MH-440D infrared gas sensor

1. Introduction
MH-440D infrared gas sensor is a miniature universal intelligent sensor, which adopts NDIR theory to detect concentration of CH4 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, widely used in various occasions with flammable and explosion hazard gas.

2. Features and main technical parameters
2.1 Features
High sensitivity
Standard output and signal output
Miniature figure
Fast response and resume
Temperature compensation
Good stability
Long life
Anti-vapor interference
Instantly convert catalytic theory meter into infrared detection meter

2.2 Main technical parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working voltage</td>
<td>3.5~5.5V dc</td>
</tr>
<tr>
<td>Working current</td>
<td>75~85mA</td>
</tr>
<tr>
<td>Detection range</td>
<td>0<del>5%vol (0</del>100%vol optional)</td>
</tr>
<tr>
<td>Output signal range</td>
<td>0.4~2V dc</td>
</tr>
<tr>
<td>Resolution</td>
<td>1%FSD</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>90s</td>
</tr>
<tr>
<td>Response time</td>
<td>T90&lt;30s</td>
</tr>
<tr>
<td>Repeatability</td>
<td>Zero &lt; ±100ppm</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt;±500ppm</td>
</tr>
<tr>
<td>Long-term drift</td>
<td>Zero &lt; ±300ppm/month</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt; ±500ppm/month</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-20°C ~50°C</td>
</tr>
<tr>
<td>Humidity range</td>
<td>0~95%RH</td>
</tr>
<tr>
<td>Lifetime</td>
<td>&gt;5 years</td>
</tr>
<tr>
<td>Dimension</td>
<td>20*16.6</td>
</tr>
<tr>
<td>Weight</td>
<td>15g</td>
</tr>
</tbody>
</table>

3. Configuration dimension
4. Pin definition
1. GND
2. Vout
3. VCC
4. TXD
5. RXD

5. Model selection
This product has two types for your selection:
MH-440V
3 pins—It is same as pins of catalytic sensor, and the linear output supplied is familiar with the ones of catalytic.
MH-440D
5 pins—The 3 pins of them are same as pins of catalytic sensor, and the other two pins are UART pins, which can communicate with circuit directly and offer more choices for users.
NDIR Gas sensor and modules MH-410D

**Brief Introduction:**
MH-410D is a miniature universal intelligent sensor, which adopts NDIR theory to detect concentration of CO2 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.

It could be used to replace catalytic component, widely used in occasions with flammable and explosion hazard gas.

**Technical Data:**

<table>
<thead>
<tr>
<th>Detected Gas</th>
<th>CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working voltage</td>
<td>3.6-5V DC</td>
</tr>
<tr>
<td>Working current</td>
<td>75-85mA</td>
</tr>
<tr>
<td>Interface Level</td>
<td>3V</td>
</tr>
<tr>
<td>Detection range</td>
<td>0-5%vol(0-100%vol optional)</td>
</tr>
<tr>
<td>Output signal range</td>
<td>0.4-2V DC</td>
</tr>
<tr>
<td>Resolution</td>
<td>1%FSD</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>90s</td>
</tr>
<tr>
<td>Response time</td>
<td>T90&lt;30s</td>
</tr>
<tr>
<td>Repeatability</td>
<td>Zero &lt; +/-100ppm</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt; +/-500ppm</td>
</tr>
<tr>
<td>Long-term drift</td>
<td>Zero &lt; +/-300ppm/month</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt; +/-500ppm/month</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-20°C -60°C</td>
</tr>
<tr>
<td>Humidity range</td>
<td>0-95%RH</td>
</tr>
<tr>
<td>Lifetime</td>
<td>&gt;5 years</td>
</tr>
<tr>
<td>Dimension</td>
<td>20mm*16.6mm</td>
</tr>
</tbody>
</table>
Weight 15g

Dimension:
**Brief Introduction:**

MH-490W is a miniature universal sensor, which adopts NDIR theory to detect concentration of CH4 and CO2 (or CH4 and CO; CO and CO2) 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, it also has EEPROM memorizer.

It could be widely used in occasions of fire detection and explosion hazard gas.

### Technical Data:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detected Gas</td>
<td>CH4 and CO2</td>
</tr>
<tr>
<td>Working voltage</td>
<td>3.5-5.5V DC</td>
</tr>
<tr>
<td>Working current</td>
<td>&lt;100mA</td>
</tr>
<tr>
<td>Detection range</td>
<td>CH4: 0-100%VOL</td>
</tr>
<tr>
<td></td>
<td>CO2: 0-50%VOL</td>
</tr>
<tr>
<td>Resolution</td>
<td>CH4: 0.1%VOL</td>
</tr>
<tr>
<td></td>
<td>CO2: 0.1%VOL</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>90s</td>
</tr>
<tr>
<td>Response time</td>
<td>T90&lt;30s</td>
</tr>
<tr>
<td>Repeatability</td>
<td>Zero &lt; +/-0.2%VOL</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt; +/-1%VOL/month</td>
</tr>
<tr>
<td>Long-term drift</td>
<td>Zero &lt; +/-0.6 VOL /month</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt; +/-1%VOL /month</td>
</tr>
<tr>
<td>Temperature range</td>
<td>-20°C -50°C</td>
</tr>
<tr>
<td>Humidity range</td>
<td>0-99%RH</td>
</tr>
<tr>
<td>Lifetime</td>
<td>&gt;5 years</td>
</tr>
<tr>
<td>Working Frequency</td>
<td>1Hz</td>
</tr>
<tr>
<td>Dimension</td>
<td>20mm*21mm</td>
</tr>
<tr>
<td>Weight</td>
<td>15g</td>
</tr>
</tbody>
</table>

**Dimension:**

![Diagram of the sensor module]
**NDIR Gas sensor and modules MH-Z12**

**Brief Introduction:**
MH-Z12 is a general, mini sensor, which adopts NDIR theory to measure concentration of CO2 in air, it has good selectivity and long life. Temperature sensor inside could be for temperature compensation, it has both digital output and Analog voltage output.
Widely used for HVAC, indoor and outdoor air quality control, industrial, agriculture and animal husbandry.

![Image of MH-Z12 sensor](image)

**Technical Data:**

<table>
<thead>
<tr>
<th>Detection gas</th>
<th>CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement range</td>
<td>0-5000ppm (Optional)</td>
</tr>
<tr>
<td>Resolution</td>
<td>5ppm(0-2000ppm) 10ppm(2000-5000ppm)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>+/-50ppm</td>
</tr>
<tr>
<td>Repeatability</td>
<td>+/-30ppm</td>
</tr>
<tr>
<td>Response time</td>
<td>&lt; 30s</td>
</tr>
<tr>
<td>Preheating time</td>
<td>3 min</td>
</tr>
<tr>
<td>Working voltage</td>
<td>4-6V</td>
</tr>
<tr>
<td>Working current</td>
<td>Max. 100mA, average less than 60mA</td>
</tr>
<tr>
<td>Working environment</td>
<td>Tem.: 0-60ºC  Hum.: 0%-90%RH (No Dew)</td>
</tr>
<tr>
<td>Storage environment</td>
<td>Tem.: -20-60ºC</td>
</tr>
<tr>
<td>Lifetime</td>
<td>&gt;5 year</td>
</tr>
</tbody>
</table>
MH-Z14 CO2 Module

MH-Z14 NDIR Infrared gas module is a common type, small size sensor, using non-dispersive infrared (NDIR) principle to detect the existence of CO₂ in the air, with good selectivity, non-oxygen dependant, long life. Built-in temperature sensor can do temperature compensation; and it has digital output and analog voltage output. MH-490W integrate sophisticated infrared absorption gas detection technology, sophisticated light transmission design and sophisticated circuit design.

MH-Z14 NDIR Infrared gas module is applied in the HVAC, indoor air quality monitoring, industrial process, safety and protection monitoring, agriculture and animal husbandry production process monitoring.

1. Technical specification:

<table>
<thead>
<tr>
<th>Detection range</th>
<th>0~10000ppm (optional)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution ratio</td>
<td>5ppm (0~2000ppm)</td>
</tr>
<tr>
<td></td>
<td>10ppm (2000~5000ppm)</td>
</tr>
<tr>
<td></td>
<td>20ppm (5000~10000ppm)</td>
</tr>
<tr>
<td>Accuracy</td>
<td>±50ppm±5%</td>
</tr>
<tr>
<td>Repeatability</td>
<td>±30ppm</td>
</tr>
<tr>
<td>Responsible time</td>
<td>&lt;30S</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>3min</td>
</tr>
<tr>
<td>Working temperature</td>
<td>0~50°C</td>
</tr>
<tr>
<td>Working humidity</td>
<td>0% ~ 90%RH (No condensation)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20~60°C</td>
</tr>
<tr>
<td>Working voltage</td>
<td>4~6V</td>
</tr>
<tr>
<td>Working current</td>
<td>Max current &lt;100mA. Average current &lt;50mA</td>
</tr>
<tr>
<td>Usageage</td>
<td>&gt;5year</td>
</tr>
</tbody>
</table>

2. Structure Dimension Chart
3. Signal output

Signal output: analog voltage output, PWM wave output, UART output.

- Pad1: Vin (input voltage 4~6V)
- Pad2: GND
- Pad4: DAC2
- Pad5: DAC1
- Pad6: PWM output
- Pad7: Pad8: Pad9: NC
- Pad10: Pad13: UART (RXD) 0~3.3V digital input
- Pad11: Pad14: UART (TXD) 0~3.3V digital output

3.1 Analog voltage output

DAC1 output voltage range (0~2.5V), corresponding gas concentration (0~full detection range)

DAC2 output voltage range (0.4~2V), corresponding gas concentration (0~full detection range)

3.2 PWM output

CO2 output range: 0ppm-2000ppm
Allowed max. current for OC: 5mA maximum
Cycle: 1004ms±5%
High level output for beginning: 2ms (in name)
Middle of cycle: 1000ms±5%
Low level output for ending: 2ms (in name)

Account formula for CO2 concentration which get through PWM:

\[ C_{\text{ppm}} = \frac{2000 \times (T_H - 2\text{ms})}{(T_H + T_L - 4\text{ms})} \]

Among:
- Cppm is calculated CO2 concentration, unit is ppm;
- TH is time for high level during an output cycle;
- TL is time for low level during an output cycle.

3.3 Output for PWM:

![PWM Output Diagram]
4. UART communication protocol

Data obtain procedure and hardware serial communication
Baud rate: 9600, 8 digit data, 1 digit stop bit, No parity bit
9 byte for each frame data, initially with 0xff, ending with check value
Check value= \( \text{(in reverse (DATA1+DATA2+......+DATA7)) +1} \)

1) Read concentration and temperature value of the sensor

Below order would be sent when host send concentration value of the sensor:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Check value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OXFF</td>
<td>Detector No.</td>
<td>order 0x86</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>00</td>
<td>Check value</td>
</tr>
</tbody>
</table>

Format of data returned by subsidiary detector:

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>Check value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OXFF</td>
<td>0x86</td>
<td>High channel</td>
<td>Low channel</td>
<td>Tem. channel</td>
<td>Tem. channel</td>
<td>Check value</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gas Concentration = High channel*256+low channel, No.of sensor: 0x01

Environment temp. value = Tem. channel

2) When make zero calibration, send value: 0xff, 0x87, 0x87, 0x00, 0x00, 0x00, 0x00, 0x00, 0xf2
The first byte (0xff) is beginning byte, the second byte (0x87) is repeated order, the third byte (0x87) is order, the last five bytes is arbitrary value, while the last byte (0xf2) is check sum. No return information.
As it is CO2 sensor, please input Nitrogen gas for 5 minutes when make zero calibration.

3) When make span calibration, send value: 0xff, 0x88, 0x88, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x0f0
The first byte (0xff) is beginning byte, the second byte (0x88) is repeated order, the third byte (0x88) is order, the fourth byte is span perch value, the fifth byte is span low value, last 3 bytes is arbitrary value, while the last byte (0x0f0) is check sum. No return information.

5. Installation

There’s four installation holes
Brief Introduction:
MH-Z92 is a general and built-in sampling sensor, which adopts NDIR theory to measure concentration of CO2 and CH4 in air, it has good selectivity and long life. Temperature sensor inside could be for temperature compensation, it has both digital output and Analog voltage output. Widely used for biogas, industrial and safety monitoring.

Technical Data:

<table>
<thead>
<tr>
<th>Detected Gas</th>
<th>CO2 and CH4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling method</td>
<td>Pump</td>
</tr>
<tr>
<td>Detection range</td>
<td>0-100%vol CH4</td>
</tr>
<tr>
<td></td>
<td>0-50%vol CO2</td>
</tr>
<tr>
<td>Error</td>
<td>&lt;= +/-2% F.S</td>
</tr>
<tr>
<td>Response time</td>
<td>T90&lt;10s</td>
</tr>
<tr>
<td>Working Temperature</td>
<td>0°C -50°C</td>
</tr>
<tr>
<td>Working Humidity</td>
<td>0-95%RH (No Dew)</td>
</tr>
<tr>
<td>Working voltage</td>
<td>3.5V-5.5V</td>
</tr>
<tr>
<td>Working current</td>
<td>Average 50mA, Max. 100mA</td>
</tr>
<tr>
<td>Lifetime</td>
<td>&gt;5 years</td>
</tr>
<tr>
<td>Dimension</td>
<td>L×b×h, 83×51×18mm</td>
</tr>
</tbody>
</table>
1. Application

MH-740A sensor is a common intelligent sensor in small sized to detect CH4 in air taking advantages of non-dispersive infrared principle. It has the advantages of good selectivity, oxygen independence, stable performance and long life. MH-740A is an infrared gas sensor in small sized combining mature technology for infrared absorption detection and micro-machining, superior circuit design closely. The sensor can be widely used in detection for fire disaster, explosive gases.

2. Product Mode & Explosion-proof Implication

Product Mode:  MH-740A
Explosion Proof:  Exmb || CT4

本产品生产制造依据:
GB3836. 1~2000  《爆炸性气体环境用电设备 第1部分：通用要求》
GB3836. 9~2000  《爆炸性气体环境用电设备 第9部分：浇封型“m”》
GB4208-93  《外壳防护等级（IP 代码）》
GB/T13384-92《机电产品包装应用技术条件》

3. Specification

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>4.5~5.5V DC</td>
</tr>
<tr>
<td>Working Current</td>
<td>120mA</td>
</tr>
<tr>
<td>Interface Power</td>
<td>5V</td>
</tr>
<tr>
<td>Detected Range</td>
<td>0<del>5%vol (0</del>100%vol can be specified)</td>
</tr>
<tr>
<td>Resolution</td>
<td>1%FSD</td>
</tr>
<tr>
<td>Warm-up Time</td>
<td>90s</td>
</tr>
<tr>
<td>Response Time</td>
<td>T90&lt;30s</td>
</tr>
<tr>
<td>Repeatability</td>
<td>Zero &lt; ±100ppm</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt;±500ppm</td>
</tr>
<tr>
<td>Long-time Drift</td>
<td>Zero &lt; ±300ppm/month</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt;±500ppm/month</td>
</tr>
<tr>
<td>Temperature</td>
<td>-40°C ~70°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>0~95%RH</td>
</tr>
<tr>
<td>Life</td>
<td>&gt;5 year</td>
</tr>
<tr>
<td>Explosion-proof</td>
<td>Exdm</td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP6</td>
</tr>
</tbody>
</table>
4. Working Environment

Working Power: 4.5~5.5V DC  
Temperature: -40°C ~70°C  
Humidity: 0~95%RH

5. Structure

5.1 Schematic Structure
5.2 Pin Definition
Red line: VCC  
Yellow Line: SCL  
Brown Line: SDA  
Black Line: GND

5.3 Characteristics
High Sensitivity  
5V constant power supply, low power consumption  
Fast response and resume  
Temperature compensation  
Excellent stability  
Long life  
Anti-poisons  
Water vapor-proof

6. Operation Instruction

6.1 Communication Protocol
MH-740A is communicated through IIC bus. Module works following slave mode and can be connected with MCU outside. The module address is 0xAA. The writing operation address is 0xAA and reading operation address is 0xAB. In the IIC communication, each
frame data has 10 bytes, and the contents of the data vary according to different host command. The last byte of the data is checksum value. The recommended SCL clock frequency is less than 10K.

6.1.1 Writing Operation

The first sent byte of each writing operation is command byte. A full writing operation sequence is as below.

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

6.1.2 Reading Operation

A full reading operation sequence is as below.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → receive acknowledge bit → …… → receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal

6.1.3 Checksum Value

Checksum Value = (converse (DATA0 + DATA1 + …… + DATA8)) + 1

6.2 IIC communication Command

One writing operation must performance before reading operation. If the production data command for module is written, then performance reading operation, the production date can be read.

In the writing operation, the high-limit alarm value can be set through writing the high limit alarm value command (0x98) and high-limit alarm value together to the module.

For all the integer data, the higher is in front, the lower is in the post. Eg, DATA1 ~ DATA2 = high limit alarm concentration, it means DATA1 = the higher 8 bytes of high limit alarm concentration, DATA2 = the lower 8 bytes of high limit alarm concentration.

6.2.1 Version & Name of the Module Command: 0x90

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x90
DATA1 ~ DATA8 is arbitrary value.
DATA9 = checksum (same with below)

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → …… → receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal

DATA0 = version number
DATA1 = ID number
DATA2 = word ID number
DATA3 ~ DATA8 = sensor name
DATA9 = checksum (same with below)

6.2.2 Module Name 2, Command: 0x91
send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x91
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → …… → receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA8 = sensor name 2

6.2.3 Module Production Date, Command: 0x92

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x92
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → …… → receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA6 = production date
DATA7 ~ DATA8 = validating date

6.2.4 Module Calibrating Date, Command: 0x93

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x93
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → …… → receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA6 = calibrating date
DATA7 ~ DATA8 = validating date

6.2.5 Module Serial Number, Command: 0x94

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x94
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
6.2.6 Reading Alarm Value of Module, Command: 0x95

send START signal → send module address (writing) → receive acknowledge bit → send

DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit

→ …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x95
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit →
receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……

→ receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal

DATA0 ~ DATA1 = low-limit alarm value
DATA2 ~ DATA3 = high-limit alarm value
DATA4 ~ DATA5 = STEL alarm value
DATA6 ~ DATA7 = TWA alarm value
DATA8 = 0

6.2.7 Module Status, Command: 0x96

send START signal → send module address (writing) → receive acknowledge bit → send

DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit

→ …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x96
DATA1 ~ DATA4 = current time (year, month, date, time)
DATA5 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit →
receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……

→ receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal

DATA0 = module status
DATA2 = unit
DATA3 = gas type
DATA4 = temperature
DATA5 ~ DATA6 = gas concentration
DATA7 ~ DATA8 = detected range

6.2.8 Low-limit alarm setting, Command: 0x97

send START signal → send module address (writing) → receive acknowledge bit → send

DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit

→ …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x97
DATA1 ~ DATA2 = low-limit alarm value
DATA3 ~ DATA8 is arbitrary value.
6.2.9 High-limit alarm setting, Command: 0x98

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x98
DATA1 ~ DATA2 = high-limit alarm value
DATA3 ~ DATA8 is arbitrary value.

6.2.10 STEL Alarm Setting, Command: 0x99

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x99
DATA1 ~ DATA2 = STEL alarm value
DATA3 ~ DATA8 is arbitrary value.

6.2.11 TWA Alarm Setting Command: 0x9a

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x9a
DATA1 ~ DATA2 = TWA alarm value
DATA3 ~ DATA8 is arbitrary value.

6.2.12 Zero Calibration, Command: 0xa0

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0xa0
DATA1 ~ DATA2 is arbitrary value.

6.2.13 SPAN Calibration, Command: 0xaa

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0xaa
DATA1~Data2: single calibration concentration
DATA3 ~ DATA8 is arbitrary value.

6.2.14 Decimal Bytes Reading, Command: 0x9b
send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal

DATA0 = 0x9b
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → …… → receive DATA9 (checksum) → send acknowledge bit → send STOP signal

DATA0 = decimal bytes
DATA1 ~ DATA8 is arbitrary value.

7. Notes for maintenance

7.1 The sensor should be calibrated regularly. The cycle time is better to be no more than 3 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 Forbidden to cut the sensor pin.

8. Order Notes

Please provide the following information in order to purchase the specified product.
Detected range of sensor
Resolution of sensor
Sensor name: MH – 740A
MH-710 Intelligent Infrared Gas Sensor

User’s Manual
1. Application

MH-710A sensor is a common intelligent sensor in small sized to detect CO2 in air taking advantages of non-dispersive infrared principle. It has the advantages of good selectivity, oxygen independence, stable performance and long life. MH-710A is an infrared gas sensor in small sized combining mature technology for infrared absorption detection and micro-machining, superior circuit design closely. The sensor can be widely used in detection for fire disaster, explosive gases.

2. Product Mode & Explosion-proof Implication

Product Mode: MH-710A
Explosion Proof: ExmB I CT4

GB3836. 1-2000
GB3836. 9-2000
GB4208-93
GB/T13384-92

3. Specification

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>4.5~5.5V DC</td>
</tr>
<tr>
<td>Working Current</td>
<td>120mA</td>
</tr>
<tr>
<td>Interface Power</td>
<td>5V</td>
</tr>
<tr>
<td>Detected Range</td>
<td>0<del>2000ppm (0</del>100%vol can be specified)</td>
</tr>
<tr>
<td>Resolution</td>
<td>5ppm</td>
</tr>
<tr>
<td>Warm-up Time</td>
<td>90s</td>
</tr>
<tr>
<td>Response Time</td>
<td>T90&lt;30s</td>
</tr>
<tr>
<td>Deviation</td>
<td>30ppm±5%</td>
</tr>
<tr>
<td>Repeatability</td>
<td>Zero &lt; ±10ppm</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt;±30ppm</td>
</tr>
<tr>
<td>Long-time Drift</td>
<td>Zero &lt; ±30ppm/month</td>
</tr>
<tr>
<td></td>
<td>SPAN &lt; ±30ppm/month</td>
</tr>
<tr>
<td>Temperature</td>
<td>-40°C ~70°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>0~95%RH</td>
</tr>
<tr>
<td>Life</td>
<td>&gt;5 years</td>
</tr>
<tr>
<td>Explosion-proof</td>
<td>ExdmB I CT4</td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP6</td>
</tr>
</tbody>
</table>
4. Working Environment

Working Power: 4.5~5.5V DC
Temperature: -40°C ~70°C
Humidity: 0~95%RH

5. Structure

5.1 Schematic Structure

5.2 Pin Definition
Red line: VCC
Yellow Line: SCL
Brown Line: SDA
Black Line: GND

5.3 Characteristics
High Sensitivity
5V constant power supply, low power consumption
Fast response and resume
Temperature compensation
Excellent stability
Long life
Anti-poisons
Water vapor-proof

6. Operation Instruction
6.1 Communication Protocol

MH-710A is communicated through IIC bus. Module works following slave mode and can be connected with MCU outside. The module address is 0xAA. The writing operation address is 0xAA and reading operation address is 0xAB. In the IIC communication, each frame data has 10 bytes, and the contents of the data vary according to different host command. The last byte of the data is checksum value. The recommended SCL clock frequency is less than 10K.

6.1.1 Writing Operation

The first sent byte of each writing operation is command byte. A full writing operation sequence is as below.

send START signal \(\rightarrow\) send module address (writing) \(\rightarrow\) receive acknowledge bit \(\rightarrow\) send DATA0 (command) \(\rightarrow\) receive acknowledge bit \(\rightarrow\) send DATA1 \(\rightarrow\) receive acknowledge bit \(\rightarrow\) …… \(\rightarrow\) send DATA9 (checksum) \(\rightarrow\) receive acknowledge bit \(\rightarrow\) send STOP signal

6.1.2 Reading Operation

A full reading operation sequence is as below.
A full reading operation sequence is as below.

send START signal \(\rightarrow\) send module address (reading) \(\rightarrow\) receive acknowledge bit \(\rightarrow\) receive DATA0 \(\rightarrow\) send acknowledge bit \(\rightarrow\) receive DATA1 \(\rightarrow\) receive acknowledge bit \(\rightarrow\) …… \(\rightarrow\) receive DATA9 (checksum) \(\rightarrow\) send non-acknowledge bit \(\rightarrow\) send STOP signal

6.1.3 Checksum Value

Checksum Value = (converse (DATA0 + DATA1 + …… + DATA8)) + 1

6.2 IIC communication Command

One writing operation must perform before reading operation. If the production data command for module (0x92) is written, then perform reading operation, the production data can be read.

In the writing operation, the high-limit alarm value can be set through writing the high limit alarm value command (0x98) and high-limit alarm value together to the module.

For all the integer data, the higher is in front, the lower is in the post. Eg, DATA1 ~ DATA2 = high limit alarm concentration, it means DATA1 = the higher 8 bytes of high limit alarm concentration, DATA2 = the lower 8 bytes of high limit alarm concentration.

6.2.1 Version & Name of the Module Command: 0x90

send START signal \(\rightarrow\) send module address (writing) \(\rightarrow\) receive acknowledge bit \(\rightarrow\) send DATA0 (command) \(\rightarrow\) receive acknowledge bit \(\rightarrow\) send DATA1 \(\rightarrow\) receive acknowledge bit \(\rightarrow\) …… \(\rightarrow\) send DATA9 (checksum) \(\rightarrow\) receive acknowledge bit \(\rightarrow\) send STOP signal

DATA0 = 0x90
DATA1 ~ DATA8 is arbitrary value.
DATA9 = checksum (same with below)
send START signal → send module address (reading) → receive acknowledge bit →
receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
→ receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 = version number
DATA1 = ID number
DATA2 = word ID number
DATA3 ~ DATA8 = sensor name
DATA9 = checksum (same with below)

6.2.2 Module Name 2, Command: 0x91

send START signal → send module address (writing) → receive acknowledge bit → send
DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x91
DATA1 ~ DATA8 is arbitrary value.
send START signal → send module address (reading) → receive acknowledge bit →
receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
→ receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA8 = sensor name 2

6.2.3 Module Production Date, Command: 0x92

send START signal → send module address (writing) → receive acknowledge bit → send
DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x92
DATA1 ~ DATA8 is arbitrary value.
send START signal → send module address (reading) → receive acknowledge bit →
receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
→ receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA6 = production date
DATA7 ~ DATA8 = validating date

6.2.4 Module Calibrating Date, Command: 0x93

send START signal → send module address (writing) → receive acknowledge bit → send
DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x93
DATA1 ~ DATA8 is arbitrary value.
send START signal → send module address (reading) → receive acknowledge bit →
receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA6 = calibrating date
DATA7 ~ DATA8 = validating date

6.2.5 Module Serial Number, Command: 0x94

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x94
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA8 = serial number

6.2.6 Reading Alarm Value of Module, Command: 0x95

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x95
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 ~ DATA1 = low-limit alarm value
DATA2 ~ DATA3 = high-limit alarm value
DATA4 ~ DATA5 = STEL alarm value
DATA6 ~ DATA7 = TWA alarm value
DATA8 = 0

6.2.7 Module Status, Command: 0x96

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x96
DATA1 ~ DATA4 = current time (year, month, date, time)
DATA5 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit → receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit → ……
receive DATA9 (checksum) → send non-acknowledge bit → send STOP signal
DATA0 = module status
DATA2 = unit
DATA3 = gas type
DATA4 = temperature
DATA5 ~ DATA6 = gas concentration
DATA7 ~ DATA8 = detected range

6.2.8 Low-limit alarm setting, Command: 0x97

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x97
DATA1 ~ DATA2 = low-limit alarm value
DATA3 ~ DATA8 is arbitrary value.

6.2.9 High-limit alarm setting, Command: 0x98

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x98
DATA1 ~ DATA2 = high-limit alarm value
DATA3 ~ DATA8 is arbitrary value.

6.2.10 STEL Alarm Setting, Command: 0x99

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x99
DATA1 ~ DATA2 = STEL alarm value
DATA3 ~ DATA8 is arbitrary value.

6.2.11 TWA Alarm Setting Command: 0x9a

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x99
DATA1 ~ DATA2 = TWA alarm value
DATA3 ~ DATA8 is arbitrary value.

6.2.12 Zero Calibration, Command: 0xa0

send START signal → send module address (writing) → receive acknowledge bit → send DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit → …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0xa0
DATA1 ~ DATA8 is arbitrary value.

6.2.13 SPAN Calibration,   Command: 0xaa

send START signal → send module address (writing) → receive acknowledge bit → send
DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit
→ …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0xaa
Data1~Data2: single calibration concentration
DATA3 ~ DATA8 is arbitrary value.

6.2.14 Decimal Bytes Reading,   Command: 0x9b

send START signal → send module address (writing) → receive acknowledge bit → send
DATA0 (command) → receive acknowledge bit → send DATA1 → receive acknowledge bit
→ …… → send DATA9 (checksum) → receive acknowledge bit → send STOP signal
DATA0 = 0x9b
DATA1 ~ DATA8 is arbitrary value.

send START signal → send module address (reading) → receive acknowledge bit →
receive DATA0 → send acknowledge bit → receive DATA1 → send acknowledge bit
→ …… → receive DATA9 (checksum) → send acknowledge bit → send STOP signal
DATA0 = decimal bytes
DATA1 ~ DATA8 is arbitrary value.

7. Notes for maintenance

7.1 The sensor should be calibrated regularly. The cycle time is better to be no more than
3 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 Forbidden to cut the sensor pin.

8. Order Notes

Please provide the following information in order to purchase the specified product.
Detected range of sensor
Resolution of sensor
Sensor name: MH – 710A

9. Contact

Address: No. 299, Jinsuo Road, National Hi-Tech Zone, Zhengzhou 450001, Henan
Tele: (86)0371-60932955 60932966 60932977
Fax: (86) 0371-60932988
Mail: sales@winsensor.com