

Boreas Preconcentrator

Datasheet



The Boreas Preconcentrator, developed by the National Physical Laboratory (NPL), is a high-precision instrument designed to enhance the measurement of atmospheric trace gases, particularly methane (CH_4), by improving signal-to-noise ratios and reducing matrix interference. It achieves this through cryogenic preconcentration, separating target analytes from ambient air and delivering them to analytical instruments in a purified carrier gas at elevated concentrations. Boreas separates methane from a 5 L air sample (configurable to 10 L or more) from a sampling pump or pressurised cylinder

When coupled with a laser spectrometer (Aerodyne TILDAS dual-laser analyser is recommended but not supplied), Boreas provides automated measurement of methane isotope ratios in air samples. Suitable for use at atmospheric monitoring stations and research laboratories. The instrument rack contains sample-handling valves, temperature-controlled trapping system and battery-backed power distribution from a single AC inlet. The automated trapping sequence is controlled using the GCWerks software allowing unattended operation and online data analysis.

Developed to support climate research and environmental policy, the Boreas system enables continuous monitoring of the isotope ratio of methane in atmospheric air samples.

Contact: chris.rennick@npl.co.uk

Web: <https://www.npl.co.uk/research/emissions-atmospheric/greenhouse-gas>

Key Features

- **Self-contained preconcentration system:** suitable for lab or field deployment. Rack-mounted system with single electrical connection protected by an uninterruptable power supply.
- **Cryogen-free cooling:** Stirling cryocooler for trapping with no need for liquid nitrogen, reducing maintenance and consumables.
- **Methane Enrichment:** Extracts CH₄ from approximately 5 L of air (~1.9 µmol/mol) and concentrates it to ~550 µmol/mol.
- **Matrix normalisation:** minimises interfering gases such as oxygen, carbon dioxide and nitrous oxide. Methane delivered to spectrometer in high purity nitrogen carrier gas.
- **Automated Operation:** Fully computer-controlled operation of trapping cycle and carrier gas flow using GCWerks software. Suitable for deployment to atmospheric monitoring stations. 6-inlet sample selector for ambient air and standard gases.
- **Continuous monitoring:** typical 10 minute integrated sampling duration and 1 hour cycle time.
- **Isotopic Analysis for methane:** If coupled to the recommended Aerodyne TILDAS Dual Laser CH₄ Isotope analyser enables precise $\delta^{13}\text{C}(\text{CH}_4)$ (~0.07 ‰) and $\delta^2\text{H}(\text{CH}_4)$ (~0.9 ‰) measurements from an ambient air sample. The analyser is not supplied with Boreas.
- **Flexible preconcentration system:** can be configured for other target species. Contact NPL to discuss custom applications, control and analysers.

Electrical specification	
Voltage rating	230 Vac
Current rating	14.6 A
Frequency rating	50 Hz
Power rating	3031 W
Mechanical specification	
Weight	423 kg
Dimensions (D×W×H)	1200 × 600 × 2200 mm
Environmental Specification	
Temperature	18 °C – 28 °C
Humidity	40 % - 65 %
Temperature stability	< 1 °C / hr
Regulatory	
Certifications	CE / UKCA
Legislation	LVD 2014/35/EU EMC 2014/30/EC RoHS 2011/65/EU
Operational Parameters	
Sample Volume	5 L
Sampling duration	10 minutes
Target Analyte	Methane isotope ratio ($\delta^{13}\text{C}(\text{CH}_4)$, $\delta^2\text{H}(\text{CH}_4)$)
Carrier gas	High purity nitrogen
Recommended measurement method	Direct absorption laser spectroscopy (Aerodyne TILDAS)
Control software	GCWerks (GCSoft)