

Product Specification

Product:	All-in-one Gas Sensor Module
Product model:	PTQS1003A
Specification No.:	PTQ4005-2018
Version:	V1.1

Writer	Verifier	Standardization	Approver
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1. Main Characteristics

- ◆ Laser scattering principle measures the concentration of paricles
- ◆ NDIR measures CO2
- ◆ Temperature and humidity output
- ◆ Unified air inlet Highly integrated



2. Overview

PTQS1003A is a multi-in-one gas sensor module that can measure various kinds of gas at the same time. The sensor module incorporates a laser particle sensor, a CO2 sensor. The sensor module also has a built-in temperature and humidity sensor chip. These parameters will be unified in the form of digital interface output. The sensor module by optimizing the internal structure, making the air inside the module path and the sensor sampling interface better combination, to reduce the size of the module, but also to the sensitivity of the sensor is guaranteed.

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3. Technical Index

Chart 1~4

Chart 1 Particle Concentration Index

Parameter	Index	unit
Range of measurement	0.3~1.0; 1.0~2.5; 2.5~10	Micrometer (μm)
Counting Efficiency	50%@0.3μm 98%@>=0.5μm	
Effective Range (PM2.5 standard)	0~500	μg/ m ³
Maximum Range (PM2.5 standard) *	≥1000	μg/ m ³
Resolution	1	μg/ m ³
Maximum Consistency Error (PM2.5 standard) *	±10%@100~500μg/ m ³ ±10μg/ <i>m</i> ³ @0~100μg/ m ³	
Standard Volume	0.1	Litre (L)

Note 1: Maximum range means that the highest output value of the PM2.5 standard data is not less than 1000.

Note 2: The consistency of particle concentration is at 20℃,50%.

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Chart 2 CO2 Index

Parameter	Index	Unit
Effective Range	400~3000	ppm
Maximum Range	5000	ppm
Resolution	1	ppm
Accuracy	± (50ppm+5%of reading)	

Chart 3 Temperature and Humidity Index

Parameter	Index	Unit
Temperature Effective Range	-10~+55	℃
Temperature Resolution	0.1	℃
Humidity Effective Range	0~99	%
Humidity Resolution	0.1	%

Chart 4 Basic Technical Index

Parameter	Index	Unit
Single Response Time	<3	Second (s)
Total Response Time	≤30	Second (s)
DC Power Supply	Typ:5.0 Min:4.5 Max: 5.5	Volt (V)
Active Current	≤200	Milliampere (mA)

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Standby Current	≤10	Milliampere (mA)
Interface Level	L <0.8 @3.3 H >2.7@3.3	Volt (V)
Working Temperature Range	-10~+55	℃
Working Humidity Range	0~99%(No condensation)	
Storage Temperature Range	-40~+75	℃
MTTF	≥3	Year (Y)
Physical Size	76×52×19	Millimeter (mm)

4. Definition of Interface

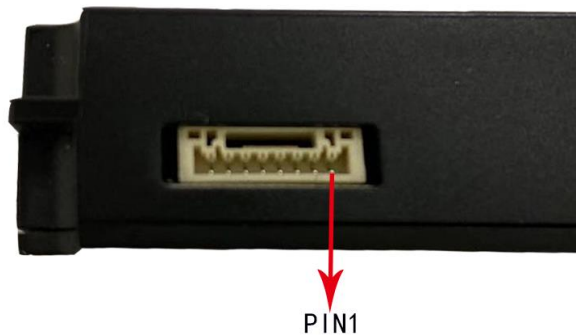


Figure 2 Connector Definition

Pin Number	Function	Description
PIN1	VCC	Positive Power (+5V)
PIN2	GND	Negative Power

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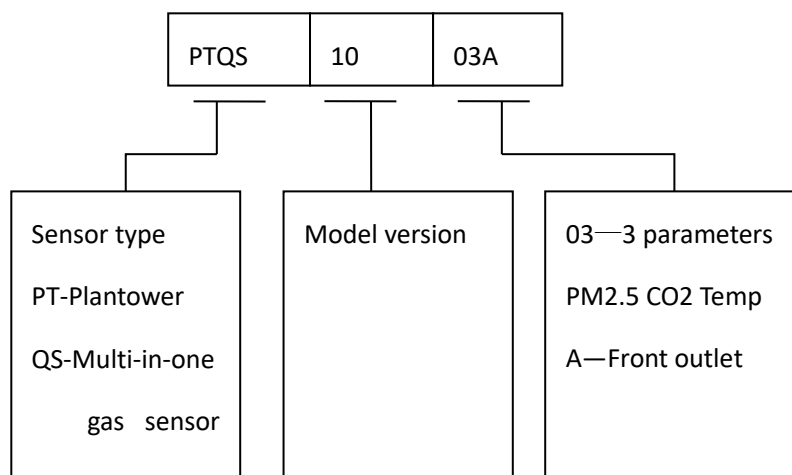
PIN3	SET	Set pin/TTL level@3.3V, high level or suspending is normal working status,while low level is sleeping mode.
PIN4	RXD/SCL	Serial port receiving pin/ I2C Clock pin /TTL level@3.3V
PIN5	TXD/SDA	Serial port sending pin/ I2C Data pin /TTL level@3.3V
PIN6	RESET	Module Set Signal/TTL level @3.3V, low reset
PIN7	SEL	Mode Selection pin/TTL level@3.3V,high level or suspending is UART,lowlevel I2C
PIN8	NC	

Note

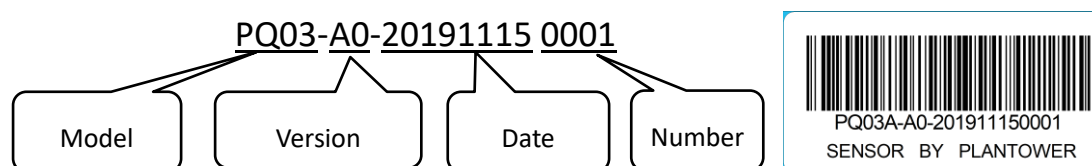
1. PTQS1003A requires 5V power supply, because the fan needs 5V drive. But other data communication and control pins require 3.3V. So the communication host board should be powered by 3.3V. If the board MCU supplies 5V, level conversion chip or circuit should be added to the communication line (Txd, Rxd) and the control line (SET, RESET).
2. SET, RESET with pull-up resister, if not used, they should be hung up.
3. PIN7 is used for switching communication mode, high level or hovering UART, low level I2C protocol.
4. PIN8 for the program internal debugging, the circuit should be hung up.

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5. Part Number Definition



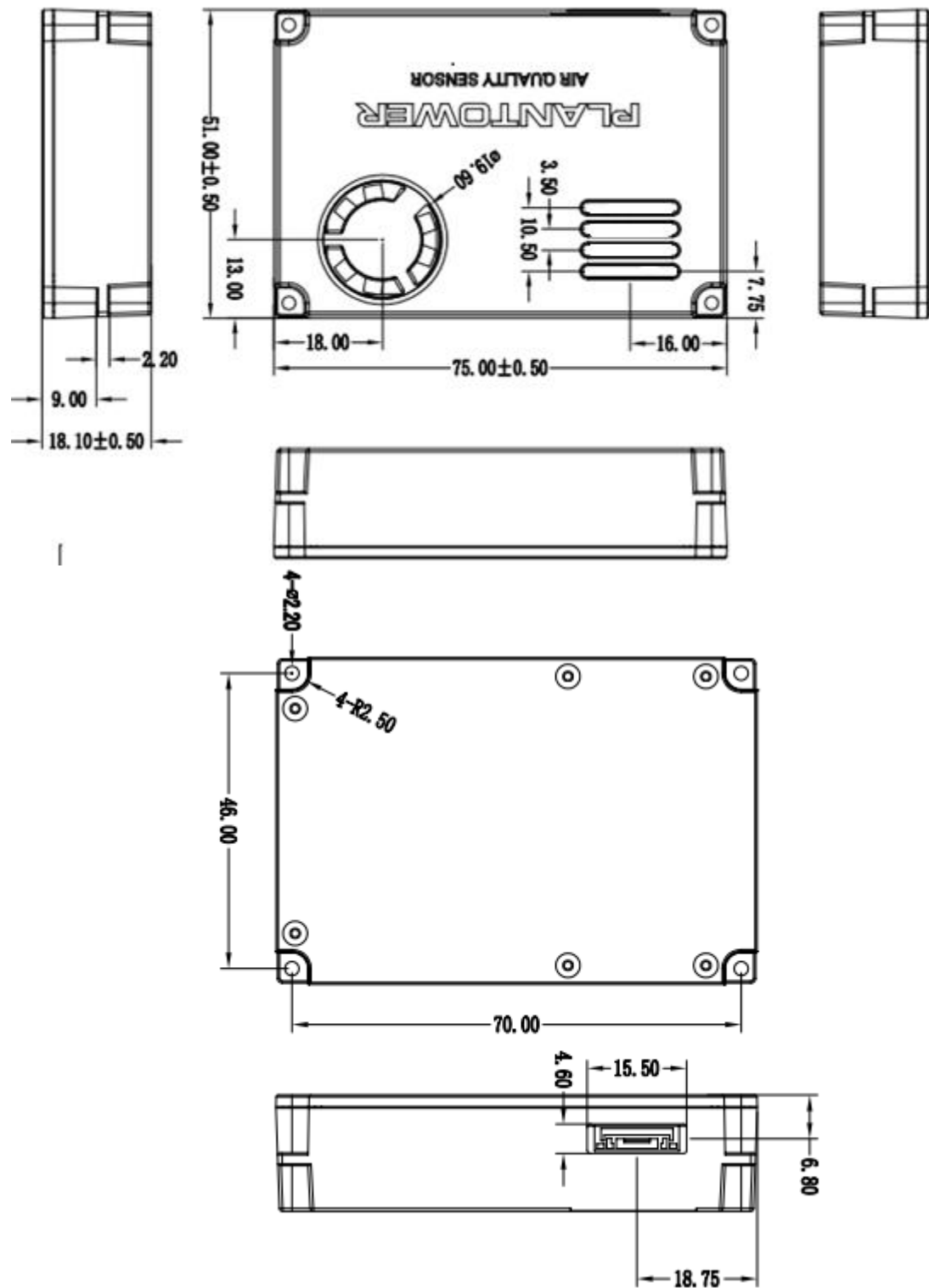
Label definition



Note: the version number in the label is the software and hardware version number, which can be read in the protocol. See UART transfer protocol for details.

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6. Physical Size

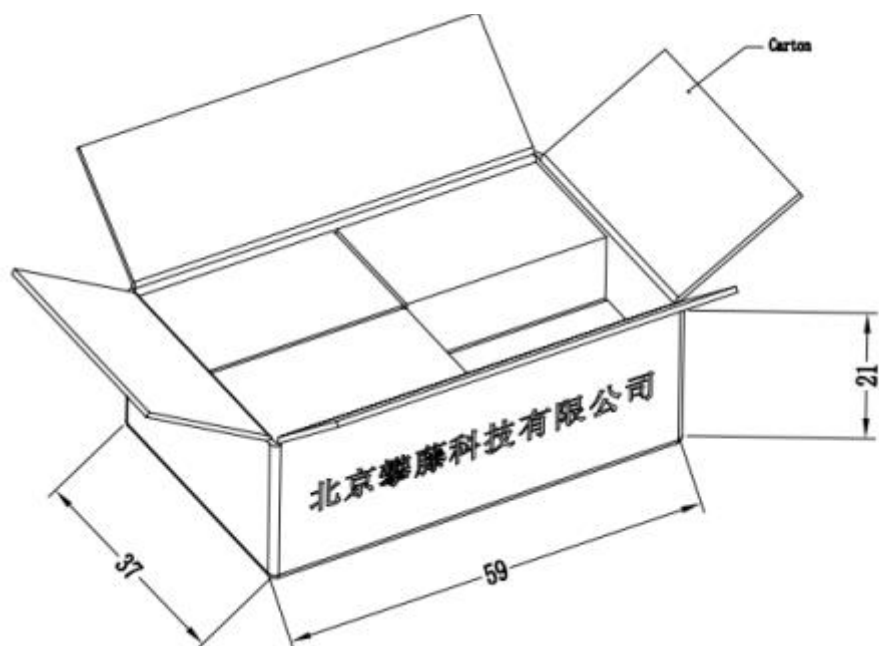
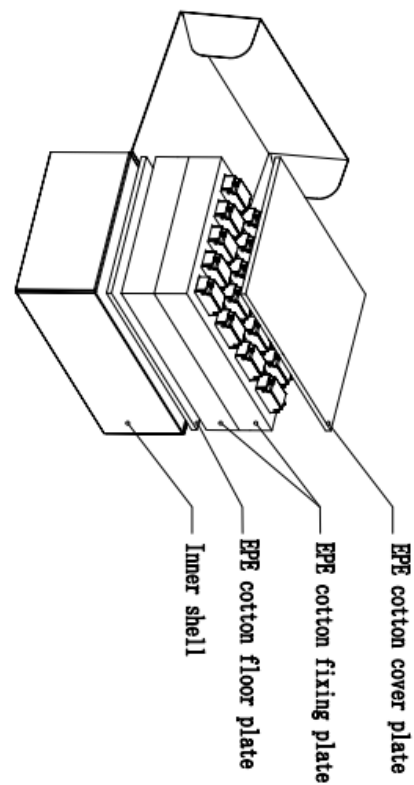
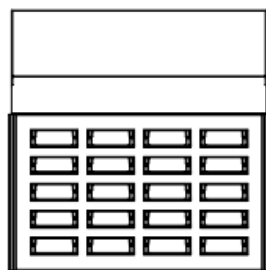
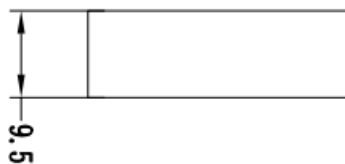
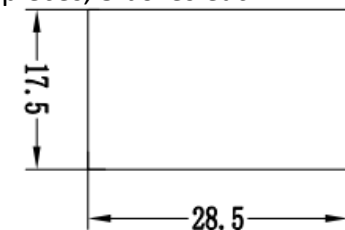


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7. Packaging information

A box of 20 pieces, 8 boxes each.

Description: 1. Number of cases: 20 per box.



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8. Attentions

Installation Attentions

- 1) Metal shell is connected to the GND so be careful not to let it shorted with the other parts of circuit except GND.
- 2) The best way of install is making the plane of inlet and outlet closely to the plane of the host. Or some shield should be placed between inlet and outlet in order to prevent the air flow from inner loop.
- 3) The blowhole in the shell of the host should not be smaller than the inlet.
- 4) The sensor should not be installed in the air flow way of the air cleaner or should be shielded by some structure.
- 5) The sensor should be installed at least 20cm higher than the grand in order to prevent it from blocking by the flock dust.
- 6) When the sensor is used to outdoor fixed equipment, the equipment should be completed for the protection of sandstorm,rain,snow,etc.
- 7) Do not break up the sensor.

Other Attentions

- 1) Only the consistency of all the PM sensors of PLANTOWER is promised and ensured. And the sensor should not be checked with any third party equipment.
- 2) The sensor is usually used in the common indoor environment. So some protection must be added if using in the conditions as followed:
 - a) The time of concentration $\geq 300\mu\text{g}/\text{m}^3$ is longer than 50% of the whole year or concentration $\geq 500\mu\text{g}/\text{m}^3$ is longer than 20% of the whole year.
 - b) Kitchen
 - c) Water mist condition such as bathroom or hot spring.
 - d) Outdoor

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9. UART Transport Protocol

(UART, 9600 ,N ,8, 1):

Host instruction:

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6
0x42	0x4D	CMD	DATAH	DATAL	LRCH	LRCL

The last two bytes are the 16bit check code, which is the sum of the first five bytes

CMD definition:

CMD	DATAH	DATAL	NOTE
0xab	X	X	Read data
0xac	X	X	Read full data
0xad	X	X	Read TSI data
0xf4	X	00H-Sleep 01H-Work	Sleep Mode

Eg Read data: 0x42,0x4D,0xAB,0x00,0x00,0x01,0x3A

a) Response instructions (0xab)

Byte number	Value	Instruction
0	0x42	Fixed byte 1
1	0x4D	Fixed byte 2
2	0x00	Frame length high 8 bits
3	0x14	Frame length low 8 bits Frame length=data(n)+check byte(2)
4		PM2.5 concentration(CF=1) unit high 8 bits

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5		PM2.5 concentration(CF=1) unit low 8 bits,unit ug/m ³
6		Reserve
7		Reserve
8		Reserve
9		Reserve
10		Reserve
11		Reserve
12		CO2 high 8 bits
13		CO2 low 8 bits, unit PPM
14		Temperature high 8 bits
15		Temperature low 8 bits Actual temperatrue=16bit data/10
16		Humidity high 8 bits
17		Humidity low 8 bits, actual humidity=16bit data/10
18	0	PM2.5 Error code
19	0	CO2 Error code
20	0	Reserve
21	0xA0	Version
22		Check code high 8 bits
23		Check code low 8 bits Check code=fixed 1 + fixed 2 + + reserved 4

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b) Response instructions (0xac)

Byte number	Value	Instruction
0	0x42	Fixed byte 1
1	0x4D	Fixed byte 2
2	0x00	Frame length high 8 bits
3	0x26	Frame length low 8 bits Frame length=data(n)+check byte(2)
4		PM1.0 concentration(CF=1) high 8 bits
5		PM1.0 concentration(CF=1) low 8 bits unit: ug/m ³
6		PM2.5 concentration(CF=1) high 8 bits
7		PM2.5 concentration(CF=1) low 8 bits unit: ug/m ³
8		PM10 concentration(CF=1) high 8 bits
9		PM10 concentration(CF=1) low 8 bits unit: ug/m ³
10		PM1.0 concentration (under atmospheric enviroment) high 8 bits
11		PM1.0 concentration (under atmospheric enviroment) low 8 bits unit: ug/m ³
12		PM2.5 concentration (under atmospheric enviroment) high 8 bits
13		PM2.5 concentration (under atmospheric enviroment) low 8 bits unit: ug/m ³
14		PM10 concentration (under atmospheric enviroment) high 8 bits

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15		PM10 concentration (under atmospheric enviroment) low 8 bits unit: ug/m ³
16		the number of particles with diameter beyond 0.3 um in 0.1 L of air high 8 bits
17		the number of particles with diameter beyond 0.3 um in 0.1 L of air low 8 bits
18		the number of particles with diameter beyond 0.5 um in 0.1 L of air high 8 bits
19		the number of particles with diameter beyond 0.5 um in 0.1 L of air low 8 bits
20		the number of particles with diameter beyond 1.0 um in 0.1 L of air high 8 bits
21		the number of particles with diameter beyond 1.0 um in 0.1 L of air low 8 bits
22		the number of particles with diameter beyond 2.5 um in 0.1 L of air high 8 bits
23		the number of particles with diameter beyond 2.5 um in 0.1 L of air low 8 bits
24		the number of particles with diameter beyond 5.0 um in 0.1 L of air high 8 bits
25		the number of particles with diameter beyond 5.0 um in 0.1 L of air low 8 bits
26		the number of particles with diameter beyond 10 um in 0.1 L of air high 8 bits
27		the number of particles with diameter beyond 10 um in 0.1 L of air low 8 bits

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28		Reserve
29		Reserve
30		Reserve
31		Reserve
32		Reserve
33		Reserve
34		CO2 high 8 bits
35		CO2 low 8 bits, unit PPM
36		Temperature high 8 bits
37		Temperature low 8 bits Actual temperatrue=16bit data/10
38		Humidity high 8 bits
39		Humidity low 8 bits Actual humidity=16bit data/10
40		Check code high 8 bits
41		Check code low 8 bits Check code=fixed 1 + fixed 2 + + humidity low 8 bits

c) Response instructions (0xad)

Byte number	Value	Instruction
0	0x42	Fixed byte 1
1	0x4D	Fixed byte 2
2	0x00	Frame length high 8 bits

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3	0x26	Frame length low 8 bits,Frame length=data(n)+check byte(2)
4		PM1.0 concentration(CF=1) high 8 bits
5		PM1.0 concentration(CF=1) low 8 bits unit: ug/m ³
6		PM2.5 concentration(CF=1) high 8 bits
7		PM2.5 concentration(CF=1) low 8 bits unit: ug/m ³
8		PM10 concentration(CF=1) high 8 bits
9		PM10 concentration(CF=1) low 8 bits unit: ug/m ³
10		PM1.0 concentration (TSI) high 8 bits
11		PM1.0 concentration (TSI) low 8 bits unit: ug/m ³
12		PM2.5 concentration (TSI) high 8 bits
13		PM2.5 concentration (TSI) low 8 bits unit: ug/m ³
14		PM10 concentration (TSI) high 8 bits
15		PM10 concentration (TSI) low 8 bits unit: ug/m ³
16		the number of particles with diameter beyond 0.3 um in 0.1 L of air high 8 bits
17		the number of particles with diameter beyond 0.3 um in 0.1 L of air low 8 bits
18		the number of particles with diameter beyond 0.5 um in 0.1 L of air high 8 bits
19		the number of particles with diameter beyond 0.5 um in 0.1 L of air low 8 bits
20		the number of particles with diameter beyond 1.0 um in 0.1 L of air high 8 bits
21		the number of particles with diameter beyond 1.0 um in 0.1 L of air low 8 bits

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22		the number of particles with diameter beyond 2.5 um in 0.1 L of air high 8 bits
23		the number of particles with diameter beyond 2.5 um in 0.1 L of air low 8 bits
24		the number of particles with diameter beyond 5.0 um in 0.1 L of air high 8 bits
25		the number of particles with diameter beyond 5.0 um in 0.1 L of air low 8 bits
26		the number of particles with diameter beyond 10 um in 0.1 L of air high 8 bits
27		the number of particles with diameter beyond 10 um in 0.1 L of air low 8 bits
28		Reserve
29		Reserve
30		Reserve
31		Reserve
32		Reserve
33		Reserve
34		CO2 high 8 bits
35		CO2 low 8 bits, unit PPM
36		Temperature high 8 bits
37		Temperature low 8 bits Actual temperatrue=16bit data/10
38		Humidity high 8 bits
39		Humidity low 8 bits Actual humidity=16bit data/10

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40		Check code high 8 bits
41		Check code low 8 bits Check code=fixed 1 + fixed 2 + + humidity low 8 bits

Note: CF=1 should be used in the factory environment.