Enviro Technology Services Ltd
part of CuraTerrae

Airyx
DIFFERENT THINKING. BETTER MEASURING.

ICAD IN SITU ANALYSERS

PATENTED, DIRECT *NO_2* AND / OR *HONO* DETECTION - NITROGENMONOXIDE (*NO*) MEASUREMENT VIA *O_3* TITRATION CONVERTER - HIGH PRECISION – EASY OPERATION - CALIBRATION NOT REQUIRED

NO_2/NO/HONO MEASUREMENT - PPT RANGE - HIGH TIME RESOLUTION - LOW POWER CONSUMPTION

HIGH SENSITIVITY, LARGE DYNAMIC RANGE & MOBILITY

The ICAD features typical advantages of high accuracy, instrumental stability, long maintenance intervals and low consumables. Further, the high dynamic range allows measurements from high polluted conditions e.g., at high traffic roads or industrial monitoring to very low concentrations in clean environments. If even ultra-low NO_x concentrations down to 15 ppt are of interest, the special ICAD high-grade versions "*L" are the perfect tool. The measurement can easily be controlled with a tablet connected to the ICAD via WiFi.

WORK SPACE NO_2 / NO_X MONITORING OR INDUSTRIAL MONITORING

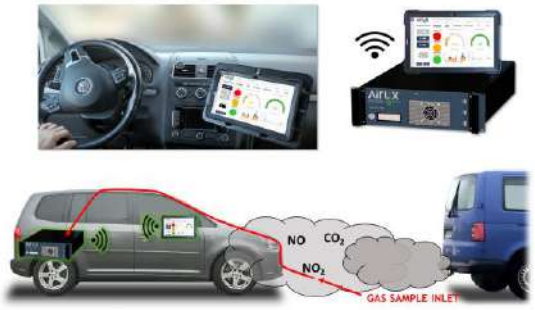
The high mobility, rugged design, and low maintenance effort make ICAD instrument the ideal instrumentation for reliable monitoring NO_x levels in workplace environments such as mines, constructions site or industrial production places. Further, ICAD instruments can be applied to measure and monitor the NO_x emissions of industrial machines. Multiple data interfaces enable optional integration of ICAD instruments with industrial processes.

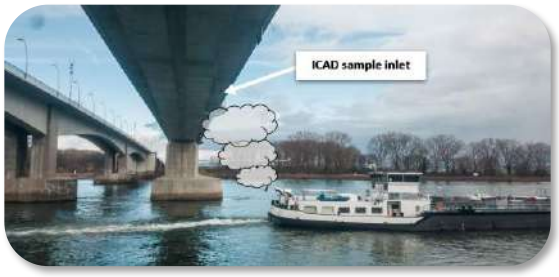
MOBILE MEASUREMENTS

The low power consumption, compact size, moderate weight and insensitivity to vibrations allow easily mobile measurements at different locations. The short set-up and warm-up time gives a lot of flexibility. Customized, ICAD versions for applications on drones are also available.

MOBILE APPLICATIONS – ON-ROAD REAL DRIVING EMISSIONS

ICAD for emissions "*E" (equipped with additional internal CO_2 sensor) allow on-road real driving emissions via the so-called Plume Chasing method. A vehicle with the ICAD, follows target vehicles to measure the gases in the diluted plume. Within seconds the system derives the specific NO_x emission signature from the vehicle. In short times, high emitting vehicles due to defects or exhaust manipulations are identified. The tool allows authorities to enhance inspection efficiency or researchers to perform a vehicle emission screening.





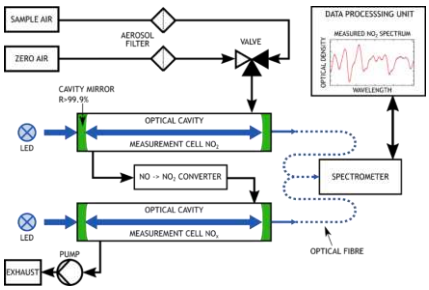
FLEXIBLE DEPLOYMENT – EXTENDED APPLICATION

The fast response time of the ICAD instrument enables monitoring and assignment of NO_x emissions from water vehicles by placing the instrument near water ways (e.g., at bridges or at the shoreline). With the ICAD emission configuration, NO_x emission factors (mg NO_x/kWh) are similar derived like for the real driving application. The calculation is independent from dilution of exhaust gases and thus, influence of meteorology.

NO DRIFTS, NO CROSS-INTERFERENCES

The selective detection of NO_2, NO_x or HONO, high measurement sensitivity and negligible drift makes the ICAD perfectly suitable for stationary air quality monitoring as well as scientific studies of chemical processes, e.g., atmospheric studies or simulation experiments. Further, the absence or cross-interferences to other gas species, enables measurements also of complex mixture (e.g., containing high concentration of CO_2, N_2O, H_2O or hydrocarbons).

TECHNIQUE



- **Direct measurement** by differential absorption spectroscopy
- **High sensitivity and accuracy** by use of ICAD algorithm (insensitive to intensity variations and aging of light sources)
- **No cross-interference**, spectral separation from other gases like water vapour (H_2O), Glyoxal ($C_2H_2O_2$), oxygen (O_2)
- **No calibration gases** required; **no pre-drying** of sample air required
- High **dynamic** detection range of **low ppt to ppm**
- **Fast response** time of 2 seconds

ICAD MODEL OVERVIEW

	NO2-200	NOx-200D	NOx-200DE	NO2-200L	NOx-200DL	HONO-200L
Detectable gases	NO_2	NO_2 / NO	NO_2 / NO / CO_2	NO_2	NO_2 / NO	HONO / NO_2
Range	5 ppm	5 / 5 ppm	5 / 5 / 2000 ppm	2 ppm	2 ppm / 2 ppm	0.5 / 2 ppm
Limit of detection at 2s, 30s, 300s in ppt	350,100,30 ppt	350,100,30 ppt	350,100,30 ppt CO_2: 4 ppm	200,50,15 ppt	200,50,15 ppt	HONO: 500,120,40 ppt NO_2: 600,150,50 ppt
Precision (1σ) at 2s, 30s, 300s in ppt	175,50,15 ppt	175,50,15 ppt	175,50,15 ppt CO_2: 2 ppm	100,25,8 ppt	100,25,8 ppt	HONO: 250,60,20 ppt NO_2: 300,75,25 ppt
Available also as mobile "M"-version	✓	✓	✓	✗	✗	✗

ICAD SPECIFICATIONS

Detection of NO_2, HONO	Direct spectroscopic measurement	**Power consumption**	Less than 40 W at 12 V (typ.)
Detection of NO (NO_x)	By conversion to NO2	**Start-up time**	Less than 1 min (typ.)
Response Time (10% to 90%)[*2]	2s at 1 l/min or 1s at 2 l/min	**Temp. range of operation**	-10 to +25°C (+40°C with cooling option)
Zero drift	Less than 0.1 ppb/month[*3]	**Temperature sensitivity**	Less than 0.01 ppb/°C
Sample flow	1 to 2.5 l/min	**Cross sensitivity**	No significant cross sensitivity[*5]
Calibration	Target calibration gas not needed[*4]	**Mechanical stability**	Insensitive to vibrations
Path length characterization	Helium gas (1 to 2 years interval)	**Consumable gases**	No gases needed for operation
Housing Size 19" Rack	43.6 x 13.2 x 36.5 cm^3 (WHD)	**Other detectable gases**	Glyoxal[*6] (respected by spectral analysis)
Housing Size 19" Rack "L"	43.6 x 13.2 x 61 cm^3 (WHD)	**Processing unit**	Internal embedded PC (WIN10)
Housing Size "M"	40.0 x 13.2 x 30 cm^3 (WHD)	**Data communication**	LAN/WiFi/RS232/M2M/OPCUA; Bayern-Hessen Protocol; Voltage/Current Output (for rack version, on request)
Weight 19" Rack	< 12 kg (depending on config)		
Weight Rugged "M" version	< 10 kg (depending on config)		

(*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. (*3) Upper limit. Drift is negligible due to regularly automated reference measurements. (*4) Literature absorption data for target gas is used for gas quantification. (*5) No significant spectroscopic cross sensitivity found for: water, ozone, Glyoxal, Carbon Oxides, Methane, Formaldehyde, Hydrogen, Sulphide, Sulphur Dioxide, Chlorine, Chlorine Dioxide, Hydrogen Cyanide, Hydrogen Chloride, Phosphine, Hydrogen, Ammonia, Acetylene, Nitromethane, Ethylene, Ethanol, Methyl Mercaptan, Ethyl Mercaptan. (*6) For NO2-200 and NOx-200 models.

19" Rack housing front and back side

Mobile "M"-version housing

HIGHLIGHTS

BENEFITS	INNOVATION
High measurement accuracy	• Direct spectroscopic gas measurement • High sensitivity, low measurement error • Fast measurement response • No zero-point or calibration drift, 100% reproducibility, no interferences • No sample pre-dryer needed
Simple and low costs operation	• No calibration with target gas (NO_2, HONO) required • Parallel NO measurement (with ozone titration converter) • No consumable gases needed • Robust setup, long lifetime
Flexible application	• High stability (not sensitive to shocks, vibration, temperature) • Compact design, mobile application • Low power consumption and 12 V operation • Data Interfaces: WiFi, LAN, Machine2Machine, RS232, Analogue Volt./Cur. • Internal memory for up to 2 years of data

Patents: DE102015000423; EP3329251; US15/748,923; China ZL201680057099.6

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