



**QAQC LAB**

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*pictured with optional pump and battery*

# MODEL 906 (0-10000ppm) OPERATING INSTRUCTIONS

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## **GENERAL DESCRIPTION**

The Quantek Model 906 is a battery or AC operated, portable carbon dioxide analyzer used for the measurement of CO<sub>2</sub> in many different applications. The unit is powered by 110-240 Vac or an internal gel battery (optional), with typically 8 hours of operation before recharging is required.

Components which make up the Model 906 include the case, CO<sub>2</sub> sensor, LCD readout, internal sampling pump (optional), a circuit board, rechargeable battery (optional), battery charger/power module and sampling probe or other inlet fitting. Sample flows through the inlet fitting and tubing and then to the sensor and out to vent. The CO<sub>2</sub> concentration is read on the display, and/or by measuring the optional Vdc output.

The operating controls and adjustments include power switch, pump switch, span, zero and pump time adjustments. For AC only units, the LOW BATT LED is not present. For units without an internal pump, the PUMP switch and SAMPLE LED are not present.



## **PRECAUTIONS**

Follow these guidelines to prevent damage to the unit:

1. Do not suck liquids or moisture into the unit through the sample port.
  1. There is an internal PTFE hydrophobic filter, but this should be treated as a last resort.
2. Turn the unit off before plugging / unplugging the charger / power supply.
3. Do not immerse in water or spray water on the unit.
4. Do not drop the unit.
5. If storing the unit for more than 2 weeks, remove the fuse to prevent battery discharge, for battery operated units. If the fuse inside the fuse holder blows, there is a spare in the holder.
6. Do not test hot samples.
7. Do not breathe into the unit! The humidity in your breath may condense and form liquid water. (Exhaling into a bag reduces the risk of this being a problem but will probably be a higher CO<sub>2</sub> level than this instrument can measure. Exhaled breath is typically 5% CO<sub>2</sub>.)

We recommend that gas being sampled be:

1. Free of particulates,
2. <95% RH, non condensing,
3. <50° C,
4. free of solvents, and
5. free of dioxides that could react with water to form acidic compounds, such as NO<sub>2</sub> and SO<sub>2</sub>

## **OPERATION**

**1.** Press the POWER switch to start unit. The meter reading at this point will not be stable. Let the unit warm up. The CO<sub>2</sub> channel needs 1 minute for the infrared sensor to stabilize. If there have been temperature changes in your facility it may take 5-10 minutes to stabilize.

**2. If you have a pump:** Press the PUMP switch or flow clean air or nitrogen through the inlet port. The pump will come on for approximately 3 to 12 seconds and pull room air into the analyzer. The CO<sub>2</sub> meter should stabilize to a reading of 500ppm to 800ppm – this is highly dependent on your ambient conditions, how many people are in the room. For areas with high CO<sub>2</sub> levels, N<sub>2</sub> may be used to check the zero setting.

You can also draw in air from the outside, but plant respiration in your vicinity will have a large effect on your reading. Outside your

facility, depending on the time of day and year, the instrument reads 380 to 500ppm.

If equipped with a red pump switch, by “clicking” the pump button into place, it will operate until “unclicked”.

When using the pump, the instrument typically takes 10 seconds to reach a good reading. However, if you are going from a high CO<sub>2</sub> level to a lower level, it may take longer – CO<sub>2</sub> typically “sticks” to the sides of the tubing and sensor, and may take longer to clear out. In this scenario it may take up to a minute to respond fully.

**3. Testing a sample if you do not have a pump, or without using the pump:** For continuous measurement of a sample stream, the sample must be at some positive pressure to force a flow through the analyzer if not equipped with a pump. Flow rates should range from 20cc/min to 1L/min. The ideal flow rate is 300 cc/min – that is what the pump draws.

Please note that at 50 cc/min or less the instrument may take longer to reach its final reading. For example, at 10 cc/min the instrument may take as long as 5 minutes to reach a reading.

The instrument typically takes 30 seconds to reach a good reading if your flow rate is sufficient. However, if you are going from a high CO<sub>2</sub> level to a lower level, it may take longer – CO<sub>2</sub> typically “sticks” to the sides of the tubing and sensor, and may take longer to clear out. In this scenario it may take up to a minute to respond fully.

#### **4. Testing a sample by introducing with syringe:**

A 60 cc gas tight plastic syringe is provided to bring a sample to the unit. The tip connects to the inlet port with short plastic connector, provided. We call that the “double orange” connector.

If you plan on injecting a sample from a syringe, you should use at least 120cc of sample (two 60cc syringes) to get an accurate reading.

Also note that the syringes supplied may adsorb CO<sub>2</sub> – if you use this method, it is best not to let the sample sit in the syringe for long periods of time. Also, it is best to plunge and pull the syringe several times to flush it adequately after sampling high levels of CO<sub>2</sub>.

While it is not advised to breathe directly into the instrument, or breathe into a bag, the analyzer will pick up exhaled CO<sub>2</sub>. If you'd like

to test this effect, activate the pump so that it runs continuously and breathe *toward* the instrument.

## **CALIBRATION ADJUSTMENTS**

These adjustments are made using the potentiometers located on the back panel of the unit.

## **CALIBRATION SETTING**

The CO<sub>2</sub> calibration can be adjusted as required by turning the CO<sub>2</sub> SPAN potentiometer. However, you must first introduce a known concentration of CO<sub>2</sub>, using preferably a calibration gas which contains the concentration close to that which you will want to measure later. Room air can not be used to set the CO<sub>2</sub> calibration, or zero the analyzer. The CO<sub>2</sub> levels in a room will usually be in the range of 0.03% to 0.1% (300 to 1000 ppm).

## **CO<sub>2</sub> ZERO SETTING**

The CO<sub>2</sub> zero is not a potentiometer adjustment. It is an auto-zero pushbutton. To make the adjustment, first sample nitrogen which does not contain high CO<sub>2</sub> levels, and make sure that the reading is stable.

**Using room air is **not recommended** for the zero adjustment** – 500ppm is equal to 10% of

the scale between 0 and 5,000ppm.  
Therefore, you will throw off the entire curve of the instrument.

**NOTE:** The analog output is independent of the LCD, so if the analyzer is recalibrated, you will want to rescale your data acquisition equipment.



**CAUTION: When autozeroing, make sure that the analyzer has N<sub>2</sub> flowing through it to disperse the CO<sub>2</sub> which may have adsorbed to the internal surfaces, before actuating the autozero. If high CO<sub>2</sub> samples have previously been checked, it may take 60-120 seconds of nitrogen flow to completely clean out the CO<sub>2</sub> sensor before zeroing.**

When you are sure that the internal sensor has been cleared of CO<sub>2</sub>, depress the CO<sub>2</sub> AUTOZERO button with your finger, hold it in for 2-3 seconds and then let it up. Note the CO<sub>2</sub> meter reading, which may initially change to high values after the button is released, will stabilize near zero.



**IMPROPER SETTING OF ZERO**

Clearing the internals of the analyzer completely of CO<sub>2</sub> is crucial. The entire slope of the curve is “flattened”, producing erroneous results throughout the measurement range. For example, pressing the autozero button on a 0-100% analyzer with 5% CO<sub>2</sub> in the sensor will yield the following erroneous readings:

- 1) 5% CO<sub>2</sub> would read 0.1%
- 2) 20% CO<sub>2</sub> would read 8.4%
- 3 85% CO<sub>2</sub> would read 48.7%
- 4) 100% CO<sub>2</sub> would read 56.4%

### **INTERNAL BYPASS**

An internal bypass has been installed in the sample train to reduce the effect of high flow rates on the readings. The flow rate of your gas should be kept to 10-1000 cc/min. The analyzer is calibrated using a flow rate of 0.5 SCFH (236 cc/min).

At higher flow rates, the expected pressure effect will cause slightly higher readings, as denoted in this table:

ACTUAL CONCENTRATION	
→	1000ppm CO <sub>2</sub>
FLOW RATE 236 cc/min	LCD reads 1000
FLOW RATE 472 cc/min	LCD reads 1010
FLOW RATE 802 cc/min	LCD reads 1022

(NOTE: In the example above, the instrument has a resolution of 1ppm. If your instrument has .01% resolution, the second column would be 1.00%, 1.01%, and 1.03%)

While this variance is still within the accuracy spec of the analyzer, for best results, you may want to limit your flow rate to under 300 cc/min.

## **INTERNAL INLINE DIRT / MOISTURE FILTER**

This analyzer contains an internal filter (25mm dia., .45µm pore size) that provides a second barrier of protection (in addition to the filters provided with the accessories). Particulate matter or moisture can damage the internal sensors if drawn into the instrument.

**PRECAUTION:** This filter will remove small droplets of moisture; however, continuous sampling of samples containing water or moisture droplets will break through the filter and contaminate the sensors.

If the flow rate of your analyzer seems to have dropped precipitously, and/or the response time of the analyzer is much slower, and/or the pump sounds like it is laboring, then your internal filter may be clogged. Follow these steps to replace it with the spare provided:

- 1) Unplug the analyzer and discharge it by pressing the power button.
- 2) Remove the four screws holding the top cover on.
- 3) The filter will be visible inside – generally as part of the plumbing with an orange fitting on either side. (Note: If the filter is clogged, the

contamination may or may not be visible upon inspection.)

4) Check the orientation of the moisture filter. It will operate better if the writing on the filter faces the side that the gas comes from, as the most absorbent layer is on the side of the filter with the smaller opening.

5) Install the new filter, ensuring that the fittings are as tight as possible to prevent leakage.

6) Reassemble the analyzer and check to see if the problem is solved.

If the problem is not solved, then your analyzer may have a different problem and we recommend that you send it in for service. Please contact us if you need additional filters.

## **POWER SUPPLY**

Using the supplied power supply is recommended. However, if it breaks, the specifications are: 12Vdc, 2.1mm barrel, center positive.

## **ANALOG OUTPUTS (optional)**

If so equipped, the analog output of 0-1Vdc, 0-5Vdc, 0-10Vdc, or 4-20mA is located on the rear panel screw terminal.

The 4-20mA signal takes its power from the main system inside the unit and does not require that you apply power to it.

Looking at the back from left to right, the terminals are:

1. O<sub>2</sub> ground (not used on Model 906)
2. O<sub>2</sub> + output (not used on Model 906)
3. CO<sub>2</sub> ground
4. CO<sub>2</sub> + output

The output voltage is nominal at 10 volts for full scale CO<sub>2</sub>, and requires a high impedance connection.

**The analog output is not adjustable by the user within the analyzer, and will not follow any calibration adjustments that you make to the span.**

For example, if you turn the span up from 1% to 1.01%, your LCD will read 1%, but your analog output will not change. It will still be linear, but it will read the same. On a 4-20mA output, at 1%, the reading will be 10.4mA. No matter what adjustments you make to the span or zero, the instrument will still read 10.4mA.

Therefore, if you calibrate the instrument for an alternate condition (such as elevation, or high

flow rates), you will want to re-scale your data collection equipment.

Please refer to the calibration certificate for actual voltage data at each concentration.