USERS MANUAL

Infrared Methane Gas Sensor

For safety and alarming

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Content

CAUTIONS

1. Working environment：-40℃～70℃。
2. This product must be used with explosion-proof equipments; the system wiring must comply with the product and the instructions associated with the use of equipment requirements shall not take the wrong terminal. Safety parameters and the maximum content of the equivalent parameter table below:

Terminals	Max input voltage Ui(V)	Max input current summary ∑Ii(mA)	Max input consumption summary ∑Pi(W)	Maximum internal equivalent parameters	
				Ci(uF)	Li(mH)
Vi-GND	6	350	0.7	16	0
Uo-GND	6			16	0
Tx-Rx-GND	6			16	0

3. This product and associated equipment’s connection cables should be protected by a sheath, the shield should be grounded.
4. Users shall not replace the product components; in conjunction with our technical staff together to solve the fault occurred in operation to prevent damage.

1 Introduction

1.1 Briefing

Welcome to use infrared methane gas sensor. It adopts advanced non-dispersive infrared technology and qualified raw materials and parts, which can be integrated in safety and alarming devices, able to be used for environmental monitoring, gas drainage monitoring; chemical, petroleum, metallurgy, oil depots, liquefied gas stations, paint jobs, gas transmission and distribution and other combustible gases, storage, indoor and outdoor use and so easy to leak dangerous places.

The sensor has advantages like easy operation, precise measurement and stable performance, which is a important part for industrial and lab applications. The sensor has voltage output and RS232 output available.

The infrared methane sensor is complied with Ex-proof Exia Ⅱ CT4. The certificate No. is GYB101873.

1.2 Specifications

Infrared CH4 gas sensor	
Working voltage	3.5-6VDC
Working current	75-80mA
Output voltage	0.4V-2VDC
Measurement range	0-5% or 0-100%vol
Resolution	Measurement range A: 0～5%vol, resolution is 0.01%；Measurement range B: 0% ～ 100%vol 0-10% resolution for 0.01%； above 10% resolution is 0.1%
Warm-up	30s
Response time T90	<25s
Zero repeatability	±1%FS （20℃）
Sensitivity repeatability	0～5%vol：0.1%；5%～100%vol：2% （20℃）
Zero drift	1%/month
Working temperature	-40℃-70℃
Storage temperature	-40℃-85℃
Digital signal format	Data bit:8; Stop bit: 1; Check bit: null
Standard baud rate	9600bps
Dimensions	Φ20 x 19mm（except pin）
Output pin	5pin

Lifespan	>5year
Weight	18g

1.3Configuration

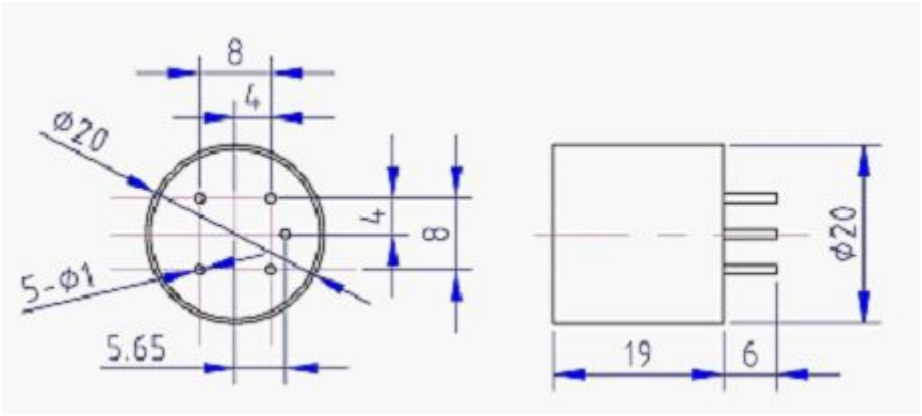
Parts	Pictures	Description
Gas sensor		SJH-CH4 Infrared gas sensor

Picture is only for reference

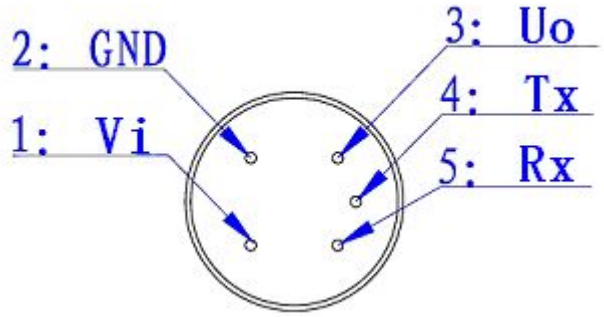
2. Functions & Operation

2.1Appearane & I/O definition

2.1.1Appearance



2.1.2 I/O definition

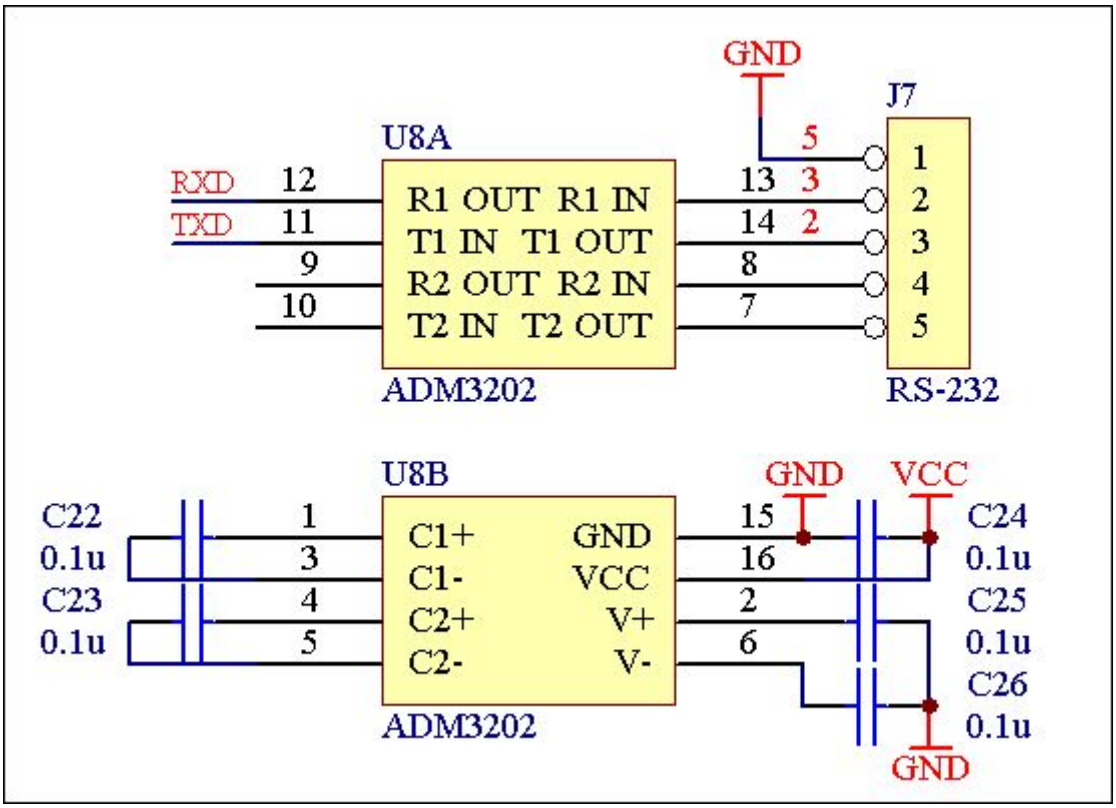


Vi：DC3.5V～6V（recommend: Vi=5V）

2.1.3 Digital output

1. Digital output：TTL electrical level，voltage signal is 0 or 2.5v，pay attention to level switching when connecting external circuit, computer circuit is illustrated below：

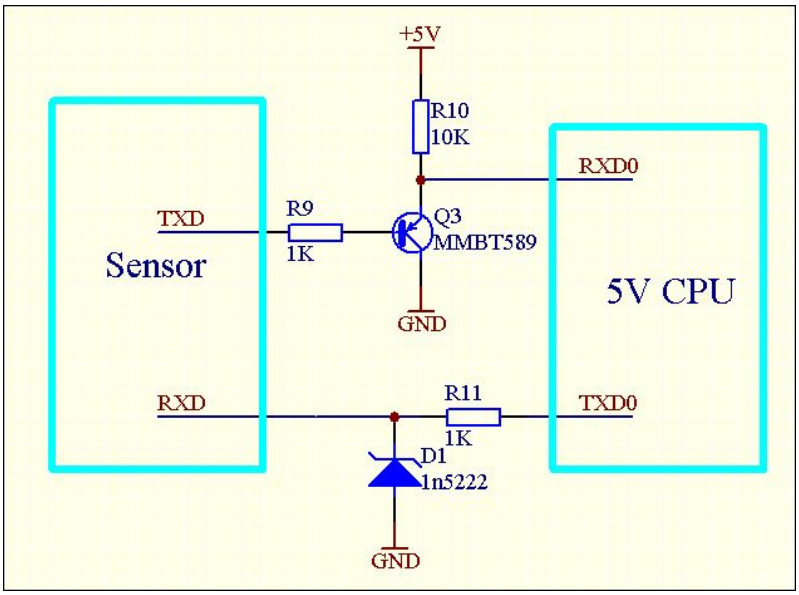
Baud rate：9600bps
Data bit：8
Stop bit：1
Check bit：null



2. Connect with CPU(SCM), baud rate: 9600bps

A. If CPU is powered by 2.5 – 3.3V, CH4 gas sensor can be connected directly and make communication. Note: RXD of CH4 gas sensor is connected to TXD of CPU. TXD of CH4 gas sensor is connected to RXD of CPU.

B. If CPU is 5V, please change PWL. Here is for reference: （Or use the other PWL conversion circuit, for example, optocoupler, converted IC etc）



2.2Operation

2.2.1 Power on

Be sure the preparation is OK before Power on:

- ✓ Power connection is right
- ✓ I/O ports connection is right

2.2.2 Power off

Sensors must be power off under the standby mode (power off is not allowed when you operating zeroing and calibration).

Before power off, the gas sensor should be in the measuring status in the fresh air for 1~3 minutes to ensure the gas cell emptying and avoid possible measurement error by the rest gas or dust.

2.2.3 Measurement

After warm up, the gas sensor is standby. In this case, the sensor can measure CH4 concentration in existing environment. And the concentration can be got by voltage output or RS232.

If the gas sensor appear zero drift in the fresh air (or pure Nitrogen), but the drift is smaller than the max error it permits, zeroing should be carried out firstly. Fresh air or If the drift is larger the max error, calibration need to be done. All these operation will assure measurement precision.

2.3 Communication protocol

Summary:

1. The data in the explanation are all hex data. Such as 46 is hexadecimal [70]
2. [xx] is single byte data(no symbol,0-255) ;(xx) is double byte data, signed integer (-32768 to +32767),the top one is ahead. "—— " followed by explanation;
3. All the data are integer. It has (100,10,1) times relationship with true data.

4. The length of command byte is [LB]+3.

Command Format:

Send： [IP] [LB] [CMD] [DF] [CS]
[IP] address（fixed as 11）。
[LB] byte length followed does not include CS
[CMD] command
[DF] parameter items with command, optional
[CS] CS= —（IP +LB+CMD +DF）

Response：
a. When the command is implemented correctly, it responses
[ACK] [LB] [CMD] [DF] [CS]
[ACK]=0X16 right command
[LB] byte length followed does not include CS
[CMD] command
[DF] parameter items with command, optional
[CS] CS=—（ACK +LB+CMD+DF）

b. When the command is not implemented correctly, it responses
[NAK] [LB] [CMD] [EC] [CS]
[NAK]=0X06 Command is not implemented correctly
[LB]=2 byte length followed does not include CS
[CMD] command
[EC] the error code that command is not implemented correctly
[CS] CS= —（NAK +LB+CMD+DF）

[EC]
1 Order length is wrong
2 The command is not correct
3 Can't implement this command under current status.

Function list

No	Function	CMD	Description
1.	**measuring results check**	0x01	Besides measuring data, it also has status information
2.	**Zero**		
2.1	**Zeroing**	0x03	
3.	**Calibration**		
3.1	**zero calibration**	0x4B	
3.2	**span calibration**	0x4C	
4	**Reset to factory model**	0x4D	
5	**software version check**	0x1E	
6	**sensor serial No. check**	0x1F	
7	**Gas measurement property check**	0x0D	

1. Look up measurement result

Send： 11 01 01 ED

Response： [ACK] 05 01 [DF1] [DF2] [ST1] [ST2] [CS]

Function： Look up measurement result.

Remarks：

1).Gas 1 concentration = （DF1*256+ DF2）/ (corresponding multiple)

2).[ST] means status of system, which give the information of working status of it. For example: to check whether it need zeroing, sampling signal is correct, users options.

2. Look up voltage result

Send： 11 02 02 [TVM] EB

Response： [ACK] 0A 02 [TVM] [FV1] [FV2] [FV3] [FV4] (refVpp) (testVpp) [CS]

Function： Look up voltage result.

Remarks：

1). [TVM] gas measurement voltage.

2). [FV1] [FV2] [FV3] [FV4] to calculate voltage. Four bytes consist of floating type

3). (refVpp) is referred voltage peak, its range is about 0-4 or 5 k

4). (testVpp) is measurement voltage peak

3. Zero

Send： 11 01 08 E6

Response： [ACK] 01 08 [CS]

Function： Zeroing

Remark： When the sensor received zeroing command you sent, please ensure zero gas is inlet for at least 40 seconds.

4. Calibration

After the bench is used for some time, it need calibration.

4.1. Zero calibration （4B）

Send： 11 04 **4B** [GasNum] [DF1] [DF2] [CS]

Response： [ACK] 01 **4B** [CS]

Function： Zero calibration for the bench

Remark：

1) [GasNum] means indicator bit of gas calibration.

TVM	Description
00	doing zero calibration for CH4

2) Gas concentration = （DF1*256+ DF2）/ (multiple)

3) Before sending zero calibration command, please inlet N2 into the bench over 2mins .

After zero calibration is done, please do span calibration immediately. If do zero calibration or span calibration only, calibration is invalid.

4.2. Span calibration （4C）: the same as zero calibration but to replace 4B by 4C

5. Calibration data reset

Send： 11 02 4D [GasNum] [CS]

Response： [ACK] 01 4D [CS]

Function：

Remark:

1. Reset users calibration data to factory calibration data
2. [GasNum] means indicator bit of gas calibration.

6. Software version check

Send: 11 01 1E D0

Response: [ACK] 0C 1E [CH1] [CH2] [CH3] [CH4] [CH5] [CH6] [CH7] [CH8][CH9][CH10][CH11][CH12] [CS]

Function: to check software version

Remark:

[CHx] is ASCLL II code.

7. Series number check

Send: 11 01 1F CF

Response: ACK] 0B 1F（SN1）（SN2）（SN3）（SN4）（SN5）[CS]

Function: to check the series number of the bench

Remark:

SNn is from 0-9999, five integer consists of 20 bits series number

8. Gas measurement property Check

Send: 11 01 0D [CS]

Response: [ACK] 06 0D [DF0] [DF1] [DF2] [DF3] [DF4] [CS]

Function: to check gas measurement range, decimal digitals, gas components, unit and so on

Remark:

1. Gas concentration=[DF0]*256+[DF1])/multiple (it is decided by decimal digital)
2. The definitions of [DF2] and [DF3] are as follows:

[DF2]	description of decimal digital	[DF3]	Gas component
0	0000, means 1 time	0	CH4
1	000.0 means 10 times	1	CO2
2	00.00 means 100 times	2	CO
3	0.000 means 1000 times	3	

3. the definitions of [DF4] is as follows:

[DF4]	Description of unit		
0	ppm		
1	mg/m^3		
2	%		
3	g/m^3		

3. After-sales services

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