QAQC LAB
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pictured with optional pump and battery

MODEL 906 (0-2½ %)
OPERATING INSTRUCTIONS

QAQC LAB
589 Rappahannock Drive White Stone VA 22578 TEL 804 318 3686
www.qclabequipment.com

GENERAL DESCRIPTION

The Quantek Model 906 is a battery or AC operated, portable carbon dioxide analyzer used for the measurement of CO_2 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_2 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_2 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_2 level than this instrument can measure. Exhaled breath is typically 5% CO_2.

We recommend that gas being sampled be:

1. Free of particulates,
2. <95% RH, non condensing,
3. <50º C,
4. free of solvents, and
5. free of dioxides that could react with water to form acidic compounds, such as NO_2 and SO_2

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_2 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_2 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_2 levels, N_2 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_2 level to a lower level, it may take longer – CO_2 $_2$ 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_2 level to a lower level, it may take longer – CO_2 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_2 – 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_2.

While it is not advised to breathe directly into the instrument, or breathe into a bag, the analyzer will pick up exhaled CO_2. 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_2 calibration can be adjusted as required by turning the CO_2 SPAN potentiometer. However, you must first introduce a known concentration of CO_2, 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_2 calibration, or zero the analyzer. The CO_2 levels in a room will usually be in the range of 0.03% to 0.1% (300 to 1000 ppm).

CO_2 ZERO SETTING

The CO_2 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_2 levels, and make sure that the reading is stable.

Using room air is not recommended for the zero adjustment – 500ppm is equal to 2% of

the scale between 0 and 25,000ppm. 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_2 flowing through it to disperse the CO_2 which may have adsorbed to the internal surfaces, before actuating the autozero. If high CO_2 samples have previously been checked, it may take 60-120 seconds of nitrogen flow to completely clean out the CO_2 sensor before zeroing.

When you are sure that the internal sensor has been cleared of CO_2, depress the CO_2 AUTOZERO button with your finger, hold it in for 2-3 seconds and then let it up. Note the CO_2 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_2 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_2 in the sensor will yield the following erroneous readings:

1) 5% CO_2 would read 0.1%
2) 20% CO_2 would read 8.4%
3 85% CO_2 would read 48.7%
4) 100% CO_2 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_2	1% CO_2
FLOW RATE 236 cc/min	LCD reads 1000	LCD reads 10000
FLOW RATE 472 cc/min	LCD reads 1010	LCD reads 10150
FLOW RATE 802 cc/min	LCD reads 1022	LCD reads 10300

(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 requires that you apply power to it.

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

1. O_2 ground (not used on Model 906)
2. O_2 + output (not used on Model 906)
3. CO_2 ground
4. CO_2 + output

The output voltage is nominal at 10 volts for full scale CO_2, 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.