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.
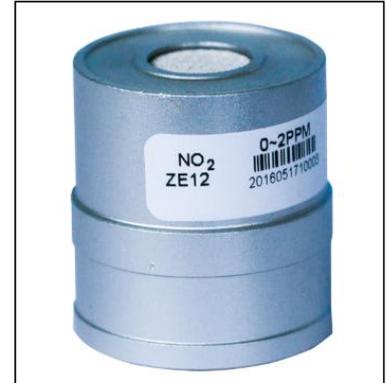
Technical Parameters

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 ㎜
Weight	75g
Operating Environment	Temp.: -20～50℃
	Humidity.: 15%RH-90％RH (no condensation)
Storage Environment	Temp.: -20～50℃
Lifespan	2 year(in air)
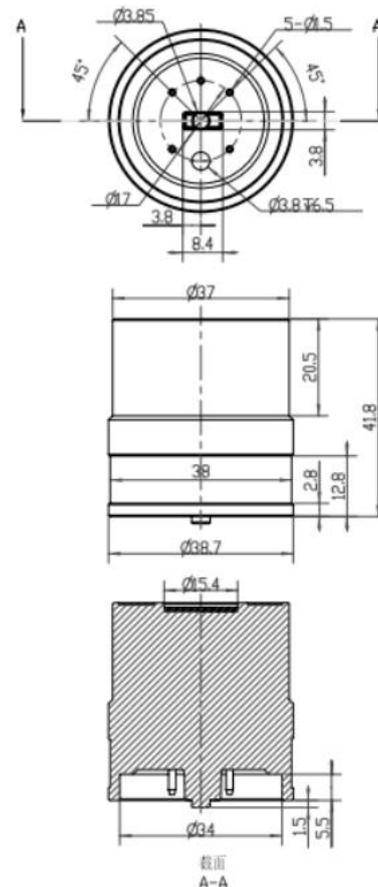
Figure 1:Module chart

Pin definition

Table 2.

Pin1	Vout (0.4～2 V)
Pin2	GND
Pin3	Vin (Vlotage input)
Pin4	UART(TXD) data output
Pin5	UART(TXD) data input
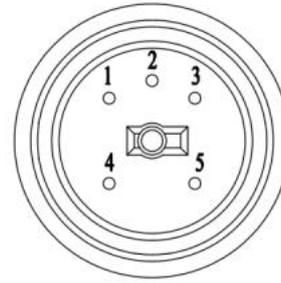
Figure 2: Module bottom view

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 ℃, 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 $N = \dfrac{ug/m3}{ppb}$, 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 concentration(high	gas concentration(low	Full measurement (high	Full measurement (low	Check value

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				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(uchar *i,ucharln)

* Functional description: Sum check 【Take 1\2\3\4\5\6\7 of sending and receiving 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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