CuraTerrae

Airyx
DIFFERENT THINKING. BETTER MEASURING.

A SPIN-OFF FROM THE UNIVERSITY OF HEIDELBERG
INSTITUTE OF ENVIRONMENTAL PHYSICS

HONO / NO_2 Analyzer ICAD-HONO/NO2-200L

PATENTED, FAST, ACCURATE AND DIRECT NITROUS OXIDE AND NITROGEN DIOXIDE DETECTION

ICAD-HONO/NO2-200L series featuring 19" rack housing and OLED display.

The ICAD *(Iterative CAvity enhanced DOAS)* HONO / NO_2 measurement system uses direct optical absorption spectroscopy in the spectral range between ~ 360 to 390 nm. By measuring the absorption spectrum and applying the ICAD algorithm, the unique and characteristic absorption structures of HONO and NO_2 are directly identified and separated from other overlapping absorptions like water vapour (H_2O) or O_4. This gives the advantage of direct HONO and NO_2 measurements (in comparison to LOPAP and CLD) without interferences to other substances or the need of drying mechanism which introduce new interferences (e.g., LOPAP, CLD, CRD, CAPS).

As the ICAD system relies not on absolute intensities, but rather characteristic differential absorption structures, it has no absolute zero-point drift and is almost completely insensitive to temperature variations, vibrations and light source degradation as found for other optical instruments. It is thus the perfect tool for accurate and precise long-term measurements, but also for mobile applications requiring a wide measurement range, high precision and fast response times. The operation is simple as no consumable gases are required. Data display is directly available with any WiFi or LAN device or over the RS232 interface. Patents: DE102015000423; EP3329251; US15/748,923; China ZL201680057099.6, EP3325928

SPECIFICATIONS

	HONO	NO_2		
Measurement range[*1]	0 – 500 ppb	0 – 2000 ppb	**Temperature range of operation**	-10 to +40°C
Limit of Detection (at 10 s)[*1]	0.2 ppb	0.4 ppb	**Temperature sensitivity**	< 0.01 ppb /°C
Limit of Detection (at 1000 s)[*1]	20 ppt	40 ppt	**Power consumption**	< 40 W, 12 V (typ.)
Precision (1σ at 10s)	0.1 ppb or 2%	0.2 ppb or 2%	**Start-up time**	< 1 min (typ.)
Zero Drift[*3]	< 0.2 ppb/month	< 0.3 ppb/month	**Cross sensitivity**	No significant cross sensitivities[*5]
Response Time (10% - 90%)[*2]	2 s at 2 l/min		**Weight**	~ 11.7 kg
Detection of HONO / NO_2	Direct spectroscopic measurement		**Dimensions**	19" Rack housing: 13.5 x 48.3 x 65.6 cm
Sample flow	1.0 to 2.5 l/min		**Consumable gases**	No gases needed for operation
Path length characterization	Helium gas (1 to 2 years interval)		**Other detectable gases**	CO_2 (optional NDIR sensor)
Calibration / Characterization of absorption path	HONO or NO_2 calibration gas not needed[*4]		**Processing unit**	Internal embedded PC, with data analysis and measurement software
Mechanical stability	Insensitive to vibrations		**Data communication**	LAN/WiFi/RS232/M2M/OPCUA;Bayern-Hessen Protocol; Voltage/Current Output

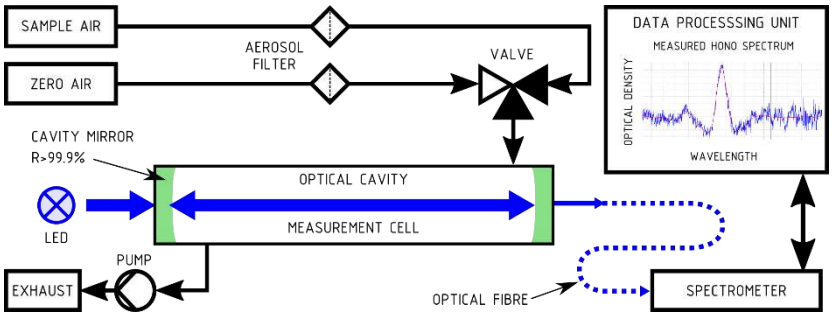
COMMENTS:

*1 Custom specifications with different measurement range are possible. By reducing the measurement range better precision and LOD can be achieved.
*2 Response: Different measurement cell types are available, allowing different response times. Smaller measurement cells allow a much faster response time, but result typically in a lower precision.
*3 Upper limit. Drift is negligible due to twice daily automated reference measurements.
*4 Regular automatic determination of the absorption path by light source modulation.
*5 No significant spectroscopic cross sensitivity with respect to: Carbon oxides, Methane, Hydrogen, Sulfide, Sulfur Dioxide, Chlorine, Chlorine Dioxide, Hydrogen Cyanide, Hydrogene Chloride, Phosphine, Hydrogen, Ammonia, Acetylene, Nitromethane, Ethylene, Ethanol, Methyl Mercaptan, Ethyl Mercaptan, Formaldehyde, Ozone < 1ppm

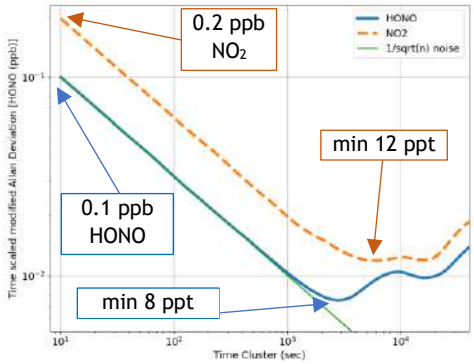
APPLICATIONS

- High precision HONO / NO_2 measurements (science, research, background air pollution monitoring)
- Urban air quality monitoring (outdoor, streets, tunnels, street canyons, mobile measurements)
- Indoor air quality and workplace monitoring
- Mobile, quick and precise HONO / NO2 pollution study, personal exposure studies e.g., for workspaces, pedestrians
- Emission monitoring (e.g., stacks)

THEORY OF OPERATION



Flow scheme and Measurement Principle of the ICAD HONO / NO_2 measurement system.



Time scaled Allan Deviation for HONO and NO_2 measurements.

ADVANTAGES

BENEFITS	INNOVATION
High measurement accuracy	• Direct spectroscopic HONO and NO_2 measurement • High sensitivity, low measurement error • High dynamic measurement range, optionally adaptable cell length • No zero-point or calibration drift, 100% reproducibility • No interferences • No water vapour dryer needed
Favourable initial and operating costs	• Simultaneous observation of HONO and NO_2 • Simple and robust setup • No consumables (e.g., gases) • Long lifetime • Fast response within seconds
Simple operation	• No calibration gas (HONO, NO_2) required • High stability (not sensitive to shocks, vibration, temperature) • Light weight • Low power consumption and 12V operation • Multiple Interfaces: WiFi, LAN, HTTP, RS232, Analogue Volt./Cur.

eXIST Existenzgründungen aus der Wissenschaft

Dated: 21.02.2023