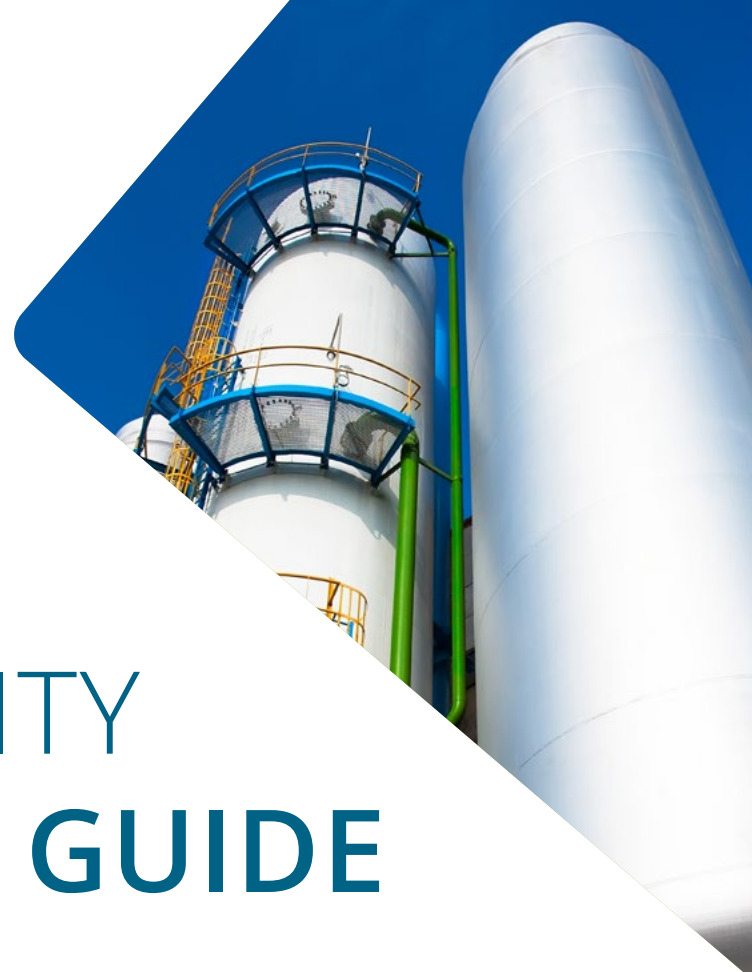




**Process
Insights™**

Premium Insights Into Process



HIGH-PURITY PRODUCT GUIDE

3RD EDITION



**HIGH-PERFORMANCE
GAS ANALYZERS FOR
HIGH PURITY APPLICATIONS**

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Company Overview

Process Insights is a global organization comprised of dedicated individuals who are passionate about promoting safer process control. Our presence spans across the world, with our innovative analytical instrumentation and process automation products and solutions making a positive impact in various industries. We are committed to manufacturing and developing cutting-edge innovations that empower our customers to create better products and services while safeguarding the environment. With a focus on strategic and global expansion, we are constantly seeking new opportunities across the value chain, benefiting not only our customers but also our channel partners and suppliers. We understand the criticality of protecting precious and limited resources in your processes, and we are here to support you.

Process Insights plays a pivotal role in optimizing processes and ensuring safety. Our solutions offer exceptional accuracy, surpassing the competition and ensuring the safety of your plant, processes, environment, and personnel. The speed of our continuous, real-time analytical solutions simplifies time-sensitive experiments and simulations. By providing real-time data on gas composition, our gas analysis solutions enhance process control, leading to increased efficiency, reduced waste, and improved product quality. Additionally, our solutions contribute to enhanced safety by detecting potentially hazardous gases, thereby preventing accidents, and protecting both personnel and equipment. We also facilitate regulatory compliance by helping companies meet emissions monitoring and control requirements, ensuring adherence to environmental regulations and avoiding penalties.

Our comprehensive range of analytical instrumentation, applications, systems, and service options ensures that we can tailor a solution that matches your specific needs and budget. We provide you with the most optimal and reliable process analysis solution for your application.

Discover the expansive suite of turnkey analytical solutions and instrumentation offered by Process Insights, catering to a wide range of industrial, high purity, laboratory, and research applications.

Our portfolio encompasses a variety of cutting-edge products, including:

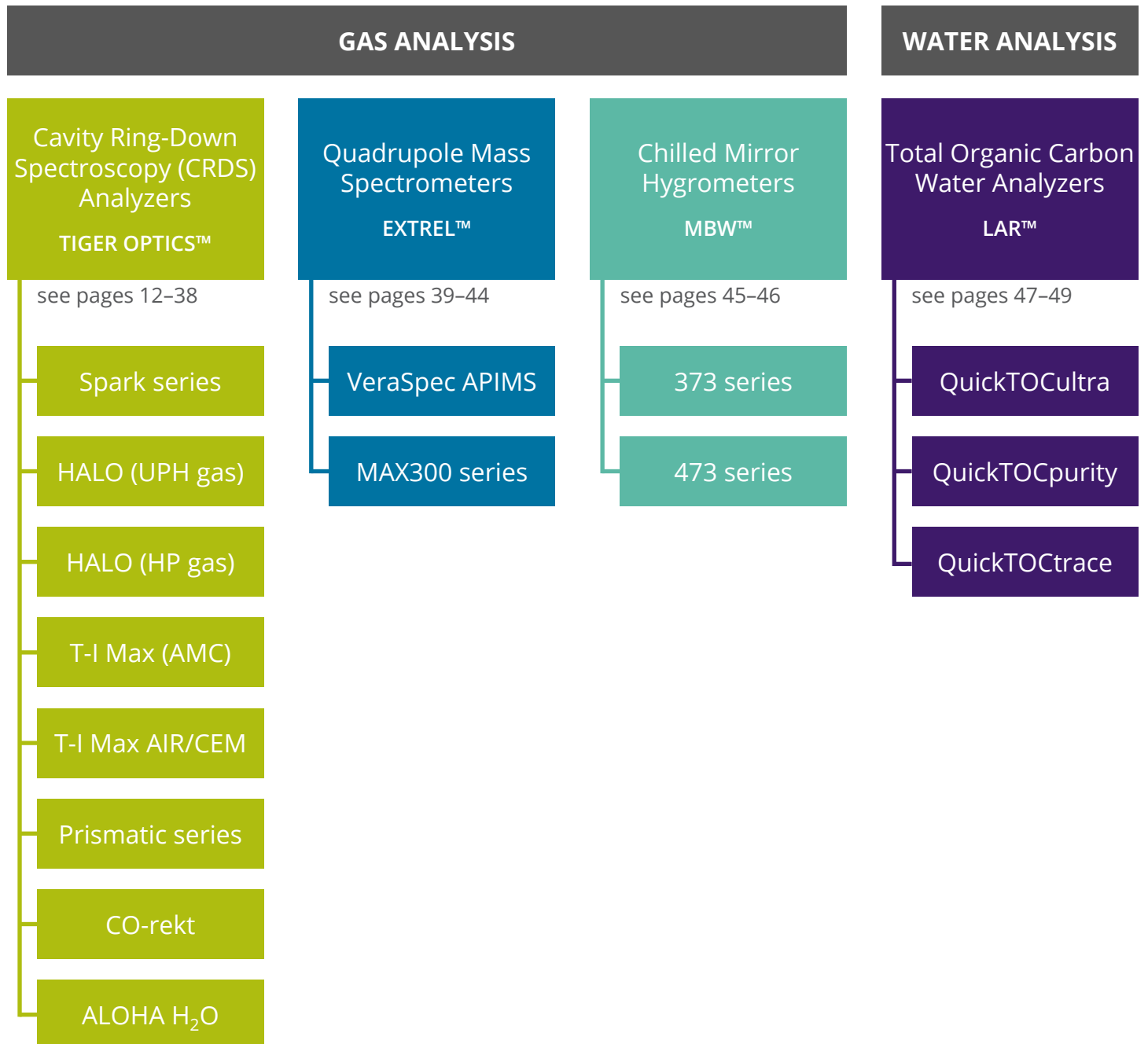
- Dew point moisture analyzers and transmitters
- Oxygen analyzers and safety monitors
- CRDS gas analyzers
- TOC water quality analyzers
- Excimer Total Sulfur-Nitrogen process and lab analyzers
- NIR UV VIS process and lab analyzers
- FTIR FT-NIR process and lab analyzers
- Relative humidity and temperature analyzers
- Chilled mirror dew point analyzers

With our comprehensive portfolio, Process Insights is committed to driving innovation and excellence ensuring that our customers receive the highest level of performance and accuracy in their processes.

Reach out to us today for a complete range of options and let us partner with you in achieving process excellence.

High-Purity Products Overview

Process Insights high-purity products comprise high-performance analytical instruments for the analysis of high-purity and ultra-high-purity gas and water. They are based on state-of-the-art technologies, such as Cavity Ring-Down Spectroscopy, Mass Spectrometry, and Chilled Mirror Hygrometry for trace detection in gases, as well as various optical measurement techniques to determine Total Organic Carbon in water.



Available Detections in Gases

Analyzer Series	Detection																	
	H ₂ O	O ₂	NH ₃	CH ₄	HF	HCl	CO	CO ₂	CH ₂ O	H ₂ S	H ₂	C ₂ H ₂	D ₂ O HDO	N ₂	Ar	He	C _x F _y	
HALO Max QCL NEW!							✓	✓										
HALO KA Max	✓		✓	✓														
HALO KA	✓																	
HALO OK		✓																
HALO H2 NEW!											✓							
HALO 3	✓		✓	✓	✓	✓	✓	✓	✓				✓					
HALO LP	✓																	
HALO RP	✓				✓													
HALO QRP	✓																	
HALO H ₂ O in N ₂ O	✓																	
Spark / Spark+	✓			✓			✓	✓					✓					
T-I Max			✓		✓	✓												
T-I Max X2/X3 NEW!			✓		✓	✓												
T-I Max AIR NEW!				✓				✓	✓									
T-I Max CEM			✓	✓	✓	✓	✓		✓	✓								
Prismatic 3/3+ NEW!	✓		✓	✓			✓	✓										
CO-rekt	✓			✓			✓	✓										
ALOHA+ H ₂ O	✓																	
Extrel VeraSpec APIMS	✓	✓	✓	✓			✓	✓			✓			✓	✓			
Extrel MAX300-LG		✓		✓							✓			✓	✓	✓		
Extrel MAX300-TGM											✓							✓
MBW 373	✓																	
MBW 473	✓																	

*Detection is currently under development or available upon request.
 Additional detections are available as a custom option. Please contact us for more information.

CRDS Detection Ranges Summary

		Approximate Detection Range (UDL to LDL)*															
Analyzer	Detection	≥3,000 ppm	≥1,000 ppm	≥300 ppm	≥100 ppm	≥30 ppm	≥10 ppm	≥3 ppm	≥1 ppm	≥0.3 ppm	≥0.1 ppm	≥30 ppb	≥10 ppb	≥3 ppb	≥1 ppb	≥0.3 ppb	≥0.1 ppb
HALO Max QCL CO NEW!	CO																
HALO Max QCL CO ₂ NEW!	CO ₂																
HALO KA Max H ₂ O	H ₂ O																
HALO KA Max NH ₃	NH ₃																
HALO KA Max CH ₄	CH ₄																
HALO KA H ₂ O	H ₂ O																
HALO OK [†]	O ₂																
HALO 3 CO	CO																
HALO 3 H ₂ O	H ₂ O																
HALO 3 NH ₃ [‡]	NH ₃																
HALO 3 CH ₄	CH ₄																
HALO 3 HF	HF																
HALO 3 HCl	HCl																
HALO 3 CO ₂ [‡]	CO ₂																
HALO 3 CH ₂ O	CH ₂ O																
HALO 3 D ₂ O/HDO	D ₂ O & HDO																
HALO LP H ₂ O	H ₂ O																
HALO RP H ₂ O	H ₂ O																
HALO RP HF	HF																
HALO QRP [‡]	H ₂ O																
HALO H ₂ O in N ₂ O	H ₂ O																
HALO H ₂	H ₂																
Spark H ₂ O	H ₂ O																
Spark H ₂ O in CO ₂	H ₂ O																
Spark CH ₄	CH ₄																
Spark+ CO	CO																
Spark CO ₂	CO ₂																
Spark C ₂ H ₂	C ₂ H ₂																
T-I Max NH ₃	NH ₃																
T-I Max HF	HF																
T-I Max HCl	HCl																
T-I Max CEM NH ₃	NH ₃																
T-I Max CEM CH ₄	CH ₄																
T-I Max CEM HF	HF																
T-I Max CEM HCl	HCl																
T-I Max CEM CO	CO																
T-I Max CEM H ₂ S	H ₂ S																
T-I Max AIR CH ₂ O	CH ₂ O																
Prismatic 3/3+	H ₂ O																
	CH ₄																
	CO																
	CO ₂																
	Ammonia																
CO-rekt CO	CO																
CO-rekt CO ₂	CO ₂																
CO-rekt H ₂ O [†]	H ₂ O																
CO-rekt CH ₄ [†]	CH ₄																
ALOHA+ H ₂ O	H ₂ O																

*Exact detection range is dependent on background gas
[†]Higher range models available
[‡]Range depends on sample pressure (example given for 10 Torr)

CRDS Specialty Gas Capabilities

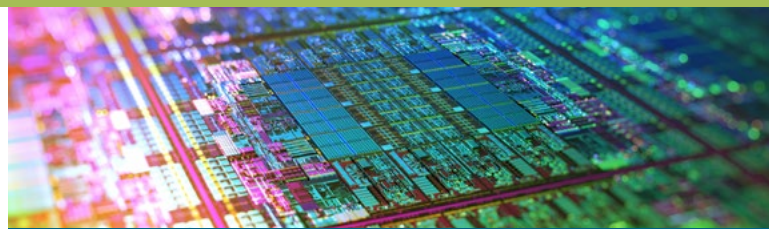
From carbon dioxide for beverages to ammonia for LED manufacturing or silane for semiconductor fabrication, high-quality specialty gases are important raw materials and process gases for many industries.

It is of utmost importance to processes that specialty gases meet high purity standards. For example, moisture impurities in ammonia directly influence the efficiency of the resulting LED. Gases used in the semiconductor industry generally require Ultra-High-Purity, whether it is deposition gases for epitaxy, fluorine compounds for etching processes, or cleaning gases.

Process Insights offers ultra-sensitive, highly accurate and easy to use analysis instruments from its TIGER OPTICS brand, which are based on renowned Cavity Ring-Down Spectroscopy (CRDS) for a large variety of specialty gases and applications.



Oxygenated Gases



Hydrides, incl. Ammonia



Corrosive Gases



Rare Gases



Fluorinated Compounds

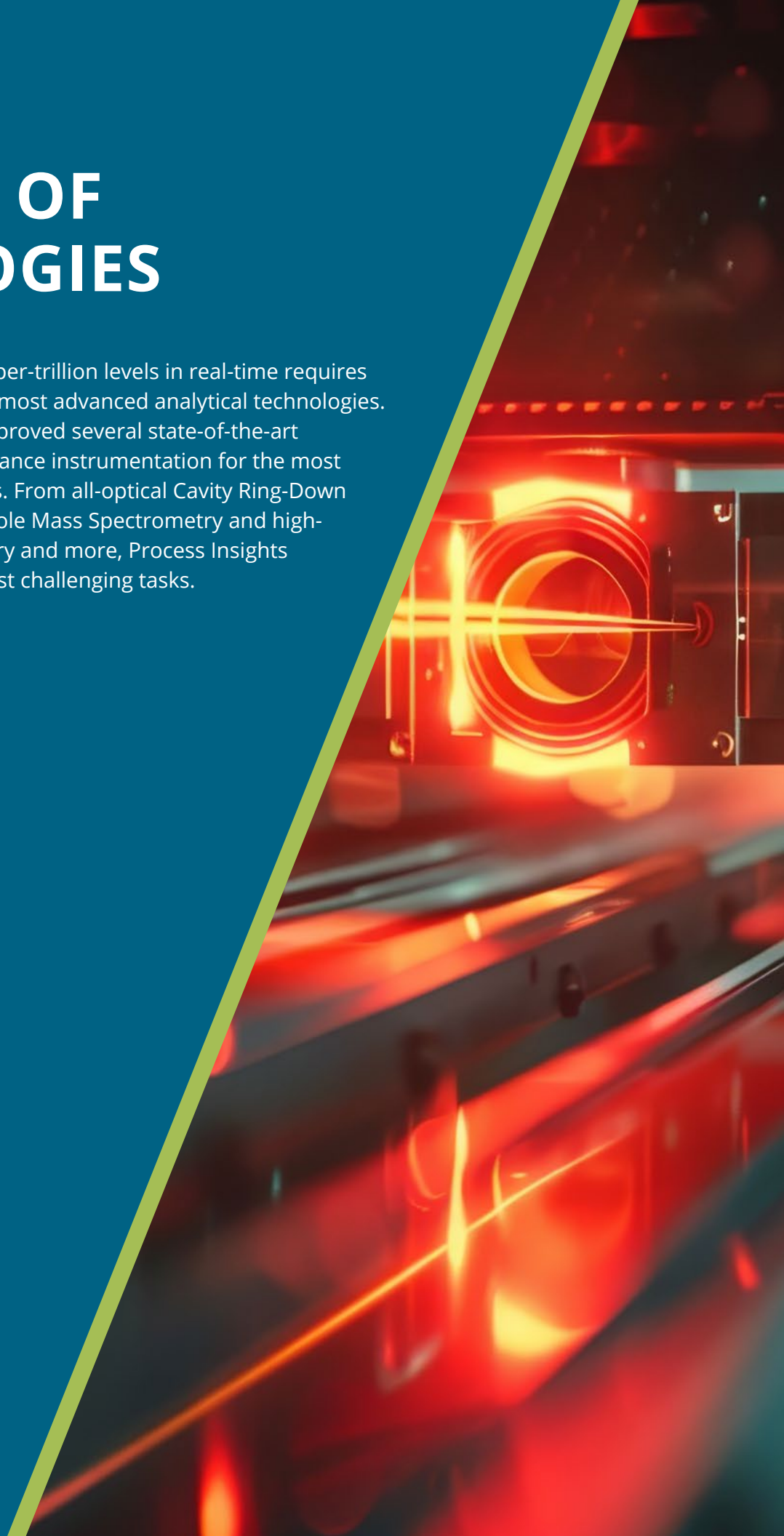


Hydrocarbons



OVERVIEW OF TECHNOLOGIES

Detecting impurities down to part-per-trillion levels in real-time requires instruments that are based on the most advanced analytical technologies. Process Insights developed and improved several state-of-the-art techniques to enable high-performance instrumentation for the most critical trace detection applications. From all-optical Cavity Ring-Down Spectroscopy to versatile Quadrupole Mass Spectrometry and high-precision Chilled Mirror Hygrometry and more, Process Insights offers the right solution for the most challenging tasks.



Overview of Technologies

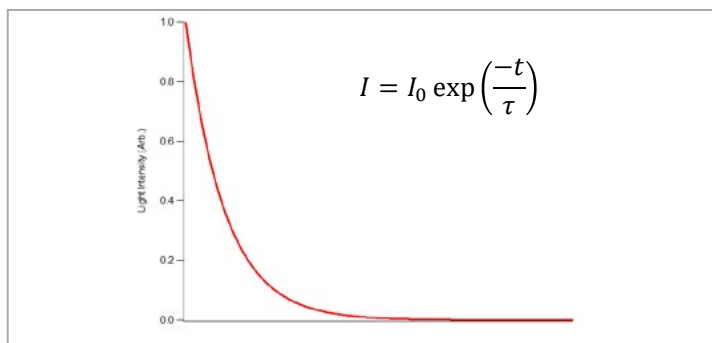
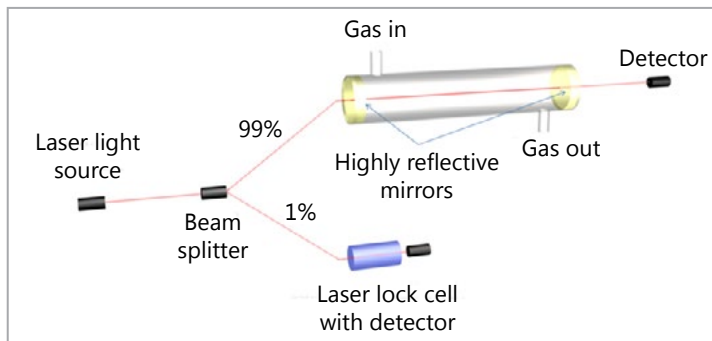
Cavity Ring-Down Spectroscopy (CRDS)

A Continuous Wave (CW) laser emits a directed beam of light into a gas cell with two highly reflective mirrors on either end (optical cavity). The laser wavelength is chosen to be absorbed by the target molecule. The light reflects back and forth between two ultra-high reflective mirrors multiple times, creating a total optical absorption path length of up to 100 kilometers. This long interaction length gives CRDS great sensitivity.

Once the detector "sees" a sufficient level of light energy built up inside the cavity, the light source is turned off quickly, starting the measurement. On each successive pass, a small amount of light emits through the output mirror and is picked up by the detector.

The resulting exponential decay, or "ring-down" is recorded. The decay time or ring-down time is a direct measure of the losses inside the cavity, which includes the absorption of the target molecule.

One key advantage of CRDS is that the ring-down time is independent of laser fluctuations or external background and provides an absolute, stable and extremely sensitive measurement of the target molecule's concentration.



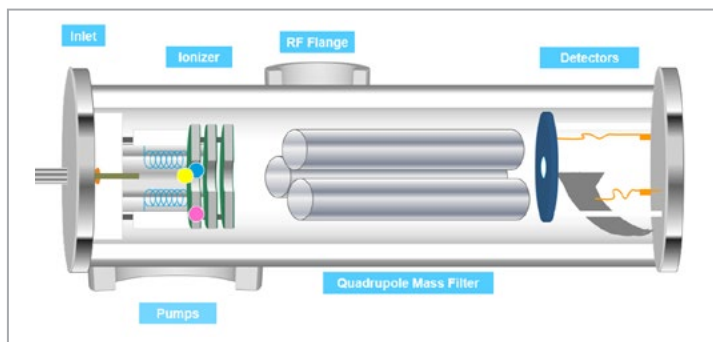
Quadrupole Mass Spectrometry (QMS)

Sample gases are connected to the mass spectrometer either directly or through an option of valves or sample selectors. Sample gas can be pressurized, providing flow through a bypass-T with a restrictive tubing inlet or actively controlled (differentially pumped) to the vacuum system inlet.

A very small amount of gas flows into the vacuum system, containing the mass spectrometer components. These are exposed to a heated, filament-based ionization source. Heating the ionization source minimizes the contamination from gas molecules.

The filaments have a high current applied to them causing them to get very hot and release electrons. These electrons collide with the neutral gas molecules creating positively charged ions. A series of electrostatic lenses accelerate and focus the ions into a quadrupole mass filter.

Applying a combination of RF and DC voltages to the quadrupole allows for separation of the ions based on their mass-to-charge ratios. The now speciated ions are quantified using a combination of faraday plate and/or electron multiplier detector.



Overview of Technologies

Atmospheric Pressure Ionization Mass Spectrometry (APIMS)

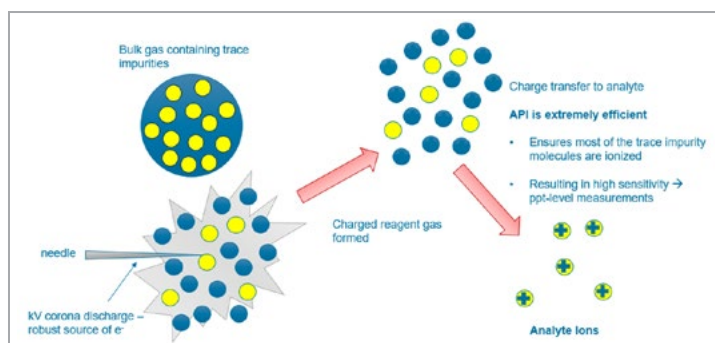
Sample gas is introduced to the APIMS system at a fixed flow rate. This gas flows, unrestricted, through a heated API ionization chamber. Unrestricted flow keeps the pressure at approximately 1 atm and heating reduces any molecule-chamber wall interactions. A corona discharge ionization needle creates a plasma; this plasma ionizes the bulk gas, creating positively charged ions.

Due to the high density of gas in this chamber, many ion-molecule collisions occur. When the bulk gas ions collide with a neutral impurity gas molecule (of lower ionization energy), a secondary reaction can occur causing a charge transfer to the impurity gas molecule.

The ionization energy of impurity gas molecule must be lower than that of the bulk gas for this reaction to occur. In this case (and due again to the density of the bulk gas ions), the efficiency of the reactions is nearly 100%, ionizing approximately all the impurity gas molecules.

This gives the ionization technique extreme efficiency. These ions are then projected and focused through three differentially pumped vacuum stages using a series of electrostatic lenses and apertures.

The final vacuum stage contains a quadrupole mass filter, where ions are then separated based on their mass-to-charge ratio for speciation and quantitation. These speciated ions are quantified using a pulse-counting electron multiplier.



Chilled Mirror Hygrometry

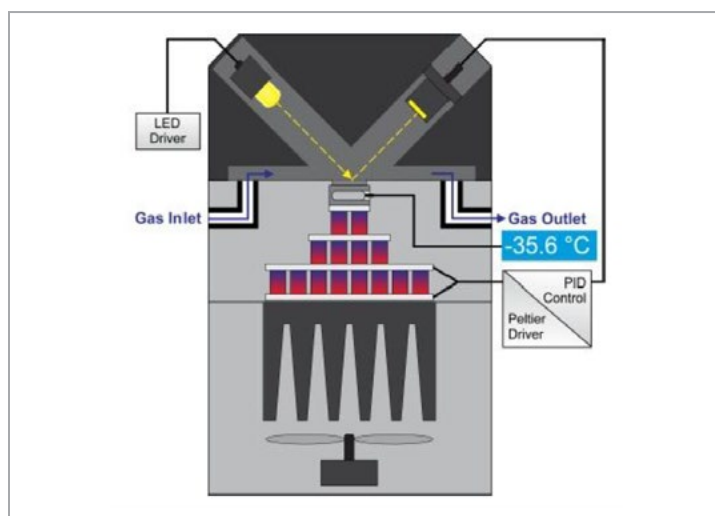
Chilled mirror hygrometry, a process used to measure the dew or frost point of a gas, works in the following manner.

Light shines onto a polished mirror surface, the temperature of which is controlled by a thermoelectric Peltier element. A light-sensitive receiver measures the intensity of the direct reflection. When the mirror is clean and dry, the intensity of the reflected light is at its maximum.

Conversely, a cooled mirror with water vapor condensed on its surface scatters the light, resulting in less light directly reflected and in reduced signal intensity. Using this received light signal as feedback in a closed loop control system, the mirror may be cooled to the temperature at which the thickness of the condensed layer, detected through the intensity of the received light, remains constant.

A condensate layer of constant thickness, with no further net increase or decrease in condensation, is in dynamic equilibrium with the gas surrounding the mirror. In this equilibrium condition, the dew or frost point temperature of the gas is determined by measuring the temperature of the mirror.

If the condensate is known to be in liquid form, even for temperatures below freezing, then the measured mirror temperature is taken as the dew point. If the condensate is known to be in a solid form as ice or frost, then the measured mirror temperature is taken as the frost point.



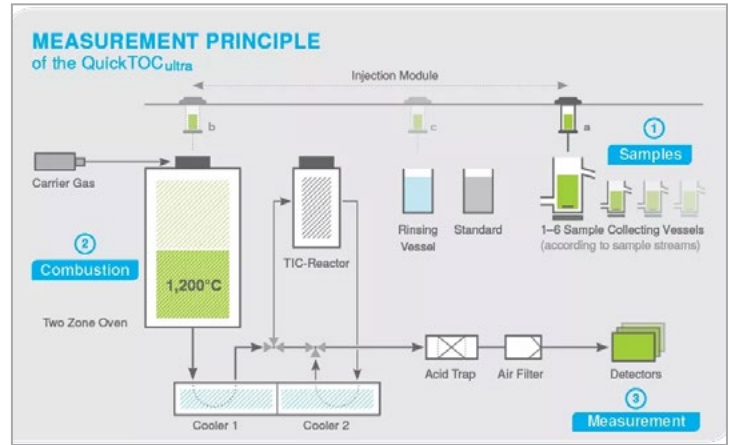
Overview of Technologies

Non-Dispersive Infrared (NDIR) Total Organic Carbon (TOC)

The sample is automatically injected into an oven and heated to 1200°C. Without catalysts, the inorganic and organic carbon is completely converted into CO₂. It is oxidized with a carrier gas, whose supply is provided by filtered ambient air or by the analyzer itself.

The CO₂ can now be easily detected: First the gas that is produced by the combustion condenses in the cooler. The remaining combustion gas is purified by a filter before its CO₂ concentration is determined by the NDIR detector.

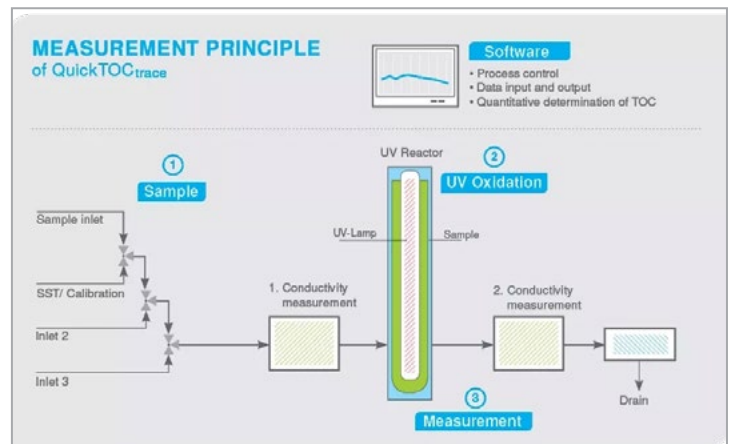
Total inorganic carbon (TIC) needs to be measured first to get the true TOC measurement. Then the inorganic compounds are purged out of the sample by using acid. Again, the combustion gas is cooled, filtered and finally the CO₂ concentration is measured. The TIC value is subtracted from the previously measured total carbon (TC) value. Hence, determining the total organic carbon, the true TOC.



UV-Excitation Conductivity Total Organic Carbon (TOC)

TOC is determined by means of oxidation of aqueous samples and the quantitative measurement of the resulting CO₂. In typical ultra-pure water application, organic contamination is <1 mg/l TOC and the sample is enriched with oxygen, which ensures total oxidation through UV light. This is an affordable method that yields quick results.

In ultra-pure water systems, electrolytic conductivity and resistance measurement are the most widely used indicators of contamination. In differential measurement, the conductivity of the sample prior to UV oxidation is measured in a first step, and a subsequent measurement is carried out after oxidation. Under UV light, organic components are oxidized into CO₂, which increases conductivity. This change is used to calculate TOC concentration.



SPARK

The Spark family offers the best balance of detection performance and cost. Designed for high-efficiency process monitoring applications, Spark analyzers are easy to install and use, require no maintenance, and deliver part-per-billion detection performance for common analytes, such as H_2O , CO , CO_2 , CH_4 , C_2H_2 and more. Typical applications for Spark analyzers include unmanned air separation units (ASUs), truck fill operations and cylinder analysis for bulk and select specialty gases of industrial and High-Purity grade. Pre-purifier measurements in UHP gas facilities also frequently use Spark analyzers as process monitors.



Spark Series

Spark CH₄

This analyzer is ideal for monitoring methane impurities in highly automated operations due to its affordable price, 24/7 operation, and zero maintenance.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA

Select Specifications

Detection	Range	LDL (3σ/24h)
CH ₄ in N ₂	0 – 80 ppm	7.5 ppb
CH ₄ in Ar	0 – 70 ppm	6.5 ppb
CH ₄ in He	0 – 50 ppm	6 ppb
CH ₄ in H ₂	0 – 80 ppm	7.5 ppb
CH ₄ in O ₂	0 – 50 ppm	6 ppb
CH ₄ in CDA	0 – 80 ppm	7.5 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- Affordable price

Applications

- Industrial gas QC
- Air separation units (safety and process control)
- Fuel-cell hydrogen analysis

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)

Spark+ CO

This analyzer extends the affordable and reliable Spark series to the detection of trace carbon monoxide in a variety of bulk and industrial gases.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA

Select Specifications

Detection	Range	LDL (3σ/24h)
CO in N ₂	0 – 2000 ppm	120 ppb
CO in O ₂	0 – 1800 ppm	110 ppb
CO in He	0 – 1800 ppm	110 ppb
CO in H ₂	0 – 2500 ppm	150 ppb
CO in CDA	0 – 2000 ppm	120 ppb
CO in Ar	0 – 1600 ppm	100 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- Affordable price

Applications

- Industrial gas QC
- ASU process control
- Truck fill measurements
- Fuel-cell hydrogen analysis

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

Spark Series

Spark CO₂

Carbon dioxide is a very common contaminant and can especially cause harm when gases are liquified. The Spark CO₂ offers an easy way to monitor this impurity before cryogenic transport and storage.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA

Select Specifications

Detection	Range	LDL (3σ/24h)
CO ₂ in N ₂	0 – 1500 ppm	250 ppb
CO ₂ in O ₂	0 – 1200 ppm	220 ppb
CO ₂ in He	0 – 1200 ppm	220 ppb
CO ₂ in H ₂	0 – 2000 ppm	400 ppb
CO ₂ in CDA	0 – 1500 ppm	250 ppb
CO ₂ in Ar	0 – 1200 ppm	220 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- Affordable price
- Wide dynamic range

Applications

- Industrial gas QC
- ASU process control
- Fuel-cell hydrogen analysis

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)

Spark C₂H₂

This analyzer provides a much more convenient way to monitor acetylene in many safety-critical applications compared to cumbersome GCs and NDIRs.

Available Background Gases

N₂ • O₂ • CDA

Select Specifications

Detection	Range	LDL (3σ/24h)
C ₂ H ₂ in N ₂	0 – 80 ppm	8 ppb
C ₂ H ₂ in O ₂	0 – 70 ppm	7 ppb
C ₂ H ₂ in CDA	0 – 80 ppm	8 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- Affordable price

Applications

- Industrial gas QC
- Air separation units (safety and process control)

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

Spark Series

Spark H₂O

Our lowest cost moisture analyzer, ideal for industrial process and quality control. The Spark makes CRDS analysis affordable, while maintaining high levels of performance.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA • Ne • Kr • Xe • SF₆ • CF₄

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
H ₂ O in N ₂	0 – 2000 ppm	12 ppb
H ₂ O in Ar	0 – 900 ppm	4.5 ppb
H ₂ O in H ₂	0 – 1750 ppm	7.5 ppb
H ₂ O in O ₂	0 – 1000 ppm	6 ppb
H ₂ O in CDA	0 – 1800 ppm	10 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- Affordable price
- Extremely wide dynamic range

Applications

- Industrial gas QC
- Air separation units
- Truck and cylinder fill measurements
- Fuel-cell hydrogen analysis
- Medical gases

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Linear fit mode
- Dew point measurement
- 19" rack mount
- Environmental enclosure

[See website for more details](#)

Spark H₂O in CO₂

Affordable & reliable, just like the Spark H₂O, with the additional capability of detecting sub-ppm moisture in pure CO₂. This analyzer is the ideal choice for industries requiring moisture analysis in CO₂ and inert gases.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA • CO • CO₂

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
H ₂ O in CO ₂	0 – 600 ppm	550 ppb
H ₂ O in N ₂	0 – 500 ppm	7.5 ppb
H ₂ O in O ₂	0 – 250 ppm	7.5 ppb
H ₂ O in CDA	0 – 450 ppm	7.5 ppb
H ₂ O in CO	0 – 480 ppm	7 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- Affordable price

Applications

- Industrial gas QC
- ASU process control
- Truck fill measurements
- Beverage CO₂ analysis
- Gas-cooled nuclear reactors

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Linear fit mode
- Dew point measurement
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (Ultra-High-Purity)

The HALO Ultra-High-Purity Gas (or P-gas) product line comprises our most powerful trace gas analyzers. These HALO CRDS analyzers are capable of detecting trace impurities in ultra-high-purity bulk gases and specialty gases. The HALO KA Max, Max QCL and others offer parts-per-trillion detection capability in electronic-grade bulk gases for H₂O, CO, CO₂, CH₄, NH₃, O₂, H₂, and more. Together, these analyzers can be used to form complete ppt-level CQC systems for semiconductor manufacturing or used in combination with other high-performance technologies, such as APIMS.

Technology: Cavity Ring-Down Spectroscopy (CRDS)

HALO (Ultra-High-Purity)

HALO Max QCL CO NEW!

This QCL-based system allows for fast and continuous real-time measurements, eliminating batch processing techniques commonly found with GCs. Additionally, QCL-CRDS eliminates the need for regular calibration and provides the most sensitive CO measurement with the lowest operating cost.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA

Specifications

Detection	Range	LDL (3σ/24h)
CO in N ₂	0 – 0.5 ppm	200 ppt
CO in He	0 – 0.35 ppm	130 ppt
CO in Ar	0 – 0.4 ppm	150 ppt
CO in H ₂	0 – 0.5 ppm	200 ppt
CO in O ₂	0 – 0.45 ppm	170 ppt
CO in CDA	0 – 0.5 ppm	200 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- Fast, real-time measurements – no batch processing
- No consumables or maintenance
- No expensive carrier gas required

Applications

- UHP Gas quality control
- Semiconductor bulk gas

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software

See website for more details

HALO Max QCL CO₂ NEW!

This system is also based on QCL-CRDS and offers extremely low detection limits for carbon dioxide (CO₂) without the need for user calibration or regular maintenance. It also eliminates batch processing common with GCs.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA

Specifications

Detection	Range	LDL (3σ/24h)
CO ₂ in N ₂	0 – 2.5 ppm	100 ppt
CO ₂ in He	0 – 2 ppm	90 ppt
CO ₂ in Ar	0 – 2 ppm	80 ppt
CO ₂ in H ₂	0 – 4 ppm	180 ppt
CO ₂ in O ₂	0 – 2 ppm	90 ppt
CO ₂ in CDA	0 – 2.5 ppm	100 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- Fast, real-time measurements – no batch processing
- No consumables or maintenance
- No expensive carrier gas required

Applications

- UHP Gas quality control
- Semiconductor bulk gas

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Requires inert purge gas for maximum performance

See website for more details



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (Ultra-High-Purity)

HALO KA Max H₂O

Our highest performing moisture analyzer. The ultimate trace gas analyzer for the highest purity bulk gases used in advanced semiconductor manufacturing.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA

Select Specifications

(see [website](#) for more)

Detection	Range	LDL*
H ₂ O in N ₂	0 – 5 ppm	100 ppt
H ₂ O in He	0 – 1 ppm	100 ppt
H ₂ O in H ₂	0 – 4 ppm	100 ppt
H ₂ O in O ₂	0 – 2.5 ppm	100 ppt
H ₂ O in CDA	0 – 4 ppm	100 ppt

*The LDL is defined as 3σ over 24h or the H₂O drydown limit, whichever is higher.

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- Fast, real-time measurements – no batch processing
- No consumables or maintenance

Applications

- UHP Gas quality control
- Semiconductor bulk gas

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- 19" rack mount

[See website for more details](#)

HALO KA Max NH₃

Our highest performing ammonia analyzer. The ultimate trace gas analyzer for the highest purity bulk gases used in advanced semiconductor manufacturing.

Available Background Gases

N₂

Specifications

Detection	Range	LDL (3σ/24h)
NH ₃ in N ₂	0 – 7 ppm	150 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance

Applications

- UHP Gas quality control
- Semiconductor bulk gas

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- 19" rack mount

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (Ultra-High-Purity)

HALO KA Max CH₄

Our highest performing methane analyzer. The ultimate trace gas analyzer for the highest purity bulk gases used in advanced semiconductor manufacturing.

Available Background Gases

N₂ • He • Ar • H₂ • O₂

Specifications

Detection	Range	LDL (3σ/24h)
CH ₄ in N ₂	0 – 8 ppm	500 ppt
CH ₄ in He	0 – 5 ppm	400 ppt
CH ₄ in Ar	0 – 7 ppm	450 ppt
CH ₄ in H ₂	0 – 8 ppm	500 ppt
CH ₄ in O ₂	0 – 7 ppm	500 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance

Applications

- UHP Gas quality control
- Semiconductor bulk gas

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- 19" rack mount

[See website for more details](#)

HALO KA H₂O

The state-of-art trace moisture analyzer for high purity bulk and specialty gases used in semiconductor manufacturing and other High-Purity applications.

Available Background Gases

N₂ • He • Ar • H₂ • D₂ • O₂ • CDA • CO • CO₂ • GeH₄ (mix) • COS • Ne • Kr • Xe • Cl₂ • HCl • HBr • SF₆ • NF₃ • C_xF_y

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
H ₂ O in N ₂	0 – 20 ppm	300 ppt
H ₂ O in He	0 – 4 ppm	100 ppt
H ₂ O in H ₂	0 – 16 ppm	200 ppt
H ₂ O in O ₂	0 – 10 ppm	150 ppt
H ₂ O in CO ₂	0 – 25 ppm	800 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Fast speed of response
- Large selection of gas matrices
- No consumables or maintenance

Applications

- UHP Gas quality control
- Semiconductor bulk gas
- Industrial gas QC
- High-Purity CO₂
- Etch and cleaning gases
- Fluorinated gases

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Corrosion-resistant model
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (Ultra-High-Purity)

HALO OK

The world's only all-optical ultra-trace oxygen analyzer. Ideal addition to HALO KA/KA Max analyzers for purity monitoring of semi bulk gases.

Available Background Gases

N₂ • He • Ar • H₂ • CO₂

Select Specifications

Detection	Range*	LDL (3σ/24h)
O ₂ in N ₂	0 – 2.5 ppm	200 ppt
O ₂ in He	0 – 0.5 ppm	50 ppt
O ₂ in Ar	0 – 1 ppm	90 ppt
O ₂ in H ₂	0 – 2 ppm	150 ppt
O ₂ in CO ₂ [‡]	0 – 5 ppm	5000/1000 ppt [‡]

*Higher range model available

[†]Special configuration required, must be specified at time of order.

[‡]LDL of 1000 ppt requires addition of TIGER OPTICS' Zero Gas Panel and Linear Fit Mode.

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No false spiking or false positives

Applications

- UHP Gas quality control
- Semiconductor bulk gas
- Oxygen analysis in CO₂
- Fuel-cell hydrogen analysis

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Requires H₂ utility gas

[See website for more details](#)

HALO H2 NEW!

The HALO H2 analyzer enables optical detection of hydrogen impurities, making this analyzer perfect for numerous applications. New: low-range model with ppt-level detection limits.

Available Background Gases

N₂ • He • Ar • O₂ • CDA

Select Specifications

(see website for more)

Detection	Range*	LDL (3σ/24h)
H ₂ in N ₂	0 – 20 ppm	0.3 ppb
H ₂ in He	0 – 4 ppm	0.10 ppb
H ₂ in Ar	0 – 9 ppm	0.13 ppb
H ₂ in O ₂	0 – 1000 ppm	15 ppb
H ₂ in CDA	0 – 1000 ppm	15 ppb

*Specifications shown are for low-range model; see website for higher ranges

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- Virtually maintenance-free

Applications

- UHP Gas quality control
- Semiconductor bulk gas
- Quality control for process gas or bulk gas systems

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Requires N₂/O₂ mixture or CDA utility gas

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (High-Purity)

The HALO analyzers for High-Purity or G-gas are our most versatile and established family of trace gas analyzers. Considered by many to be the “gold standard” of trace gas analysis, these HALO CRDS analyzers serve a wide range of applications from High-Purity bulk gas to specialty gas analysis. The HALO 3 line offers a versatile selection of part-per-billion-level analyzers for detecting H₂O, CO, CO₂, CH₄, NH₃, CH₂O and more. Many HALO systems are available for detecting trace contaminants in specialty gases, such as corrosives, hydrides, fluorocarbons, oxides and so on. And specially designed low pressure analyzers, such as the HALO RP and QRP, can detect residual H₂O in vacuum chambers and semiconductor deposition tools.

Technology: Cavity Ring-Down Spectroscopy (CRDS)

HALO (High-Purity)

HALO 3 CO

Improved detection limits for carbon monoxide (CO) make this analyzer a compelling solution for various applications from air separation to fuel-cell hydrogen analysis.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • CDA

Specifications

Detection	Range	LDL (3σ/24h)
CO in N ₂	0 – 2000 ppm	40 ppb
CO in O ₂	0 – 1800 ppm	35 ppb
CO in CDA	0 – 2000 ppm	40 ppb
CO in Ar	0 – 1600 ppm	30 ppb
CO in He	0 – 1800 ppm	35 ppb
CO in H ₂	0 – 2500 ppm	50 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance

Applications

- UHP Gas quality control
- Industrial gas QC
- Air separation units
- Certified reference materials and calibration gases
- Research & development
- Fuel-cell hydrogen analysis
- Syngas and fuel gas

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)

HALO 3 H₂O

Our most versatile moisture analyzer, with sub-ppb detection limits, excellent range, and a large selection of background gases. The HALO 3 is the moisture analyzer of choice in many industries.

Available Background Gases

N₂ • He • Ar • H₂ • D₂ • O₂ • CDA • CO • CO₂ • GeH₄ (mix) • SO₂ • COS • Ne • Kr • Xe • Cl₂ • HCl • HBr • H₂S • H₂Se • SF₆ • NF₃ • C_xF_y

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
H ₂ O in N ₂	0 – 20 ppm	1.2 ppb
H ₂ O in He	0 – 4 ppm	0.25 ppb
H ₂ O in H ₂	0 – 16 ppm	1.0 ppb
H ₂ O in O ₂	0 – 12 ppm	0.7 ppb
H ₂ O in CO ₂	0 – 25 ppm	2 ppb

Features and Benefits

- Sub-part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- Large selection of background gas matrices
- No consumables or maintenance

Applications

- UHP Gas quality control
- Semiconductor bulk gas
- Industrial gas QC
- Air separation units
- Fluorinated gases
- Gas standard preparation
- Gas-cooled nuclear reactors

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Corrosion-resistant model
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (High-Purity)

HALO 3 NH₃

This analyzer offers a variety of ranges for ammonia analysis in bulk gases, plus an "N₂O model" for analysis of NH₃ in pure nitrous oxide.

Available Background Gases

N₂ • H₂ • CO₂ • N₂O

Select Specifications

Detection	Range	LDL (3σ/24h)
NH ₃ in N ₂ *	0 – 35 ppm	2.5 ppb
NH ₃ in H ₂ *	0 – 30 ppm	2.0 ppb
NH ₃ in CO ₂	0 – 30 ppm	2.5 ppb
NH ₃ in N ₂ O†	0 – 200 ppm	10 ppb/50 ppb

*Higher and lower ranges available

†Available with "N₂O model", lower LDL requires vacuum pump

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance
- Multiple detection ranges available

Applications

- UHP Gas quality control
- Industrial gas QC
- Fuel-cell hydrogen analysis
- Gas standard preparation

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure
- Vacuum pump may be required for N₂O model

[See website for more details](#)

HALO 3 CH₄

Methane is a key indicator for hydrocarbon impurities in gases. This analyzer is designed to measure trace CH₄ down to low ppb levels to ensure bulk gases and standard cylinders are free from harmful hydrocarbons.

Available Background Gases

N₂ • He • Ar • H₂ • O₂

Specifications

Detection	Range	LDL (3σ/24h)
CH ₄ in N ₂	0 – 8 ppm	1.6 ppb
CH ₄ in He	0 – 5 ppm	1.1 ppb
CH ₄ in Ar	0 – 7 ppm	1.4 ppb
CH ₄ in H ₂	0 – 8 ppm	1.6 ppb
CH ₄ in O ₂	0 – 6 ppm	1.1 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance
- Custom detection ranges available

Applications

- UHP Gas quality control
- Industrial gas QC
- Air separation units
- Gas standard preparation

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (High-Purity)

HALO 3 HF

This analyzer specializes in monitoring trace HF down to sub-ppb levels in fluorinated specialty gases, as well as common inert bulk gases.

Available Background Gases

N_2 • He • SF_6 • NF_3 • C_xF_y

Select Specifications

(see website for more)

Detection	Range	LDL (3 σ /24h)
HF in N_2	0 – 5 ppm	0.4 ppb
HF in He	0 – 1.3 ppm	0.4 ppb
HF in SF_6	0 – 8 ppm	1.2 ppb
HF in NF_3	0 – 7.5 ppm	0.6 ppb
HF in CF_4	0 – 6 ppm	0.8 ppb

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance

Applications

- UHP Gas quality control
- Fluorocarbon chemistry
- Semiconductor specialty gas
- Gas standard preparation

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)

HALO 3 HCI

High sensitivity, fast speed of response and maximum ease of use make this system ideal for detecting trace HCl in various industrial and research applications.

Available Background Gases

N_2 • H_2 • CDA

Select Specifications

(see website for more)

Detection	Range	LDL (3 σ /24h)
HCl in N_2	0 – 20 ppm	1.0 ppb
HCl in CDA	0 – 20 ppm	1.0 ppb
HCl in H_2	0 – 10 ppm	1.0 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance

Applications

- UHP Gas quality control
- CEM standard preparation
- Fuel-cell hydrogen analysis
- Research & development
- High-purity gas systems
- Gas mixtures

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (High-Purity)

HALO 3 CO₂

This analyzer offers single-digit ppb-level detection of trace carbon dioxide (CO₂) for bulk gas applications.

Available Background Gases

N₂ • He • Ar • O₂ • CDA • HCl

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
CO ₂ in N ₂	0 – 25 ppm	8 ppb
CO ₂ in He	0 – 25 ppm	8 ppb
CO ₂ in Ar	0 – 25 ppm	8 ppb
CO ₂ in O ₂	0 – 25 ppm	8 ppb
CO ₂ in CDA	0 – 25 ppm	8 ppb
CO ₂ in HCl	0 – 30 ppm	9 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance

Applications

- UHP Gas quality control
- Industrial gas QC
- Air separation units
- Certified reference materials and calibration gases
- Research & development
- Fuel-cell hydrogen analysis
- Syngas and fuel gas

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)

HALO 3 CH₂O

This model detects trace amounts of formaldehyde in the low-ppb range. It is ideal for the preparation of CH₂O air quality gas standards and the analysis of fuel-cell hydrogen.

Available Background Gases

N₂ • H₂

Specifications

Detection	Range	LDL (3σ/24h)
CH ₂ O in N ₂	0 – 40 ppm	5 ppb
CH ₂ O in H ₂	0 – 40 ppm	6 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance

Applications

- UHP Gas quality control
- Industrial gas QC
- Fuel-cell hydrogen analysis
- Gas standard preparation
- Research & development

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (High-Purity)

HALO 3 D₂O/HDO

Deuterium (D₂) is used in various applications from research to the manufacturing of optical fibers. Moisture impurities in D₂ are therefore a combination of the heavy water isotopes D₂O and HDO. This analyzer is designed to detect traces of both molecules.

Available Background Gases

N₂ • D₂ (2H₂)

Specifications

Detection	Range	LDL (3σ/24h)
D ₂ O in D ₂	0 – 20 ppm	3 ppb
D ₂ O in N ₂	0 – 50 ppm	7 ppb
HDO in D ₂	0 – 30 ppm	5 ppb
HDO in N ₂	0 – 40 ppm	6 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance

Applications

- Research & development
- Optical fiber manufacturing
- Semiconductor fabrication
- Healthcare & pharmaceuticals

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- 19" rack mount
- Environmental enclosure

[See website for more details](#)

HALO LP H₂O

The HALO LP is designed for the detection of trace moisture in hydrides, such as ammonia, phosphine and arsine, which are used in the production of LEDs and semiconductor devices.

Available Background Gases

N₂ • He • Ar • H₂ • NH₃ • PH₃ • AsH₃ • GeH₄ • SiH₄ • NO

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
H ₂ O in NH ₃	0 – 20 ppm	9 ppb
H ₂ O in PH ₃	0 – 10 ppm	9 ppb
H ₂ O in N ₂	0 – 6 ppm	1.0 ppb
H ₂ O in NO	0 – 100 ppm	16 ppb
H ₂ O in AsH ₃ *	0 – 10 ppm	5 ppb

*Detection in arsine requires special model

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance
- Low-pressure operation for interference-free detection

Applications

- High-brightness LED production
- Semiconductor specialty gas
- UHP ammonia QC
- MOCVD

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure
- 19" rack mount
- Requires vacuum pump

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (High-Purity)

HALO RP H₂O

This HALO RP model detects moisture impurities in chambers and semiconductor process tools down to 50 Torr of pressure in various background gases, including purge, cleaning and process gases.

Available Background Gases

N₂ • He • Ar • H₂ • CO • NH₃ • PH₃ • AsH₃ • HCl

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
H ₂ O in N ₂	0 – 20 ppm	1.5 ppb
H ₂ O in H ₂	0 – 20 ppm	1.5 ppb
H ₂ O in HCl	0 – 25 ppm	3 ppb
H ₂ O in PH ₃	0 – 25 ppm	3 ppb
H ₂ O in AsH ₃	0 – 10 ppm	5 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance
- Large selection of background gases

Applications

- Epitaxy
- MOCVD

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Requires vacuum pump
- Corrosion-resistant model
- 19" rack mount

[See website for more details](#)

HALO RP HF

This HALO RP model detects hydrogen fluoride impurities in low-pressure chambers and semiconductor process tools down to 50 Torr of pressure.

Available Background Gases

N₂ • BF₃

Select Specifications

Detection	Range	LDL (3σ/24h)
HF in N ₂	0 – 10 ppm	0.75 ppb
HF in BF ₃	0 – 13 ppm	0.9 ppb

*Arsine detection requires special mode

Features and Benefits

- Sub-part-per-billion detection limits
- Calibration-free with zero drift
- Fast speed of response
- No consumables or maintenance

Applications

- Epitaxy
- MOCVD

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Requires vacuum pump
- 19" rack mount

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

HALO (High-Purity)

HALO QRP

This HALO QRP is designed to monitor moisture impurities in state-of-the-art semiconductor process tools at pressures as low as 1 Torr.

Available Background Gases

N₂ • He • Ar • H₂ • HCl

Select Specifications

Detection	Range	LDL (3σ/24h)
H ₂ O	0 – 12 mTorr _{pp} (1200 ppm @ 10 Torr)	1 μTorr _{pp} (100 ppb @ 10 Torr)

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- No consumables or maintenance
- Works over a wide pressure range from 1 Torr to 1000 Torr

Applications

- Epitaxy
- Atomic Layer Deposition (ALD)
- MOCVD

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Requires vacuum pump
- Corrosion-resistant model

[See website for more details](#)

HALO H₂O in N₂O

This analyzer specializes on detecting moisture impurities in High-Purity nitrous oxide (N₂O), but also offers ppb detection limits in common bulk gases.

Available Background Gases

N₂ • He • Ar • H₂ • O₂ • N₂O

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
H ₂ O in N ₂ O	0 – 20 ppm	7.5 ppb
H ₂ O in N ₂	0 – 15 ppm	2.2 ppb
H ₂ O in Ar	0 – 6 ppm	1.0 ppb
H ₂ O in He	0 – 3 ppm	0.5 ppb
H ₂ O in H ₂	0 – 12 ppm	1.9 ppb
H ₂ O in O ₂	0 – 8 ppm	1.2 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- No consumables or maintenance
- Can be used in N₂O, but also in bulk gases

Applications

- Gas standards preparation
- Medical gas
- Quality control for process gas or bulk gas systems

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- 19" rack mount
- Environmental enclosure

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

T-I MAX (AMC)

The T-I Max product line is designed for ultra-trace impurity detection in semiconductor fabs. Airborne molecular contamination (AMC) in cleanrooms, reticle storage, FOUP cleaning tools and litho secondary filters are just some of the popular applications. The unique design of these analyzers makes them keenly adapted to provide maximum speed of response in semi-humid environments. The T-I Max series masters the challenging parts-per-trillion (ppt) detection of reactive species like HF, HCl or NH₃.

No matter if it is our single-species models or the new T-I Max X2/X3 with multiple contaminants in one unit, the systems are designed for maximum uptime to ensure that your process will not be operating blind to AMC threats.

Technology:

Cavity Ring-Down Spectroscopy (CRDS)



T-I Max (AMC)

T-I Max NH₃

The proven generation of AMC monitors for the most advanced semiconductor fabs. This analyzer monitors ppt-levels of ammonia (NH₃) in real-time in the cleanroom and other critical environments.

Available Background Gases

Cleanroom Air • N₂ • CDA

Specifications

Detection	Range	LDL (3σ@100sec)
NH ₃ in Air	0 – 40 ppm	300 ppt
NH ₃ in N ₂	0 – 40 ppm	300 ppt
NH ₃ in CDA	0 – 40 ppm	300 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No maintenance
- Resistant to VOC and particulate contamination

Applications

- Cleanroom AMC monitoring
- FOUF and Pod monitoring
- Reticle storage
- Mobile AMC cart (w/ GO-cart)

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- GO-cart mobile solution
- SmartAlarm™ interference prevention
- External particle filter
- Requires vacuum pump

[See website for more details](#)

T-I Max HF

The proven generation of AMC monitors for the most advanced semiconductor fabs. This analyzer monitors ppt-levels of hydrogen fluoride (HF) in real-time in the cleanroom and other critical environments.

Available Background Gases

Cleanroom Air • N₂ • CDA

Specifications

Detection	Range	LDL (3σ@100sec)
HF in Air	0 – 1 ppm	20 ppt
HF in N ₂	0 – 1 ppm	20 ppt
HF in CDA	0 – 1 ppm	20 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No maintenance
- Resistant to VOC and particulate contamination

Applications

- Cleanroom AMC monitoring
- FOUF and Pod monitoring
- Reticle storage
- Mobile AMC cart (w/ GO-cart)

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- GO-cart mobile solution
- SmartAlarm™ interference prevention
- External particle filter
- Requires vacuum pump

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

T-I Max (AMC)

T-I Max HCl

The proven generation of AMC monitors for the most advanced semiconductor fabs. This analyzer monitors ppt-levels of hydrogen chloride (HCl) in real-time in the cleanroom and other critical environments.

Available Background Gases

Cleanroom Air • N₂ • CDA

Specifications

Detection	Range	LDL (3σ@100sec)
HCl in Air	0 – 4 ppm	100 ppt
HCl in N ₂	0 – 4 ppm	100 ppt
HCl in CDA	0 – 4 ppm	100 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No maintenance
- Resistant to VOC and particulate contamination

Applications

- Cleanroom AMC monitoring
- FOUF and Pod monitoring
- Reticle storage
- Mobile AMC cart (w/ GO-cart)

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- GO-cart mobile solution
- SmartAlarm™ interference prevention
- External particle filter
- Requires vacuum pump

[See website for more details](#)

T-I Max X2 and X3 NEW!

The latest generation AMC monitor now comes in an all-in-one package. This analyzer measures two (X2) or all three (X3) critical molecules, HF, NH₃ and HCl, in one integrated, rack-mountable package to save space and cost.

Available Background Gases

Cleanroom Air • N₂ • CDA

Select Specifications

Detection	Range	LDL (3σ@100sec)
HF in Air	0 – 1 ppm	40 ppt
NH ₃ in Air	0 – 40 ppm	300 ppt
HCl in Air	0 – 4 ppm	100 ppt

Features and Benefits

- Part-per-trillion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- Compact design
- Resistant to VOC and particulate contamination

Applications

- Cleanroom AMC monitoring
- FOUF and Pod monitoring
- Reticle storage
- Multi-point monitoring (w/ 32-point sampling system)

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- 32-point stationary sampling system
- SmartAlarm™ interference prevention
- External particle filter
- Requires vacuum pump

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

T-I MAX AIR/CEM

These versions of the T-I Max family include -I Max AIR line for detecting harmful chemicals (e.g. CH_2O) and greenhouse gases (CO_2 and CH_4) in environmental applications, as well as the T-I Max CEM for the detection of pollutants in diluted stack gas.

Our T-I Max AIR GHG monitor is designed to meet World Metrological Organization (WMO) measurement requirements to participate in greenhouse gas monitoring networks.

Technology:

Cavity Ring-Down Spectroscopy (CRDS)

T-I Max AIR/CEM

T-I Max AIR **NEW!**

Accurate and precise measurements of greenhouse gases (GHG), in particular CO₂ and CH₄, are important to assess the effects of climate change. This analyzer meets the latest precision requirements of the World Meteorological Organization (WMO) and is therefore ideal for GHG monitoring networks.

Available Background Gases

Air

Specifications

Detection	Range	Precision* (1σ) - 5 min/24 hrs
CH ₄ in Air	0 - 20 ppm	1 ppb/2 ppb
CO ₂ in Air	0 - 1000 ppm	50 ppb/100 ppb
H ₂ O in Air	0 - 7%	30 ppm/100 ppm

*at typical ambient levels

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No maintenance

Applications

- Indoor air quality
- Fenceline monitoring

Communication Interfaces

Ethernet, USB, RS-232, RS-485,

Market



Options & Accessories

- Serani Max interface software
- External particle filter
- Requires vacuum pump

[See website for more details](#)

T-I Max AIR CH₂O

This advanced, real-time monitor can detect low-ppb levels of formaldehyde (CH₂O) in the environment and indoor air samples to help control this harmful pollutant.

Available Background Gases

Air • N₂ • CDA

Specifications

Detection	Range	LDL (3σ/24h)
CH ₂ O in Air	0 - 100 ppm	10 ppb
CH ₂ O in N ₂	0 - 100 ppm	10 ppb
CH ₂ O in CDA	0 - 100 ppm	10 ppb

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No maintenance

Applications

- Indoor air quality
- Fenceline monitoring

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- External particle filter
- Requires vacuum pump



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

T-I Max AIR/CEM

T-I Max CEM

Excellent sensitivity and outstanding speed of response allow these analyzers to measure emissions from coal-fired power plants, cement kilns, and other sources requiring high dilution ratios, thus simplifying CEM installations and compliance tests.

Available Background Gases

Air • Diluted Stack Gas

Specifications

Detection	Range	LDL (3σ/24h)
T-I Max CEM NH ₃	0 – 40 ppm	6 ppb
T-I Max CEM CH ₄	0 – 20 ppm	1.5 ppb
T-I Max CEM HF	0 – 1 ppm	0.15 ppb
T-I Max CEM HCl	0 – 4 ppm	0.75 ppb
T-I Max CEM H ₂ S	0 – 500 ppm	40 ppb

Features and Benefits

- Part-per-billion detection limits
- No heated sample lines needed for stack measurements
- Outstanding speed of response
- No maintenance
- Designed for high specificity to target detection molecule

Applications

- Continuous Emissions Monitoring (CEM)
- Air Quality Measurements

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Dilution probe
- Linear fit mode
- 19" rack mount
- Environmental enclosure
- Requires vacuum pump

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

PRISMATIC

The Prismatic series offers true multi-species capability with the detection of up to four analytes simultaneously in a single gas stream. This way, multiple measurements can be obtained while conserving sample and simplifying gas connections. Applications for the Prismatic series include customized laboratory measurements for routine analytical and research needs, deployment in air separation units (ASUs) and fuel-cell hydrogen analysis in the lab and in the field.

Technology: Cavity Ring-Down Spectroscopy (CRDS)



Prismatic – Multispecies Detection

Prismatic 3

This analyzer allows users to **detect up to four trace molecules simultaneously** in a single gas stream. The Prismatic 3 is ideal for fuel-cell hydrogen QC, laboratory analysis or any other application where convenience and sample preservation are important.

Available Background Gases

N₂ • Ar • H₂ • O₂

Select Specifications

(see website for more)

Detection	Range	LDL (3σ/24h)
CO in H ₂	0 – 500 ppm	50 ppb
H ₂ O in H ₂	0 – 25 ppm	100 ppb
CO ₂ in H ₂	0 – 1000 ppm	320 ppb
CH ₄ in H ₂	0 – 100 ppm	100 ppb

Features and Benefits

- Part-per-billion detection limits
- Up to four simultaneous detections
- Outstanding speed of response
- No consumables or maintenance
- No vibration sensitivity

Applications

- Laboratory analysis
- Industrial gas QC
- Fuel-cell hydrogen analysis

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software

[See website for more details](#)

Prismatic 3+ **NEW!**

This analyzer allows users to **detect up to four trace molecules simultaneously** in a single gas stream. The Prismatic 3+ is ideal for process control and product QC in air separation units and related applications.

Available Background Gases

N₂ • Ar • He • H₂ • O₂ • CDA

Select Specifications

(see website for more)

Detection	Range	LDL (3σ)
H ₂ O in N ₂	0 – 100 ppm	10 ppb
CH ₄ in N ₂	0 – 200 ppm	10 ppb
CO in N ₂	0 – 2900 ppm	50 ppb
CO ₂ in N ₂	0 – 4000 ppm	50 ppb

Features and Benefits

- Improved detection limits
- Four simultaneous detections
- Outstanding speed of response
- No consumables or maintenance
- No vibration sensitivity

Applications

- Process control in ASUs
- Industrial gas QC
- Truck fill analysis

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

CO-rekt AND ALOHA+ H₂O

The CO-rekt and ALOHA+ H₂O are analyzers specifically designed for special applications.

The CO-rekt is our only CRDS analyzer with Class I, Div 2 rating, making it ideal to monitor trace CO, H₂O and other impurities in hydrogen production (SMR and HyCO).

The ALOHA+ H₂O offers the world's lowest detection limit for moisture in pure NH₃. It is therefore the ideal analyzer for semiconductor and high-brightness LED manufacturing where ultra-high-purity ammonia is used.

Technology: Cavity Ring-Down Spectroscopy (CRDS)



CO-rekt Series

CO-rekt

Featuring Class I, Div. 2 compliant housing, this analyzer is perfect for monitoring CO, CO₂, H₂O or CH₄ impurities in flammable gas processes, such as HyCO, SMR, and syngas production.

Available Background Gases

H₂ • Syngas

Specifications in H₂

Detection	Range	LDL (3σ/24h)
CO-rekt CO	0 – 2000 ppm	150 ppb
CO-rekt CO ₂	0 – 1500 ppm	500 ppb
CO-rekt H ₂ O	0 – 16 ppm*	1.0 ppb
CO-rekt CH ₄	0 – 100 ppm*	7 ppb

*Higher ranges available

Features and Benefits

- Part-per-billion detection limits
- Calibration-free with zero drift
- Outstanding speed of response
- No consumables or maintenance
- No vibration sensitivity
- Class I, Div. 2 certification

Applications

- Hydrogen production (HyCO and SMR)
- Syngas production

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Requires inert gas purge for hazardous locations

[See website for more details](#)

ALOHA H₂O Series

ALOHA+ H₂O

This analyzer was specifically designed for the analysis of moisture in ultra-pure ammonia used for the production of high-brightness LEDs and other specialized semiconductor devices. It offers the lowest H₂O detection limit in the industry without background interference.

Available Background Gases

N₂ • He • Ar • NH₃

Specifications

Detection	Range	LDL (3σ/24h)
H ₂ O in NH ₃	0 – 20 ppm	3 ppb
H ₂ O in N ₂	0 – 6 ppm	0.5 ppb
H ₂ O in He	0 – 3 ppm	0.3 ppb
H ₂ O in Ar	0 – 4 ppm	0.4 ppb

Features and Benefits

- Single-digit part-per-billion detection limit in pure NH₃
- Calibration-free with zero drift
- No consumables or maintenance
- No vibration sensitivity

Applications

- High-brightness LED production
- Semiconductor specialty gas
- UHP ammonia QC

Communication Interfaces

Ethernet, USB, RS-232, RS-485, 4-20mA analog, Modbus TCP (optional)

Market



Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Requires vacuum pump
- 19" rack mount

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

VeraSpec APIMS

The VeraSpec APIMS is a quadrupole-based mass spectrometer with atmospheric pressure ionization source designed for ultra-high sensitivity detection of trace-level impurities in UHP gases. The system allows for the speciated measurement of contaminants in these gases with ppt-level detection limits. Fast, online analysis rates give the ability for real-time, 24-hour process monitoring of gas supplies for consistent confidence in the supply and quick alerts to users if there are any issues. Low gas flow requirements and minimum maintenance allow this system to be utilized with minimum operating costs.

Technology: Atmospheric Pressure Ionization Mass Spectrometry (QMS)

Quadrupole Mass Spectrometers – APIMS

VeraSpec™ APIMS

Our Ultra-High-Purity gas analyzers have the speed, sensitivity, and ease-of-use to continuously monitor Nitrogen, Argon, Helium and Hydrogen supply streams and rapidly report ppt-level contamination to protect the electronics fabrication process.

The VeraSpec™ APIMS combines Atmospheric Pressure Ionization (API) technology with a high-performance mass spectrometer (MS) optimized for ppt-level UHP gas analysis to mainly serve customers in the semiconductor industry.

Available Background Gases

N₂ • He • Ar • H₂

Features and Benefits

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

Applications

- UHP Gas quality control
- Semiconductor bulk gas
- Quality control for process gas or bulk gas systems
- Purifier qualification

Communication & Software

- Questor 5 Process Control Software
- Tracks and records data
- Automated alarms, validations and calibrations
- Network accessible
- Secure to 21 CFR Part 11
- Ethernet, Modbus, Profibus, digital I/O, analog I/O, OPC

Detection Limit (LDL) Specifications (2σ)

Detection*	in N ₂	in Ar	in He	in H ₂
Hydrogen (H ₂)	150 ppt	100 ppt	50 ppt	N/A
Oxygen (O ₂)	10 ppt	10 ppt	10 ppt	10 ppt
Methane (CH ₄)	10 ppt	10 ppt	10 ppt	10 ppt
Water (H ₂ O)	10 ppt	10 ppt	10 ppt	10 ppt
Carbon Monoxide (CO)	50 ppt	10 ppt	10 ppt	50 ppt
Carbon Dioxide (CO ₂)	10 ppt	10 ppt	10 ppt	5 ppt
Ammonia (NH ₃)	500 ppt	500 ppt	500 ppt	500 ppt
Nitrogen (N ₂)	N/A	100 ppb	10 ppt	150 ppt
Argon (Ar)	75 ppb	N/A	10 ppt	50 ppt

*Additional detections are available

Market



Technology

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

Additional features:

- 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)
- Pulse-counting electron multiplier
- Simple maintenance (<1 per year)
- Ambient or heated getter purifier (optional)

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

Quadrupole Mass Spectrometers – APIMS

VeraSpec™ APIMS-SX5 **NEW!**

The VeraSpec APIMS-SX5 gives up to 5 stream selection options for automatic monitoring of ppt-level impurities in different bulk gases.

Available Background Gases

N₂, Ar, He, H₂, Kr, others

Features and Benefits

- Part-per-trillion measurements of multiple critical impurities
- Fast stream switching of up to 5 bulk gases
- Integrated back flow protection
- Life safety sensors

Applications

- Bulk gas measurement

Communication & Software

- Modbus and Profibus
- Analog I/O and digital I/O
- Ethernet

Select Specifications

Detection*	Range	LDL (2σ)**
Hydrogen (H ₂)	0 – 100%	100ppt
Oxygen (O ₂)	0 – 100%	10ppt
Methane (CH ₄)	0 – 100%	10ppt
Water (H ₂ O)	0 – 100%	10ppt
Carbon Monoxide (CO)	0 – 100%	10ppt
Carbon Dioxide (CO ₂)	0 – 100%	10ppt
Nitrogen (N ₂)	0 – 100%	10ppt
Argon (Ar)	0 – 100%	10ppt

*Gas dependent

**To be determined (shown numbers are estimates)

Market



Options & Accessories

- Ambient or heated purifiers
- Any combination of up to 5 bulk gases

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

MAX300 MASS SPECTROMETERS

The MAX300 series of mass spectrometers offer the widest breadth of gas analysis capabilities, measuring any gas or vapor sample from ppb-level to 100% concentrations. These systems come with a variety of sample inlet and sample path material options allowing for the measurement of multiple gas streams with various compositions.

Technology: Quadrupole Mass Spectrometry (QMS)



Quadrupole Mass Spectrometers – MAX300

MAX300-LG™

Our EXTREL™ MAX300-LG™ brings an unmatched combination of speed, sensitivity and precision to continuous, quantitative gas analysis.

Based on cutting-edge quadrupole mass spectrometer technology, the MAX300-LG has the dynamic range to measure component concentrations from 100% down to the low parts per billion (ppb) in many gas or vapor samples. It provides a full composition update every few seconds and can analyze multiple sample points in a fully automated analysis routine.

Available Background Gases

N₂ • He • Ar • H₂ and more

Features and Benefits

- Provides complete quantitative sample composition
- Real-time analysis of the input and effluent streams reveals what is happening in the reaction
- Useful at every stage of process development: laboratory, pilot, production

Applications

- UHP Gas quality control
- Quality control for process gas or bulk gas systems
- Fuel-cell hydrogen analysis

Communication & Software

- Questor 5 Process Control Software
- Tracks and records data
- Automated alarms, validations and calibrations
- Network accessible
- Secure to 21 CFR Part 11
- Ethernet, Modbus, Profibus, digital I/O, analog I/O, OPC

Detection Limit Specifications (3σ)

Detection*	in Ar	in H ₂	in He	in N ₂
Argon (Ar)	N/A	0.5 ppm	0.5 ppm	0.5 ppm
Carbon Dioxide (CO ₂)	1.5 ppm	1.5 ppm	3 ppm	3 ppm
Carbon Monoxide (CO)	1.5 ppm	1.5 ppm	1.5 ppm	200 ppm
Helium (He)	0.75 ppm	0.75 ppm	N/A	0.75 ppm
Hydrogen (H ₂)	60 ppm	N/A	60 ppm	60 ppm
Methane (CH ₄)	1 ppm	1 ppm	1 ppm	4 ppm
Nitrogen (N ₂)	1.5 ppm	1.5 ppm	1.5 ppm	N/A
Oxygen (O ₂)	0.5 ppm	0.5 ppm	0.5 ppm	0.5 ppm

*Additional detections are available

Market



Technology

Industry-leading 19mm quadrupole mass filter, combined with state-of-the-art electronics, provides the user with an impressive list of advantages:

- Near-zero mass scale drift for outstanding measurement precision and stability
- Uniform resolution across the entire mass range for ultra-high sensitivity to all compounds
- Extreme resistance to corrosion and contamination for long-term, continuous, low-maintenance operation
- Performance specifications that exceed those common to other mass spectrometers and process technologies

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

Quadrupole Mass Spectrometers – MAX300

MAX300-TGM™

The MAX300-TGM was specifically designed for toxic gas monitoring in ambient air. With fast measurements and high sensitivity this multi-channel, multi-sample point analyzer provides stable and accurate analysis for life safety and airborne molecular contamination (AMC) applications.

This versatile and flexible platform enables detection of 15+ gases on up to 46 sample points providing a low cost per gas, per point monitoring solution. An intuitive software platform provides an interface that is user friendly and customizable. The robust analyzer design provides a low cost of ownership by decreasing complexity of maintenance and upkeep.

Available Background Gases

Ambient air and many more

Select Specifications

(see website for more)

Detection Limit Specifications (3σ)

Gas	LDL (3σ)
Carbon Tetrachloride (CCl ₄)	0.03 ppm
Carbonyl Sulfide (COS)	0.015 ppm
Difluoromethane (CH ₂ F ₂)	0.06 ppm
Germane (GeH ₄)	0.05 ppm
Hexafluoro 1, 3-Butadiene (C ₄ F ₆)	0.06 ppm
Hydrogen (H ₂)	200 ppm
Methyl silane (CH ₃ Si)	2.5 ppm
Nitrogen Trifluoride (NF ₃)	0.03 ppm
Octafluorocyclopentane (C ₅ F ₈)	0.03 ppm
Tetraethylorthosilicate (TEOS)	2.5 ppm

Features and Benefits

- Fully automated, real-time contamination alerts
- Reliable, 24/7 operation
- Reduce false alarms
- Highly responsive to changes in chemical concentration – reducing downtime after an event

Applications

- Life Safety
- Airborne Molecular Contaminants (AMCs)
- Ambient Air Monitoring

Communication & Software

- Questor5 Software
- Tracks and records data
- Automated alarms
- Network accessible
- Secure to 21 CRF Part 11
- Modbus TC/PIP

Market



Technology

The MAX300's industry-leading 19mm quadrupole mass filter combined with a design specific to application needs provides the user with an impressive list of advantages:

- Near-zero mass scale drift for outstanding measurement precision and stability
- Analysis rate of less than 0.4 seconds per chemical
- Meet or exceed industry requirements for continuous monitoring
- Dry, oil-free pumping configuration
- Integrated redundant sample pump
- Simple maintenance (<1 per year)
- Customizable alarms and monitoring scheme

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

CHILLED MIRROR HYGROMETERS

The MBW™ 373 and 473 Chilled Mirror Dew Point Analyzer is the flagship device for the measurement of dew point and relative humidity in gas processes, research and development, and transfer standards/calibrations. This analyzer supports a wide range of dew point measurements ranging from -95°C up to 140°C. The system incorporates a controlled heating sample path and measurement head, internal pressure measurements, integrated cooling system, and an external platinum resistance thermometer for the widest range of humidity measurements.

Technology: Chilled Mirror Hygrometry



Chilled Mirror Hygrometers

373 Dew Point Hygrometer

The 373 Dew Point Hygrometer measures the dew point and relative humidity of gases.

Available Background Gases

Air • N₂ • Ar • H₂ • O₂ • He • Kr • Xe • others

Select Specifications

Detection	Range	LDL
H ₂ O (dew point)	-90°C to +95°C	-90°C

Features and Benefits

- Wide dew point/RH Range
- Secondary PRT
- Temperature controlled sample path and measuring head
- Integrated refrigerant cooling
- Internal pressure measurement

Applications

- Calibrations/Transfer Standard
- H₂ Fuel Cell R&D
- Chamber control/validation

Communication Interfaces

RS-232 Software interface
Analog outputs

Market



Options & Accessories

- Pressure upgrade to 2 MPa
- Internal sample pump
- SCS Accredited ISO 17025 calibration
- Measuring head mount endoscope
- 500 hPa vacuum measurement capability

[See website for more details](#)

473 Dew Point Hygrometer

The 473 Dew Point Hygrometer measures the dew point and relative humidity of gases.

Available Background Gases

Air • N₂ • Ar • O₂ • H₂ • He • Kr • Xe • others

Select Specifications

Detection	Range	LDL
H ₂ O (dew point)	-30°C to +99°C	-30°C

Features and Benefits

- Wide dew point/RH Range
- Cable-Mounted, Remote Measuring Head
- Integrated Measuring Head Flow Module
- High Temperature Environment Measurements

Applications

- Calibrations/Transfer Standard
- Chamber control/validation
- Fuel Cell Test

Communication Interfaces

RS-232 Software interface
Analog outputs

Market



Options & Accessories

- 12 Channel PRT T12 Interface
- Internal Barometric Pressure Sensor
- Two, User-Programmable Analog Outputs
- Upgrade to SCS Accredited ISO 17025 Calibration

[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

QuickTOC

TOC (total organic carbon) is used and is an important indicator for water quality. The QuickTOC product line measures TOC in various types of water samples, from ultra-pure and purified water used in semiconductor and pharmaceutical manufacturing, to effluent streams and wastewater from dairies, paper, or paint factories. To ensure high product quality and to guarantee process security, the fast and reliable monitoring of the QuickTOC series is of the utmost importance.

Technology:

Non-Dispersive Infrared TOC (QuickTOCultra)

UV-Excitation Conductivity TOC (QuickTOCtrace)

QuickTOC Series

QuickTOCultra™

The QuickTOCultra continually checks the TOC content of wastewater. Optionally, other sum parameters can be detected as well. At 1200°C, samples are completely oxidized, and within 3 minutes the TRUE TOC result is determined. Our TOC analyzer is the most reliable measurement system for the roughest wastewater applications. Due to an unrivaled injection and oxidation technique, the QuickTOCultra easily handles sticky, fatty, salty, and high-particle samples unlike other TOC analyzers.

Measurement Ranges

0.1 – 50000 mg/l (ppm) TOC, with optional dilution up to 500000 mg/l (ppm) possible, other ranges on request

Features and Benefits

- High-temperature method at 1200°C
- Catalyst-free technique
- Batch principle
- Robotic injection system
- Excellent reproducibility
- Low maintenance
- 1 to 2 minutes response time

Applications

- Influent and effluent water
- Discharge control
- Wastewater
- Process water

Communication Interfaces

TFT Touchscreen-Graphic-Display, 10.4", high resolution, back-lit
Self-explanatory software, Autostart function, Standard data interface to office PC (USA 2.0)

Market



[See website for more details](#)

QuickTOCtrace™

QuickTOCtrace measurement—the fastest way to analyze ultra-pure water! The QuickTOCtrace is a measuring system for the continuous, online determination of total organic carbon (TOC) in ultra-pure water applications such as UP process water in semiconductor manufacturing.

Measurement Ranges

0.1 – 1000 ppb TOC,
0.055 – 2.0 µS/cm conductivity

Features and Benefits

- Online determination of organic impurity of water for process and product quality.
- Recognized differential conductivity measurement with UV oxidation
- Reaction time of <30 seconds
- Continuous measurement (every 2 seconds)
- Easy calibration (once per year)
- Easy system validation with fully automatic SST (optional)

Applications

- Pure and ultra-pure water
- Process water
- Boiler feed water
- Condensate return
- Semiconductor UPW
- Pharma WFI, HPW and PW

Market



[See website for more details](#)



Ultra-High Purity Gas / P-Gas



Industrial Gas / G-Gas & Hydrogen



Specialty Gas



Airborne Molecular Contaminants (AMC)



Vacuum & Deposition Chambers



Life Safety



Environmental CEM & GHG



Water Analysis

QuickTOC Series

QuickTOCPurity™

Purity series analyzers continuously monitor the TOC content of pure water at the lowest concentrations. Even the smallest impurities are detected. At 1200°C, the samples are completely oxidized, and within 2 minutes the TRUE TOC is determined.

Optimize your processes with the leading TOC analyzer for the determination of total carbon (TC), total organic carbon (TOC), total inorganic carbon (TIC) in pure water. Optionally, other sum parameters such as TNb can also be detected.

Measurement Ranges

0.1 – 2000 µg/l

Features and Benefits

- High temperature method at 1200°C
- Catalyst-free technique
- Batch principle
- Robotic injection system
- Excellent reproducibility
- Low maintenance
- 1 to 2 minutes response time
- Contamination-free closed-loop injection system
- Patented calibration and validation feature by test gas

Applications

- Boiler feed water
- Condensate return
- Pure water
- Drinking water
- Semiconductor UPW
- Pharma WFI, HPW and PW

Communication Interfaces

TFT Touchscreen-Graphic-Display, 10.4", high resolution, back-lit, Self explanatory software, Autostart function, standard data interface to office PC (USA 2.0)

Market



See website for more details



Ultra-High Purity Gas / P-Gas



Vacuum & Deposition Chambers



Industrial Gas / G-Gas & Hydrogen



Life Safety



Specialty Gas



Environmental CEM & GHG

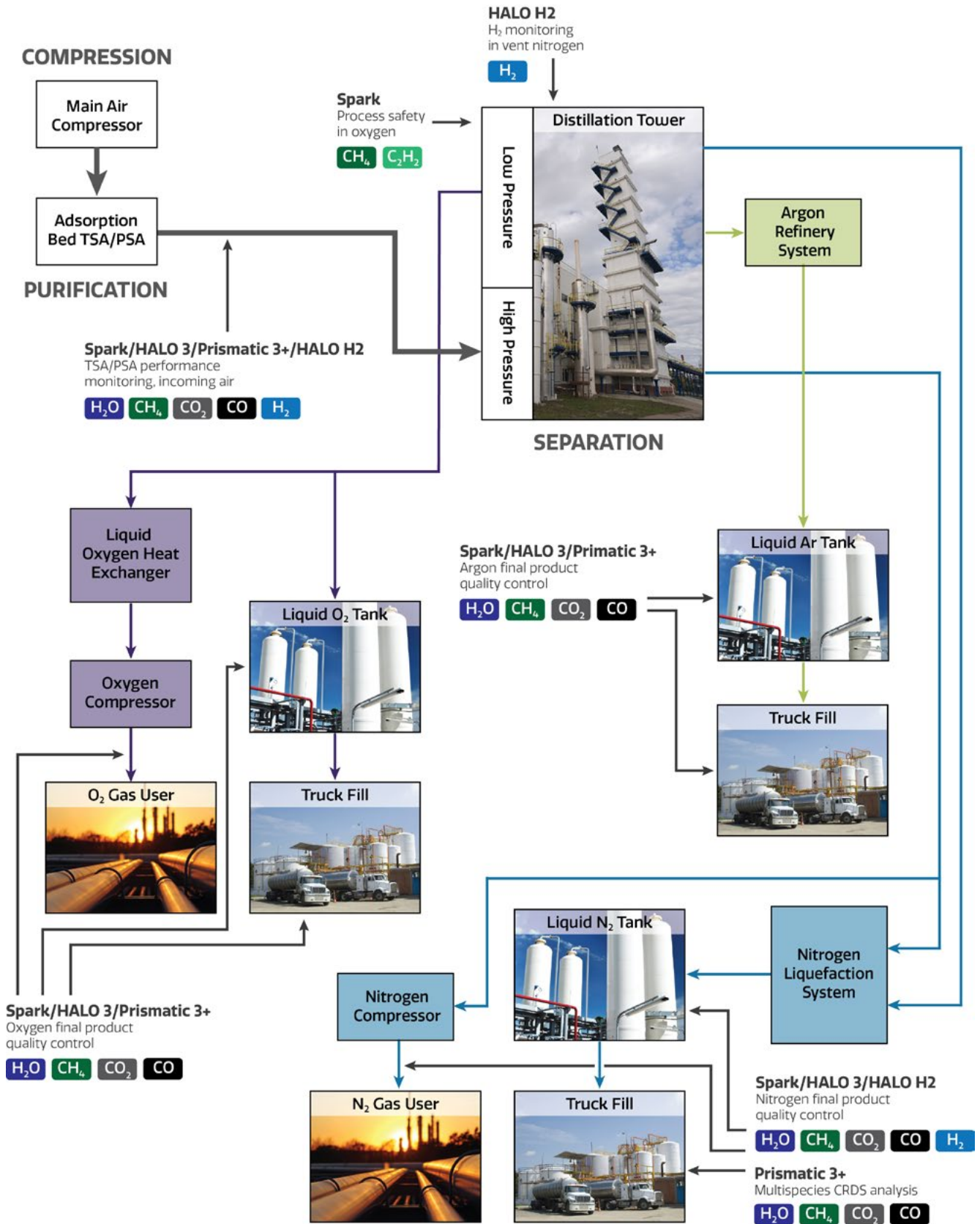


Airborne Molecular Contaminants (AMC)

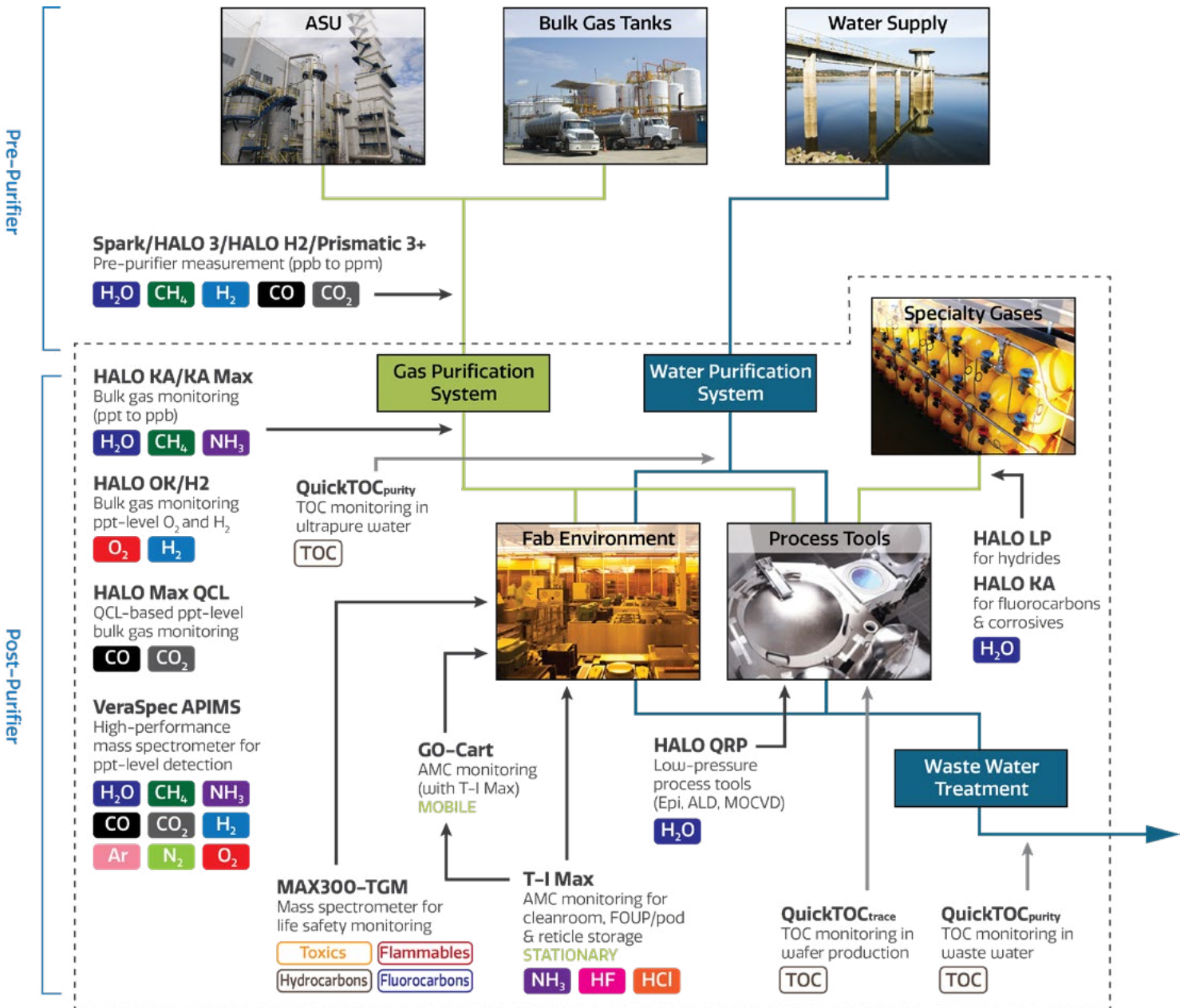


Water Analysis

Application Feature: Air Separation Units (ASUs)



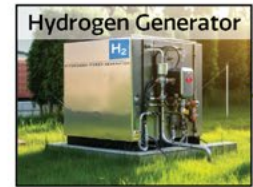
Application Feature: Semiconductor Fabrication



Application Feature: Ultra-High Purity Hydrogen



On-Site Hydrogen Production



MAX300-RTG

Mass spec quality control

CH ₄	CO	CO ₂	C _x H _y
N ₂	Ar	He	H ₂ S

CO-rekt/Spark/Prismatic 3

End product quality control

H ₂ O	CH ₄	CO ₂	CO
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Spark/HALO 3/Prismatic 3

Delivered product quality control

H ₂ O	CH ₄	CO ₂	CO
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Large-Scale Hydrogen Production

SMR Plant

Blue Hydrogen
Grey Hydrogen

Hydrogen-Rich Well

White Hydrogen

Electrolyzer Plant

Green Hydrogen
Pink Hydrogen

Purification

Purification

Dryer

UHP HYDROGEN

MAX300-RTG

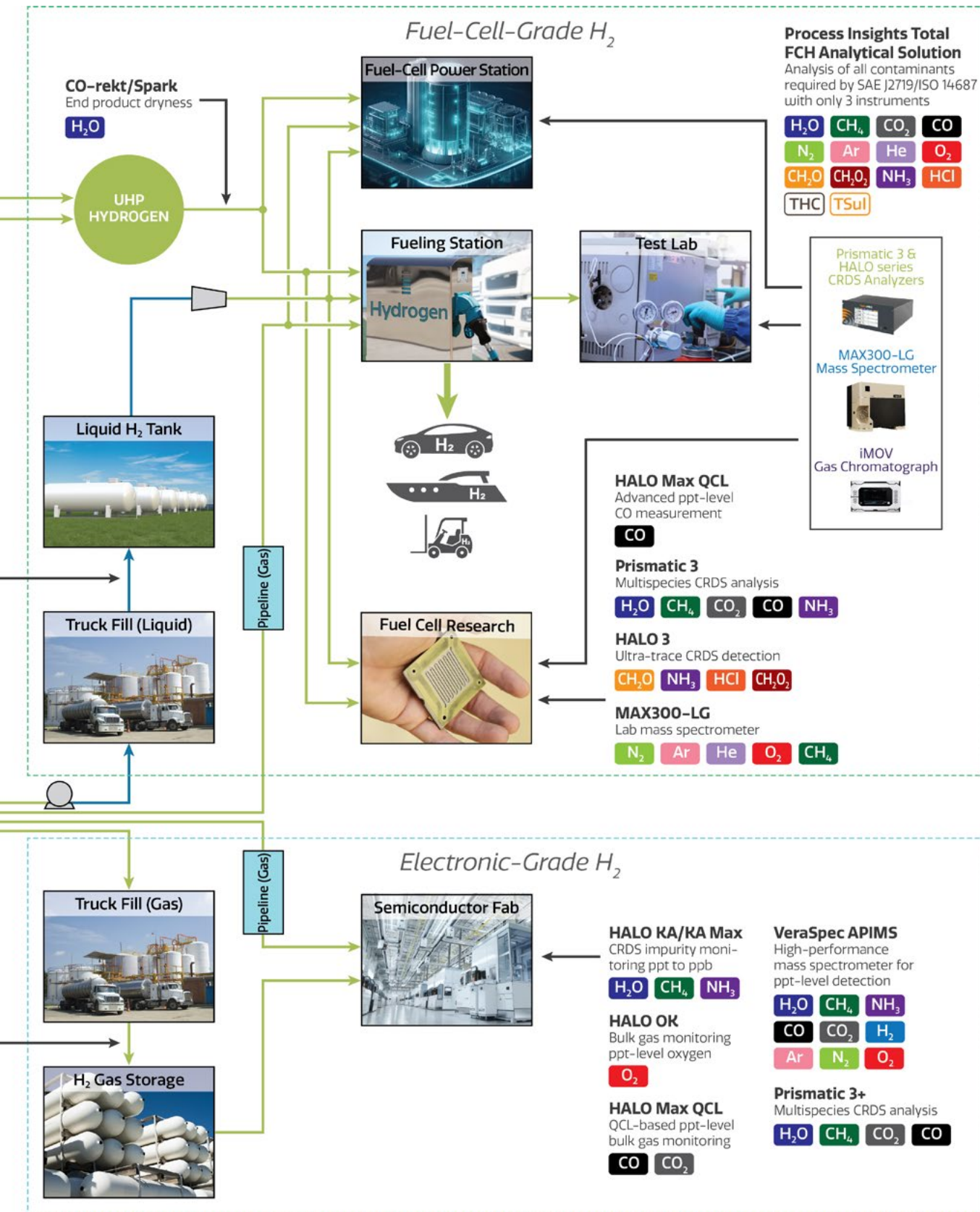
Mass spec quality control

H ₂ O	CH ₄	O ₂
N ₂	Ar	He

CO-rekt/Spark

End product dryness

H ₂ O



Integration Solutions

GO-Cart

This mobile cart is designed to provide a flexible monitoring solution for semiconductor cleanrooms. Equipped with up to three single-species T-I Max AMC monitors or a T-I Max X2/X3, the GO-cart can be deployed rapidly to monitor AMCs in critical locations.

Compatible Products

T-I Max Series AMC monitors

Features and Benefits

- Fits up to 3 T-I Max analyzers or a T-I Max X2/X3
- Central 10.4" touchscreen for controlling all installed analyzers
- Cleanroom-compatible materials
- Backup UPS available

Applications

- Airborne Molecular Contaminants in cleanrooms
- Mobile AMC monitoring



Environmental Enclosures

Some applications require analyzers to be installed outdoors or in unheated/uncooled instrument sheds. We offer custom-made enclosures for our analyzers to protect the system from environmental exposure and ensure reliable operation.

Compatible Products

Any HALO, Spark or T-I Max

Features and Benefits

- Custom-fit to your application and analyzer
- Heated/air-conditioned if needed
- Custom mounting options
- Available with virtually any TIGER OPTICS analyzer

Applications

- Unmanned Air Separation Units
- Environmental monitoring



Gas Test Panels

Tiger's analyzers operate so reliably that they require virtually no maintenance or calibration checks. Thus, customers ask sometimes how to verify the analyzer's performance. We offer several convenient gas test panels that can be connected to the analyzer to perform zero baseline and span validations.

Compatible Products

Any TIGER OPTICS analyzer

Features and Benefits

- Three different basic configurations to match your application
- Purifiers and permeation devices available as accessories

Applications

- Zero and span verification
- Analyzer testing



Integration Solutions

Multi-Max AMC

Surveying different micro-environments in a fab is now fast and easy with our safe, flexible, and user-friendly Multi-Max AMC Monitoring Solution. The specialized cabinet can be equipped with any combination of our T-I Max CRDS analyzers to monitor simultaneously and in real-time for the most critical contaminants in cleanroom air: NH₃, HCl, and HF, among others.

Compatible Products

T-I Max Series AMC monitors

Features and Benefits

- Fits multiple T-I Max AMC analyzers or a T-I Max X2/X3
- Automated manifold with 16, 24 or 32 sampling points
- Optimized sampling lines for shortest response time
- User-friendly interface

Applications

- Airborne Molecular Contaminants in cleanrooms
- Mobile AMC monitoring



CQC Systems

Process Insights large portfolio of analyzers allows us to offer complete Continuous Quality Control (CQC) systems consisting of CRDS, mass spec and other instrumentation to meet UHP customer needs. One typical application is CQC cabinets for real-time bulk gas purity monitoring in semiconductor fabs.

Compatible Products

Most analyzers

Features and Benefits

- Fits almost any combination of gas analyzers (incl. rack-mountable third-party products)
- Fully integration, single-supplier solution

Applications

- Fixed CQC systems
- Pre- and post-purifier monitoring



Enclosure for Hazardous Applications

In some installations, instruments must meet safety classifications to operate in a hazardous area or with flammable or toxic gases. A rated enclosure allows the use of any analyzer in areas that require Class I Div 2, ATEX or other safety classification. Enclosures are purpose-built to fit the installation location and any combination of analyzers.

Compatible Products

Most analyzers

Features and Benefits

- Custom designed to fit your installation and choice of analyzer
- Available for most required safety ratings

Applications

- Measurements in hazardous areas
- Hydrocarbon or hydrogen gas streams
- Toxic gases
- Rating compliance without the need for a special analyzer



Featured CRDS Services & Upgrades

Annual Performance Verification

This annual procedure ensures that your analyzer continues to meet its original specifications. This low cost process is 100% remote, no removal of the analyzer or expensive service visit are required. After completion, we issue a Verification Certificate testifying to the analyzer's correct operation.

Compatible Products

All TIGER OPTICS analyzers

Features and Benefits

- Easy, in-situ remote verification process, with no need to return the analyzer to the factory
- Up-to-date Verification Certificate to comply with your QA/QC standards
- Necessary data can be collected most easily via Serani or Serani Max interface software



Installation, Commissioning & Training Package

Purchasing this package with your new CRDS analyzer means that the unit is correctly installed at your site by our trained personnel. This service guarantees that your analyzer will have the best possible performance.

Compatible Products

All TIGER OPTICS analyzers

Features and Benefits

- Ensures correct installation to prevent future issues with your analyzer
- User training and applications support service available
- Gains you peace of mind that your analyzer will not experience issues related to improper installation
- Saves money in the long run by avoiding expensive repair or maintenance costs



Gas Library Additions

Our analyzers come with a variety of pre-calibrated background gases suitable for most users. To utilize the analyzer for more applications, additional background gases can be added, most of them via a simple software update.

Compatible Products

All TIGER OPTICS analyzers (availability of background gases varies by model)

Features and Benefits

- Use existing analyzer for new applications
- Measure in custom background gases used specifically in your facility
- Save money by purchasing additional background gas packages with your new and existing analyzer



CRDS Software Products

Serani & Serani Max Interface Software

The Serani/Serani Max software allows full control of your analyzer from your desktop or laptop.

Compatible Products for Serani

HALO, Spark and ALOHA H₂O series analyzers w/o front USB port; CO-rekt and Tiger-i models

Compatible Products for Serani Max

HALO & Spark series, Prismatic 3/3+ and ALOHA+ H₂O analyzers w/ front USB port; all T-I Max models

Features and Benefits

- Monitoring and control of your TIGER OPTICS analyzer remotely
- Data plotting and download to your computer
- Easy change of analyzer settings, such as gas type and data filter
- One-step data collection for "Performance Verification"



Speed+ Performance Upgrade

Intelligent data processing allows this software add-on to adjust the analyzer's response automatically and in real-time to deliver the best performance.

Compatible Products

Most new and existing TIGER OPTICS analyzers

Features and Benefits

- Boosts analyzer's speed of response without sacrificing sensitivity or measurement precision
- Software-only upgrade, no hardware changes required (with compatible analyzers)
- Analyze with Ease™ – no manual adjustments required, Speed+ is fully automatic



Linear Fit Mode, Dew Point Measurement & Modbus Communication

The Linear Fit mode add-on allows the user to use custom calibration curves or adjust readings for a dilution ratio.

Dew Point Measurement enables users to switch H₂O readings from concentration to dew point.

Modbus adds the capability of monitoring and controlling hard-to-reach or remote analyzers using existing MODBUS TCP edata loggers and software applications.

Compatible Products

Most new and existing TIGER OPTICS analyzers

Features and Benefits

- Linear $y = a x + b$ fit function permits user-defined calibration curves with programmable slope (a) and offset (b)
- Can directly display readings adjusted for a dilution factor
- Dew point capability allows easy comparison to dew point meters, such as chilled mirrors
- Modbus expands remote control and reporting capability to facilitate system and cabinet integration



Mass Spectrometer Software & Accessories

Questor5 Software

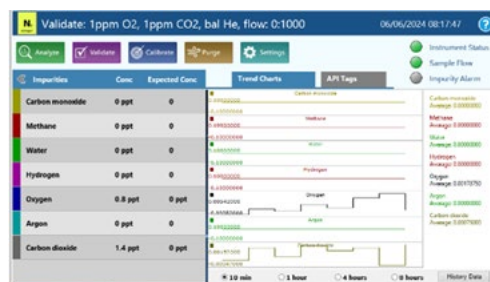
The Questor5 Software features hand-free analyzer automation and a straight-forward user interface that integrates easily with facility management systems.

Compatible Products

All EXTREL mass spectrometers

Features and Benefits

- Analyze, validate or calibrate at the touch of a button
- Automated multipoint calibration procedures
- Built-in report generation
- Simplified procedure for measuring additional chemicals
- Seamless transition between ionizer sources and detectors



Maintenance Agreements

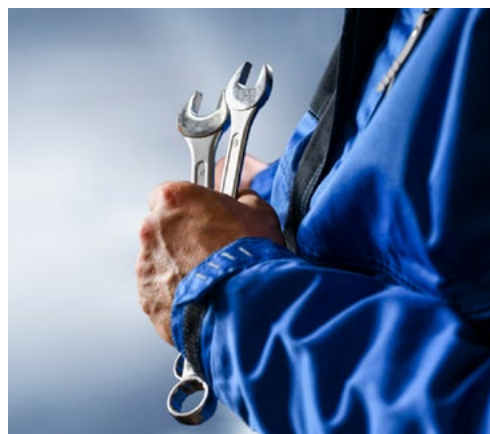
Our analyzers are designed for simplified maintenance routines and >99% uptime. Purchasing a maintenance agreement gains you peace of mind knowing that your analyzer is covered between and during maintenance periods.

Compatible Products

All EXTREL mass spectrometers

Features and Benefits

- Maintenance work is performed by factory trained and certified individuals
- Peace of mind knowing that downtime will be minimized
- Standard user training
- Various levels of coverage to meet the site and application requirements



Analyzer Options

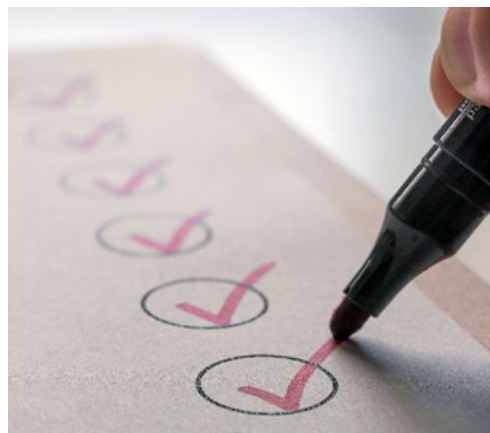
Need to expand your capabilities? No problem! Our analyzers are designed with plug-and-play options that can be installed at the time of purchase or years later in the field. The VeraSpec and MAX300 lines of products each have options that can easily be integrated when the time is right.

VeraSpec APIMS

- Additional sample lines
- Stream switcher
- Heated getter (various chemicals)
- Purifier (various chemicals)
- Additional chemicals

MAX300 Series

- Additional sample ports
- Expanded control capabilities
- Additional chemicals



Service

Process Insights' Service Capabilities & Offerings

Process Insights is renowned in the industry for its robust, low-maintenance systems and its excellent customer service!

- Experienced factory staff & field service engineers
- Fast response time to inquiries and issues
- Worldwide service through global service centers and distributors
- More than 90% of issues are resolved without sending the analyzer in for service
- Fast turn-around time for analyzers requiring factory service or repair
- Refreshes and upgrades available for many older systems to keep them in service
- Spare parts available for purchase, simple to replace with factory instructions

Custom Service Agreements

Annual services tailored to your requirements bundled into an attractive fixed price. Typical services may include:

- Initial installation & training
- Annual Performance Verification
- Onsite inspection, maintenance and applications support
- Refresher training
- Spare parts agreement
- Rental/back-up analyzer(s)

Customer Training

- Tailored training courses focusing on your specific needs
- Remote training via webinars
- Training at your site by experienced personnel
- Extensive training at factory

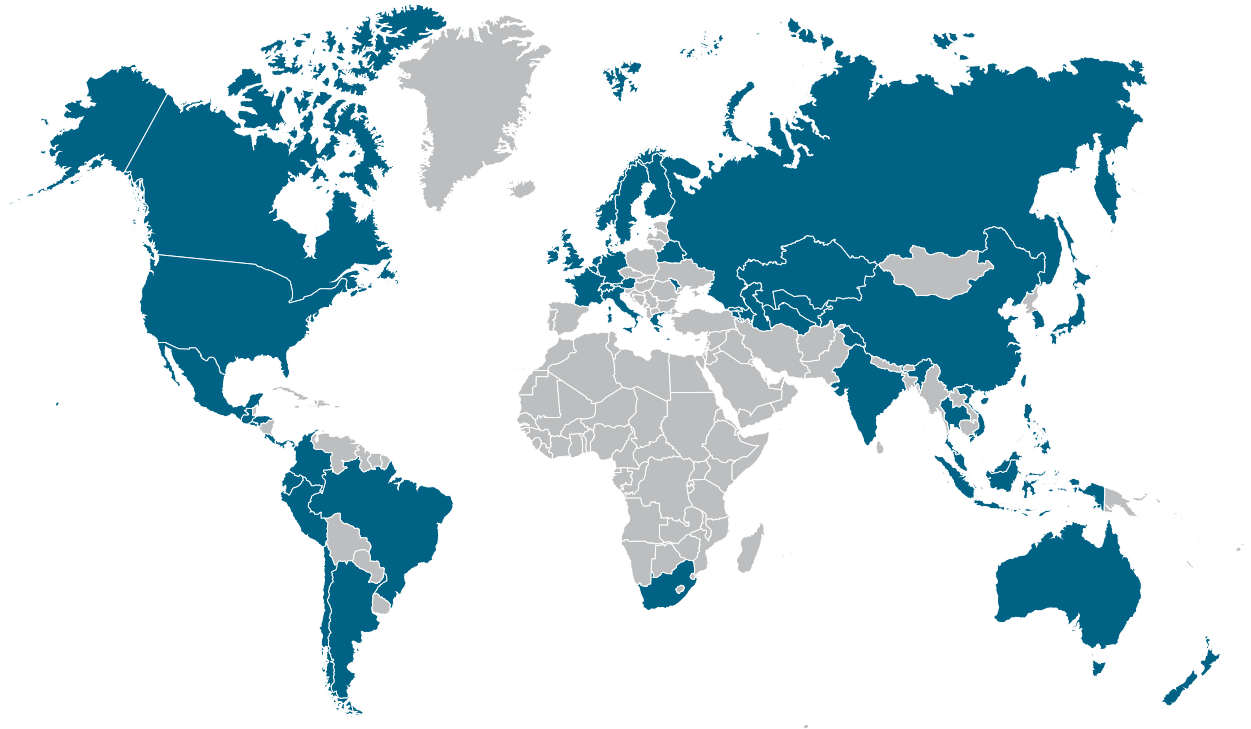
Application Support

- Support from experienced application engineers that help you through the process of selecting, purchasing, installing and optimizing your analyzer
- Sampling system optimization to obtain the best performance
- On-site setup inspection and consultation
- Rental units or spares to support your measurement needs

Calibration & Validation Services

- Factory-validation of your analyzer against NIST-traceable reference standards
- Calibrated rental units for on-site comparisons
- Annual preventative maintenance and Performance Verification services

Worldwide Service & Support Network



All countries marked in blue are supported by Process Insights distributors or service representatives. Process Insights also provides direct service & support to these and most other countries.

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 | PROVIDING PROVEN SOLUTIONS

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For a complete range of products, applications, systems, and service options, please contact us at: info@process-insights.com

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