

## MicroCapnoGraph with CO<sub>2</sub>/N<sub>2</sub>O Monitor

### **General description:**

The instrument should include microprocessor control, waveform display, digital calibration, multiple alarms. It needs to be suitable for both intubated or non-intubated small animals like rats and mice. It needs to include an internal fast response CO<sub>2</sub>/N<sub>2</sub>O gas analyzer and state of the art pressure and pneumatics control system which utilizes a very low sample flow rate (5 mL/minute to 20 mL/minute). The equipment needs to include 3 microprocessors to distribute the processing requirements. An optionally interfaces via RS232 serial output to a personal computer (PC) via analog output for interfacing with a data acquisition system or chart recorder device is required.

The microcapnograph has to be capable of accurate measurements of CO<sub>2</sub> and N<sub>2</sub>O concentration and Respiration rate at very low sample flow rate preferably with a standard nondispersive infrared gas sensor. It should operate at low pressure, using a heavy-duty air pump and digital closed loop pressure control system. The design should maintain the sample cell pressure and sample flow rate constant at the desired reference pressure. It is expected to use an infrared light source, optical band pass filter and detector to measure the amount of CO<sub>2</sub> in the sample. The sample should be read as a partial pressure in mmHg or as a volume in percentage and the amount of N<sub>2</sub>O as a volume in percentage. Based on the continuous waveform it has to be able to calculate the respiration rate in breath per minute (BPM) and to be able find the End tidal value of CO<sub>2</sub> (ETCO<sub>2</sub>) and the Base line value of CO<sub>2</sub> (BLCO<sub>2</sub>) on a breath-by-breath basis. ETCO<sub>2</sub>, BLCO<sub>2</sub> and respiratory rate are displayed as an average of 1, 4 or 8 (user selectable) breaths updated every breath. The inspired N<sub>2</sub>O is displayed continuously.

### **Features/ Specifications:**

- Ideal for rats and mice
- Utilizes low air sample flow rates (5 cc or 20 cc/min.)
- Based on low pressure-high velocity principle for analyzing sampled gas with infrared gas sensor technology
- Determines respiration rate by counting the period from the wave pattern of CO<sub>2</sub> concentration
- Capable of measuring CO<sub>2</sub> concentration in expired air (end-tidal CO<sub>2</sub>) of small (mice, rats) or large subjects

### **CO<sub>2</sub> Measurement:** Non-dispersive infrared absorption

Measurement Range: 0 - 80mmHg or 0 - 10%

Accuracy: 2.5 mmHg or 0.3%

Resolution: 0.1mmHg or 0.01%

Calibration: digital zero and span calibration

Response Time: 75msec at 20mL/min to 90% of value

### **N<sub>2</sub>O Measurement:** Non-dispersive infrared absorption

Measurement Range: 0 - 100%

Accuracy: 3%

Resolution: 0.1%

Calibration: digital zero and span calibration

Response Time: 150msec at 20mL/min to 90% of value

**ETCO<sub>2</sub>** (End Tidal CO<sub>2</sub>) & **BLCO<sub>2</sub>** (Base Line CO<sub>2</sub>): Display 4 digits seven segments LED

Averaging User-selectable: 1 - Breath (no average), 4 - Breath or 8-Breath average updated every breath.

Respiration Rate (RR): Display 3 digits seven segments LED

Averaging User-selectable: 1 - Breath (no average), 4 - Breath or 8-Breath average updated every breath.

Range 10 - 250 BPM , Accuracy 2 BPM

Flow Rate: User-selectable: 20mL/min at 250 BPM, 10mL/min at 100BPM, 5mL/min at 50BPM

Serial Output: RS232 ET<sub>CO</sub><sub>2</sub>, BL<sub>CO</sub><sub>2</sub>, INSP N<sub>2</sub>O and RR

Analog Output: Output CO<sub>2</sub> and N<sub>2</sub>O waveforms

Resolution CO<sub>2</sub> in mmHg: 0.06v/mmHg

CO<sub>2</sub> in %: 0.5v/%

N<sub>2</sub>O: 0.05v/%

Alarms: Settings Multiple for ET<sub>CO</sub><sub>2</sub>, INSP N<sub>2</sub>O and RR

Method User-selectable: Flash or Flash & Sound

Indicators Front panel Green LEDs: the alarm is

Enabled and its method F&S

Front panel Flashing Red LEDs

Adjustable Volume

Sound alarm (Alarm Limit Range User-selectable: Maximum and/or Minimum limits.)

Chart Recorder Calibration User-selectable: 5v Full Scale (FS) or 0v Zero Scale (ZS) signal.

Chart Recorder Start/Stop signal.

Power Requirements: 120-240 Volts AC, 50/60HZ