OxyCycler A41OV

Dynamic O_2 Controller for Animal Modeling

Highly Reproducible:

- **Disease modeling**
- **Pathology modeling**
- **Therapy modeling**

with

- **Dynamic Protocols**
- **Multiple Set Points**
- **Multiple Variables**

The OxyCycler A41OV controls chamber atmosphere via an actuator pod that attaches snugly to standard cutout.

Single Chamber Dynamic 0.1-99.9% O_2

POWERFUL TOOL
The OxyCycler A41OV is a powerful research tool for those who do oxygen sensitive work. It makes complex oxygen profile control easy.

FULL RANGE PROFILES
Control oxygen profiles with multiple setpoints anywhere from 0.1-99.9% oxygen.

DYNAMIC CONTROL
Fluctuations in O_2 levels can be programmed as a protocol, then set to repeat 1-99 times or loop infinitely. O_2 is a widely used single gas system for hypoxia and hyperoxia. N_2 is biologically neutral, and thus used to flush chambers and lower O_2 concentrations without interfering with the experiment.

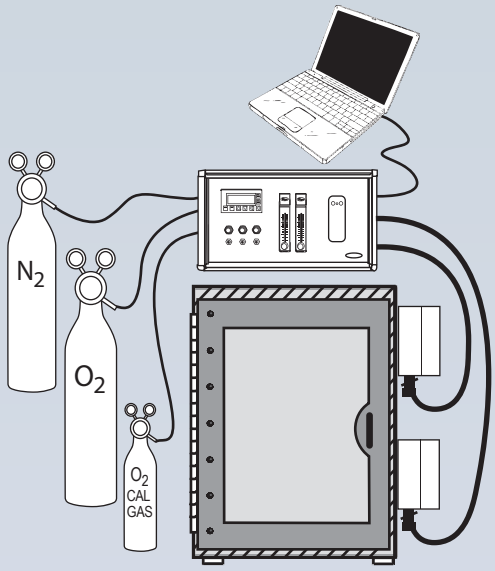
MULTI-SETPOINT
The gas concentration can be programmed to change at any time. Simply set a series of setpoints, each associated with a separate time. Intermittent hypoxia is a common example.

WORKS IN ANY CHAMBER
The OxyCycler A41OV works exceptionally well with BioSpherix A-Chambers. However, it can work with practically any semi-sealable enclosure. Large or small, any shape. Flexible or rigid. Manufactured or custom made. Most chambers can be fitted in minutes.

CONTROL IS EFFICIENT
Nitrogen is infused to lower oxygen. Oxygen is infused to raise it. Feedback from oxygen sensor inside chamber tells the OxyCycler A41OV exactly when and exactly how much gas to infuse. No gas is ever wasted! Any disturbances are immediately detected and corrected.

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 A41OV on or near host chamber and plug it in.
2. Mount the actuator pod to its host chamber.
3. Mount monitor pod to host chamber (optional).
4. Hook up gas supply.

How It Works

The OxyCycler A41OV connects to the chamber via flexible umbilical. At the end of the umbilical is an actuator pod which contains an oxygen sensor, a gas nozzle, homogenizing fan, and mounting hardware. Pods mount to chamber over special precut holes so oxygen sensors can monitor chamber oxygen and gas can be infused.

The fan pushes air inside the chamber at an array of 3x3 ventilation holes, forcing circulation and gas homogenization while displacing off-gases, ensuring **GLP** quality air conditions for animals.

Operation

Use PC software for easy interface, real-time trend charting, data logging, and remote operation. Dynamic O_2 exposures are programmed with a series of setpoints that can change, be stored and re-run with the click of a mouse.

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.

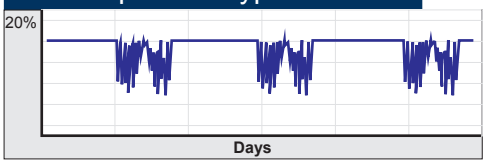
Monitor Pod

Precisely adjust the ventilation of the chamber by using the sensors in a monitor pod (ppm CO_2, humidity and temperature). In most cases, if the ppm CO_2 exhaled by the animals is controlled and limited all other off-gases will be handled successfully as well. One exception may be relative humidity when there is an excessive source of humidity such as overly moist litter, increased animal activity, dripping water, etc.

Once the monitor pod has been used to adjust the ventilation, it can be used for documentation in animal safety reviews to verify all worrisome off gases were successfully handled. Furthermore, the monitor pod can be easily moved from chamber to chamber when there is a new need to characterize a chamber. A chamber needs to be characterized before an experiment is performed if there is any change in the chamber. The need to characterize the off-gas in each individual chamber is the reason why the monitor pod has its unique mobile design.

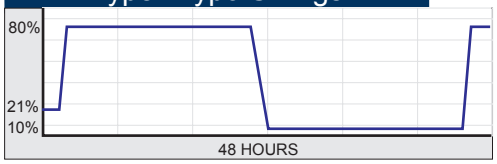
Performance

Episodic Hypoxia



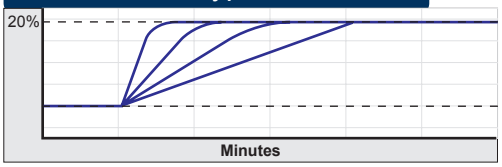
Recurring episodes of hypoxia can reproduce hypoxemia patterns created by occupational flight, sleep apnea, asthma, and pulmonary infections. Chronic hypoxic episodes might promote chronic degenerative diseases such as hypertension, diabetes, rheumatoid arthritis, macular degeneration, psoriasis, osteoporosis,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

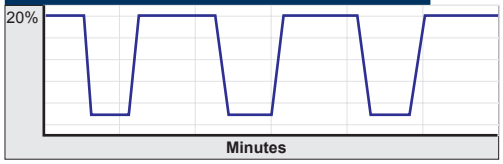


Sudden increases in inspired oxygen can cause pulmonary damage. Model toxicity of oxygen therapy in young (premature born) and old (emphysemics) and in between (trauma patients). Model toxicity of recreational oxygen inhalation by athletes and revelers. Rate of oxygen increase can be adjusted faster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

Graded Hypoxia

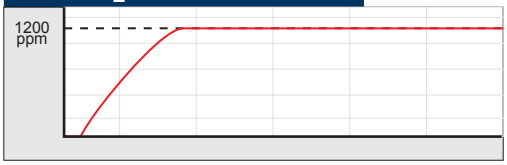
Model altitude acclimation. Or condition for hypoxia. Organs transplant better when prepared for the hypoxic journey. Conditioning can be gentle, but any rate of change can be set and repeated. Faster or slower. And held there any length of time.

Acute/Intermittent Hypoxia



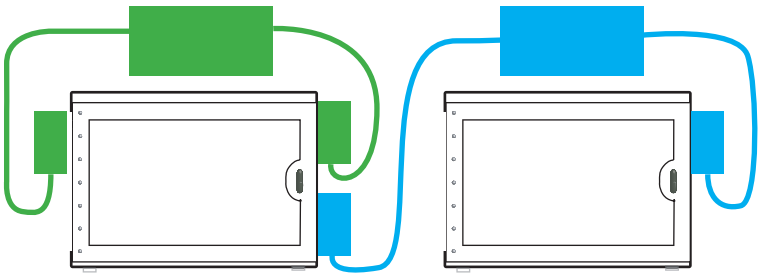
Hypoxia stress can model components of many severe diseases: heart attacks, stroke, asthma, choking, epilepsy, massive hemorrhage, etc. Deep sudden drops in chamber oxygen can create ischemia, apoptosis, and necrosis. Frequency, duration, and degree of drop are all adjustable.

CO_2 Limit Control



The optional Monitor Pod can track CO_2 and signal the controller to increase airflow to flush excess while maintaining O_2 protocols. CO_2 is the by-product animals produce the most. If it is limited, other by-products will also be kept low.

Works With Other Controllers



The OxyCycler A41OV can also supplement CO, NO and NO_2 controllers to ensure O_2 levels are not flushed too low. The monitor pod can move between chambers to characterize them, or log vital atmosphere conditions over the course of an experiment.

The OxyCycler A41OV can work with any BioSpherix controller, or completely independently. A-Chambers come standard with two cutouts, one on each side, but can easily be modified to accommodate up to four separate controllers. This can lead to many configuration options for control chambers and simultaneous experiment protocols.

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 flux can affect physiology. It can only be studied if it can be recreated. Profiles are reproducible flux patterns. Profiles have multiple setpoints which change at precise times, with any rate of change from one setpoint to the next.

NORMOBARIC FLUX
Oxygen profiles in a semi-sealed chamber are normobaric. Nitrogen and oxygen gas infusions displace chamber gas. Pressure inside the chamber equilibrates with ambient barometric pressure outside the chamber.

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

MULTIPLE PROFILING
Up to 17 different profiles can be stored. Each can be run or re-run at any time.

MODEL ANY OXYGEN FLUX
Pattern any oxygen flux. Each profile can have 1- 20 setpoints. Setpoints can be anywhere from 0.1 - 99.9% oxygen. Straight line rate between any two sequential setpoints can be 0 - 999 minutes with resolution to seconds. Profiles can be cycled 1-99 times, or looped to cycle continuously.

Create virtually any Oxygen model!
See examples above!

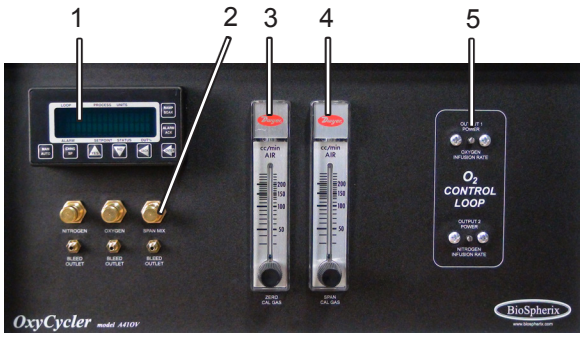
Specs

ELECTRICAL POWER: 12 VDC @ 6.66A
CONTROL RANGE: 0.1-99.9% Oxygen
ACCURACY: ± 1%
RESOLUTION: 0.1%
GAS SOURCE: Compressed gas tanks, liquid carboys (from headspace), or generators.
GAS SUPPLY: Nitrogen, Oxygen
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: 27lbs
DIMENSIONS: 9"h x 17"w x 14.5"d

Sensor Operational Parameters

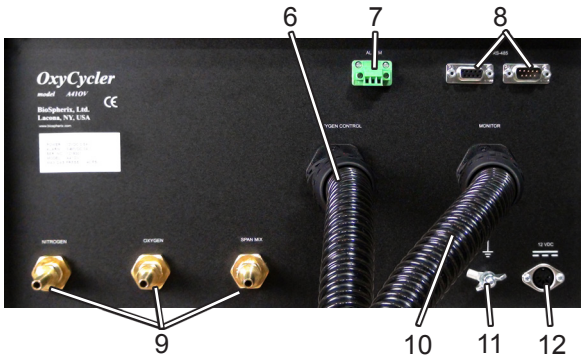
HOST CHAMBER TEMPERATURE: 0-40°C
HOST CHAMBER CO_2: 0.1-20%
HOST CHAMBER HUMIDITY: 5-95% non-condensing

Front Panel



1.Controller: Bright blue digits on black back ground. Continuously displays current control gas level, control status, and alarm status in all chambers. Displays menu items and settings during programming.
2. Bleed Valves and Barbs: Bleeds gases out of gas supply lines. Calibration cup for sensor attaches here.
3. ZERO Cal Gas Flowmeter: Used for calibration.
4. SPAN Cal Gas Flowmeter: Used for calibration.
5. Needle Valves: Sets infusion rate of control gases in each chamber to accommodate different dynamics. Can manually override controller to shut off gas.

Back Panel



6. Actuator Pod Umbilical: Flexible umbilical connects remote actuator pod to back panel. Semi-swivel connectors at both ends allow 360° orientation. Some models are hard welded; function is the same.
7. Alarm Receptacle: Connect an appropriate alarm to this jack.
8. 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).
9. Supply Gas Hose Barb: Barbs for 1/4 inch I.D. hose from gas sources. Handles pressure up to 40 PSIG.
10. Monitor Pod Umbilical: Flexible umbilical connects remote monitor pod to back panel. Semi-swivel connectors at both ends allow 360° orientation. Some models are hard welded; function is the same.
11. Ground Stud: For grounding the unit to protect from electric damage.
12. Power Receptacle: 12VDC power supply connects here.

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