CuraTerrae

Scientific Newsletter 2025

World-leading environmental monitoring solutions

Contents

In this issue we discuss

Introduction

Welcome to the latest edition of our Scientific Air Newsletter:
Atmospheric/Environmental edition

From Cura Terrae Air – part of Cura Terrae

Since the previous scientific newsletter, we have continued to innovate –just as we have since 1983. Our team have been busy seeking out emerging technologies, supporting novel research applications, and expanding into new sectors and territories. An update for our valued scientific customers is already overdue thanks to the speed of sector developments. It would be impossible to summarise every interesting development in a single newsletter, nevertheless, we have instead distilled our most topical and exciting news for you here. For more updates, detailed technical specs, and our unabridged catalogue of instrumentation, visit our website (cura-terrae.com/air). The all-new website splits our products into different sectors for easy browsing. It also includes an upgraded search function to help you find all the solutions we can offer for a particular sector, application, or analyte.

Enviro Technology is now Cura Terrae Air

We have rebranded as Cura Terrae Air. While the name has changed, our people, products, and exceptional services will remain the same.

After a modern, clean redesign of our website, we join Cura Terrae Water, and Cura Terrae Land & Nature, and Cura Terrae Occupational Hygiene and Emissions Testing within the group.

Cura Terrae means take care of the Earth, and we are now perfectly positioned as a one-stop-shop for all of our clients' environmental monitoring needs, including but not limited to air monitoring, water monitoring, ecology, and archaeology services.

See the products and services our group can offer at www.cura-terrae.com. Keep an eye out for more updates on our website and social media.

In This Edition

Trends in environmental research are constantly evolving, and the past four years have been no exception. The measurement of greenhouse gases and ammonia using our class-leading ABB-Los Gatos Research analysers remains ever popular. Direct NO2 monitoring technologies such as AirYX's ICAD also continue to gain momentum, but particulates have stolen the spotlight in recent years. New climate discoveries and public health concerns are driving researchers and government to look deeper into particulate monitoring, particularly bioaerosols and nanoparticles. Thermo-optical OC-EC monitoring has also seen a marked uptick in interest, tied to increased scrutiny on engine emissions and biomass burning. These once niche particulate instruments are now our fastest growing product sector.

As such, the first section of this newsletter focuses solely on particulates. For those with no interest in particulates, feel free to skip to the gas instruments on pages 10-13!

If any of these instruments piqued your interest, or if you have any queries, please feel free to contact Lewis John directly. My contact details are below. Enjoy the newsletter.

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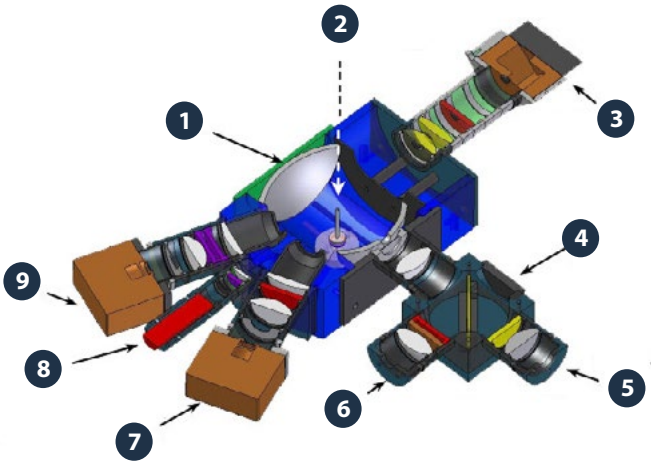
Monitoring Bioaerosols and Microplastics

With the **WIBS-5** from Droplet Measurement Technologies.
Providing particle-by-particle laser scatter and fluorescence information.

The WIBS-5 (Wideband Integrated Bioaerosol Sensor) from Droplet Measurement Technologies is the World's only instrument for real-time, particle-by-particle measurement of bacteria, moulds, pollen, and other bioaerosols. The WIBS-5 combines single-particle light scattering with fluorescence flash lamps. This provides information on particle size, shape, and fluorescence in three channels tuned to common biomarkers. A rich dataset is collected for every particle sampled (including non-biological particles), allowing characterisation of mixed aerosols. The unique capabilities of the WIBS-5 make it suitable for various novel and challenging research applications.

Particles entering the WIBS-5 are first detected by the 635 nm laser scatter module. This counts the particle and provides a size measurement. Particle shape information (asymmetry factor) is determined based on the scattering pattern on the multi-element detector. The laser scatter detection then triggers fluorescence flash lamps further down in the instrument. The WIBS-5 features 3 UV detection channels, sensitive to key biomarkers NADH, Riboflavin, and Tryptophan. The laser scatter and fluorescence measurements are performed in real-time for each particle, as it passes through the instrument.

Because of its versatile data output and robust design, the WIBS-5 is suitable for a wide range of applications including aerosol characterisation, pollen counting, airbourne measurements, and even biochemical weapons monitoring. The WIBS-5 can also be used for studying non-biological aerosols. One recent study (reference below) showed that the fluorescence detection of the WIBS-5 is sensitive to the plastics PCura Terrae, PE, and PP, at particle sizes 2 µm and smaller.



1. Fluorescence collection mirrors
2. Direction of aerosol flow
3. Multi-element forward-scattering detector (particle shape)
4. Dichroic beamsplitter (400nm)
5. FL2 - Fluorescence detection channel 2 (420-650nm)
6. FL1 - Fluorescence detection channel 1 (310-400nm)
7. Xe2 Xenon (370nm)
8. Diode laser (635nm) particle trigger
9. Xe1 xenon 1 (280nm)

https://chemrxiv.org/engage/chemrxiv/article-details/6526a29745aaa5fdbbc5d8d6 1. Gratzl J, Seifried TM, Stolzenburg D, Grothe H. A fluorescence approach for an online measurement technique of atmospheric microplastics. ChemRxiv. 2023; doi:10.26434/chemrxiv-2023-qzhr8

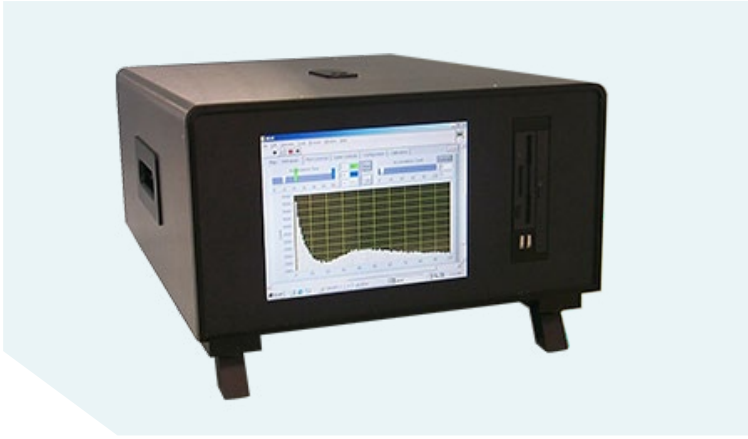
Optical Particle Sizing from 1µm Down to 60nm

With the **Droplet UHSAS-G**. A real-time instrument requiring no butanol or radioactive chargers.

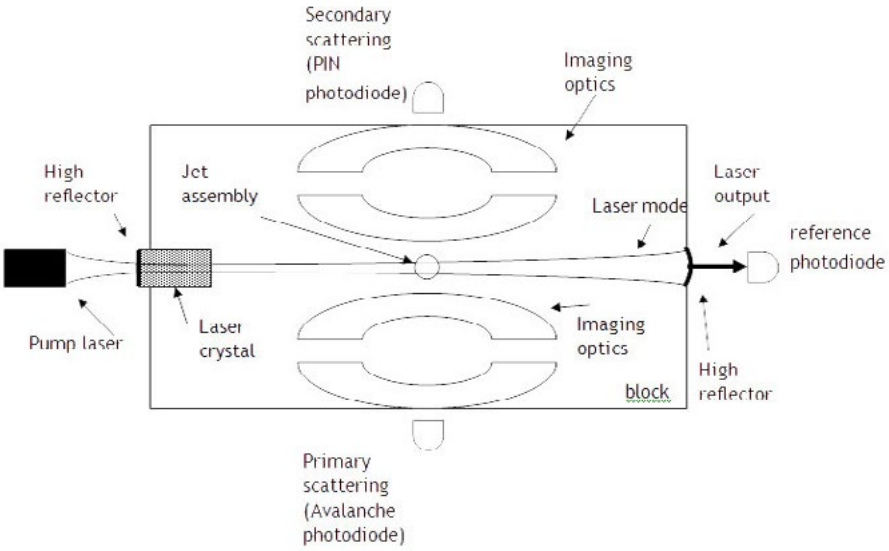
The Droplet Measurement Technologies UHSAS-G (Ultra High-Sensitivity Aerosol Spectrometer) is an optical-scattering, laser-based aerosol particle spectrometer. This high sensitivity, real-time instrument sizes particles from 0.06 µm – 1 µm in up to 100 user-defined bins, with resolution as fine as 1 nm / bin. The UHSAS-G is a highly configurable platform, applicable to static, mobile, and airbourne measurements.

Like all Droplet instruments, the UHSAS-G comes with a comprehensive LabVIEW-designed software package. Users can view histograms of particles binned by diameter, transit time, or by peak optical signal. The UHSAS-G also features an adjustable sample flow rate, and precise monitoring of housekeeping parameters such as temperature, pressure, and laser current.

The UHSAS-G uses a solid-state Nd3+:Y LiF4: ~1054 nm laser to illuminate particles. Scattered light is collected by two pairs of Mangin optics – a highly sensitive APD-based system to size smaller particles, and a secondary PIN photodiode system for larger particles. Amplification of these scattering signals allows detection of particles as small as 60 nm.



A versatile and powerful, yet compact instrument, the UHSAS-G is fully self-contained. It includes a built-in monitor and data logging system and offers a range of mounting options. Thanks to its impressive capabilities and robustness in harsh environments, the UHSAS-G continues to explore niches in aerosol research institutes around the World, with high-profile users including NASA, NOAA, and the Max Planck Institute.



Nanoparticle Instrumentation for Every Application

with the **GRIMM** family of CPCs.

GRIMM Aerosol Technik is a class-leading manufacturer of nanoparticle instruments based in Ainring, Germany. The GRIMM portfolio covers a vast range of applications, from portable nanoparticle counters for cleanrooms and health studies, to rack-mounted scanning mobility particle sizer systems. All GRIMM nanoparticle instruments are based on GRIMM's patented 90° laser scatter cell, featuring aerosol focussing, and a flow of sheath air to protect the optics from contamination. Aerosol focussing also prevents coincidence, enabling accurate counting of individual particles at both high and low concentrations.

The GRIMM range of condensation particle counters (CPCs) combine the 90° laser scatter detection with a butanol saturator. Sampled nanoparticles grow by condensation as they pass through the saturator before entering the detector. This enables the measurement of particles that would otherwise be too small to measure optically (down to a D_{50} of 4 nm).

GRIMM scanning mobility particle sizer (SMPS) systems add a particle sizer called a differential mobility analyser (DMA) column to the CPC. The DMA column provides a controllable size cut, based on the applied voltage. This allows the measurement to be selective to specific size cut points. The DMA column can be set to scan through a range of cut points in a sequence, yielding a particle size distribution. The typical size range is 10 – 1,094 nm – this can be adjusted with different DMA columns.

Cura Terrae can offer GRIMM nano instrumentation to suit any research application. For outdoor deployments, the EDM-465 offers a reliable all-in-one solution, with a CPC and data logger built into a weatherproof, air-conditioned enclosure. For mobile applications, the 1371 MiniWRAS provides particle size distribution over a wide range of 10 nm to 35 µm, by combining a Faraday cup electrometer with an optical particle counter in a portable, battery-powered package. For permanent installations where detailed nano size distribution information is required, we recommend a full GRIMM SMPS system. These are available in benchtop and 19" rackmount configurations, with a variety of DMA and aerosol neutraliser options.

All GRIMM nano instruments supplied by Cura Terrae include hands-on training, UK-based support, and service capability from our team of factory trained engineers.

Wide Range Aerosol Spectrometer System Model EDM 665

Mini Wide Range Aerosol Spectrometer Model 1371

5430 Basic PMP Condensation Particle Counter

Scanning Mobility Particle Sizer Systems SMPSC SMPSE

Automated PM10 & PM2.5 Sampling

made possible with the NEW dual-channel **Digitel** DPA-14 DL sequential sampler.

Digitel Elektronic AG is a world-renowned manufacturer of environmental monitoring equipment and a key Cura Terrae partner of many years. Digitel are well known for their **DHA-80** high-volume sequential sampler and **DRA-12** precipitation sampler, both of which are widely used on monitoring networks and atmospheric "supersites" such as Auchencorth Moss. More recently, the compact **DPA-14** low-volume sequential sampler has been gaining popularity. The DPA-14 is particularly relevant for academic research due to its portability, ease of use, and ubiquitous 47mm filter size. Despite its smaller proportions, the DPA-14 still retains the excellent accuracy, reliability, and weatherproofing of its bigger brother, the DHA-80.

DRA-12 DHA-80 DPA-14

At the end of 2024, Digitel released the NEW **DPA-14 DL**, a dual-channel version of the DPA-14 sequential sampler. The DPA-14-DL features two separate inlets and two filter holders, enabling simultaneous sampling of PM_{10} & $PM_{2.5}$ (or PM_1, TSP). Automated filter changes can be programmed independently for each of the inlets, with a capacity of 2 x 30 filters. The DPA-14 DL is compatible with the same interchangeable inlet heads and size-selective impactor plates of other DPA-14 models.

DPA-14 DL

For researchers in need of a truly portable single-channel sampler, we can also offer the NEW **DPA-14 Baby**. This tiny sequential sampler weighs just 21kg, allowing it to be hand-carried. Despite its small size, the Baby uses standard 47mm filters and has a capacity of 18, with automated filter changes and a full Digitel touchscreen interface.

DPA-14 Baby

Portable, Modular Samplers & Nephelometers

from new Cura Terrae partners **AirPhoton**.

AirPhoton's instruments provide advanced capabilities for understanding aerosol and trace gas properties. Their products offer unique advantages for advancing air quality research, climate modelling, and public health studies.

Cura Terrae partnered with AirPhoton in 2023 to bring these cutting-edge monitoring solutions to the UK and Ireland. AirPhoton's feature-rich samplers and nephelometers will appeal to scientists and regulators who need to maximise their measurement capabilities. Using adjustable flow technology, samplers and nephelometers can achieve different mechanical cut points (e.g. PM_{10} & $PM_{2.5}$), without changing the inlet. A Sampling Station can also be combined with a Nephelometer in a single system (as in NASA's MAIA program and the SPARTAN network), providing real-time optical measurements in combination with filter sample collection.

AeroExplorer

IN102 Ex

AeroExplorer Sampling Stations

- The AeroExplorer is a customisable, field-deployable sampling solution. Key features include:
- Programmable Sampling Protocols: Set by time, date, or wind direction.
- Adjustable Flow Rate: Measure different mass fractions with a single inlet.
- Dual Inlet Option: Simultaneous collection of $PM_{2.5}$ and PM_{10}.
- Trace Gas Sampling: Denuder collects ammonia, nitrates, VOCs, and more.
- Energy Efficiency: Can operate on solar or battery power for remote deployment.

Nephelometers

AirPhoton Nephelometers are optical based instruments that provide real-time information to characterise airbourne particulates. Advanced models use the GRASP inversion to derive dry $PM_{2.5}$ mass and size distribution. Built into rugged Peli cases, these instruments are suitable for outdoor deployment in a wide range of environments and applications. Models include:

- IN101T: Basic integrating nephelometer provides information on bulk particle size and amount.
- IN102: With size-selective inlet for measurement of PM_{10} or $PM_{2.5}$.
- IN102 Ex: Extended range version, adjustable from PM_1 to PM_{10}.
- AirPhoton Nephelometers are whitelisted for use in the ACTRIS network, reflecting their reliability, research quality, and performance in diverse settings.

Real-Time PM10 & PM2.5 Monitoring

With the **Palas** Fidas® 200 and Fidas® Smart 100.

Fidas 200

Palas has been developing aerosol technologies including dust monitors, nanoparticle instruments, and aerosol generators for over 40 years. Cura Terrae partnered with Palas very recently, at the beginning of 2025. With the addition of Palas' impressive MCERTS certified PM_{10} and $PM_{2.5}$ monitors to our range, Cura Terrae is now able to offer full, comprehensive suites of real-time instrumentation to outfit DEFRA monitoring stations for all criteria pollutants.

Measuring PM_{10} and $PM_{2.5}$ with high precision and temporal resolution is more important than ever. Ambient particulate concentrations are, thankfully, trending downwards. Higher sensitivity instruments are therefore required to track these small changes. Palas Fidas dust monitors provide fast, sensitive measurements of PM_{10}, $PM_{2.5}$, and more, using optical scattering technology. Instead of a laser, a high-intensity LED is used as a light source, providing improved stability and service life. Fidas instruments require little maintenance, and the calibration can be checked and adjusted at any time using a monodisperse test aerosol.

Fidas 200

The Fidas 200 is Palas' EN-16450 and UK MCERTS approved fine dust monitor for simultaneous measurement of PM_{10} and $PM_{2.5}$, plus PM_4, PM_{10}, TSP, C_N, particle size distribution, ambient pressure, ambient temperature, and rel. ambient humidity. The Fidas 200 was explicitly designed for environmental regulatory monitoring and is optimised for reliability and high data capture rates in the field.

Versions include:

- **Fidas 200 E** – 19" rack-mounted version for installation in monitoring stations, with roof pass-through inlet and outdoor weather sensor.
- **Fidas 200 S** – built into stainless steel weatherproof housing for outdoor deployment, with integrated weather sensor.

Fidas Smart 100

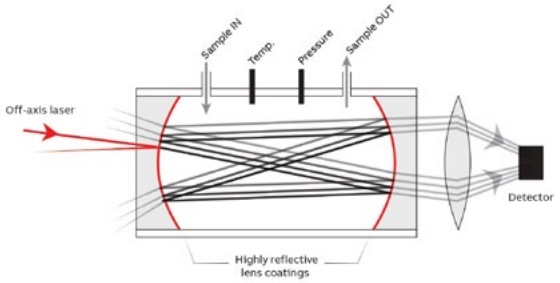
The **Fidas Smart 100** is Palas' most advanced and compact instrument for air quality measurements. This portable unit weighs less than 4kg and includes a weatherproof enclosure, with an internal data logger and communications options including WiFi and 4G. This combined with the capability to measure PM_1, $PM_{2.5}$, PM_4, PM_{10}, TSP, C_N, particle size distribution, and meteorological parameters simultaneously (depending on configuration), makes the Fidas Smart 100 ideal for a wide range of mobile and semi-permanent deployments.

Fidas Smart 100

Precision Greenhouse Gas Analysers

From **ABB-LGR**, and the NEW UAV-mounted GLA133-GGA.

Cura Terrae has been working with ABB-Los Gatos Research for over a decade. Their cavity-based laser gas analysers are our most popular scientific product line, and we are proud to have supplied over 100 analysers to universities, laboratories, and monitoring stations around the World. The vast majority of these, some well over 10 years old, are still in operation, and still supported by Cura Terrae's expert service team.



Los Gatos Research were among the first innovators to develop a methane analyser portable and robust enough to take into the field, with their patented Off-Axis ICOS (Integrated Cavity Output Spectroscopy) technique. This is a 4th generation technique based on traditional CRDS (Cavity Ring-Down Spectroscopy). Unlike CRDS, OA-ICOS is a direct, absorption-based measurement with continuous wavelength scanning, improving the sensitivity, selectivity, and robustness of the technique. Thanks to the "Off-Axis" arrangement of the optics, nanometre-level alignment is not needed, meaning the optics are insensitive to dust, vibration, and shocks. This also means the optics can be removed, cleaned, and reinstalled in the field, requiring minimal tools and training.

GLA133-GGA

GLA131-GGA

The ruggedness, user-serviceability, and portability of these analysers make them popular for research in challenging applications from the Atacama Desert to the Arctic Tundra, as well as mobile and airbourne measurement platforms. ABB-LGR have continued to improve and miniaturise their technology over the years, culminating in the latest series of Microportable Greenhouse Gas Analysers. Read more about how Cura Terrae-supplied ABB-LGR analysers are used for flux monitoring in the field:

View the Somerset Wildlife Trust Case Study

Click here

The **GLA131-GGA** Microportable Greenhouse Gas Analyser is a 6.1 kg CH_4, CO_2, $H_2O_{(vapour)}$ analyser that is small enough to fit into a backpack. It also includes an internal battery with up to 3 hours autonomy. An evolution of the flagship Ultraportable Greenhouse Gas Analyser or "UGGA", the new GLA131-GGA offers similarly impressive precision despite its small size, and a response time of just one second.

The Microportable GGA is now also available in a UAV-mounted version! The new **GLA133-GGA** features the same optics and exceptional performance as the GLA131-GGA, in an even smaller 3kg chassis designed to mount on a drone.

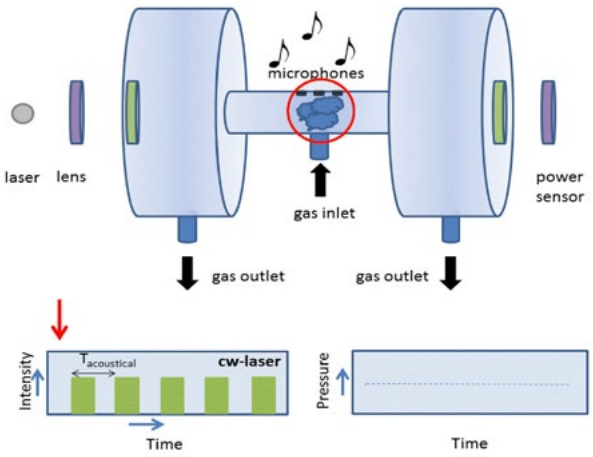
Photoacoustic NH_3 & N_2O Analysers

From **LSE Monitors**. High sensitivity rackmount instruments with a compact footprint.

LSE Monitors is a Netherlands-based company specialising in high-sensitivity analysers for ammonia and nitrous oxide. Using quantum cascade lasers and a small photoacoustic measurement cavity, LSE Monitors can monitor trace levels of NH_3 or N_2O, with minimal installation and space requirements. Each analyser weighs 8kg, with a height of just 12cm, making it easy to accommodate on a bench or rack. The small cavity volume (around 10cc) also minimises memory effects, improving response times.

The photoacoustic measurement technique uses a dumbbell-shaped optical cavity. Sample gas flows into the middle, and out through the bottom of each dumbbell lobe. Mid-IR light passes through the cavity axially, with the quantum cascade laser at one end and detector at the other. As the laser passes through the cavity, some of the energy is absorbed by NH_3/N_2O molecules and released as heat. This creates a pressure change in the cavity.

Absoprtion spectroscopy



Rapidly modulating the laser results in rapid oscillations in pressure – sound waves. The intensity of the sound waves is proportional to the NH_3/N_2O concentration. Wavelength scanning allows the measurement to be specific, by focussing on a narrow range of frequencies. The shape of the measurement cavity amplifies the sound waves, making the technique highly sensitive.

LSE offer two NH_3 analyser models and two N_2O analyser models:

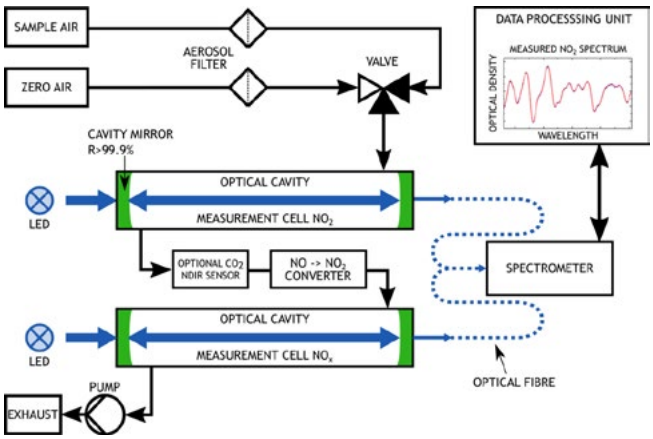
- **Model NH_3-1700**
  1 ppb precision, 1 minute time resolution.
- **Model NH_3-1710**
  25 ppb precision, 1 second time resolution.
- **Model N_2O-4405**
  5 ppb precision, 2 minute time resolution.
- **Model N_2O-4410**
  25 ppb precision, 1 second time resolution.

Next-Generation Direct NO_2 & HONO Measurement

With Iterative CAvity-enhanced DOAS (ICAD) Analysers from **AirYX**.

ICAD-200DE-M

Iterative CAvity-enhanced DOAS (ICAD) is a next-generation optical technique for measuring NO_2/NO_x with extreme sensitivity and selectivity. A cavity-based evolution of Differential Optical Absorption Spectroscopy (DOAS), the ICAD technique provides precise, direct measurements of NO_2 and HONO at fast measurement rates, with an effective absorption path of several kilometres.



AirYX ICAD analysers are available in rack-mounted and portable housings to suit both laboratory and mobile measurement applications. Configuration options include single cavity NO_2 measurements, dual cavity NO_2/NO_x (with O_3 titration NO converter), or dual NO_2 inlets with dual inlets (for comparative NO_2 measurements e.g. indoor/outdoor).

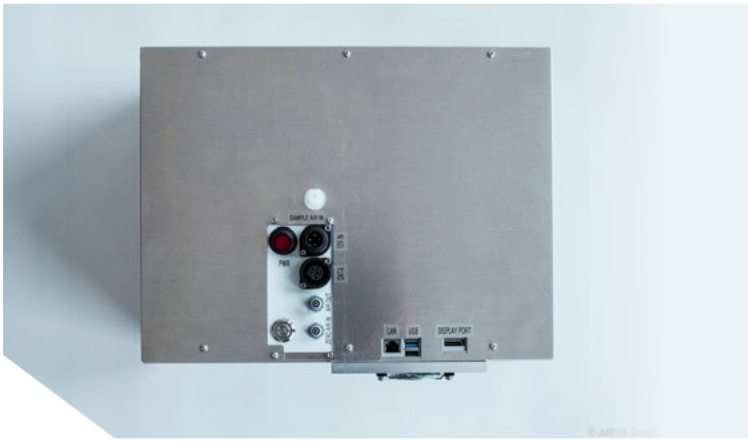
A NEW HONO/NO_2 version is now also available, allowing researchers to directly investigate the enigmatic nitrous acid as never before.

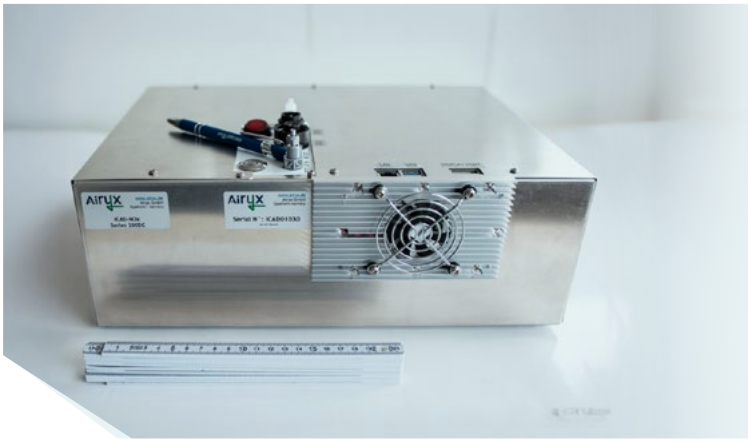
ICAD-NOx-200DE Rack

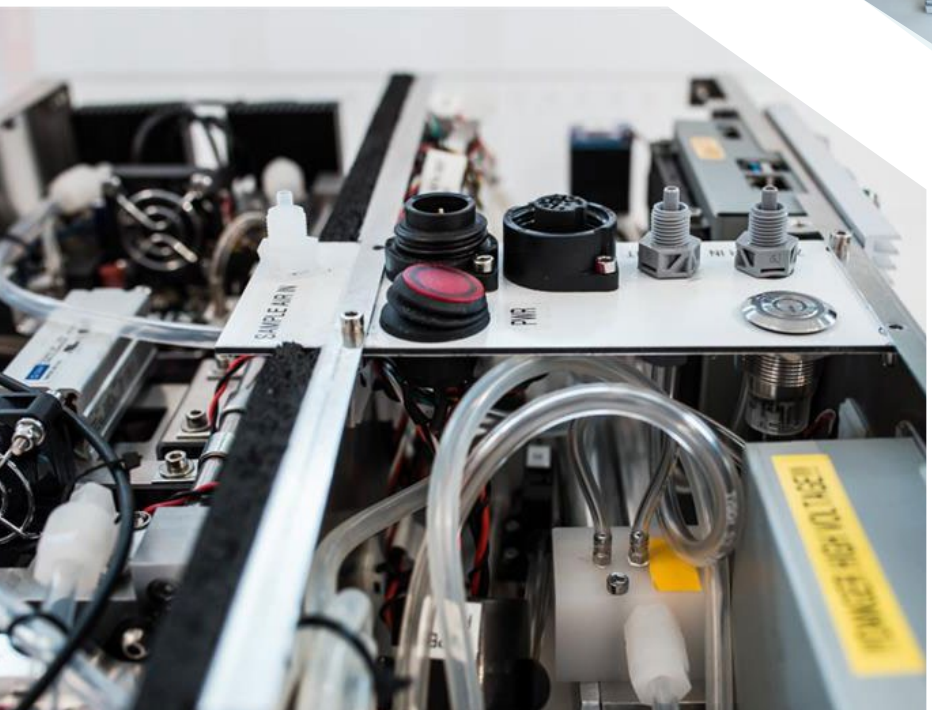
New UAV version now available

This new lightweight version enables fast and direct NO_2 measurements on airborne platforms, opening up new novel mobile monitoring applications.

ICAD analysers are robust, simple to operate, and suitable for myriad applications ranging from atmospheric trace gas trending to mobile emissions / compliance monitoring. WiFi control is included as standard, with an intuitive browser-based interface, and extensive diagnostics / graphing options. AirYX's unique "plume chasing" software is also available on models with the optional CO_2 sensor. This powerful tool enables the exhaust emissions of a vehicle to be analysed with just a few seconds of driving behind it. Operators can tell at a glance if a vehicle is likely to be compliant with Euro emissions standards.







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