MH-440D NDIR Infrared C3H8 Sensor (V2.8)

1. Introduction



MH-440D infrared gas sensor is a miniature universal intelligent sensor, which adopts NDIR theory to detect concentration of C3H8 in air and has good selectivity, stable performance, long life, also is independent of Oxygen. The inside temperature sensor could be used for temperature compensation. This miniature infrared gas sensor is developed by the tight integration of mature infrared absorbing gas detection technology, micro machine workout and superior circuit design.

It is convenient in use and also instead of catalytic component directly, widely used in various occasions with flammable and explosion hazard gas.

2.Features

- High sensitivity, high resolution, fast response
- Output method: UART, analog voltage signal
- Temperature compensation, excellent linear output
- Excellent stability, Long lifespan
- Anti-poisons, anti-vapor interference
- Can replace catalytic type gas sensor directly

3.Applications

Widely used for HVAC refrigeration, air monitoring indoor, industrial-process control and safety protection, agriculture and animal husbandry.

4.Main Parameters

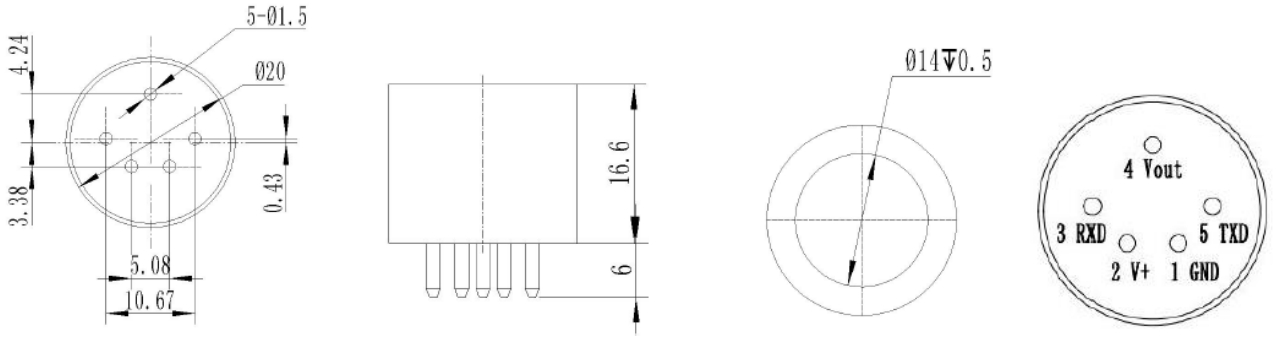
Fig1.Technical Parameters

Detection Gas	Propane (C3H8)
Working Voltage	3.6~5V DC (Need to be powered by safety barrier)
Average Current	＜85mA
Interface Level	3.0V
Detection range	0~2.00%vol (0-100%LEL)
Output Signal	UART(3.0V)
	0.4~2.0V DC
Warm-up time	3 min
Response time	T90<30s
Working Temperature	-20°C ~ 60°C
Working Humidity	0~95%RH(no condensation)
Sizes	Φ20×22.6mm
Weight	35g
Lifetime	>5 years
Defense Grade	IP54
Power, communication terminal Intrinsic safety	Ui=7.5VDC，Ii=265mA，Pi=0.5W， Ci=10 μF， Li=0mH

Fig2.Measuring Range and Resolution

Target Gas	Molecular Formula	Measuring Range	Resolution	No. of decimal	Note
Propane	C3H8	0~2.00%VOL	0.01%VOL	2	Temperature compensation
		0~100%LEL	1%LEL	none	

5.Struction Size



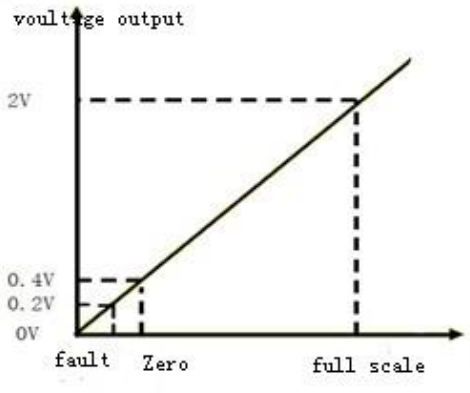
■ **Pin definition**

Pin 2-Vin power supply
Pin 1-GND
Pin 4-Vout (0.4~2V)
Pin 3-UART (RXD) 0~3.0V data input
Pin 5- UART (TXD) 0~3.0V data output

6.Output way.

6.1 Analog Output

The output of Vout is proportional to the gas concentration,0.4-2.0V output stands for 0 to full range.
Connection: Vin –5V, GND- Power Ground, Vout-ADC input.
After warm-up, Vout will show the voltage standing for the gas concentration.
If self-checking detects a fault, the output voltage is 0V.



6.2 Digital Output

Connections: Vin-5V power, GND- Power Ground, RXD - TXD of detector, TXD - RXD of detector.
Users must use TTL level, if you use RS232 level, it must be changed.
Detectors can read gas concentration via UART interface of sensor, no need to calibrate.

6.2.1UART Communication Protocol

General setting

Baud rate	9600
Data bit	8 bit
Stop bit	1 bit
Check bit	Null

Command:

Every command includes 9 bytes from byte0 to byte8

The start byte is 0xff

The command includes sensor no and it is 0x01 by default. The command is ended with checksum.

0x86	To read gas concentration value
0x87	To calibrate sensor zero point（ZERO）
0x88	To calibrate span point(SPAN）

0x86-to read gas concentration value:

Send command								
Byte0	Byte1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Start bit	Sensor no.	Command	-	-	-	-	-	checksum
0XFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79
Returning								
Byte0	Byte1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Start bit	command	Concentration high byte	Concentration low- byte	-	-	-	-	checksum
0XFF	0x86	0x02	0x60	0x47	0x00	0x00	0x00	0xD1
If the detection range is 0~100%LEL C3H8, Gas concentration (unit is ppm)= [(Changing byte2 value from hexadecimal into decimalism)*256+ (Changing byte3 value from hexadecimal into decimalism)]*200 If the detection range is 0~2.00%vol C3H8, Gas concentration (unit is ppm)= [(Changing byte2 value from hexadecimal into decimalism)*256+ (Changing byte3 value from hexadecimal into decimalism)]*100								

0x87-to calibrate zero point

Send command								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start bit	Sensor no.	Command	-	-	-	-	-	checksum
0XFF	0x01	0x87	0x00	0x00	0x00	0x00	0x00	0x78
No returning								

0x88-to calibrate span point

Send command								
Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start bit	Sensor no.	Command	Span high byte	Span low byte	-	-	-	checksum
0XFF	0x01	0x88	0x07	0xD0	0x00	0x00	0x00	0xA0
No returning								

Please note: zero calibration must be done before span calibration.

checksum = (negation（byte1+byte2+……+byte7）)+1

For example.

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
Start bit	Sensor no.	Command	-	-	-	-	-	checksum
0XFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79

Calculation method as follow:

1. except byte0, to add all of other bytes
   0x1 + 0x86 + 0x00 + 0x00 + 0x00 + 0x00 + 0x00 = 0x87
2. negate to above value: 0xFF – 0x87 = 0x78
3. add 1 to above value
   0x78 + 0x01 = 0x79

Eg.

```
char getCheckSum(char *packet)
{
    char i, checksum;
    for( i = 1; i < 8; i++)
    {
        checksum += packet[i];
    }
    checksum = 0xff – checksum;
    checksum += 1;
    return checksum;
}
```

7. Cautions for Maintenance

7.1 The sensor should be calibrated regularly. The suggested cycle time is 6 months.

7.2 Do not use the sensor in the high dusty environment for long time.

7.3 Please use the sensor with correct power supply.

7.4 Forbid to weld the sensor pins directly.

7.5 Forbid to cut the sensor pins.