

PRODUCT DATASHEET

# HALO 3 D<sub>2</sub>O/HDO™

TRACE LEVEL HEAVY WATER ANALYZER



## The HALO 3 D<sub>2</sub>O/HDO analyzer ensures purity and process protection with:

- Parts-per-billion (ppb) D<sub>2</sub>O and HDO detection capability
- Wide measurement range
- Freedom from calibration (absolute CRDS measurement technology)
- Low cost of ownership and zero maintenance
- Easy to use touchscreen and remote software interface

Deuterium ( $D_2$  or  $^2H_2$ ), also known as “heavy hydrogen”, is used in a variety of applications, including industrial and university research comparisons between hydrogen and deuterium in deposited film analysis, rapid thermal anneal for certain semiconductor devices, and optical fiber manufacturing to eliminate the water peak in the telecom E-band. Whether it is for process control or quality assurance, gas suppliers need accurate, low-level contaminant monitoring to ensure deuterium purity, especially for the detection of trace  $D_2O$  (heavy water) and HDO (semiheavy water).

The HALO 3  $D_2O$ /HDO™ analyzer offers unparalleled accuracy and reliability for your deuterium purity analysis. Compact and easy to use, this analyzer features our proven Cavity Ring-Down Spectroscopy technology to effortlessly detect single-digit ppb levels of  $D_2O$  and HDO in your sample.

Users enjoy freedom from periodic sensor maintenance, and with no calibration gases required, operating costs are nearly eliminated. With drift-free stability and rapid response time, the HALO 3  $D_2O$ /HDO analyzer is ideal for continuous, online gas monitoring that is critical to process control in gas and chemical industries or anywhere purity is a necessity.

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## Specifications

### Performance

<b>Operating range:</b>	See table below
<b>Detection limit (LDL, <math>3\sigma/24h</math>):</b>	See table below
<b>Precision (<math>1\sigma</math>, greater of):</b>	$\pm 0.75\%$ or $1/3$ of LDL
<b>Accuracy (greater of):</b>	$\pm 4\%$ or LDL
<b>Speed of response:</b>	< 1 minute to 90%
<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>Wetted materials:</b>	316L stainless steel, 10 Ra surface finish
<b>Gas connections:</b>	1/4" male VCR inlet and outlet
<b>Leak tested to:</b>	$1 \times 10^{-9}$ mbar l / sec
<b>Inlet pressure:</b>	10 – 125 psig (1.7 – 9.6 bara)
<b>Flow rate:</b>	0.05 to 1.8 slpm
<b>Sample gases:</b>	$D_2$ and $N_2$
<b>Gas temperature:</b>	Up to 60°C

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## Dimensions & Weight

<b>Standard sensor:</b>	H × W × D: 8.73 x 8.57 x 23.6 in (222 x 218 x 599 mm)
<b>Sensor rack</b> (fits up to two sensors):	H × W × D: 8.73 x 19.0 x 23.6 in (222 x 483 x 599 mm)
<b>Standard sensor weight:</b>	28 lbs (12.7 kg)

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## Electrical and Interfaces

<b>Platform:</b>	Max series analyzer
<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>	40 Watts max.
<b>Signal output:</b>	Isolated 4–20 mA per sensor
<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

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### Performance in D<sub>2</sub>O

	Range	LDL (3 $\sigma$ )	Precision (1 $\sigma$ ) @ zero
<b>In Deuterium:</b>	0 – 20 ppm	3 ppb	1.0 ppb
<b>In Nitrogen:</b>	0 – 50 ppm	7 ppb	2.5 ppb

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### Performance in HDO

	Range	LDL (3 $\sigma$ )	Precision (1 $\sigma$ ) @ zero
<b>In Deuterium:</b>	0 – 30 ppm	5 ppb	2 ppb
<b>In Nitrogen:</b>	0 – 40 ppm	6 ppb	2 ppb

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

## GAIN REAL-TIME INSIGHT INTO YOUR PROCESS

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