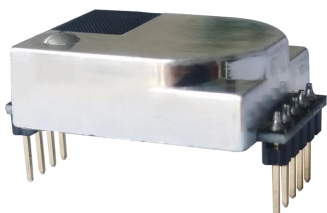


Product Instruction Manual

	Product Name: Carbon Dioxide Sensor
	Product Model: FS00302
	Specification Version:v2.09
	Spec Status: <input type="checkbox"/> sample <input type="checkbox"/> mass-product
	Sample Spec : suitable for small batch trial production of products
	Mass Production Spec: Suitable for mass production of products

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Buyer		Vendor		
Confirmation	Date	Production	Verify	Approve

Remark: We have improvement adjustment, without affecting the customer's use, we will not make any further notice, please raise any objection.

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1. Product overview

1.1 Detection principle

The non-dispersive infrared (NDIR) principle is used to detect the presence of CO₂ in the air. When infrared light passes through, the intensity of light transmitted by CO₂ molecules at a particular wavelength is significantly reduced, the degree of intensity attenuation being dependent on the gas concentration, the relationship between the two following the Lambert-Bier law.

1.2 Product description

FS00302 is an intelligent carbon dioxide gas sensor that combines NDIR detection technology with optical circuitry and circuitry to give excellent selectivity and no oxygen dependence. Long service life and stable data output; supports digital output and analogue voltage output for ease of use.

2. Product characteristic

- ✚ Gold plated air chamber, water and corrosion resistant
- ✚ Resistant to water vapour interference and non-toxic
- ✚ High sensitivity and strong anti-interference ability
- ✚ Full range of temperature compensation, excellent linear output
- ✚ Long service life and low power consumption

3. Fields of application

- ✚ Air quality monitoring equipment
- ✚ Portable instruments and meters
- ✚ Fresh air systems, air conditioners, smart home equipment
- ✚ Hospitals, hotels, schools and other public places

4. Technical specification

Electric Parameter	Technical Specification	
Type of detection	Carbon dioxide gas	
Range of test	400~5000ppm (Scalable to 10000ppm)	
Detection accuracy	Min. resolution	1ppm
	Data accuracy	400~5000ppm: $\pm(50+3\%\text{reading})$
		400~10000ppm: $\pm 10\%\text{reading}$
Batch consistency	$\geq 90\%$	
Operating voltage	DC 4.5V~5.5V	
Operating current	150mA (@5V Electricity supply)	
Stable time	30s	
Detection frequency	Data updated 1 time per second (default)	
Output method	Default output	UART (3.3V_TTL level)
	Optional	DAC (0.4V~2V)
Service life	> 10 years (in air)	
Reference size	32.6x20.1x9.0 mm	

Table 1

Environmental Parameter	Technical specification
Operating temperature	0°C~50°C
Operating humidity	15%RH~95%RH (No condensation)
Storage temperature	-10°C~ 50°C
Storage humidity	0~99%RH (No condensation)

Table 2

5. Pin definition



Figure 3 pin spacing 2.54mm

PIN	Definition	Explanation
01	Vout	Power supply output 3.3V, output current less than 10mA
02	TXD	UART-RXD (data input @3.3V)
03	RXD	UART-TXD (data output @3.3V)
04	DAC	analogue voltage (reserve)
05	HD	Zero calibration, low level requires more than 7 seconds to be valid
06	Vin	voltage input 3.7V~6V
07	GND	grounding terminal
08	AOT	reserve
09		

Table 4

6. Communication protocol

6.11 UART Communication Protocol (default)

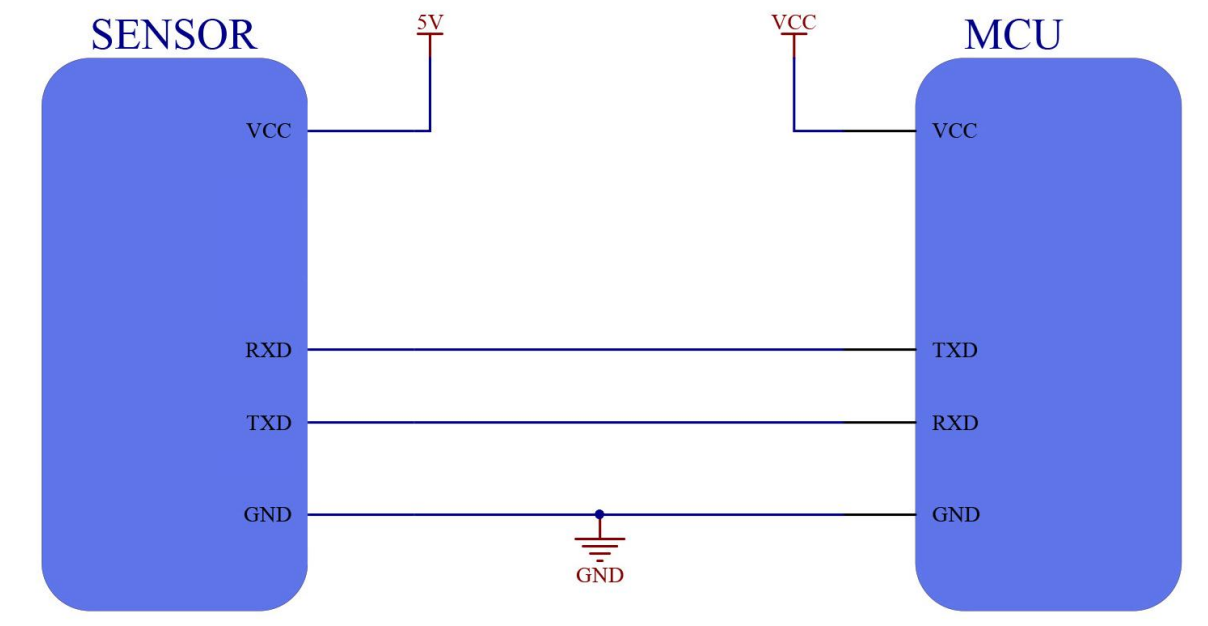


Figure 5 application circuit

6.12 UART General Setting

Baud rate	9600
Data bit	8 bits
Stop bit	1 bit
Check bit	None

Table 6

6.13 UART Communication Order

Read the gas concentration value in the following format:

order word	0xA0	read the concentration value							
send	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7	DATA8
	order header	addresses	order	undefined					calibration value
	0xFF	0x01	0xA0	-	-	-	-	-	**
example	send: ff 01 a0 00 00 00 00 00 5f								

Table 7

	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7	DATA8
send	order header	addresses	order	undefined	concentration value		undefined		calibration value
	0xFF	0x01	0xA0	-	H	L	-	-	**
example	Return: FF 01 A0 A1 01 E9 14 11 AF (indicates that the concentration is 0x01e9, or 489ppm)								
remark	The order header must be 0xFF, the address is reserved for variable values, the order must be 0xA0, all bytes are case-insensitive								

Table 8

The concentration value correction format is as follows:

order word	0xA8	concentration correction							
	DATA0	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7	DATA8
send	order header	addresses	order	concentration value		undefined			concentration value
	0xFF	0x01	0xA8	H	L	-	-	-	**
example	For example send: FF 01 A8 02 58 00 00 00 FD (target value is 0x0258,i.e. 600ppm), the sensor will adjust to 600ppm								
remark	Make sure the current ambient concentration is close to the target value and stable for at least 2 minutes before sending this command. The target value is between 400 and 1500ppm.								

Table 9

6.14 Auto Calibration Function

1.The automatic calibration function means that after a period of continuous operation, the sensor intelligently determines the zero point and calibrates itself according to the ambient concentration. The calibration period is once every 24 hours from power-on operation. The zero point for automatic calibration is 400ppm.

2.The auto-zero function is suitable for use in office environments and home environments. However, it is not suitable for agricultural greenhouses, farms, cold storage and other places. In such places, the automatic zero calibration function should be switched off, and after it is switched off, the user is requested to carry out zero detection on the sensor regularly, and carry out command zero calibration or manual zero calibration when necessary.

3.The automatic calibration function is enabled by default, and it is not supported for users to manually disable it. Please contact our company before purchasing to choose whether to disable this function.

6.15 UART Calibration Algorithm

calibration value = (fetch the opposite(DATA1+DATA2+.....+DATA7))+1

An example of the procedure is as follows:

```
/******
```

* Name: check_sum(u8 *str, u8 length)

* Function: The data at the address pointed to by *str, whose length is length, is summed and

inverted+1 check

```
*****/
```

```
u8 check_sum(u8 *str, u8 length)
```

```
{
    u8 i,j,sum;
    sum = 0;
    for(i=0;i<length;i++)
    {
        j = *(str+i);
        sum = (u8)(sum + j);
    }
    sum = (u8)(~sum+1);
    return( sum );
}
```

6.2 DAC Communication Protocol (reserve)

DAC voltage 0.4~2V Corresponding to 0~full range, linear output

Example: The range is 0~1.5mg/m³, DAC output 1.2V, corresponding concentration is:

0.75mg/m³

Table 10

8. Reliability test

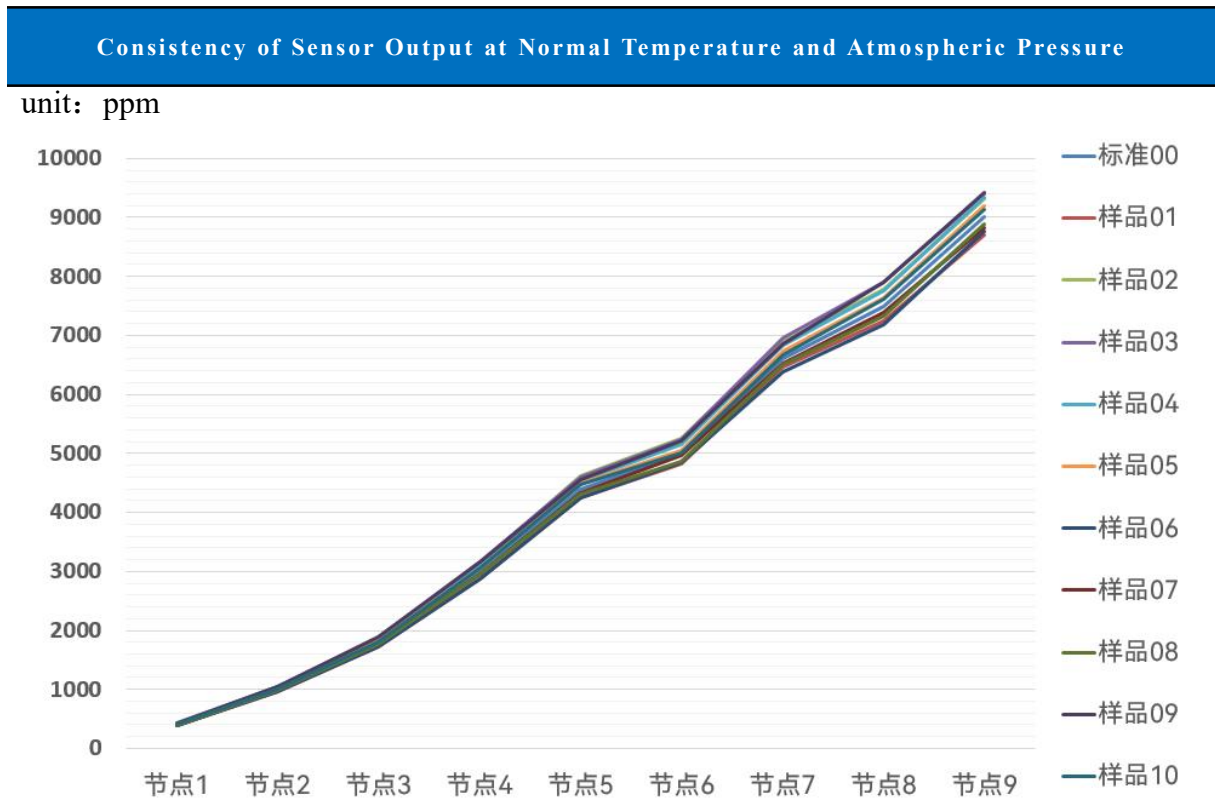


Figure 12

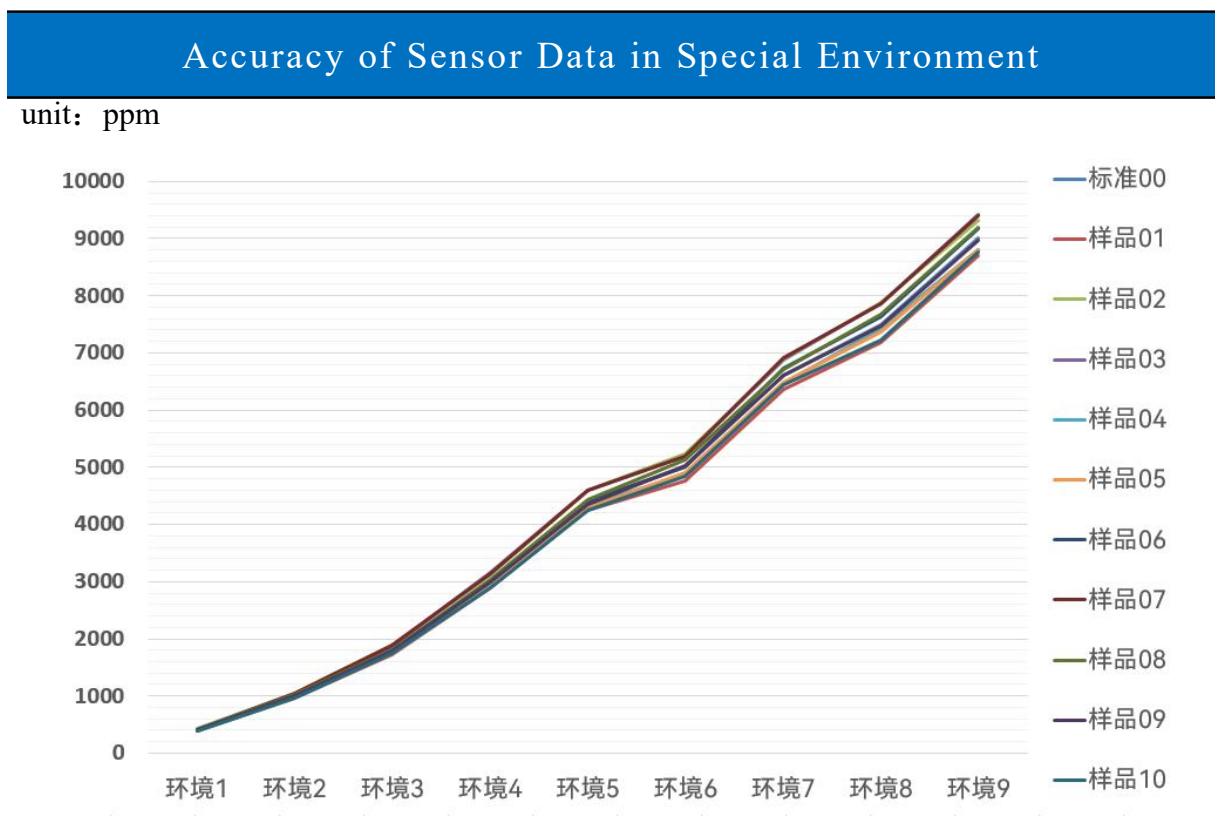


Figure 13

Test Items	Test Condition	Standard	Number of Samples : N
			Number of Defects : C
low temperature storage	The sensor is stored unenergised at $-30\pm 2^{\circ}\text{C}$ for 72 hours and then placed in a normal temperature environment to measure the error.	After 2 hours of recovery in the normal temperature environment, the sensor should work normally.	N=5 C=0
High temperature storage	The sensor is stored unenergised at $60\pm 2^{\circ}\text{C}$ for 72 hours and then placed in a normal temperature environment to measure the error.	After 2 hours of recovery in the normal temperature environment, the sensor should work normally.	N=5 C=0
Low temperature work	The sensor is placed in a low temperature environment of $-10\pm 2^{\circ}\text{C}$, the rated voltage is applied and the sensor is operated for 72 hours and then placed in a normal temperature environment to measure the measurement error of the sensor.	After 2 hours of recovery in the normal temperature environment, the sensor should work normally.	N=5 C=0
High temperature work	The sensor is placed in a high temperature environment of $50\pm 2^{\circ}\text{C}$, the rated voltage is applied and the sensor is operated for 72 hours and then placed in a normal temperature environment to measure the measurement error of the sensor.	After 2 hours of recovery in the normal temperature environment, the sensor should work normally.	N=5 C=0
High and low temperature shock	After holding at -30°C for 60 minutes, switch to 60°C within 10 s and keep it for another 60 minutes, repeating the cycle 10 times. During the test, the sample was not energized.	After 2 hours of recovery in the normal temperature environment, the sensor should work normally.	N=5 C=0
High temperature and humidity work	Place the sensor in an environment of $45\pm 2^{\circ}\text{C}$, $90\pm 5\%\text{RH}$, and work with the maximum voltage (within the acceptable working voltage range) for 72 hours.	After 2 hours of recovery in the normal temperature environment, the sensor should work normally.	N=5 C=0
Salt spray test	According to GB/T2423.17, place the sensor in a salt spray box at 35°C and spray it with 5% sodium chloride brine for 24 hours. After the experiment, it was washed with distilled water and air-dried.	Recovery should be no less than 1h and no more than 2h in a standard environment, with no ill appearance or corrosion.	N=2 C=0
Vibration	The bare machine in the X / Y / Z axis should be able to withstand vibration tests under the following conditions: Frequency range: 10~55~10 Hz/min. Amplitude of vibration: 1.5 mm. Scan period: 2H	After the test, there should be no defects in appearance. The sensor meets basic performance test criteria.	N=4 C=0
Package drop	Drop height: Set the height according to the weight height specified in GB/T4857.18. Test in accordance with GB/T4857.5 Packaging and transport packaging drop test method. The order of the drop test is one corner, three lines and six sides.	After the package drop test, the sensor should have no bad appearance, no parts fall off, and the sensor should work normally.	N=1 box C=0

Table 14

9. Caution

- ✦ During the welding, installation and use of the sensor, the gold-plated plastic cavity should be protected from pressure in any direction.
- ✦ If the sensor is to be placed in a small space, this space should be well ventilated, in particular the two diffusion windows should be in a well ventilated position.
- ✦ The sensor should be kept away from heat sources and protected from direct sunlight or other thermal radiation.
- ✦ The sensor should be calibrated regularly, with a recommended calibration interval of no more than 6 months.
- ✦ Do not use the sensor in densely dusty environments for long periods of time.
- ✦ In order to ensure that the sensor can work normally, the power supply voltage must be kept in the range of 4.5V~5.5V DC, and the power supply current must not be less than 150mA. If it is not within this range, the sensor will fail (the output concentration of the sensor is too low or the sensor cannot work normally) .

10. Packaging scheme

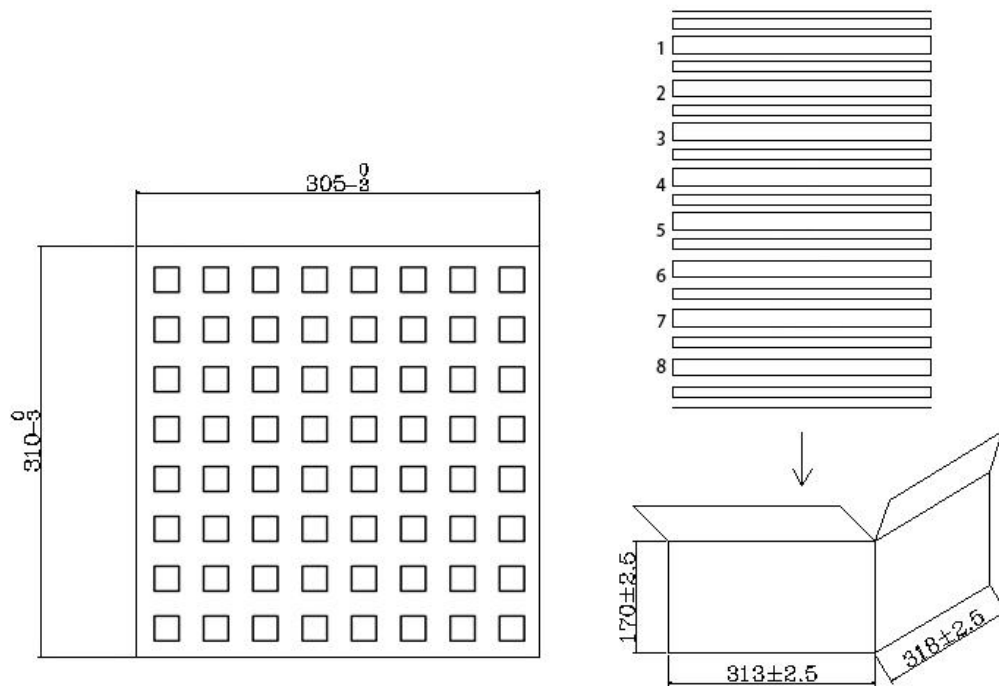


Figure 15

Number per floor	Number of floor	Complete box	Carton size	Packaging material	Weight per box
64 pcs	8	512 pcs	W318*L313*H170 mm	Red pearl cotton(EPE)	3.5 kg

Table 16

11. Model naming rule

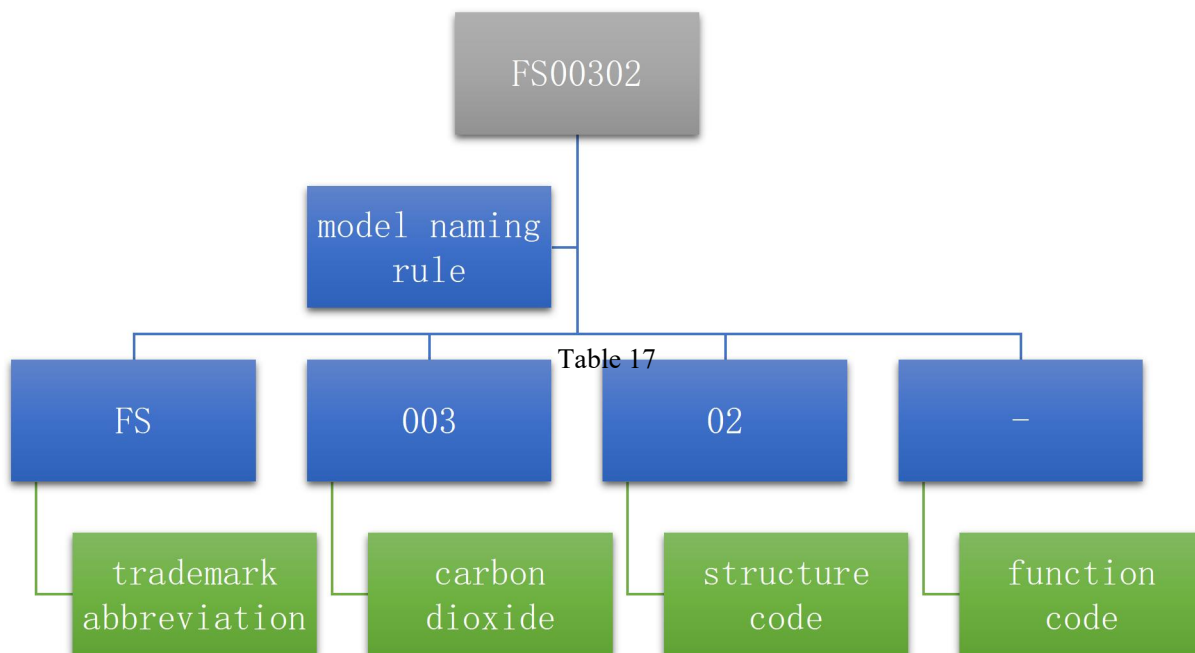


Table 17