Electrochemical Gas

Detection Module

User's Manual V2.4

（Model：ZE03）

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Zhengzhou Winsen Electronics Technology Co., Ltd

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Electrochemical Detection Module ZE03

ZE03 is a general-purpose and high-performance electrochemical module. 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

Model No.	ZE03
Target Gas	CO, O2, NH3, H2S, NO2, O3, SO2, 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	∅23.5mm*24.5mm

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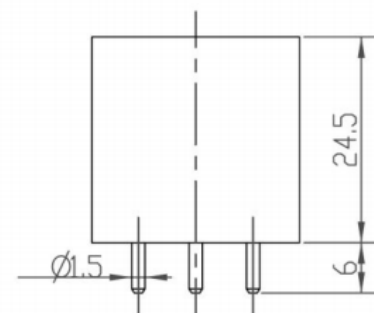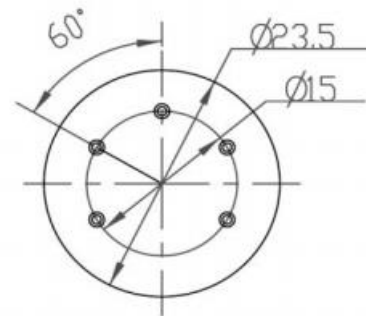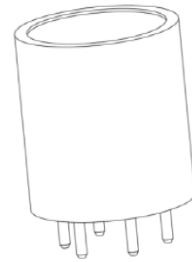
Detection range and signal output   stable2.

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(max detection value) is not corresponding to the right side value of voltage output range. Take ZE03-O2 (0-25%vol) as an example: 0%vol is corresponding to 1.5V, but the corresponding value of 25%vol should subject to inspection report, not 0V.

Pin definition stable3.

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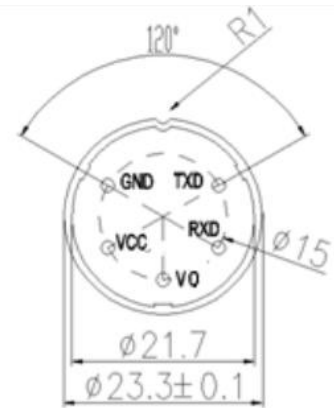
Bottom view

The meaning of V0 (Vout) : It means original voltage (linear) after amplifying circuit, rather than concentration value of current environment. If choose this pin test, users need to keep us informed when purchase, thus zero voltage Vout0 and test voltage Vout1 can be shown in the inspection report deliveried to customer with the modules together.

 Users can calculate gas concentration of current environment based on Vout0 and Vout1.

Take ZE03-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:

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

Name rules

Model name: ZE03-X-X-X

"Z" means module, "E " means electrochemical type sensor, "03" means version, the first X means gas type, the second X means detection range, the third X means output way.

Eg. "ZE03-CO-(0-1000)ppm-UART/VDC","ZE03-O2-(0-25)%VOL-UART/VDC".

"UART/VDC" means the output way is series port and analog voltage (non standard voltage, refer to stable2.)

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 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 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							
	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).

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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.