

Micro Oxygen Uptake Systems

These systems were designed specifically to determine oxygen consumption rates (OCR) of cell suspensions or organelles as well as enzyme reactions that consume or evolve oxygen in samples as low as 200 μ L. They were designed by Instech in collaboration with Drs. Klearchos Papas and Clark Colton of the Department of Chemical Engineering at MIT.

Oxygen tension in the sample fluid is sensed fluorometrically using a fiber optic titanium needle probe coated at the tip with a captured fluorescent dye. Fluorescence levels are detected using a one- or two-channel monitor which incorporates the excitation light sources, miniature spectrometers and a high-speed A/D converter. The chamber cups and probes are made of titanium in order to avoid drift due to material oxidation and for rapid thermal equilibrium of solutions. A standard user-provided PC with USB port and the included software control all monitor functions. Data is displayed on the screen and can be logged to disk and recalled for analysis.

The systems are available in the six possible combinations of one or two channels and 250, 500 or 1000 μ L chambers. The systems include:

- Fiber optic oxygen monitor (one or two channel)
- 0.062" OD titanium fiber optic oxygen probe(s)
- 400 μ bifurcated fiber bundle with coupler(s)
- Water jacketed micro chamber block
- Titanium chamber cup(s) (250, 500 or 1000 μ L)
- Acrylic center-fill plug(s)
- Glass plug/valve(s) (250 μ L system only)
- Stirring speed controller (one or two channel)
- Low speed motor-magnet stirring assembly
- Glass coated 5mm stir bar(s)
- Probe seal kit (25 pcs)
- Thermocouple thermometer

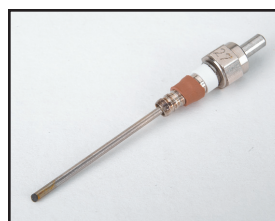
The only required part not included in the systems is a circulating water to control the temperature of the chamber.

Part No.	Description	Unit
FO/SYS1-T250	Complete oxygen uptake system, single Ti 250 μ L chamber	ea
FO/SYS2-T250	Complete oxygen uptake system, dual Ti 250 μ L chambers	ea
FO/SYS1-T500	Complete oxygen uptake system, single Ti 500 μ L chamber	ea
FO/SYS2-T500	Complete oxygen uptake system, dual Ti 500 μ L chambers	ea
FO/SYS1-T1000	Complete oxygen uptake system, single Ti 1000 μ L chamber	ea
FO/SYS2-T1000	Complete oxygen uptake system, dual Ti 1000 μ L chambers	ea

<http://www.instechlabs.com/Oxygen/fiberoptic/sys210t.php>



Titanium Fiber Optic Probes



The oxygen sensing probe is constructed of rugged, .062" diameter titanium tube with a 600 micron central fiber that has been coated with a fluorescent dye instilled in a sol-gel coating at the tip. The tip is then overcoated with a thin layer of oxygen permeable black silicone.

This prevents ambient light interference with the measurement. Because of the small size of these probes, it is possible to achieve low chamber volumes.

Unlike polarographic probes, these probes require neither membranes nor electrolytes, making for less maintenance and longer times between calibration. Once the probe tip comes into equilibrium with the surrounding oxygen concentration, no further oxygen utilization occurs. Since the probe does not consume oxygen, there will be no errors due to probe uptake and no stirring artifacts. The probes are capable of gaseous measurements as well but should be calibrated in solution when making dissolved oxygen measurements. Only aqueous solutions should be used with these probes to prevent leaching out of the dye.

Part No.	Description	Unit
FO/P062T	.062" titanium fiber optic probe with silicone overcoat	ea
FO/PC400	400 μ bifurcated fiber bundle with coupler	ea

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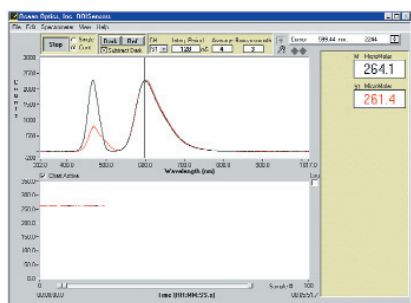
Monitor and Software



The OOIsensors software, running on a standard PC, controls the operation of a one- or two-channel fiber optic oxygen monitor. Each channel of the monitor consists of a pulsed blue LED excitation light source and a miniature board-mounted spectrometer. A single 1000 sample/second analog to digital converter serves all channels. A reading is generated from the intensity spectrum by calculating the area of a band under the curve, centered at the peak of fluorescence (nominally 600nm).

Since the intensity of fluorescence is a non-linear function of the quenching produced by the presence of oxygen, the software linearizes this function once a simple 2-point calibration has been performed. Zero and ambient oxygen levels, at the operating temperature, are typically used.

Oxygen levels, both graphically displayed and numeric values, may be viewed on the screen as the experiment progresses. This information along with any time stamped comments can be logged to a .txt file for post-processing using commercially available spreadsheets.

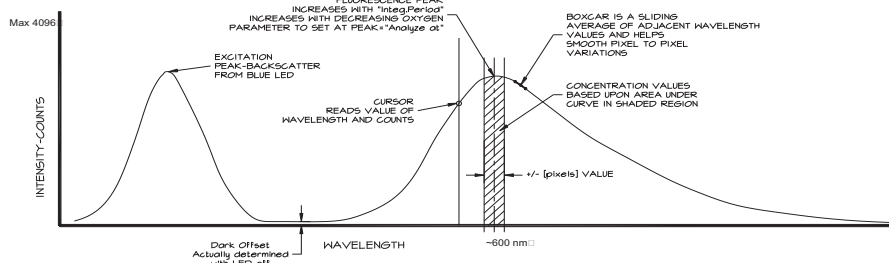


Main software display screen

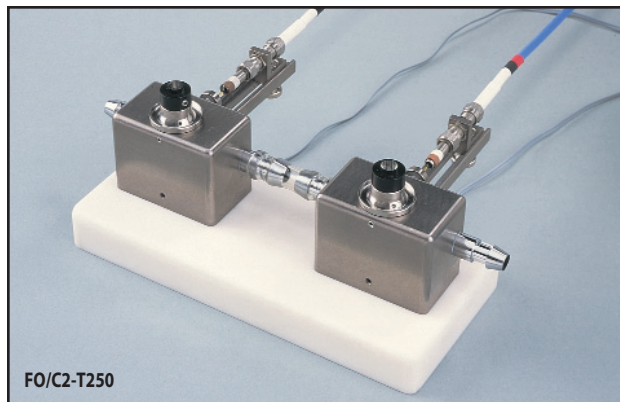
A separate DOS utility program (INTAKE) is provided to assist in determining the correct value for ambient concentration or partial pressure as a function of temperature and, in the case of concentration, the cell volume.

Part No.	Description	Unit
FO/110	One channel fiber optic oxygen monitor	ea
FO/210	Two channel fiber optic oxygen monitor	ea

How the software analyzes spectral data



Titanium Micro Chambers



These top-loading chamber cups are constructed of titanium, an inert metal with zero oxygen permeability for accurate rate of change measurements. The chamber cups are available in 250, 500 and 1000 microliter sizes and they fit into a common aluminum water-jacketed block for thermal control. Thermal equilibration times are less than 30 seconds.

Chamber systems are available in single and dual configurations, and include the following components:

- Water jacketed micro chamber block (single or dual)
- Titanium chamber cup(s) (250, 500 or 1000µL)
- Acrylic center-fill plug(s)
- Glass plug/valves (250µL chambers only)
- One or two channel stirring speed controller
- Low speed motor-magnet stirring assembly(s)
- Glass coated 5mm stir bar(s)
- Probe seal kit (25 pcs)

A miniature magnetic stirring system is built into the chamber block. It features a high strength, neodymium iron boron magnet to ensure constant coupling of the tiny stir bar, even at highest speeds. The drive motor is geared down for accurate slow speed stirring when used with fragile cells. Instech speed controllers provides accurate, reproducible rotational speeds.



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A thermocouple thermometer is required to verify chamber block temperature.

A circulating water bath is required to provide temperature control. (Haake model DC10-3B recommended; purchase separately.)



Chamber Systems

Part No.	Description	Unit
FO/C1-T250	Single 250µL titanium chamber system	ea
FO/C2-T250	Dual 250µL titanium chamber system	ea
FO/C1-T500	Single 500µL titanium chamber system	ea
FO/C2-T500	Dual 500µL titanium chamber system	ea
FO/C1-T1000	Single 1000µL titanium chamber system	ea
FO/C2-T1000	Dual 1000µL titanium chamber system	ea
FO/CTC	Thermocouple thermometer	ea

Chamber System Replacement Parts

Part No.	Description	Unit
FO/CP250G	Glass plug/valve for 250µL chamber	ea
FO/CP250P	Acrylic center-fill plug for 250µL chamber	ea
FO/CC250	Titanium 250µL chamber	ea
FO/CP500P	Acrylic center-fill plug for 500µL chamber	ea
FO/CC500	Titanium 500µL chamber	ea
FO/CP1000P	Acrylic center-fill plug for 1000µL chamber	ea
FO/CC1000	Titanium 1000µL chamber	ea
FO/C062SK	Probe seal kit	pkg of 25
FO/C2X5	Glass covered 5mm stir bars	pkg of 3
FO/C1060	One channel stirring speed controller for 6V motors	ea
FO/C2060	Two channel stirring speed controller for 6V motors	ea
606KIT	Miniature low-speed neo magnet stirring kit	ea

System Specifications

FO/110 and FO/210 Monitors

Channels	1 (FO/110) or 2 (FO/210)
Excitation wavelength	450nm
Communication	USB (cable included)
Power source	12VDC 800Ma wall-mounted adapter
Power consumption	2.4W
Dimensions	8 3/8"W x 5 1/4"H x 6"D
Weight	3.9 lbs

Chamber Systems

No. of Chambers	1 or 2
Chamber material	Titanium
Chamber volume	250, 500 or 1000µL
Chamber plugs	Glass plug/valve (250µL) or acrylic center-fill
Chamber block material	Nickel-Teflon coated aluminum
Water bath ports	Fit 5/16" ID Tygon
Stirring	Integral motor/magnet assembly
Stirring speed control	Use FO/C1060 or FO/C2060 controller

FO/P062T Fiber Optic Probes

Material of needle	Titanium
Fiber	Coated 400µ
Fluorescence peak	600nm
OD of needle section	0.0625"
Length of needle section	1.25"
Connection	SMA
Dynamic range	0 - 40.7 ppm (0 - 760 mmHg)
Response time	30-50 sec
Resolution @ 0 ppm	0.003 ppm
Resolution @ 8.5 ppm	0.02 ppm
Resolution @ 40 ppm	0.2 ppm
Drift	<0.02 ppm per day