



Electrochemical Gas Detection Module

User's Manual V1.2

(Model: ZE12)

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Zhengzhou Winsen Electronics Technology Co., Ltd

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Zhengzhou Winsen Electronics Technology CO., LTD

Electrochemical Detection Module ZE12

ZE10 is a general-purpose and high-performance electrochemical module. It can detect the CO、SO2、NO2、O3 based on electrochemical principle, it has good selectivity and stability. A temperature sensor is built-in for temperature compensation. 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 & long working life
- UART, analog voltage and PWM output
- Good stability and excellent anti-interference ability

Main Application

City atmospheric environmental monitoring , enterprise environment monitoring, Factory area unorganized emission monitoring, emergency monitoring, environment evaluation monitoring, Portable gas detector, various gas detection equipment and smart home appliance.



Technical Parameters

| | |
|-----------------------|--|
| Model No. | ZE12 |
| Target Gas | CO, H2S, NO2, SO2, O3 |
| Preheat time | ≤5 Min |
| Response time | ≤30 Sec |
| Resume time | ≤30 Sec |
| Resolution | ≤10ppb |
| Working Voltage | DC 5.0V±0.1V |
| Output Data | DAC(0.4~2V) standard voltage signal |
| | UART Output(3V level, compatible with 5V) |
| | PWM Output |
| Dimension | Φ39×44 mm |
| Weight | 75g |
| Operating Environment | Temp.: -20~50°C |
| | Humidity.: 15%RH-90% RH (no condensation) |
| Storage Environment | Temp.: -20~50°C |
| Lifespan | 2 year(in air) |

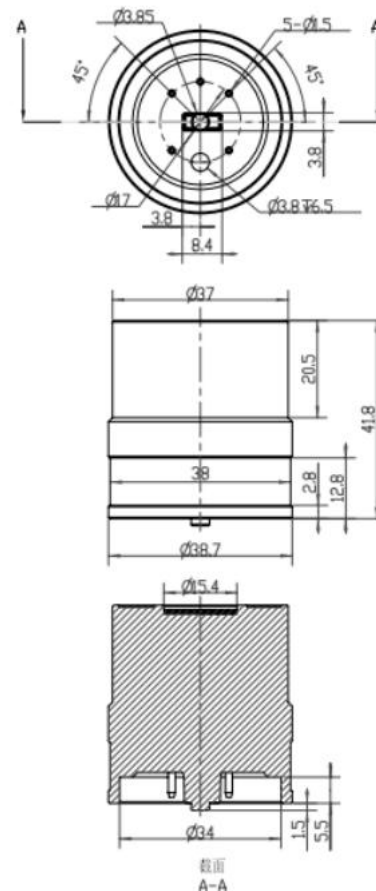


Figure 1:Module chart

Pin definition

Table 2.

| | |
|------|-----------------------|
| Pin1 | Vout (0.4~2 V) |
| Pin2 | GND |
| Pin3 | Vin (Voltage input) |
| Pin4 | UART(TXD) data output |
| Pin5 | UART(TXD) data input |

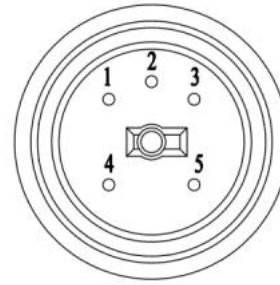


Figure 2: Module bottom view

Detection range and signal output

| | | | | | |
|-----------------|-----------|--------|--------|--------|--------|
| Detection gas | CO | H2S | SO2 | NO2 | O3 |
| Detection range | 0-12.5ppm | 0-2ppm | 0-2ppm | 0-2ppm | 0-2ppm |
| Gas code | 0x04 | 0x03 | 0x2B | 0x2C | 0x2A |

Concentration Unit Conversion

| | | | | | |
|---------------------|------|-------|-------|-------|-------|
| Detection gas | CO | H2S | SO2 | NO2 | O3 |
| Conversion Factor N | 1.25 | 1.518 | 2.857 | 2.054 | 2.143 |

In room temperature 25 °C, under a standard atmospheric pressure, the measured value [ug/m3] = [ppb] * gas relative molecular mass/air relative molecular mass.

E.g.: relative molecular mass of CO is 28, while for air it is 22.4, thus N = 28/22.4 = 1.25.

Conversion Factor N = $\frac{ug / m^3}{ppb}$ e.g.: If current concentration of CO is 500ppb, its ug/m3 is:

1.25*500=625ug/m3.

Accessories

Fool-proofing socket (it is necessary to connect user’s pcb board and module, and this accessory has pcb library, see note 7)

Communication Protocol

1. General Settings

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

2. Communication Specification

The default communication type is active upload and it sends gas concentration every one second. For example, if detect CO, the command line format is like below (Table 4).

| | | | | | | | | |
|------------|----------|-------------|---------------------|-------------------------------|------------------------------|-----------------------------|----------------------------|----------------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Start byte | Gas name | Unit PPB | no decimal point | gas concentrati on(high | gas concentrati on(low | Full measur ent (high | Full measur ent (low | Check value |

| | | | | | | | | |
|------|------|------|------|-------|-------|-------|-------|------|
| | | | | byte) | byte) | byte) | byte) | |
| 0xFF | 0x04 | 0x04 | 0x00 | 0x00 | 0x00 | 0x30 | 0xD4 | 0xF4 |

Gas concentration value=concentration high byte*256+concentration low byte

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

Shift to question and answer mode, command line format as below (table 5)

| | | | | | | | | |
|------------|---------|----------------|---------------------|---------|---------|---------|---------|-------------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Start byte | Reserve | Switch command | Question and answer | reserve | reserve | reserve | reserve | Check value |
| 0xFF | 0x01 | 0x78 | 0x41 | 0x00 | 0x00 | 0x00 | 0x00 | 0X46 |

Switch to initiative upload mode, commands as following (table 6).

| | | | | | | | | |
|------------|---------|----------------|-----------------|---------|---------|---------|---------|-------------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Start byte | Reserve | Switch command | Actively upload | reserve | reserve | reserve | reserve | Check value |
| 0xFF | 0x01 | 0x78 | 0x40 | 0x00 | 0x00 | 0x00 | 0x00 | 0X47 |

Read gas concentration (table 7).

| | | | | | | | | |
|------------|---------|---------|---------|---------|---------|---------|---------|-------------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Start byte | Reserve | command | Reserve | reserve | reserve | reserve | reserve | Check value |
| 0xFF | 0x01 | 0x86 | 0x00 | 0x00 | 0x00 | 0x00 | 0x00 | 0X79 |

Sensor responses (table 8).

| | | | | | | | | |
|------------|---------|------------------------------------|-----------------------------------|---------|---------|-----------------------------------|----------------------------------|-------------|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Start byte | Command | gas concentration(high byte ug/m3) | gas concentration(low byte ug/m3) | reserve | reserve | Gas concentration high byte (ppb) | Gas concentration low byte (ppb) | Check value |
| 0xFF | 0x86 | 0x00 | 0x2A | 0x00 | 0x00 | 0x00 | 0x20 | 0X30 |

3. Checksum and calculation

```

/*****
* Function Name: unsigned char FucCheckSum(unsigned char *i,unsigned char ln)
* Functional description: Sum check 【Take 1\2\3\4\5\6\7 of sending and receving protocol Non+1】
* Function declaration: array[n] NOT { Sum (array[1]~array[n-1]) }+1
(number of array must be larger than2)
*****/

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

- Please do not use the modules in systems which related to human being's safety.
- Please do not use the modules in strong air convection environment.
- Please do not expose the modules in high concentration organic gas for a long time.
- Sensor shall avoid organic solvent, coatings, medicine, oil and high concentration gases.
- Excessive impact or vibration should be avoided, otherwise the value won't be accurate.
- The module should be charged for over 24hours for the first time, and supply circuit should be equipped with power reservation function. Otherwise, it will affect continuity and accuracy of returned data if it goes offline for too long.
- The module should avoid direct sunlight, and fool-proof socket should be used to fix the module (PCB package library info pls contact salesperson). Its peripheral structure needs to be anti-rain, anti-shake and anti-drop from the socket.
- When communicate with module, it is recommended to correspond a serial port with a module, thus make it convenient for later calibration and maintenance.
- According to communication protocols, it is necessary to check whether byte0, byte1 and checksum are correct after receiving the data, thus to ensure correctness of receiving data frames.
- It is suggested to use USB - convert - TTL tools and UART debug assistant software, and observe based on communication protocols to judge whether module communication is normal.

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