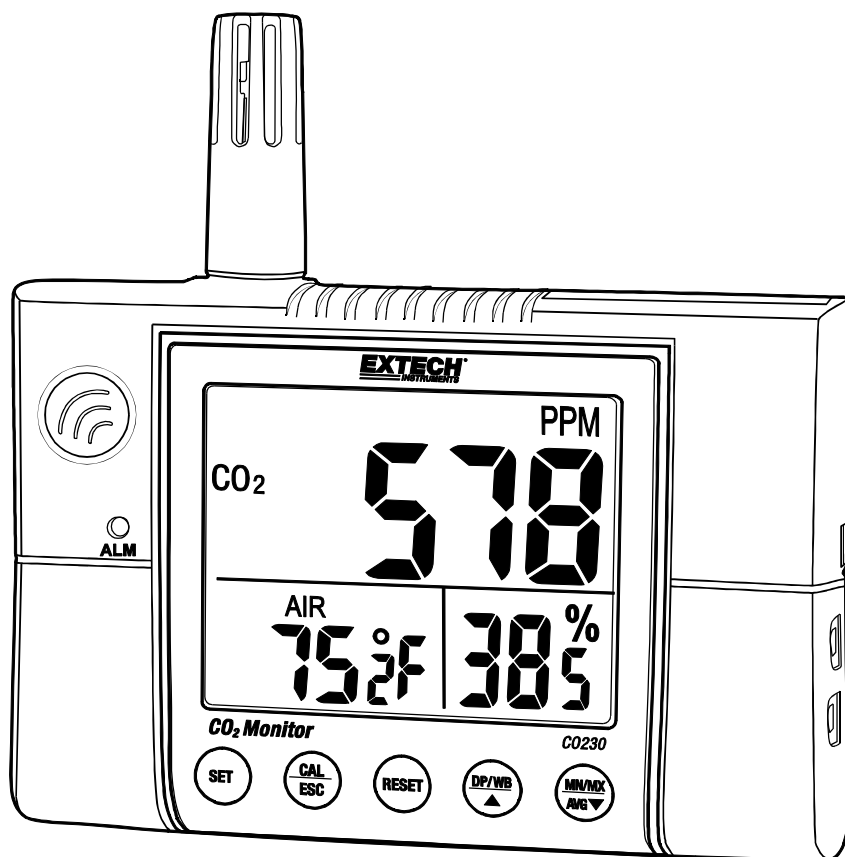


# Wall-Mount CO<sub>2</sub> Monitor

## Model CO230



# ***Introduction***

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Thank you for selecting the Model CO230 Carbon Dioxide Monitor. This meter measures CO<sub>2</sub> concentration, air temperature, dew point, wet bulb temperature and relative humidity.

The audio-visual alarm and alarm relay output make this is an ideal instrument for indoor air quality (IAQ) diagnostics. Carbon dioxide (CO<sub>2</sub>) is a gaseous component of the earth's atmosphere. The concentration of CO<sub>2</sub> in natural ambient air is approximately 0.04% or 400ppm.

The NDIR (non-dispersive infrared) sensor provides stable, long term monitoring.

This meter is shipped fully tested and calibrated and, with proper use, will provide years of reliable service. Please visit our website ([www.extech.com](http://www.extech.com)) to check for the latest version of this User Guide, Product Updates, and Customer Support.

## **FEATURES**

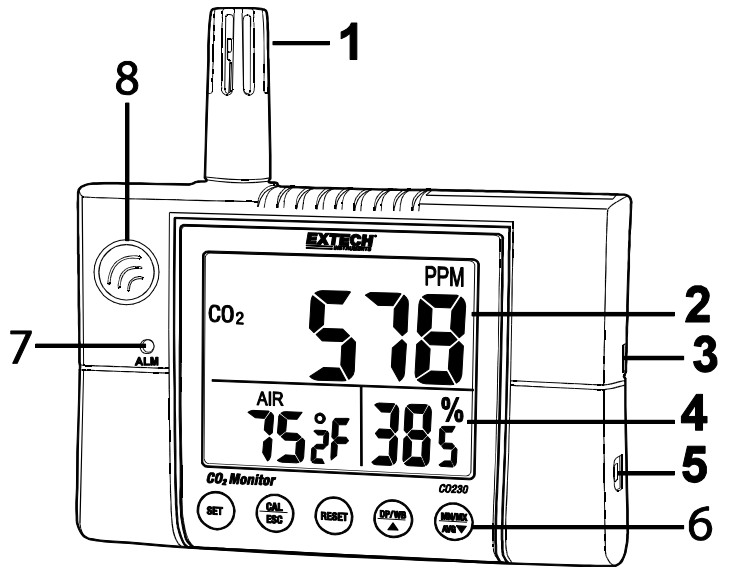
- LCD simultaneously displays CO<sub>2</sub> Level, Relative Humidity, and Temperature (air, dew point, or wet bulb)
- Stable NDIR sensor for CO<sub>2</sub> detection
- Weighted averaging: TWA (8 hours) & STEL (15 minutes)
- Automatic Baseline Calibration (ABC). Can be disabled for use in areas with continuously elevated CO<sub>2</sub> levels (>400ppm)
- Manual CO<sub>2</sub> calibration
- Audio-visual CO<sub>2</sub> concentration warning alarm
- Dew Point and Wet Bulb temperature calculations
- Relay output for connecting external indicators or controllers

# Descriptions

## Meter Description

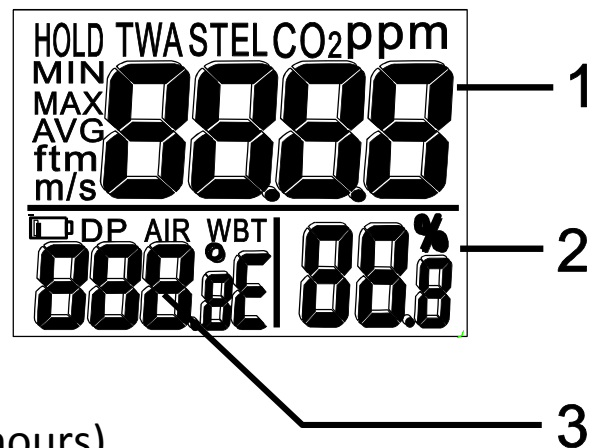
1. Temperature/RH sensor
2. Main Display
3. Alarm Relay Output
4. Aux. Displays
5. 12V AC Adaptor jack
6. Keypad
7. Alarm alert lamp
8. CO<sub>2</sub> sensor

Note: Wall mount hole and relay wiring screws are located on the back



## Display Description

1. CO<sub>2</sub> concentration (ppm)
2. Relative Humidity (%)
3. Air Temperature, Dew Point or Wet Bulb Temperature (°C / °F)



## Display Icons

TWA	Time weighted average (8 hours)
STEL	Short-term exposure limit (15-min. weighted average)
HOLD	Holds reading on display
MIN/MAX	Minimum/Maximum readings
DP	Dew point temperature
AIR	Air temperature
WBT	Wet bulb temperature
%	Relative Humidity measurement unit
°E (C/F)	Temperature units (Celsius/Fahrenheit)

## Keypad Description

<b>SET</b>	Meter ON/OFF power Setup mode Save settings
<b>CAL/ESC</b>	CO <sub>2</sub> calibration with ▲/DP WB RH calibration with MXN/AVG/▼ Exit setup mode
<b>RESET</b>	Reset the meter and clear MAX/MIN readings Terminate Calibration
<b>▲/DP WB</b>	Selects AIR, DP, or WBT temperature display Selects units or increases value in calibration and setup
<b>MXN/AVG/▼</b>	Activates MIN, MAX, STEL, TWA functions Select mode or decrease value in calibration and setup

## Operation

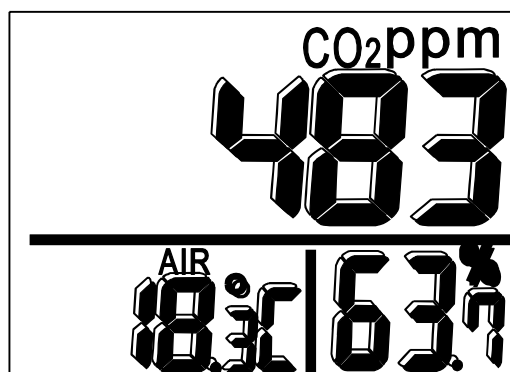
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### POWER ON/OFF

The meter is powered by a 12VDC adaptor.

Power the unit by plugging the AC adaptor into the meter and into an AC source. The meter will switch ON with a short beep.

The LCD will perform a 30 second countdown and then displays the current CO<sub>2</sub> concentration, air temperature, and relative humidity.



## TAKING MEASUREMENTS

The meter starts to measure when powered on and readings update every second. If the operating environment changes (from high to low temperature, for example) the meter requires 30 seconds for the CO<sub>2</sub> sensor and 30 minutes for the RH sensor to stabilize.

**NOTE:** Do not obstruct the sensors or hold the meter close to the mouth or any source of CO<sub>2</sub> when measuring.

### AIR, DP and WBT Temperature

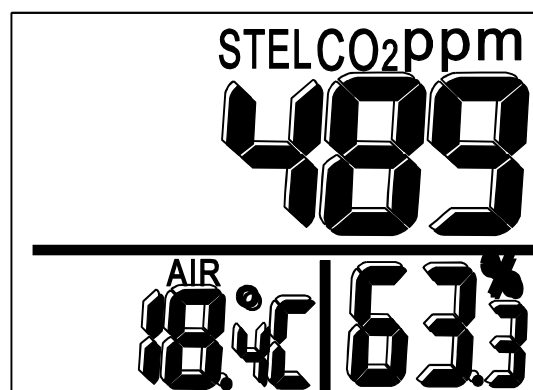
Use the **DP/WBT** button to step through **AIR** (air temperature), **DP** (dew point temperature) and **WBT** (wet bulb temperature) shown on the lower left display.

### MIN, MAX, STEL, TWA MODES

In the normal mode, use the **Max/AVG** button to see the minimum, maximum, and weighted average readings. Use the **Max/AVG** button to step through **MIN**, **MAX**, **STEL**, and **TWA** modes in sequence and then back to the normal mode.

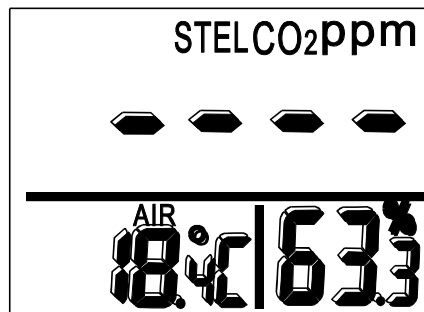
In MIN and MAX modes, the meter shows the minimum and maximum readings of CO<sub>2</sub> (main display), AIR, DP or WB temperatures (lower left display) and Humidity (lower right display).

In STEL and TWA modes, the main display shows the weighted average of CO<sub>2</sub> readings for the prior 15 minutes (STEL) or 8 hours (TWA). The lower display shows the current AIR, DP/WB temperature and humidity.



## NOTES:

1. If the meter has been powered on for less than 15 minutes, the STEL value will be the weighted average of readings taken since power on. The TWA mode will display a weighted average of the readings taken during the prior 8 hours of operation.
2. The CO230 requires at least 5 minutes to calculate STEL and TWA values. The display shows “----” during this time.



## ALARM OVERVIEW

Audio-visual alarms give warnings when CO<sub>2</sub> concentration exceeds the high limit. The meter beeps (~80dB) and flashes the LED when the CO<sub>2</sub> level exceeds the high limit. The beeper stops when any key is pressed or if the reading falls below the low setpoint limit.

Press and hold SET to stop the beeper. The LED lamp will continue to flash when the beeper is manually shut off if there is still an alarm condition. The LED will stop flashing when readings return to normal.

## ALARM RELAY OUTPUT

The meter includes an internal reed relay that can be connected to an external device (not supplied). When the CO<sub>2</sub> readings exceed the high limit, the relay closes. When the CO<sub>2</sub> readings fall below the low limit, the relay will open. This relay can be used to switch in an external device. The meter can be connected to a device to control such things as alert signs/beepers or ventilation systems for conditioning the air quality.

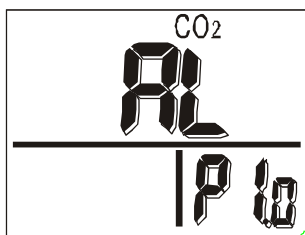
## SETUP MODE (for Alarm limits and Temperature units)

In normal mode, press and hold **SET** to enter the setup mode. To exit the setup mode, press **CAL/ESC** when P1.0, P3.0, or P4.0 is displayed.

### P1.0 CO2 ALARM Upper and lower limit

When setup mode is accessed, P1.0 and “AL” are displayed.

Press **SET** to scroll to P1.1 to set the CO<sub>2</sub> upper limit. The current CO<sub>2</sub> set value will be blinking.

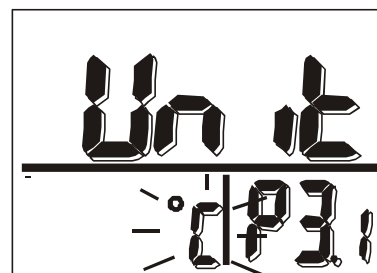
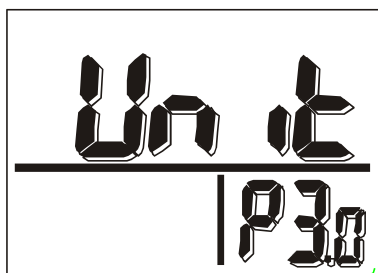


Use the arrow **▲ ▼** buttons to adjust the value. Each button-press adjusts by 100 ppm (100~9900ppm). When the desired value is set, press **SET** to enter P1.2 to set the lower limit (using the same method as for the high limit). When finished, press **SET** to save or **CAL/ESC** to exit without saving and return to P1.0.

### P3.0 TEMPERATURE UNITS (C/F)

Use the **▲/DP WB** button from the P1.0 display to access P3.0.

Press **SET** to enter P3.1 for setting the temperature units. The currently selected unit (°C / °F) will be blinking in the lower display. To switch units press **▲/DP WB** or **MXN/AVG/▼**. Press **SET** to save the setting or press **CAL/ESC** to exit without saving and return to P3.0.



## **P4.0 AUTOMATIC BASELINE CALIBRATION (ABC) ON/OFF**

ABC (Automatic Baseline Calibration) is used to implement a baseline CO<sub>2</sub> calibration to eliminate the zero drift of the sensor. See the next section (Calibration) for instructions on performing the calibration. The ABC function defaults to the ON state. To disable this feature: press **▲/DP WB** while in P3.0 mode (or **MXN/AVG/▼** when in P1.0 mode) to access the P4.0 settings. Press **SET** to enter P4.1. The screen will flash “en” in the lower display. To disable the ABC function press **▲/DP WB** or **MXN/AVG/▼** until “dis” is displayed on the LCD. Press **SET** to save the settings or **CAL/ESC** to exit without saving and return to P4.0.

## ***Calibration***

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

The meter is factory calibrated to a 400ppm CO<sub>2</sub> standard concentration.

**NOTE:** The meter should be returned to Extech for calibration once per year or whenever the accuracy of the meter is in question.

**CAUTION:** Do not calibrate the meter in an atmosphere of unknown CO<sub>2</sub> concentration.

There are 2 options for calibration; Automatic Baseline Calibration and Manual Calibration; see below

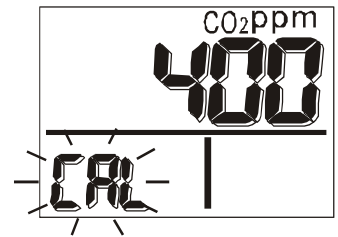
### **AUTOMATIC CO<sub>2</sub> BASELINE CALIBRATION (ABC)**

Automatic Baseline Calibration (ABC) will calibrate the meter at the minimum CO<sub>2</sub> reading detected during 7 days of continuous monitoring. The ABC default is ON. To disable the ABC function, please refer to the P4.0 Setup mode section above. Perform the calibration in a well ventilated area with a CO<sub>2</sub> level near 400ppm.



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

**Recommendation:** The manual calibration should be performed by a qualified laboratory every 12 months.



1. Place the meter in the 400ppm calibration chamber. Turn the meter on and hold down the **CAL/ESC** and **▲/DP WB** buttons simultaneously to enter CO<sub>2</sub> calibration mode. 400ppm and “CAL” will blink on the LCD.
2. Wait approximately 5 minutes until the blinking stops. The calibration is then complete and the meter will automatically return to the normal mode.
3. To abort the calibration at any time, press **RESET**.

## RH CALIBRATION

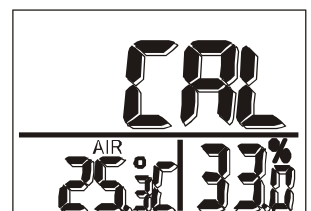
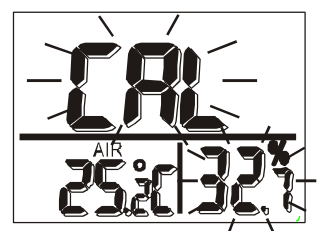
The meter is calibrated to standard 33% and 75% salt solutions.

To abort calibration press and hold the **RESET** button for > 1 second.

**CAUTION:** Do not calibrate the humidity without standard calibration salt bottles. Otherwise, the meter will have to be returned for specialized calibration service. Contact Extech for calibration salts or calibration service.

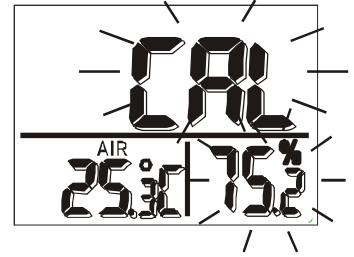
### 33% calibration

1. Plug the sensor into the 33% salt bottle.
2. Press and hold **CAL/ESC** and **MXN/AVG/▼** to enter the 33% calibration. “CAL” and the calibration value (32.7%, if at 25°C) will blink on the LCD with the current temperature shown on the left.
3. The meter is now calibrating and will finish in approximately 60 minutes (when “CAL” and the humidity reading are no longer blinking).



## 75% calibration

1. After the 33% calibration, plug the sensor into the 75% salt bottle.
2. Press **SET** to enter the 75% calibration.
3. "CAL" and the calibration value (75.2%, if at 25°C) will blink on the LCD with the current temperature shown on the left side of the display.
4. The meter is now calibrating and will finish in approximately 60 minutes (blinking stops). The meter will automatically return to the normal mode.



**NOTE:** Single point calibrations can also be performed. To calibrate 33% only, press **CAL/ESC** and stop after the 33% calibration is completed. To calibrate 75% only, press **▲/DP WB** or **MXN/AVG/▼** within 5 minutes of initializing the 33% calibration.

## Specifications

Function	Range	Resolution	Accuracy
CO <sub>2</sub>	0~2000ppm	1ppm	±(5%rdg + 50ppm)
	2001~9999ppm	1ppm	Not specified
	Pressure dependent: ±1.6% reading per kPa deviation from normal pressure (100kPa)		
Temperature	-10~60°C 14~140°F	0.1°	±0.6°C (0.9°F)
Humidity	0.0~99.9%	0.1%	±3% (10 to 90%) ±5% (< 10 or > 90%)
Wet Bulb	-5 to 60°C 23 to 140°F	0.1°	Calculated from RH and Temperature
Dew Point	-20 to 60°C -4 to 140°F	0.1°	

<b>Display</b>	Backlit LCD with three display windows
<b>Sensors</b>	CO <sub>2</sub> : NDIR (non-dispersive infrared) type Humidity: Capacitance type Temperature (air): Thermistor
<b>Alarm relay</b>	30VDC/1A (125VAC/0.5A) Form C Reed relay 30W (DC) 62.5VA (AC) max. Switching power
<b>Warm-up Time</b>	30 seconds
<b>Operating Conditions</b>	0 to 50°C (32 to 122°F); < 95% RH non-condensing
<b>Storage Conditions</b>	-20 to 60°C (-4 to 140°F); <99% RH non-condensing
<b>Power Supply</b>	12VDC, 1.0A adaptor (100-240VAC 50/60Hz)

# ***Maintenance***

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## **CLEANING AND STORAGE**

1. The meter should be cleaned with a damp cloth and mild detergent when necessary. Do not use solvents or abrasives.
2. Store the meter in an area with moderate temperature and humidity (see specifications section above).

## **TROUBLESHOOTING**

### **No Power**

Check that the AC adaptor is properly connected.

### **Slow response**

Ensure that air flow channels on the back of meter are not blocked.

### **Error messages**

E01: CO<sub>2</sub> sensor damage

E02: Under-range measurement

E03: Over-range measurement

E04: Humidity, Dew Point, or Wet Bulb error

E07: Low voltage; check that the AC adaptor output is 12V.

E11: Calibration error; retry the humidity calibration

E17: Calibration error; retry the CO<sub>2</sub> calibration

E31: Temperature sensor damage

E34: Humidity sensor damage

# ***CO<sub>2</sub> Levels and Guidelines***

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## **Reference levels (for general purpose only)**

- 250~350 ppm: Background (normal) outdoor air level
- 350~1,000 ppm: Typical level for occupied spaces with good air exchange.
- 1,000~2,000 ppm: Level associated with complaints of drowsiness and poor air.
- 2,000~5,000 ppm: Level associated with headaches, sleepiness, and stagnant, stale, stuffy air. Poor concentration, loss of attention, increased heart rate and slight nausea may also be present.
- >5,000 ppm: Exposure may lead to serious oxygen deprivation resulting in permanent brain damage, coma, and death.

## **Regulatory exposure limits**

- ASHRAE Standard 62-1989: 1000ppm: CO<sub>2</sub> concentration in occupied building should not exceed 1000ppm.
- OSHA: 5000ppm: Time weighted average over five 8-hour work days should not exceed 5000ppm.
- Building bulletin 101 (Bb101): 1500ppm. UK standards for schools specify that CO<sub>2</sub>, averaged over one school day (i.e. 9:00am to 3:30pm), should not exceed 1500ppm.
- Germany, Japan, Australia, UK...: 5000ppm (8-hour weighted average occupational exposure limit is 5000ppm).

**Note:** The information provided in this section is intended for general reference purposes only. It is the responsibility of the end user to obtain current information for the specific location where this device is to be used and to interpret the meter readings accordingly.

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