

**PRODUCT DATASHEET**

# HALO Max QCL™

QCL-CRDS ANALYZER FOR PPT LEVEL  
CO AND CO<sub>2</sub> DETECTION



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

- Parts-per-trillion (ppt) detection capability for carbon monoxide (CO) and carbon dioxide (CO<sub>2</sub>) 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

# Specifications

## Performance

<b>Operating range:</b>	See gas performance table on the next page
<b>Detection limit (LDL, 3<math>\sigma</math>/24h):</b>	See gas performance table on the next page
<b>Precision (1<math>\sigma</math>, greater of):</b>	$\pm$ 0.75% or see table on the next page
<b>Accuracy (greater of):</b>	$\pm$ 4% or LDL
<b>Speed of response:</b>	< 1 min to 95%
<b>Environmental conditions:</b>	10°C to 40°C, 30% to 80% RH (non-condensing)
<b>Storage temperature:</b>	-10°C to 50°C

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## Gas Handling System and Conditions

<b>Sample gas connections:</b>	1/4" male VCR inlet and outlet
<b>Leak tested to:</b>	1 x 10 <sup>-9</sup> mbar l / sec
<b>Inlet pressure:</b>	6 – 125 psig (1.4 – 9.6 bara)
<b>Flow rate:</b>	<1 slpm in N <sub>2</sub> (gas dependent)
<b>Sample gases:</b>	Most inert and passive gases
<b>Gas temperature:</b>	Up to 60°C
<b>Purge gas</b> (CO <sub>2</sub> only):	Inert gas (e.g. N <sub>2</sub> ), <1 ppm CO <sub>2</sub> , 30 – 150 psig, 4 – 5 slpm
<b>Purge gas connection:</b>	1/8" Swagelok®

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## Dimensions & Weight

<b>Standard sensor</b> (19" rack-mountable):	H x W x D 8.75 x 19.0 x 24.0 in (222 x 483 x 610 mm)
<b>Standard sensor weight:</b>	40 lbs (18 kg)

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## Electrical and Interfaces

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

## HALO Max QCL CO

### Performance, CO

	Range	LDL (3 $\sigma$ )	Precision (1 $\sigma$ ) @ 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

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## HALO Max QCL CO<sub>2</sub>

### Performance\*, CO<sub>2</sub>

	Range	LDL (3 $\sigma$ )	Precision (1 $\sigma$ ) @ 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<sub>2</sub> in air, purging of the analyzer housing is required to achieve specified LDL (see previous page for purge gas requirements).

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

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