

# Indoor Air Quality Meter

800046

Instruction Manual

SPER  
SCIENTIFIC

*Environmental Measurement Instruments*

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# TABLE OF CONTENTS

Introduction	3
Features	4
Power Supply	5
LCD Display	6
Keypad	7
Measurement Procedures	8-12
CO <sub>2</sub> Calibration	13
RH Calibration	14-15
Troubleshooting	16
PC Connection	17
CO <sub>2</sub> Levels and Guidelines	18
Specifications	19

## INTRODUCTION

Poor air quality may cause tiredness, inability to concentrate, and even illness (i.e., Sick Building Syndrome). This instrument is ideal for monitoring indoor air quality in crowded public spaces with potentially high levels of CO<sub>2</sub> (carbon dioxide) such as offices, factories, classrooms, hospitals and hotels. The same measurement parameters can also be used to test air from HVAC equipment.

Simultaneously backlit display of CO<sub>2</sub> (carbon dioxide) level, humidity and air temperature, or the user may choose a rotating display of dew point and wet bulb temperature instead of air temperature. Also calculates TWA (Time Weighted Average) and STEL (Short-Term Exposure Limit). Simple user calibration of CO<sub>2</sub> and RH. Features audible CO<sub>2</sub> threshold alarms, min/max/ave, hold and a USB computer interface. NDIR (non-dispersive infrared) technology ensures long-term accuracy, stability and reliability.

## **FEATURES**

- Triple display of CO<sub>2</sub> level, temperature and humidity
- Stable NDIR sensor for CO<sub>2</sub> detection
- Backlight for working in dark areas
- Audible CO<sub>2</sub> warning alarm
- Battery and adapter power supply
- Easy manual calibration of CO<sub>2</sub> and humidity
- PC connect via USB serial interface
- Statistics of weighted averages
  - TWA (8 hours weighted average)
  - STEL (15 minutes weighted average)

## **MATERIALS SUPPLIED**

- Meter
- 4 AA Alkaline Batteries
- Instruction Manual
- Hard Carrying Case

# POWER SUPPLY


The unit is powered by either 4 AA Alkaline Batteries or an optional AC adapter (9V/1A output).

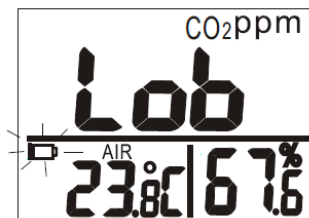
## Battery Installation

1. Install the batteries into the battery compartment located at the bottom-rear of the unit by pressing downward on the battery compartment door's locking-hinge and remove the cover.
2. Install 4 AA Alkaline Batteries ensuring the polarity is correct and the batteries are firmly seated.
3. Re-install the cover and ensure it snaps securely into place.

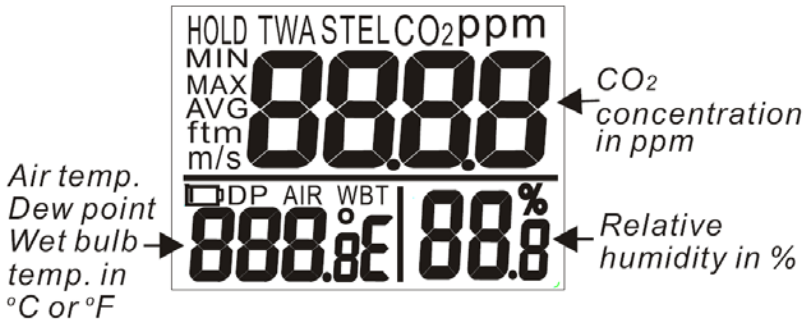
### Note...

When the AC Adapter is used, power supplied from the batteries is disabled. The adapter does not charge the batteries.


When the battery voltage is low, , **Lob** appears on LCD and an alarm sounds. Under low battery conditions, the meter's CO<sub>2</sub> sensor will not function properly, readings are not displayed, and an audible beep indicates a failed CO<sub>2</sub> measurement (press any key except the **SET** key to disable the audible beeps). Replace the batteries or connect the meter to the AC adapter.



# LCD DISPLAY



## LCD Symbols

TWA	Time weighted average (8 hours)
STEL	Short-term exposure limit (15 minutes weighted average)
HOLD	Readings are frozen
MIN/MAX	Minimum/Maximum readings
	Low battery indicator
DP	Dew point temperature
AIR	Air temperature
WBT	Wet bulb temperature
%	Relative humidity
°E (C/F)	Celsius/Fahrenheit
AVG/ftm/m/s	Measurement icons

# KEYPAD

Keypad functionality is defined as follows:



Turns meter **On** and **Off**.

Enters **Setup** mode.

Sets **Non-Sleep** mode with



Exits **Setup Page** mode.

Enters **CO<sub>2</sub> calibration** with

Enters **RH calibration** with



**Freezes** current readings.



Turns **LCD Backlight** On and Off.

Selects unit or **increases Setup** value.



Selects **AIR, DP, or WBT** temperature displays.

Selects unit or **decreases Setup** value.



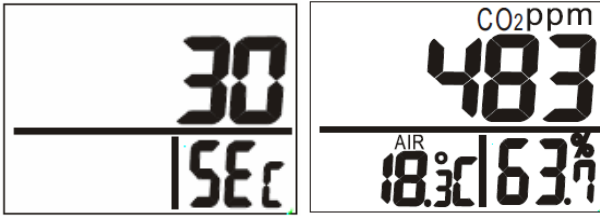
Activates **MIN, MAX, STEL, and TWA** functions.

**Saves** settings.

# MEASUREMENT PROCEDURES

## Power On/Off

Press **SET** to turn the meter on and off. The meter emits a short beep, performs a 30-second countdown and then displays current CO<sub>2</sub>, temperatures and humidity readings.



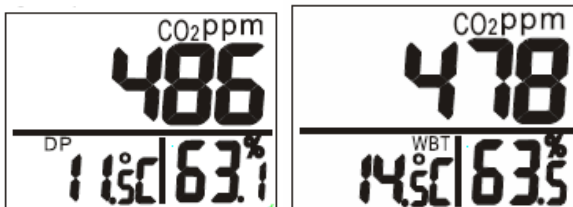
The meter starts acquiring measurements and updates its readings every second. In environments where conditions change (i.e., from low to high temperature), it takes the meter's sensor 30-seconds to respond for CO<sub>2</sub> and 30 minutes for RH.

## Note...

Do not hold the meter close to your face while taking measurements because exhaling affects CO<sub>2</sub> levels.

## Air, Dew Point and Wet Bulb Temperature

Press **DP/WBT** to switch temperature modes. The lower left of the LCD display cycles from air temperature to dew point temperature to wet bulb temperature.

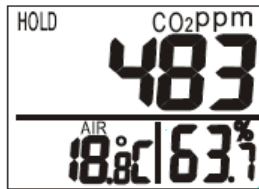




# MEASUREMENT PROCEDURES

## Data Hold

1. Press **HOLD** to freeze readings. The “HOLD” icon will appear in the left-top corner of the LCD. All current readings are frozen, except STEL and TWA.
2. Press **HOLD** again to cancel the “HOLD” function and resume measurement.



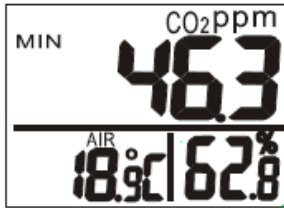
## Backlight

1. Press **MODE** for more than one second to turn the backlight on/off.

## Minimum, Maximum, Short-Term Exposure Limit and Time Weighted Average

1. While in Normal mode, press **MN/MX/AV** to view minimum, maximum, and weighted average readings.
2. Press **MN/MX/AV** to display MIN, MAX, STEL, and TWA readings in sequence and then return to Normal mode.
3. In MIN and MAX modes, the unit displays minimum and maximum CO<sub>2</sub> readings on the upper LCD and the AIR and D<sub>por</sub> WB temperatures and humidity on the lower LCD.

# MEASUREMENT PROCEDURES



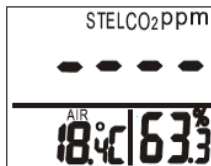
- In STEL and TWA modes, the main display indicates the weighted average of CO<sub>2</sub> readings for the previous 15 minutes (STEL) and 8 hours (TWA). The lower displays are current AIR, DP/WB temperatures and humidity.



## Note...

When the meter is turned on for a period shorter than 15 minutes, STEL value readings will indicate the weighted average of readings sampled since the unit was turned on. This rule also applies to TWA when the meter is on for a period shorter than 8 hours.

It takes at least 5 minutes to calculate STEL and TWA readings. During the first 5 minutes, the LCD displays "----."



While all readings are frozen, STEL and TWA are updated every 5 minutes.

# MEASUREMENT PROCEDURES

## Alarm

When CO<sub>2</sub> concentration exceeds a preset threshold (refer to Setup), an audible alarm sounds. The audible alarm stops when any key except **SET** is pressed, or readings fall below the threshold. If the audible alarm cannot be disabled normally, turn the unit off then on again.

## Auto Power Off

The meter automatically turns off after 20 minutes of inactivity. To override Auto Power Off, turn the meter off by pressing **SET**, then press and hold **SET** and **HOLD** simultaneously for 2 seconds until “n” appears on the LCD.

## Note...

Auto Power Off is disabled when the unit is in the Calibration mode.

## Setup

To enter Setup mode, ensure the meter is in Normal mode and press and hold **SET** for more than 1 second. To exit Setup mode, press **CAL** with either P 1.0 or P 3.0 displayed and the meter will return to Normal mode.

## P 1.0 - CO<sub>2</sub> Alarm

1. When entering Setup mode, P 1.0 and “AL” are displayed on the LCD. Press **MN/MX/AV** to set the CO<sub>2</sub> alarm threshold. The current threshold setting will blink on the LCD.



# MEASUREMENT PROCEDURES

2. Press **MODE** to increase the value or **DP/WBT** to decrease the value. The alarm range is 100ppm to 9900ppm in 100ppm increments.
3. When your preferred alarm value is reached, press **MN/MX/AV** to save the setting or press **CAL** to cancel (without saving) and the meter returns to P 1.0.

## Note...

P2.0 is not applicable for the 800046 but has been reserved for future models.

## P3.0 - Temperature Scale

1. While in P1.0, press **MODE** or **DP/WBT** to access P 3.0 and choose the temperature scale.
2. Press **MN/MX/AV** and the meter will go into the P 3.1 mode with its current setting for °C or °F displayed.
3. To switch between °C and °F scales, press **MODE** or **DP/WBT**.
4. Press **MN/MX/AV** to save your setting or press **CAL** to exit (without saving) and return to P 3.0.



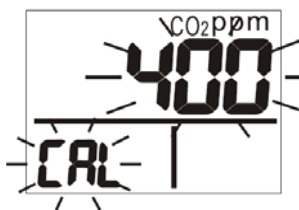
## CO<sub>2</sub> CALIBRATION

Manually calibrate the meter in an environment where the expected ambient air CO<sub>2</sub> concentration is approximately 400ppm.

This is typically fresh outdoor air that is well ventilated, preferably sunny and away from crowds of people. Avoid calibrating the meter in crowds of people, near ventilation ducts, fireplaces, or areas of industrial or combustion engine exhaust.

### Procedure

1. Take the meter to an appropriate calibration area.
2. Turn the meter on and simultaneously hold down **CAL** and **MODE** to enter CO<sub>2</sub> calibration mode.
3. 400ppm and “CAL” will blink on the LCD while calibration is being performed.



4. In approximately 10 minutes, blinking stops, calibration is completed and the meter returns to Normal mode.
5. To abort calibration, turn the meter off at any time during this process.

### Note...

Before performing calibration, ensure batteries are in good condition to prevent interruption or calibration failure.

# RH CALIBRATION

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

## Caution...

Do not calibrate humidity without the calibration salt as doing so may cause permanent damage. Contact Sper Scientific for calibration salt or services.

## 33% Calibration

1. Plug the sensor probe into a 33% salt bottle.
2. With the meter in Normal mode, hold **CAL** and **DP/WBT** simultaneously to enter the 33% calibration mode.
3. "CAL" and the calibrating value (32.7% if at 25°C) will blink on the LCD with the current temperature displayed on the left.



4. Meter calibration is completed in approximately 60 minutes when "CAL" and humidity stop blinking, and the meter returns to Normal mode.



# RH CALIBRATION

## 75% Calibration

1. After performing the 33% calibration, plug the sensor probe into a 75% salt bottle.
2. Press **MN/MX/AV** o enter the 75% calibration mode.
3. “CAL” and the calibrating value (75.2% if at 25°C) blink on the LCD.



4. The calibration process will be completed in approximately 60 minutes when “CAL” and humidity stop blinking.

### Note...

Users can also calibrate individually either to 33% or 75%.

To calibrate 33% only, press **CAL** and exit when 33% calibration is completed.

To calibrate 75% only, press **MODE** or **DP/WBT** within the first 5 minutes of initializing the 33% calibration process.

# TROUBLESHOOTING

- ***Can't turn the meter on?***

Press **SET** for more than 3 seconds and try again. Check that the batteries have been installed properly (check for correct polarity) and/or that the adapter is firmly plugged in.

- ***Frozen readings?***

Data Hold function is enabled (Data Hold icon located at the top left). Disable the Data Hold function.

- ***Slow Response?***

Ensure that the air flow channels located at the top-rear of the unit are not blocked.

## **Error Messages**

E01: CO<sub>2</sub> sensor is damaged.

E02: The value is under range.

E03: The value is over range.

E04: The temperature or humidity data error results in this DP, WB error.

E07: Voltage too low to measure CO<sub>2</sub>. Replace batteries or use adapter.

E11: Retry humidity calibration.

E17: Retry CO<sub>2</sub> calibration.

E31: Temperature sensor is damaged.

E34: Humidity sensor is damaged.



## PC CONNECTION

The meter can be linked to a PC for online logging and data analysis via USB serial interface and software. The protocol is:

9600 bps, 8 data bits, no parity

Format (ASCII)

Cxxxxppm: Txxx.xC(F): Hxx.x%

dxxx.xC(F):wxxx.xC(F) LRC CRLF

Description: \$CO<sub>2</sub>:Air:RH:DP:WBT LRC CRLF

## CO<sub>2</sub> LEVELS AND GUIDELINES

The following are excerpts from ANSI/ASHRAE addendum standard 62.1-2004:

### Enforceable and/or Regulatory Levels:

**OSHA** – The Occupational Safety and Health Administration  
5,000ppm

**MAK** – German Institution  
5,000ppm or 10,000ppm (1h)

### Non-Enforced Guidelines and Reference Levels:

**Canadian** – 3500ppm (Long-term)

**NIOSH** – The United States National Institutes of Health  
5,000ppm or 30,000ppm (15 min)

**ACGIH** – 5,000ppm or 30,000ppm (15 min)  
The American Conference of Government Industrial Hygienists (ACGIH)

### **Note...**

**TWA** (Time Weighted Average) stands for the average carbon dioxide level exposure during 8 hours (working day) is 5,000ppm/5 days.

**STEL** (Short-Term Exposure Limit) value shows the last 15 minutes CO<sub>2</sub> concentration is 30,000ppm.

**ASHARE** – Standard 62 – 1989, Sec.6.1.3: Comfort (odor) criteria are likely to be satisfied if the ventilation rate is set so that 1,000ppm of CO<sub>2</sub> is not exceeded.

# SPECIFICATIONS

<b>CO<sub>2</sub></b>	
Range	0-5000ppm 5001-9999 (out of scale)
Resolution	1ppm
Accuracy	±30ppm±5%rdg (0~5000) Not specified for out of scale
Pressure Dependence	+1.6% reading per kPa deviation from normal pressure, 100kPa
<b>Temperature</b>	
Range	-10.0~60.0°C (14~140°F)
Resolution	0.1°C/0.1°F
Accuracy	±0.6°C/±0.9°F
<b>Humidity</b>	
Range	0~100%
Resolution	0.1%
Accuracy	±3% (10~90%), ±5% (others)
<b>Dew Point</b>	
Range	-13.3~60.0°C (8~140°F)
Resolution	0.1°C/0.1°F
<b>Wet Bulb</b>	
Range	-73.4~60.0°C (-100~140°F)
Resolution	0.1°C/0.1°F
<b>Warm Up</b>	
	30 seconds
<b>Operating</b>	
	0~50°C, 0~95%RH (avoid condensation)
<b>Storage</b>	
	-20~60°C, 0~99%RH (avoid condensation)
<b>Power</b>	
	4pcs AA Alkaline Batteries, AC Adapter
<b>Battery Life</b>	
	24 hours (Alkaline)
<b>Dimensions/Weight</b>	
	8½" x 3" x 2½" (210 x 75 x 65mm), 10oz (280g)

## Optional Accessories

840027	AC Adapter
840052	Data Acquisition Software
840054	USB Cable
840090	Water Resistant Instrument Pouch
860019	33% calibration salt solution
860020	75% calibration salt solution

Sper Scientific warrants this product against defects in materials and workmanship for a period of **five (5) years** from the date of purchase, and agrees to repair or replace any defective unit without charge. If your model has since been discontinued, an equivalent Sper Scientific product will be substituted if available. This warranty does not cover probes, batteries, battery leakage, or damage resulting from accident, tampering, misuse, or abuse of the product. Opening the meter to expose its electronics will void the warranty. To obtain warranty service, ship the unit postage prepaid to:

**SPER SCIENTIFIC LTD**  
7720 E Redfield Rd, Suite 7  
Scottsdale, AZ 85260  
[WWW.SPERSCIENTIFIC.COM](http://WWW.SPERSCIENTIFIC.COM)  
[INFO@SPERSCIENTIFIC.COM](mailto:INFO@SPERSCIENTIFIC.COM)

The defective unit must be accompanied by a description of the problem and your return address. Register your product online or return your warranty card within 10 days of purchase.

