
Data storage	Internal or external flash drive
Certification	CE Mark

*Refer to List of Detectable Gases for available gases and LDLs. If your chemical of interest is not on the list, inquire with your regional sales manager.



Highly Customizable Solutions for Your Bulk Gas Applications

Process Insights is your turnkey solution provider for analytical instrumentation and process control integration, with both IQC and CQC options. Whether you're considering gas-cycling, or a dedicated stationary or mobile system, we're ready to support your applicational needs.

- Monitor all critical impurities in bulk gases, both pre-purification and post-purification
- Statistical Process Control has never been so easy
- Our TIGER OPTICS product line provides flexibility in detection limits and ranges
- CRDS systems clean-up in hours, so your system will be operational same day
- Low Cost of Ownership, Minimal Maintenance and No Calibrations Required (CRDS)

Pneumalogic™

Our proprietary automated system, which combines intelligent software with tried-and-true pneumatics, only ever allows for a single gas inlet valve to open at a time. Pneumalogic utilizes hardware and clever programming to avoid the possibility of back-flowing any one gas into another. Leveraging physical pneumatic controls allows our hardware design to become a double-check on the actions of the operator or automation software. The pneumatics act as a physical lock-out to prevent any stream from mixing into a different inlet or back-flowing.

So, What? Instrument racks driven by Pneumalogic can drastically reduce your analytical CapEx costs for CQC, IQC, Truck Fill, ASU Control and/or Quality applications. Since our measurements are completed at the speed of light, we can afford to spend a few seconds switching valves and sampling multiple gas inlets. A well designed system purging and exhausting multiple samples can drastically reduce your analytical and integration costs, not to mention the footprint of the room needed to contain the equipment



GAIN REAL-TIME INSIGHT INTO YOUR PROCESS

Process Insights delivers premium analytical sensors, analyzers, instrumentation, software and solutions that are mission-critical to keep your operations, personnel, and the environment safe. Our commitment to customer satisfaction is evident through our diverse range of products, programs, and services, designed to accommodate various budgets and application needs.

CENTERS OF EXCELLENCE

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