

Real-Time CRDS Analyzers for Electronic and Industrial Specialty Gases

SPECIALTY GAS APPLICATIONS

From carbon dioxide for beverages to ammonia for LED manufacturing or silane for semiconductor fabrication, high-quality specialty gases are important raw materials and process gases for many industries.

It is of utmost importance to processes that specialty gases meet high purity standards. For example, moisture impurities in ammonia directly influence the efficiency of the resulting LED. Gases used in the semiconductor industry generally require ultra-high purity, whether it is silane or germane for epitaxy, fluorine compounds for etching processes, or cleaning gases.

Process Insights offers ultra-sensitive, highly accurate and easy to use analysis instruments from its Tiger Optics brand, which are based on renowned Cavity Ring-Down Spectroscopy (CRDS) for a large variety of specialty gases and applications.



Oxygenated Gases

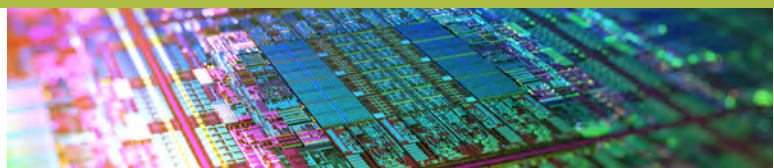
CO

CO₂

NO

N₂O

COS



Hydrides, incl. Ammonia

NH₃

PH₃

AsH₃

SiH₄

GeH₄

B₂H₆

H₂S



Corrosive Gases

Cl₂

HCl

HBr



Rare Gases

Ne

Kr

Xe

D₂



Fluorinated Compounds

SF₆

NF₃

BF₃

PF₃

GeF₄

CF₄

C_xF_y



Hydrocarbons

CH₄

C₂H₄

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ADVANTAGES OF CRDS TECHNOLOGY

Detecting impurities in specialty gases is complex due to the gases' chemical properties and possible background interference. This often rules out certain techniques or limits their sensitivity to levels not suitable for the industry's high purity requirements.

Process Insights CRDS analyzers have been widely used in a variety of specialty gas applications for many years because of their ease of use, fast response, accuracy, robustness, low flow rate, and freedom from calibration.

Advantages of Cavity Ring-Down Spectroscopy

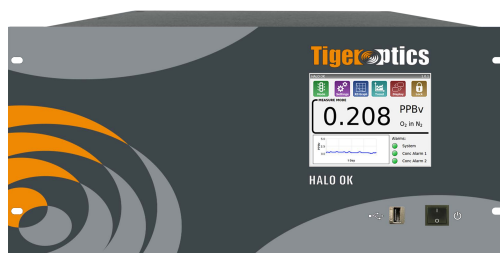
- ✓ Optical, non-contact measurement
- ✓ High selectivity to minimize background
- ✓ High chemical and corrosion resistance
- ✓ Excellent sensitivity
- ✓ Real-time, 24/7 operation
- ✓ Low cost of ownership

Common Issues with Legacy Technologies

- ❖ Chemical reaction with background gas
- ❖ Background interference
- ❖ Material incompatibility
- ❖ Insufficient sensitivity
- ❖ Not real-time, batch processing
- ❖ Labor-intensive and costly to operate



HALO 3 H₂O
Versatile, ppb-Level Moisture
Analyzer



HALO OK
ppt-Level Detection of Oxygen



HALO Max QCL CO & CO₂
ppt-Level Detection of CO and CO₂

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DETECTION SPECIFICATIONS

CRDS Analyzer Lowest Detection Limit (LDL, 3 σ /24h) in ppb

Back-ground Gas	Analyte																
	HALO KA Max H ₂ O	HALO KA H ₂ O	HALO 3 H ₂ O	Spark H ₂ O	Spark H ₂ O in CO ₂	HALO H ₂ O in N ₂ O	HALO LP H ₂ O	ALOHA+ H ₂ O	HALO RP H ₂ O	HALO HC	HALO OK	HALO H ₂ (LR)	HALO Max QCL CO	HALO Max QCL CO ₂	HALO 3 CO ₂	HALO 3 CH ₄	HALO 3 NH ₃
CO	0.6	1.5	15	7			2				N/A	N/A	<1 [†]				
CO ₂	0.3	0.8	2.0	550					5/1 [†]				N/A	N/A	35	2.5	
NO						16											200
N ₂ O					7.5										10		N/A
SO ₂		4															N/A
COS	12	12															
NH ₃					9	3									N/A		
PH ₃		500			9	9											
AsH ₃					5	5											
SiH ₄					400 [*]												
GeH ₄					20	20											
H ₂ S	200	200															
H ₂ Se	30	30															
B ₂ H ₆ (1-2%)	10	10															
Cl ₂	0.65	1.5															
HCl	1.2	3				3					<1 [†]	<1 [†]	9				
HBr	12	12															WIP
BCl ₃ (10%)	3	12															
Ne	0.10	0.3	30							0.10							
Kr	0.16	0.6	5.5							0.16							
Xe	0.25	0.8	7.5							0.25	0.17	0.075					
D ₂ (2H ₂)	0.9	0.9															
SF ₆	0.4	1.0	15												1.2		
NF ₃	0.6	2.5	9								100	10			0.6	0.9	200
PF ₃	0.7	WIP															
BF ₃																0.9	
GeF ₄																1.0 [‡]	
CF ₄	0.8	4	9													0.8	
C ₂ F ₆	1.2	3														1.6	
C ₃ F ₈	1.2	3														1.6	
C ₃ F ₆ O			300														
C ₄ F ₆	150	150														15	
C ₄ F ₈	1.2	3														1.6	
C ₅ F ₈	8	30															
CH ₄							50										
C ₂ H ₄							100 [‡]										

Numbers in red indicate new capabilities

*effective LDL based on 20:1 dilution with nitrogen

[†]LDL of 1.0 ppb requires addition of Tiger Optics' Zero Gas Panel and Linear Fit Mode

[‡]estimated LDL, pending experimental verification

Custom detection capabilities are available upon request. Please contact us to discuss your specific application.

GAIN REAL-TIME INSIGHT INTO YOUR PROCESS

Process Insights delivers premium analytical sensors, analyzers, instrumentation, software and solutions that are mission-critical to keep your operations, personnel, and the environment safe. Our commitment to customer satisfaction is evident through our diverse range of products, programs, and services, designed to accommodate various budgets and application needs.

CENTERS OF EXCELLENCE

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