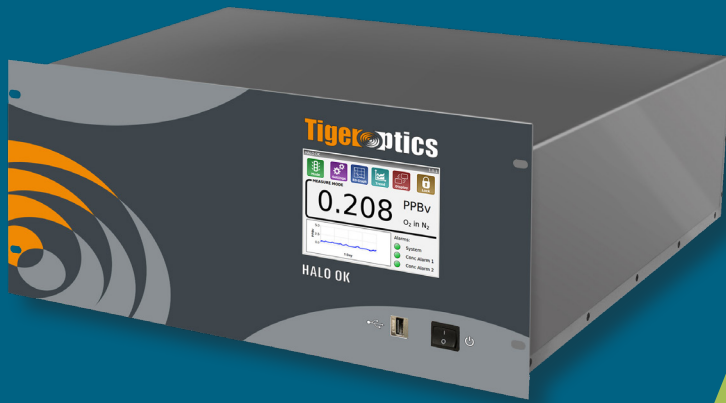


PRODUCT DATASHEET

HALO™ OK/OK+ Trace-Level Oxygen Analyzer



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

- Industry-leading detection capability, as low as 20 parts per trillion
 - Fast speed of response—Speed+ included
 - Direct measurement in many matrices, including pure carbon dioxide (CO₂)
 - No sensor replacement required
 - Low maintenance and lowest cost of ownership
 - No liquid sensor consumables needed
 - No false spiking, even in light gases
 - Absolute measurement—no need for zero & span calibration gases
-

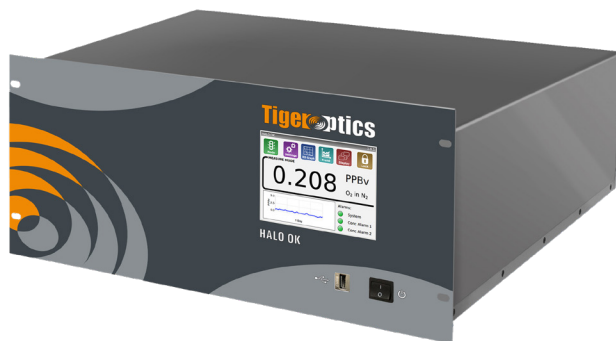
Leading Choice for Ultra-high Purity Gas Users

Detect gas quality upsets before they damage your process. Using the HALO OK oxygen analyzer, you can verify oxygen impurity levels with parts-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 HALO 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.

HALO OK/OK+

Trace-Level Oxygen CRDS Analyzer



Performance

Operating range:	See below for Detection Specifications
Detection limit (LDL, 3σ/24h):	as low as 20 ppt in He, see below for Detection Specifications
Precision (1σ, greater of):	$\pm 0.75\%$ or 1/3 of LDL
Accuracy (greater of):	$\pm 4\%$ 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 & 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
H₂ supply requirements*:	~15 sccm, 20 – 125 psig

Dimensions & Weight

Standard sensor:	H x W x D 8.73 x 19.0 x 23.6 in (222 x 483 x 599 mm)
Standard sensor weight:	45 lbs (20.4 kg)

Electrical & 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

*H₂ supply (maximum 10 ppm H₂O and O₂ impurity) is required for sample conditioning via catalytic conversion. For enhanced safety, a special model is available which uses a mixture of 3% H₂/97% N₂ as an alternative to pure H₂. See next page for detection performance specifications.

HALO OK+ (using pure H₂ utility gas)

Performance, O ₂	Range	LDL [†] (3σ)	Precision (1σ) @ zero
In Helium:	0 – 0.5 ppm	20 ppt	7 ppt
In Argon:	0 – 1 ppm	35 ppt	12 ppt
In Hydrogen:	0 – 1 ppm	60 ppt	20 ppt
In Nitrogen:	0 – 2.5 ppm	75 ppt	25 ppt

HALO OK Standard Model (using pure H₂ utility gas)

Performance, O ₂	Range	LDL [†] (3σ)	Precision (1σ) @ zero
In Helium:	0 – 0.5 ppm	50 ppt	17 ppt
In Helium (ER [†]):	0 – 2 ppm	150 ppt	50 ppt
In Helium (HR [#]):	0 – 5 ppm	500 ppt	200 ppt
In Argon:	0 – 1 ppm	90 ppt	30 ppt
In Hydrogen:	0 – 1 ppm	150 ppt	50 ppt
In Hydrogen (ER [†]):	0 – 8 ppm	600 ppt	200 ppt
In Hydrogen (HR [#]):	0 – 20 ppm	2000 ppt	700 ppt
In Nitrogen:	0 – 2.5 ppm	200 ppt	70 ppt
In Nitrogen (ER [†]):	0 – 10 ppm	750 ppt	250 ppt
In Nitrogen (HR [#]):	0 – 20 ppm	2000 ppt	700 ppt

HALO OK CO₂ Model (using pure H₂ 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

HALO OK Enhanced Safety Model (using 3% H₂/97% N₂ 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. Linear Fit Mode may be used to zero readings.

[‡]LDL is limited by minimum achievable O₂ concentration, not by 3σ baseline noise.

[§]LDL of 1000 ppt requires addition Gas Panel and Linear Fit Mode. Please contact us for more information.

^{††}The Extended Range (ER) option is available as add-on to any Standard Model

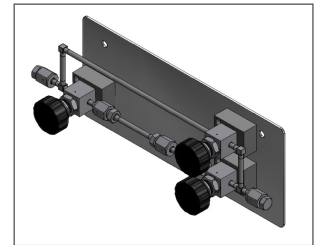
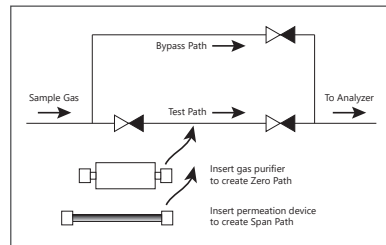
[#]The High Range (HR) option is available as add-on to any Standard Model

Optional Packages

Customize your HALO OK/OK+ analyzer with these

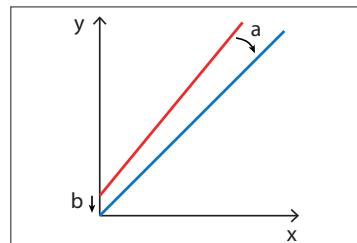
Zero Gas Panel

- Inserting a purifier into the Test Path allows for verification of the analyzer's Zero Calibration
- Helps achieve lower detection limit in CO₂ 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 CO₂ 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 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 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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