

Dissolved Oxygen Measurement

Laboratory instrumentation for routine and research applications in biotechnology, medicine, industry and environmental studies.



- Simple, rugged proven design
- Choice of controller
- Glass and perspex electrodes
- Large range of electrode volume options
- Easy to maintain
- Thousands in service

The need to measure dissolved oxygen is widespread throughout industry and academia with analyses being made on many diverse sample types, from blood to boiler feed water. Applications continue to grow with developments in physiological studies, microbiology research and biotechnology fermentation processes.

For over 20 years Rank Brothers has worked with leading scientists in many fields to develop and evolve a comprehensive range of equipment and accessories for oxygen measurement. During that time thousands of instruments have been supplied throughout the world for routine monitoring, research and teaching.

Instrumentation for Dissolved Oxygen Measurement

A Measurement System

In order to meet the requirements of different applications Rank Brothers offer a comprehensive selection of electrodes and range of controllers, providing highly cost-effective systems appropriate to the working environment.

To measure dissolved oxygen the system must comprise:

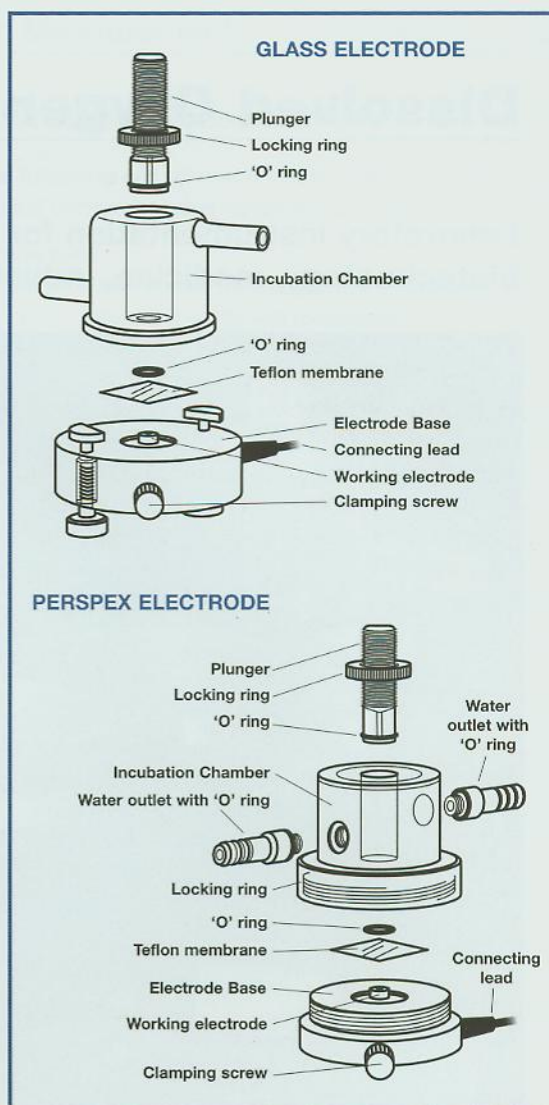
- an Oxygen Electrode
- a Controller, to supply the polarising voltage between the platinum and silver/silver chloride electrodes
- and, for liquid samples, a stirrer.

The Oxygen Electrode

The Rank Brothers Oxygen Electrode is based on the 'Clark cell' as first described by I.C. Clark, and also known as an Oxygen Membrane Polarographic Detector. The electrode has been designed to measure the uptake or production of oxygen by cell suspensions, subcellular particles or enzyme systems. It can, however, be used to determine the partial pressure of either dissolved or gaseous oxygen over the range 10^{-4} to >1 atmosphere, making the electrode performance attractive for many applications.

The Oxygen Electrode as supplied comes in two main components

- The Electrode Base, which houses the central platinum working electrode, and the surrounding silver/silver chloride counter/reference electrode. Conduction between these electrodes is by 3M potassium chloride with a semi-permeable membrane used to separate the sample.
- The incubation or monitoring chamber mounted on the base has a built-in water jacket. This ensures any measurements are conducted at a constant temperature, which is essential for accurate readings. A plunger fits into the top of the chamber and has two functions. The first to seal the sample from the atmosphere apart from a very small hole which is used to inject materials with a syringe. The second function is to provide a reduction of the specified sample volume by up to 6:1.



Principal components of an oxygen electrode.

The standard electrode can be supplied with either a perspex or a glass incubation chamber and has a sample volume of approximately 1 to 7mL. It should be noted that the bases for the two electrodes (perspex or glass) are not interchangeable. Alternative incubation chambers from 1 to 50mL are available, however, glass units are limited to standard precision bore glass tube sizes. Another option available is a flow through plunger with two holes drilled, instead of one, enabling the electrode to sample from a process or flowing system.

Technical Data

Each electrode is supplied with a screened lead connected to a DIN plug, 75 x 300mm of teflon membrane, 1 stirring bar (flea), and 1 spare teflon 'O' ring

Size 50 x 100 x 50 mms approx

Weight 100 gms approx

Response time 100%-0 air saturation in less than 15 sec

Controllers

A range of controllers is available to provide different levels of sophistication in the measurement of oxygen and to enable the most appropriate and cost effective configuration to be selected for an application or the working environment.

Digital Model 10

Designed as an integrated unit to make oxygen measurements. The standard version includes an electronic magnetic stirrer and the electronics to supply the polarising voltage, signal amplification and digital display of 'percentage saturation'. The only additional requirement is a supply of constant temperature water to the incubation chamber to ensure accurate readings.



Digital Model 10.

Located on the front panel are controls to

- operate and adjust the stirring speed
- set the polarising voltage between 0-1V
- zero the electronics and electrode output
- calibrate the electrode

At the rear a socket provides a 0-1V output suitable for a chart recorder.

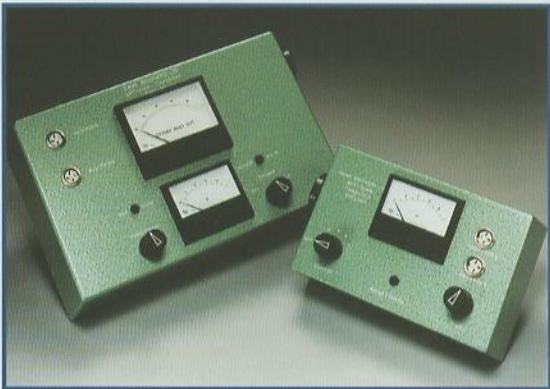
A range of oxygen electrodes is available to meet the needs of different applications and a Dual Digital System is available to provide additional measurement capability.

Technical Data

	Digital Model 10	Combined Polarising Circuit and Readout Meter	Polarising Circuit
Resolution	0.1% saturation	2% saturation	n/a
Polarising voltage	0-1 V	0-1.5 V	0-1.5 V
Recorder output	0-1 V Via BNC connection	0-30 mV	0-30 mV
Stirrer	120-1200 rpm	Not included	Not included
Power supply	220/240 or 110/120V AC; power cord supplied	1 x 'C' type and 2 x PP3 type batteries; supplied	1 x 'C' type battery; supplied
Size (mm)	230 (w) x 300 (d) x 200 (l)	280 (w) x 170 (d) x 70 (l)	200 (w) x 120 (d) x 70 (l)
Weight (kgms)	2.5	1.4	0.8

Combined Polarising Circuit and Readout Meter

The Combined Polarising Circuit and Readout Meter provides an analogue alternative to the Digital system. The unit is battery operated and has two analogue meters which simultaneously display polarising voltage and oxygen levels. The controls allow adjustment of the polarising voltage, calibration of the electrode and also enable the unit to be used without the oxygen meter reading (when being used with a chart recorder for instance). Two DIN sockets are located on the front panel for the electrode and connection to a chart recorder. A stirrer is not included.



Combined Polarising Circuit and Readout Meter (left) and Polarising Circuit.

Polarising Circuit

This simple, low cost, battery operated unit supplies the polarising voltage and produces an analogue output for a chart recorder.

The controls allow the polarising voltage to be adjusted which is displayed on a meter. The recorder output voltage is adjusted by a 5 position, coarse adjustment switch and a ten-turn 'fine' potentiometer which enables the electrode to be calibrated to the recorder. The electrode and the recorder are connected via DIN sockets on the front panel. A stirrer is not included.

Instruments and Accessories for Oxygen Measurement

How to Order

To order a working oxygen measurement system it is necessary to specify an electrode with sample stirring and a controller. For some controllers a separate stirrer will be required. A choice is available to provide the system most appropriate to the application and the requirements of the laboratory. Select the electrode(s) of choice, a Controller, and ancillary equipment as required.

Oxygen Electrode

Each electrode is supplied with instructions

OXY040A	7mL perspex oxygen electrode
OXY041A	1mL perspex oxygen electrode
OXY042A	2.5mL perspex oxygen electrode
OXY043A	4mL perspex oxygen electrode
OXY045A	30mL perspex oxygen electrode
OXY046A	50mL perspex oxygen electrode
OXY050A	6mL glass oxygen electrode
OXY051A	2.5mL glass oxygen electrode
OXY052A	50mL glass oxygen electrode
OXY060A	Special oxygen electrode with gold working electrode

Note: Plungers enable the electrode volume to be adjusted by an approximately 6:1 ratio.

Controllers

Note: Electrodes are not supplied with these units

OXY018A	Digital Model 10 - 110/120V
OXY020A	Digital Model 10 - 220/240V
OXY022A	Dual Digital System - 220/240V
OXY024A	Dual Digital System - 110/120V
OXY030A	Combined Polarising Circuit and Readout Unit #
OXY031A	Polarising Circuit #

stirrer not included

Ancillary Equipment

MAG007B	Model 300 Electronic Stirrer
MAG101A	Electronic Stirring Head Type 1
OXY032A	Single pen Chart Recorder
OXY033A	Dual pen Chart Recorder

Spares and Consumables

The following are commonly used items, but for the full comprehensive range see the price list.

Stirring bars:

OXY328A	Glass coated for 1 and 2.5mL electrodes
OXY329A	Glass coated for 4mL electrodes
OXY330A	Glass coated for 6mL and larger electrodes

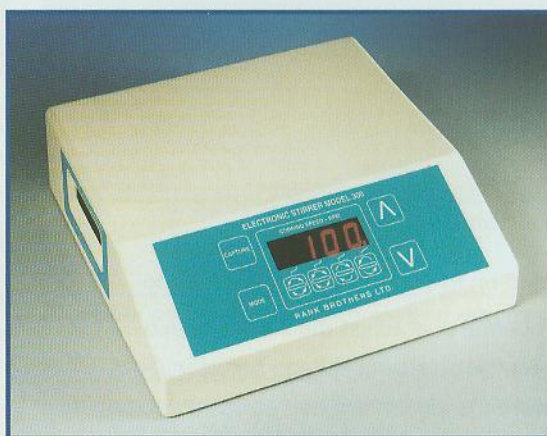
Other:

OXY300A	3/8" OD x 1/16" section 'O' ring for teflon membrane
OXY310A	75 x 300mm of teflon membrane

Other Products from Rank Brothers

Model 300 Electronic Stirrer

A high performance motorless stirrer for use with different sizes and types of vessel. Separate data sheet available with full details.



Model 300 without stirrer.

Electrochemical Processor

Designed for microelectrode techniques, controlled potential and current can be applied for electrochemical analyses. The low noise and high stability is particularly suited to the more demanding application.

The processor is suitable for 2 and 3 electrode electrochemical sensors including oxygen electrodes.

Separate data sheet available with full details.

Rank Brothers Ltd reserve the right to change specifications in the light of continuing developments.

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