Sontay®
Four Elms Road - Edenbridge
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GS-PM-D
Duct Mount PM2.5/10, CO_2, TVOC, RH & Temp. Sensor

Issue Number 7.0
04/06/2021

Features and Benefits

- Real time indoor air quality
- Temperature & RH compensation
- Built in regulated controlled fan to guarantee constant air volume improving stability and lifetime
- Easy to clean filter mesh
- Modbus RTU output

Technical Overview

The GS-PM-D is real time monitoring parameter for PM2.5/10, CO_2, TVOC, humidity and temperature measurement, monitored via the Modbus RTU output.
Particulate matter is sensed via a laser particle sensor, light scattering method, making these suitable for homes, offices, small ventilation systems etc.
Using unique technology of compensating method, and up to nine calibration points, to guarantee GS-PM-D measurements accuracy in different environments.

Product Codes

GS-PM-D	Duct PM2.5/10. CO_2, TVOC, Humidity & Temperature sensor

Specification

Outputs	Modbus RTU 9600 8N1 (default)
Power Supply	12-28Vdc or 18-27Vac
Data upload interval cycle	60 second avg.
Air speed (within duct)	2-15m/s
Electrical connections	Rising cage to suit 0.2 to 1.5mm²
Output ranges:	
PM2.5/10	0 to 500µg/m³
CO_2	0 to 2000ppm
TVOC	0.01 to 4.00mg/m³
Humidity	0 to 99%RH
Temperature	-20 to +60°C
Accuracy:	
PM2.5	±5µg/m + 10% of reading (0 to 300µg/m³ 10-30°C, 10-60%RH)
CO_2	±50ppm + 3% reading
TVOC	<±0.05 mg/m³ + 15% of reading
Humidity	<±3.5%RH (10-60%RH)
Temperature	<±0.5°C @ 25°C
Environmental:	
Temperature	-20 to 60°C
Humidity	0 to 99% non-condensing
Housing:	
Material	PC
Dimensions	180 x 125 x 65.5mm
Pitot tube	240 x 30.4mm dia.
Protection	IP30
Conformity	EMC, CE, UKCA Marked & RESET
Country of origin	China

WEEE Directive:

At the end of the products useful life please dispose as per the local regulations.
Do not dispose of with normal household waste.
Do not burn.

CE UKCA

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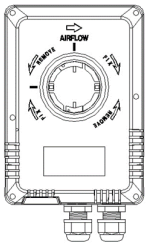
Installation Requirements

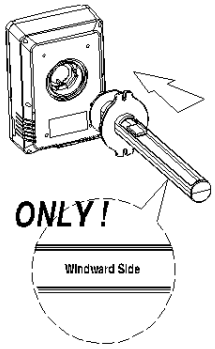
- If installation of sensor is for the air supply duct, please note to install on the main air duct the fresh fan machine or close to the branch duct.
- If installation of sensor is for the return air duct. Please note to Install on the main air duct close to the return air fan, or more than 1 meter from the return air outlet.
- Installation of pitot tube should be accordance with the direction of the wind, please see “Installation”.
- Note that the serial number on the pitot tube must be mated with the GS-PM-D device with the same s/n number. The two parts make up a whole device. Its temperature and humidity is calibrated for the whole device. Therefore, each pitot tube must be matched with its own main unit. Do not mix them up.
- When disassembling and assembling the pitot tube, must cut off the power firstly. The pitot tube must be assembled and tightened on the main unit.

Assembly of Main Unit & Pitot Tube

1. See the mark of the main unit, as shown in the figure below, REMOVE is the direction in which the pitot tube is removed, and FIX is in the fixed direction. The pitot tube must be matched with the original main unit with the same serial number

2. The pitot tube is docked with the main unit. Their series numbers are the same, don’t mess up.
As shown in the figure below, install the side of the pitot tube marked with the Windward Side facing down, and align it with the rear mounting hole of the main unit.





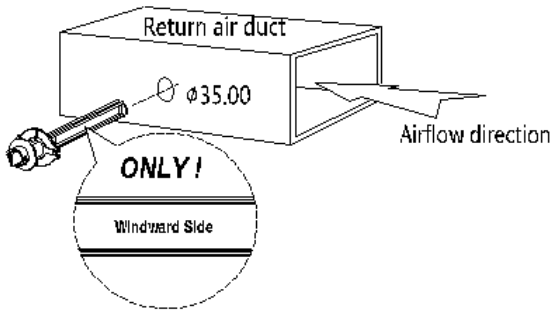
3. After the pitot tube is inserted into the main unit assembly hole, the alignment mark horizontal line is rotated 90 degrees clockwise.

Installation

Antistatic precautions must be observed when handling these sensors. The PCB contains circuitry that can be damaged by static discharge.

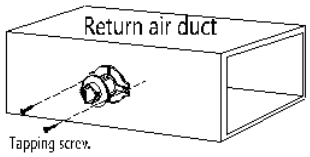
For the wind flow is from right to left (ie "right", factory default)

1. Confirm the installation position, and open a hole of 35mm diameter with the hole opener on the air duct. Insert the pitot tube into the air duct. (Note: the side of the pitot tube marked with the Windward Side face to the airflow direction)

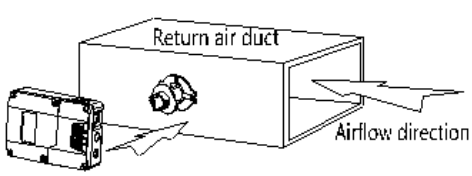


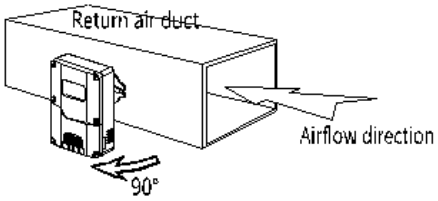
Installation (continued)

2. Insert the pitot tube and screw it to the outside of the air duct.



3. Install the main unit. Connect the main unit horizontally (logo is on the left) with the pitot tube interface (as shown in the left figure), and then rotate it 90 degrees clockwise fixed. (right figure). Complete installation.

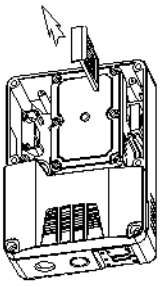


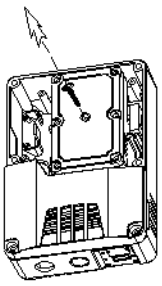


The direction of the wind's airflow is opposite to the above, that is, the wind flow is from left to right (ie "left").

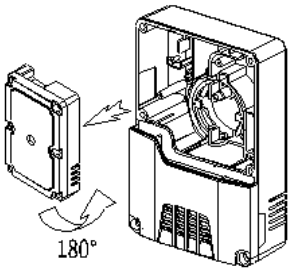
1. Unscrew the four assembly screws and open the upper casing part of the main unit.

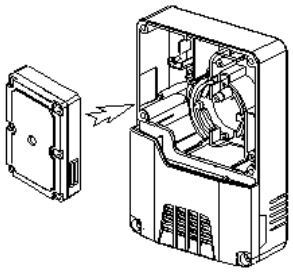
2. See the black MSM sensor module. Pull out the air inlet filter (as the left figure) pressed to the lower right side of the MSM module, and then remove the fixing screws on the middle of the module (as the right figure)





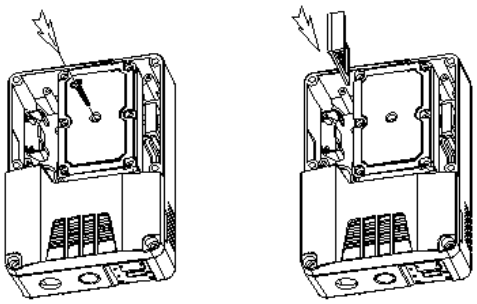
3. Remove the MSM module from the sealed compartment and rotate the module 180 degrees (left figure), and replace the MSM module (right figure) with the original position.



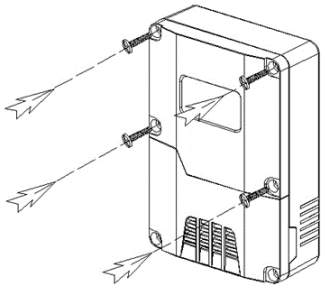


Installation (continued)

4. Fix the MSM module and insert the air inlet filter into the upper left slot of the MSM module.

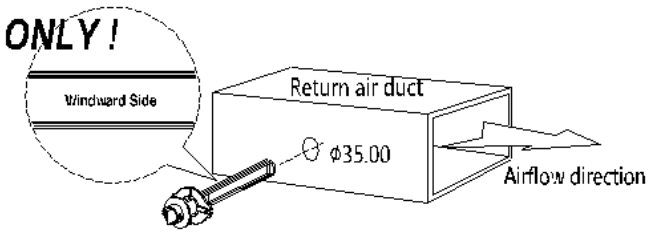


5. Put the sealing compartment casing back and fix it.

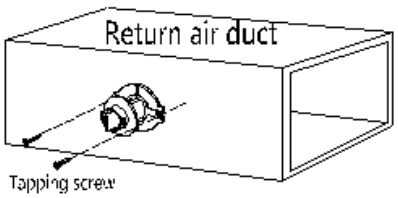


6. Install the pitot tube. Confirm the installation position and open a hole of a 35mm diameter with the hole opener on the air duct. Insert the pitot tube into the air duct.

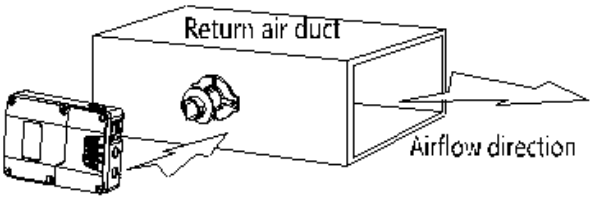
   (Note that the side of the pitot tube marked with Windward Side face to the airflow direction)

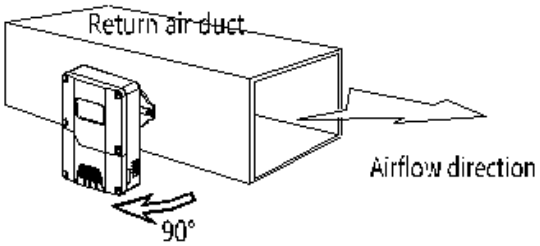


7. Insert the pitot tube and fix it with screws.



8. Assemble the main unit. Insert the main unit laterally into the air duct's counter interface (left figure) and then rotate it 90° clockwise (right figure). The installation is completed.





Electrical Connections

1. Open the casing of the electrical wiring part of the main unit.

2. Remove the two sets of terminals for power supply and RS485 respectively
   Note: The left terminal is the power terminal block. The right terminal is the RS485 terminal block.

3. Go through the power cable and RS485 cable from each waterproof connector respectively.

4. Press the cable on the terminal blocks.

5. Plug the terminals of the wired cable back into the pin position of the power supply board and lock the inlet of the waterproof connector.

6. Fasten the casing of the electrical wiring part and install the original screws.

Maintenance

In order to ensure the accuracy of the PMD data, the end users need to perform regular maintenance on the equipment under typical environment. The maintenance period of the general project is 3, 6, and 12 months, and the special environment should shorten the maintenance period. The main maintenance should include: internal cleaning of the outer casing, internal structure cleaning, air inlet filter cleaning, and module cleaning.

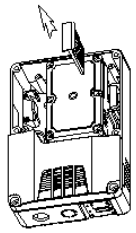
- Cleaning of the inlet filter: The general maintenance period is up to 3 months, and the special environment should shorten the maintenance period, especially in the environment where the return air duct is dusty.

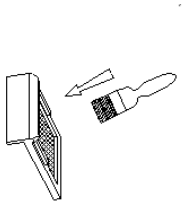
- Cleaning of internal structure: The general maintenance period is up to 12 months, and the special environment should shorten the maintenance period.

- Sensing module cleaning: The general maintenance period is up to 12 months, and the special environment should shorten the maintenance period.

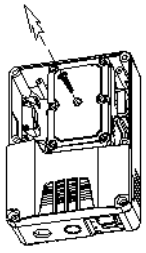
1. Open the upper main casing removing the 4 screws.

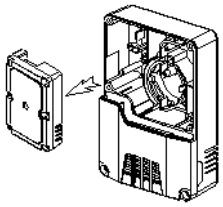
2. remove the dust filter next to the air inlet of the black MSM sensor module, clean filter

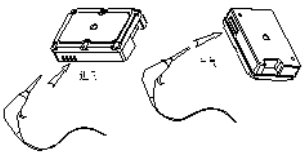




3. Remove the mounting screw on the middle of the MSM module, take out the module, and clean the module inlet and outlet with the air pump to clean the module inside.







4. Re-assemble the MSM module after cleaning.

Trouble Shooting

Fault phenomenon	**Reference Reason**
PM2.5 data deviation is too large, the value is too high	Check whether the environmental factors around the equipment have any influence, whether there is any foreign matter inside the housing, and there is foreign matter inside the sensing module.
PM2.5 data deviation is too large, the value is too low	The air inlet filter is blocked by foreign matter or dust, and the exhaust port is blocked. Especially in the season of catkins and poplars or the sensor module exceeds the specified calibration period, the spare sensor module can be directly replaced.
CO_2 value is too high or too low	The CO_2 sensor has a self-calibration function that allows the ABC self-calibration function to return to normal values under normal use. In special cases, if it is subjected to severe vibration, it cannot be repaired, and it is necessary to recalibrate or replace the CO_2 sensor.
TVOC data deviation is too large, the value is too high or too low	Check the influence of environmental factors around the equipment, or sudden changes in the temp. & humidity of the environment. Whether the power is stable for 48 hours. These will affect the large changes in TVOC values. The TVOC value should be compared to the hourly average.
Too large deviation for T & RH or value does not change for a long time	Check whether the pitot tube is tightened and fixed on the main unit, the pitot tube loosening makes the device unable to detect the external temperature and humidity sensor. Disassembly and installation of the pitot tube maybe with power on, should be disassembled and installed after power off Please try turning off power and turning on again.
Communication interruption RS485 (Modbus RTU)	Check if the power supply is normal, if the RS485 terminal is loose. Whether the RS485 communication line is accidentally cut by other constructions. Whether an inductive load with electromagnetic interference is added or started near the equipment or RS485 communication line, such as a water pump.

Modbus Parameters

Mode:	RTU	
Baud Rate:	1-4800 2-9600 3-14400 4-19200 5-38400 6-56000 7-57600 8-115200	(default : 2-9600bps)
Start Bits:	1	
Data Bits:	8	
Stop Bits:	1 / 2	(default: 1)
Parity:	None / Odd / Even	(default: None)

Support Function code:

- 3 - Read Holding Registers
- 4 - Read Input Registers
- 6 - Write Single Register
- 16 - Write Multiple registers

Modbus Register Tables

Starting Register Decimal	Data Description	Function	Read/Write	Quantity of Registers (2Bytes/16bit)	Format	Decimals	Data Range, Data Description	Default
0/1050	PM2.5 hourly average measurement	4	R	2	Float-Big Endian	1	0 ~1000.0μg/m3	
2/1052	PM10 hourly average measurement	4	R	2	Float-Big Endian	1	0 ~1000.0μg/m3	
8/1058	CO2 hourly average measurement	4	R	2	Float-Big Endian	0	0~5000 ppm	
10/1060	TVOC hourly average measurement	4	R	2	Float-Big Endian	3	0~4.000mg/m3	
1074	Pressure hourly moving average measurement	4	R	2	Float-Big Endian	0	-1000~200000Pa	
12/1000	PM2.5 one minute average measurement	4	R	2	Float-Big Endian	1	0 ~1000.0μg/m3	
14/1002	PM10 one minute average measurement	4	R	2	Float-Big Endian	1	0~1000.0μg/ m3	
16/1004	Temperature real-time measurement	4	R	2	Float-Big Endian	2	-20.00 °C~ 60.00 °c	
18/1006	Humidity real-time measurement	4	R	2	Float-Big Endian	2	0-100.00% RH	
20/1008	CO2 real-time measurement	4	R	2	Float-Big Endian	0	0~5000 ppm	
22/1010	TVOC real-time measurement	4	R	2	Float-Big Endian	3	0~4.000mg/m3	
1024	Pressure real-time measurement	4	R	2	Float-Big Endian	0	-1000~200000Pa	
24/1100	PM2.5 24-hour moving average measurement	4	R	2	Float-Big Endian	1	0- 1000.0μg/ m3	
26/1102	PM10 24-hour moving average measurement	4	R	2	Float-Big Endian	1	0- 1000.0μg/ m3	

Modbus Register Tables (continued)

Starting Register Decimal	Data Description	Function	Read/Write	Quantity of Registers (2Bytes/16bit)	Format	Decimals	Data Range, Data Description	Default
32/1108	CO2 24-hour moving average measurement	4	R	2	Float-Big Endian	0	0~5000 ppm	
34/1110	TVOC 8-hour moving average measurement	4	R	2	Float-Big Endian	3	0~4.000mg/m3	
1124	Pressure 24-hour moving average measurement	4	R	2	Float-Big Endian	0	-1000~200000Pa	
1300	Primary pollutant 24-hour average measuring value (One of PM 2.5/ PM10/ CO2/ TVOC) (Calculated based on 24-hour or 1-hour moving average measurement) Primary pollutant type (One of PM 2.5/ PM10/ C02/ TVOC) (Calculated based on 24- hour or 1-hour moving average measurement)	4	R	2	Float-Big Endian		1300	
1302	Primary pollutant type (One of PM 2.5/ PM10/ CO2/ TVOC) (Calculated based on 24- hour or 1-hour moving average measurement)	4	R	1	INT16		1-PM25, 2-PM10, 3-CO2, 4-TVOC	
1303	Index level of the primary pollutant (One of PM2.5/PM10/CO2/TVOC) (Calculated based on 24-hour or 1-hour moving average measurement)	4	R	1	INT16		Level 1-Excellent Level 2-Good Level 3-Light pollution Level 4-Mediumpollution Level 5-Heavy pollution Level 6-Severe pollution	
1304	AQI value of the primary pollutant (One of PM2.5/PM10/CO2/TVOC) . (Calculated based on 24-hour or 1-hour moving average measurement)	4	R	1	INT16		0~500	
1320	PM2.5 AQI value (Calculated based on 24-hour moving average measure-	4	R	1	INT16		0-500	
1321	PM10 AQI value (Calculated based on 24-hour moving average measurement)	4	R	1	INT16		0-500	
1322	CO2 AQI value (Calculated based on 24-hour moving average measurement)	4	R	1	INT16		0-500	
1323	TVOC AQI value (Calculated based on 24-hour moving average measurement)	4	R	1	INT16		0~500	
1350	PM2.5 Pollution index level (Calculated based on 24-hour moving average measurement)	4	R	1	INT16		1-6	
1351	PM10 Pollution index level (Calculated based on 24-hour moving average measurement)	4	R	1	INT16		1-6	
1352	CO2 Pollution index level (Calculated based on 24-hour moving average measurement)	4	R	1	INT16		1-6	
1353	TVOC Pollution index level (Calculated based on 24-hour moving average measurement)	4	R	1	INT16		1-6	

Modbus Register Tables (continued)

Starting Register Decimal	Data Description	Function	Read/Write	Quantity of Registers (2Bytes/16bit)	Format	Decimals	Data Range, Data Description	Default
78	3 color LED status	4	R	1	INT16		0-OFF, 1-Green, 2-Yellow, 3-Red	
0	Modbus Address	3/6	R/W	1	UINT16		1-247	1
1	Modbus rate (bps)	3/6	R/W	1	UINT16		1-4800, 2-9600, 3-14400, 4-19200, 5-38400, 6-56000, 7-57600, 8-115200	2
2	Modbus Parity check bit	3/6	R/W	1	UINT16		1-NONE, 1 STOP_BIT, 2-NONE,2 STOP_BIT, 3-Odd,1 STOP_BIT, 4-Even,1 STOP_BIT	1
4	Temperature correction value	3/16	R/W	2	Float-Big Endian	2	-3.0~3.0°C/ -6.0~6.0F	-2.0
6	Humidity correction value	3/16	R/W	2	Float-Big Endian	2	-5.0~5.0%RH	0
14	CO2 compensation value	3/16	R/W	2	Float-Big Endian	0	-300.0~300.0ppm	0

In order to reserve the decimal part, the measuring value with decimal will be magnified 10/100/1000 times, marked as x 10/ x100/ x1000.

Starting Register Decimal	Data Description	Function	Read/Write	Quantity of Registers (2Bytes/16bit)	Format	Decimals	Data Range, Data Description	Default
50/1175	PM2.5 hourly average measurement x 10	4	R	1	UINT16	1	0~10000 corresponding to 0~1000.0μg/m3	
51/1176	PM10 hourly average measurement x 10	4	R	1	UINT16	1	0-10000 corresponding to 0~1000.0μg/m3	
54/1179	CO2 hourly average measurement x 1	4	R	1	UINT16	0	0~5000 corresponding to 0~5000ppm	
55/1180	TVOC hourly average measurement x 100	4	R	1	UINT16	3	0~4000 corresponding to-4.000mg/m3	
1187	Pressure hourly moving average measurement x 10	4	R	1	UINT16	0	-10000~20000000 corresponding to -1000~200000Pa	
56/1150	PM2.5 one minute average measurement x 10	4	R	1	UINT16	1	0~10000 corresponding to 0~1000.0μg/ m3	
57/1151	PM10 one minute average measurement x 10	4	R	1	UINT16	1	0~10000 corresponding to 0 - 1000.0μg/ m3	
58/1152	Temperature real-time measurement x 100	4	R	1	INT16	2	-2000-6000 corresponding to -20.00 °C~60.00°C	
59/1153	Humidity real-time measurement x 100	4	R	1	UINT16	2	0~10000 corresponding to 0~100.00% RH	
60/1154	CO2 real-time measurement x 1	4	R	1	UINT16	0	0~5000 corresponding to 0~5000 ppm	
61/1155	TVOC real-time measurement x 1000	4	R	1	UINT16	3	0~4000 corresponding to -4.000mg/ m3	
1162	Pressure real-time measurement x 10	4	R	1	UINT16	0	-10000~20000000 corresponding to -1000~200000Pa	
62/1200	PM2.5 24-hour moving average measurement x 10	4	R	1	UINT16	1	0~10000 corresponding to 0-1000.0μg/ m3	

Modbus Register Tables (continued)

Starting Register Decimal	Data Description	Function	Read/Write	Quantity of Registers (2Bytes/16bit)	Format	Decimals	Data Range, Data Description	Default
63/1201	PM10 24-hour moving average measurement x 10	4	R	1	UINT16	1	0~10000 corresponding to 0~1000.0μg/m3	
66/1204	CO2 24-hour moving average measurement x 1	4	R	1	UINT16	0	0~5000corresponding to 0~5000 ppm	
67/1205	TVOC 24-hour moving average measurement x 10000	4	R	1	UINT16	3	0~4000 corresponding to 0~4.000mg/m3	
1212	Pressure 24-hour moving average measurement x10	4	R	1	UINT16	0	-10000~20000000 corresponding to -1000~200000Pa	

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