Chamber Environment Control

Control temperature, CO₂ and O₂ in a microscope chamber environment

The front panel of this ECU-HOC displays four monitored parameters: CO₂ level, O₂ level, air flow, chamber temperature.

This system offers precision control of temperature, carbon dioxide and oxygen, as well as remote control and data logging via a USB connection. The system is flexible and easy to configure for a variety of experimental conditions. A satellite AirTherm provides heat to the chamber, which is controlled by the Environmental Control Unit (ECU).

Control System Configurations

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The Environmental Control Unit (ECU) houses all the electronics for:

- Regulating the CO₂ and O₂ flow and temperature in the chamber
- Controlling the temperature of our AirTherm Satellite or an auxiliary heater
- Monitoring the air flow, CO₂ level, O₂ level and temperature

The system comes in a variety of configurations:

- **ECU-H5**—Pre-mixed CO₂ gas of the desired concentration is pumped into the system, and this ECU regulates the airflow at the desired level. It also controls the heating and monitors the environment chamber.

- **ECU-HC**—This control unit mixes the air and CO₂ gas to the desired concentration. An internal CO₂ sensor (inside the ECU controller) monitors the concentration of the gas. The ECU-HC regulates the airflow at the desired level, controls the heating of the system and monitors the environment chamber.

- **ECU-HOC**—This unit performs like the ECU-HC. In addition to controlling the temperature and CO₂, this unit also controls the O₂ level. However, it offers no auxiliary heating options. Nitrogen is used to displace oxygen from the background air, which generally has about 20.7% oxygen. The O₂ level of the background gas can be regulated down to as low as 1%.

- **ECU-HCP**—This unit performs like the ECU-HC. In addition to controlling the temperature and CO₂, this unit comes with a remote CO₂ sensor that is positioned inside the stagetop environment chamber.
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**Satellite Heater Features**

- USB-based remote control and data logging
- Electronic flow meter
- Programmable alarm for out of tolerance condition
- Compact and lightweight
- Adjustable setpoints for parameters, including:
  - Temperature PID controls for the environmental chamber with ±0.1°C precision
  - CO₂ and O₂ digital PID control with ±0.1% precision
  - Airflow digital PID control from 0–900 SCCM

**SPECIFICATIONS**

- **Power**: 110/240V, 50/60Hz
- **Operating Temperature (ambient)**: 10 – 50°C (50 – 122°F)
- **Operating Humidity (ambient)**: 15 – 70% RH, non-condensing
- **Warm up Time**: 20 minutes
- **Computer Interface**: USB via external USB/RS232 converter
- **Sensor**: Non-dispersive infrared (NDIR), dual beam, 20s response time

**CO₂ Sensor (ECU-HCP and ECU-HC only)**

- **Sensor Range**: 0 – 20% CO₂
- **Control Range**: 0 – 20%
- **Control Precision**: 0.1% CO₂
- **Control Accuracy**: 0.1 – 3% of reading
- **Drift**: <2.5% reading/year

**O₂ Sensor (ECU-HOC only)**

- **Sensor Type**: Zirconium Dioxide, diffusion, 4s response time
- **Sensor Range**: 0–25%
- **Control Range**: 0–25%
- **Control Precision**: 0.1% O₂
- **Control Accuracy**: ±0.5% (2% of the full scale)

*The upper limit of the ECU-HOC oxygen control range is constrained by the oxygen content in the background gas. For example, if the background air has 20.7% oxygen, the ECU-HOC can only control up to 20.7% oxygen.*

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