

# OXYTHERM SYSTEM

- PC operated Oxytherm electrode control unit suitable for liquid-phase measurements of photosynthesis & respiration.
- Peltier oxygen electrode unit with integral thermoelectric temperature control.
- Compact design with integral electronics & magnetic stirrer.
- Computer controlled oxygen electrode system with direct on-screen display of traces.
- Custom Windows® software for instrument control & data analysis.
- System expansion to 8 channels via purchase of additional components.

## Overview

The Oxytherm 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 measurements of isolated chloroplast suspensions in photosynthesis research.

Oxytherm is supplied with a sophisticated temperature controlled oxygen electrode chamber consisting of a fan assisted Peltier Element with a large surface area and thermally insulated reaction vessel in order to achieve rapid equilibration and maintenance of any user-selected temperature within the range 3-40°C (assumes ambient temperature of 20°C). This provides freedom to site the unit away from the traditional laboratory setting and ensures that temperature related artefacts are minimised during measurement.

In conjunction with user-friendly Oxygraph Plus data acquisition and system configuration software, the Oxytherm oxygen electrode control unit provides an effective tool for the measurement of

oxygen signals from the S1/MINI Clark type electrode disc with quick and easy system calibration and configuration.

The Oxytherm oxygen electrode control unit comprises a robust yet lightweight enclosure containing the integrated electronics and magnetic stirrer. The electrode chamber consists of a similarly constructed enclosure containing the 10mm precision bore borosilicate glass reaction vessel which is well insulated in order to minimise heat loss through the casing and also provides the capability to perform both light and dark reaction measurements.

An optical port is situated on the side of the casing to suit FMS 1 and FMS 2 chlorophyll fluorometer fibre-optic cables allowing simultaneous measurement of chlorophyll fluorescence from photosynthetically active samples. There is also a viewing port in the front of the electrode unit with an illuminating white LED controlled by a push button on the side of the unit. Both control box and the electrode unit are powered from a single external 12V DC power supply.



An Oxytherm system may be configured as a single or multi-channel setup in order to make comparative measurements of oxygen 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 OXY/PHA amplifier unit coupled via the auxiliary input on the rear of the Oxytherm oxygen electrode control unit.

A system comprises a minimum of one (maximum of eight) control units linked together in a chain to the serial port of a Windows® PC. Oxytherm control units may be freely interspersed with Oxygraph oxygen 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.

### SI/MINI Oxygen Electrode Disc

The S1/MINI is based on the standard 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.

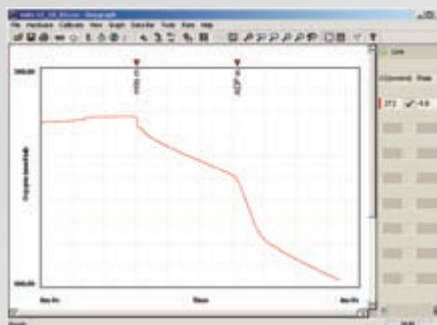


The electrode disc comprises a central platinum cathode and a concentric silver anode. Preparation of the electrode includes the addition of electrolyte and the application of a thin oxygen permeable P.T.F.E. membrane to the electrode dome.

Once prepared and positioned in the electrode chamber, the disc is connected to the Oxytherm 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 Oxytherm 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/MINI 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/MINI 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

### OXYTI Oxytherm Electrode Control Unit

Measuring Range	0 - 40% oxygen
Min. O <sub>2</sub> Resolution	Typically 10 x 10 <sup>-6</sup> 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
Data Acquisition Rate	Software selectable between 0.2 - 10 readings per second
Communications	Bi-directional RS232. USB using HAN/USB adapter (supplied)
Dimensions	250 (w) x 126 (d) x 136mm (h). Weight: 1.27Kg
Power Supply	95 - 260V universal input mains supply. Output 12V DC 2.5A
Peltier Electrode Chamber	<b>Temp range:</b> 3 - 40°C (25°C ambient). <b>Response time:</b> <10 min, accuracy: +/- 0.5°C. <b>Sample volume:</b> 0.2-2.5ml. Optical port for FMS fluorimeters, Front viewing window. <b>Dimensions:</b> 132 x 100 x 90mm
Additional Information	Expandable up to 8 channels

### SI/MINI Oxygen Electrode Disc

Electrode Type	Clark type polarographic oxygen sensor
Electrode Output	Typically 1μA at 21% O <sub>2</sub> . Residual current in 0% O <sub>2</sub> typically 0.02μA
Response Time	10 - 90% typically < 5 seconds
Oxygen Consumption	Typically <0.015 μmol hr <sup>-1</sup>