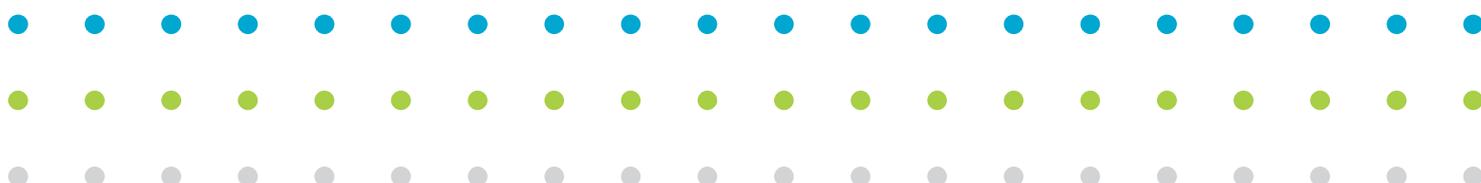


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PRODUCT CATALOGUE



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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 O₂ and CO₂ concentration in flow through the sample under controlled conditions. Flow, temperature, pressure, humidity are also measured continuously. Software automatically calculates **CO₂ production** and **biodegradation %**. Additional gases can also be measured.

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;
- **¹³C Isotope** measurements (with additional **δ¹³C** analyzer).

- 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;

- O₂ and CO₂ sensors installed;
- Optional sensors: CH₄, H₂S, H₂, NH₃;
- 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 CO₂ production;
- Calculation of biodegradation %.

Advantages



12 channel Respirometer

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);

- O₂ and CO₂ sensors (additional sensors on request);

- MFC $\pm 1.5\%$ 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



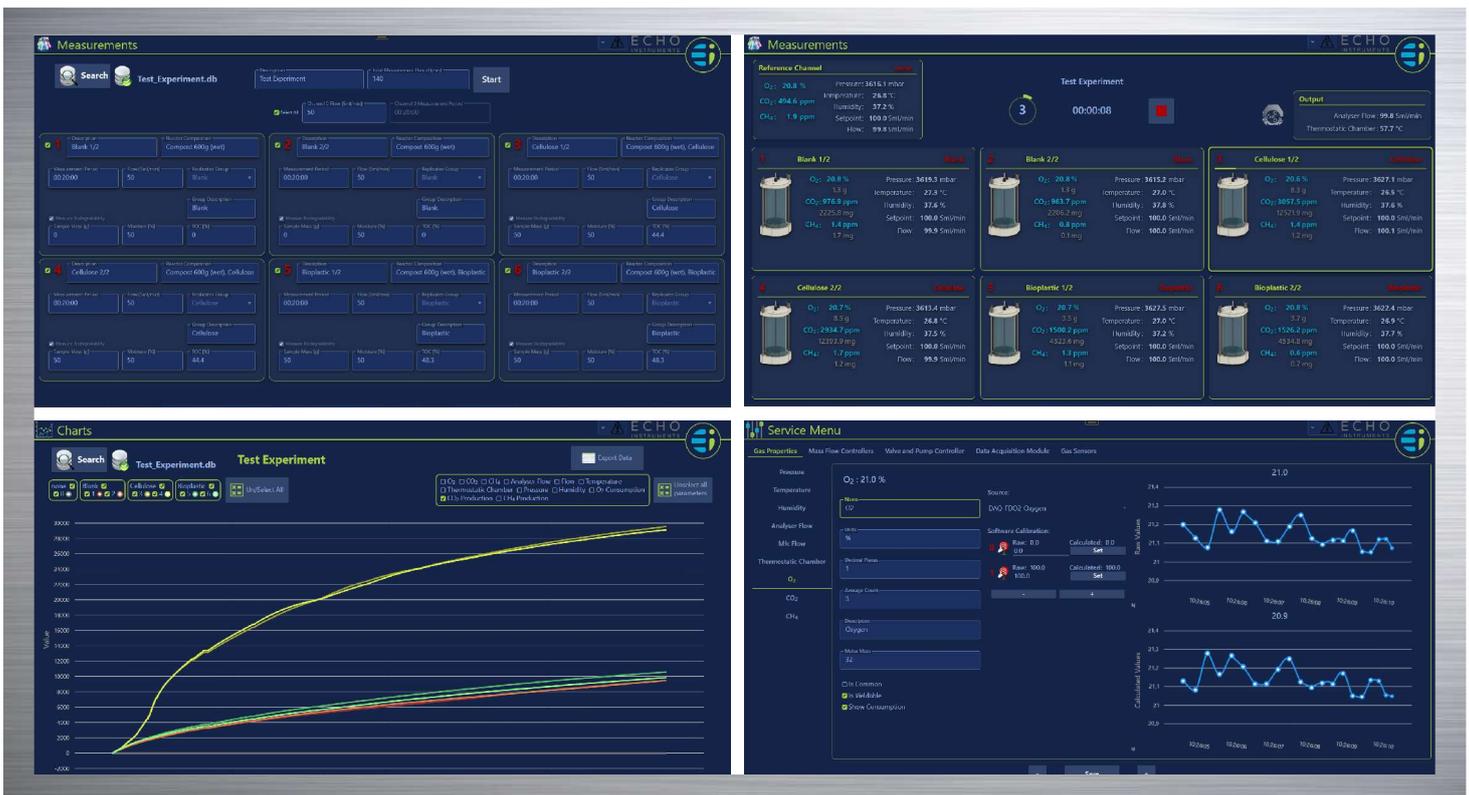
Vessel for solid samples



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



CO₂ Scrubber



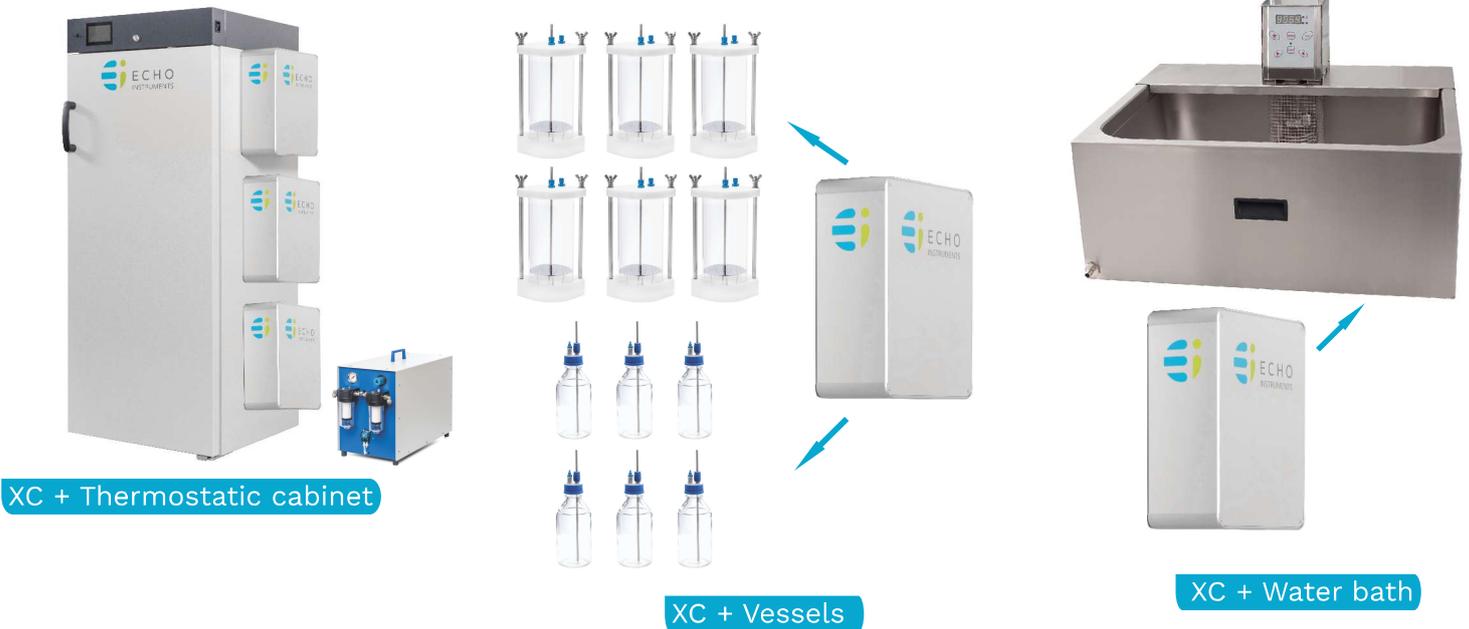
Complete setup XC Respiriometer

Advantages

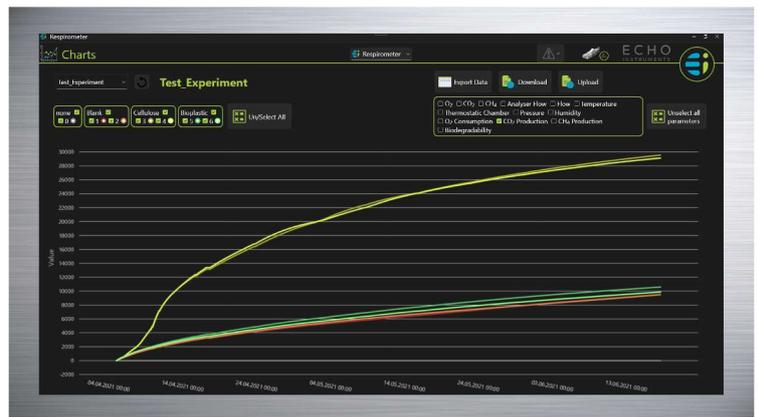
- Multi-channel system: 6 / 12 / 18 / 24 / 36, etc;
- Plug & Play design (easy to install, use and maintain);
- Suitable for screening and R&D measurements;
- O₂, CO₂, temperature, flow, pressure, humidity measurements;
- Various sizes of vessels;
- Remote desktop control;
- Various ranges of gas sensors;
- 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.



ECHO Instruments XC respirometer software



¹³C 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 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 O₂ 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 O₂: Range 0–25 %, Accuracy: 2 %;
- Various sizes of vessels;
- Remote desktop control;
- Air pump – compressor;
- User-friendly software with excel export files.

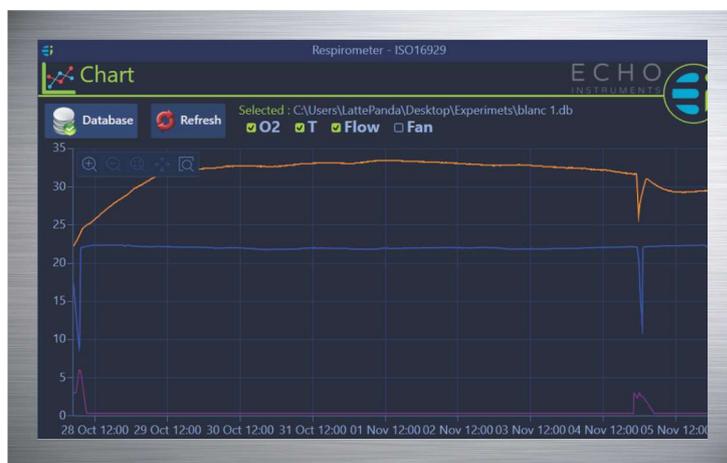
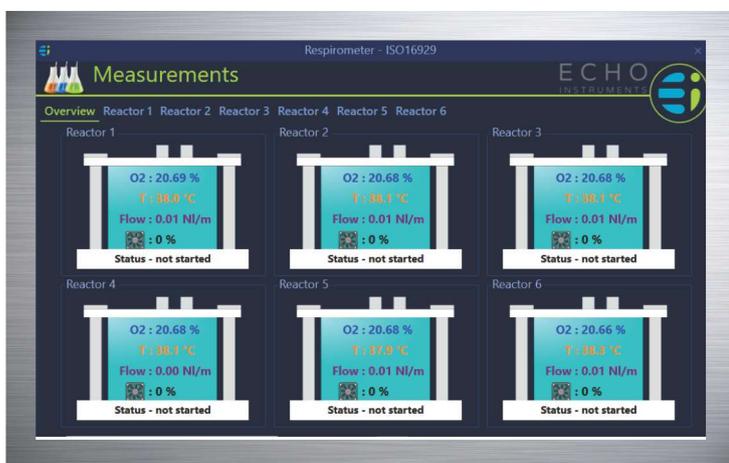


Bioreactor 64 L

Technical specifications

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

ECHO Instruments DT respirometer software



DYNAMIC RESPIRATION INDEX RESPIROMETER – DRI

WASTE DEGRADATION TESTS

Principles

DRI Respirometer measures O_2 to determine the activity of microorganisms in degradable organic matter under defined continuous airflow and adiabatic conditions. The samples are measured in hermetically sealed vessels (adiabatic), which create controlled conditions determined by EU and other norms.



Multi-channel DRI Respirometer

Applications

- **UNI 11184**; Determination of biological stability by DRI;
- **EN 15590**; Determination of the current rate of aerobic microbial activity using DRI;
- Other applications for waste degradation.

Advantages

- Single or multi-channel system: 1 / 3 / 6 / 12;
- Plug & Play design (easy to install, use and maintain);
- Temperature sensor in each vessel;
- Automatic condensate removal system;
- Temperature, flow, pressure, humidity measurements;
- Sensor O_2 : Range 0–25 %, Accuracy: 2 %;
- Various sizes of vessels: 2 L, 10 L, 20 L, 30 L;
- User-friendly software with MS Excel export files;
- Remote desktop control;
- Air source (compressor) included;
- No special connections required;
- Suitable for various applications in different fields;
- Rack (stand) for vessels, control unit and PC.

Technical specifications

- **Dimensions – Control unit for 3 & 6 channels:**
 - 48 × 40 × 28 cm; Weight: 17 kg;
- **Dimensions – Rack for vessels:**
 - 140 × 60 × 150 cm; Weight: 50 kg;
- **Dimensions – 10 L vessel:**
 - 42 × 42 × 45 cm; Weight: 9 kg;
- **Dimensions – 2 L vessel:**
 - 33 × 33 × 28 cm; Weight: 5.5 kg;
- **Dimensions – 30 L vessel:**
 - 50 × 50 × 55 cm; Weight: 24 kg.



1 channel DRI Respirometer



Adiabatic vessel 30 L



Adiabatic vessels 2 & 10 L

ECHO Instruments DRI respirometer software



PORTABLE OXYGEN ANALYZERS IN MAP PACKAGING

HAND O2 & FOOD O2

FOR MAP PACKAGING IN PHARMACEUTICAL AND FOOD & BEVERAGE INDUSTRY

Hand O2 & Food O2 devices are used for determination of oxygen concentration in headspace in various MAP packaging (MAP – modified atmosphere packaging). Micro-invasive measurements are enabled by optical sensor tips smaller than 140 μm . Devices are compliant with pharmaceutical standards and **21 CFR Part 11**.

Principles

Optical sensors with optical transmitter combined with intelligent software instantly measure the O_2 concentration in very small headspaces.

Applications

- Pharmaceutical: O_2 concentration in blisters, vials, tubes, patches, sealed bags, etc;
- Food & Beverage: O_2 concentration in coffee, meat, dairy products, all MAP packaging;
- Science: Biotechnology, Micro-respirometry, marine research, R & D.



Advantages

- Measurements in gas or liquid phase;
- No sample extraction;
- High accuracy;
- No O₂ consumption during measurements;
- Salinity factor input for different salinity samples in vials;
- IQ & OQ documentation;
- Sterilizable sensors;
- Calibration is fast and can be performed by the user;
- Battery or regular power supply;
- Measuring range: 0–25 % or 0–100 % O₂;
- Accuracy: ±0.4 % at 20.9 % O₂ or ±0.05 % at 0.2 % O₂;
- Temperature measurement range: 0–50 °C;
- Response time (t₉₀) < 15 sec;
- Calibration: 2-point calibration using nitrogen and synthetic air;
- Dimensions: 180 × 90 × 270 mm, Weight: 1 kg;
- Interface: USB, RS485, Ethernet;
- Needles Ø: 0.4 mm, 0.8 mm.

ECHO Instruments HAND O2 & FOOD O2 software

Measurements :

O2: 20.19 % O2[avg]: 14.13 %
O2: 8.432 mg/l O2[avg]: 5.90 mg/l
T: 19.98 °C p: 979 mBar

Data logging: ON OFF
 Location: USB SD card
 File name: 06062022Log
 Interval: 1 min sec
 Salinity: 0 ppt

Secondary units:
 hPa Torr Air saturation %
 mg/l ppm µmol/l
 10 : measurements average

Status : Select next position

No.2 O2: 0.0 %	No.4 O2: 4.6 %	No.6 O2: 0.0 %	No.8 O2: 0.0 %	No.10 O2: 0.0 %
No.1 O2: 7.6 %	No.3 O2: 0.0 %	No.5 O2: 0.0 %	No.7 O2: 0.0 %	No.9 O2: 0.0 %

O2 : 0.00
T : 20.0°C

Next blister
Print report
Exit

Status : Measurements in vial 1 in liquid are finished

Vial	O2 Current	O2[vial] Average
Headspace O2: 0.0 %	0.0 %	0.0 %
Liquid O2: 0.001 ppm	0.001 ppm	0.001 ppm

O2:0.00 % O2:0.001 mg/l
T:20.2°C p:989mBar

Next
Finish

Status : Measurements in tube 1 are finished

Tube	O2 Current	O2[tube] Average
O2: 0.0 %	0.0 %	0.0 %

O2:0.02 % O2:0.010 mg/l
T:20.2°C p:988mBar

Next
Finish

AUTOMATIC OXYGEN ANALYZER FOR BLISTERS

AUTOMATIC O₂ ANALYZER B-O2

FOR MAP PACKAGING IN PHARMACEUTICAL AND FOOD & BEVERAGE APPLICATIONS

B-O2: Fully automatic optical O₂ analyzer for determination of oxygen concentration in blister packs and other MAP packaging for pharmaceutical industry in quality control and production lines. The analyzer can analyze 1-6 blisters at once, with up to 72 measuring points in one serial measurement. Device is compliant to pharmaceutical standard, **21 CFR Part 11** and Industry 4.0.

Applications

Applications B-O2

- O₂ concentration in blister packs. Measuring 1-6 blisters at once, with up to 72 measuring points in one serial measurement.



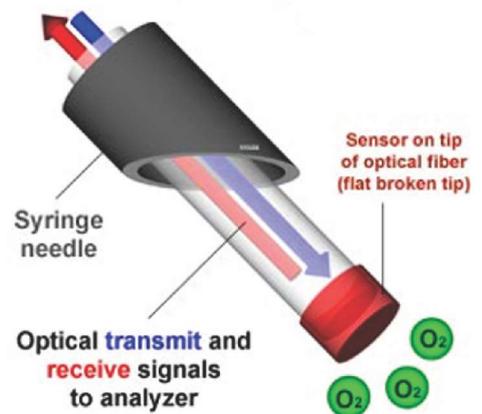
Principles

Optical sensors with optical transmitter installed combined with intelligent software instantly measure the O₂ concentration in very small headspaces.

Devices provide reliable, accurate and reproducible analysis that eliminates the possibility of human errors. The measuring procedure is simple, fast and efficient. The user interface is designed for easy operation. The operator selects the required type of analysis, i.e. single point analysis or serial measurements. Statistical analysis report is automatically generated by the software, compliant to **21 CFR Part 11**. Special designed cartridges enable fast and precise measurements of different types of blisters.

Advantages

- Measurements in headspace;
- No sample extraction;
- High accuracy;
- No O₂ consumption during measurements;
- Automatic calibration;
- **IQ & OQ** documentation;
- **21 CFR Part 11 compliant**;



Optical O₂ sensor

Technical specifications

- Needles Ø: 0.4 mm, 0.8 mm;
- Measuring range: 0–25 % O₂;
- Accuracy: ±0.1 % O₂;
- Limit of detection: 0.1 % O₂;
- Operating temperature range: 5–40 °C;
- High precision positioning: < 0.02 mm;
- Interface: USB, RS485, Ethernet.

ECHO Instruments B-O2 software



CO₂ FLUX MEASUREMENTS

PORTABLE AND AUTOMATIC SOIL FLUX ANALYZERS

Portable and automatic Soil flux devices are ideal for simultaneous measurements of gas flux CO₂, O₂, CH₄, and other gases 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 CO₂ from soil;
- Flux CO₂ from compost;
- Flux CO₂ 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

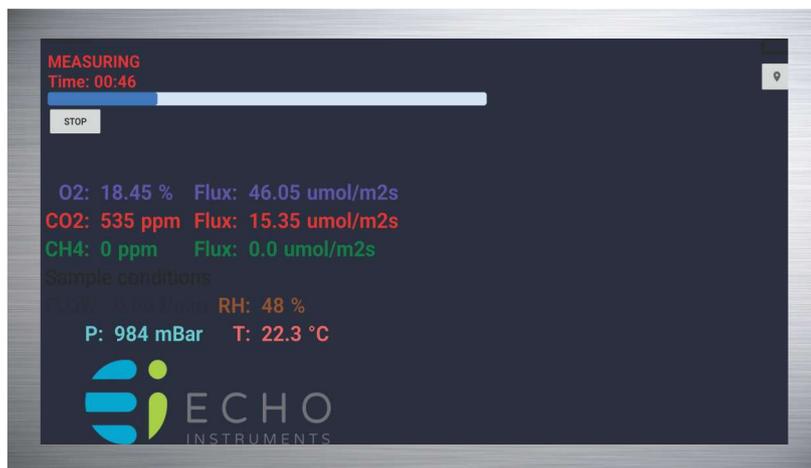
Advantages

- 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: O₂, CO₂, CH₄; (other sensors on request);
- Automatic system: 4 / 8 channels.

ECHO Instruments Soil Flux software



GAS MIXING DEVICE

PORTABLE AND STATIONARY DEVICES

FOR PRECISE GAS MIXTURES

Gas mixing devices are used for production of high precision gas mixtures in calibration procedures, and preparation of gas mixtures for industrial or laboratory applications. Precise dilution of various gases enables the user to obtain the most accurate gas mixture for used application. The user simply sets the target output concentration for the desired gas. Actual concentrations based on flow measurements are displayed in real time during mixing procedure.



Portable gas mixing device

Principles

Various gas sensors combined with high accurate mass flow controllers and sophisticated software mixes the gas mixture from 100 % down to 1 ppm.

Applications

- Gas mixtures for sensor calibration;
- Calibration of personal gas monitors;
- Calibration of emission & imission monitors;
- Gas mixtures for industrial, laboratory use;
- Applicable also in biotechnology, pharmacy, chemical, and biological experiments.



Custom gas mixing device

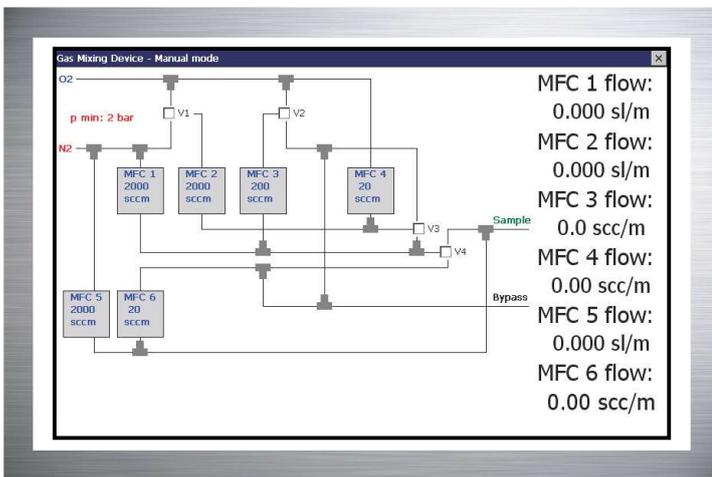
Advantages

- Mixing non-corrosive and corrosive gases, such as SO₂, NO, NO₂, Cl₂, H₂S, etc;
- 1–4 channels;
- High accuracy and repeatability;
- Stationary or portable;
- Mixtures from 100 % to ppm ranges;
- Suitable for accredited calibrations.

Technical specifications

- Accuracy: ±1 % of full-scale including linearity over 15–25 °C and 0.7–4 bar;
- ±2 % of full-scale including linearity over 0 °C to 50 °C and 0.3–10 bar;
- ±1 % of full-scale accuracy at a specific temperature and pressure is available with special calibration;
- Reproducibility: ±0.25 % full-scale (±0.15 % full-scale on demand);
- Response time: 300 ms;
- Flow range: 0–10 sccm to 0–50 slpm; flow ranges specified are for an equivalent flow of nitrogen at 760 mm Hg and 21 °C;
- Response time: 300 ms, 2 s average;
- Higher accuracy, repeatability, measuring ranges, response time on demand.

ECHO Instruments Gas mixing device software





ECHO
INSTRUMENTS

Zeče 25
3210 Slovenske Konjice
Slovenia, EU

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

