

WORKS IN:

- Incubators
- Gloveboxes
- Refrigerators
- Animal cages
- Plant chambers
- Plastic bags
- Ice boxes
- Tents
- Etc.



Single Chamber 0.1-20.0% CO₂

VERSATILE CO₂ TOOL

The new ProCO₂ P120 is a versatile, compact carbon dioxide controller for people who do CO₂ sensitive work. The ProCO₂ P120 fits in virtually any chamber, and makes it easy to control the CO₂ level inside that host chamber.

PHYSIOLOGIC OR AMBIENT RANGES

Controller set point can be anywhere from 0.1-20.0% CO₂ for most physiologic concentrations. Alternatively, low level, high resolution set points from 10-10,000 ppm can be limit-controlled over ambient range with a version of this controller.

WORKS IN ANY CHAMBER

The ProCO₂ P120 fits and controls CO₂ inside any semi-sealable enclosure. What ever size, shape, rigidity, or isolation, most chambers can be fitted in minutes. The ProCO₂ P120 works from outside the host chamber by remotely sensing the CO₂ inside the chamber. It infuses CO₂ gas to raise the carbon dioxide levels, or nitrogen to displace and lower the CO₂ levels.

CONTROL IS EFFICIENT

The ProCO₂ P120 gains feedback from the CO₂ sensor, in order to precisely regulate gas infusion according to the set point. No gas is ever wasted.

OPERATION IS SIMPLE

CO₂ is quickly taken to set point and held there indefinitely. Any disturbances are instantly detected and corrected immediately. Calibration and gas supply must be checked once in a while. All else is automatic.

HANDLES ANY CO₂ CONTROL JOB

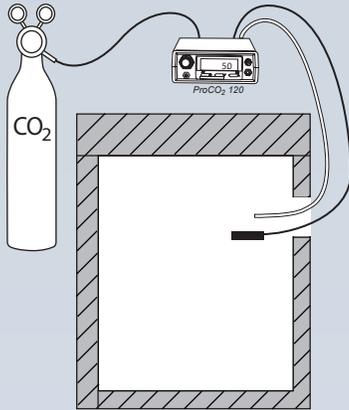
- Where ambient air CO₂ is too low or too high, it can provide any other level you need up to 20%.
- Where ambient is not air, it can restore and maintain air equivalent CO₂.
- Where CO₂ consumptive or generative processes need to be countered, it can hold CO₂ stable.

Run it continuously year-round, or on occasion as needed. No other CO₂ controller offers so much value.

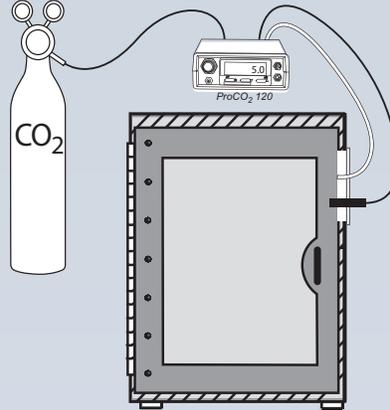


Compact design takes up minimal lab space.

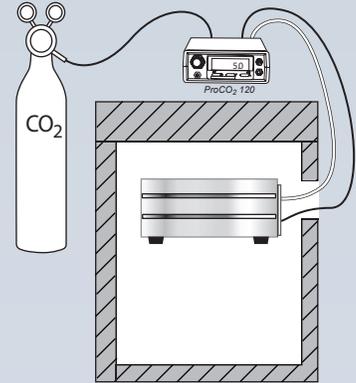
Installation Schematics



Direct insertion of sensor/tubing
(shown on incubator)



Control via Adapter Plate
(shown on BioSpherix A-Chamber)



Subchamber via Adapter Plate
(shown on BioSpherix C-Chamber)

ProCO₂ P120 can control any semi-sealable chamber by one of the methods shown above, installation may vary based on chamber.

Installation

1. Set ProCO₂ P120 on or near host chamber and plug it in.
2. Hook up sensor and gas infusion tube and insert both into chamber.
3. Hook up gas supply.

How It Works

From outside the host chamber, the ProCO₂ P120 works by remotely sensing the carbon dioxide concentration inside the chamber and infusing either nitrogen to lower it or carbon dioxide to raise it.

Installation is easy. Simply insert sensor and nozzle of infusion tube into chamber through any convenient passageway. Doors, windows, sample ports, access ports, holes (built-in or custom-drilled) all work.

Operation



FRONT PANEL INTERFACE

All operators are conveniently located on the front panel. All connections are on the back panel, out of the way. Carbon dioxide concentration at sensor continuously displays in bright green digits that can easily be read from across the room. Manual switch for gas provides convenient shut off. It saves gas when the chamber door is open. Just don't forget to turn it back on! The alarm buzzer also has a manual switch.



Gas

USE ANY GAS SUPPLY

The ProCO₂ P120 conveniently utilizes gas from any source. Best supply depends on consumption. Compressed gas is best in low consumption applications. Generator is best in high consumption applications. Liquid is best in between.

SAVES GAS AND MONEY

Chamber gas consumption varies widely, but in every case the ProCO₂ P120 always and absolutely minimizes gas consumption. It's maximally efficient! Gas costs are reduced to absolute minimum.



1. No control yet. Chamber CO₂ is ambient air CO₂ (0%).
2. Control starts. Control gas is CO₂ and the ProCO₂ P120 immediately infuses it to raise chamber levels of CO₂ up.
3. CO₂ is taken to setpoint. How fast depends on infusion rate. Infusion rate is adjustable. The higher the infusion rate, the faster to setpoint. Gas consumption in this phase is mostly a function of chamber size. The larger the chamber, the more gas it takes.
4. Steady-state control at setpoint is established. Infusion of control gas exactly matches chamber leakage to hold CO₂ level constant. Gas consumption here is mostly a function of chamber leakage. The leakier the chamber, the more gas it takes.
5. Door of chamber is suddenly opened and closed. Steady-state is disrupted. In-rush of air is immediately detected and chamber CO₂ is promptly returned to setpoint. Gas consumption depends on how wide and how long the door was opened. The more it's disrupted, the more gas it takes to get back to setpoint.
6. Door suddenly unlatches. Leakage goes up, but the ProCO₂ P120 compensates and immediately re-establishes steady setpoint. Gas consumption goes up dramatically, but CO₂ is kept at setpoint. Consumption increases in proportion to leakage.
7. Door gets shut tight. Leakage goes back down to normal. The ProCO₂ P120 compensates by drifting back to setpoint and re-establishes steady-state at setpoint. Gas consumption goes back down to normal levels, while CO₂ stays put.

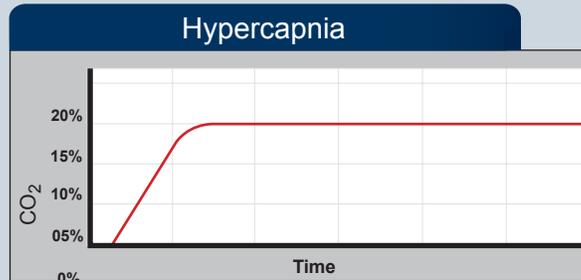
NORMOBARIC FEEDBACK CONTROL

ProCO₂ P120 works in semi-sealable chambers. It controls chamber carbon dioxide by infusing it, displacing some of the current gaseous contents. Pressure inside the chamber stays the same as pressure outside.

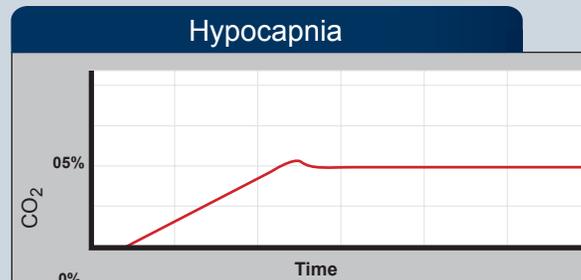
Reaching a setpoint is a logarithmic process. The further away from ambient the setpoint is, the slower it goes. But closed-loop control is efficient. By constantly monitoring chamber carbon dioxide, it promptly gets to setpoint. It responds immediately to correct any disturbance. It automatically adjusts to different loads. And in the process, it uses the least amount of gas possible!



Power is a function of infusion rate of control gas. The higher the infusion rate, the faster to setpoint. Above: infusion rate #4>#3>#2>#1. Infusion rate is a function of control gas supply pressure. The higher the pressure, the higher the infusion rate. Maximum 25 PSIG provides 35 SCFH.



Hypercapnia is a relative term that means excess concentration of CO₂. The ProCO₂ P120 can create hypercapnia by infusing the CO₂ into the chamber until it reaches the setpoint and holding it there.



Hypocapnia is a relative term that means a lesser amount of CO₂ concentration (relevant to cell culture). In cell culture, 5% CO₂ is pretty standard practice. The ProCO₂ can create hypocapnia by infusing the CO₂ to a specific setpoint.

Specs

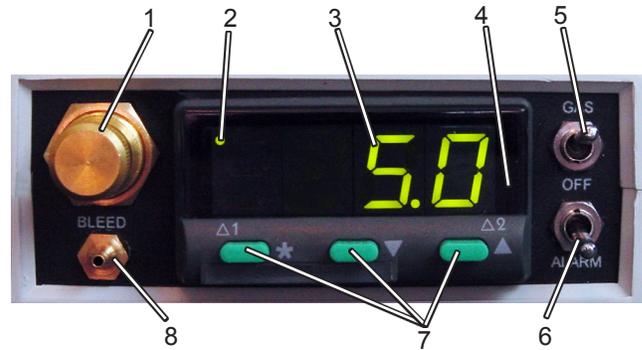
ELECTRICAL POWER: 12 VDC at 2.5A
CONTROL RANGE: 0.1-20% carbon dioxide (depending on the power/ load balance)
ACCURACY: ±.3% (@0%) to ±.7% (@20%) at 25°C and 1013hPa
RESOLUTION: 0.1%
CARBON DIOXIDE SENSOR: various application specific sensors are available.
GAS SOURCE: compressed gas tanks, liquid carboys (from headspace), or generators.
GAS SUPPLY: pressurized CO ₂ or N ₂
GAS SUPPLY LINE: 1/8" I.D. hose pressure rated to 25 PSIG.
GAS SUPPLY LINE PRESSURE: 1-25 P.S.I.G.
GAS INFUSION RATE: 0-25 S.C.F.H.
GAS CONSUMPTION: depends on (1) size and leakiness of host chamber, (2) frequency and duration of opening chamber doors, and (3) carbon dioxide level controlled.
GAS SUPPLY HOSE FITTING: 1/8" hose barb.
INFUSION TUBING HOSE FITTING: 1/8" ID hose barb.
INFUSION TUBING DIAMETER: 1/4" O.D. x 1/8" I.D. (special tubing sizes available).
INFUSION TUBING LENGTH: 10 ft. (custom lengths available).
SENSOR CABLE LENGTH: 6'8"
SENSOR CABLE DIAMETER: 6mm.
ALARM OUTPUT: audible 40dB alarm and visible flashing indicator.
ALARM MODES: process high, process low, deviation high, deviation low, deviation band.
WEIGHT: .7 lbs (Controller Only)
DIMENSIONS: 1.5"H x 3.5"W x 7"D

Sensor Operational Parameters

HOST CHAMBER SIZE: depends on the chamber gas dynamics and carbon dioxide level controlled.
HOST CHAMBER TEMPERATURE: -20-50°C (depending on sensor).
HOST CHAMBER CO₂: 0-99% (depending on sensor)
HOST CHAMBER HUMIDITY: 1-100% R.H. non-condensing.

Optional: Windows® based software package that provides trend plotting, data logging, and remote operation via RS connection to your PC. Multiple ProCO₂ P120s can be daisy chained via optional RS-485 interface.

Front Panel



- 1. Bleed Valve:** Bleeds gas out of gas supply line. Used for calibrating sensor and depressurizing gas supply.
- 2. Control Indicator Light:** Flashes when gas is infused.
- 3. Digital Display:** Bright green 0.4 inch digits. Continuously displays CO₂ concentration at sensor, unless pre-empted by other operations. Displays menu items and settings during programming.
- 4. Alarm Indicator Light:** Flashes when alarm output is actuated.
- 5. Gas Switch:** Manually overrides controller to shut off gas.
- 6. Alarm Switch:** Manually overrides controller to shut off alarm.
- 7. Touch Keys:** 3 amply spaced tactile keys for setting configuration and control parameters.
- 8. Bleed Barb:** 1/8" hose barb where gas bleeds out from bleed valve. Calibration tubing for sensor attaches here.

Back Panel



- 9. Sensor Input Jack:** Locking sensor cable connects here. Finger tightened locking nut on cable plug secures it.
- 10. Power Receptacle:** 12VDC power supply connects here.
- 11. Supply Gas Hose Barb:** Barbs for 1/8" I.D. hose from gas sources. Handles pressure up to 25 PSIG.
- 12. Control Gas Outlet:** Brass 1/8" hose barb where infusion tubing into host chamber connects.



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