OxyCycler A42OC

Dynamic O_2 & CO_2 Controller for Animal Modeling

Two Chamber Dynamic 0.1-99.9% O_2 & 0.1-20.0% CO_2

Bioactive Gas Control System for in vivo:

- Disease modeling
- Pathology modeling
- Therapy modeling

With

- Multiple chambers
- Multiple set points
- Multiple variables

The OxyCycler A42OC controls gases via an actuator pod that attaches snugly to your chamber.

MULTI-CHAMBER
Chambers can be controlled in many combinations. This includes simultaneous, independent gas control, different gas percentages in different chambers, or identical conditions at different times. You can independently control and profile two chambers at the same time, which means you have one control profile and one experimental profile.

MULTI-VARIABLE
O_2 is a widely used single gas system for hypoxia and hyperoxia. CO_2 is an animal off-gas that must be managed, but is also useful in modeling. N_2 is biologically neutral, and thus used to flush chambers and lower either O_2 or CO_2 concentrations without interfering with the experiment. The OxyCycler A42OC manages the three simultaneously with a single controller.

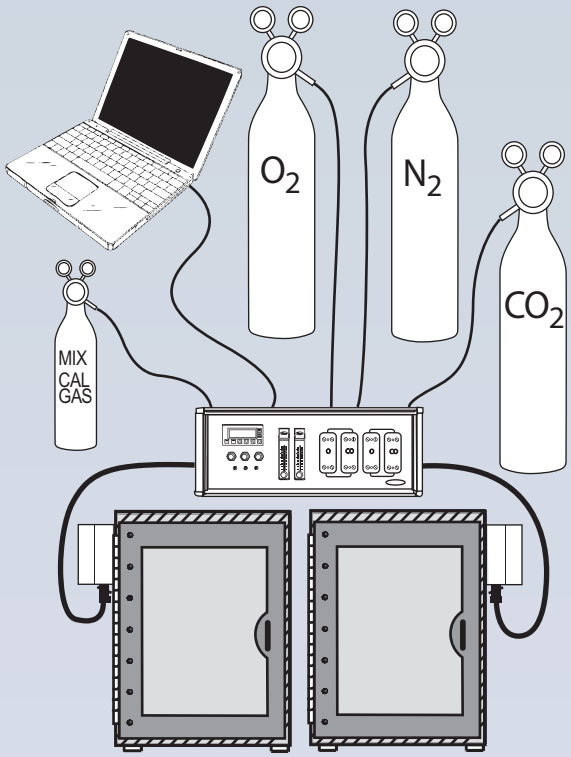
CONTROL IS EFFICIENT
Feedback from the adapter pod's sensors tells the OxyCycler A42OC the exact amount of gas to infuse. No gas is ever wasted. Recovery after access is rapid within the BioSpherix sub chambers, which avoids prolonged deviations from the set-point.

MULTI-SETPOINT
The gas concentration can be programmed to change at any time. Simply program a series of setpoints each associated with a separate time. Intermittent hypoxia is a common example.

Dynamic control allows the operator the unique ability of simulating natural conditions, as well as creating and manipulating new artificial conditions.

OPERATION IS SIMPLE
Once installed and configured, it's easy. Check the calibration once in a while and don't run out of gas. Otherwise it's all automatic. The system can work continuously year round, or on occasion as needed.

Installation Schematic



Installation

1. Set OxyCycler A42OC on or near host chambers and plug it in.
2. Mount each actuator pod to its host chamber.
3. Hook up gas supply.

How It Works

From outside two chambers, the OxyCycler A42OC works by remotely sensing oxygen and carbon dioxide inside each chamber, infusing nitrogen to reduce oxygen or carbon dioxide, and infusing oxygen or carbon dioxide to raise it. A continuous supply of both gases is required.

The OxyCycler A42OC connects to the chambers via two flexible umbilicals. At the tip of each umbilical is an actuator pod which contains a carbon dioxide sensor, oxygen sensor, a gas nozzle, and mounting hardware.

Pods mount to chamber over special precut holes so sensors can monitor chamber oxygen and carbon dioxide levels; gas can be infused when necessary.

Operation

Use PC software for easy interface, real-time trend charting, data logging, and remote operation.

The OxyCycler A42OC can be augmented with the OxyCycler AT Series controllers at any point to also grant control of CO/NO/NO2. The controllers work together to provide the most sophisticated exotic gas atmosphere control available.

This is illustrated in the image to the left. Note the unattached pod between the two chambers - this is a remote alarm monitoring pod that is part of the AT Series controllers.

This entire setup is generally placed within a BioSpherix Safety Hood (not pictured) to safely vent away any odors and exotic gas spill-off.

Gas

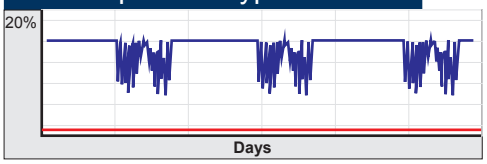
USE ANY GAS SUPPLY
Conveniently utilizes gas from any source. Compressed gas is best in low consumption applications. Generator is best in high consumption applications. Liquid is best in between.

SAVES GAS
Maximum efficiency reduces chamber gas consumption.

SAVES MONEY
Gas costs are reduced to absolute minimum.

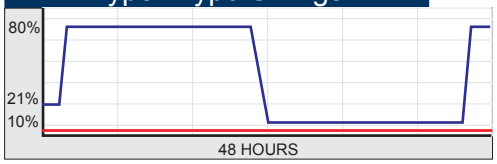
Multiple and Independent Gas Profiling

Episodic Hypoxia



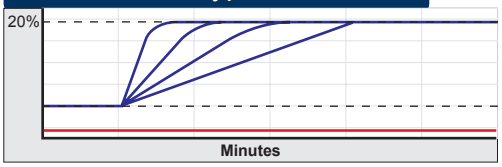
Recurring episodes of hypoxia can reproduce hypoxemia patterns created by occupational flight, sleep apnea, asthma, and pulmonary infections. Chronic hypoxic episodes might promote chronic degenerative diseases such as hypertension, diabetes, rheumatoid arthritis, macular degeneration, psoriasis, osteoporosis, etc.

Hyper/Hypo Swings



Hyperoxia for a day, then hypoxia for a day, back to hyperoxia for a day, hypoxia, hyperoxia, etc. quickly creates rich neovascularization in neonatal retina. Specifically models neovascular retinopathies. Nonspecifically models angiogenesis. Throws off redox regulation.

Acute Hyperoxia

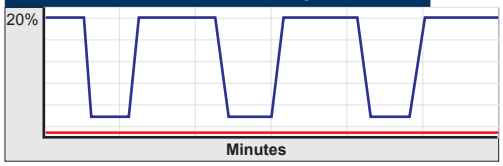


Sudden increases in inspired oxygen can cause pulmonary damage. Model toxicity of oxygen therapy in young (premature born) and old (emphysemics) and in between (trauma patients). Model toxicity of recreational oxygen inhalation by athletes and revelers. Rate of oxygen increase can be adjusted faster or slower. Change faster to overwhelm antioxidants, or change slow to condition for antioxidants.

Graded Hypoxia

Model altitude acclimation. Or condition for hypoxia. Organs transplant better when prepared for the hypoxic journey. Conditioning can be gentle, but any rate of change can be set and repeated. Faster or slower, and held there any length of time.

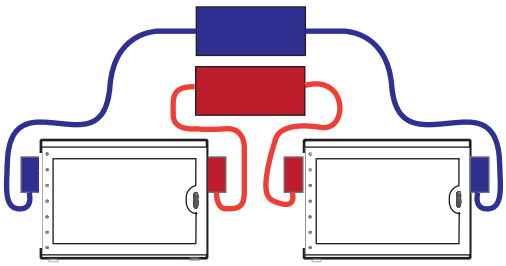
Acute/Intermittent Hypoxia



Hypoxia stress can model components of many severe diseases: heart attacks, stroke, asthma, choking, epilepsy, massive hemorrhage, etc. Deep sudden drops in chamber oxygen can create ischemia, apoptosis, and necrosis. Frequency, duration, and degree of drop are all adjustable.

Create
virtually any possible
O_2/CO_2 model!

Works With Other Controllers



The OxyCycler series was designed to be very flexible to meet researcher's needs. You never know exactly what you will discover when running animal experiments, and this flexibility allows you to add additional gas controls down the line if you discover you need them.

OxyCyclers can work together on the same chamber. Software configuration makes two controllers work together seamlessly as one. Each controls their respective gases simultaneously; even dynamic setpoints while holding other gases static.

PROFILING IS FLUX
Oxygen and Carbon Dioxide flux can affect physiology. It can only be studied if it can be recreated. Profiles are reproducible flux patterns. Profiles have multiple set points which change at precise times, with any rate of change from one set point to the next.

NORMOBARIC FLUX
Oxygen and Carbon Dioxide profiles in a semi-sealed chamber are normobaric. O_2, CO_2 and N_2 gas infusions displace chamber gas and equilibrates with the ambient barometric pressure outside.

Normobaric avoids hassles of pressure equipment. Chamber control avoids hassle of ventilation equipment.

MULTIPLE PROFILING
Two chambers allow for an experimental protocol and a control protocol. Comparing profiles makes optimizing models easy and straightforward. It also makes dose-response studies possible.

Up to 17 different profiles can be stored. Each can be run or re-run in any of the chambers at any time. Any given profile can be run in all the chambers simultaneously, or staggered at different times. Or every chamber can have a different profile running.

MODEL ANY OXYGEN OR CARBON DIOXIDE FLUX
Pattern any oxygen flux. Each profile can have 1- 20 set points. Set points can be anywhere from 0.1 - 99.9% oxygen and 0.1-20.0% carbon dioxide. Straight line rate between any two sequential set points can be 0 - 999 minutes with resolution to seconds. Profiles can be cycled 1-99 times, or looped to cycle continuously.

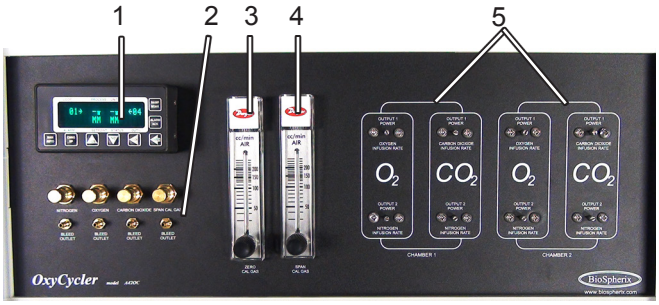
Specs

ELECTRICAL POWER: 12 VDC @ 6.66A
CONTROL RANGE: 0.1-99.9% Oxygen, 0.1-20.0% Carbon Dioxide
ACCURACY: ± 1%
RESOLUTION: 0.1%
GAS SOURCE: Compressed gas tanks, liquid carboys (from headspace), or generators.
GAS SUPPLY: Nitrogen, Oxygen, Carbon Dioxide
GAS SUPPLY LINE: 1/4 inch I.D. hose pressure rated at 40 PSIG.
GAS SUPPLY LINE PRESSURE: 0-40 PSIG
GAS INFUSION RATE: 1-150 S.C.F.H. each control gas each chamber.
GAS SUPPLY HOSE FITTINGS: 1/4 inch hose barb.
UMBILICAL LENGTH: 12 feet (custom lengths available).
ACTUATOR POD SIZE: 7"h x 4.375"w x 4.5"d
ALARM OUTPUT: Visible flashing indicator. PC adds audible and more visible indicators.
ALARM MODES: Process high, process low, deviation high, deviation low, deviation band.
WEIGHT: 22lbs
DIMENSIONS: 9"h x 21"w x 18.5"d

Sensor Operational Parameters

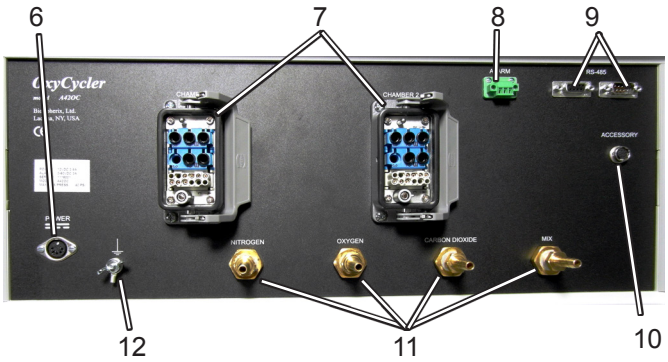
HOST CHAMBER TEMPERATURE: 0-40°C
HOST CHAMBER CO_2: 0.1%-20%
HOST CHAMBER HUMIDITY: 5-95% non-condensing

Front Panel



1. Digital Display: Bright blue digits on black back ground. Continuously displays oxygen, carbon dioxide, control status, and alarm status in all chambers, unless pre-empted by touch-key operations. Displays menu items and settings during programming.
2. Bleed Barbs and Valves: Bleeds gases out of gas supply lines. Used for depressurizing gas supplies and manual sensor calibration.
3. ZERO Cal Gas Flowmeter: Used in calibration.
4. SPAN Cal Gas Flowmeter: Used in calibration.
5. Power Adjustments: Sets infusion rate of control gases in each chamber to accommodate different dynamics. Can manually override controller to shut off gas.

Back Panel



6. Power Receptacle: 12VDC power supply connects here.
7. Actuator Pod Umbilical: Flexible umbilicals connect remote actuator pods to back panel. Semi-swivel connectors at both ends allow 360° orientation. Some models are hard welded; function is the same.
8. Alarm Receptacle: Connect an appropriate alarm to this jack.
9. RS 485 Connections: One cable attaches to a computer and the other cable attaches to another unit, to allow communication with the computer (if applicable).
10. Accessory Jack: A port for accessories to attach to the controller
11. Supply Gas Hose Barb: Barbs for 1/4 inch I.D. hose from gas sources. Handles pressure up to 40 PSIG
12. Ground Stud: For grounding the unit to protect from electric damage.

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