

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.



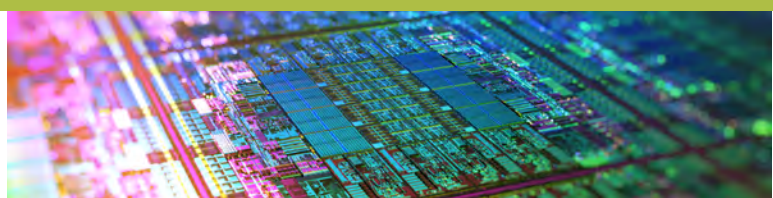
Oxygenated Gases

CO

CO₂

NO

N₂O



Hydrides, incl. Ammonia

NH₃

PH₃

AsH₃

SiH₄

GeH₄



Corrosive Gases

Cl₂

HCl

HBr



Fluorinated Compounds

SF₆

NF₃

CF₄

C_xF_y

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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

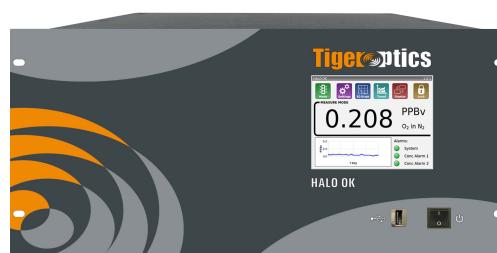
- ✓ Optical, non-contact measurement
- ✓ High selectivity to minimize background
- ✓ High chemical and corrosion resistance
- ✓ Excellent sensitivity
- ✓ Real-time, 24/7 operation
- ✓ Low cost of ownership

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)

| Back-ground Gas | Analyte | | | | | | | | | | | | | | | |
|-------------------------------|--------------------------|-------------------------|------------------------|---|---|--------------------------|-------------------------|-----------------|-----------------|-----------|------------------------------|------------------------|------------------------|------------------------|-----------|-------------------------|
| | 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 OK | HALO Max QCL CO | HALO 3 CO | HALO Max QCL CO ₂ | HALO 3 CO ₂ | HALO 3 CH ₄ | HALO 3 NH ₃ | HALO 3 HF | HALO 3 N ₂ O |
| CO | 0.6 | 1.5 | 15 | 7 | | | | N/A | N/A | | | | | | | |
| CO ₂ | 0.8 | 2.0 | | 550 | | | 0.5/0.1 [†] | | N/A | N/A | 35 | 2.5 | | | 200 | 500 |
| NO | | | | | 16 | | | | | | | | | | | N/A |
| N ₂ O | | | | | 7.5 | | | | | | | 10 | | N/A | N/A | |
| NH ₃ | | | | | 9 | 3 | <5 [‡] | <5 [‡] | | | N/A | | | | | |
| PH ₃ | | | | | 9 | | | | | | | | | | | |
| AsH ₃ | | | | | 5 | | | | | | | | | | | |
| SiH ₄ | | | | | 400 [*] | | | | | | | | | | | |
| GeH ₄ | | | | | 20 | | | | | | | | | | | |
| Cl ₂ | 0.65 | 1.5 | | | | | | | | | | | | | | |
| HCl | 1.2 | 3 | | | | | <1 [‡] | <1 [‡] | | | | | | | | |
| HBr | 12 | 12 | | | | | | | | | | | | | | |
| SF ₆ | 0.4 | 1.0 | 15 | | | | | | | | | 1.2 | | | | |
| NF ₃ | 0.6 | 2.5 | 9 | | | | | 100 | 10 | | | 0.6 | 200 | | | |
| 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 ₄ F ₆ | 150 | 150 | | | | | | | | | | 15 | | | | |
| C ₄ F ₈ | 1.2 | 3 | | | | | | | | | | 1.6 | | | | |
| C ₅ F ₈ | 8 | 30 | | | | | | | | | | | | | | |

*effective LDL based on 20:1 dilution with nitrogen

[†]LDL of 0.1 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.

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Process Insights manufactures and delivers premium sensors, monitors, detectors, analyzers, instrumentation, and software that are mission-critical to keep your operations, personnel, and the environment safe – every day across the globe.

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For a complete range of products, applications, systems, and service options, please contact us at: info@process-insights.com

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REVOLUTIONIZING MEASUREMENT

EVERYWHERE