# Wireless Indoor Air Quality Monitoring

## WFA930Z Technical Sheet

## General Description

Traditional carbon dioxide sensors do not respond to changes in air quality caused by odors, cigarette smoke, mold and many other airborne pollutants generated in our daily indoor activities.

This chart shows common sources of indoor pollutants.

| *VOC Concentrations Corresponding to 0-2,000 ppm $CO_2$* | | |
|---|---|---|
| *Compound* | *Formula* | *Source* |
| Carbon monoxide | CO | Car exhaust, fuel-based heating, cooking appliance, smoking |
| Methane | $CH_4$ | Natural gas |
| Propane | $C_3H_8$ | Fuel-based heating, cooking appliances, cleaners |
| Ethyl alcohol | $C_2H_6O$ | Cosmetics, cleaners, disinfectants, detergents, paints, coatings, breath |
| Acetaldehyde | $C_2H_4O$ | Adhesives, coatings, plastics, lubricants, ripening of fruits |
| Methylethylketone | $C_4H_8O$ | Adhesives, coatings, plastics, lubricants |
| Toluene | $C_7H_8$ | Paints, coatings, cleaners, detergents, smoking, polyurethane lacquers |

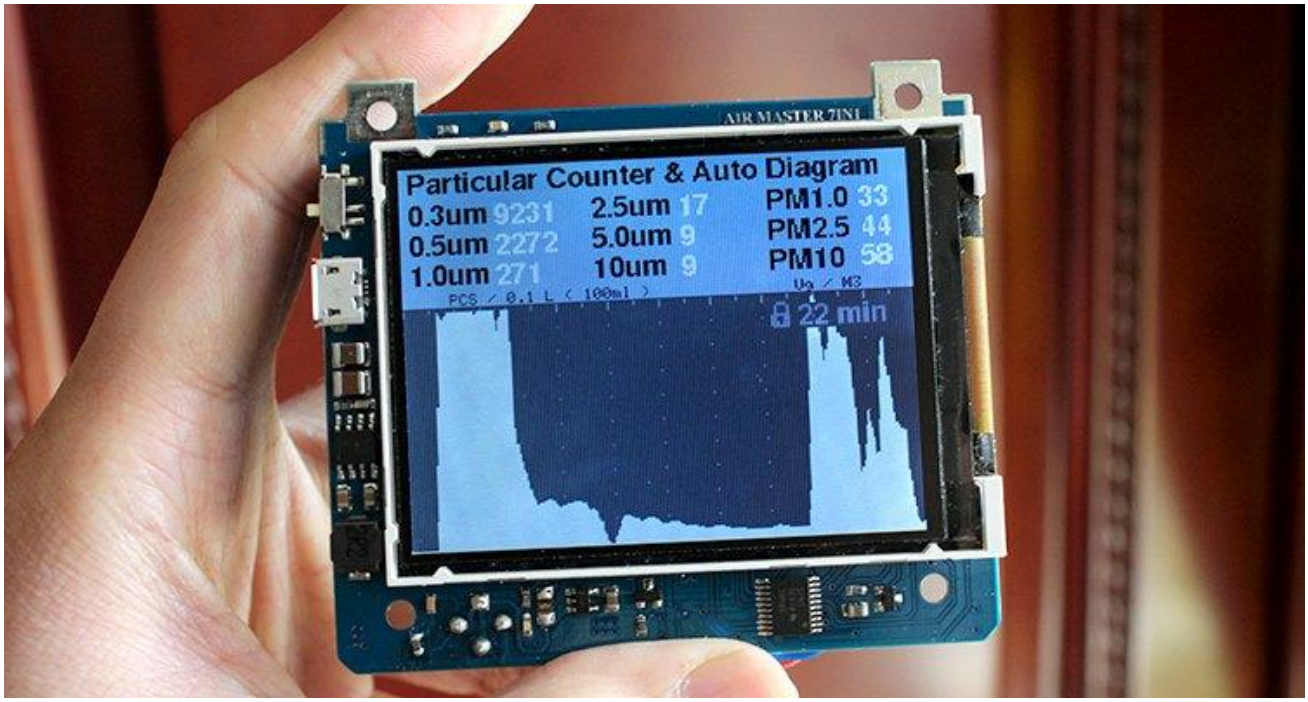
WFA930Z is a room type electronic indoor air quality monitor on mulitple parameters which can work standing alone, or going with wireless connectivity to a system as part of a sensor grid for real time spatial enviornmental monitoring, control and data analysis.

The monitor is designed for ease of installation and versatility in use. It can either be wall-mounted or stand on desk top application. It has built-in rechargeable battery for hours of portable site-wise measurement.

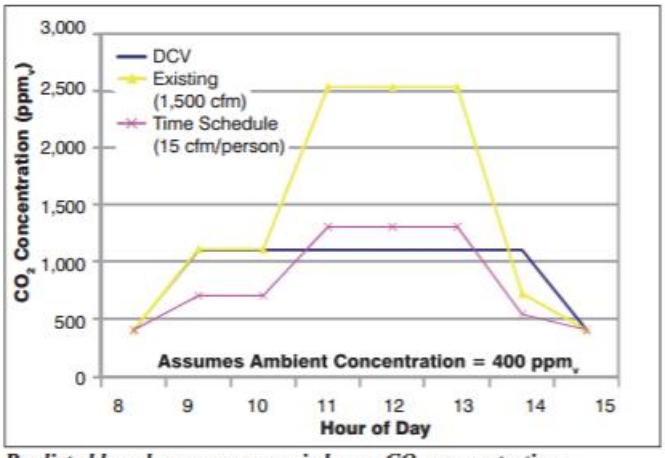


Woofaa Company Limited 鏸發有限公司
Unit 1006, 10/F, Kingsford Industrial Centre, 13 Wang Hoi Road, Kowloon Bay, Hong Kong
香港九龍灣宏開道13號景發工業中心1006室
Tel: +852 2649 4000 Fax: +852 3007 5188 Whatsapp: +852 5993 5280
Website: www.woofaa.com Email: hotline@woofaa.com

WFA930Z has optional local color LCD display for real time measure figures and up to 24-hour charting capacity in standalone mode. It is capable to measure and to display mulitple air quality parameters such as: air temperature, relative humidity, partiuclate matters (PM0.3, PM0.5, PM1, PM2.5, PM5 and PM10 sizes), carbon dioxide, formaldehyde, and composite gaseous volatile organic compounds.




The connected system is capable to facilitate demand-controlled ventilation (ANSI/ASHRAE Standard 62.1 & 90.1) or any other air treatment equipment in both on/off, modulating modes. The control logic management function has the flexibility for matix-type mapping, which means user can map whichever measured parameter(s) to control whichever set of air treatment equipment connected. The scene-and-event control function is to be available for management accessing from both desktop computer or mobile device.




*Predicted hourly average occupied zone $CO_2$ concentration.*

The system is able to provide data exchange function with third party sysetms via RS485 or RJ45 connector in open data formate. All sesnors can be calibrated either electronically or its output figure can be adjusted arithmetically by a K-factor certified by an accredited instrument calibration institute on yearly basis.



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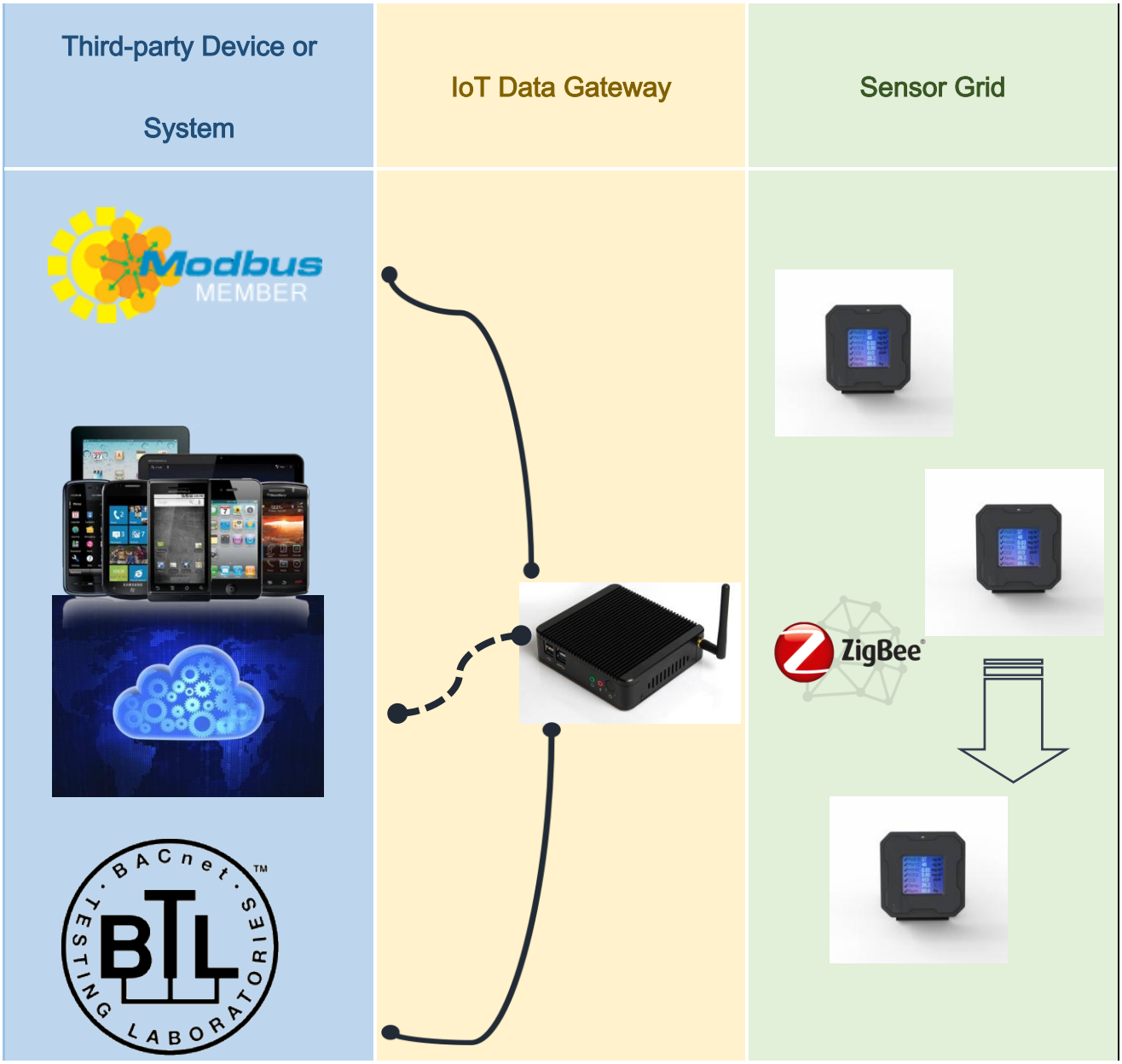
# System Architecture

Unlimited number of WFA930Z can be applied to form a sensor grid in a permises. Sensor data is transmitted to an IoT (internet-of-things) data gateway for upstream connectivity. We have both household and industrial grades data gateway hardware to match with total number of sensors be used in a project, making sure data traffic in both ends are managed efficiently.

**Sensor Grid**: A robust wireless Zigbee mesh topology is used. It is proven to be reliable and fail-safe as every Zigbee device in the mesh network has self-detect-and-heal function over broken data transmission path. **IoT Data Gateway**: Data conversion, adjustment, exchange, and fault management functions are executed here. API port with open data formate is available and can be customized on project basis as per specification. Multiple connectors are availabe: USB, RS485, & RJ45. **Third-party Device or System**: All sensor data are sent to cloud or any local server for data analysis as well as extending the monitoring network with control function over other connected devices.



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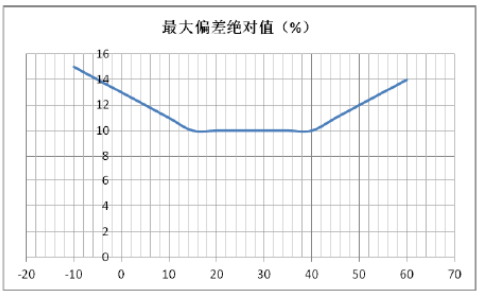
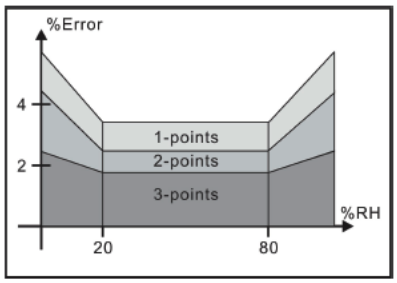
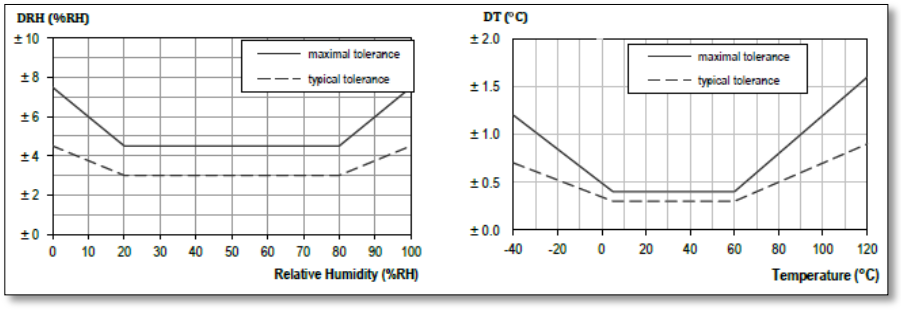
# Sensor Specifications

| Sensor Type | Sensing Method | Range | Response Time (s) | Accuracy | Resolution | Working Conditions | Prdt Life |
|---|---|---|---|---|---|---|---|
| **Particulate Matters (PM2.5, PM10)** | Laser scattering (MIE) | 0-500 ug/m3 | < 10 | ±10% @100-500 ug/m3, ±10 ug/m3 @0-100 ug/m3 | 1 ug/m3 | -10~60°C, 0-99% RH (non-condensing) | > 3 years |
| **HCHO** | Electro-chemical | 0-2 mg/m3 | < 10 | ±5% FS | 0.001 mg/m3 | -10~60°C, 0-99% RH (non-condensing) | > 3 years |
| **VOC (Ethanol, Toluene, NH3, H2S)** | Metal oxide semi-conductor | 0-9.99 mg/m3 | < 30 | ±5% | 0.01 mg/m3 | 10~50°C, 10-90% RH (non-condensing) | > 3 years |
| **Carbon Dioxide** | NDIR | 0-5000 ppm | < 180 | ±50 ppm + 3% reading | 1 ppm | 0-50°C, 0-95% RH (non-condensing) | > 5 years |
| **Air Temp** | Low-K Polymeric Dielectrics | -10~85° C | < 6 | ±0.5°C | 0.1°C | -40~125°C, 0-100% RH (non-condensing) | > 10 years |
| **Relative Humidity** | Low-K Polymeric Dielectrics | 0-100% RH | < 20 | ±3% | 0.1% | -40~125°C, 0-100% RH (non-condensing) | > 3 years |

Sensor tolerance over ambient temperature (Left: Particulate Matter; Right: VOC; Bottom: Relative Humidity & Temp.)



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# Product List

| Type | Code | Description |
|---|---|---|
| **Sensor** | WFA930Z-B | 7-in-1 IAQ Monitor without LCD display |
| **Sensor** | WFA930Z-L | 7-in-1 IAQ Monitor with LCD display |
| **Server** | ZBIOT-P | IoT data gateway for up to 50 Zigbee devices, connecting for cloud-based Big Data* and online sensor calibration functions |
| **Server** | ZBIOT-D | IoT data gateway for up to 500 Zigbee devices, connecting for cloud-based Big Data* and online sensor calibration functions |
| **Server** | ZBDMC | Zigbee device management console for up to 250 devices, with built-in monitoring and control functions, managed via any iOS mobile device, 24-hour historical data |
| **Controller** | ZBDMC-86RRE | 100-240 VAC 10A wall-mounted switch 1-4 gangs |
| **Controller** | ZBDMC-86RDP | 100-240 VAC 10A wall-mounted pulse-width-modulation (PWM) switch 1-2 gangs |
| **Controller** | ZBDMC-86RDV | 100-240 VAC 10A wall-mounted 0-10 VDC modulating switch 1-2 gangs |
| **Controller** | ZBDMC-86SK | 100-240 VAC 10A wall-mounted electric power socket with manual-overriding switch |
| **Controller** | ZBDMC-86ACCSSK | 100-240 VAC 10A wall-mounted electric power socket with manual-overriding switch and infra-red transmitter (for air-side conditioning unit) |
| **Controller** | ZBDMC-86ACCS | 100-240 VAC 10A room-type wall-mounted infra-red transmitter with manual-overriding switch (for air-side conditioning unit) |
| **Controller** | ZBDMC-86RL-485 | Zigbee to RS485 transmitter rail-mounted |
| **Control Module** | ZBDMC-86FMD | 100-240 VAC 500W switch module 1-4 gangs |
| **Control Module** | ZBDMC-86FMDP | Pulse-width-modulation (PWM) module |
| **Control Module** | ZBDMC-86FMDV | 0-10 VDC output module |
| **Control Module** | ZBDMC-86FMD-485 | Zigbee to RS485 output module |
| **Control Module** | ZBDMC-86FMD-FCR | Fan-coil-unit receiving module |
| **Control Module** | ZBDMC-86FMD-FCT | Fan-coil-unit transiting module |

**Big Data cloud function: a comprehensive online service on high volume data management, analytics and visualization*



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# Typical Applications

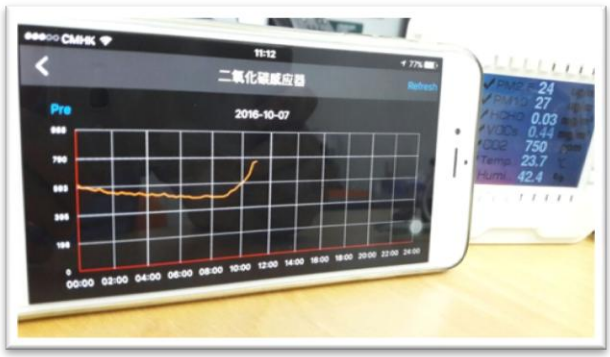
## Standalone Monitoring Device

Bad air affects productivity and arises staff complaint. Installing a few IAQ Monitors in problematic spots can ease staff concern showing them real-timeair quality quantitfied.

*Product to use: XSR930Z*

## Remote Monitoring on Device Groups

If your space is sizable with a number of IAQ monitors installed, you may like to access all data from one single place in a management perspective. We arrange this to be done over your cell phone. Simply adding a Zigbee data gateway (ZBIOT) will do the job. No hardwiring is ever needed. Your can change monitor location to wherever convenient to you in any time. Only with this gateway installed you can view historical data of all air quality measurements, on top of real-time data in standalone mode.

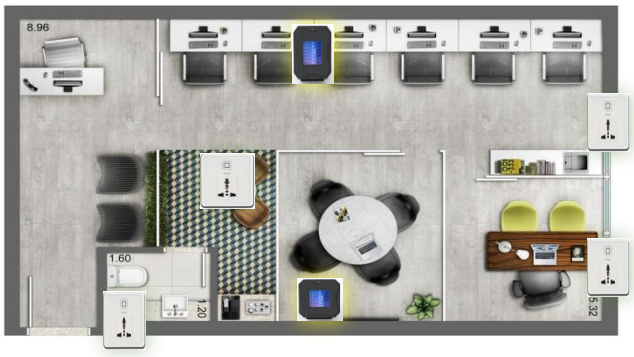



*Products: XSR930Z, ZBDMC (single group, expandable to control function), or ZBIOT (for multiple groups and cloud functions)*

## Monitoring and Control

In an overcrowded meeting room carbon dioxide level shoots sky high within minutes. Who is going to turn-on a fan or something? Likely no one does the job until the boss found most people started losing concentration and some are even falling asleep.

Add the ZBDMC server, all your networked ventilation fan, air purifier and air conditioner will be turn-on automatically, in according to level of pollution occurs. You can set up easily using your cell phone, on which air quality parameter to trigger on what level of air treatment. You will never waste energy turning on a machine for an unoccupied space.



*Products: XSR930Z, ZBDMC (on-site read/write), ZBDMC-86, and ZBIOT (for cloud functions)*



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# System Specifications

## IAQ Monitor

A room type electronic indoor air quality monitor (IAQ monitor) on mulitple parameters is to be supplied in each zone as annotated on drawings and equipment schedule. The IAQ monitor should be able to work standing alone, or going with wireless connectivity to a system as part of a sensor grid for real time spatial enviornmental monitoring, control and data analysis. The IAQ monitor is to be designed for ease of installation and versatility in use. It can either be wall-mounted or stand on desk top application. It has built-in rechargeable battery for hours of portable site-wise measurement.

The device should have optional local color LCD display for real time measure figures and up to 24-hour charting capacity in standalone mode. It is capable to measure and to display mulitple air quality parameters such as and not limited to: air temperature, relative humidity, partiuclate matters (in both PM2.5 and PM10 sizes), carbon dioxide, formaldehyde, and composite gaseous volatile organic compounds.

## Wireless Network IAQ Monitors

IAQ monitors are able to be connected wirelessly forming a sensor grid for a spatial and zonned air quality monitoring. Sensor data is transmitted to a data gateway for upstream connectivity.

The network of IAQ monitors is capable to facilitate demand-controlled ventilation or any other air treatment equipment in both on/off, modulating modes. The control logic management function has the flexibility for matix-type mapping, which means user can map whichever measured parameter(s) to control whichever set of air treatment equipment connected. The scene-and-event control function is to be available for management accessing from both desktop computer or mobile device.

## Data Connectivity

The system is able to provide data exchange function with third party sysetms via RS485 or RJ45 connector in open data formate (non-proprietary data formate).

## Sensor Calibration

All sesnors within a monitor can be calibrated either electronically, or its output figure can be adjusted arithmetically by a K-factor certified by an accredited instrument calibration institute on yearly basis.



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