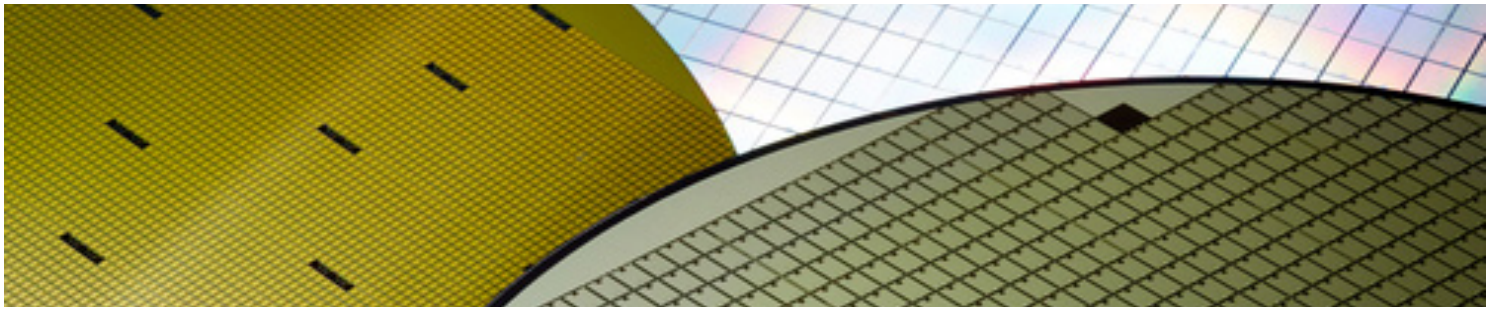

HALO OK

Trace-Level Oxygen Analyzer

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

Designed for trace-level oxygen analysis, the HALO OK offers:

- Industry-leading parts-per-trillion detection capability
- Unprecedented speed of response
- Wide dynamic range
- Absolute measurement (freedom from need for calibration gases)
- Low maintenance and cost of ownership
- Compact, portable package, ideal for both fixed and mobile cart installation
- Direct measurement in many matrices

Leading Choice for Ultra-high Purity Gas Users

Detect gas quality upsets before they damage your process. Using Tiger Optics' HALO OK oxygen analyzer, you can verify oxygen impurity levels with part-per-trillion accuracy, drift-free stability and instantaneous response. You'll find our system exceptionally easy and fast to install, and effortless to maintain, with built-in zero verification. Its robust design—free of moving parts—results in an analyzer that has a high Mean Time Between Failure (MTBF) rate and a very low Cost of Ownership (CoO).

With its patented catalytic conversion technique, utilizing a minute amount of hydrogen to cleanly and safely convert oxygen to moisture, the OK offers a fully laser-based solution for Continuous Quality Control of your process. Based on powerful Cavity Ring-down Spectroscopy, the HALO OK aligns with the SEMI F-112 standard for moisture dry-down characterization of gas systems. Pair the HALO OK with our HALO KA or HALO KA Max for ppt-level moisture measurement and enjoy the many advantages of profit-boosting CRDS technology for both critical contaminants.

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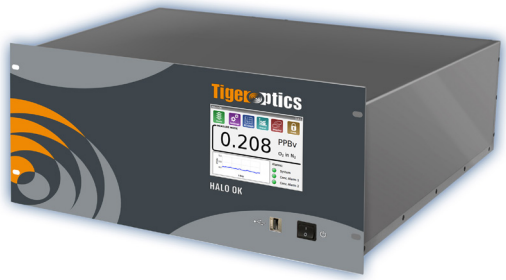
HALO OK
Trace-Level Oxygen Analyzer



Performance	
Operating range	See table on next page
Detection limit (LDL, 3σ/24h)	See table on next page
Precision (1σ, greater of)	± 0.75% or 1/3 of LDL
Accuracy (greater of)	± 4% or LDL
Speed of response	< 3 minutes 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	
Wetted materials	316L stainless steel
	10 Ra surface finish
Leak tested to	1 x 10^{-9} mbar l / sec
Gas connections	1/4" male VCR
Sample inlet pressure	10 – 125 psig (1.7 – 9.6 bara)
Sample flow rate	0.5 to 1.8 slpm (gas dependent)
Sample gases	Most inert matrices
Gas temperature	Up to 60°C
H_2 supply requirements*	~15 sccm, 20 – 125 psig

Dimensions	H x W x D [in (mm)]
Standard sensor	8.73 x 19.0 x 23.6 (222 x 483 x 599)

Weight	
Standard sensor	45 lbs (20.4 kg)

Electrical and Interfaces	
Platform	Max series analyzer
Alarm indicators	2 user programmable
	1 system fault
	Form C relays
Power requirements	100 – 240 VAC, 50/60 Hz
Power consumption	450 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

*H_2 supply (maximum 10 ppm H_2O and O_2 impurity) is required for sample conditioning via catalytic conversion. For enhanced safety, a special model is available which uses a mixture of 3% H_2/97% N_2 as an alternative to pure H_2. See next page for detection performance specifications.

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HALO OK
Trace-Level Oxygen Analyzer

Standard Model (using pure H_2 utility gas)

Performance, O_2:	Range	LDL† (3σ)	Precision (1σ) @ zero
In Helium	0 – 0.5 ppm	50 ppt	17 ppt
In Argon	0 – 1 ppm	90 ppt	30 ppt
In Hydrogen	0 – 2 ppm	150 ppt	50 ppt
In Nitrogen	0 – 2.5 ppm	200 ppt	70 ppt

CO_2 Model (using pure H_2 utility gas)

Performance, O_2:	Range	LDL† (3σ)	Precision (1σ) @ zero
In Helium	0 – 0.5 ppm	50 ppt	17 ppt
In Argon	0 – 1 ppm	90 ppt	30 ppt
In Hydrogen	0 – 2 ppm	150 ppt	50 ppt
In Nitrogen	0 – 2.5 ppm	200 ppt	70 ppt
In Carbon Dioxide	0 – 5 ppm	5000 ppt‡ / 1000 ppt§	300 ppt

Enhanced Safety Model (using 3% H_2/97% N_2 mixture utility gas)

Performance, O_2:	Range	LDL†,‡	Precision (1σ) @ zero
In Helium	0 – 0.5 ppm	400 ppt	17 ppt
In Argon	0 – 1 ppm	400 ppt	30 ppt
In Hydrogen	0 – 2 ppm	400 ppt	50 ppt
In Nitrogen	0 – 2.5 ppm	400 ppt	70 ppt

Contact us for additional analytes and matrices or information about our optional purged enclosure.
†LDL is dependent upon the quality of the sample gas and the integrity of the sampling system.
‡LDL is limited by minimum achievable O_2 concentration, not by 3σ baseline noise.
§LDL of 1000 ppt requires addition of Tiger Optics' **Zero Gas Panel** and **Linear Fit Mode**. Please contact us for more information.

U.S. Patent # 7,277,177 · U.S. Patent # 7,255,836

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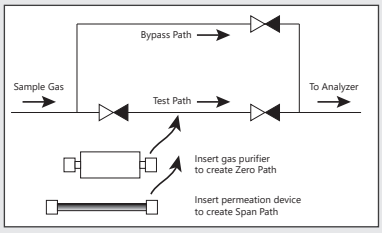
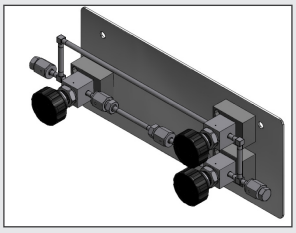
Optional Packages

Customize your HALO OK analyzer with these powerful add-ons:

Zero Gas Panel

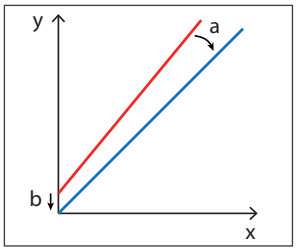
- Inserting a purifier into the Test Path allows for verification of the analyzer's Zero Calibration
- Helps achieve lower detection limit in CO_2 in combination with Linear Fit Mode
- Spool pieces are included to allow insertion of purifiers with different lengths





Linear Fit Mode

- Linear y = a x + b fit function permits user-defined calibration curves with programmable slope (a) and offset (b)
- Automatically adjusts readings to factor in dilution probes and sampling system offsets, while retaining absolute data
- Enables custom zero calibration for lower LDL in CO_2 in combination with Zero Gas Panel



Annual Performance Verification

- Low-cost and easy remote verification process, with no need to return the analyzer to the factory
- Annual verification by Tiger Optics ensures that your analyzer continues to meet its original specifications
- Up-to-date Verification Certificate to comply with your QA/QC standards

Installation & Commissioning Package

- On-site analyzer installation and start-up by Tiger Optics trained personnel
- Ensuring correct installation helps prevent future issues with the analyzer or your sampling system
- Gain peace of mind and save money in the long run

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4/2022