

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 facilitates 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



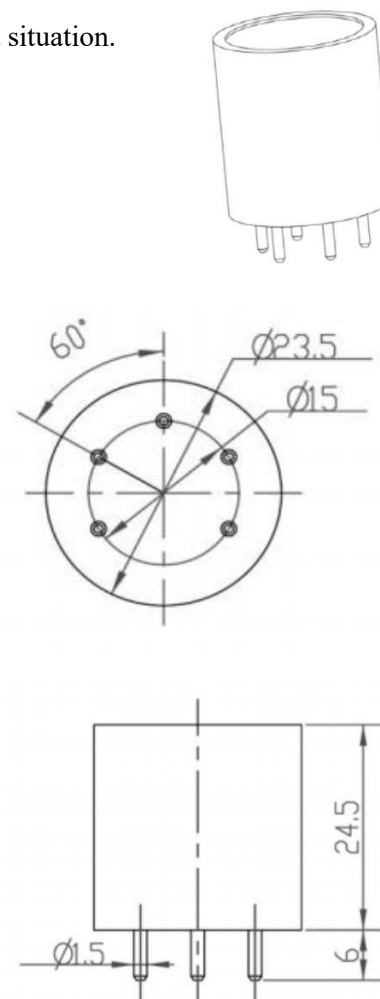
Main Application

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

Technical Parameters

Stable1.

| | |
|-----------------------|---|
| Target Gas | CO、O ₂ 、NH ₃ 、H ₂ S、NO ₂ 、HCL、H ₂ 、PH ₃ 、SO ₂ 、O ₃ 、CL ₂ 、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

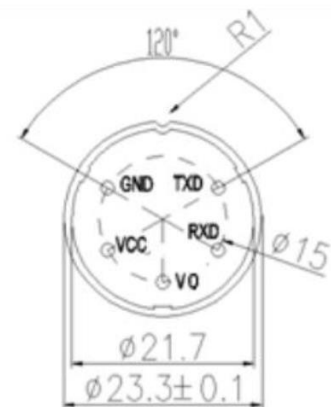
stable2.

| 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.):

$$N = \frac{200}{V_{out1} - V_{out0}} * (V_{outx} - V_{out0}) = 400\text{ppm.}$$

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 00 7A(concentration is 0) | | | | | | | | |

gas concentration=(High byte \times 256+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 | | | | | | | |
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | Start Byte | Address | Demand | Communication Type | -- | -- | -- | -- | Checksum |
| Upload | 0xFF | 0X01 | 0x78 | 0x03 | 0 | 0 | 0 | 0 | 0x84 |
| EXP. | FF 01 78 03 00 00 00 00 84 (switch to active upload type) | | | | | | | | |
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| | Start Byte | Command | Return calibration | -- | -- | -- | -- | -- | Checksum |
| Receive | 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 byte \times 256+Low byte)ppm

For O2, NO2, SO2, O3, CL2, the concentration=(High byte \times 256+Low byte) \times 0.1 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=27 \times 256+44 or Concentration=(27 \times 256+44) \times 0.1

4.Checksum and calculation

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

```
* Function Name: ucharFucCheckSum (uchar *i,uchar ln)
```

```
* 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.