Combustible Gas Module

For Industrial Use

Manual

（Module:ZC101）

Version: V1.1

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Zhengzhou Winsen Electronic Technology Co., Ltd

Statement

Thanks for purchasing our product. In order to let customers use it better and reduce the faults caused by misuse, please read the manual carefully and operate it correctly in accordance with the instructions. If users disobey the terms or remove, disassemble, change the components inside of the sensor, we shall not be responsible for the loss.

The specific such as color, appearance, sizes &etc, please in kind prevail.

We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this

manual. At the same time, users' comments on optimized using way are welcome.

Please keep the manual properly, in order to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD

ZC101 Combustible Gas Module for Industrial Use

Product Profile

ZC101 industrial gas module adopts catalytic type sensor, special instrument amplifier, high-precision processor, combined with intelligent algorithm to convert the detected gas concentration into identifiable digital signal, which is transmitted through serial port. Convenient for users to use and debug, shorten the user's design and development cycle.

The module is equipped with good linearity, high precision, fast response, anti-hydrogen sulfide and silicone interference sensors, combined with temperature and humidity compensation algorithm, greatly improve the reliability. The module can meet the needs of different customers such as commercial restaurants, underground pipe galleries, petrochemical industry, underground mines, etc. for methane, propane, isobutane and other combustible gas detection.

Without shell with shell

Feature

Multi-point calibration, the standard point can be flexibly set according to the specific application

UART signal output, temperature compensation, High stability, strong anti-interference ability

Main applications

Widely used in portable, fixed methane, propane, isobutane gas detector, as well as a variety of combustible gas detection occasions and equipment.

Parameters Table 1.

Model No.	ZC101
Detection Gas	Methane, propane, isobutane
Detection Range	Unit LEL: 0-100%LEL Unit ppm:CH4:0-50000ppm, C3H8: 0-22000ppm
Working Voltage	DC (5±0.1)V
Working Current	≤170mA
Output	UART output (TTL, 3.3V)
Alarm point	High point: 50%LELE, Low point: 20%LEL
Response time	≤10s
Recovery time	≤30s
Preheat Time	3min
Resolution	1ppm
Expected Lifespan	3~5 years
Working conditions	Temperature: -40～70℃, Humidity: 15%～95%RH(no condensation)

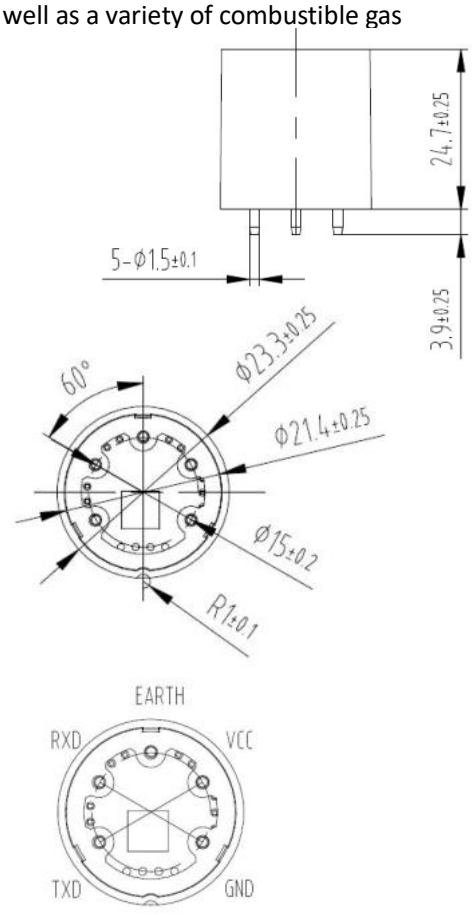

Fig1.From side, from bottom

Storage Conditions	Temperature: -20～60℃, Humidity: 15%～90%RH
Size	Φ23.5mm× 24.5mm

Description for pins **Table 2.**

GND	Power ground
VCC	Power voltage
EARTH	The earth
RXD	Serial port data input
TXD	Serial port data output

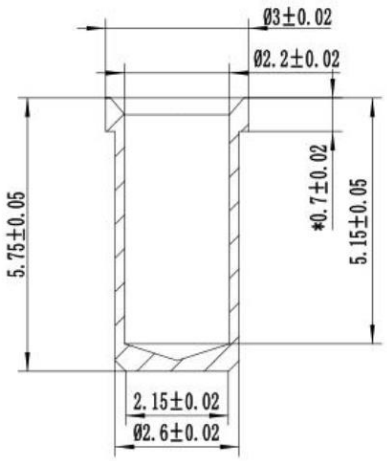

Fig2. Pin socket size

Communication Protocol

1. General Settings **Table 3.**

Baud rate	9600
Data bit	8
Stop bit	1
Parity	None

2. Communication instruction

There are two kinds of communication mode, active upload mode and question & answer mode. Default settings is Q&A mode (question & answer mode). The module will automatically switch to active upload mode if it doesn't receive any inquiry command within 30s. Under active upload mode, modules upload gas concentration value (hexadecimal) every other second. If modules receive any inquiry command, it will switch to Q&A mode.

3. Communication commands

Active upload mode **Table 4.**

0	1	2	3	4	5	6	7	8
Start Byte	Gas Name	Unit	No. of decimal	Concentration (High Byte)	Concentration (Low Byte)	Alarm sign (High Byte)	Alarm sign (Low Byte)	Checksum
0xFF	0x01	0x03	0x00	0x00	0x00	0x00	0x00	0xFC
EXP.FF 01 03 00 00 00 00 FC								

Gas name 0x01 represents CH4 gas. Unit 0x03 represents ppm. Full range is 50000ppm.

Gas name 0x0A represents C3H8 gas. Unit 0x03 represents ppm. Full range is 22000ppm.

Gas name 0x32 represents CH4, C3H8 and C4H10(isobutane). Unit 0x01 is %LEL, full range is 100%LEL.

Unit 0x03 represents ppm. Unit 0x01 represents %LEL.

No. of decimal 0x00 means gas concentration value is an integer, no fractional part.

No. of decimal 0x00 means resolution is 1.

No. of decimal 0x01means resolution is 0.1.

No. of decimal 0x02means resolution is 0.01.

Gas concentration = Concentration (High Byte)*256+ Concentration (Low Byte)

Alarm sign definition as follow: **Table5**

D15	D14	D13	D12	D11	D10	D9	D8	D6	D7	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	0	Reserved			sensor fault sign	Alarm Sign-High point	Alarm Sign-Low point

D0 presents alarm sign-low point. 1 means concentration is higher than low alarm point. 0 means concentration is lower than low alarm point.

D1 presents alarm sign-high point. 1 means concentration is higher than high alarm point. 0 means concentration is lower than high alarm point.

D2 sensor fault sign: 1 means sensor has a problem. 0 means sensor is normal.

Question and upload mode **Table 6.**

0x86 to read gas concentration

1	0x86	To read concentration							
Send	0	1	2	3	4	5	6	7	8
	Start byte	address	Command	--	--	--	--	--	Check sum
	0xFF	0x01	0x86	0	0	0	0	0	0x79
EXP.	FF 01 86 00 00 00 00 00 79								
Answer	0	1	2	3	4	5	6	7	8
	Start byte	Command	Concentration		Reserved	Reserved	Reserved	Reserved	Check sum
	0xFF	0x86	High byte	Low byte	High byte	Low byte	0	0	
EXP.	FF 86 00 00 00 00 00 7A								

Gas concentration=High byte*256+Low byte

0x88 to calibrate the module **Table7**

1	0x88	模组标定							
Send	0	1	2	3	4	5	6	7	8
	Start byte	address	Command	Calibration point high byte	Calibration point low byte	--	--	--	Check sum
	0xFF	0x01	0x88	0	0	0	0	0	0x77
EXP.	FF 01 88 00 00 00 00 00 77								
Answer	0	1	2	3	4	5	6	7	8
	Start byte	Command	result	Reserved	Reserved	Reserved	Reserved	Reserved	Check sum
	0xFF	0x88		0	0	0	0	0	
EXP.	FF 88 01 00 00 00 00 00 77								

Send: the value of (calibration point high byte*256+ calibration point low byte) is the calibration point.

Take an example: 0 means to do calibration zero point in clean air.

In unit ppm, 0x2710 means to calibrate 10000 ppm point, 0x4e20 means to calibrate 20000 ppm point.

In unit %LEL, 0x14 means to calibrate 20%LEL, 0x32 means to calibrate 50%LEL.

Result: 0x01 means success, 0x00 means failure.

Relationship between %LEL and ppm **table8.**

Gas name	Unit ppm	Unit %LEL
Methane CH4	50000	100
	25000	50
	10000	20
	500	1
Propane C3H8	22000	100
	11000	50
	4400	20
	220	1
Isobutane C4H10	18000	100
	9000	50
	3600	20
	180	1

NOTE: Factory default: to detect CH4 in ppm.

3. Check sum and calculation

```
/*****************************************************************************
* Function name: ucharFucCheckSum(uchar *i,ucharln)
* Functional description: Sum check【Take Not(Byte1+Byte2+…Byte7) +1】
* Function declaration: Take Not(Byte1+Byte2+…ByteX (X>2)

*****************************************************************************/
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 .Following conditions must be prohibited

1.1 Exposed to organic silicon steam

Sensing material will lose sensitivity and never recover if the sensor absorbs organic silicon steam.

Sensors must avoid exposing to silicon bond, fixature, silicon latex, putty or plastic contain silicon environment.

1.2 High Corrosive gas

If the sensors are exposed to high concentration corrosive gas (such as H2S, SOX, Cl2, HCl etc.), it will not only result in corrosion of sensors structure, also it cause sincere sensitivity attenuation.

1.3 Touch water

Sensitivity of the sensors will be reduced when spattered or dipped in water.

1.4 Freezing

Do avoid icing on sensor's surface, otherwise sensing material will be broken and lost sensitivity.

2 . Following conditions must be avoided

2.1 Water Condensation

Indoor conditions, slight water condensation will influence sensors' performance lightly. However, if water condensation on sensors surface and keep a certain period, sensors' sensitive will be decreased.

2.2 Used in high gas concentration

No matter the sensor is electrified or not, if it is placed in high gas concentration for long time, sensors characteristic will be affected. If lighter gas sprays the sensor, it will cause extremely damage.

2.3 Long time storage

The sensors resistance will drift reversibly if it's stored for long time without electrify, this drift is related with storage conditions. Sensors should be stored in airproof bag without volatile silicon compound.

For the sensors with long time storage but no electrify, they need long galvanical aging time for stability before using. The suggested aging time as follow:

Stable9.

Storage Time	Suggested aging time
Less than one month	No less than 48 hours
1 ~ 6 months	No less than 72 hours
More than six months	No less than 168 hours

2.4 Long time exposed to adverse environment

No matter the sensors electrified or not, if exposed to adverse environment for long time, such as high humidity, high temperature, or high pollution etc., it will influence the sensors' performance badly.

3. It is forbidden to weld the pins of the module directly, and the sockets can be welded. The size of the socket is shown in Fig2.

4. The module shall not withstand excessive impact or vibration.

5. Do not use the module in the system involving personal safety.

6. Do not install the module in a strong air convection environment.

7. The data uploaded by the module through the serial port is the real-time concentration value in the current environment. In the absence of standard gas, please do not send calibration command, which will cause the calibration data to be cleared and the data returned by the serial port to be inaccurate.

8. To determine whether the module communication is normal, it is recommended to use the USB to TTL tool (communication level 3.3V), observe and judge according to the communication protocol through the serial debugging assistant software.

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