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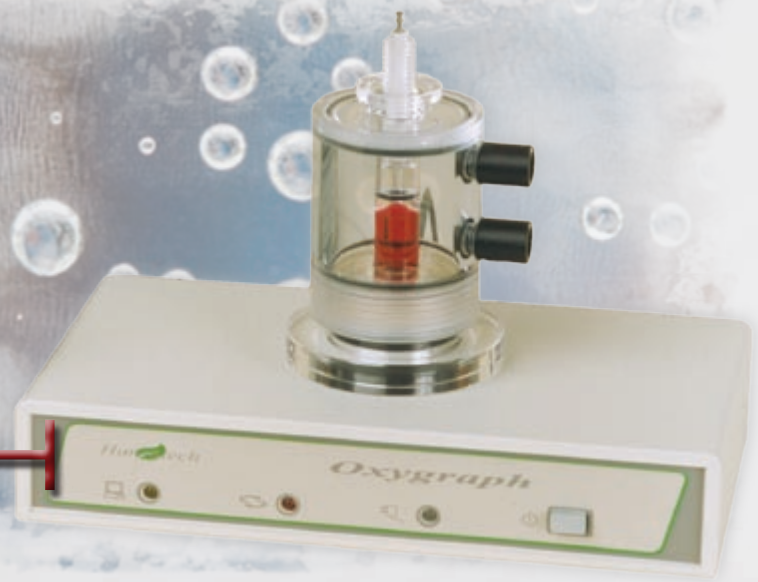


Oxygraph System

- PC operated Oxygraph oxygen electrode control unit.
- Suitable for liquid and gas-phase measurements in cellular respiration & photosynthesis research.
- Compact design with integral electronics & magnetic stirrer.
- System expansion to 8 channels via purchase of additional components.
- Real time chart recorder emulation of O_2 signal & optional auxiliary input.
- Custom Windows® software for hardware control & data analysis.
- Compatible with all Hansatech Instruments oxygen electrode chambers.

Overview

The Oxygraph oxygen electrode control unit is designed to provide PC control of oxygen uptake or evolution measurements across a broad range of applications from studies of mitochondrial and cellular respiration to studies of isolated chloroplast suspensions or leaf-discs in photosynthesis research applications.

In conjunction with user-friendly Oxygraph Plus data acquisition and system configuration software, the Oxygraph oxygen electrode control unit provides an effective tool for the measurement of oxygen signals from the S1 Clark type electrode disc mounted in one of a range of liquid and gas-phase oxygen electrode chambers with quick and easy system calibration and configuration.

An Oxygraph system may be configured as a single or multi-channel setup in order to make comparative measurements of oxygen in either liquid or gas-phase from multiple samples.

Simultaneous recording of an optional auxiliary input signal (e.g. temperature, pH, fluorescence, TPP+ or other specific ion electrodes etc) is also possible using the appropriate apparatus (such as the OXY/PHA) coupled via the OXY/AUX adapter cable.

A system comprises a minimum of one (maximum of eight) Oxygraph control units linked together in a chain to the serial port of a Windows® PC. Each control unit features a built-in magnetic stirrer and all the electronics required to control and measure the signal from the oxygen electrode.

Oxygraph is compatible with all existing liquid and gas-phase Hansatech oxygen electrode chambers and accessories. Oxygraph control units may be freely interspersed with Oxytherm electrode control units within a multi-channel system.

The control unit connects to a PC via the serial port and uses bi-directional RS232 communications for instrument control from the PC and data acquisition to the PC. There is no requirement for separate loggers, internal PC interfaces or A/D cards. Laptop or notebook computers are therefore just as suitable as a desktop PC and provide a highly portable, compact system whenever bench space is limited.

DWI/AD Electrode Chamber

The DW1/AD oxygen electrode chamber provides a highly versatile solution to measurements of dissolved oxygen in liquid-phase samples. It can be used for a wide range of applications from basic teaching through to more advanced research assays.

However, due to the gas-tight plunger assembly, the DW1/AD lends itself particularly well to respiration assays in small sample volumes where any minute diffusion of ambient oxygen into the chamber may cause measurement artefacts. The DW1/AD oxygen electrode chamber is constructed from clear cast acrylic providing good sample visibility & uniform illumination.

Precise temperature control of the sample and electrode disc can be achieved by connecting the water jacket of the DW1/AD to a thermoregulated circulating water bath. The sample is housed within a borosilicate glass reaction vessel which has a variable sample volume of between 0.2 and 2.5ml controlled by the gas-tight adjustable plunger assembly. This plunger has a stoppered central precision bore allowing additions/subtractions to be made to/from the reaction mixture using a standard Hamilton type syringe.

S1 Oxygen Electrode Disc

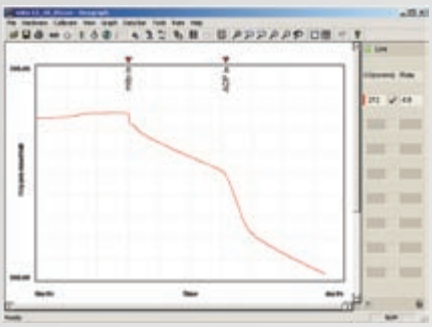
The Oxygraph system is based around the S1 Clark type polarographic oxygen electrode disc. When fitted, the dome of the electrode disc forms the floor of the electrode chamber reaction vessel providing a sensitive and rapid response to small changes in oxygen tension within the sample.

The electrode disc comprises a central platinum cathode and a concentric silver anode. Preparation of the electrode includes the addition of electrolyte and the application of a thin oxygen permeable P.T.F.E. membrane to the electrode dome.

Once prepared and positioned in the electrode chamber, the disc is connected to the Oxygraph control circuitry which applies a small polarising voltage between the platinum and silver electrodes.

In the presence of oxygen, a small current is generated proportional to oxygen activity in the sample.

Oxygraph Plus Software



A custom Windows® software package, Oxygraph Plus, is supplied with the Oxygraph electrode control unit. The software is designed to provide control of all hardware functions from simple dialogue based controls. Oxygraph Plus contains Wizard-type semi-automated calibration routines for liquid or gas-phase measurements allowing system calibration to be performed with ease by following a series of onscreen prompts in order to record the signal from the S1 electrode at 2 known oxygen concentrations.

Signal gain and back-off controls are also included in Oxygraph Plus which may be used to amplify smaller signals from samples with lower oxygen concentrations.

Once calibrated, Oxygraph Plus records the signal from the S1 electrode disc (and an optional auxiliary input signal) at a user-defined data acquisition rate and presents the values as a real-time chart recorder emulation. Recorded values are also presented in a digital panel meter in calibrated units along with a Live Rate measurement which is calculated in real-time over a user-defined number of recorded data points.

Once the recording is complete, Oxygraph Plus contains several tools for basic analysis of the recorded data. A rate measurement tool provides easy estimation of oxygen rates over user-defined intervals and spot measurement tool allows precise oxygen and time base values to be obtained for any given point on the recorded trace.

Data files are saved in a Comma Separated Values (*.CSV) format which may be opened directly in external data analysis packages, such as Microsoft Excel®, for more detailed statistical and graphical analysis of recorded data.

Technical Specifications

OXYGI Oxygraph Electrode Control Unit

Measuring Range	0 - 40% oxygen
Min. O_2 Resolution	Typically 10 x 10^{-6} µmols/ml at 20 °C
Integral Magnetic Stirrer	Software controlled between 150 - 900rpm in % steps
Polarising Voltage	700mV
Gain/Back Off Control	Software adjustable. Gain: up to x50 (10 bit resolution) Back off: 12 bit resolution
Integral Test Resistor	Yes
Signal Inputs	Electrode disc connection. Auxiliary input using OXY/AUX splitter cable
Data Acquisition Rate	Software selectable between 0.2 - 10 readings per second
Communications	Bi-directional RS232. USB using HAN/USB adapter (supplied)
Dimensions	203 (w) x 110 (d) x 60mm (h). Weight: 350g
Power Supply	95 - 260V universal input mains supply. Output 12V DC 2.5A
Electrode Chamber Compatibility	All Hansatech Instruments electrode chambers
Additional Information	Expandable up to 8 channels via additional OXYG2 units

DWI Oxygen Electrode Chamber

Measurement Suitability	Liquid-phase respiration/photosynthesis
Construction	Clear cast acrylic
Sample Chamber	Precision bore, borosilicate glass tube
Sample Volume	0.2 - 2.5ml
Temperature Control	Water jacket connected to thermoregulated circulating water bath
Dimensions	65 (d) x 105mm (h). Weight 100g
Additional Information	Variable plunger assembly with central bore for sample additions

S1 Oxygen Electrode Disc

Electrode Type	Clark type polarographic oxygen sensor
Electrode Output	Typically 1µA at 21% O_2. Residual current in 0% O_2 typically 0.02µA
Response Time	10 - 90% typically < 5 seconds
Oxygen Consumption	Typically <0.015µmol hr^{-1}

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