



# SABLE SYSTEMS INTERNATIONAL

## ROXY-1 O<sub>2</sub> or CO<sub>2</sub> Regulator/Controller

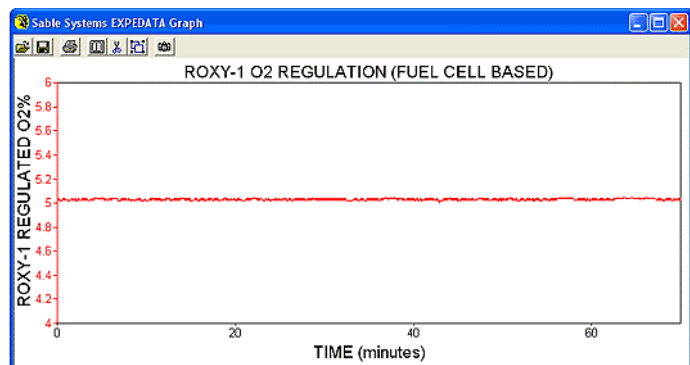


Responding to researchers' need for a **high quality, intelligent and versatile "universal" regulator/controller** of oxygen or carbon dioxide concentration in growth chambers, tissue culture chambers, and incubators of various kinds, we present the **ROXY-1 Oxygen and Carbon Dioxide Regulator**. The ROXY-1 builds on Sable Systems' expertise in gas analysis and flow control. It is a versatile, sophisticated and very economically-priced solution for single channel gas regulation and control.

**HOW IT WORKS.** The compact ROXY-1 works by pulsing nitrogen (for hypoxic control), oxygen (for hyperoxic control) or carbon dioxide into the chamber being regulated. Only enough gas is added to reach the user-defined setpoint – reducing tank gas use to an absolute minimum. Sophisticated PID (Proportional-Integral-Derivative) control is used, guaranteeing practically zero overshoot or undershoot, and compensating for pressure variations in the gas line. It's as close to perfect control as you can get.

**SOPHISTICATED FEATURES.** The ROXY-1 offers several features that set it apart. **First**, it contains a **pressure sensor that monitors input gas pressures**. If a tank is about to run out, the ROXY-1 can **sound an alarm**. **Second**, it has both **analog and digital outputs** so that the regulated value can be recorded with any data acquisition system for documentation or QC purposes. **Third**, it offers **full serial control of setpoint**, allowing ramping, profiling and other sophisticated experimental designs by computer control in addition to its full capabilities in **standalone mode**. **Fourth**, the ROXY-1 has an **extremely versatile input system**, allowing it to be used with a fuel cell oxygen sensor (its usual mode), or with a user-supplied gas analyzer or other sensor of almost any kind. In fact, the ROXY-1 *can even regulate pressure* if the appropriate sensor and effector(s) are connected. **The setpoint for regulation is set quickly and easily through the ROXY-1's very user-friendly, intuitive menu system.** All settings for the ROXY-1 are accessible through the menu system, and changes are stored in nonvolatile memory with a rated retention of > 100 years.

**CONTROL OXYGEN.** The ROXY-1 can **intelligently regulate anywhere from <1% to 100% oxygen**. The ROXY-1 is so intelligent that it can use either our fuel cell sensor or an external oxygen analyzer to read oxygen concentrations! That's right - connect one of our inexpensive fuel cell sensors to the ROXY-1's input and place the sensor inside the cabinet you wish to regulate, and you have immediate oxygen control. Alternatively, use an external oxygen analyzer (which might be, but doesn't have to be, one of ours) and connect it to the ROXY-1's input path. This versatility is possible because the ROXY-1 uses sophisticated signal processing, programmable gain instrumentation amplifiers and a super-resolution (24 bit!) analog to digital conversion system, combined with an intelligent microcomputer. With the ROXY-1, some tubing and the appropriate gas source, setting up a regulated environment is easy. The ROXY-1 also supports single point or two point sensor calibrations directly from its menu system.



We're using the ROXY-1 in current research on the thermal effects of hypoxia in *Drosophila* and it regulates O<sub>2</sub>% very closely and accurately - for example, at a setting of 5% O<sub>2</sub> our mean reading is 5.01% with a standard deviation < 0.008% over a period of an hour (see the graph at right). The ROXY-1 outperforms most dedicated gas mixing systems based on mass flow control valves, which are typically accurate to only 1% of full scale at best. This can translate to mixing inaccuracies approaching 10% at the far ends of their ranges - inaccuracies that our ROXY-1 avoids because it senses oxygen levels directly, using a calibrated sensor, within a closed-loop control system using PID (Proportional-Integral-Derivative) algorithms that minimize "hunting".

**CONTROL CARBON DIOXIDE.** Using an external carbon dioxide analyzer, the ROXY-1 can read and regulate CO<sub>2</sub> concentrations anywhere within the range of the analyzer. Set the analyzer to read the CO<sub>2</sub> concentration within the controlled environment, connect a CO<sub>2</sub> line to the ROXY-1, connect a line from the ROXY-1 to your controlled environment, connect the analog signal from the analyzer to the ROXY-1, tell the ROXY-1 your setpoint and you're done. The ROXY-1 will add sufficient CO<sub>2</sub> to the air within the regulated environment to bring it to the correct setpoint with no waste. Want to log the results? No problem - choose between analog and digital (RS-232) outputs.

**CONTROL DISSOLVED OXYGEN.** The ROXY-1 can **intelligently regulate anywhere from <1% to 100% dissolved oxygen in aquatic media.** Use your own dissolved-oxygen analyzer with an analog output to read oxygen concentrations, and bubble air or nitrogen into your medium under the ROXY-1's command to maintain an exact setpoint with no wasted gases!

**You can, in fact, use the ROXY-1 to control practically anything in the aerial or dissolved gas phase** for which you have a suitable analyzer. Other examples might include dew point (water vapor), methane, carbon monoxide or hydrogen. Connect the analyzer, connect the gas, give the ROXY-1 an appropriate setpoint - and proceed to regulate flawlessly. What could be simpler?

**RELIABILITY IS DESIGNED-IN.** Sable Systems has always offered a three year guarantee, so we never take shortcuts that competitors or imitators take to hold down cost - because our pledge is to manufacture only instruments that we ourselves would rely on in our own research. The ROXY-1 also does its part to **alert you if a problem develops.** In the event of user error, low gas pressure, or the unlikely event of equipment failure, the ROXY-1 includes a **user-configurable alarm** to alert users to the problem. For example, the critical transistor that operates the gas solenoid is closely monitored. In the very unlikely event it develops an open or short circuit, or if the solenoid develops an open-circuit fault, an alarm immediately sounds so that disruption to regulation is minimized. **You can trust us and our products, period.**

**For all its versatility and reliability, the ROXY-1 is very reasonably priced!**  
*Would you trust your research to anything less?*

## ROXY-1 TECHNICAL SPECIFICATIONS

**Single chamber regulation**

**Uses fuel cell oxygen sensor, or user-supplied gas or pressure analyzer with voltage output**

**Covers the range** <1 - 99+% oxygen (fuel cell), or whatever range an attached analyzer can measure (analog input range -0.2V to +5.2V)

**Voltage sensitivity for attached sensor or analyzer:** <1 mV to +5.2 V

**Gain range and resolution:** gain 1 to 10,000 (auto-ranging), 24 bits resolution, update rate 5 Hz

**Gas pressure sensor** 0 - 350 kPa; sounds alarm if tank pressure falls below user-settable limit

**Gas pressure (input line):** 50 - 175 kPa (10 - 25 psi) recommended

**Fully self-contained, with display** - no expensive surprises!

**Microcomputer-based,** intelligent, auto-diagnosing

**Fully menu-driven;** intuitive and flexible

**Driftless digital controls** backed by 100-year memory

**Full user control** over all PID control parameters

**Power Requirement:** 100-240VAC or 12VDC operation

**Power consumption** 0.1W - 2W, depending on operation mode

**Digital** (RS-232) outputs for regulation monitoring and control

**Analog** output for regulation monitoring, 0 - 4 VDC, multiple ranges

**THREE YEAR WARRANTY**

A fully **detailed instruction manual** covers all aspects of the ROXY-1's operation, and **technical assistance is only an email or 'phone call away.** The ROXY-1 comes with a 120VAC or 220VAC - 12VDC adapter (specify input voltage at time of order). Note that the uncritical 12VDC power input makes the ROXY-1 a "natural" for battery backup - an important consideration in critical applications. Remember that the ROXY-1 comes with a **three year guarantee** and **free, lifetime technical support.**

If you're ready to make the move to **intelligent oxygen and/or CO<sub>2</sub> regulation and control,** contact us for pricing and other information.

Sable Systems International Inc., 6340 S Sandhill Rd Ste 4, Las Vegas NV89120 USA  
702-289-4445; 800-330-0465; Fax: 702-269-4446 ; [www.sablesys.com](http://www.sablesys.com); [mail@sablesys.com](mailto:mail@sablesys.com)