Electrochemical Gas Module

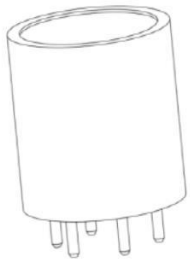
Gravity gas sensors are equipped with high-performance, general-purpose electrochemical series modules.It uses three electrodes,electrochemical gas sensor and high-performance micro-processor. By installing different gas sensor,the module could detect relevant gas. It is with built-in temperature sensor to make temperature compensation, which makes it could detect the gas concentration accurately. It has the digital output and analog voltage output at the same time which facilities the usage and calibration and shorten the development period. It is a combination of mature electrochemical detection principle and sophisticated circuit design, to meet customers' different detection needs.

Features

High sensitivity & resolution
Low power consumption
UART and analog voltage output
Good stability and excellent anti-interference ability

Main Application

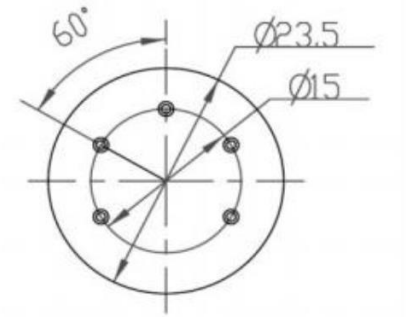
Portable and fixed gas detector, various gas detection equipment and situation.

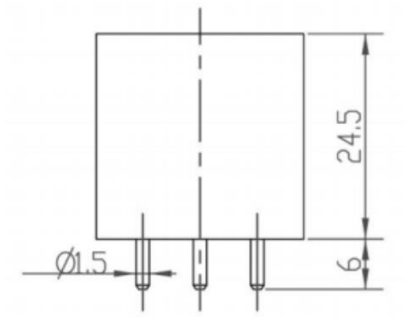


Technical Parameters

Stable1.

Target Gas	CO、O2、NH3、H2S、NO2、HCL、H2、PH3、SO2、O3、CL2、HF
Measurement Range	Refer stable 2.(can be customized also)
Working Voltage	DC 5±0.1V
Working Current	＜5 mA
Output Data	UART Output (TTL electrical level,3V)
	Analog Voltage(refer stable2. for sensor original amplifying signal)
Working Life	2 year
Operating Environment	Temp.: -20～50℃
	Humidity.: 15%RH-90％RH(no condensation)
Storage Environment	Temp.: 20～25℃
	Hum.: 30%RH-70％RH
Size	Ø23.5mm*24.5mm





Detection range and signal output

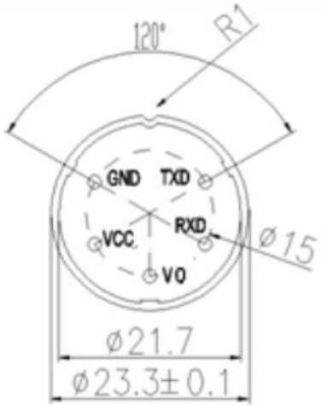
stable2.

Detection gas	CO	O2	NH3	H2S	NO2	HF	SO2	CL2	O3
Detection range	0-1000 ppm	0-25% vol	0-100 ppm	0-100 ppm	0-20 ppm	0-10 ppm	0-20 ppm	0-10 ppm	0-20 ppm
Decimal point of serial port	null	1 byte	null	null	1 byte	Null	1 byte	1 byte	1 byte
Voltage output	0.6-3V	1.5-0V	0.6-3V	0.6-3V	2-0V	2-0V	0.6-3V	2-0V	2-0V
Response Time	⩽20s	⩽15s	⩽150s	⩽30s	⩽25s	⩽60s	⩽30s	⩽60s	⩽120s

Left side value of detection range (zero point) is corresponding to left side value of voltage output range ,but right side value of detection is not corresponding to the right side value of voltage output range. Take O2 (0-25%vol) as an example: 0%vol is corresponding to 1.5V, but the corresponding 25% vol value should refer to the actual test value in the wiki, not 0V.

Pin definition stable3.

GND	Ground
VCC	Power supply
VO	Voltage output
RXD	Series port input
TXD	Series port output



Bottom view

The meaning of V0 (Vout) : It means original voltage (linear) after amplifying circuit, rather than concentration value of current environment. Users can calculate gas concentration of current environment based on Vout0 and Vout1. Take CO for example: zero voltage Vout0 = 0.6 V; in 200ppm CO gas,Vout1=0.9V, If the current voltage Voutx=1.2V, then the CO concentration(The Vout1 voltage is based on the measured value provided in the wiki.):

$$N=\frac{200}{Vout1-Vout0}*(Voutx-Vout0)=400ppm.$$

Communication Protocol

1.General Settings

Baud Rate	9600
Data Bits	8 bytes
Stop Bits	1 byte
check bits	1 byte

2.Communication Specification

The default communication type is active upload and it sends gas concentration every other one second (the concentration is 16 hexadecimal). Send 0x78 command to change communication type. After changing the communication type to 0x04 (Q&A type), only by receiving the 0x86 command (reading concentration value command), current concentration value can be sent. Communication cycle is 1s.

3.Commands

Active sending mode

Receive	0	1	2	3	4	5	6	7	8
	Start byte	Command	Gas concentration		--	--	--	--	Checksum
	0xFF	0x86	High byte	Low byte	0	0	0	0	7A
EXP.	FF 86 00 00 00 00 00 7A(concentration is 0)								

gas concentration=(High bytex256+Low byte)

Please note that in the above calculation formula, the High byte and Low byte means the decimalism value changed from hexadecimal.

0X78—to change the communicate type (communication type: 0x03 is active upload type, 0x04 is Q&A type)

1	0x78	Change communication type							
Upload	0	1	2	3	4	5	6	7	8
	Start Byte	Address	Demand	Communication Type	--	--	--	--	Checksum
	0XFF	0X01	0x78	0x03	0	0	0	0	0x84
EXP.	FF 01 78 03 00 00 00 00 84 (switch to active upload type)								
Receive	0	1	2	3	4	5	6	7	8
	Start Byte	Command	Return calibration	--	--	--	--	--	Checksum
	0XFF	0X78	Success: 1 Failure: 0	0	0	0	0	0	0x84
EXP	FF 78 01 00 00 00 00 00 87								

If switch to Q&A type, send FF 01 78 04 00 00 00 00 83(hexadecimal).

0x86 — To read the concentration value

1	0x86	Change communication type							
Upload	0	1	2	3	4	5	6	7	8
	Start Byte	Address	Command	--	--	--	--	--	Checksum
	0XFF	0X01	0x86	0	0	0	0	0	0x79
EXP.	FF 01 86 00 00 00 00 00 79								
Receive	0	1	2	3	4	5	6	7	8
	Start Byte	Command	Concentration value		--	--	--	--	Checksum
	0XFF	0X86	High byte	Low byte	0	0	0	0	--
EXP.	FF 86 00 00 00 00 00 00 7A (concentration value is 0)								

For CO, NH3, H2S, HF, the concentration =(High bytex256+Low byte)ppm
For O2, NO2, SO2, O3, CL2, the concentration=(High bytex256+Low byte)x0.1 ppm
Please note that in the above calculation formula, the High byte and Low byte means the decimalism value changed from hexadecimal.
For example: Original high byte is 1B and original low byte is 2C.
1B is hexadecimal and it is 27 after changing to decimalism.
2C is hexadecimal and it is 44 after changing to decimalism.
Concentration=27x256+44 or Concentration=(27x256+44)x0.1

4.Checksum and calculation

```
/**********************************************************************
* Function Name: ucharFucCheckSum (uchar *i,ucharln)
* Functional description: Sum check【Take Non(Byte1+Byte2+…Byte7) +1】

**********************************************************************/
unsigned char FucCheckSum(unsigned char *i,unsigned char ln)
{
    unsigned char j,tempq=0;
    i+=1;
    for(j=0;j<(ln-2);j++)
    {
        tempq+=*i;
        i++;
    }
```

```
        tempq=(~tempq)+1;

        return(tempq);

    }
```

Cautions

1. Please do not take away or plug the sensor in the module.
2. It is prohibited to weld the pins of the module. The socket could be welded.
3. Sensor shall avoid organic solvent, coatings, medicine, oil and high concentration gases.
4. Excessive impact or vibration should be avoided.
5. Please keep the modules warming up for at least 5 minutes when first using.
6. Please do not use the modules in systems which related to human being's safety.
7. Please do not use the modules in strong air convection environment.
8. Please do not expose the modules in high concentration organic gas for a long time.
9. Returned data of module serial port is real-time density of current environment, without standard gas, please do not use standard command, for it will cause calibrated data and returned data of serial port to zero.
10. To judge whether module communication is normal, it is advisable to use tools that can change USB to TTL(communication level 3V), debug assistant software via serial port, and determine it by communication protocol.
11. When choosing module, users should choose products of different applications and ranges. If there is no special requirement, products will use conventional range.

Cross Interference Characteristics

The sensor also responds to gases other than the target gas. The response characteristics of the sensor for several common interfering gases are listed in the table below for reference. The data in the table are typical responses for the interfering gases at a given concentration.

SEN0466 - CO

Gas	Concentration	CO
H2S	100ppm	0ppm
SO2	20ppm	0ppm
H2	200ppm	100ppm
C2H4	100ppm	100ppm
NO	35ppm	9ppm
NO2	5ppm	2ppm

SEN0467 - H2S

Gas	Concentration	H2S
CO	200ppm	< 0.5ppm
CL2	10ppm	< -0.7ppm
C2H4	400ppm	< 0.3ppm
H2	10000ppm	< 16ppm
C2H5OH	1000ppm	< 0.3ppm
NH3	50ppm	<-0.3ppm
SO2	20ppm	< 1.6ppm
PH3	20ppm	< 14ppm
HCHO	10ppm	< 2.5ppm
C6H6	100ppm	< 0.2ppm
CH3OH	200ppm	< 0.15ppm

SEN0468 - CL2

Gas	Concentration	CL2
H2S	15ppm	< -3ppm
CO	200ppm	0ppm
NO	35ppm	0ppm
SO2	5ppm	0ppm
HCN	10ppm	0ppm
H2	400ppm	0.1ppm
C2H4	400ppm	0.1ppm
HCL	5ppm	0ppm
CO2	5%	0
NH3	20ppm	0.1ppm

SEN0469 - NH3

Gas	Concentration	NH3
CO	200ppm	< -6ppm
H2S	50ppm	< 25ppm
CL2	10ppm	< -7ppm
C2H4	100ppm	0ppm
H2	10000ppm	< 14ppm
C2H6O	1000ppm	< 20ppm
SO2	20ppm	< 9ppm
PH3	20ppm	< 18ppm
HCHO	10ppm	< 38ppm
C6H6	100ppm	< 0.7ppm
CH3OH	200ppm	< 4ppm

SEN0470 - SO2

Gas	Concentration	SO2
CO	200ppm	< 2.5ppm
H2S	50ppm	< 0.15ppm
CL2	10ppm	< -0.6ppm
C2H4	130ppm	5ppm
H2	400ppm	< 1ppm
C2H6O	1000ppm	< 1.5ppm
NH3	50ppm	< 0.1ppm
PH3	20ppm	< 3ppm
HCHO	10ppm	<18ppm
C6H6	100ppm	0ppm
CH3OH	200ppm	< 0.1ppm

SEN0471 - NO2

Gas	Concentration	NO2
H2S	15ppm	< -3ppm
CO	300ppm	0ppm
SO	35ppm	0ppm
CL2	5ppm	≈5ppm
SO2	5ppm	0ppm
HCN	10ppm	0ppm
HCL	5ppm	0ppm
C2H4	50ppm	< 5ppm
NH3	20ppm	< 2ppm

SEN0472 - O3

Gas	Concentration	O3
CL2	3ppm	1ppm
H2S	15ppm	< -1ppm
CO	300ppm	0ppm
SO2	5ppm	0ppm
HCN	10ppm	0ppm
HCL	5ppm	0ppm
SO	35ppm	0ppm
NO2	5ppm	2ppm
H2	500ppm	0ppm
C2H4	100ppm	0ppm

SEN0473 - H2

Gas	Concentration	H2
H2S	15ppm	4ppm
SO2	5ppm	0ppm
CO	200ppm	30ppm
SO	35ppm	10ppm
NO2	5ppm	0.5ppm
CL2	10ppm	0ppm
HCL	5ppm	0ppm
SO2	5ppm	0ppm
C2H4	100ppm	85ppm

SEN0474 - HCL

Gas	Concentration	HCL
CO	200ppm	< 2ppm
NO2	5ppm	≈-5ppm
CL2	10ppm	< -10ppm
CH4	400ppm	0ppm
SO	35ppm	0ppm
H2	500ppm	< 2ppm
HCN	10ppm	< 0.2ppm
C2H4	100ppm	< 6ppm
H2S	15ppm	29ppm

SEN0475 - HF

Gas	Concentration	HF
CO	200ppm	0ppm
SO2	10ppm	≤1ppm
CL2	10ppm	≈5ppm
CH4	1000ppm	0ppm
CH3COOH	100ppm	100ppm
C2H5OH	1000ppm	0ppm
HCL	10ppm	6ppm

SEN0476 - PH3

Gas	Concentration	HF
CO	200ppm	< 0.4ppm
H2S	50ppm	< 15ppm
CL2	10ppm	< -0.5ppm
C2H4	130ppm	< 0.7ppm
H2	400ppm	< 0.2ppm
C2H5OH	1000ppm	< 0.3ppm
NH3	50ppm	< 0.05ppm
SO2	20ppm	< 3.5ppm
HCHO	10ppm	< 3.5ppm
C6H6	100ppm	< 0.15ppm
CH3OH	200ppm	< 0.02ppm