XC RESPIROMETER - APPLICATIONS

Precision instrument that turns measurements into insight

XC Respirometer specifications

- Measuring microbial activity in solid & liquid samples
- Aerobic or anaerobic respirometry
- Suitable for screening and R&D measurements
- Modular & multi-channel system: 6 / 12 channels, etc.
- Measurements of O_2, CO_2, temperature, flow, pressure and humidity
- User-friendly software with Excel data export
- Plug & Play design
- Tabletop controller with optional accessories (reaction vessels, water baths, thermostatic chambers, etc)
- Interface: Wi-Fi, USB, Ethernet
- Remote connection to the integrated computer
- Unlimited number of XC respirometers connected from different locations
- Digital integration of various components (e.g., pH meters, additional gas sensors CH_4, H_2, H_2S, etc.)
- **Suitable for applications in:**
  Biology, Microbiology, Environmental, Agriculture, Food & Beverage, Pharmaceutical, Animal respirometry, etc.

Wastewaters & environmental monitoring

Using ECHO Instruments Respirometers, microbial respiration in activated sludge can be monitored in real time by measuring O_2 consumption and CO_2 production. This enables rapid assessment of biological activity, nutrient limitation, and toxic effects, supporting wastewater treatment research and process optimization.

Experimental applications

- Effect of nutrient addition on activated sludge activity
- Effects of inhibitory and toxic compounds on bacterial respiration in wastewater (sewage) treatment plants.
- Measuring biodegradation of test substances in activated sludge

These measurements help understand microbial respiration and detect inhibition or toxicity, providing valuable insight for wastewater treatment performance, environmental safety, and method development.

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Marine biochemical processes

XC enables direct, flow-through measurement of biological O_2 and CO_2 fluxes in seawater, freshwater and surface samples. This allows accurate quantification of respiration, primary production, and net metabolic balance under continuous conditions, avoiding artifacts associated with closed incubations. The system enables realistic simulation of environmental parameters such as temperature, water chemistry (e.g. pH changes), and biological variability (e.g. nutrient availability). As well it enables continuous control and monitoring of headspace airflow and controlled mixing without sediment interference.

Experimental applications

- Carbon cycle response to nutrient enrichment
- Metabolic balance in macroalgae cultivation
- CO_2 uptake vs. release under altered water chemistry
- Microbial activity in marine or freshwater sediments
- Temperature sensitivity of marine respiration
- Biodegradation of polymers in water & sediments
- Toxicity measurements

Biodegradation measurements

Using ECHO Respirometers, the biodegradation of materials can be quantified by measuring microbial respiration (CO_2 production and O_2 consumption) in natural water, sediment, compost and soil matrices. This enables direct assessment of biodegradation rates, lag phases, and overall mineralization, under realistic environmental conditions and within mixed microbial communities.

Applicable norms:
ISO 14855, ISO 17556, ASTM D6691, ISO 19679, ISO 22403, ISO 22404, ISO 14852, OECD 301B, and many more.

Experimental applications

- Aquatic biodegradation of polymers (glucose, PHA, PHB, etc.)
- Biodegradation of various polymers in soil
- Long-term biodegradation monitoring in compost
- Biodegradation rates and disintegration under natural conditions
- ^{13}C isotope-based mineralization measurements

Such experiments support simple and scalable biodegradation testing in aquatic and terrestrial environments, aligned with ISO / ASTM / OECD biodegradation testing procedures and guidelines.

Plant and Algae respiration

ECHO Instruments Respirometers enable continuous monitoring of plant or algal respiration by measuring CO_2 and O_2 dynamics over time. This allows quantification of daily metabolic cycles, growth-related changes, and physiological responses to light and nutrient availability.

Experimental applications

- Daily respiration cycles in plants
- Algal growth monitoring and respiration cycles
- Effects of natural or synthetic pesticides and herbicides on plant respiration
- Respiratory responses of genetically modified (GM) plants to environmental stress
- Fungal cultivation and respiration monitoring

Fermentation monitoring

Monitoring fermentation activity using a real-time CO_2 signal enables quantitative comparison of lag phase, fermentation rate, and total metabolic output. This allows sensitive detection of process differences driven by mixing, inoculum level, substrate composition, and matrix effects, under aerobic or anaerobic conditions.

Experimental applications

- Milk fermentation kinetics
- Effect of mixing on fermentation dynamics
- Pasteurization process control through fermentation activity monitoring
- Detection of microbial contamination in milk and dairy products
- Measurements of activity of various yeasts
- Alcoholic fermentation in grape juice

Animal and Insect respiration

Using the XC Respirometer, respiration rates of individual insects or small animals can be measured continuously and non-invasively. The system enables high-resolution monitoring of metabolic activity under controlled environmental conditions, making it suitable for both research and teaching applications, even with very small organisms.

Experimental applications

- Effects of environmental factors on insect respiration
- Respiration across life stages
- Dietary suitability and digestibility testing

Quantify metabolism, physiological stress, development, and environmental responses in insects or small animals, supporting applications in animal physiology, ecology, education, and R&D screening.

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Respirometry software

ADVANCED PROCESS CONTROL SOFTWARE FOR RELIABLE RESPIROMETRY ANALYSIS WITH DATA ACQUISITION, CHARTS, STATISTICS AND DATA EXPORT

SOFTWARE ENABLES THE CO-CREATION OF AI-DRIVEN ANALYTICAL TOOLS, ALLOWING CLIENTS TO TAILOR MACHINE-LEARNING ALGORITHMS TO THEIR SPECIFIC RESPIROMETRY PROFILES.

Respirometer accessories

XC Respirometer can be equipped with various vessels, with or without agitation, as well as water baths, compressors, thermostatic chambers, CO_2 scrubbers and many other accessories.

Downloadable content

www

Catalogue

Video-Aquatic

Video-Algae

Video-Soil