BioSpherix

CytoCentric Products

OxyCycler GT41

Gasotransmitter Ready O_2/CO_2 Culture System

- **First Gasotransmitter Upgradeable Cell Culture System**
- **Precise Automated Exposures of O_2 and CO_2**
- **Dynamic or Static Exposures**
- **Simulate Physiologic and Pathophysiologic Conditions**
- **Unprecedented O_2 Phenotypes**
- **Upgrade with CO or NO or both CO and NO**

Single Chamber Dynamic 0.1-99.9% O_2 and 0.1-20% CO_2

ADVANCED GASOTRANSMITTER INCUBATION

The OxyCycler GT41 is a powerful controller with unique capabilities for subchamber culture systems. It fits subchambers using an advanced adapter plate with a versatile multipod sensor assembly. This assembly makes it quick and easy to add or change control functions.

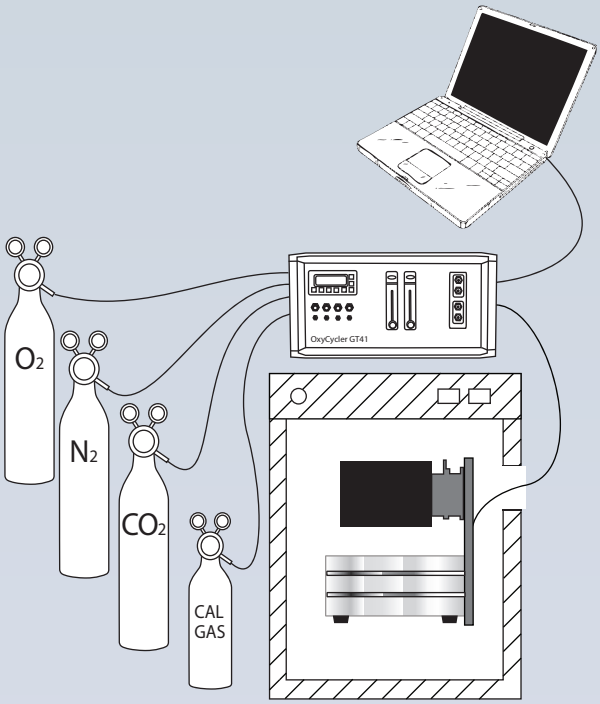
UNLIMITED PROGRAMMED, DYNAMIC EXPOSURES

The GT41 can work as a fully functional, stand-alone controller providing advanced oxygen (O_2) and carbon dioxide (CO_2) range control with humidity limiting for simulating physiologic and pathophysiologic O_2. With static or programmable dynamic O_2 control, it can create a wide variety of hypoxic and hyperoxic exposures, as well as cell normoxia, which is normally much lower than room air or oxygen levels in CO_2 incubators.

MODULAR FLEXIBILITY

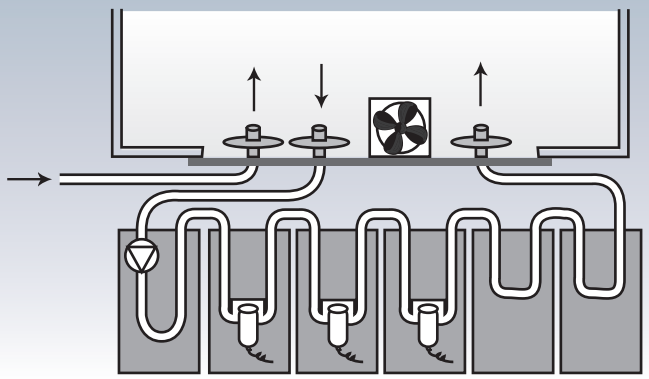
In addition, the GT41 based subchamber culture systems can be upgraded with gasotransmitter control. As the core controller in a set of controllers it can be configured to work with different piggyback controller combinations to create CO and NO gasotransmitter culture systems. The GT41 is often used as a starter set for later upgrade. Since many pathophysiologic O_2 events and gasotransmitter responses are interrelated, eventually simulating physiologic and pathophysiologic carbon monoxide (CO) and/or nitric oxide (NO) in these cell cultures offers an attractive upgrade path in gasotransmitter research laboratories. No other subchamber controller offers this unique and powerful upgrade option.

Installation Schematic



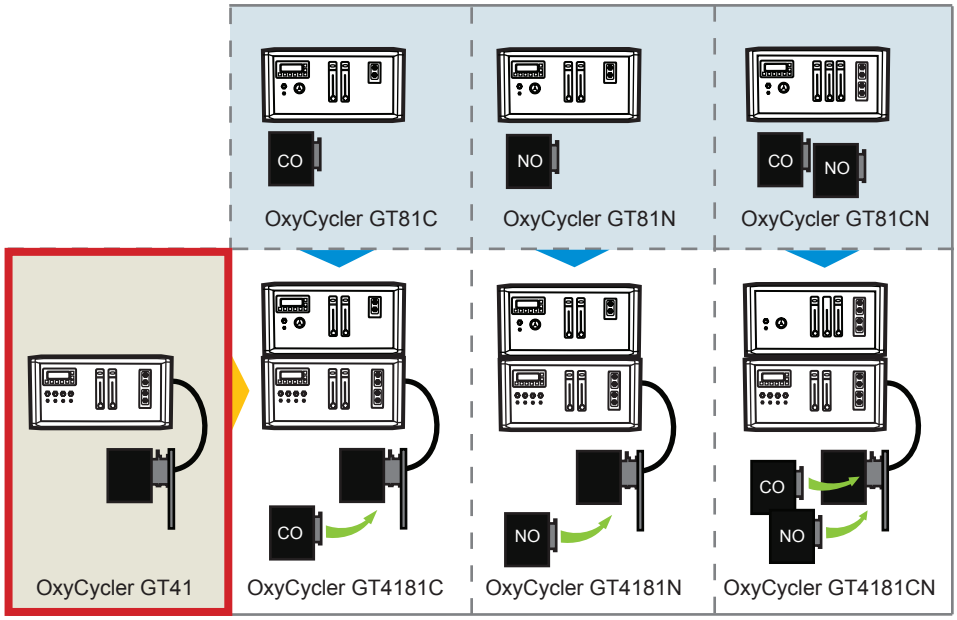
OxyCycler GT41 Culture System. Controls dynamic or static O_2, CO_2, and limits RH in subchamber. Fits most standard incubators. Supply gases required: Oxygen, Nitrogen, and Carbon Dioxide. Calibration gas required: certified pre-mix of 10% CO_2 in balance oxygen.

How It Works



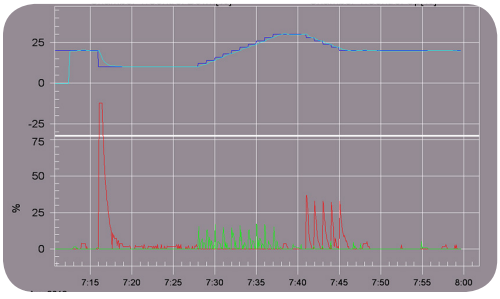
Hot swap multipod adapter plate provides microbial barrier filters between cells culturing in the subchamber and all of the sensors and mechanisms that control O_2, CO_2, RH, CO, NO/NO_2 and temperature. Hot swap multipods provide upgrade flexibility and immediate, easy maintenance. A pump draws a sample of the controlled atmosphere and passes by all sensors and returns to chamber through disposable microbial barrier filters. Appropriate gases are infused as necessary by controllers through terminal, microbial barrier filters. A small fan homogenizes gases throughout chamber and can be easily removed, sterilized and replaced. Loop pods (depicted to the far right) keep a continuous flow of the sample draw in the absence of the CO and NO/NO_2 multipods. If the system is upgraded at a later date, these loop pods are easily removed and replaced with CO and/or NO/NO_2 multipods.

Configuration



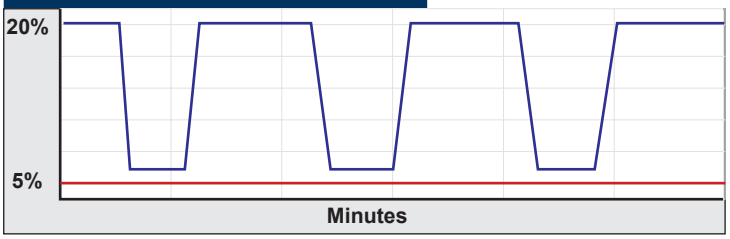
The GT41 is the core controller of the common O_2/CO_2 and RH levels as part of a modular controller set designed to allow configuration of 3 different gasotransmitter cell culture systems for cell research. The set offers options for precise, automated, and reproducible exposures to carbon monoxide (CO) and/or nitric oxide (NO). Depending on which secondary piggyback controller, you can have CO only, NO only, or CO and NO control, both in one system.

Controller sits outside the incubator and umbilicals extend through port hole on the incubator and connect to Hot Swap Minipod Assembly inside the incubator.



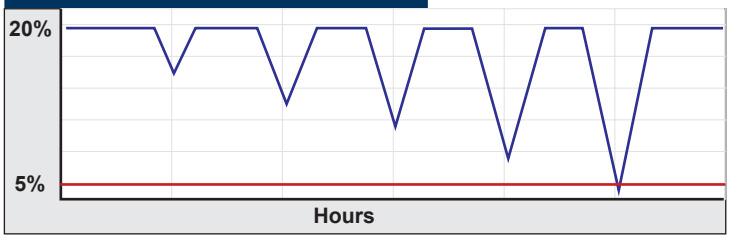
Operated by a computer and powerful software allows user to program any type of exposure with all variables and repeat those exposures with the click of a mouse. Profiles can be created, stored and recorded 24 hrs a day/7 days a week.

Acute/Intermittent Hypoxia



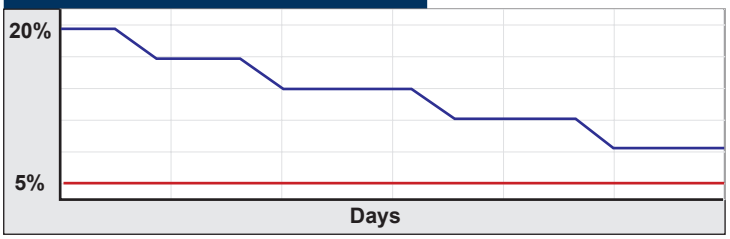
Hypoxic stress can model components of many severe diseases such as heart attacks, strokes, asthma, or epilepsy. Frequency, duration and degree of drops are all adjustable.

Hypoxic Preconditioning



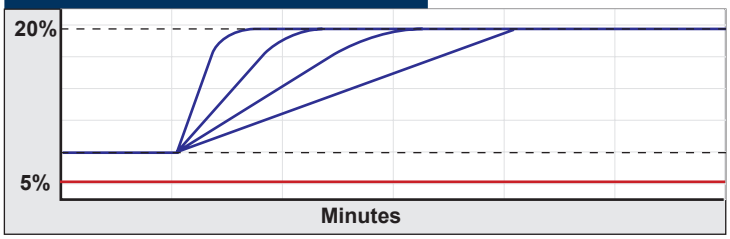
Cells destined for implantation will experience hypoxia and may be better prepared if they are conditioned to it before implantation. Ischemia may also be protected by conditioning. The OxyCycler GT41 can easily run any preconditioning profile.

Graded Hypoxia



Model step reduction in oxygen, similar to altitude acclimation, to gradually condition cells for hypoxic upregulation of gene expression. The rate of change between any two levels is adjustable and repeatable. The duration at any given level is adjustable and repeatable.

Acute Hyperoxia



Sudden increases in oxygen can cause cell damage. The OxyCycler GT41 allows modeling toxicity of oxygen in any cell culture, similar to toxicity from recreational oxygen inhalation by athletes, therapeutic oxygen administration in critical care units, and other sudden exposures to high oxygen. The rate of oxygen increase can be adjusted to change faster to overwhelm antioxidants, or change slower to condition for antioxidants.

HUMIDITY IS CHALLENGING

Most cell culture procedures treat humidity as a necessary second thought. Humidity saturation is usually the result, and saturation leads to condensation. Condensation is always undesired for multiple reasons. #1 High contamination risk. #2 Equipment malfunction. #3 Inconvenient mess. OxyCycler GT41 meets the challenge with the ability to limit the negative consequences of excessive humidity; one of the few in all cell culture devices.

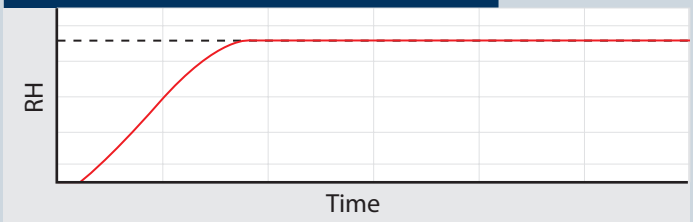
HUMIDITY IS NORMALLY NEGLECTED

Despite the undesired consequences of condensation, humidity is mostly neglected, permitting the drying of cultures. Part of the reason is an assumption that high humidity is necessary but technology is limited to control it.

HUMIDITY EFFECTS GASOTRANSMITTER PERFORMANCE

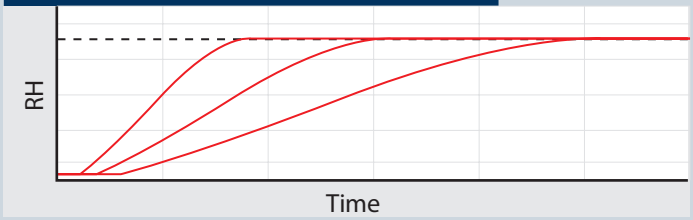
Gasotransmitter culture systems require better humidity control and necessitate a much lower level of humidity in routine cultures. In fact, best performance is when humidity is 60% or less. The OxyCycler GT41 uses a simple but effective way to limit humidity to optimal levels. User has to verify that lower levels are not going to be detrimental to the drying of their cultures or has to accommodate the suppression of certain performance capabilities of the system.

RH Limit Control



Open water surfaces are used in the subchamber to humidify the atmosphere but limits are set by operator to be as low as possible. The controller monitors relative humidity and infuses dry nitrogen as necessary to prevent the humidity from exceeding predetermined limits.

Humidification Rate



A water pan is included with each subchamber, however it is not recommended to pour water directly into the pan for humidification purposes. Instead it is highly recommended to place sterile plates of sterile, distilled water in the water pan which serves as a catch basin in case of a spill. Humidification rate is a function of the surface area of the open water. Adjusting the surface area to increase or decrease the surface area is proper way to balance the humidification rate with the chamber size. Otherwise it would take a reasonable amount of gas consumption to counter the rate of humidification.

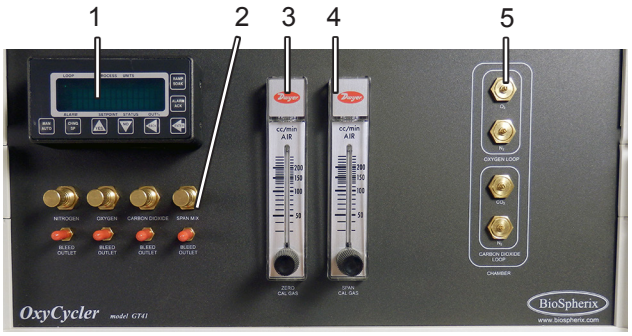
Specs

ELECTRICAL POWER: 12VDC, 6.6AMP
ACCURACY: O_2: ±1% at constant temperature/pressure, ±2% over entire temperature range. CO_2: ±5% of measurement or 0.1% CO_2. Temperature: ±0.6°C. Relative Humidity: ±3% RH between 0-40°C
RESOLUTION: 0.1%
OXYGEN SENSOR: Electro-galvanic fuel cell
CARBON DIOXIDE SENSOR: Infrared sensing
GAS SOURCE: Compressed gas tanks, liquid carboys (from headspace) or generators
GAS SUPPLY: Pressurized O_2, CO_2, N_2, O_2/CO_2 SPAN mix. Customer should consider protocol when ordering SPAN gases
GAS SUPPLY LINE: 1/4" ID hose, pressure rated to 25 PSIG
GAS INFUSION RATE: 1-25 S.C.F.H (Adjustable depending on application)
GAS CONSUMPTION: Depends on (1) size and leakiness of host chamber, (2) frequency and duration of opening chamber doors and (3) gas level
UMBILICAL LENGTH: 12 ft
UMBILICAL DIAMETER: 1/16" ID
SENSOR CABLE LENGTH: 12 ft
SENSOR CABLE DIAMETER: 6mm
ALARM OUTPUT: Global Alarm Output
ALARM MODES: Process High, Process Low, Deviation High, Deviation Low, Deviation Band
WEIGHT: 22 Lbs
CONTROLLER DIMENSIONS: 9"H, 17"W, 15"D
REMOTE MONITOR POD DIMENSIONS: 4.25"H, 7.0625"W, 4.25"D

Sensor Operational Parameters

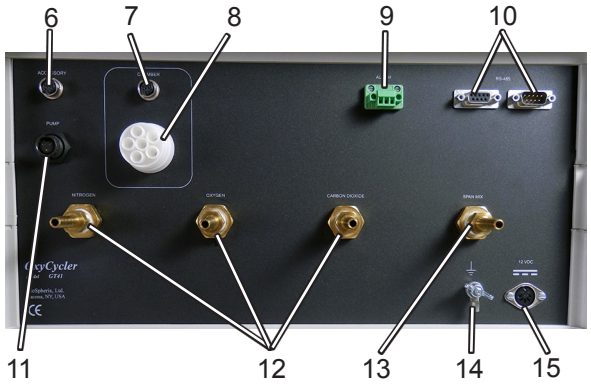
HOST CHAMBER TEMPERATURE: 5-40°C
HOST CHAMBER HUMIDITY: 5-95%

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 Calibration Gas Flowmeter: Used for calibration.
4. SPAN Calibration 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. Accessory Receptacle: 10 Pin Receptacle is for connecting optional accessory units.
7. Communications Cable Jack: This cable relays information for the sensors.
8. Actuator Pod Umbilical: Flexible umbilicals connect remote actuator pods to back panel.
9. Alarm Receptacle: Connect an appropriate alarm to this jack.
10: 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).
11: Pump Connection: This 3 pin receptacle supplies power to the Mini Pod Pump.
12: Supply Gas Hose Barb: Barbs for 1/4 inch I.D. hose from gas sources. Handles pressure up to 40 PSIG.
13: Span Mix Barb: Barb for 1/4 inch I.D. hose from gas source.
14: Ground Stud: For grounding the unit to protect from electric damage.
15: Power Receptacle: 12VDC power supply connects here.

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