GT5000 Portable Multi-Parameter Soil Respiration Measurement System

The GT5000 portable multi-parameter soil respiration measurement system consists of a portable high-precision soil greenhouse gas analyzer based on Fourier Transform Infrared (FTIR) spectroscopy technology and an automatic soil flux chamber, both manufactured by Gasmet Oy (Finland). This instrument can simultaneously measure multiple major greenhouse gas components, such as N_2O, CH_4, CO_2, H_2O, CO, and NH_3, within seconds, with a measurement accuracy reaching the ppb level. The GT5000 system is applicable for greenhouse gas flux measurements in various environments, including farmlands, wetlands, forests, pastures, power plants, and fire scenes.

Key Features

- Fourier Transform Infrared Spectroscopy (FTIR) technology.
- Simultaneous measurement of six greenhouse gases: N2O, CH4, CO2, H2O, CO, and NH3, with the capability to measure up to 50 gases concurrently.
- Multiple wireless connectivity options, including WI-FI and Bluetooth.
- User-friendly operation with navigation-guided interface, one-click measurement, and instant online result processing, without the need for specialized knowledge.
- Five different views to display relevant measurement information.
- Automated chamber with a mechanical arm for slow ascending and descending.
- The internal inlet and outlet circuits of the chamber effectively promote gas mixing, and the vent design ensures stable atmospheric pressure.
- The system is equipped with a GPS module, WI-FI communication module, and environmental sensors (soil moisture, temperature, and conductivity parameters).

Performance Specifications

Measurement Principle	FTIR Fourier Transform Infrared Spectroscopy	**Analysis Software**	Calcmet (requires Windows 7 or 10 OS)
Gas Measurement Types	Standard: 6 gases (N_2O, CH_4, CO_2, H_2O, CO, NH_3), Maximum: 50 gases	**Data Connection**	USB, Ethernet, Bluetooth, WI-FI

Response Time	Typically <120 s, depending on the gas measured and measurement duration	**Sampling Pump Flow Rate**	2 L/min
Battery	Lithium-ion, single battery lasts 3 hours	**Gas Sampling Filter**	2 μm pore size polytetrafluoroethylene filter
Charging Power Supply	115/230 V AC	**Sampling Gas Inlet/Outlet Fittings**	6 mm quick connectors
Housing	Dimensions: 450×287×166 mm	**Sample Chamber**	Structure: Multi-pass, with a fixed optical path length of 5 m
	Material: ABS PC		Reflecting mirror: Fixed, gold-plated
	Protection Class: IP54 (suitable for field portable equipment)		Volume: 0.5 L
Spectrometer	Resolution: 8 cm^{-1}	**Operating Temperature**	-5 - 40 °C (short-term)
	Frequency: 10 times/s		5 - 30 °C (long-term)
	Detector: Mercury Cadmium Telluride (MCT) photodetector (Peltier cooled)	**Working Temperature**	Ambient temperature (-5 - 40 °C), no condensation
	Beam Splitter Material: Zinc Selenide (ZnSe)	**Zero Drift**	Drift by less than 2% of the measurement range within 24 hours under environmental conditions
	Wavenumber Range: 900 - 4200 cm^{-1}	**Linearity Deviation**	Less than 2% of the measurement range
Weight	9.4 kg (with battery) / 8.0 kg (without battery)	**Temperature Drift**	For every 10 K temperature change, drift by less than 1% of the measurement range (with temperature compensation)
Sampling Gas Pressure	Ambient pressure	**Pressure Effect**	For a 1% change in measurement pressure, the measured value changes by 1% (with pressure compensation)
Measurement Ranges and Detection Limits for Major Greenhouse Gases			
H_2O	0 - 3%; Detection Limit: 0.010 Vol-%	**N_2O**	0 - 50 ppm; Detection Limit: 7 ppb

CO_2	0 - 2000 ppm; Detection Limit: 5 ppm	**NH_3**	0 - 100 ppm; Detection Limit: 70 ppb
CH_4	0 - 100 ppm; Detection Limit: 40 ppb	**CO**	0 - 200 ppm; Detection Limit: 70 ppb

Accompanying Software

Analyzer Control Software

The GT5000 is equipped with powerful Calcmet software that provides operational support for the gas analyzer.The software is user-friendly, requiring no specialized knowledge background, and offers step-by-step operation for easy use and one-click measurement functionality for instant online results.Additionally, the software monitors data quality in real-time through warning prompts and provides five different views to visually display key information.

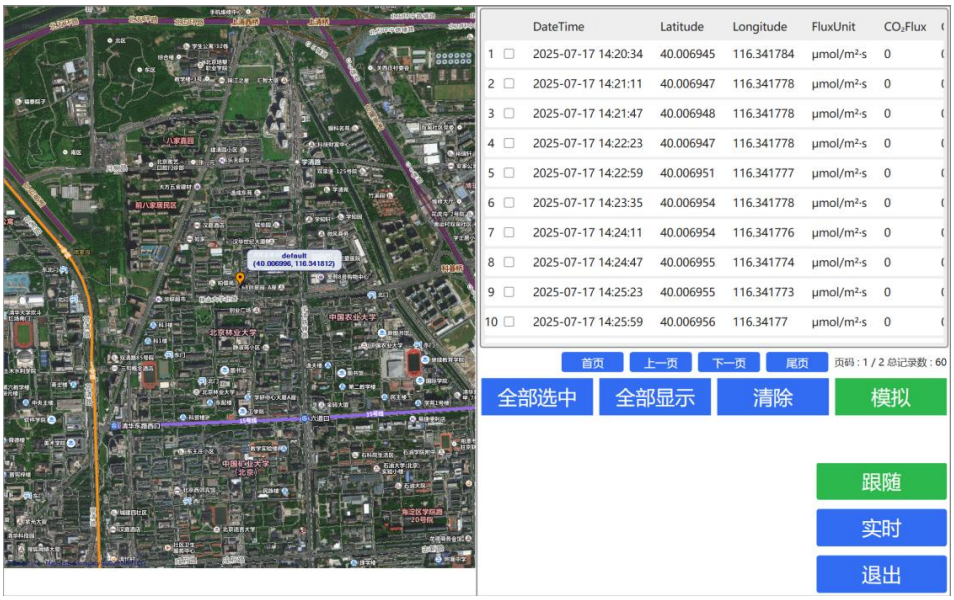
Chamber Flux Control Software

The flux control software features robust real-time data processing and display capabilities. It can perform real-time calculations on collected gas concentration data to accurately generate flux data. The software interface displays real-time gas concentration values, as well as key environmental parameters such as soil temperature, humidity, conductivity, and chamber pressure and temperature.

The software includes a carbon footprint map display module that visually presents the sample point locations on a GPS map along with real-time carbon flux data, enabling users to intuitively grasp the spatial distribution of carbon fluxes. The software supports multi-channel control, allowing independent configuration of each measurement channel. Parameters that can be set include measurement area, height, chamber equilibration time, flux measurement time, and post-measurement evacuation time, meeting diverse measurement needs in various scenarios.

The software is capable of performing in-depth secondary processing on saved raw gas concentration data. It supports batch processing functionality, allowing one-click uniform processing of data from various sample points. Furthermore, the flux calculation system holds software copyright, ensuring its technical independence and

professionalism.



Optional Accessory Chambers

SFC-20 Automatic Soil Flux Chamber

- Covers the soil surface to form a sealed space and periodically collects gas samples from the chamber.
- Equipped with a soil three-parameter sensor and soil ring.
- Wi-Fi connectivity for viewing real-time calculated flux results.
- Designed specifically for field research, it is portable and has a long battery life.

叶室类型	暗室（不锈钢）	**测量面积**	314 cm^2
整体外形尺寸	34×29×40 cm	**腔室体积**	2093 cm^3
重量	约 7.5 kg	**供电**	12 V，内置 5600 mAh 可充电锂电池
测量方式	自动开合，流通式测量	**内置传感器**	气体温度、湿度、压力
通讯方式	Wi-Fi	**外置传感器**	土壤水分、温度、电导率

WSF-20 Walking Water Flux Chamber

- Designed for walking surveys with multi-point (patrol measurement).
- Circular float design for floating on water surfaces and resisting water flow.
- Lightweight, high buoyancy, sturdy, and impact-resistant.
- Easy installation and flexible combination, with a non-slip design on top for safety and stability.
- Resistant to freezing, UV rays, gasoline, oil, acids, alkalis, and environmentally friendly.
- Buoy ring dimensions: Inner diameter 320 mm, outer diameter 720 mm, height 220 mm

SNC-50 Community Static Photosynthesis Box - Ecosystem Net Exchange (NEE) Measurement

- Control unit includes rechargeable lithium battery, WI-FI communication module, GPS module, air temperature and humidity sensor, soil sensor, mixing fan, and power interface.
- High transparent acrylic material, customizable shape and size, with built-in gas mixing fan.

- Cooperates with flux calculation software to directly display and save NEE measurement results.
- Can measure the net photosynthetic rate of individual plants or communities (e.g., shrubs and grasses).

External Dimensions	50×50×50 cm(customizable shape and size)	**Communication Mode**	Wi-Fi
Chamber Volume	125000 cm^3	**Power Supply**	12 V, with built-in 5600 mAh rechargeable lithium battery
Material	Acrylic, transparent or non-transparent	**External Sensors**	Soil moisture, temperature, electrical conductivity

Automatic Opening/Closing Static Chamber

- Automatically controls the opening and closing of the chamber to meet long-term continuous NEE measurement needs.
- The flux calculation software can set the opening and closing times and cycles of the automatic chamber.
- Fully open convection design allows full exchange with ambient gas when the chamber is open.
- Solar-powered for long-term field use.

Chamber Style	Transparent/Non-transparent	**Control Method**	Master Controller Control
Chamber Dimensions	50×50×40 cm	**Power Supply**	12 V
Chamber Weight	Approx. 15 kg	**Chamber Volume**	100000 cm^3
Chamber Operating Mode	Controllable automatic rotation opening/closing (upper window 90°, side window 45°)	**Chamber Measurement Area**	2500 cm^2
Drive Method	Electric push rod	**Temperature Monitoring Range**	-40℃ - 85 ℃
Material	Aluminum alloy, imported transparent PC board	**Sealing Method**	Sealing strip sealing

SMC Intelligent Multi-Channel Control System

- Multi-channel monitoring: Can simultaneously connect multiple measurement chambers for long-term,

continuous monitoring of soil greenhouse gas fluxes in multiple locations.

- Flexible connectivity: Can flexibly connect to various gas analyzers.
- Long-term unattended monitoring: Precise, automatic, and repetitive measurements without the need for field attendance.

Number of Channels	4-36 channels optional	**Sampling Flow Rate**	Standard 1 L/min, adjustable
Operation Mode	Touch screen	**Operating Environment**	-20 ~ 50 °C, <99% RH, no condensation
Data Calculation	Flux, respiration rate	**Power Supply**	12 VDC
Optional Modules	Can add other gas measurement modules, soil temperature and humidity sensors, 4G transmission modules, GPS modules, etc.		
Communication Method	The main control board reserves multiple data transmission channels. Additional accessories and sensors can be added according to customer requirements, and the software is independently developed to synchronously integrate data from the added relevant sensors. It can also be equipped with soil respiration chambers and canopy flux boxes for soil interface observation research, realizing a multi-dimensional trace gas monitoring system with interface emission capabilities.		

SFL-20 Long-Term Soil Respiration Chamber

- Special dynamic pressure balancing design to better simulate real-world conditions.
- Capable of long-term, continuous operation.
- Compact, lightweight, and easy to carry.
- Curved design for good waterproof and dustproof effects, suitable for field measurements.

Soil Respiration Chamber Type	Transparent (Acrylic)/Non-transparent (Aluminum Alloy)	**Power Supply**	12 V
Overall Dimensions	530×351×208 mm（L×W×H）	**Measurement Area**	314 cm^2
Chamber Volume	2093 cm^3	**Measurement Volume**	4188 cm^3
Control Method	Master Controller Control	**Working Mode**	Controllable automatic opening/closing, dynamic pressure balance flow-through measurement

Underground Profile Gas Sampling Device

- Technology Principle: Semi-permeable membrane gas sampling technology.
- Dimensions: 500 mm (L) × 6 (customizable).
- Material: Semi-permeable membrane, aluminum alloy bracket.
- Control Method: Main control unit.
- Sensor: Temperature sensor.