454B Refrigerant Gas Sensor
（Model: MH-441D）

Manual

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Zhengzhou Winsen Electronics Technology Co., Ltd
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Zhengzhou Winsen Electronics Technology CO., LTD
MH-441D-454B NDIR Infrared Refrigerant Sensor

1. Introduction
MH-441D-454B refrigerant sensor is an intelligent infrared gas sensor (hereinafter referred to as the sensor), which uses the principle of non-dispersive infrared (NDIR) to detect refrigerant (label 454B), which has good selectivity and no oxygen dependence; The sensor is a compact high-performance sensor produced by combining mature infrared absorption gas detection technology with micro-machining and sophisticated circuit design. It is easy to use and can be directly used to replace the catalytic combustion element.

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
- HVAC refrigeration,
- industrial-process control and safety protection

4. Main Parameters

Table 1. Technical Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>MH-441D</td>
</tr>
<tr>
<td>Detection Gas</td>
<td>454B</td>
</tr>
<tr>
<td>Detection Range</td>
<td>0~5% VOL</td>
</tr>
<tr>
<td>Working Voltage</td>
<td>3.6~5V DC (Require powered by safety barrier)</td>
</tr>
<tr>
<td>Average Current</td>
<td>&lt;85mA</td>
</tr>
<tr>
<td>Detection Range</td>
<td>0~5.00% Vol</td>
</tr>
<tr>
<td>Interface Level</td>
<td>3.0V</td>
</tr>
<tr>
<td>Output Signal</td>
<td>UART</td>
</tr>
<tr>
<td>Warm-up time</td>
<td>3 min</td>
</tr>
<tr>
<td>Response time</td>
<td>T90&lt;30 seconds</td>
</tr>
<tr>
<td>Working Temperature</td>
<td>-20°C ~ 60°C</td>
</tr>
<tr>
<td>Working Humidity</td>
<td>0~95%RH (no condensation)</td>
</tr>
<tr>
<td>Sizes</td>
<td>φ20×22.4mm</td>
</tr>
<tr>
<td>Weight</td>
<td>35g</td>
</tr>
<tr>
<td>Lifetime</td>
<td>&gt;5 years</td>
</tr>
<tr>
<td>Defense Grade</td>
<td>IP54</td>
</tr>
<tr>
<td>Power, communication terminal</td>
<td>Ui=7.5VDC, li=265mA, Pi=0.5W, Ci=10 μF, Li=0mH</td>
</tr>
</tbody>
</table>

Fig 1. Sensor struction
Table 2. Measuring Range and accuracy

<table>
<thead>
<tr>
<th>Target Gas</th>
<th>Molecular Formula</th>
<th>Measuring Range</th>
<th>Resolution</th>
<th>No. of decimal</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>454B</td>
<td>CH₃F₂(68.9%)</td>
<td>0~5.00% Vol</td>
<td>0.01% Vol</td>
<td>2</td>
<td>±5% F.S(0.00%-1.00%)±10% F.S(1.00%-5.00%)</td>
</tr>
<tr>
<td></td>
<td>C₃H₆F₄(31.1%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Structure Size (Tolerance of unmarked dimensions is ±0.2)

![Structure Size Diagram]

- Pin definition MH-441D

<table>
<thead>
<tr>
<th>Pin</th>
<th>Pin definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 2</td>
<td>V+ power supply</td>
</tr>
<tr>
<td>Pin 1</td>
<td>GND</td>
</tr>
<tr>
<td>Pin 4</td>
<td>Vout (0.4~2 V)</td>
</tr>
<tr>
<td>Pin 3</td>
<td>UART (RXD) 0~3.0 V data input</td>
</tr>
<tr>
<td>Pin 5</td>
<td>UART (TXD) 0~3.0 V data output</td>
</tr>
</tbody>
</table>

6. Analog Output

Vout output range (0.4~2.0V) stands for gas concentration (0 to full range)
Connection: V+ –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.
Output concentration = Full range value * output voltage

![Analog Output Graph]
Intrinsically safe explosion-proof

This product meets the standards of GB3836.1-2010 "Explosive Atmosphere Part 1: General Requirements for Equipment" and GB3836.4-2010 "Explosive Atmosphere Part 4: Equipment Protected by Intrinsically Safe "i"" standards; the explosion-proof mark is Exib II B T4 Gb, it is suitable for zone 1 and zone 2, contains Class IIA, T1-T3 explosive environment formed by the flammable gas, mixture of steam and air; it has passed the inspection by the National Quality Inspection Center for Explosion-proof Electrical Products and obtained the explosion-proof certificate. When using, please note the following:

- The intrinsically safe power supply must be used to power the sensor, otherwise the explosion-proof performance will be affected.
- It is forbidden to replace the sensor in dangerous places.
- It is forbidden to disassemble or replace the sensor element to avoid affecting the explosion-proof performance.
- It is not allowed to replace components or structures, so as not to affect the explosion-proof performance.
- The installation and wiring of the safety barrier must be carried out in accordance with the safety barrier instruction manual, and the safety barrier must obtain an explosion-proof certificate.

Connection diagram of intrinsically safe explosion-proof system

The on-site installation must comply with the relevant regulations of the GB3836.15—2000 "Electrical Equipment for Explosive Gas Environment Part 15: Electrical Installation in Hazardous Locations (Except Coal and Mines)."

The distribution parameters of the connecting cable between the safety barrier and the sensor should meet:

\[ C_c \leq C_o - C_i \]
\[ L_c \leq L_o - L_i \]
\[ U_i \geq U_o \]
\[ I_i \geq I_o \]
\[ P_i \geq P_o \]

**Note:**

- \( U_o \): Maximum output voltage of safety barrier;
- \( I_o \): Maximum output current of safety barrier
- \( P_o \): Maximum output power of safety barrier
- \( C_o \): Maximum external capacitance of safety barrier
- \( L_o \): the maximum external inductance of the safety barrier (see the safety barrier instructions for the above parameters book)
- \( C_c \): Maximum allowable distributed capacitance of connecting cable
- \( U_i \): sensor maximum input voltage
- \( I_i \): Maximum sensor input current
- \( P_i \): sensor maximum input power
- \( C_i \): Maximum internal capacitance of the sensor
- \( L_i \): Maximum internal inductance of the sensor
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 The sensor should be kept away from heat sources and away from direct sunlight or other thermal radiation.
7.4 Please use the sensor with correct power supply.
7.5 Forbid to weld the sensor pins directly.
7.6 Forbid to cut the sensor pins.