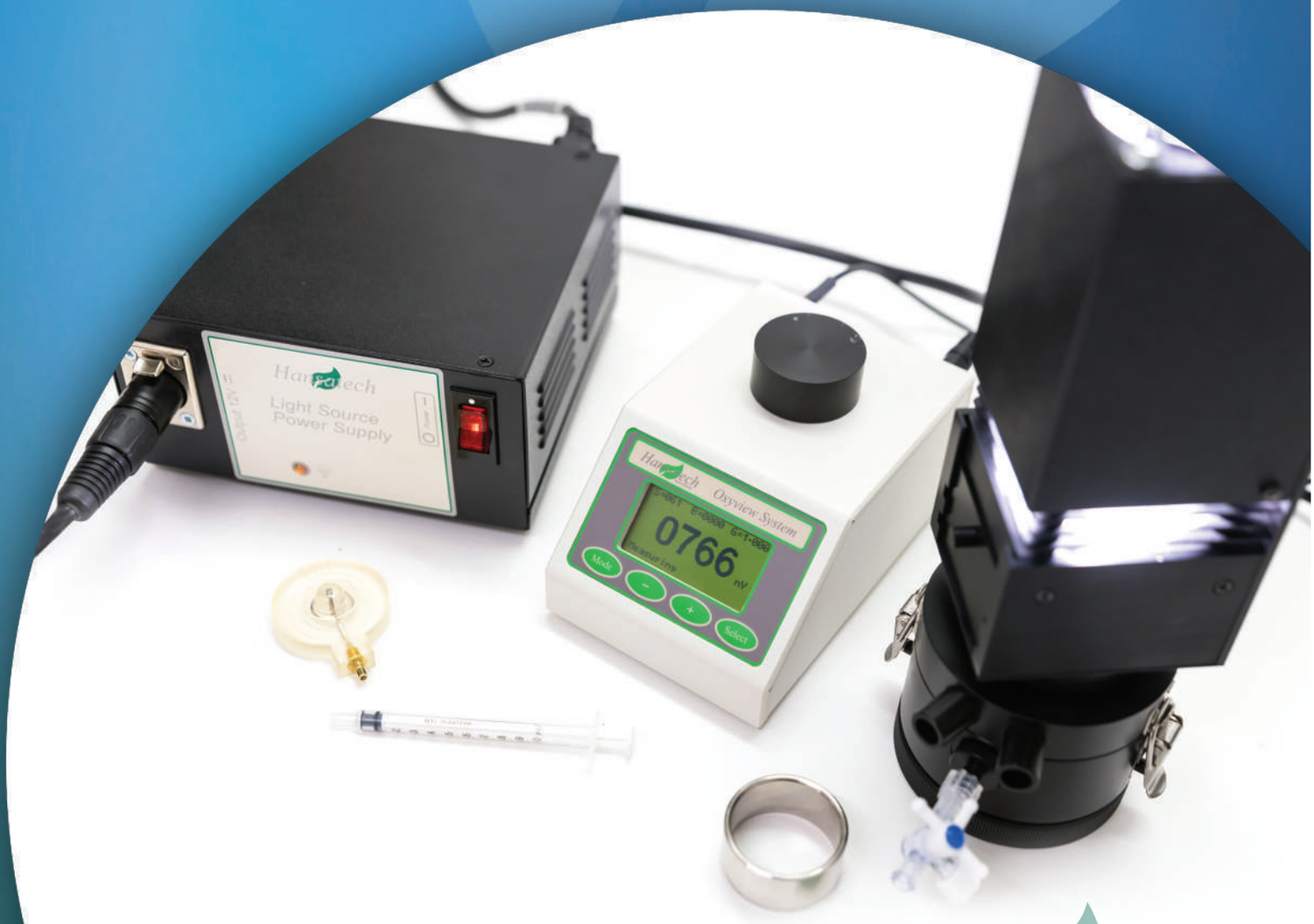
Leafview 1

Entry-level gas-phase oxygen electrode system for advanced photosynthesis & respiration studies



Hansatech
Instruments

Leafview 1

Entry-level gas-phase oxygen electrode system for advanced photosynthesis & respiration studies

- Convenient, entry-level system for the study of photosynthesis & respiration measurements in gas-phase samples under illumination
- LD1/2 electrode unit suitable for leaf-discs up to 10cm^2 cut from whole leaves, algae or moss etc
- Oxygen electrode control & signal acquisition via Oxyview control unit
- Illumination via LS2 high-intensity tungsten-halogen white light source
- LS2 intensity adjustable by insertion of neutral density filters
- Oxygen signal output from Oxyview to recording device via 0 – 5V analogue output
- Upper optical port allows uniform illumination from LS2 from directly above the sample

Oxyview control unit

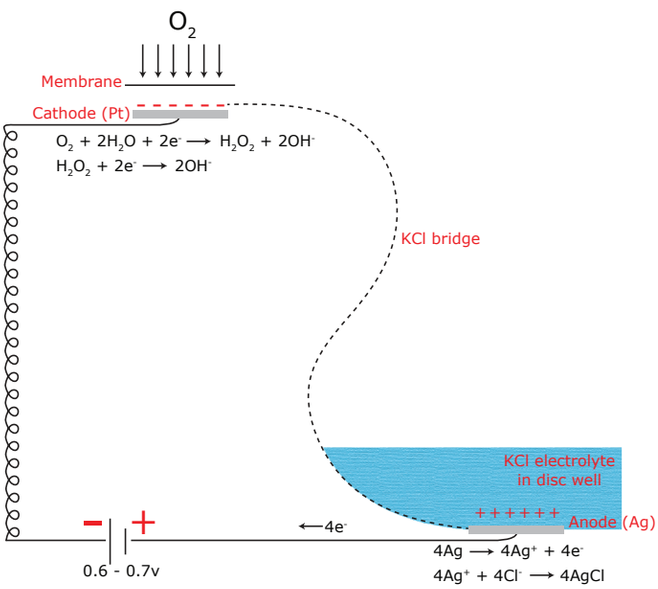
The OXYV1 Oxyview control unit has been designed as a convenient, low cost oxygen electrode control unit for teaching studies of photosynthesis and cellular respiration using the oxygen electrode measurement technique.

The Oxyview control unit is fully compatible with the range of oxygen electrode chambers produced by Hansatech Instruments thus allowing a wide range of different assays to be performed in both liquid and gas-phases.

The Oxyview is configured and controlled via a front mounted control panel featuring 4 touch-sensitive buttons. Configuration is achieved by navigating through a series of simple menu screens and following the displayed guidelines for each step of the setup process. These configuration steps include setting of the stirrer speed (for liquid-phase measurements) and back-off and gain settings. Once configured, the Oxyview control unit provides an accurate and stable reading of the oxygen content of the sample in question.

The Oxyview control unit has an integral magnetic stirrer for liquid-phase applications allowing the overall footprint of the Oxyview 1 system to be minimal (90 x 135mm); convenient when multiple setups are required for teaching programmes in limited space.

The Oxyview control unit is powered by a 12V DC wall cube which connects directly to the rear of the unit. Also at the rear is a 0 – 5V analogue output. This allows the measured values from the control unit to be logged to an external recording device such as a chart recorder or similar datalogger accepting a 0 – 5V analogue input.



Oxygen electrode disc

Since its original design in the early 1970's by Tom Delieu and David Walker, the S1 Clark Type Oxygen Electrode disc remains largely unchanged – a true testament to the quality and reliability of the sensor. The S1 consists of a platinum cathode and silver anode set into an epoxy resin disc and is prepared for use by trapping a layer of 50% saturated KCl solution beneath an oxygen permeable PTFE membrane. A paper spacer placed beneath the membrane acts as a wick to provide a uniform layer of electrolyte between anode and cathode.

When a small voltage is applied across these electrodes (with the platinum negative with respect to the silver), the current which flows is at first negligible and the platinum becomes polarised (i.e. it adopts the externally applied potential). As this potential is increased to 700 mV, oxygen is reduced at the platinum surface, initially to hydrogen peroxide H_2O_2 so that the polarity tends to discharge as electrons are donated to oxygen (which acts as an electron acceptor). The current which then flows is stoichiometrically related to the oxygen consumed at the cathode.

When connected to Oxygraph+, the S1 provides a fast, effective and accurate method of detecting small changes in oxygen tension in a liquid-phase sample.

LD1/2 electrode chamber

The LD1/2 leaf-disc electrode chamber is a simple device for measuring oxygen exchange from a 10cm^2 leaf-disc mounted within a sealed, gas-tight chamber.

The LD1/2 is constructed from black acetal with a cast acrylic top window allowing the sample to be evenly illuminated for photosynthesis measurements using the LS2 high-intensity white light source.

A prepared S1 oxygen electrode disc mounts into the base of the LD1/2 with the dome of the electrode forming the floor of the sample chamber.

Temperature of the sample can be accuratley controlled by connecting an external circulating water bath (not included) to the water jacket inputs of the LD1/2

LS2 white light source

The LS2 light source is a high-intensity (100W) tungsten-halogen light source which is powered from a stabilised power supply.

The lamp housing contains a cooling fan, infrared reducing “Hot-Mirror” and optics to provide light with minimum variation of intensity across the beam and little divergence from parallel. 2 slots are provided to accept 50mm square optical filters or a manual shutter plate.

A range of light intensity steps may be achieved by adding permutations of the 4 A5 neutral density filters supplied (0.1,0.3,0.6 and 1.0 O.D.) to attenuate the light intensity. Maximum sample illumination intensities vary depending on the type of electrode chamber in use.

When used with the LD1/2 electrode chamber the LS2 can achieve a maximum intensity of 1800 µmol m^{-2} s^{-1} when mounted vertically onto optical window of the chamber

System components

Leafview 1 systems are supplied with the following components:

- OXYV1+: Oxyview electrode control unit
- LD1/2: Electrode chamber
- LS2 : High-intensity white light source
- S1: Oxygen electrode disc and SMB-SMB connection cable
- A5: Neutral density filter set
- A2: Membrane applicator to assist with smooth application of electrode membrane
- S4: Reel of PTFE membrane (0.0125mm x 25mm x 33m)
- S8B: Spare O-rings for LD1/2 electrode chamber
- S14: Set of 3 stainless steel discs, capillary matting and foam spacer for Leafdisc electrode chambers
- S15: 3-way gas taps and 1ml disposable syringe for Leafdisc electrode chambers (4 taps + 2 syringes)
- S16: Cleaning kit for the S1 electrode disc.

Technical specifications

Oxyview 1 electrode control unit

Measuring range:	Oxygen: 0 - 100%
Signal inputs:	Oxygen electrode (SMB)
Resolution:	10 x 10^{-6} µmols/ml at 20 °C
Polarising voltage:	Selectable between 0.4 - 0.9V (0.7V recommended default)
Gain:	Coarse: x1, x2, x5, x10, x20, x50, x100. Fine: 1mV steps
Back off:	Signal back off in 1mV steps
Analogue output:	0 - 5V electorde signal
Dimensions (HWD):	90 x 135 x 85mm
Weight:	320g
Power:	95 - 260V universal input mains supply. Output 12V DC 2.5A

LD1/2 electrode chamber

Suitability:	Gas-phase respiration/ photosynthesis
Construction:	Black acetal
Sample chamber:	Leaf chamber (7.5cc)
Sample area:	10cm^2
Optical Ports:	Cast acrylic top window
Temperature control:	Water jacket connected to thermoregulated circulating water bath
Dimensions (DH):	95 x 75mm
Weight:	350g

S1 oxygen electrode disc

Electrode type:	Clark type polarographic sensor
Electrode output:	Typically 1.6µA at 21% O_2
Residual current:	Typically 0.04µA in 0% O_2
Response time:	10 - 90% typically < 5 seconds
Oxygen consumption:	Typically <0.015µmol/hr^{-1}

LS2 light source

Lamp Type:	100W tungsten-halogen (50W available on request)
Power Supply:	Mains, stabilised power supply. 12V DC 10A. 120/240V 60/60Hz
Intensity Adjustment:	Via combinations of 4 neutral density filters (supplied)
Max Intensity in DW1:	1800 µmol m^{-2} s^{-1}
Dimensions:	Light housing: 145 x 65 x 75mm. Weight 1.0kg Power supply: 86 x 150 x 140mm. Weight 1.4kg

Hansatech Instruments is a British company that has been developing high quality scientific instrumentation for over 40 years. Our systems are used widely for teaching & research in cellular respiration & photosynthesis programs in more than 100 countries throughout the world. We have gained an enviable reputation for quality, reliability & excellent price/performance.

Our product range consists of a range of modular solutions for the measurement of oxygen using Clark type polarographic sensors. We also develop chlorophyll fluorescence measurement systems using both continuous excitation & pulse-modulated measurement techniques with further optical instrumentation for the measurement of sample chlorophyll content.

Purchasers of Hansatech Instruments products can be assured of ongoing support & prompt & efficient attention to enquiries at all times. Support is available both directly & from our global distributor network. Customers are encouraged to register their instruments on our website which allows access to our Support Ticketing System in addition to instruments manuals & software upgrades.

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