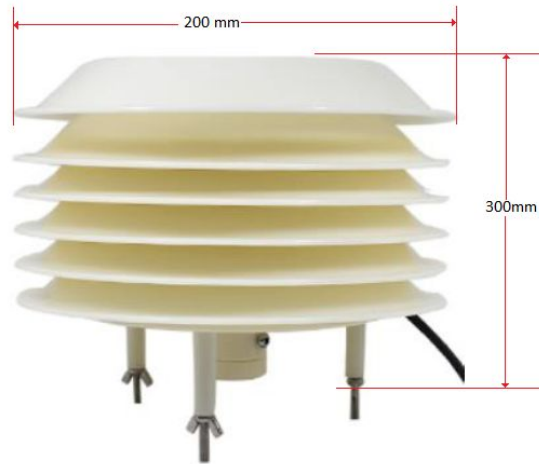


# Air Quality Station 7 in 1

## DIG-AQS-P-12V



### Description

The transmitter is widely used in applications that require air quality monitoring such as agricultural greenhouses and for pollution monitoring in the cities. The input power supply, the sensor probe, and the signal output in the sensor are completely isolated, safe and reliable.

This product uses a high-sensitivity gas detection probe with stable signal and high accuracy. It is 7 in 1 type including the air temperature, PM2.5, PM10, CO, NO2, SO2, O3, could include humidity as an optional. It has the characteristics of wide measurement range, good linearity, convenient use, easy installation, and long transmission distance. It is suitable for indoor and outdoor use, and the shell is IPV65 fully waterproof and can be used in various harsh environments.

Notable features are:

- Wide measurement range
- High precision, fast response.
- No moving parts, less maintenance.
- Built-in heating device to ensure normal work in cold weather.

## Technical Specifications

Measured Variable	Range	Resolution	Accuracy
Temperature	-40 to 80°C	0.1 °C	±0.5 °C
CO	0~50 ppm	0.05 ppm	3% FS
NO2	0~5 ppm	0.05 ppm	2% FS
SO2	0~5ppm	0.1 ppm	3% FS
O3	0~5ppm	0.01 ppm	2% FS
PM2.5	0~500ug/m <sup>3</sup>	1ug/m <sup>3</sup>	10.00%
PM10	0~500ug/m <sup>3</sup>	1ug/m <sup>3</sup>	10.00%
Humidity (optional)	0 to 100%	0.10%	5% FS

## Technical Specifications

Power Supply	10-24 VDC
Output	MODBUS-RTU
Response Time	<15s
Power	100mA@12V
Operating Temperature	-20 a 60°C
Main Materials	ABS + Aluminium Alloy
IP Protection	IP65

## Electrical Connections

Cable	RS485
Brown	V+ (10-24VDC)
Green	RS485A
Black	V- (GND)
Blue	RS485B

## WARRANTY

This product is warranted to be free from defects in materials and construction for a period of 12 months from the date of delivery. The supplier's liability is limited to the repair or replacement of the defective item.

**Note:** This product has been tested and meets the European CE requirements for the EMC directive.

## Air Quality Station Gases guide



### Important notes for the internal gas sensors of the Air Quality Station

- The useful life of the internal gas sensors of the air quality station is approximately 2 years working at their maximum accuracy since each sensor loses over time a small percentage of its original calibration, depending on external conditions such as the concentration of the measured gas, temperature, humidity, environmental conditions that may corrode or degrade the sensor, etc. For this reason, after the two years have elapsed, it is recommended to replace the sensors of the air quality station.
- The accuracy indicated for each sensor is an ideal reference (e.g.  $\pm 0.01$ ). This theoretical value has been calculated by the manufacturer as the best error that could be expected, the optimum case. In real conditions, the measurement error may be higher (e.g. " $\pm 0.05$  ppm"). The older the sensor, the more deteriorated it is, so the accuracy degrades over time. Aggravating factors can also be high concentrations of the gas to be measured or extreme ambient conditions.
- In some cases, the internal gas sensors of the air quality station need a stabilization time to work properly. For this reason, it is recommended to wait 6 hours of operation to ensure that the measured values are stable.

- The internal gas sensors of the air quality station must avoid contact with organic solvents, alcohol, paints, oils and high concentration gases, including silica gel and other adhesives.
- Measuring gas concentration near 0 ppb is a complex technical challenge, because the electrochemical sensors integrated within the air quality station emit tiny currents (in nA) that require amplification, bringing with them an inherent error in the sensor signal. This error has 2 mathematical components: the constant error (bias) and a random/unpredictable component.  
Since this error is given by the sensor itself, it is difficult to eliminate. The best practice is to calibrate the sensor, therefore, the sensors are pre-calibrated by the manufacturer, but this calibration may not be sufficient for certain applications that require extreme accuracy. For these cases, the user can create an additional calibration procedure to meet their special needs, especially focusing on the constant error (bias).
- When calibrating or testing the sensor, the correct method should be performed in a clean atmosphere, and with stable and gentle ventilation rate, to simulate a gas diffusion state. Otherwise, if the sensor is blown strongly, or the air flow is unstable during ventilation, unsatisfactory calibration results will be obtained, and the accuracy and repeatability of the test will be affected.
- It is not recommended to test the sensor with non-standard methods, such as placing the sensor directly over concentrated ammonia water, spraying cigarettes on the sensor, lighting a lighter next to the sensor, exhaling on the sensor, bringing the sensor close to alcohol, etc., as the regional concentration of liquid ammonia water or alcohol can be as high as tens of thousands of ppm, and the concentration of carbon dioxide in human breath can reach 40,000 ppm, which could affect the correct operation of the sensor.

- The correct test method is to introduce the target gas with air as the background gas.

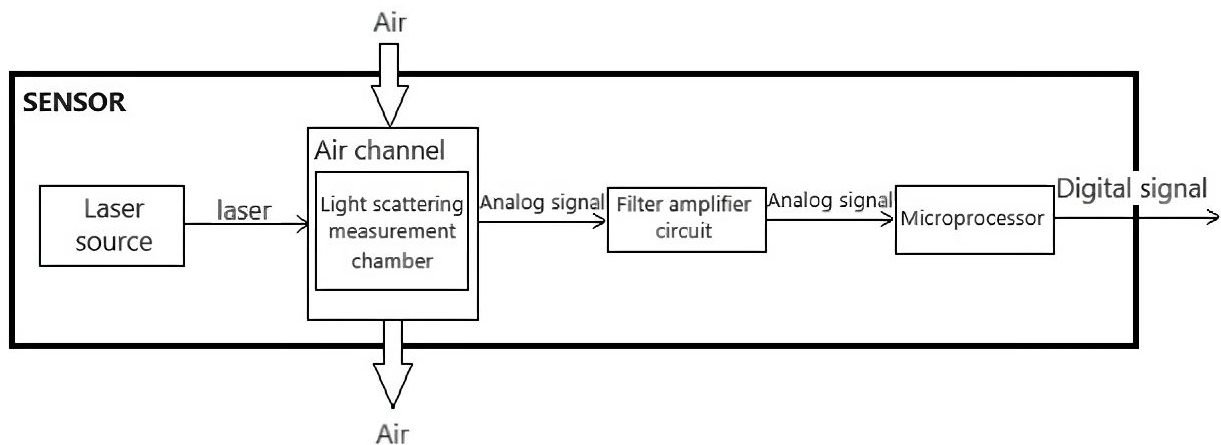
## Basic operation of the laser scattering sensors PM2.5, PM10

### Advantages:

- Accurate measurement.
- Zero false alarm rate.
- Minimum particle size resolution 0.3  $\mu\text{m}$ .

The digital particle concentration sensor based on the laser scattering principle can continuously collect and calculate the number of suspended particles of different sizes per unit volume.

This sensor uses the laser scattering principle, that is, the laser is irradiated on airborne particles to cause scattering, and the scattered light is collected at a specific angle to obtain a curve of the scattered light intensity that changes with time. Then, the microprocessor uses an algorithm based on the MIE theory to obtain an equivalent particle size and the number of particles of different sizes per volume unit. The block diagram of each functional part of the sensor is shown in the figure below.



### Technical indicators:

Parameter	Index	Unit
Particle measurement range	1.0 - 2.5 ; 2.5 - 10	Micron (um)
Particle counting efficiency	50%@0.3 um 98%@>=0.5 um	
Particle mass concentration effective range (PM2.5 standard value)	0-500	microgram/ cubic meter
Maximum mass concentration of particulate matter (PM2.5 standard value)	≥ 1000	microgram/ cubic meter
Resolution of particle mass concentration	1	microgram/ cubic meter

### Basic operation of the electrochemical sensors CO, NO2, O3, SO2

The gas sensors produce, by means of an electrochemical process, a current proportional to the quantity of each gas. In the case of CO, NO2 and O3 sensors there are 3 electrodes, Working electrode interacts with the gas producing a current, Counter electrode delivers a balancing current and Reference electrode sets the operating potential. For SO2 there is an additional one, the auxiliary electrode, that functions as another working electrode and is used to compensate for temperature variations in the base current.

**Technical indicators:**

<b>Parameter</b>	<b>O3</b>	<b>SO2</b>	<b>NO2</b>	<b>CO</b>
Max. Overload (ppm)	50	10	10	100
Sensitivity (μA/ppm)	-0.60 soil 0.15	0.90±0.15	0.90±0.15	0.4±0.1
Response Time (T90, seconds)	<30	<30	<30	<15
Max. Zero Drift (+20 °C to+40 °C)	0.2 ppm	0.05 ppm	0.05 ppm	0.2 ppm