

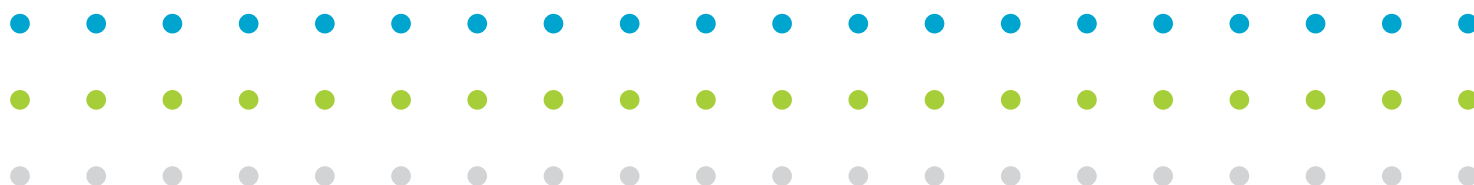


ECHO  
INSTRUMENTS



ECHO  
INSTRUMENTS

RESPIROMETRY SYSTEMS



[WWW.ECHOINSTRUMENTS.EU](http://WWW.ECHOINSTRUMENTS.EU)

# INSTRUMENTS FOR BIODEGRADATION MEASUREMENTS

SOLID / LIQUID / AEROBIC / ANAEROBIC

Respirometer is a device that measures respiration of living organisms. Respirometer determines aerobic or anaerobic biodegradability of solid, liquid and algae samples in various applications. The system measures O<sub>2</sub> and CO<sub>2</sub> concentration in flow through the sample under controlled conditions. Flow, temperature, pressure, humidity are also measured continuously. Software automatically calculates **CO<sub>2</sub> production** and **biodegradation %**. Additional gases can also be measured.



12 channel Respirometer

## Applications

- **ISO 14855-1, ASTM D 5338**; Aerobic biodegradability of plastics in compost;
- **ISO 14852**; Biodegradability of plastics in aqueous medium;
- **ISO 17556**; Biodegradability of plastic materials in soil;
- **ASTM D6691**; Marine degradation, **OECD 301 B**, etc;
- Sea and lake sediment biodegradability tests;
- Sludge measurements;
- Organic waste biodegradation measurements;
- Insects and small animals respirometry;
- Food respiration, R&D in plastics, biotechnology, ecology, pharmacy, packaging, etc;
- **<sup>13</sup>C Isotope** measurements (with additional  $\delta^{13}\text{C}$  analyzer).

## Advantages

- Modular design (upgradable);
- On-line biodegradation measurements;
- Plug & Play system;
- Aerobic or anaerobic measurements;
- 12 / 24 / 36 / 48 / 60 channel systems;
- Laboratory or industrial use;
- MFC (mass flow controller) for each channel;
- Various flow configurations;
- Flow leakage alarm;
- Automatic humidification;
- Multitube cable connections;
- Customizable;
- O<sub>2</sub> and CO<sub>2</sub> sensors installed;
- Optional sensors: CH<sub>4</sub>, H<sub>2</sub>S, H<sub>2</sub>, NH<sub>3</sub>;
- Temperature range +3...+70 °C;
- Air source (compressor) included;
- Internal air supply connection;
- Various sizes of vessels;
- Vessels with illumination;
- No special connections required;
- Remote control software;
- Data export in MS Excel;
- Calculation of CO<sub>2</sub> production;
- Calculation of biodegradation %.

# Technical specifications

## ● Dimensions – Control units:

- 12 channel respirometer: 60 × 60 × 60 cm;
- 24 channel respirometer: 60 × 60 × 120 cm;
- 36, 48 & 60 channel respirometer: 60 × 60 × 200 cm;

## ● Dimensions – Thermostatic chambers:

- 12 channel respirometer: 60 × 60 × 150 cm;
- 24 channel respirometer: 80 × 80 × 200 cm;
- 36 channel respirometer: 150 × 86 × 200 cm;
- 48 & 60 channel respirometer: 150 × 86 × 200 cm (2x);

- O<sub>2</sub> and CO<sub>2</sub> sensors (additional sensors on request);

- MFC ±1.5 % full-scale: 0–200 mL/min, 0–500 mL/min or 0–1000 mL/min;
- Connecting multicore cables;
- Vessels for solid samples: 2.8 L;
- Vessels for liquid samples: 250–1000 mL;
- Vessels for algae samples (controlled LED lighting): 1000 mL.



60 channel Respirometer



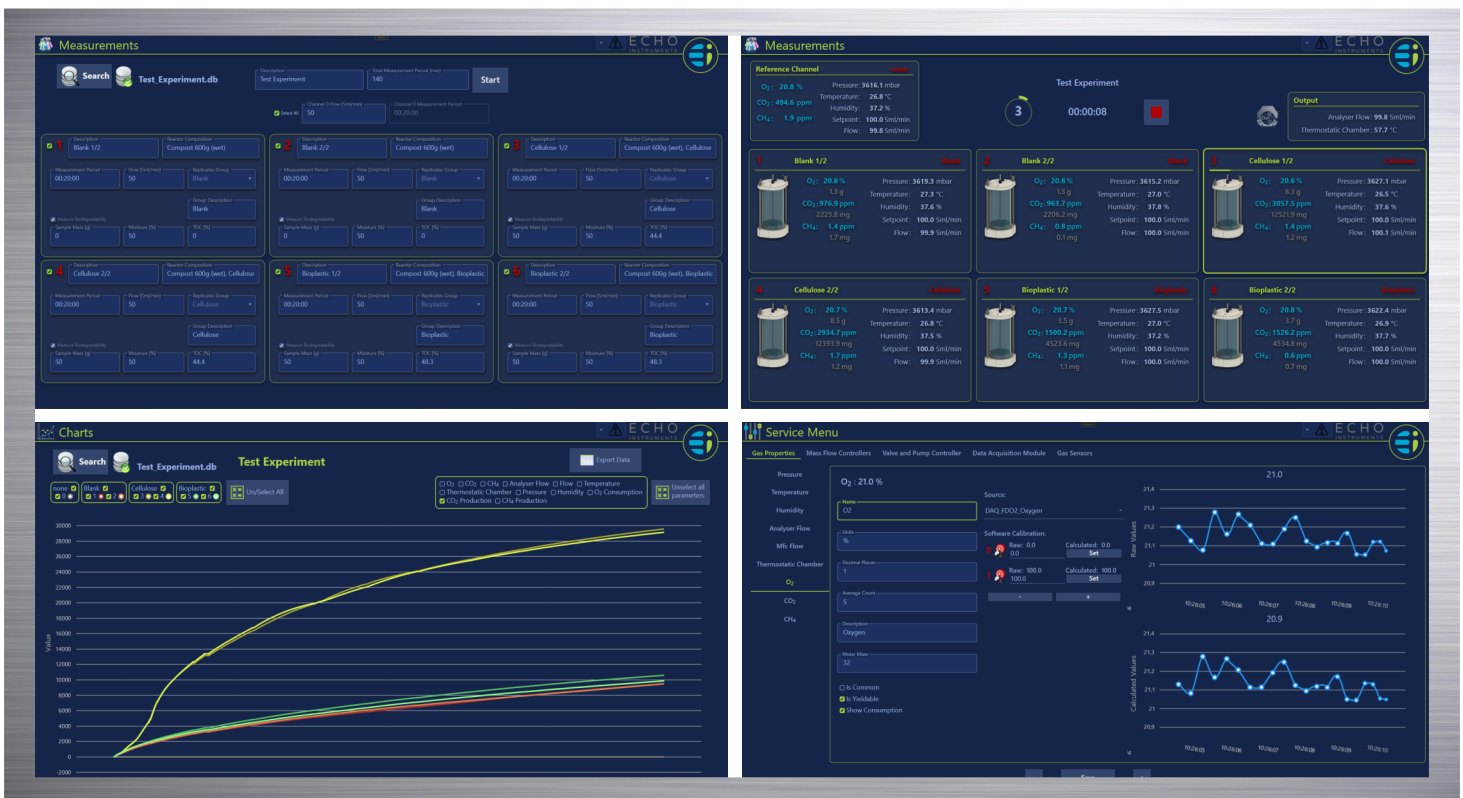
Vessel for solid samples



Vessel for liquid samples

Vessels

## ECHO Instruments ER respirometer software



# COMPACT – MODULAR XC RESPIROMETER

FOR SCREENING AND R&D MEASUREMENTS

COMPACT XC RESPIROMETER FOR SCREENING AND R&D MEASUREMENTS,  
CONNECTED TO EXISTING HARDWARE OR AS A COMPLETE SETUP

## Features

- **STAND-ALONE CONTROLLER** for connection to existing hardware (vessels, cabinets, etc);
- **COMPLETE SETUP** with vessels, thermostatic cabinet, air source, PC, etc;
- **SUITABLE FOR R&D TESTS, SCREENING and RAPID TESTS;**
- **MODULAR DESIGN & UPGRADABLE;**
- **NEW** Software with additional features;
- Different mixing options.

Vessels



Solid samples



Liquid samples

Compressor – AP03



CO<sub>2</sub> Scrubber



Complete setup XC Respiriometer



# Advantages

- Multi-channel system: 6 / 12 / 18 / 24 / 36, etc;
- Plug & Play design (easy to install, use and maintain);
- Suitable for screening and R&D measurements;
- O<sub>2</sub>, CO<sub>2</sub>, temperature, flow, pressure, humidity measurements;
- Various sizes of vessels;
- Remote desktop control;
- Various ranges of gas sensors;
- User-friendly software with MS Excel export;

# Modularity

XC RESPIROMETER CAN BE CONNECTED TO VARIOUS LABORATORY EQUIPMENT & BIOREACTORS. CONFIGURATION OF MULTIPLE UNITS IS POSSIBLE WITH ONE SOFTWARE. MEASUREMENTS DATA BASE CAN BE SYNCHRONIZED TO ANY CLOUD OR BACKUP SERVICE.



XC + Thermostatic cabinet



XC + Vessels



XC + Water bath

# ECHO Instruments XC respirometer software



# $^{13}\text{C}$ ISOTOPE MEASUREMENTS WITH ER RESPIROMETER

## ER RESPIROMETER + $\delta^{13}\text{C}$ ISOTOPE ANALYZER

CONNECT  $\delta^{13}\text{C}$  ISOTOPE ANALYZER TO ER RESPIROMETER FOR PRECISE ON-LINE BIODEGRADATION MEASUREMENTS

### Features



ER Respiriometer



$\delta^{13}\text{C}$  isotope analyzer, e.g. 1



$\delta^{13}\text{C}$  isotope analyzer, e.g. 2

- **MEASURING  $\delta^{13}\text{C}$  ISOTOPE ON-LINE;**
- Software integration between analyzers;
- Biodegradation in compost;
- Biodegradation in soil;
- Biodegradation in marine waters;
- Biodegradation in fresh waters;
- Biodegradation in waste waters;
- Biodegradation in sediments;
- Biodegradation in algae environment;
- **Certification** measurements;
- Modular and upgradable;
- Suitable for various applications;
- Customizable.

# RESPIROMETERS STANDARDS AND APPLICATIONS

## Applications

- Biodegradation in compost;
- Biodegradation in soil;
- Biodegradation in marine waters;
- Biodegradation in fresh waters;
- Biodegradation in waste waters;
- Biodegradation in sediments;
- Biodegradation in activated sludge;
- Biodegradation in algae environment;
- Measuring  $\delta^{13}\text{C}$  Isotope ON-LINE;
- Organic waste biodegradation measurements;
- Insects and small animals respirometry;
- Food respiration, R&D in plastics, biotechnology,
- Aerobic and anaerobic conditions;
- And many more.

## Standards

- **ISO 14855-1 & ASTM D5338;** Determination of the ultimate aerobic biodegradability of plastic materials under controlled composting conditions;
- **ISO 17556:2019;** Determination of the ultimate aerobic biodegradability of plastic materials in soil by measuring the oxygen demand in a respirometer or the amount of carbon dioxide evolved;
- **ISO 14852:2021;** Determination of the ultimate aerobic biodegradability of plastic materials in an aqueous medium. Method by analysis of evolved carbon dioxide;
- **ISO 16929:2021;** Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test;
- **ASTM D6691-17;** Standard Test Method for Determining Aerobic Biodegradation of Plastic Materials in the Marine Environment by a Defined Microbial Consortium or Natural Sea Water Inoculum;
- **OECD 301B;** Biodegradability of the material by evaluating the production of  $\text{CO}_2$  over a minimum of 28 days in a liquid environment;
- **ISO 23977, ISO 18830, ISO 19679, ISO 22403, ISO 22404** and many more.

# PLASTIC DISINTEGRATION RESPIROMETER – DT

## DISINTEGRATION PILOT SCALE TESTS

DETERMINATION OF THE DEGREE OF DISINTEGRATION OF PLASTIC MATERIALS UNDER DEFINED COMPOSTING CONDITIONS IN A PILOT-SCALE TEST

### Principles

The biological treatment of biodegradable plastic materials includes aerobic composting in well-operated, municipal or industrial biological waste treatment facilities. Determining the degree of disintegration of plastic materials in a pilot-scale plant is an important step within a test scheme to evaluate the industrial compostability of such materials.

The disintegration test is performed under defined and standardized composting conditions on a pilot-scale level.

The test material is mixed with fresh bio waste in a precise concentration and introduced into a defined composting environment. A natural ubiquitous microbial population starts the composting process spontaneously and the temperature increases. The composting mass is regularly turned over and mixed. Temperature and  $O_2$  concentration are regularly monitored.

### Applications

- **ISO 16929**; Plastics — Determination of the degree of disintegration of plastic materials under defined composting conditions in a pilot-scale test



DT Respiriometer



## Advantages

- Single or multi-channel system: 1 / 3 / 6 / 12;
- Plug & Play design (easy to install, use and maintain);
- Integrated PC in the control unit;
- Cooling system for each reactor;
- Temperature, flow, measurements;
- Sensor O<sub>2</sub>: Range 0–25 %, Accuracy: 2 %;
- Various sizes of vessels;
- Remote desktop control;
- Air pump – compressor;
- User-friendly software with excel export files.

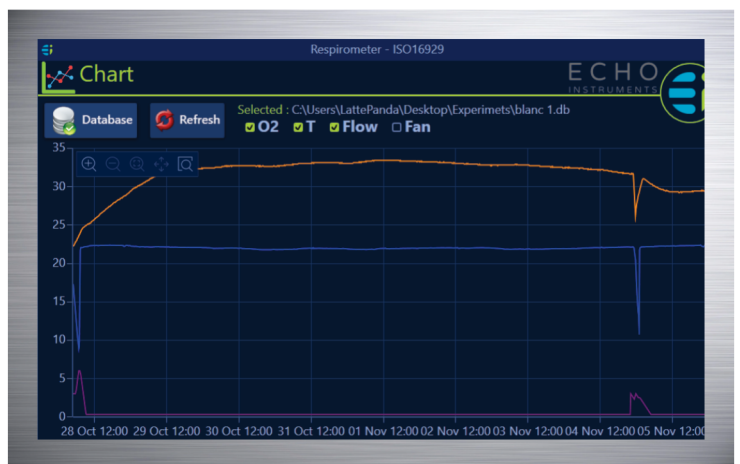
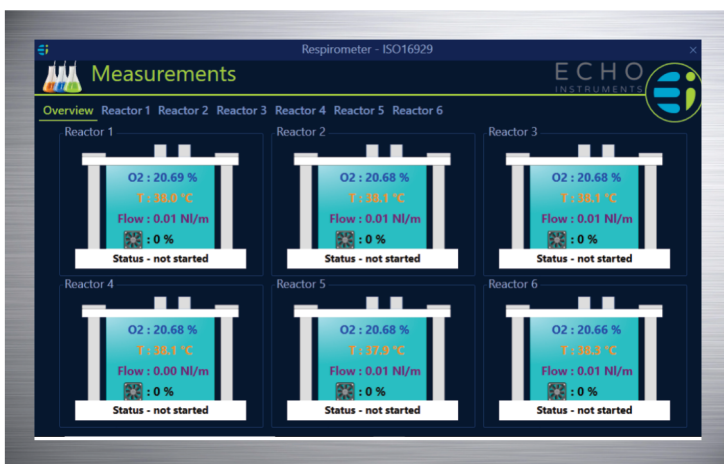


Bioreactor 64 L

## Technical specifications

- Dimensions – Control unit: 39 × 49 × 20 cm;
- Volume of vessels: 35 L, 64 L, 140 L, etc;

## ECHO Instruments DT respirometer software



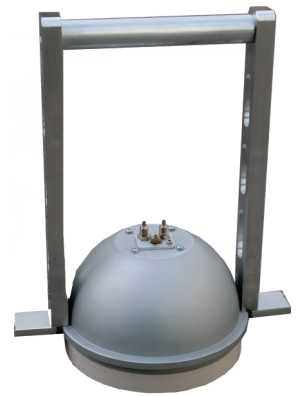
# CO<sub>2</sub> FLUX MEASUREMENTS

## PORTABLE AND AUTOMATIC SOIL FLUX ANALYZERS

Portable and automatic Soil flux devices are ideal for simultaneous measurements of gas flux CO<sub>2</sub>, O<sub>2</sub>, CH<sub>4</sub>, Radon, H<sub>2</sub>, H<sub>2</sub>S, SO<sub>2</sub>, VOC, Hydrocarbons, etc. over a wide dynamic range on various surfaces. Devices are suitable for measurements in the fields, forests, landfills and other areas.



Portable Soil Flux



### Principles

Various gas sensors measure the gas concentration inside the measuring head. Software calculates the flux directly on-site. Accurate GPS module determines the exact location of the measurements.

### Applications

- Flux CO<sub>2</sub> from soil;
- Flux CO<sub>2</sub> from compost;
- Flux CO<sub>2</sub> from landfills;
- Identifying ground and underground spills – pollution in ecological disasters;
- Agronomy;
- Post-fire ground activity;
- Uranium mines mapping;
- Carbon fingerprint & greenhouse gases;
- Gas presence on playground areas.



Automatic Soil Flux

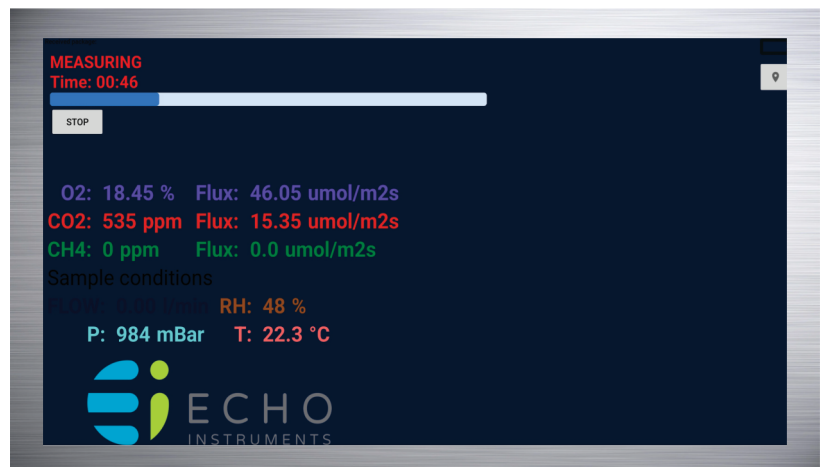
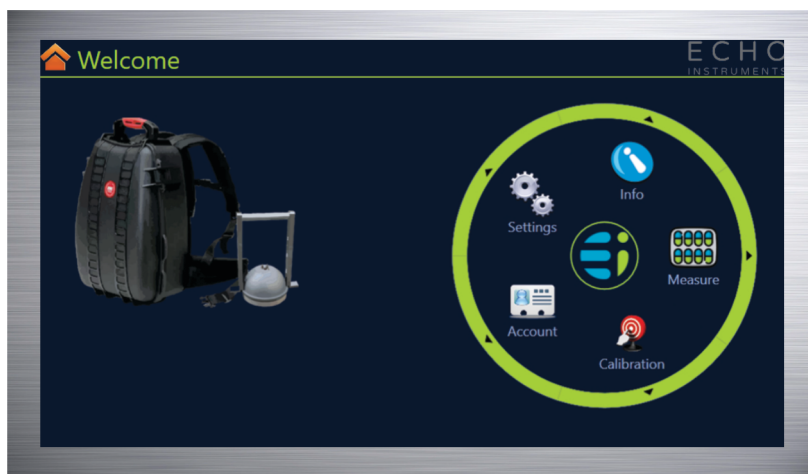
## Advantages

- Portable or stationary (automatic);
- Map location (inbuilt GPS module);
- Up to 5 different gas sensors with different ranges;
- Operation via tablet, mobile phone or PC.

## Technical specifications

- Operating conditions; Portable version: +5...+40 °C < 90 % RH, non-condensing;
- Operating conditions automatic: +10...+40 °C < 90 % RH, non-condensing;
- Storage conditions: +20...+40 °C < 90 % RH, non-condensing;
- Power supply: Li-ion battery;
- Gas sensors: O<sub>2</sub>, CO<sub>2</sub>, CH<sub>4</sub>, VOC, H<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, Rn, etc;
- Automatic system: 4 / 8 channels.

## ECHO Instruments Soil Flux software





# ECHO INSTRUMENTS

Zeče 25  
3210 Slovenske Konjice  
Slovenia, EU

Phone: +386 (0)3 759 23 80  
Email: [info@echoinstruments.eu](mailto:info@echoinstruments.eu)

