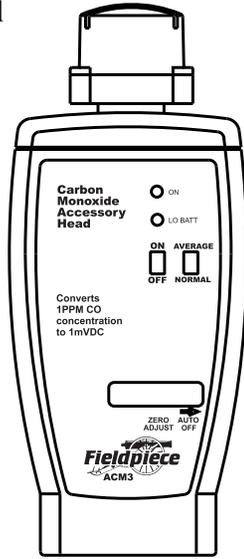


Carbon Monoxide Accessory Head Model: ACM3



OPERATOR'S MANUAL

Description

The model ACM3 carbon monoxide accessory head enables most digital multimeters to measure low levels of carbon monoxide in parts per million (PPM). It is intended to measure levels of CO in still ambient air. In many cases, it can help pinpoint sources of CO.

It uses a catalytic chemical sensor that consumes no chemicals. Life is primarily determined by the type of exposure.

The most practical application is to determine if the indoor CO levels are higher than outdoor levels and to determine the source. This instrument detects changes in CO levels very quickly.

"Walk around" test

The ACM3 is fast enough to respond almost instantaneously to changes in CO levels in the air. If you see a difference in CO levels from outside to inside, you need to find the source of the CO. Walk around and watch the display. By constantly going towards the area of highest concentration, you can determine the source of the CO. It may be that someone just drove their car into the garage and opened the kitchen door and you don't have to take any action. Or it could be that the furnace is starved for air and that CO is entering the house. You've got to fix that.

How to use

1. Connect to COM and Volts jacks using the Fieldpiece deluxe test leads. For Fieldpiece "stick" meter, slide the head directly over the meter.
2. Select the 2000mVDC range.
3. Turn on. Let stabilize 45 seconds.
4. Take the instrument outside and adjust it to zero. Then bring inside to take measurements.
5. Expose sensor to a still, stable air sample (see precautions). The display reacts to the presence of CO in seconds. Take final reading when reading stabilizes.
6. For initial tests, walk around the building, watching for the readings to go up to determine where maximum concentrations of CO are. To measure air from register, use a pump or measure out of the air stream. Hot blowing air can adversely affect the reading. The temperature of the sample must be near ambient.

Zero adjust

As needed, adjust reading to zero in a known zero CO atmosphere and in temperature similar to the sample air to be tested and when ambient air is within specifications and head is in equilibrium (temperature and relative humidity) with ambient.

Specifications

- Range:** 0 to 1000PPM (2000PPM with 5 minute max exposure time.)
- Initial accuracy:**
 - 0-15ppm ±5% reading ±1 ppm after zeroing
 - 15-35ppm ±5% reading ±2 ppm after zeroing
 - 0-1000ppm ±5% reading ±5ppm after zeroing
- Accuracy:** Stated accuracy at 73°F±9°F, <90% relative humidity
- Response time:** <70sec to 90% of reading
- Operating temperature:** 32 to 105 °F
- Operating relative humidity:** 15 to 90%RH, non-condensing
- Storage temperature:** -4°F to 140°F, 0 to 80% R.H. with battery removed from meter.
- Long term drift:** <5% / year (depending on use)
- Sensor calibration:** Factory calibrated on 205ppm
- Sensor type:** Electrochemical (specific to CO)
- Battery life:** 200 hours typical. No measurable current draw when in "off" position.
- Battery:** 9V
- Average switch**
 - The average switch averages the readings over the last two or three seconds. This allows the user to read more stable measurements.

CO detectors and cracked heat exchangers

A CO detector cannot tell you if a heat exchanger is good. A CO detector can indicate a heat exchanger maybe be cracked only if all of the following conditions occur simultaneously:

1. The flame generates high concentrations of CO (lack of oxygen, excess fuel, high temp).
2. Enough exhaust gases are emitted from the heat exchanger crack.
3. The exhaust gases from the crack are not diluted too much before coming in contact with the sensor. A cracked heat exchanger may leak CO in a small stream. You may measure high concentrations at one point but low concentrations only an inch away.
4. The heat exchanger is the only possible source for the CO detected.

WARNING

Do not take measurements directly at a tailpipe, in a furnace flue, or at a register. See precautions.

Do not rely solely on a carbon monoxide measurement to determine if a heat exchanger is bad. See paragraph on left.

Precautions

1. Do not measure gas engine exhaust or other high CO or highly contaminated gases. High levels of CO and other contaminants can ruin the sensor.
2. Do not take readings directly in stream of air at register or in a flue.
3. Allow enough time for accessory head to reach ambient temperature and RH%.

Air being measured must be stable and between 32°F and 105°F and 15%RH and 90 %RH. Temperature and humidity changes can cause transient readings. For best results, use a AOX2 pump to sample the air, cool it to near room temperature, and raise the relative humidity.

CO exposure effects

CO ppm	Effects
9 ppm	Minimal. Max allowable concentration for eight hours (EPA and ASHRAE).
35 ppm	Max for continuous exposure for one hour (EPA and ASHRAE).
50 ppm	Max for eight hours (OSHA).
100 ppm	Trips installed CO detectors. UL2034 specifies a max exposure of 100 min.
200 ppm	In two to three hours: slight headache, tiredness, dizziness, nausea. UL2034 specifies a max exposure of 35 min.
400 ppm	In one or two hours: frontal headaches. In three hours: life threatening. UL2034 specifies a max exposure of 15 minutes.
800 ppm	In forty five minutes: dizziness, nausea, and convulsions.
800 ppm	In two to three hours: death.
1600 ppm	In one hour: death.
6400 ppm	In fifteen minutes: death.
12800 ppm	In three minutes: death.

Effects can vary significantly depending on age, sex, weight, and overall health.

Coffee cup test

To demonstrate that your CO head works, turn a ceramic coffee cup upside down and slide it over the edge of a counter (or desk) to expose about a third of the mouth of the cup. Burn a cigarette lighter inside the exposed mouth of the cup. Don't burn the counter. When the flame starts to flicker, you've burned up most of the oxygen in the cup creating carbon dioxide and now you're starting to produce CO (carbon monoxide). Bring the flame in and out of the mouth of the coffee cup to just keep the flame alive. The longer you keep the flame flickering, the more CO you produce. After 10 seconds of flickering, extinguish the flame and put the CO head in the mouth of the cup. You should see readings in the 100s. Take it out if it approaches 1000PPM.

Storage

Do not store in areas which contain solvent vapors. This includes aerosols such as air-freshener, wax polish, window cleaner, and all organic solvents.

Calibration

Because the chemical sensor can be degraded by exposure to harmful chemicals, dirt and other contamination, high temperatures, and extremes in humidity, periodic calibration can maintain accuracy of the sensor over time. Drift is expected to be less than 5%/year in most cases but is dependent on use.

Optional pump

Use the model AOXP2 pump to extract ambient air samples from hard to reach places or from locations where the air temperature is high.

For potentially high concentrations of CO, pump slowly and stop if the measurement approaches 2000PPM.

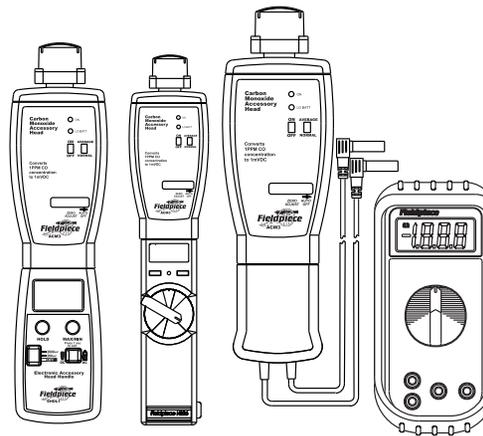
Carbon monoxide concentrations will begin to be shown in two or three squeezes. For final reading, pump until the reading stabilizes--approximately 30 squeezes.

Press MAX on DMM to hold highest reading.

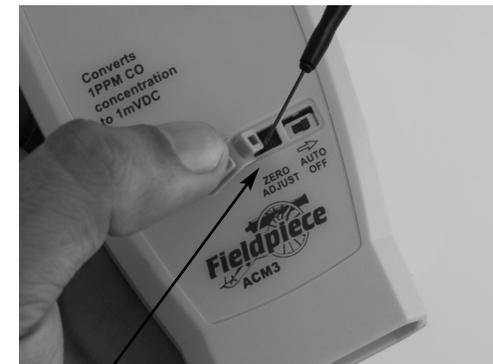


AOXP2

Connect ACM3 in multiple ways



EHD1 HS series AHDL1 w/ Meter



Removable rubber strip

Use your calibration tool that comes with the ACM3 to zero adjust.

Cross-sensitivity

The sensor has a permanent unreplaceable filter built inside the sensor to filter out trace concentrations of SO₂, NO₂, and most hydrocarbons. If exposed to high concentrations of harmful chemicals or dirt, the filter can deteriorate and/or impede diffusion of air to the sensor.

Gas	PPM	Cross sensitivity %
Hydrogen sulfide	207	1.3
Sulphur dioxide	208	-0.7
Nitric oxide	1000	46
Nitrogen dioxide	20	-4.4
Chlorine	15	-3.8
Hydrogen	200	78
Hydrogen cyanide	15	-0.5
Hydrogen chloride	135	-0.7

One Year Limited Warranty

This head is warranted to the original purchaser against defects in material and workmanship for a period of one year from the date of purchase. During the warranty period, Fieldpiece will replace or repair the defective unit, subject to verification of the defect.

Any damage to the sensor from dirt, mechanical abuse, or overexposure to damaging chemicals, including overexposure to carbon monoxide, are not covered under this warranty. Also not covered are defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use.

ANY IMPLIED WARRANTIES ARISING OUT OF THE SALE OF A FIELDPIECE INSTRUMENT PRODUCT, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE ABOVE. FIELDPIECE SHALL NOT BE LIABLE FOR LOSS OF USE OF THE INSTRUMENT OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, OR ECONOMIC LOSS, OR FOR ANY CLAIM OR CLAIMS FOR SUCH DAMAGE, EXPENSES, OR ECONOMIC LOSS.

Local laws vary. Above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary by location.

Service

Return any defective ACM3 to Fieldpiece for warranty service along with proof of purchase. Contact Fieldpiece for out of warranty repair charges.



Fieldpiece Instruments, Inc.
California, U.S.A.
www.fieldpiece.com