

Indoor PM2.5 / PM10 / CO₂ / Temperature / Humidity 5-In-1 Detection Sensor

Model: WH45

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1. Introduction

Thanks for your purchasing of this integrated multifunction indoor air quality monitoring sensor. It measures PM2.5 / PM10 / CO2 / Temperature / Humidity. To ensure the best product performance, please read this manual and retain it for future reference.

Help

Our product is continuously changing and improving, particularly online services and associated applications. To download the latest manual and additional help, please contact us at support@ecowitt.com or support.eu@ecowitt.net (EU/UK).

2. Unpacking

Open your box and inspect that the contents are intact (nothing broken) and complete (nothing missing). Inside you should find the following:

QTY	Item Description
1	Particle Detection Sensor (PM2.5 / PM10 //CO2 / Temperature / Humidity 5-In-1)
1	USB Cable
1	User Manual

Table: Package content

If any component is missing from the package, or broken, please contact our Customer Service department to resolve the issue.

3. Features

Particle Detection Sensor

- Measures indoor PM2.5, PM10, CO₂ concentration, Temperature and Humidity every 60 seconds when powered with USB or detecting every 10 minutes when powered with batteries only
- USB power connection for indoor use only
- CO₂ value calibration function available on the device
- PM2.5 value Calibration function available when paired with GW1000/GW1100/HP2551/HP3500 /HP3501
- Long wireless range, up to 300 feet (100 meters) in open areas

When paired with a GW1000/GW1100 Wi-Fi Gateway:

- Monitor live sensor data on the Live Data page of the WS View app (requires the gateway and your phone using the same Wi-Fi network)
- Displays current PM2.5 / PM10 concentration/AQI and 24H AQI and air quality level index on the Live Data page of the WS View app
- Displays current CO₂ concentration and 24H average CO₂ concentration on the Live Data page of the WS View app
- Displays temperature and humidity data where the sensor located
- Calibration function available for PM2.5 value

When paired with a Weather Station Console (HP2551/HP3500/HP3501):

- The PM2.5, PM10 and CO₂ data automatically scrolls displaying on the screen every 5 seconds

- Calibration function available for PM2.5 value

When uploaded to Ecowitt Weather Server:

- View current sensor data & history records & graph on the website
- Set and receive email alerts from the server when alarm condition set under your account.
- Remote monitoring with smart phone, laptop, or computer by visiting the website

Note: On the 48-hour self-test which takes place with maximum fan rotation and is therefore clearly perceptible. You can set the commissioning start time by removing the batteries and the USB connection to a point in time where the necessary fan noise does not interfere.

4. Sensor Set Up

1. Remove the battery door on the base of the air quality sensor as shown in Figure 1

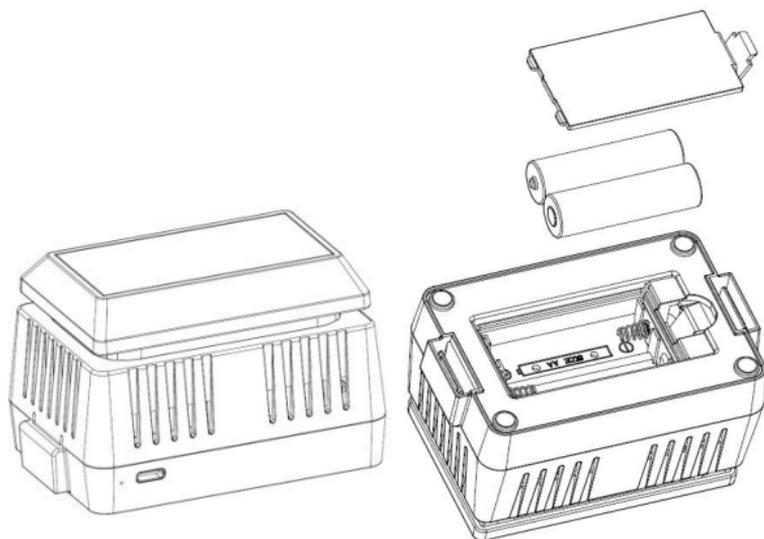


Figure 1

No	Description	No	Description
1	Red LED Indicator (RF transmission)	3	Battery Compartment Cover
2	AC Adapter USB Power Port	4	Battery Compartment

2. Insert two AA batteries and close the battery door.

Note: The batteries (not included) are mainly for backup purpose.

3. Connect the USB cable between the sensor and an AC adapter(not included).

Note: After inserting the batteries or connecting AC power, the sensor LED indicator will light for 3 seconds – flash once after 20s, and then flash once per 1 minute thereafter (10 minutes if only powered by batteries). Each time it flashes, the sensor is transmitting data.

5. Sensor Installation

Before install the sensor into its permanent location, you may go to Section 6 to configure with the gateway first. Once the sensor has been confirmed working correctly, then you can go back here.

Place the sensor on a horizontally surface. Note that the vents must be clear of any obstructions, and we recommend placement away from other electronic devices to prevent interference. Do not place on a metal table to prevent RF signal loss.

Note: This sensor is designed for indoor use only.

Wireless communication is susceptible to interference, distance, walls and metal barriers. We recommend the following best practices for trouble free wireless communication.

1. Electro-Magnetic Interference (EMI). Keep the console several feet away from computer monitors and TVs.

2. Radio Frequency Interference (RFI). If you have other devices using the same RF frequency and communication is intermittent, try turning off these other devices for troubleshooting purposes. You may need to relocate the transmitters or receivers to avoid intermittent communication.

3. Line of Sight Rating. This device is rated at 300feet line of sight (no interference, barriers or walls) but typically you will get 100feet maximum under most real-world installations, which include passing through barriers or walls.

4. Metal Barriers. Radio frequency will not pass through metal barriers such as aluminum siding. If you have metal siding, align the remote and console through a window to get a clear line of sight.

6. Wi-Fi Configure with gateway

This Particle Detection Sensor doesn't have a display function and you need to view the data on weather server <https://www.ecowitt.net> or WS View App after pairing this device with our GW1000/GW1100 Wi-Fi Gateway or HP2551/HP3500/HP3501/WH0295 console (all sold separately).

6.1 Pair with Gateway

If GW1000/GW1100 has been in operation, and you have never had any WH45 sensor setup before, just power up the sensor and GW1000/GW1100 will pick sensor data automatically.

If a WH45 sensor has been hooked on GW1000/GW1100 before, and you have a new sensor to replace the old one, just power off the old sensor and power on the new sensor, open the APP: WS View, tap the device and go to sensor ID page, locate the WH45 sensor, select "Register", then the gateway will erase the previous registered sensor and have the new sensor paired.

6.2 Wi-Fi Connection for the Gateway

For this part, please refer to the manual of the GW1000/GW1100 Wi-Fi gateway.

Any question, please contact the customer service.

7. View Online Data on the web page (IP address: 192.168.4.1) or WS View

When the Wi-Fi configuration is done, you can view the live data of your sensor on the web page (IP address: 192.168.4.1) or WS View application.

Device List		Live Data		More	
GW1000B-WIFI38B4					
Indoor Temperature			Indoor Humidity		
30.1 °C			71 %		
Absolute Pressure			Relative Pressure		
992.3 hPa			992.3 hPa		
CO2 (bc)					
Temperature			Humidity		
32.5 °C			63 %		
PM2.5	Real-time AQI	24H AQI			
1.6 ug/m ³	7 Good	21 Good			
PM10	Real-time AQI	24H AQI			
2.3 ug/m ³	2 Good	6 Good			
CO2			24H CO2		
463 ppm			507 ppm		
GW1000B_V1.6.3					

Figure 2

Note:

The WH45 sensor data can be only viewed on the Live Data interface since it doesn't support uploads to weather underground.

If you choose to upload the data to our weather server: <https://www.ecowitt.net>, you can view the live data/history graph and download the records on the website. You can add a shortcut of the website on the home screen of your phone for quick access.

8. Appendix

8.1 Air Quality Index (AQI) Reference

This section provides the concentration breakpoints for PM2.5 and PM10 particles. These standards are used to calculate the Air Quality Index (AQI) shown on your device.

AQI Index	Category	PM2.5 (μ g/m ³)	PM10 (μ g/m ³)	Health Implications
0 - 50	Good	0 - 35	0 - 50	Air quality is satisfactory; no health risk ³ .
51 - 100	Moderate	35.1 - 75	51 - 150	Acceptable quality; sensitive individuals should limit exertion ⁴ .
101 - 150	Lightly Polluted	75.1 - 115	151 - 250	Slight irritation may occur; sensitive groups should stay indoors ⁵ .
151 - 200	Moderately Polluted	115.1 - 150	251 - 350	Health effects likely for the public; avoid long outdoor

AQI Index	Category	PM2.5 (μg/m³)	PM10 (μg/m³)	Health Implications
				exposure ⁶ .
201 - 300	Heavily Polluted	150.1 - 250	351 - 420	High health risk; heart/lung patients should remain indoors ⁷ .
> 300	Severely Polluted	> 250	> 420	Emergency conditions; everyone should avoid outdoor activity ⁸ .

8.2 Carbon Dioxide(CO₂) Guidelines

Carbon Dioxide Levels and potential health problems are indicated below:

- 250-350 ppm: background (normal) outdoor air level
- 350-1,000 ppm: typical level found in 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: This indicates unusual air conditions where high levels of other gases also could be present. Toxicity or oxygen deprivation could occur. This is the permissible exposure limit for daily workplace exposures.
- >40,000 ppm: This level is immediately harmful due to oxygen deprivation.

Reference link:

<https://ohsonline.com/Articles/2016/04/01/Carbon-Dioxide-Detection-and-Indoor-Air-Quality-Control.aspx?Page=2>

8. Sensor Calibration

CO₂: There is an easy way to find the CO₂ sensor is drifted or not: put the sensor in outdoor open air locations, away from any combustion exhausts, wait for 30 minutes, you should see the CO₂ reading is 420ppm +/-10. If it is far from this reading, you can wait for some more time, and test it during night to confirm. Once it is confirmed, you can open the back housing, and use a clipper pin to press the Calibrate button as below figure shows, leave it for 30s, and the reading will be shifted back to 420ppm.

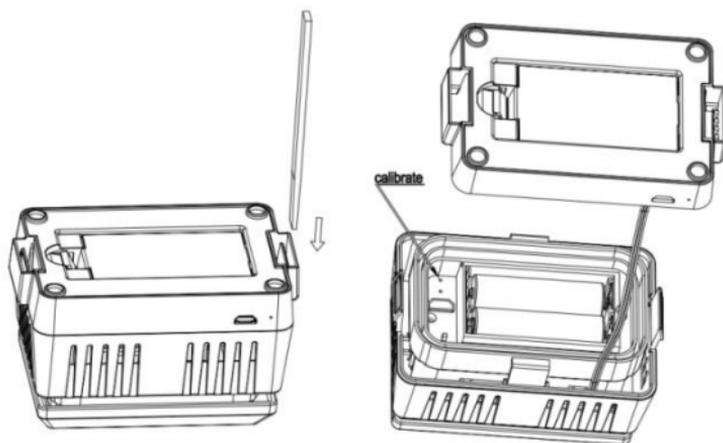


Figure 3

Note:

If you have a reliable source to calibrate the CO2 data, you may calibrate the offset on the web page (IP address: 192.168.4.1) or the WS View app (for GW1000/GW1100/WN1900 only), or the HP2551/HP3500/HP3501 console. If the deviation is large, it's recommended to place the sensor in an outdoor ventilated place for 30 minutes before calibrating.

PM2.5: It is not possible to calibrate on the sensor side, and you can calibrate through the web page (IP address: 192.168.4.1) or WS View App when paired with GW1000/GW1100 or on the console when paired with HP2551/HP3500/HP3501, which saves the offset value on the gateway side before sending data to www.ecowitt.net server. However if PM2.5 data is persistently low, it can be that there is a spider net going inside the sensor. So please clean the sensor from time to time to see if there is any sign of spider penetration.

Note: If the battery level is lower than 4 bars, calibration is prohibited. When the led light on the sensor is steady for 3 seconds, it indicates that calibration is prohibited.

9. Specification

Model	WH45
Name	CO ₂ and PM2.5 haze sensor
Dimensions	106×68×67(mm)
Weight	(g)
Material of Plastic Casing	ABS
Mass concentration range	0 ug/m ³ to 1000 ug/m ³
Mass concentration precision for PM2.5	± 【10ug/m³】 (0 ug/m ³ to 100 ug/m ³) ± 10 % (100 ug/m ³ to 1000 ug/m ³)

Mass concentration precision for PM10	$\pm 25 \text{ ug/m}^3$ (0 ug/m^3 to 100 ug/m^3) $\pm 25 \%$ (100 ug/m^3 to 1000 ug/m^3)
Mass concentration resolution	1 ug/m^3
CO ₂ measuring range	400 to 10000 ppm
CO ₂ measurement accuracy	\pm (30 ppm + 3% of reading)
CO ₂ Accuracy drift per year	\pm (5ppm + 5% of reading)
CO ₂ measurement resolution	1 ppm
Temperature Metering Range	-40° C to 60° C (-40° F to 140° F)

Temperature Accuracy	Metering	$\pm 1^{\circ} \text{ C}$ (33.8° F) when 15° C to 35° C (59° F to 95° F) $\pm 1.5^{\circ} \text{ C}$ (2.7° F) when -10° C to 60° C (14° F to 140° F)
Temperature Resolution	Metering	0.1° C (0.1° F)
Humidity Metering Range		1%RH to 99%RH
Humidity Metering Accuracy		$\pm 6\% \text{RH}$ when 15° C to 35° C (59° F to 95° F) $\pm 9\% \text{RH}$ when -10° C to 60° C (14° F to 140° F)
Humidity Metering Resolution		1%RH
Humidity Accuracy drift per year		$< 0.25\% \text{RH}$

Automatic cleanup interval	2 days
Reading Update Interval	About 1 minute
RF Connection Frequency	920/915/868/433MHz (depending on local regulations)
RF Wireless Range	Over 100 meters (in open areas)
Operating Temperature Range	0° C to 50° C(32°F to 122°F)
Power Supply	2*1.5AA or USB 5V
Battery Life	2 days

Note:

This device is mainly used to detect the particle concentration in air. The accuracy for temperature and humidity reading may vary due to different environment:

When the sensor is placed at unventilated environment, the temperature reading may be 2 degrees higher in worst case.

When the sensor is placed at ventilated environment, the temperature and humidity reading may be lower than the actual reading.

10. Warranty Information

We disclaim any responsibility for any technical error or printing error, or the consequences thereof.

All trademarks and patents are recognized.

We provide a 1-year limited warranty on this product against manufacturing defects, or defects in materials and workmanship.

This limited warranty begins on the original date of purchase, is valid only on products purchased, and only to the original purchaser of this product. To receive warranty service, the purchaser must contact us for problem determination and service procedures.

This limited warranty covers only actual defects within the product itself and does not cover the cost of installation or removal from a fixed installation, normal set-up or adjustments, or claims based on misrepresentation by the seller, or performance variations resulting from installation-related circumstances.