OPERATION MANUAL

PORTABLE IAQ METER



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Model: ☐ 77597, 4 in 1
☐ 77596, 3 in 1

INTRODUCTION

Thank you for purchasing this portable IAQ meter. The meter measures CO_2 level,CO level, air temp., dew point, wet bulb temp. and humidity(DP, WB, RH are for models 77597 only) and is an ideal instrument for indoor air quality (IAQ) diagnosis.

Poor indoor air quality is considered unhealthy because it causes tiredness, loss of ability to concentrate, and even illness(ex. Sick Building Syndrome). IAQ monitoring and survey, especially on CO_2 level and air ventilation become widely applied in public areas such as offices, classrooms, factories, hospitals and hotels. It is also suggested in regulations of industrial hygiene in some countries. (Appendix)

The portable CO_2 meter uses NDIR (non-dispersive infrared) technology to ensure the reliability and long term stability. It's useful in verifying HVAC system 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.

Maximum indoor air quality level per ASHRAE Residential standards 62-1989 for living area is under 9ppm. Besides, it is also necessary to remove employees from enclosed space if the CO concentration exceeds100ppm per OSHA exposure limit. Please refer to Appendix for the details.

Features:

- Big LCD display with blue backlight to use in dark area
- One touch to display CO_2 /Dew point temperature/Wet bulb temperature/ Air temperature/Humidity/CO in turns.
- Designed with NDIR (non-dispersive infrared) Waveguide technology CO_2 sensor
- Programmable warning CO level
- Long time drift compensation on CO_2 sensor
- Audible alarm (~80db)threshold setting
- Max, Min, TWA, STEL functions included
- Mini USB to PC download function for analysis
- 99 points manually recording
- 32000/24000 points auto recording
- Review 99 points manual record
- Hold function freezes current readings
- Housing design surrounds with rails to help Air ventilation for quick & accurate response
- Easy to manually calibrate CO2 at fresh air around 380-420ppm

MATERIAL SUPPLIED

This package contains:

- ✓ Meter
- ✓ 4pcs AA batteries
- ✓ Mini USB cable and software CD
- ✓ Operation manual
- ✓ Hard carrying case

Optional accessory:

- ✓ 33% calibration salt (VZ0033AZ1)
- ✓ 75% calibration salt (VZ0075AZ1)
- ✓ Adaptor (9V/100~240Vac)

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 and make sure they are in correct polarity and good contact. When an adaptor is used, it will cut off the power supply from batteries. The adaptor can't be used as a battery charger.

When battery voltage gets low, B will appear on the LCD (Fig.1).
The CO_2 sensor can't work normally under low voltage, please replace with fresh batteries or connect with an adaptor.

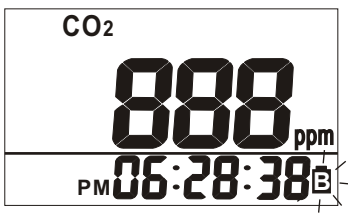


Fig.1

LCD DISPLAY



Symbols

UpperLCD	CO2/CO/Temp....reading
LowerLCD	Real time display
CO_2	Carbon dioxide reading
CO	Carbon monoxide reading
HOLD	Readings are freezed unchanged
MIN/MAX	Minimum/Maximun readings
STEL	Short-term exposure limit (15 minutes weighted average)
TWA	Time weighted average(8 hours)
B	Low battery indicator
DP	Dew point temperature(77597)
TA	Air temperature
WBT	Wet bulb temperature(77597)
%rh	Unit of relative humidity (77597)
$^{o}C/^{o}F$	Celsius/Fahrenheit of temp.
CAL	In calibration status
REC	In manual/automatic logging
RECALL	In manual records recall mode

KEYPAD

(ON/OFF SET) Turns on and off the meter.
Enters setup mode while meter is off.
Sets as non-sleep mode with (HOLD ▲).

(START ESC) Exits setup/recall page.
Start automatic logging.

(MODE RECALL) Press to switch displayed mode.
Long press to enter memory recall mode.

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 Activates MIN, MAX, TWA, STEL function. Saves and finishes settings.

OPERATION

POWER ON/OFF

Press ON/OFF SET to turn the meter on and off. At power up, it emits a short beep and performs 30 seconds countdown(Fig.2) for meter warm up, then enters normal mode with current CO_2 and real time displayed (Fig.3). The real time display date and time in turns.

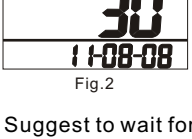


Fig.2

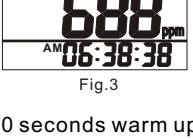


Fig.3

Suggest to wait for 30 seconds warm up time. For quick start, you may press M/AVG for 2 seconds to end the warm up and entering normal display.

TAKING MEASUREMENT

The meter starts measurement when power on and update readings every second. In the condition of operating environment change (ex. from high to low temp.), it takes 30 sec to respond for CO_2 sensor and 30 minutes for RH.
NOTE: Do not hold the meter close to faces in case exhalation affects CO_2 levels.

CO2 (Carbon Dioxide)

Press MODE/RECALL to switch the mode to CO2. User can get the CO2 reading in ppm unit on main display.(Fig.4). The lower display shows the real time clock.



Fig.4



Fig.5

CO (Carbon Monoxide)

Press MODE/RECALL to switch the mode to CO. User can get the CO reading in ppm unit on main display.(Fig.5). The lower display shows the real time clock.

AIR(all models),DP,WBT(77597)

Press MODE/RECALL to switch to temperatures display.(Fig.6). In 77597 model, dew point temp. and wet bulb temp. are also available.(Fig.7). The lower display shows the real time clock.



Fig.6



Fig.7

Humidity (77597)

Press MODE/RECALL to switch to humidity display. (Fig.8).The lower display shows the real time clock.



Fig.8

DATA HOLD

In normal display mode, press HOLD to freeze the readings, "HOLD" icon is flashed on the left top of LCD(Fig.9). All current readings are kept unchanged. Press HOLD again to cancel the hold function.

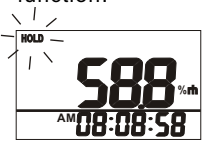


Fig.9

NOTE:
THE HOLD FUNCTION IS DISABLE IN MIN/MAX/ AVG MODE.

BACKLIGHT

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

MIN,MAX,STEL,TWA, CURRENT REVIEW

This meter allows you to check the minimun, maximun, STEL,TWA and current value from the moment you press the M/AVG key. Under normal mode, press M/AVG to see the minimum, maximum, STEL, TWA and current value in turns. Each press of M/AVG,it displays MIN, MAX, STEL,TWA, current value in sequence. (Fig.10~12). To return to normal mode, press START ESC key to escape(Fig.13)

If the meter is turned on for shorter than 15 mins, the STEL value will be the weighted average of readings take since power on. Same for TWA values appear before 8 hours.

It takes at least 5 mins to calculate STEL and TWA. The display shows "----" during the first 5 mins from power on.

While in “HOLD” mode, STEL and TWA will remain updating every 5 mins.

In this max/min/STEL/TWA/current modes, it shows the corresponding readings on main display and the **accumulated time** of how long you are in this mode.（Fig10~12).

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

The dispalyed sequence in this mode is min→max→STEL→TWA→current→min→max.....Press (START ESC) key can immediately leave this mode and return to normal.

Distinguishing the normal display and current review by checking the time display format. In normal display, the date & time displayed in turns. In current review, the time display is the **accumulated time** of how long you are in max/min mode.



Fig.10



Fig.11

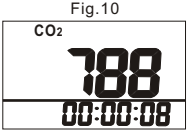


Fig.12

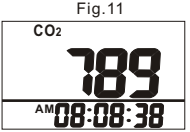


Fig.13



Fig.14

NOTE:
“HOLD” & “MANUALLY RECORD” & “RECALL” FUNCTION ARE DISABLE IN MIN/MAX/AVG MODE.

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

MANUALLY RECORDING

The meter features 99 point memories.

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 , at most 99 points.(Fig. 15)

Each memory contains all parameters (CO2, CO, TA.....%rh), not only the parameter you choose to see on main display.



Fig.15

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

The manually recording function is disabled in min/max mode.

99 MEMORIES RECALL

The meter features 99 point memories review function.

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 the memories. The memory serial number displays on main LCD fist and reading comes after. (Fig. 16&17)

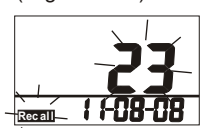


Fig.16



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 audible alarm to give warnings when CO concentration exceeds the limit. (See P20 in setup 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.

DATA LOGGING

The meter can automatically record readings of CO2/CO/TEMP./RH for long time environment monitoring. The memory capacity is 32000 (#77597) or 24000 (#77596) points. Users can set up sampling rate from 1 second to 4hours 59 minutes and 59 seconds (See SETUP 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 value. Lower displays are the real time clock.(Fig.19)



Fig.19

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

While press START/ESC to start the logging again, the previous logging records are overwrite.

Press MODE/RECALL key to switch to the mode you want to see. Except the mode switch function, min/max, manual record, hold and recall functions are all disabled during logging.

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.

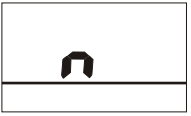


Fig.20



Fig.21

SETUP

When the meter is off, hold down ON/OFF/SET for more than 1 sec to enter setup mode. To exit setup, press START/ESC in P10 ~ P60 and it returns to normal mode. (Fig.21)

P10: 99 MEMORIES CLEAR

When entering setup mode, P10 and "CLr" (Fig.21) are displayed on the LCD. Press M/AVG to go into P11 and decide to clear or keep all the manual records. The current set will be blinking on LCD (Fig.22).

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



Fig.22

Press START ESC to escape and return to P10.

P20: CO ALARM

When entering setup mode, P20 and "ALAr" (Fig.23) are displayed on LCD. Press M/AVG to go into P21 for setting CO alarm threshold. The current set value will be blinking on LCD(Fig.24). Press HOLD to increase the value or MEM to decrease. The selectable alarm limits are 15~200ppm,each press tunes 5ppm. When the preferred alarm value is set, press M/AVG to save the setting or START ESC without saving and return to P20.



Fig.23



Fig.24

P30 TEMPERATURE UNIT

When entering setup mode, P30 and "unit" (Fig.25) are displayed on the LCD. Press M/AVG to go into P31 and decide the temperature unit.

The current set 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

Press START ESC to escape and return to P30.

P40:LOGGING SAMPLING RATE

Go into P40 for setting sampling rate of data logging(Fig.27). The range is from 1 second to 4 hours 59 minutes and 59 seconds.

Press M/AVG and it goes into setting with blinking Hour digits on the lower display. To change the digit, press HOLD to increase and MEM to decrease. Press M/AVG to confirm and enter Minute setting . Press M/AVG again to confirm and enter Second setting (Fig.28). Press M/AVG to confirm the rate setting or START ESC without saving and return to P40.



Fig.27



Fig.28

P50 PRESSURE COMPENSATION

When entering setup mode, P50 and "PrES" (Fig.29) are displayed on the LCD. Press M/AVG to set pressure compensation value for CO2 measurement.

The current set will flash on LCD (Fig.30).The barometric pressure unit is kpa.

Press HOLD or MEM to adjust the pressure value and press M/AVG to confirm.

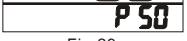


Fig.29

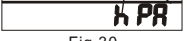


Fig.30

Press START/ESC to escape and return to P50.

P60:REAL TIME CLOCK

Go into P60 for setting the real time clock of this meter.

Press M/AVG and it goes into P61to set the time format as 12hour 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 entering real time clock setting.(Fig.31)

The blinking Year digits on the lower display. To change the digit, press HOLD or MEM to adjust. Press M/AVG to confirm and enter Month setting. Repeat above steps to complete the month/date/hour/ minute/second setting.(Fig.32)



Fig.31



Fig.32

CO_2 CALIBRATION

The meter is calibrated at standard 400ppm CO_2 concentration in factory. It's suggested to do manual calibration regularly to maintain good accuracy.

Note:

When the accuracy becomes a concern after a long time usage, return to dealers for standard calibration.

CAUTION:

Do not calibrate the meter in the air with unknown CO_2 concentration. Otherwise, it will be calibrated as 400ppm by default and leads to inaccurate measurements.

The manual calibration is suggested to to be done in fresh outdoor air that is well ventilated and in sunny weather.

Place the meter in the calibration site. First press (START/ESC) + (MEM), then also (ON/OFF/SET) simultaneously for 3 seconds to turn on the meter and enter calibration mode (Fig.33). Three calibration menu is available: Humidity/CO/CO2.

Press (M/AVG) key to select the CO2 calibration. 400ppm and " CAL " icon are blinking on the LCD. Press (M/AVG) to start calibration. (Fig.34)

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

NOTE:

Ensure the batteries are with full voltage during the calibration to prevent from interruption or failed calibration.



Fig.33



Fig.34

RH CALIBRATION (77597)

The meter defaults to be calibrated the humidity with 33% and 75% salt solution. The ambient condition is recommended to be at 25°C and stable humidity(better to be close to the calibrating value). To abort calibration, just turn off the meter.

CAUTION:
Do not calibrate the humidity without the default calibration salt. Otherwise, it will cause permanent damage. Contact the dealer for calibration salt or services.

33% calibration

Plug the sensor probe into 33% salt bottle. Press START/ESC + MEM and ON/OFF/SET simultaneously for 3 seconds to turn on the meter and enter calibration mode (Fig.33.).
Hold down M/AVG to enter 33% calibration. "CAL" and "Calibrating Value" (32.8% if at 25°C) are blinking on the LCD.
Meter is now calibrating, and will finish in about 60 minutes when "Calibrating Value" stop blinking, "CAL" will keep blinking for 75% calibration afterward.
To abort the calibration, turn off the meter at any time.

75% calibration

After 33% calibration, plug sensor probe into 75% salt bottle and press M/AVG for more than 3 second to enter 75% calibration. (Fig.35).
"CAL" and calibrating value (75.3% if at

25°C) are blinking on the LCD.
Meter is now calibrating, and will finish in about 60 minutes when “CAL” and “Calibrating Value” stop blinking.
After 75% Calibration finished, meter will turn off automatically.
To abort the calibration, turn off the meter at any time.



Fig.35

CO CALIBRATION

When the accuracy becomes a concern after a long time usage, return to dealers 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. Otherwise, it will be calibrated as 0 or 400ppm by default and leads to inaccurate measurements.

Place the meter in the calibration site. First 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 the CO 0ppm or 400ppm calibration. ppm and “ CAL “ icon are blinking on the LCD. Press (M/AVG) to start calibration. (Fig.36&37)

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

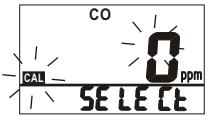


Fig.36 Fig.37

NOTE: It is allowed to adjust the CO calibration point from 385~415ppm (400±15ppm)

TROUBLESHOOTING

? Can't power on

-Press (ON/OFF SET) for more than 0.3 seconds and try again. Check whether batteries are in good contact and correct polarity, or the adaptor is well plugged.

-You may also take off the batteries for 10 mins and then put back again.

? Fixed readings

Check whether data hold function was activated. (HOLD icon at the left top)

? Slow response

Check whether the air flow channels on the rear were blocked.

? Error messages

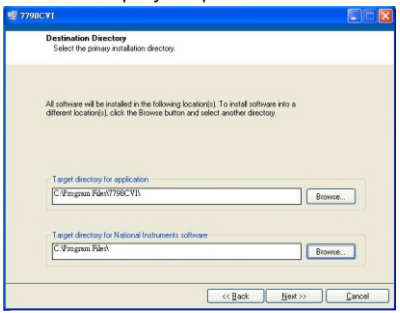
E01/E33: CO_2 sensor is out of order. Try new battery first.
E02: The value is under range.
E03: The value is over range.
E04: The original data error results in this error (DP, WB)
E11: Retry humidity calibration.
E16: Retry CO calibration.
E31: Temperature sensor or AD damaged.
E32: Memory IC damaged.
E33: Humidity sensor or circuit damaged.

PC CONNECTION

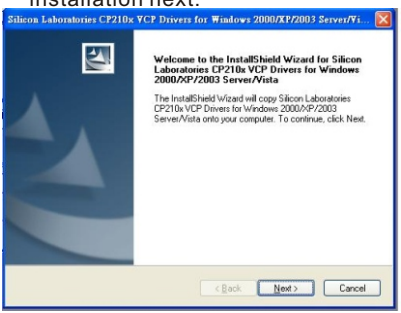
Connect the logger to PC, users can do logging setting and data transmission with the included software.

Plug the USB cable into the socket at the right side of the meter and the other port to PC. Then install the software in your PC with the following procedure.

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

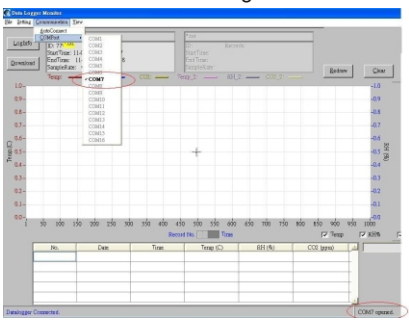


2. After the software installation is completed, it will run USB driver installation next.



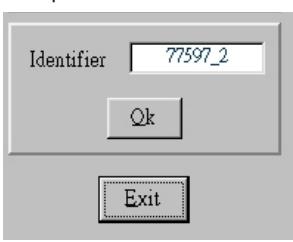
AutoConnect

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



Logger Settings

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

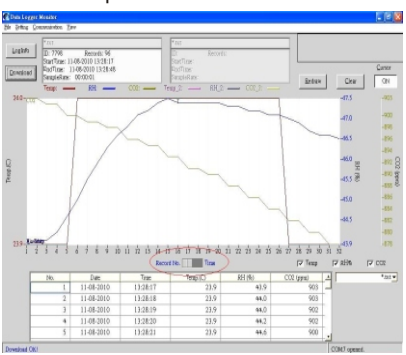


Users can set up the logger identifier number. Click OK for setting and Exit the screen to confirm the settings.

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 Temp, RH,DP, WBT, CO_2&CO level in different line colors. And the X-axis can be switched to show Time or Recorded No. Stamp.



Data Review Function

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

Under **View** function, there are 4 tools to enlarge the Graph data for detailed data review.

Zoom in: Hold down "Ctrl" key on the PC keyboard and click any target point on the graph. It enlarges the point in each click.

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 Xaxis: 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.

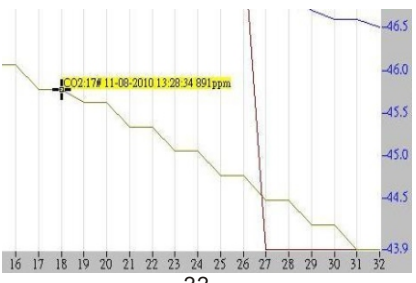
Zoom Yaxis: Hold down “Ctrl” key and drag click the left button of the mouse to select an area on the Graph and the Y-axis of the selected area will be enlarged.

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

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

Clear: 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.

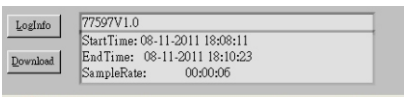
Cursor: Switch Cursor **ON** and it shows the raw data with the cursor. In any click on the graph, the digital data displayed. Switch **OFF** to disable the function.



Data Processing

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

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

	77597	77596
Measuring range		
CO2	0~9999 ppm, (5001~9999 ppm out of scale range)	0~9999 ppm, (5001~9999 ppm out of scale range)
CO	0~1000 ppm,	0~1000 ppm,
Temperature	-20~60°C (-5~140°F)	
Relative Humidity	0.1%~99.9%RH	N/A
DP(Dew point temp.)	-20.0~59.9°C	N/A
WB(Wet bulb temp.)	-5.0~59.9°C	N/A
Resolution	1ppm , 0.1°C/°F, 0.1%RH	
Accuracy		
CO2	±30ppm±5% of reading(0~5000ppm) Other ranges are not specified	
CO	+/-10 ppm for less than 100 ppm +/-10% or reading for 101~500 ppm +/-20% of reading for 501ppm and above	
Temperature	±0.6°C/±0.9°F	
Relative Humidity	±3%RH (at 25°C, 10~90%RH) ; ±5%RH (at 25°C , other range)	
CO2 Warm-up time	30 seconds	
Response time		
CO2	<30 seconds(90% step change)	
CO	<60 seconds(90% step change)	
Tair	<2 mins (90% step change)	
RH	<10 minutes (90% step change)	
LCD / Meter size (mm)	26(H)x44(L), 205(L)x70(W)x56(H)	
Operating condition (avoid condensation)	-20 to 50 °C (CO2 sensor),0 to 50 °C (CO sensor) -20 to 60 °C (for the rest parameters)	
Storage condition	-20~ 60°C,10~90%RH(avoid condensation)	
Power supply	AA x 4pcs or 9V adaptor	
Battery life	> 24 hours (Alkaline battery)	
Weight	200g	
Standard package	Meter, manual , AA bat. , USB cable &CD, carry case	

CO_2 LEVELS AND GUIDELINES

Non-Enforced Reference levels

NIOSH recommendations

250-350 ppm: normal outdoor ambient concentrations

600 ppm: minimal air quality complaints

600-1000 ppm: less clearly interpreted

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

EPA Taiwan: 600ppm and 1000ppm

Type 1 indoor areas such as department stores, theaters, restaurants, libraries, the acceptable CO_2 concentration of 8 hours avarge is 1000ppm.

Type 2 indoor areas with special requirements of good air quality such as schools, hospitals, day care centers, the suggested CO_2 level is 600ppm.

Regulatory exposure limit

ASHRAE Standard 62-1989: 1000ppm
CO_2 concentration in occupied building should not exceed 1000ppm.

Building bulletin 101 (BB101): 1500ppm
UK standards for schools say that CO_2 at averaged over the whole day(i.e. 9am to 3.30 pm) should not exceed 1500ppm.

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

Germany, Japan, Australia, UK...: 5000ppm
8 hours weighted average in occupational exposure limit is 5000ppm.

CO LEVELS AND GUIDELINES

ppm	Symptoms and applicable standard
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 hrs of continuous exposure per California OSHA workplace standards.
35	Maximum 8 hrs average exposure level per US OSHA workplace standards.
50	Maximum concentration for continuous exposure in any 8 hrs average level per OSHA standards.
100	Remove employees from enclosed space if the CO concentration exceeds 100ppm per OSHA exposure limit.
200	Mild headache, fatigue, nausea and dizziness w/i 2-3 hrs.
400	Frontal headache, life threatening after 3hrs. Maximum concentration in flue gas per the US EPA and AGA standards.
800	Dizziness, nausea, convulsions, death w/i 2-3 hrs.
1600	Nausea w/i 20 min.,death w/i 2-3 hrs

WARRANTY

The meter is warranted to be free from defects in material and workmanship for a period of one year from the date of purchase. This warranty covers normal operation and does not cover misuse, abuse, alteration, neglect, improper maintenance, or damage resulting from leaking batteries. Proof of purchase is required for warranty repairs. Warranty is void if the meter has been opened.

RETURN AUTHORIZATION

Authorization must be obtained from the supplier before returning items for any reason. When requiring a RA (Return Authorization), please include data regarding the defective reason, the meters are to be returned along with good packing to prevent any damage in delivery and insured against possible damage or loss.

OTHER RELATED PRODUCTS

Other related CO_2 products:

a. Model 7721 Wall mount Temp./CO_2 meter, general purpose.
b. Model 77231 Wall mount Temp./CO_2 meter, high performance.
c. Model 7722 Wall mount Temperature/RH/Co_2 meter, general purpose.
d. Model 77232 Wall mount Temperature/RH/Co_2 meter, high performance.

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pH Meter
Conductivity Meter
T.D.S. Meter
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More products available !

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