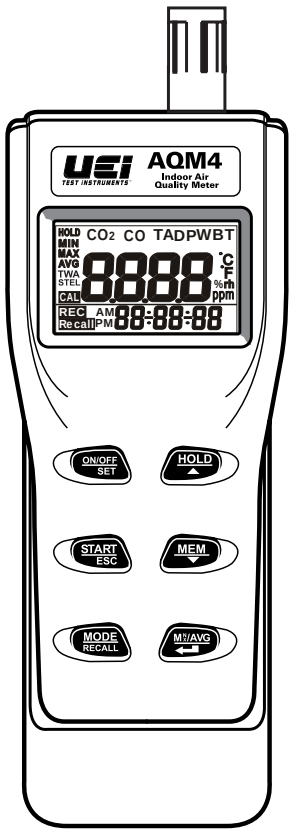
INSTRUCTION MANUAL

AQM4

TEST INSTRUMENTS

Indoor Air Quality Meter



INTRODUCTION

Thank you for purchasing the UEi AQM4 IAQ meter. The meter measures CO_2 levels, CO levels, air temperature, dew point, wet bulb temperature, and humidity. The AQM4 is an ideal instrument for indoor air quality (IAQ) diagnosis.

Poor indoor air quality causes tiredness, inability to concentrate, and even illness (ex. Sick Building Syndrome). IAQ monitoring and surveying especially for CO_2 levels and air ventilation has become widely applied in public offices, classrooms, factories, hospitals, and hotels. It is also recommended for regulating standards of industrial air quality in some countries.

The portable AQM4 uses NDIR (non-dispersive infrared) technology for CO_2 measurement to ensure reliability and long-term stability. It is useful in verifying HVAC systems performance and air ventilation control.

CO is a colorless, odorless, and tasteless gas which is slightly lighter than air. It is highly toxic to humans and animals. Carbon Monoxide is measured using a long-life electrochemical sensor.

Maximum indoor air quality CO level per ASHRAE Residential standards 62-1989 for living area is under 9ppm. It is necessary to evacuate employees from enclosed spaces if the CO concentration exceeds 100ppm per OSHA exposure limit.

FEATURES

- Large LCD display with blue backlight for use in dark areas
- One touch to display CO_2 / dew point / temperature / wet bulb temperature / air temperature / humidity / CO in sequence
- Designed with NDIR waveguide technology CO_2 sensor
- Programmable CO level alarm
- Extended drift compensation on CO_2 sensor
- Audible alarm (~ 80db) threshold setting
- Max and Min functions included (TWA and STEL for CO_2 only)
- Mini USB to PC download function for analysis
- 99 points manual recording
- 8000 points auto recording
- Review 99 points manual record from meter
- Hold function freezes current readings
- Housing designed to help air ventilation for quick and accurate response.
- Easy to manually calibrate CO_2 to fresh air (380-420ppm)

MATERIAL SUPPLIED

This package contains:

- Meter
- 4 AA batteries
- Mini USB cable and software CD
- Operation manual
- Hard carrying case
- 33% calibration salt
- 75% calibration salt
- AC Power Adapter

POWER SUPPLY

The meter is powered by either 4 AA batteries or a DC adaptor (9V/1A output.)

Install the batteries into the battery compartment on the rear of the instrument. Verify correct polarity and solid contact. When an adaptor is used, it will cut off the power supply from the batteries. The adaptor can not be used as a battery charger.

When battery voltage gets low, B will appear on the LCD (Fig. 1.) The CO_2 sensor accuracy is compromised under low batteries, replace with fresh batteries or connect to an adaptor.

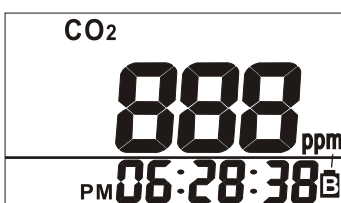
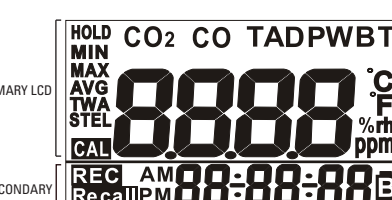


Fig.1

LCD DISPLAY



SYMBOLS

Primary LCD	Measured and calculated values
Secondary LCD	Real time clock
CO_2	Carbon dioxide reading
CO	Carbon monoxide reading
HOLD	Readings are frozen
MIN/MAX	Minimum/maximum readings
STEL	Short-term exposure limit (15 minutes weighted average)*
TWA	Time weighted average (8 hours)*
🪫	Low battery indicator
DP	Dew point temperature
TA	Air temperature
WBT	Wet bulb temperature
%RH	Percentage of relative humidity
°C/°F	Celsius/Fahrenheit scale
CAL	In calibration status
REC	In manual/automatic logging
RECALL	In manual records recall mode

*CO_2 Only

KEYPAD

(ON/OFF SET) Turns the meter on or off.
Press and hold to enter setup mode while meter is off.
Press (HOLD) while turning the meter on to disable auto power off.

(START ESC) Exits setup/recall page. Press and hold to start automatic logging.

(MODE RECALL) Press to switch display mode.
Press and hold to enter memory recall mode.

KEYPAD CONT.

HOLD Freezes the current readings. Selects unit or increases value in setup. Cancels data hold function.

MEM Press to manually record the reading. Selects unit or decreases value in setup.

M/AVG Displays MIN, MAX, TWA, STEL function. Saves and finishes settings while in sleep mode.

OPERATION

POWER ON/OFF

Press ON/OFF SET to turn the meter on and off. At power up, the meter emits a short beep and begins 30 second warm-up countdown (Fig. 2), then enters normal mode with current CO_2 and real time displays (Fig. 3).

NOTE:
THE REAL TIME DISPLAYS DATE (YY-MM-DD) AND TIME IN SEQUENCE.

Fig.2

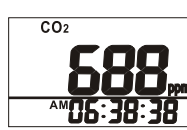


Fig.3

TAKING MEASUREMENT

The meter starts measurements when powered on and updates readings every second. In the condition of an operating environment change, (ex. high to low temp) it takes 30 seconds for the CO_2 sensor to respond and 30 minutes for RH sensor.

NOTE: DO NOT HOLD THE METER IN CLOSE PROXIMITY TO THE FACE AS EXHALED BREATH AFFECTS CO_2 LEVELS.

CO_2 (CARBON DIOXIDE)

Press (MODE/RECALL) to switch the mode to CO_2. CO_2 concentration will display in ppm on primary display (Fig. 4). The lower display shows the real time clock.

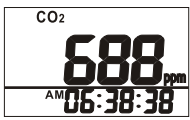


Fig.4

AIR, (DP, WBT, TA) TEMPERATURES

Press (MODE/RECALL) to switch to temperature display (Fig. 5). In the AQM4, dew point temperature and wet bulb temperature are also available by repeated pressing of (MODE/RECALL) (Fig 6). The lower display shows the real time clock.

Fig.5

Fig.6

HUMIDITY

Press (MODE/RECALL) to switch to humidity display (Fig. 7). The lower display shows the real time clock.

Fig.7

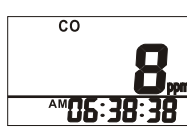


Fig.8

CO (CARBON MONOXIDE)

Press (MODE/RECALL) to switch the mode to CO. CO concentration will display in ppm on primary display (Fig. 8). The lower display shows the real time clock.

DATA HOLD

In normal display mode, press (HOLD) to freeze the readings, the "**HOLD**" icon is displayed on the left top of the LCD (Fig. 9). All current readings are kept unchanged. Press (MODE) to cycle through all held readings.

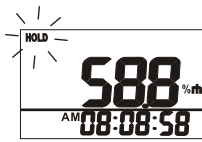


Fig.9

While in "**HOLD**" mode, STEL and TWA will continue updating every 5 minutes.

BACKLIGHT

The backlight will be activated for 10 seconds by pressing any key.

MIN, MAX, STEL, TWA

This meter allows you to check the minimum and maximum, STEL and TWA values calculated since power on. Under normal mode, press (M/AVG) to see the minimum, maximum, STEL and TWA and real time sequence. Each press of (M/AVG), displays MIN, MAX, STEL, TWA in sequence and returns to current value (Fig 10 - 13). STEL and TWA values are calculated for CO_2 only.

If the meter is turned on for less than 15 minutes, the STEL value will be the weighted average of readings taken since power on. This is also true for TWA values displayed prior to 8 hours. It takes at least 5 minutes to calculate STEL and TWA. The display shows "----" during the first 5 minutes from power on.

In the MAX/MIN/STEL/TWA modes, it shows the corresponding readings on the main display and the real time clock on the lower display.

In this mode, press MODE/RECALL to switch the displayed parameters (Fig 14).

The displayed sequence in this mode is MIN MAX STEL TWA. Press MODE/RECALL key to return to live readings.

"**HOLD**", "Manually Record", Record" and "Recall" functions are all available when meter is in MIN/MAX/AVG mode.

To clear the MIN/MAX/AVG since power on, restart the meter or press M/AVG for more than 2 seconds to clear previous data and restart.

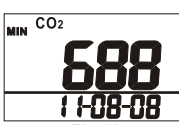


Fig.10

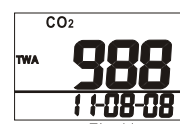


Fig.11

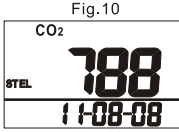


Fig.12

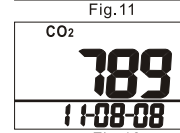


Fig.13

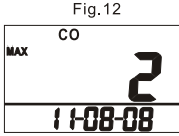


Fig.14

NOTE:
TWA & STEL ARE FOR CO2 ONLY. MIN/MAX ARE FOR ALL PARAMETERS

MANUALLY RECORDING

The meter features 99 manual memory locations.

In normal or hold mode, press MEM key to record, **REC** icon and main display flash for about 3 seconds. The main display shows the memory serial number. The AQM4 has 99 locations. (Fig. 15)

Each memory contains all parameters (CO_2, CO, TA....%rh), not limited to the selected parameter on the main display.

Fig.15

If the reading changes quickly, press HOLD to freeze the reading before manually recording the data.

99 MEMORIES RECALL

In normal or hold mode, press MODE/RECALL key for more than 2 seconds until the **Recall** icon flashes.

Press HOLD or MEM to scroll through the memory locations. The memory serial number displays on the main LCD first and then readings stored in that location. (Fig. 16 & 17)

Fig.16

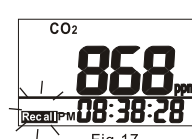


Fig.17

Press (MODE RECALL) key to switch the display parameter. (Fig. 18)

Fig.18

The time displayed in memory recall mode is the recording time of this memory.

To escape the memory recall mode, press (START ESC) key to leave and return to normal display.

ALARM

The meter features an audible alarm to give warnings when CO concentration exceeds a pre-set limit. (See Pg 12, P20 for setting alarm threshold.) It emits beeps (Abt. 80dB) when CO level goes over the set value and stops only when the readings fall below the set value. It beeps again when value goes over the limit.

The meter can automatically record readings of CO_2/CO/TEMPERATURE/RH for extended environment monitoring. The memory capacity is 8,000 points. Users can set up sampling rate from 1 second to 4 hours, 59 minutes and 59 seconds. (See pg 11, P40)

After sampling rate is selected, press (START ESC) for 2 seconds under normal mode to start logging. The **REC** icon flashes to indicate the logging status and LCD main display shows the real time CO^2 measured value. Lower display is the real time clock. (Fig. 19)

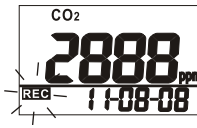


Fig.19

To terminate data logging, press START/ESC for 2 seconds, until **REC** icon stops flashing.

NOTE:
The AQM4 will only record one session. If **REC** is activated all previous data is erased. Download logged data prior to starting another **REC** session.

AUTO POWER OFF

The meter turns off automatically after 20 minutes of inactivity. To override the function, hold down ON/OFF/SET and HOLD for 2 seconds to turn on the meter until "**n**" appears. (Fig. 20)

NOTE:
AUTO SLEEP FUNCTION WILL BE DISABLED DURING CALIBRATION MODE

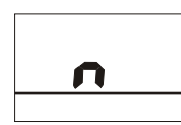


Fig.20

SETUP

When the meter is off, hold down ON/OFF/SET for more than 1 second to enter setup mode. (Fig 21) To exit setup, press START/ESC to return to normal mode.

Fig.21

Press (HOLD) or (MEM) to scroll through set-up options from the following:
P10 - 99 Memory Clear
P20 - CO Alarm
P30 - Temperature Units
P40 - Logging Sample Rate
P50 - Pressure Compensation
P60 - Real Time Clock

P10: 99 MEMORIES CLEAR
P10 and "**CLR**" (Fig. 21) are displayed on the LCD, press (M□/AVG) to enter into P11 and clear or keep all the manual records. The current setting will be blinking on the LCD. (Fig. 22)

Press (HOLD) or (MEM) to choose NO or YES and press (M□/AVG) to confirm.

Fig.22

-OR- Press (START ESC) to escape and return to P10

P20: CO ALARM
When P20 and "**ALAR**" (Fig. 23) are displayed on LCD, press (M□/AVG) to enter into P21 for setting CO alarm threshold. The current set value will be blinking on the LCD (Fig 24). Press (HOLD) to increase or (MEM) to decrease the value. The selectable alarm limits are 25~200ppm in 5 ppm increments. When the preferred alarm value is set, press (M□/AVG) to save the setting
-OR- Press (START ESC) without saving and return to P20.

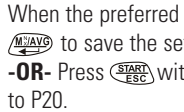


Fig.23

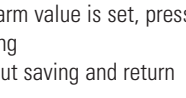


Fig.24

P30 TEMPERATURE UNIT

When P30 and "**UNIT**" (Fig 25) are displayed on the LCD, press M/AVG to go into P31 to choose the temperature unit.

The set value will display on LCD (Fig 26)

Press HOLD or MEM to choose C° or F° and press M/AVG to confirm.

Fig.25

Fig.26

-OR- Press START/ESC to escape and return to P30.

P40: LOGGING SAMPLING RATE

P40 allows you to set sampling rate of data logging (Fig. 27). The range is from 1 second to 4 hours 59 minutes and 59 seconds.

Press M/AVG to display current setting and enter edit mode. The display is in the format [HH. MM. SS.] The hour digits will be flashing. To change intervals between logged readings, press HOLD to increase and MEM to decrease. Press M/AVG again to confirm and enter minute setting. Press M/AVG to confirm and enter seconds setting. (Fig 28) Press M/AVG to confirm the rate setting.

-OR- Press START/ESC to escape and return to P40.

Fig.27

Fig.28

P50 PRESSURE COMPENSATION

When P50 and "**PRES**" (Fig. 29) are displayed on the LCD, press (M/AVG) to set pressure compensation value for CO_2 measurement. The current set will flash on LCD. (Fig. 30) The barometric pressure unit is kPa.

Fig.29

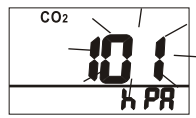


Fig.30

Press (HOLD) to increase or (MEM) to decrease barometric pressure.

-OR- Press (START ESC) to escape and return to P50.

NOTE: ONLY ENTER THIS MODE IF CURRENT BAROMETER PRESSURE IS KNOWN. MULTIPLY IN. Hg BY 3.39 TO OBTAIN kPa VALUE.

P60: REAL TIME CLOCK

Enter P60 for setting the real time clock of this meter. Press (M/AVG) to enter into P61 to set the time format as 12 hour or 24 hour. The current set will flash on LCD. Press (HOLD) or (MEM) to change the format and press (M/AVG) to confirm and continue to set the date and time. (Fig 32)

-OR- Press (START ESC) to escape and return to P60.

NOTE: DATE FORMAT IS YY:MM:DD.

The date will show on the lower display with year digits blinking. Press (HOLD) to increase or (MEM) to decrease digits. Press (M/AVG) to confirm and continue to next setting. Repeat above steps to complete the year/month/day/hour/minute/second setting. (Fig. 32)

Fig.31

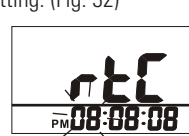


Fig.32

CALIBRATION MODE

The AQM4 allows you to calibrate CO_2 and RH, for CO calibration please send unit to UEi. To enter calibration mode, place unit at suitable calibration site specified in the following sections.
Press (START/ESC) + (MEM), then also (ON/OFF/SET) simultaneously for 3 seconds to turn on the meter and enter calibration mode (Fig. 33). Press (HOLD) or (MEM) to select parameter to calibrate. To cancel or exit calibration at any time, turn meter off.

NOTE:
ENSURE THE BATTERIES ARE AT FULL VOLTAGE BEFORE THE CALIBRATION TO PREVENT INTERRUPTION OR FAILED CALIBRATION.

CO_2 CALIBRATION

The manual calibration is suggested to be done in sunny outdoor air that is well ventilated. To begin, enter calibration mode. Press (HOLD) or (MEM) to select parameters for calibration and press enter. The meter is calibrated at standard 400ppm CO_2 concentration at the factory. It is suggested to manually calibrate regularly to maintain good accuracy.

NOTE:
WHEN THE ACCURACY BECOMES A CONCERN, RETURN TO UEi FOR STANDARD CALIBRATION.

CAUTION:
Do not calibrate the meter in the air with unknown CO_2 concentration. It could be calibrated as 400ppm by default which leads to inaccurate measurements.

Wait 10 minutes until the blinking stops and the calibration is completed. To cancel the calibration, turn off the meter at any time.

Fig.33

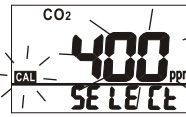


Fig.34

RH CALIBRATION

To begin, enter calibration mode. Press (HOLD) or (MEM) to select parameters for calibration and press enter.

The meters default for calibration of humidity is 33% and 75% salt solution. The ambient condition is recommended at 70 ~ 75°F (25°C) and stable humidity. To cancel calibration, turn off the meter.

CAUTION:
Do not calibrate the humidity without default calibration salts. Contact UEi for calibration salt or for service

33% Calibration

Plug the sensor probe into 33% salt bottle. Hold down (M/AVG) to enter 33% calibration. "**CAL**" and calibrating value (32.8% if at 77°F) are blinking on the LCD.

75% Calibration

Plug sensor probe into 75% salt bottle and enter calibration mode. In calibration mode, press to select 75% calibration (Fig. 35), press (M/AVG) to start. "**CAL**" calibrating value (75.3% if at 77°F) will blink on the LCD.

Meter will begin calibration and finish in 60 minutes when "**CAL**" and humidity stop blinking. To cancel the calibration, turn off the meter at any time.

Fig.35

CO CALIBRATION

When the accuracy becomes a concern, return to UEi for standard calibration. It is necessary to have standard CO gas for calibration.

CAUTION:
Do not calibrate the meter in the air with unknown CO concentration. It could be calibrated as 400ppm by default which leads to inaccurate measurements.

TROUBLESHOOTING

Will Not Power On
- Press (ON/OFF SET) for more than 3 seconds.
- Check that the adaptor is connected and on.
- Check that battery level is sufficient and properly installed.

Readings Not Changing
- Check whether data hold function is activated (**HOLD** icon is at the left top).

Slow Response
- Check the air flow channels on the rear. Verify no blockage exists.

Error Messages
E01/E33: CO_2 sensor is out of order. Try new battery first.
E02: The value is under range.
E03: The value is over range
E04: The original data error results in this error (DP, WB)

Error Messages Cont.

E11: Retry humidity calibration
E16: Retry CO calibration
E31: Temperature sensor AD damaged
E32: Memory IC damaged.
E33: Humidity sensor or circuit damaged.

PC CONNECTION

The UEi AQM4 can be connected to a PC to download recorded data.

Plug the USB cable into the socket at the right side of the meter and the other port to your PC. Next, install the software on your PC following these procedures.

1. Insert the CD ROM and run installation. Select a preferred directory and click "Next" step by step to finish.

2. After the software installation is completed, it will run USB driver installation next.

AUTO CONNECT

Start the software and it will detect the logger connection automatically, indicating the COM port information at the bottom of the main screen as well as the COM Port setting column.

LOGGER SETTINGS

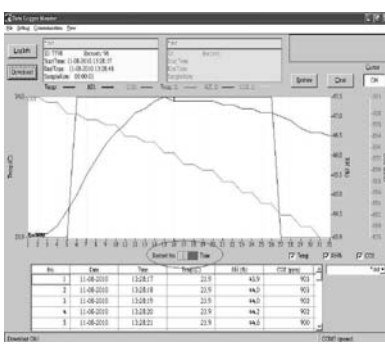
To set up logging plan, click "Setting" icon and select "Logger". The setting page is opened.

Users can set up the logger identifier number. Click OK for setting and exit the screen to confirm the settings.

DATA TRANSMISSION

To transmit auto recorded data from the meter, click "Download" icon on the left top side of the main screen. All auto-recorded data in the logger will be transmitted. The raw data with time stamp will display at the lower part of the screen and the graph in the middle.

In the Graph display, the Y-axis indicates Temperature, RH, DP,WBT, CO2, and CO levels in different line colors. The X-axis can be switched to show Time or Recorded Number Stamp.



VIEW MENU

The following functions help to view the GRAPH data in more detailed way.

In the view menu, there are 4 tools to enlarge the Graph data for detailed data review.

Zoom in: Hold down "Ctrl" key on the PC keyboard and left click any target point on the graph to zoom in. Right click at any point to zoom out.

Zoom Window: Hold down "Ctrl" key and drag click the left button of the mouse to select an area on the Graph and the selected area will be enlarged.

Zoom X-Axis: Hold down "Ctrl" key and drag click the left button of the mouse to select an area on the Graph and the X-axis of the selected area will be enlarged.

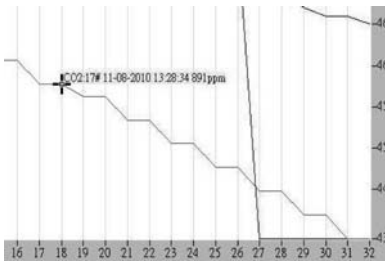
Zoom Y-Axis: Hold down "Ctrl" key and drag click the left button of the mouse to select an area on the Graph and the Y-axis of the selected area will be enlarged.

Three icons on the right top side of the main screen:

Redraw Button: After any review and zooming on the Graph, click "Redraw" to reset it to original format.

Clear Button: Click "Clear" to delete all data and Graph on the window. A warning box shows up for confirmation. Press "Yes" and all data will be cleared from the PC.

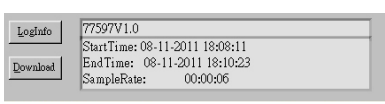
Cursor Button: Switch cursor ON and it shows the raw data with the cursor. Click anywhere on the graph and the digital data will be displayed. Switch OFF to disable the function.



DATA PROCESSING

The downloaded data can be **Saved** or **Printed** via "**File**" processing function.

Load: To retrieve saved files, just click "**Load**" and select a desired file and it will be loaded in the main screen with the file details at the left top side.



SPECIFICATION

Measuring Range	
CO_2	0 ~ 9999ppm
CO	0 ~ 1000ppm
Temperature	-20 ~ 60°C -5 ~ 140°F
Relative Humidity	0.1% ~ 99.9%
Dew Point Temp.	-20.0 ~ 59.9°C
Wet Bulb Temp	-5.0 ~ 59.9°C
Resolution	1ppm, 0.1°C/°F, 0.1%RH
Accuracy	
CO_2	±30ppm ± 5% of reading (0 ~ 5000ppm)
CO	±10ppm for less than 100ppm ±10% of reading for 101~500ppm ±20% of reading for 501ppm and above
Temperature	±0.6°C/+0/9°F
Relative Humidity	±3% (at 25°C, 10~90%) ±5% (at 25°C, other range)
Response Time	
CO_2	<30 seconds (90% step change)
CO	<60 seconds (90% step change)
Tair	<2 mins (90% step change)
Relative Humidity	<10 mins (90% step change)
LCD/Meter Size (mm)	26(H) x 44 (L), 205(L) x 70 (W) x 56(H)
Operating Condition	-20 to 50°C (CO^2 Sensor) 0 to 500°C (CO Sensor) -20 to 60°C
Storage Condition	-20 ~ 60°C, 10 ~ 90% RH
Power Supply	AA x 4pcs or 9V Adaptor
Battery Life	>24 hours (Alkaline Battery)
Weight	200g

CO^2 LEVELS AND GUIDELINES

REGULATORY EXPOSURE LIMIT

ASHRAE Standard 62.1-2004:
CO_2 concentration in occupied building should not exceed 1000ppm.

Building Bulletin 101 (BB101): 1500ppm
UK standards for schools state that CO_2 averaged over the whole day (i.e. 9am to 3:30pm) should not exceed 1500ppm.

OSHA: 5000ppm
Time weighted average over five 8-hour work days should not exceed 5000ppm.

Mak: Germany, Japan, Australia, UK: 5000ppm
Eight hours weighted average in occupational exposure limit is 5000ppm. (See Ashrae 62.1-2004 Table B-1)

NON-ENFORCED REFERENCE LEVELS

NIOSH Recommends
250-350ppm: normal outdoor ambient concentrations

600ppm: minimal air quality complaints

600 - 1000ppm: less clearly interpreted

1000ppm: indicates inadequate ventilation; complaints such as headaches, fatigue, eye/throat irritation will be more widespread. 1000ppm should be used as an maximum limit for indoor levels.

CO LEVELS

ppm	Symptoms and Applicable Standards
0-1	Normal background levels
9	Maximum indoor air quality level: Maximum allowable concentration per ASHRAE Residential Standards 62-1989 for living area.
25	Maximum limit 8 hours of continuous exposure per California OSHA workplace standards
35	Maximum 8 hours average exposure level per US OSHA workplace standards
50	Maximum concentration for continuous exposure for any 8 hours average level per OSHA standards
100	Evacuate employees from continuous exposure in any 8 hour average level per OSHA standards.
200	Mild headache, fatigue, nausea, and dizziness within 2-3 hours
400	Frontal headache, life threatening after 3 hours. Maximum concentration in flue gas per the US EPA and AGA standards
800	Dizziness, nausea, convulsions, death within 2-3 hours
1600	Nausea within 20 minutes, death within 2-3 hours.

CE

CE CERTIFICATE

The product complies with EMC directive 2004/108/EC
Technical standard: Emission EN 61326-1:2006 Class B
EN 55011:2009/A1:2010 Group 1 Class B
Immunity EN 61326-1:2006 EN 61000-4-2:2009
EN 61000-4-3:2006 A2:2010

LIMITED WARRANTY

The AQM4 is warranted to be free from defects in materials and workmanship for a period of two years from the date of purchase. If within the warranty period your instrument should become inoperative from such defects, the unit will be repaired or replaced at UEi's option. This warranty covers normal use and does not cover damage which occurs in shipment or failure which results from alteration, tampering, accident, misuse, abuse, neglect or improper maintenance. Batteries and consequential damage resulting from failed batteries are not covered by warranty.

Any implied warranties, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the express warranty. UEi 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. A purchase receipt or other proof of original purchase date will be required before warranty repairs will be rendered. Instruments out of warranty will be repaired (when repairable) for a service charge. Return the unit postage paid and insured to:

Claims are not acceptable for improper use (including adaptation) to particular applications not foreseen in the instruction manual or improper combination with incompatible accessories or equipment, or for repair carried out by unauthorized personnel.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state.