Tiger Optics

Product Guide 2021

Issue 1

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Tiger Optics
A Process Insights Company

Company Overview

Tiger Optics

Founded in 2001, Tiger Optics has been the preferred provider for high-performance, laser-based gas analyzers to advance industrial standards and enable cutting-edge research. By leveraging the expertise of scientists, engineers and industry specialists, we offer advanced total solutions, field support, analyzer training, and advice to help customers improve yields and reduce costs. By creating out-of-the-box solutions that deliver fast, reliable and stable measurements, Tiger Optics supports continuous innovation for gas & chemical production, semiconductor fabrication, and many other markets.

- Field-proven, drift-free, ultimate performance
- Outstanding manufacturing quality, consistency & reliability
- Absolute, NIST-traceable measurement technology
- Excellent customer service and on-time delivery
- Strong local support through our global distributor network

Analyze with Ease™

☑ ISO 9001:2015 Certified

Process Insights

Our products and solutions are at work all over the world. We focus on innovative and differentiated solutions and technologies that add high value to our end-users applications and processes. We are committed to operational excellence and innovation that help our customers create the products and services that make our lives better. Our businesses are global in nature with meaningful presence in developed as well as emerging markets. Our continued strategic and global expansion offers significant future opportunities across our value chain for our customers, our channel partners and our suppliers.

Since 2018, Tiger Optics is part of Process Insights Holdings.

cosa+xentaur

Tiger Optics

HYGROCONTROL

extrel

ALPHA OMEGA INSTRUMENTS

ATOM Instrument

LAR THE TOC COMPANY

MBW calibration

Available Detections

Analyzer Series	Detection																	
	H_2O	O_2	NH_3	CH_4	HF	HCl	CO	CO_2	CH_2O	CH_2O_2	H_2S	H_2	C_2H_2	D_2O HDO	N_2	Ar	He	C_xH_y
HALO Max QCL *NEW!*							✓	✓										
HALO KA Max	✓		✓	✓														
HALO KA	✓																	
HALO OK		✓																
HALO 3	✓		✓	✓	✓	✓	✓	✓	✓	✓*	✓*			✓				
HALO LP	✓																	
HALO RP	✓				✓													
HALO QRP	✓																	
HALO H_2O in N_2O	✓																	
HALO H2												✓						
Spark Max *NEW!*								✓										
Spark / Spark+	✓			✓			✓						✓					
T-I Max			✓		✓	✓												
T-I Max CEM			✓	✓	✓	✓	✓		✓*		✓							
CO-rekt	✓			✓			✓	✓										
ALOHA+ H_2O	✓																	
Extrel VeraSpec APIMS	✓	✓	✓	✓			✓	✓				✓			✓	✓		✓
Extrel MAX300-LG		✓		✓					✓	✓		✓			✓	✓	✓	

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

Product Details Explained

Shows readily available background gas options, more may be available on request.

Product name

Detected molecule(s)

Typical background gas types:
UHP = Ultra-High Purity Gas
IND = Industrial-Grade Gas
CR = Corrosive Gas (HCl, Cl_2, HBr,...)
SP = Specialty Gas (CO/CO_2, hydrides, fluorocarbons,...)
AIR = Ambient Air or Emissions Gas

HALO KA Max H_2O

Detection H_2O

Gas Type UHP IND CR SP AIR

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

Available Background Gases
N_2 · He · Ar · H_2 · O_2 · CDA

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

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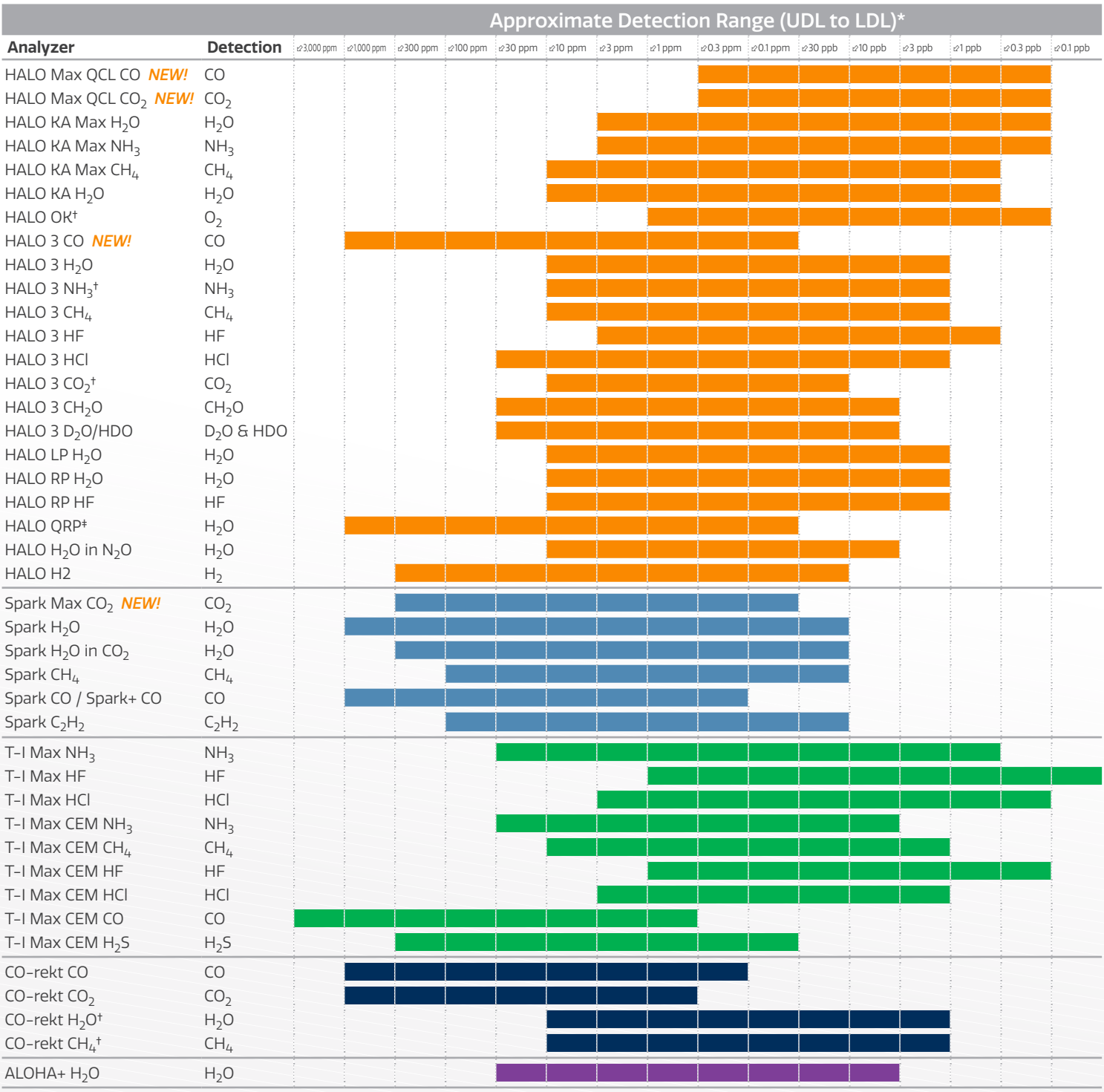
Tiger Optics Detection Ranges Summary



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

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HALO Series

HALO Max QCL CO NEW!

Detection CO

Gas Type UHP

This QCL-based system allows for fast & 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

N_2 · He · Ar · H_2 · O_2 · CDA

Specifications

Detection	Range*	LDL (3σ/24h)
CO in N_2	0 – 0.4 ppm	200 ppt
CO in He	0 – 0.4 ppm	180 ppt
CO in Ar	0 – 0.4 ppm	150 ppt
CO in O_2	0 – 0.4 ppm	180 ppt
CO in CDA	0 – 0.4 ppm	200 ppt

*higher range available upon request

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)

POWERED BY QCL ADVANCED TECHNOLOGY

Options & Accessories

- Serani Max interface software

See Product Brochure for more details

HALO Max QCL CO_2 NEW!

Detection CO_2

Gas Type UHP

This system is also based on QCL-CRDS and offers extremely low detection limits for carbon dioxide (CO_2) without the need for user calibration or regular maintenance. It also eliminates batch processing common with GCs.

Available Background Gases

N_2 · He · Ar · H_2 · O_2 · CDA

Specifications

Detection	Range*	LDL (3σ/24h)
CO in N_2	0 – 0.4 ppm	100 ppt
CO in He	0 – 0.4 ppm	90 ppt
CO in Ar	0 – 0.4 ppm	90 ppt
CO in O_2	0 – 0.4 ppm	90 ppt
CO in CDA	0 – 0.4 ppm	100 ppt

*higher range available upon request

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)

POWERED BY QCL ADVANCED TECHNOLOGY

Options & Accessories

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

See Product Brochure for more details

HALO Series

HALO KA Max H_2O

Detection H_2O Gas Type UHP

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

Available Background Gases

N_2 · He · Ar · H_2 · O_2 · CDA

Select Specifications

(see Product Brochure for more)

Detection	Range	LDL*
H_2O in N_2	0 – 5 ppm	100 ppt
H_2O in He	0 – 1 ppm	100 ppt
H_2O in H_2	0 – 4 ppm	100 ppt
H_2O in O_2	0 – 2.5 ppm	100 ppt
H_2O in CDA	0 – 4 ppm	100 ppt

*The LDL is defined as 3σ over 24h or the H_2O drydown limit, whichever is higher.

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)

Options & Accessories

- Serani Max interface software

See Product Brochure for more details

HALO KA Max NH_3

Detection NH_3 Gas Type UHP

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

Available Background Gases

N_2

Specifications

Detection	Range	LDL (3σ/24h)
NH_3 in N_2	0 – 7 ppm	100 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)

Options & Accessories

- Serani Max interface software

See Product Brochure for more details

HALO Series

HALO KA Max CH_4

Detection CH_4 Gas Type UHP

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

Available Background Gases

N_2 · He · Ar · H_2 · O_2

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)

Options & Accessories

- Serani Max interface software

See Product Brochure for more details

HALO KA H_2O

Detection H_2O Gas Type UHP IND CR SP

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

N_2 · He · Ar · H_2 · O_2 · CDA · CO · CO_2 · GeH_4 (mix) · COS · Ne · Kr · Xe · Cl_2 · HCl · HBr · SF_6 · NF_3 · C_xF_y

Select Specifications

(see Product Brochure for more)

Detection	Range	LDL (3σ/24h)
H_2O in N_2	0 – 20 ppm	300 ppt
H_2O in He	0 – 4 ppm	100 ppt
H_2O in H_2	0 – 16 ppm	200 ppt
H_2O in O_2	0 – 10 ppm	150 ppt
H_2O 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 CO_2
- Etch and cleaning gases
- Fluorinated gases

Communication Interfaces

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

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Corrosion-resistant model
- Environmental enclosure

See Product Brochure for more details

HALO Series

HALO OK

Detection O_2 Gas Type UHP IND SP

The world's only all-optical ultra-trace oxygen analyzer. Ideal addition to HALO KA and HALO KA Max analyzers for purity monitoring of bulk gases used in semiconductor manufacturing.

Available Background Gases

N_2 · He · Ar · H_2 · CO_2

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 ppt

*Higher range model available
†Special configuration required, must be specified at time of order.

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 CO_2
- Fuel-cell hydrogen analysis

Communication Interfaces

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

Options & Accessories

- Serani Max interface software
- Requires H_2 utility gas

See Product Brochure for more details

HALO 3 CO *NEW!*

Detection CO Gas Type UHP IND

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

N_2 · He · Ar · H_2 · O_2 · 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

HALO Series

HALO 3 H_2O

Detection H_2O Gas Type UHP IND CR SP

Our most versatile moisture analyzer, with low-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

N_2 · He · Ar · H_2 · O_2 · CDA · CO · CO_2 · SO_2 · COS · Ne · Kr · Xe · Cl_2 · HCl · HBr · SF_6 · NF_3 · C_xF_y

Select Specifications

(see Product Brochure for more)

Detection	Range	LDL (3σ/24h)
H_2O in N_2	0 – 20 ppm	1.2 ppb
H_2O in He	0 – 4 ppm	0.25 ppb
H_2O in H_2	0 – 16 ppm	1.0 ppb
H_2O in O_2	0 – 12 ppm	0.7 ppb
H_2O in CO_2	0 – 25 ppm	2 ppb

Features and Benefits

- Part-per-billion 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
- 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Corrosion-resistant model
- Environmental enclosure

See Product Brochure for more details

HALO 3 NH_3

Detection NH_3 Gas Type UHP IND SP

This analyzer offers a variety of ranges for ammonia analysis in bulk gases, plus an "N_2O model" for analysis of NH_3 in pure nitrous oxide.

Available Background Gases

N_2 · H_2 · CO_2 · N_2O

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_2O†	0 – 200 ppm	8 ppb/40 ppb

*Higher and lower ranges available
†Available with "N_2O 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure
- Vacuum pump may be required for N_2O model

See Product Brochure for more details

HALO Series

HALO 3 CH_4

Detection CH_4 Gas Type UHP IND

Methane is a key indicator for hydrocarbon impurities in gases. This analyzer is designed to measure CH_4 down to low ppb levels to ensure bulk gases and standard cylinders are free from harmful hydrocarbons.

Available Background Gases

N_2 · He · Ar · H_2 · O_2

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
- Multiple 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

HALO 3 HF

Detection HF Gas Type UHP IND SP

This analyzer specializes in monitoring hydrogen fluoride (HF) impurities 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 Product Brochure for more)

Detection	Range	LDL (3σ/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

- Sub-part-per-billion 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

HALO Series

HALO 3 HCl

Detection HCl

Gas Type UHP IND

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

Available Background Gases

N_2 · H_2 · CDA

Specifications

Detection	Range	LDL (3σ/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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

HALO 3 CO_2

Detection CO_2

Gas Type UHP IND

This analyzer offers two different ranges to detect trace carbon dioxide (CO_2) for bulk gas applications.

Available Background Gases

N_2

Specifications

Detection	Range	LDL (3σ/24h)
CO_2 in N_2 (low range)	0 – 12 ppm	8 ppb
CO_2 in N_2 (high range)	0 – 1500 ppm	250 ppb

Features and Benefits

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

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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

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HALO Series

HALO 3 CH_2O

Detection CH_2O Gas Type UHP IND

This model detects trace amounts of formaldehyde in the low-ppb range. It is ideal for the preparation of CH_2O air quality gas standards and the analysis of fuel-cell hydrogen.

Available Background Gases

N_2 · H_2

Specifications

Detection	Range	LDL (3σ/24h)
CH_2O in N_2	0 – 40 ppm	5 ppb
CH_2O 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
- Syngas and fuel gas

Communication Interfaces

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

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

HALO 3 D_2O/HDO

Detection D_2O HDO Gas Type UHP SP

Deuterium (D_2) is used in various applications from research to the manufacturing of optical fibers. Moisture impurities in D_2 are therefore a combination of the heavy water isotopes D_2O and HDO. This analyzer is designed to detect traces of both molecules.

Available Background Gases

N_2 · D_2 ($^2H_2$)

Specifications

Detection	Range	LDL (3σ/24h)
D_2O in D_2	0 – 20 ppm	3 ppb
D_2O 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

HALO Series

HALO LP H_2O

Detection H_2O Gas Type UHP SP

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

N_2 · He · Ar · H_2 · NH_3 · PH_3 · AsH_3 · NO

Select Specifications

(see Product Brochure for more)

Detection	Range	LDL (3σ/24h)
H_2O in NH_3	0 – 20 ppm	9 ppb
H_2O in PH_3	0 – 10 ppm	9 ppb
H_2O in N_2	0 – 6 ppm	1.0 ppb
H_2O in NO	0 – 100 ppm	16 ppb
H_2O 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure
- Requires vacuum pump

See Product Brochure for more details

HALO RP H_2O

Detection H_2O Gas Type UHP CR SP

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

Available Background Gases

N_2 · He · Ar · H_2 · CO · NH_3 · PH_3 · AsH_3 · HCl

Select Specifications

(see Product Brochure for more)

Detection	Range	LDL (3σ/24h)
H_2O in N_2	0 – 20 ppm	1.5 ppb
H_2O in H_2	0 – 20 ppm	1.5 ppb
H_2O in HCl	0 – 6 ppm	1.0 ppb
H_2O in PH_3	0 – 25 ppm	3 ppb
H_2O 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
- Large selection of background gases

Applications

- Epitaxy
- MOCVD

Communication Interfaces

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

Options & Accessories

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

See Product Brochure for more details

HALO Series

HALO RP HF

Detection HF

Gas Type UHP SP

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

N_2 · BF_3

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 model

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)

Options & Accessories

- Serani Max interface software
- Requires vacuum pump

See Product Brochure for more details

HALO QRP

Detection H_2O

Gas Type UHP CR

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

N_2 · He · Ar · H_2 · HCl

Specifications

Detection	Range	LDL (3σ/24h)
H_2O	0 – 12 $mTorr_{pp}$ (1200 ppm @ 10 Torr)	1 $\mu Torr_{pp}$ (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)

Options & Accessories

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

See Product Brochure for more details

HALO Series

HALO H_2O in N_2O

Detection H_2O Gas Type UHP IND SP

This analyzer specializes on detecting moisture impurities in high-purity nitrous oxide (N_2O), but also offers ppb detection limits in common bulk gases.

Available Background Gases

N_2 · He · Ar · H_2 · O_2 · N_2O

Specifications

Detection	Range	LDL (3σ/24h)
H_2O in N_2O	0 – 20 ppm	7.5 ppb
H_2O in N_2	0 – 20 ppm	2.2 ppb
H_2O in Ar	0 – 6 ppm	1.0 ppb
H_2O in He	0 – 3 ppm	0.5 ppb
H_2O in H_2	0 – 12 ppm	1.9 ppb
H_2O 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 N_2O, 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)

Options & Accessories

- Serani Max interface software
- Environmental enclosure

See Product Brochure for more details

HALO H2

Detection H_2 Gas Type UHP IND

The HALO H2 analyzer enables optical detection of hydrogen impurities, making this analyzer perfect for a numerous applications.

Available Background Gases

N_2 · He · Ar

Specifications

Detection	Range	LDL (3σ/24h)
H_2 in N_2	0 – 500 ppm	8 ppb
H_2 in He	0 – 125 ppm	4 ppb
H_2 in Ar	0 – 200 ppm	6 ppb

Features and Benefits

- Part-per-billion 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)

Options & Accessories

- Serani Max interface software
- Requires N_2/O_2 mixture or CDA utility gas

See Product Brochure for more details

Spark Series

Spark Max CO_2 NEW!

Detection CO_2 Gas Type IND

Carbon dioxide is a very common contaminant and can especially cause harm during when gases a liquefied. The Spark Max CO_2 offers an easy way to monitor this impurity before cryogenic transport and storage.

Available Background Gases

N_2 · H_2 · CDA

Specifications

Detection	Range	LDL (3σ/24h)
CO_2 in N_2	0 – 500 ppm	50 ppb
CO_2 in H_2	0 – 800 ppm	80 ppb
CO_2 in CDA	0 – 400 ppm	40 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

Spark H_2O

Detection H_2O Gas Type IND SP

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

N_2 · He · Ar · H_2 · O_2 · CDA · Ne · Kr · Xe · SF_6 · CF_4

Select Specifications

(see Product Brochure for more)

Detection	Range	LDL (3σ/24h)
H_2O in N_2	0 – 2000 ppm	12 ppb
H_2O in Ar	0 – 900 ppm	4.5 ppb
H_2O in H_2	0 – 1750 ppm	7.5 ppb
H_2O in O_2	0 – 1000 ppm	6 ppb
H_2O 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 fill measurements
- Fuel-cell hydrogen analysis
- Medical gases

Communication Interfaces

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

Options & Accessories

- Serani interface software
- Speed+ performance upgrade
- Linear fit mode
- Dew point measurement
- Environmental enclosure

See Product Brochure for more details

Spark Series

Spark H_2O in CO_2

Detection H_2O Gas Type IND SP

Affordable & reliable, just like the Spark H_2O, with the additional capability of detecting sub-ppm moisture in pure CO_2. This analyzer is the ideal choice for industries requiring moisture analysis in CO_2 and inert gases.

Available Background Gases

N_2 · He · Ar · H_2 · O_2 · CDA · CO · CO_2

Select Specifications

(see Product Brochure for more)

Detection	Range	LDL (3σ/24h)
H_2O in CO_2	0 – 600 ppm	550 ppb
H_2O in N_2	0 – 500 ppm	7.5 ppb
H_2O in O_2	0 – 250 ppm	7.5 ppb
H_2O in CDA	0 – 450 ppm	7.5 ppb
H_2O 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 CO_2 analysis
- Gas-cooled nuclear reactors

Communication Interfaces

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

Options & Accessories

- Serani interface software
- Speed+ performance upgrade
- Linear fit mode
- Dew point measurement
- Environmental enclosure

See Product Brochure for more details

Spark CH_4

Detection CH_4 Gas Type IND

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

N_2 · He · Ar · H_2 · O_2 · CDA

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

Options & Accessories

- Serani interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

Tigeroptics
A Process Insights Company

Spark Series

Spark CO / Spark+ CO

Detection CO

Gas Type IND

This analyzer extends the affordable and reliable Spark series to the detection of trace carbon monoxide in a variety of bulk and industrial gases. Chose the Spark+ for an improved detection limit.

Available Background Gases

N_2 · He · Ar · H_2 · O_2 · CDA

Specifications

Detection	Range	LDL* (3σ/24h)
CO in N_2	0 – 2000 ppm	200/120 ppb
CO in O_2	0 – 1800 ppm	180/110 ppb
CO in He	0 – 1800 ppm	180/110 ppb
CO in H_2	0 – 2500 ppm	250/150 ppb
CO in CDA	0 – 2000 ppm	200/120 ppb
CO in Ar	0 – 1600 ppm	160/100 ppb

*Lower number is LDL for Spark+

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

Options & Accessories

- Serani interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

Spark C_2H_2

Detection C_2H_2

Gas Type IND

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

Available Background Gases

N_2 · O_2 · CDA

Specifications

Detection	Range	LDL (3σ/24h)
C_2H_2 in N_2	0 – 80 ppm	8 ppb
C_2H_2 in O_2	0 – 70 ppm	7 ppb
C_2H_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, RS-232, 4-20mA analog, Modbus TCP (optional)

Options & Accessories

- Serani interface software
- Speed+ performance upgrade
- Environmental enclosure

See Product Brochure for more details

T-I Max Series

T-I Max NH_3

Detection NH_3 Gas Type UHP AIR

The latest generation AMC monitor for the most advanced semiconductor fabs. This analyzer monitors ppt-levels of ammonia (NH_3) in real-time in the cleanroom and other micro environments.

Available Background Gases

Cleanroom Air · N_2 · CDA

Specifications

Detection	Range	LDL (3σ@100sec)
NH_3 in Cleanroom Air	0 – 40 ppm	300 ppt
NH_3 in N_2	0 – 40 ppm	330 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

Applications

- Airborne Molecular Contaminants in cleanrooms
- FOUP 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)

Options & Accessories

- Serani Max interface software
- GO-cart mobile solution
- External particle filter
- Requires vacuum pump

See Product Brochure for more details

T-I Max HF

Detection HF Gas Type UHP AIR

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

Available Background Gases

Cleanroom Air · N_2 · CDA

Specifications

Detection	Range	LDL (3σ@100sec)
HF in Cleanroom Air	0 – 1 ppm	20 ppt
HF in N_2	0 – 1 ppm	25 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

Applications

- Airborne Molecular Contaminants in cleanrooms
- FOUP 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)

Options & Accessories

- Serani Max interface software
- GO-cart mobile solution
- External particle filter
- Requires vacuum pump

See Product Brochure for more details

Tigeroptics
A Process Insights Company

T-I Max Series

T-I Max HCl

Detection HCl

Gas Type UHP AIR

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

Available Background Gases

Cleanroom Air · N_2 · CDA

Specifications

Detection	Range	LDL (3σ@100sec)
HCl in Cleanroom Air	0 – 4 ppm	100 ppt
HCl in N_2	0 – 4 ppm	110 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

Applications

- Airborne Molecular Contaminants in cleanrooms
- FOUP 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)

Options & Accessories

- Serani Max interface software
- GO-cart mobile solution
- External particle filter
- Requires vacuum pump

See Product Brochure for more details

T-I Max CEM

Detection NH_3 CH_4 HF HCl CO H_2S

Gas Type AIR

Its excellent sensitivity allows this analyzer to measure emissions from coal-fired power plants, cement kilns and other sources with high dilution ratio, thus simplifying CEM setups and compliance tests. Models for six different detections available.

Available Background Gases

Air · Diluted Stack Gas

Specifications

Model	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 CO	0 – 2500 ppm	250 ppb
T-I Max CEM H_2S	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
- Each model is designed for high specificity to its target detection without interference

Applications

- Continuous Emissions Monitoring (CEM)
- Air Quality Measurements

Communication Interfaces

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

Options & Accessories

- Serani Max interface software
- Dilution probe
- Linear fit mode
- Environmental enclosure
- Requires vacuum pump

See Product Brochure for more details

CO-rekt Series

CO-rekt CO

Detection CO

Gas Type IND

Featuring Class I, Div. 2 compliant housing, this analyzer is perfect for monitoring carbon monoxide (CO) impurities in hazardous processes, such as HyCO, SMR, and syngas production. Free from drift and insensitive to vibrations, the CO-rekt is an ideal replacement for NDIR instruments.

Available Background Gases

H_2 · Syngas

Specifications

Detection	Range	LDL (3σ/24h)
CO in H_2	0 – 2000 ppm	150 ppb

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

Options & Accessories

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

See Product Brochure for more details

CO-rekt CO_2

Detection CO_2

Gas Type IND

Offering the same advantages as the CO-rekt CO, this model measures monitoring carbon dioxide (CO_2) impurities in hydrogen, syngas, and similar gases. Free from drift and insensitive to vibrations, the CO-rekt is an ideal replacement for NDIR instruments.

Available Background Gases

H_2 · Syngas

Specifications

Detection	Range	LDL (3σ/24h)
CO_2 in H_2	0 – 1500 ppm	500 ppb

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

Options & Accessories

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

See Product Brochure for more details

CO-rekt Series

CO-rekt H_2O

Detection H_2O Gas Type IND

Moisture is another important process impurity for HyCO, SMR, and syngas production. This analyzer combines all the great features of Tiger's renowned H_2O analyzers with a Class I, Div. 2 compliant housing. Two ranges are available for pre- and post-purification measurements.

Available Background Gases

H_2 · Syngas

Specifications

Detection	Range	LDL (3σ/24h)
H_2O in H_2 (low range)	0 – 16 ppm	1.0 ppb
H_2O in H_2 (high range)	0 – 400 ppm	6 ppb

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

Options & Accessories

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

See Product Brochure for more details

CO-rekt CH_4

Detection CH_4 Gas Type IND

This system allows the user to detect trace amounts of methane (CH_4) in hydrogen and syngas without the hassle of maintenance, calibration, and fuel gas, which are common with FID. We offer two detection ranges to cover various applications.

Available Background Gases

H_2 · Syngas

Specifications

Detection	Range	LDL (3σ/24h)
CH_4 in H_2 (low range)	0 – 8 ppm	1.6 ppb
CH_4 in H_2 (high range)	0 – 100 ppm	7 ppb

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

Options & Accessories

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

See Product Brochure for more details

ALOHA H_2O Series

ALOHA+ H_2O

Detection H_2O Gas Type UHP SP

This analyzers 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 H_2O detection limit in the industry without background interference thanks to low pressure operation.

Available Background Gases

N_2 · He · Ar · NH_3

Specifications

Detection	Range	LDL (3σ/8h)
H_2O in NH_3	0 – 20 ppm	3 ppb
H_2O in N_2	0 – 6 ppm	0.5 ppb
H_2O in He	0 – 3 ppm	0.3 ppb
H_2O in Ar	0 – 4 ppm	0.4 ppb

Features and Benefits

- Single-digit part-per-billion detection limit in pure NH_3
- 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)

Options & Accessories

- Serani Max interface software
- Speed+ performance upgrade
- Requires vacuum pump

See Product Brochure for more details

Extrel Quadrupole Mass Spectrometers

VeraSpec™ APIMS

Detections: H_2 O_2 CH_4 H_2O CO CO_2 NH_3 N_2 Ar C_xH_y

Gas Type: UHP

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

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

N_2 · He · Ar · H_2

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

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

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)
- 1-500 amu standard configuration (multiple mass ranges available)
- Pulse-counting electron multiplier
- Simple maintenance (<1 per year)

Detection Limit Specifications (3σ)

Detection*	in N_2	in Ar	in He	in H_2
Hydrogen (H_2)	100 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_2O)	10 ppt	10 ppt	10 ppt	10 ppt
Carbon Monoxide (CO)	50 ppt	10 ppt	10 ppt	50 ppt
Carbon Dioxide (CO_2)	5 ppt	5 ppt	5 ppt	5 ppt
Ammonia (NH_3)	500 ppt	500 ppt	500 ppt	500 ppt
Nitrogen (N_2)	N/A	200 ppt	10 ppt	150 ppt
Argon (Ar)	200 ppt	N/A	10 ppt	50 ppt
Ethane (C_2H_6)	30 ppt	10 ppt	10 ppt	150 ppt
Propane (C_3H_8)	50 ppt	50 ppt	50 ppt	50 ppt
>C_3 (Butane, Pentane,...)	10 ppt	10 ppt	10 ppt	10 ppt

*Additional detections are available

See Product Note for more details

Extrel Quadrupole Mass Spectrometers

MAX300-LG™

Detections: H_2 O_2 CH_4 CH_2O CH_2O_2 N_2 Ar He

Gas Type: UHP IND

The 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

N_2 · He · Ar · H_2
and many more

Features and Benefits

- Measures any gas/vapor sample
- 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

Technology

The MAX-300's 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

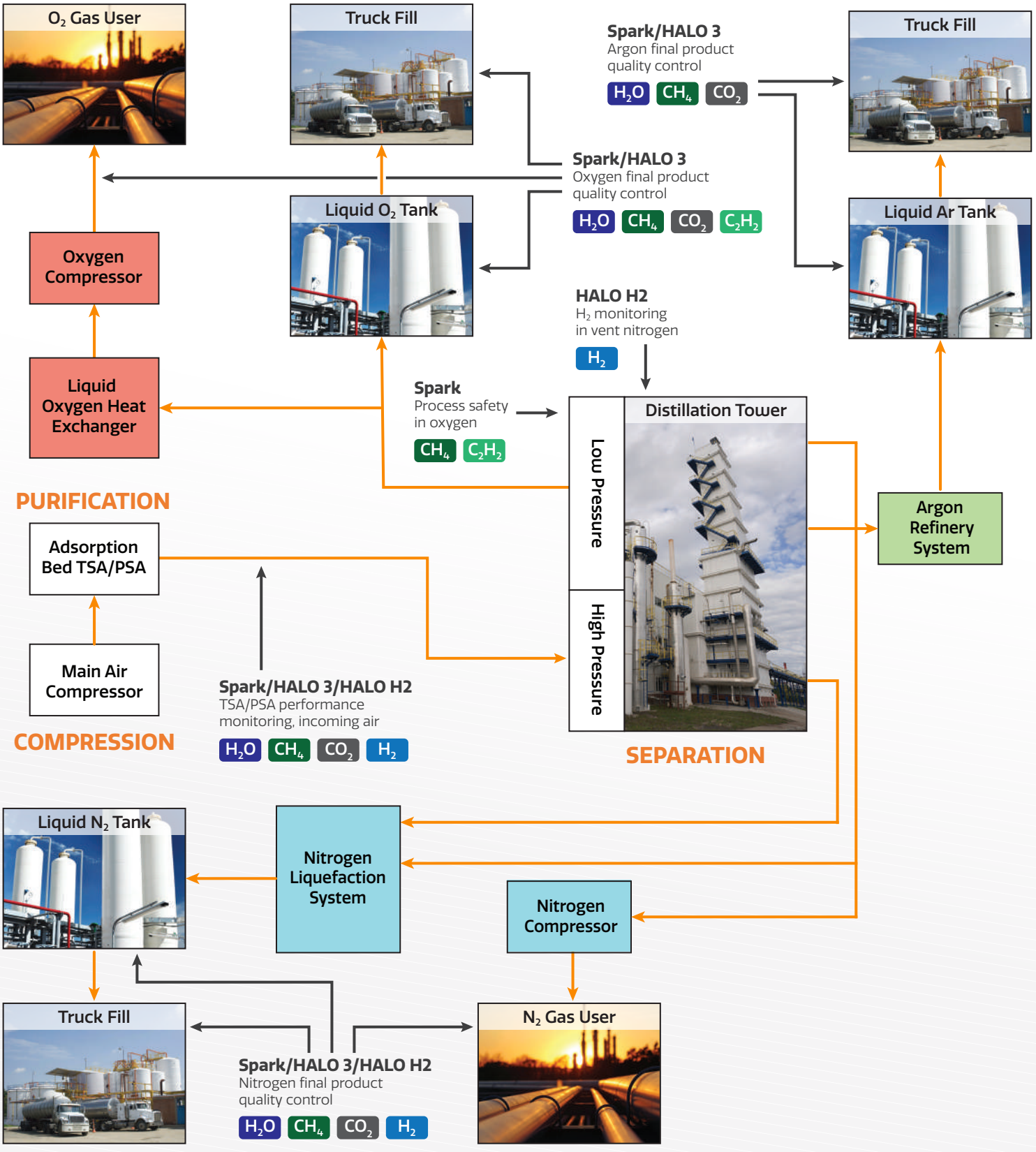
Detection Limit Specifications (3σ)

Detection*	in N_2	in Ar	in He	in H_2
Hydrogen (H_2)	60 ppm	60 ppm	100 ppm	N/A
Oxygen (O_2)	1.0 ppm	1.0 ppm	1.0 ppm	1.0 ppm
Methane (CH_4)	1.0 ppm	1.0 ppm	1.0 ppm	1.0 ppm
Formaldehyde (CH_2O)	25 ppm	0.02 ppm	0.02 ppm	0.02 ppm
Formic Acid (CH_2O_2)	0.13 ppm	0.02 ppm	0.02 ppm	0.02 ppm
Nitrogen (N_2)	N/A	5 ppm	5 ppm	5 ppm
Argon (Ar)	0.02 ppm	N/A	0.02 ppm	0.02 ppm
Helium (He)	0.5 ppm	0.5 ppm	N/A	0.5 ppm

*Additional detections and ranges are available

See Product Note for more details

Application Feature: Air Separation Units (ASUs)



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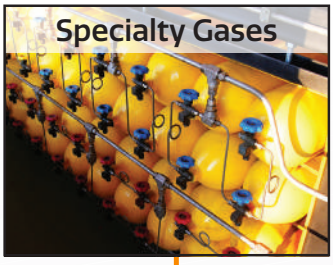
Application Feature: Semiconductor Fabrication

Pre-Purifier

Spark/HALO 3/HALO H2
Pre-purifier measurement (ppb to ppm)

H_2O CH_4 H_2



Post-Purifier

Gas Purification System

HALO KA/KA Max
Bulk gas monitoring ppt to ppb

H_2O CH_4 NH_3

HALO OK
Bulk gas monitoring ppt-level oxygen

O_2

HALO Max QCL
QCL-based ppt-level bulk gas monitoring

CO CO_2

extrel

VeraSpec APIMS
High-performance mass spectrometer for ppt-level detection

H_2O CH_4 NH_3 O_2
CO CO_2 H_2 N_2
Ar C_xH_y

HALO LP
for hydrides

HALO KA
for fluorocarbons & corrosives

H_2O

GO-Cart
AMC monitoring (with T-I Max)
MOBILE

HALO QRP
Low-pressure process tools (Epi, ALD, MOCVD)

H_2O

T-I Max
AMC monitoring for cleanroom, FOUP/pod & reticle storage
STATIONARY

NH_3 HF HCl

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Integration Solutions

GO-Cart

This mobile cart is designed to provide a flexible monitoring solution for semiconductor cleanrooms. Equipped with up to three T-I Max AMC monitors, 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
- 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

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 and ALOHA H_2O series analyzers w/o front USB port; Spark, CO-rekt and Tiger-i models

Compatible Products for Serani Max

HALO series and ALOHA+ H_2O analyzers w/ front USB port, all T-I Max models

Features and Benefits

- Monitoring and control of your Tiger 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

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 H_2O readings from concentration to dew point.

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

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Featured 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

Tiger Optics
High-Performance Gas Analyzers

Verification Certificate

Customer: The Trusted Gas Company
Item: HALO 3
Serial Number: 3252-0-24
Date Tested: 4 February 2019

This certifies that Tiger Optics, LLC has analyzed the instrument data from the instrument described above in accordance with our standard test procedures. The HALO 3 described above does meet factory specifications. Based on the data provided, 3252-0-24 has been certified to meet the criteria below, which we understand are acceptable to the user.

Test	Test Standard	Result
Peak Position	Laser Optimization	37.84 C
Alignment (S-bow test)	Noise below factory spec	passed
LDL (in N2)	<1.2 ppb	<1.2 ppb

The instrument data was analyzed for stability, accuracy, and low detection limit. The instrument data meets the specifications indicated above in the column headed "Result" for

Installation & Commissioning Package

Purchasing this package with your new Tiger Optics analyzer means that the unit is correctly installed at your site by Tiger Optics 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 or sampling system
- Provides standard user training
- 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 analyzer

Tiger Optics Service

Tiger Optics' Service Capabilities & Offerings

Tiger Optics 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 from our headquarters in Pennsylvania and 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

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
- Quarterly on-site inspections by TO field service personnel
- Annual 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 Tiger Optics personnel
- Extensive training at Tiger Optics headquarters

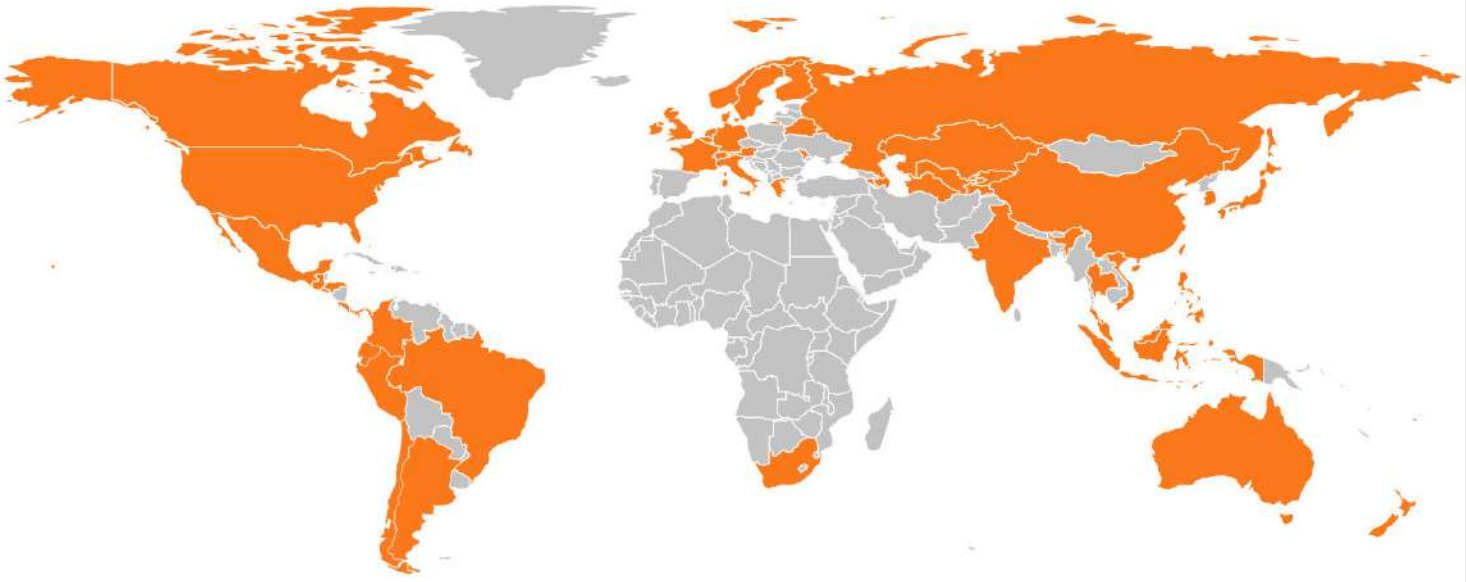
Application Support

- 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
- Easy & low-cost remote Performance Verification process

Worldwide Service & Support Network



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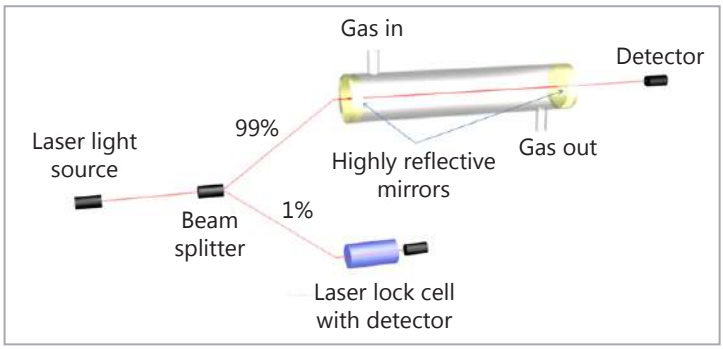
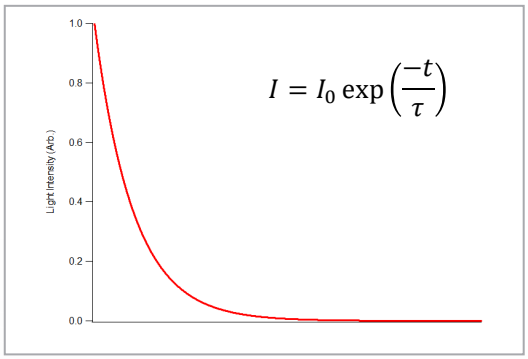
Overview of Cavity Ring-Down Spectroscopy (CRDS)

How CRDS Works

1. A Continuous Wave (CW) laser emits a directed beam of light into a gas cell with two highly reflective mirrors on either end (cavity). The laser wavelength is chosen to be absorbed by the target molecule.
2. 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.
3. 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.
4. On each successive pass, a small amount of light or ring-down signal emits through the second mirror and is sensed by the light detector.
5. This exponential decay, or "ring-down" is recorded and is a direct measure of the losses inside the cavity, which includes the absorption of the target molecule.
6. The CRDS decay constant (ring-down time) is independent of laser fluctuations or external background and provides an absolute and extremely sensitive measurement of the target molecule's concentration.





Advantages of Tiger's CRDS Technology

High Accuracy, Specificity & Stability

Rapid Deployment & Fast Speed of Response

Versatility & Ease of Use

Unparalleled Sensitivity

Outstanding Reliability

Exceptionally Low Cost of Ownership

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