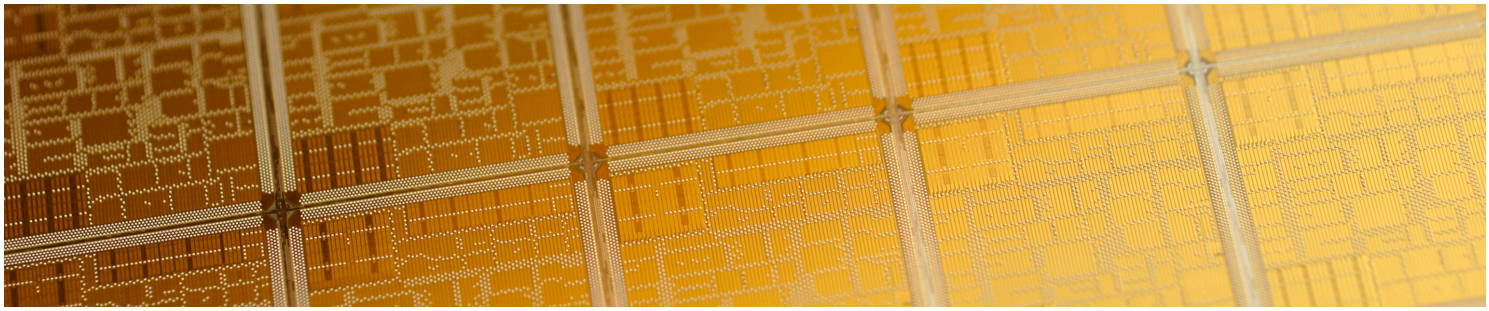

HALO Max QCL

QCL-CRDS Trace Gas Analyzer

GASES & CHEMICALS | CEMS | ENERGY | SEMI & HB LED | ATMOSPHERIC | LAB & LIFE SCIENCE

Our first analyzer series based on Quantum Cascade Laser Cavity Ring-Down Spectroscopy (QCL-CRDS), the HALO Max QCL series offers:

POWERED BY QCL ADVANCED TECHNOLOGY

- Parts-per-trillion (ppt) detection capability for carbon monoxide (CO) or carbon dioxide (CO_2) in UHP bulk gases
- Incorporates mid-infrared QCL technology to achieve the ultimate sensitivity
- Absolute measurement (freedom from calibration)
- Excellent speed of response at ppb levels and below
- Continuous measurement—no batch processing typical with GCs
- Robust design & maximum ease of use

Expanding Optical Contaminant Detection Capabilities for Semiconductor Manufacturing

Tiger Optics takes Cavity Ring-Down Spectroscopy (CRDS) to the next level by bringing you the latest optical technology. Utilizing mid-infrared Quantum Cascade Lasers (QCLs), the new HALO Max QCL allows dramatic decreases in detection limits for certain molecules, such as CO.

Introducing the HALO Max QCL for ppt-level CO or CO_2 detection, it is based on Tiger Optics' latest Max platform, offers exceptional speed and further improved usability in an all-inclusive and robust package. The analyzer is fast to install, offers continuous, real-time detection, and is easy to use and effortless to maintain, with built-in zero verification and zero drift.

The HALO Max QCL CO and HALO Max QCL CO_2 perfectly complement Tiger's HALO KA Max series (for H_2O, NH_3 and CH_4) and the HALO OK (for O_2) to utilize the advantages of CRDS for detection of a large variety of critical trace impurities.

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HALO Max QCL
QCL-CRDS Trace Gas Analyzer

Performance	
Operating range	See table below
Detection limit (LDL, 3σ/24h)	See table below
Precision (1σ, greater of)	± 0.75% or see table below
Accuracy (greater of)	± 4% or LDL
Speed of response	< 1 min to 95%
Environmental conditions	10°C to 40°C
	30% to 80% RH (non-condensing)
Storage temperature	-10°C to 50°C

Gas Handling System and Conditions	
Sample gas connections	1/4" male VCR inlet and outlet
Leak tested to	1 x 10^{-9} mbar l / sec
Inlet pressure	6 – 125 psig (1.4 – 9.6 bara)
Flow rate	<1 slpm in N_2 (gas dependent)
Sample gases	Most inert and passive gases
Gas temperature	Up to 60°C
Purge gas (CO_2 only)	Inert gas (e.g. N_2), <1 ppm CO_2
	30 – 150 psig, 4 – 5 slpm
Purge gas connection	1/8" Swagelok®

Dimensions	H x W x D [in (mm)]
Standard sensor	8.75 x 19.0 x 24.0 (222 x 483 x 610)
(19" rack-mountable)	

Weight	
Standard sensor	40 lbs (18 kg)

Electrical and Interfaces	
Platform	Max QCL series analyzer
Alarm indicators	2 user programmable
	1 system fault
	Form C relays
Power requirements	90 – 240 VAC, 50/60 Hz
Power consumption	100 Watts max.
Signal output	Isolated 4–20 mA
User interfaces	5.7" LCD touchscreen
	10/100 Base-T Ethernet
	USB, RS-232, RS-485
	Modbus TCP (optional)
Data storage	Internal or external flash drive
Certification	CE Mark (pending)

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HALO Max QCL
QCL-CRDS Trace Gas Analyzer

HALO Max QCL CO

Performance, CO:	Range	LDL (3σ)	Precision (1σ) @ zero
In Nitrogen	0 – 0.5 ppm	200 ppt	70 ppt
In Helium	0 – 0.35 ppm	130 ppt	45 ppt
In Argon	0 – 0.4 ppm	150 ppt	50 ppt
In Hydrogen	0 – 0.5 ppm	200 ppt	70 ppt
In Oxygen	0 – 0.45 ppm	170 ppt	60 ppt
In Clean Dry Air (CDA)	0 – 0.5 ppm	200 ppt	70 ppt

HALO Max QCL CO_2

Performance*, CO_2:	Range	LDL (3σ)	Precision (1σ) @ zero
In Nitrogen	0 – 2.5 ppm	100 ppt	35 ppt
In Helium	0 – 2 ppm	90 ppt	30 ppt
In Argon	0 – 2 ppm	80 ppt	25 ppt
In Oxygen	0 – 2 ppm	90 ppt	30 ppt
In Clean Dry Air (CDA)	0 – 2.5 ppm	100 ppt	35 ppt

*Due to the high abundance of CO_2 in air, purging of the analyzer housing is required to achieve specified performance (see previous page for purge gas requirements).

Contact us for additional analytes and matrices.
U.S. Patent # 7,277,177

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10/2021