

air quality research

 aqicn.org/sensor

Sensing the Air Quality: Research on Air Quality Sensors

Overview of Air Quality sensors experiments

Air quality monitoring device & sensors research

Air
Quality



monitoring is well known and established science which started back in the 80's. At that time, the technology was quite limited, and the solution used to quantify the air pollution complex, cumbersome and really expensive.

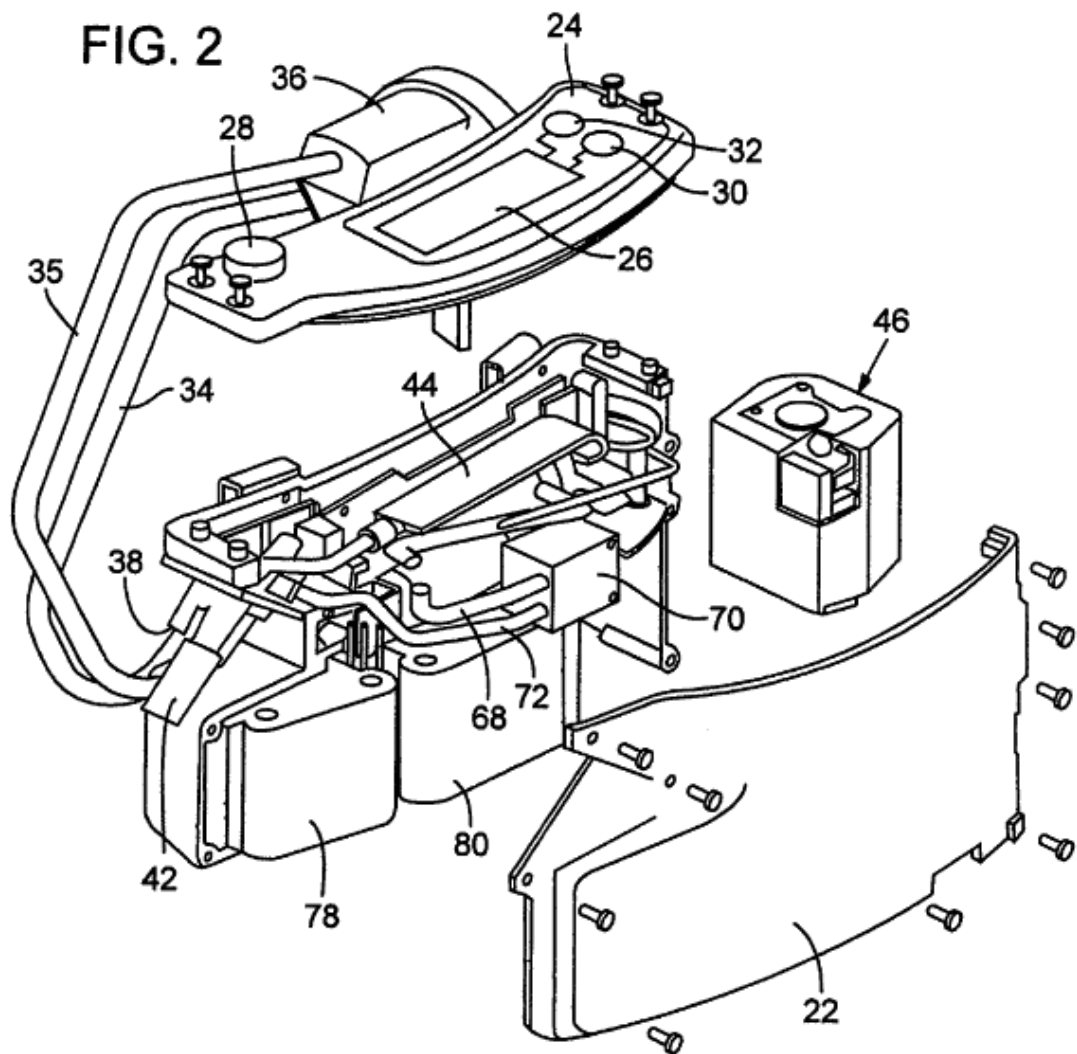
Patent [US7947503](#): Monitor and methods for characterizing airborne particulates

Fortunately, now days, with the most recent and modern technologies, the solutions used for Air Quality monitoring are becoming not only more precise, but also faster at measuring.

Devices are becoming smaller, and cost much more affordable than ever before. For instance, new technologies like the *Tapered element oscillating micro balance (TOEM)* provide significant advantages over the traditional *Beta Attenuation Monitors (BAM)*

Even more recently, ultra-affordable sensors are starting to appear on the market - many of them linked to the IOT trend of sensing everything. While most of them are purely gimmick, and so definitely useless toys, some of them are starting to achieve performances comparable to professional monitors, at one hundred time less of cost of them. In order to asses the reliability

of
those



sensors, the Earth Sensing Labs from the World Air Quality Index project is and has been conducting many Air Quality Sensor research and live-data experiments from many years.

Particle Sensors

The particle sensors can detect the amount of dust in the Air. While the first generation was just able to detect the amount of opacity, most recent sensors can now detect not $PM_{2.5}$ and PM_{10} but also up to 7 different particle size (aka bins).

HoneyWell HPMA 115

Laser based $PM_{2.5}/PM_{10}$ sensor

20USD (130CNY)

Plantower PMS 7003

Laser based $PM_{2.5}/PM_{10}$ sensor

20USD (130CNY)

Plantower PMS 5003

Laser based $PM_{2.5}/PM_{10}$ sensor

18USD (120CNY)

Plantower PMS 3003

Laser based $PM_{2.5}/PM_{10}$ sensor

14USD (90CNY)

Plantower PMS 1003

Laser based $PM_{2.5}/PM_{10}$

sensor

14USD (90CNY)

Comming Soon

Plantower PMS

A003

Laser based PM_{2.5}/PM₁₀
sensor

24USD (160CNY)

Novafitness SDO11

Laser based PM_{2.5}/PM₁₀
sensor

23USD (150CNY)

Comming Soon

Novafitness SDO18

Laser based PM_{2.5}/PM₁₀
sensor

19USD (128CNY)

Novafitness SDO21

Laser based PM_{2.5}/PM₁₀ sensor

23USD (155CNY)

Yuntong YT-001

Laser based PM_{2.5}/PM₁₀ sensor

20USD (130CNY)

Comming Soon

Sharp DN7C3JA001

Virtual Impactor for Sharp
GP2Y1051AU0F

20USD (135CNY)

Shinyei PPD42NS

LPO Optical PM sensor

5USD (35CNY)

Samyoung DSM501

LPO Optical PM sensor

4USD (24CNY)

Modified Shinyei PPD42NS

Analog Optical PM sensor

5USD (35CNY)

Dylos DC1100

Laser based PM_{2.5}/PM₁₀
integrated monitor

300USD (2000CNY)

Comming Soon

Alphasense OPC-N2

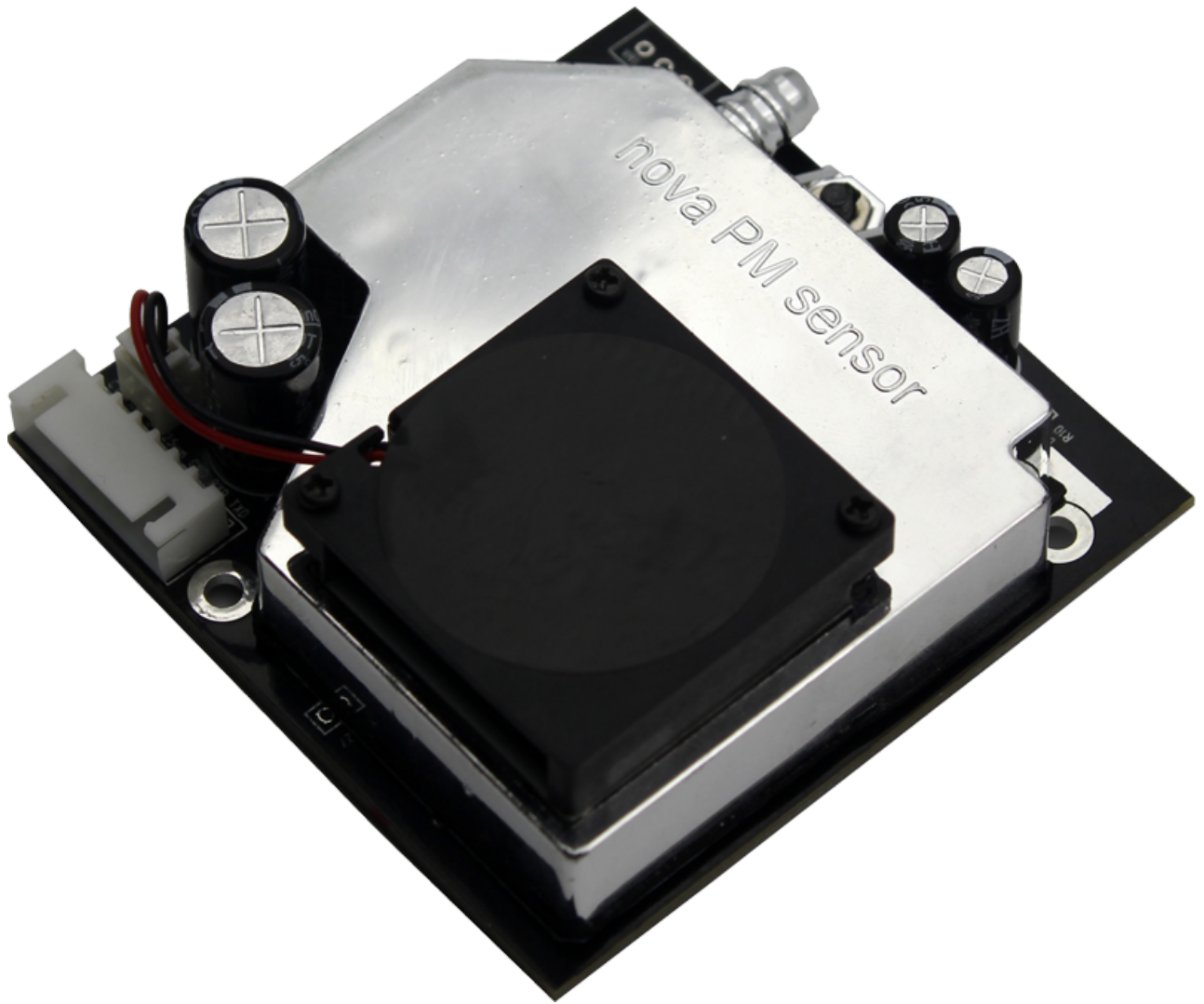
Laser based PM_{2.5}/PM₁₀ sensor

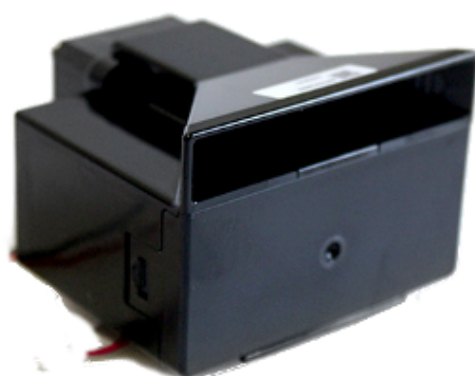
500USD (3333CNY)

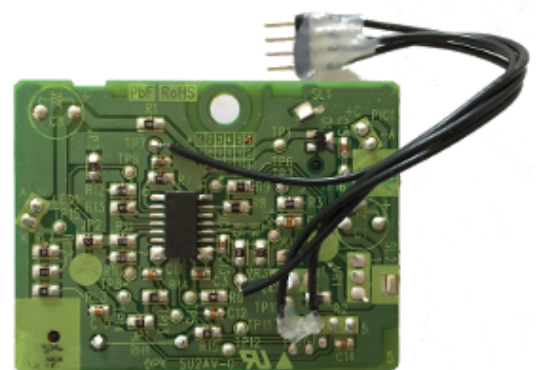
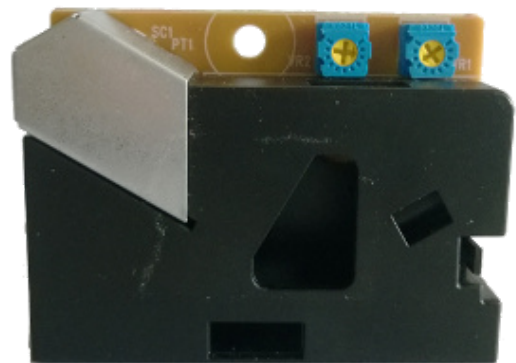
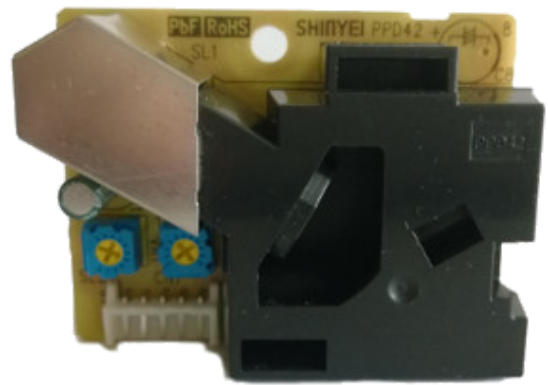














Gas Sensors

On the opposite of particle sensors, the gas sensor can detect and count the type of *particle* present in the air, such as for instance Ozone (O_3), Nitrogen Dioxide (NO_2), Sulfur Dioxide (SO_2), ...

MQ 131

Ozone Electro-Chemical sensor

60CNY

Specs

Ozone Electro-Chemical sensor

57USD (380 CNY)

SGX MiCs 2614

Ozone MEMS sensor

18USD (120 CNY)

SGX MiCs 2714

NO₂ MEMS sensor

23USD (150 CNY)

Alphasense NO2 B43F

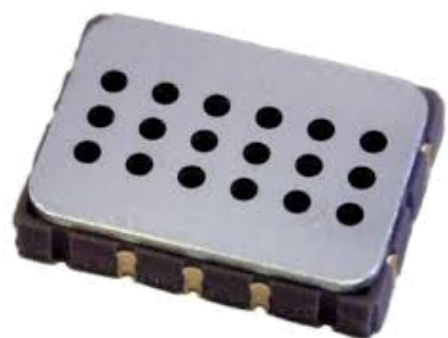
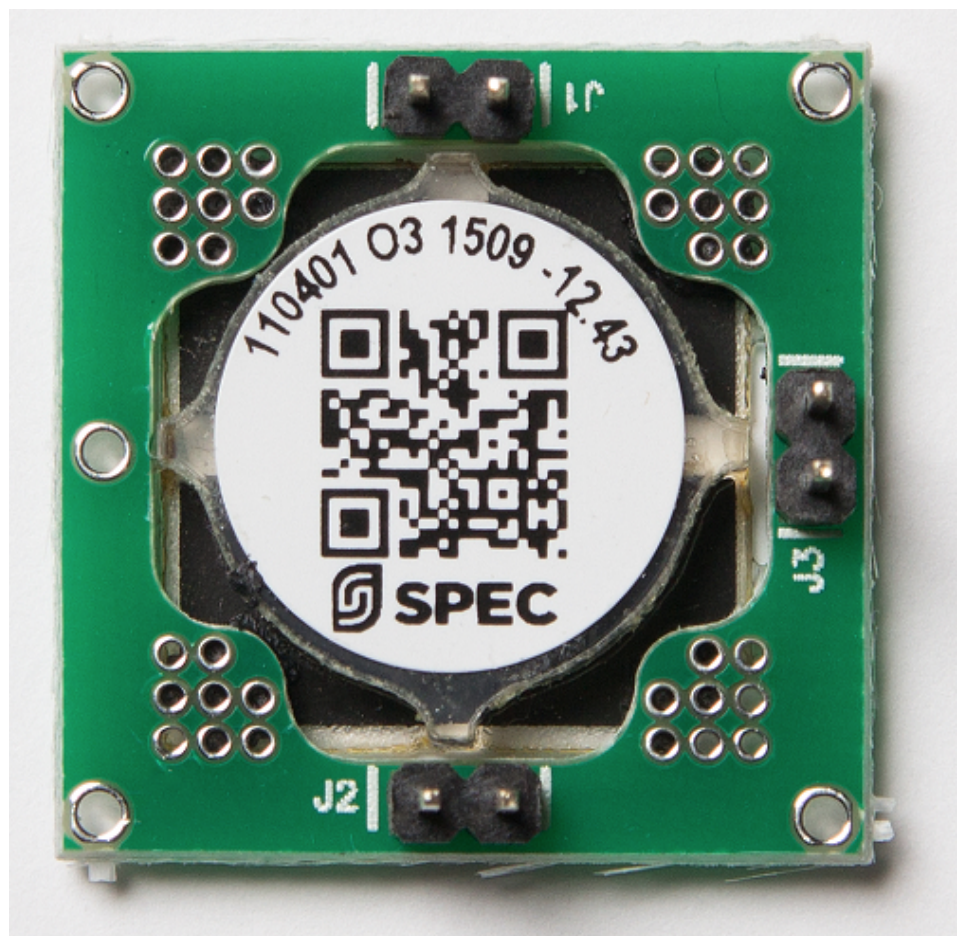
NO₂ Electro-Chemical sensor

90USD (600 CNY)

MQ.9

Carbon Monoxide Electro-Chemical sensor

5CNY





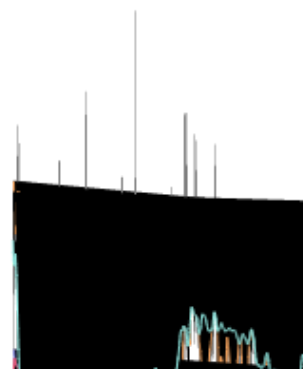
Notes

- Note1: The USD/CNY conversion rate is based on $1 \text{ CNY} = 0.15 \text{ USD}$. The price are based on direct purchase from the vendors without shipping cost.
- Note2: The Dyllos monitor does not really belong to the PM sensor category since it is a completely integrated and standalone monitoring equipment, much more expensive than any other sensor, but it is listed here for historical reason.

- Note 3: The Alpha Sense OPCN2 is expensive, and the the price you pay is for the traceable calibration (done using Polystyrene Spherical Latex Particles). Otherwise, from a technology side, it does not include anything better than what the \$20 sensors can do, except from an IC.
- Note4: There are many scientific article on low-cost sensor. See the one from NCAS and WACL for an excellent and brief [overview](#) on the evaluation of low cost chemical sensors for air pollution measurement.
- Note5: If you would like to suggest news sensors, please [contact](#) us or just post a message in the discussion board at the bottom of this page.

Last 5 days PM_{2.5} comparative measurement

The graph "BAM PM_{2.5}" is the reference measurement from a professional [BAM](#) monitor. A [loess](#) smoothing is applied to all the other graphs in order to minimize the noise. You can move your mouse over the graph labels to see the actual output vs. the averaged values.



Sensor ID/ Specie	Update time		pm25	pm10	pm1	db5.0- um	db2.5- um	db10.0- um	db1.0- um	db0.5- um
HPMA 115SO	January 15, 2021 2:24 PM	a few seconds ago	56	58	0	-	-	-	-	-
SDS 011 (new)	January 15, 2021 2:24 PM	a few seconds ago	290.9	309.5	0	-	-	-	-	-

PMS 3003	January 15, 2021 2:24 PM	a minute ago	18.6	33.4	4.5	16973	509.5	20	26368	10.4
SDS 021	January 15, 2021 2:23 PM	2 minutes ago	86.6	91	0	-	-	-	-	-
SDS 011 (old)	January 15, 2021 2:23 PM	2 minutes ago	3	4.8	0	-	-	-	-	-
PMS 5003	January 15, 2021 2:23 PM	2 minutes ago	2.5	2.5	1.2	0	0.4	0	16	119.7
PMS 7003	January 15, 2021 2:22 PM	3 minutes ago	2.7	3.8	2	1.8	1.8	0.5	22.8	138.8
BAM PM2.5	January 15, 2021 1:00 PM	an hour ago	13.4	-	-	-	-	-	-	-
Dylos	June 28, 2018 2:43 PM	3 years ago	1.6	0.2	-	-	-	-	-	-
PMS 1003	June 23, 2018 5:11 AM	3 years ago	17.8	19.9	15.3	0.9	2.8	0.6	32.3	442.5



For the list of all air quality sensors, check the [Sensor Overview](#) page

AQI	Air Pollution Level	Health Implications	Cautionary Statement (for PM2.5)
0 - 50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk	None
51 -100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
101-150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
151-200	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects	Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion
201-300	Very Unhealthy	Health warnings of emergency conditions. The entire population is more likely to be affected.	Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.
300+	Hazardous	Health alert: everyone may experience more serious health effects	Everyone should avoid all outdoor exertion

Settings

Language Settings:

Temperature unit:
Celcius

