Catalytic Gas Sensor
（Model: MC113/ MC113C）

Manual

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Zhengzhou Winsen Electronics Technology Co., Ltd
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Zhengzhou Winsen Electronics Technology CO., LTD
MC113/ MC113C Catalytic Flammable Gas Sensor

Profile
MC113/ MC113C adopts catalytic combustion principle, and its two arms of electric bridge consists of a test element and a compensate element. The resistance of the test element rises once it meets the combustible gases, in the same time, the output voltage of the bridge changes and the voltage variation rises in direct proportion to the gas concentration. The compensate element, as a conference, has the function of compensating temperature and humidity.

Features
It has good sensitivity to methane in wide range, and has advantages such as long lifespan, low cost and simple drive circuit &etc. The bridge output is linear, quick response, good repeatability and selectivity, good stability, excellent resistance to the interference of H2S gas and organosilicone.

Main Applications
It is widely used in industrial occasion to detect the concentration of natural gas, LPG, CO and alkanes. It is also used in combustible gas leakage alarm system, combustible gas detector and gas concentration meter and so on.

Fig1. Sensor Structure                                       Fig2. Basic Test Circuit
Technical Parameters

<table>
<thead>
<tr>
<th></th>
<th>Model</th>
<th>MC113/ MC113C</th>
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<tbody>
<tr>
<td><strong>Model</strong></td>
<td>MC113/ MC113C</td>
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<tr>
<td><strong>Sensor Type</strong></td>
<td>Catalytic</td>
<td></td>
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<tr>
<td><strong>Standard Encapsulation</strong></td>
<td>Metal, Metallurgy powder mesh</td>
<td></td>
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<tr>
<td><strong>Working voltage (V)</strong></td>
<td>2.8 ± 0.1</td>
<td></td>
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<tr>
<td><strong>Working current (mA)</strong></td>
<td>MC113: 90 ± 10; MC113C: 95 ± 10</td>
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<tr>
<td><strong>Sensitivity (mV)</strong></td>
<td>1% CH4: MC113: 20 to 40; MC113C: 16 to 35; 1% C3H8: MC113: 30 to 60; MC113C: 25 to 55</td>
<td></td>
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<tr>
<td><strong>Linearity</strong></td>
<td>≤5%</td>
<td></td>
</tr>
<tr>
<td><strong>Measuring range (%LEL)</strong></td>
<td>0 to 100</td>
<td></td>
</tr>
<tr>
<td><strong>Response Time (90%)</strong></td>
<td>≤10s</td>
<td></td>
</tr>
<tr>
<td><strong>Recovery Time (90%)</strong></td>
<td>≤30s</td>
<td></td>
</tr>
<tr>
<td><strong>Working Environment</strong></td>
<td>-40 to +70℃, less than 95%RH</td>
<td></td>
</tr>
<tr>
<td><strong>Storage Environment</strong></td>
<td>-20 to +70℃, less than 95%RH</td>
<td></td>
</tr>
<tr>
<td><strong>Size (mm)</strong></td>
<td>MC113: 19×9.5×14; MC113C: 14×8×10</td>
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</tr>
<tr>
<td><strong>Anti-explosion Mark</strong></td>
<td>Exdib I</td>
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</table>

Sensitivity, response and recovery

**Fig3. Sensitivity Curve**
Changing of output signal at different temperature

**Fig4. Response and recovery curve**

**Fig5. Zero point at different temp.**

**Fig6. Sensitivity at different temp.**
Changing of output signal at different humidity

![Graph showing output signal at different humidity](image1)

Fig 7. Zero point at different humidity

![Graph showing sensitivity at different humidity](image2)

Fig 8. Sensitivity at different humidity

Changing of output signal with different voltage supplying

![Graph showing output signal with different voltage](image3)

Fig 9. Zero point with different voltage

![Graph showing sensitivity with different voltage](image4)

Fig 10. Sensitivity with different voltage

Long-term Stability

The drift in air per year is within ±2mV, in 1% CH₄ is within ±2mV. For a short period storage (in 2 weeks), the sensor need be galvanical continuously for 8 hours to reach stability. For more than one year storage, it need more than 48 hours.

![Graph showing sensitivity fluctuation over time](image5)

Fig 11. Sensitivity fluctuation
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, SO₂, Cl₂, HCl etc.), it will
       not only result in corrosion of sensors structure, also it cause sincere sensitivity attenuation.
   1.3 Alkali, Alkali metals salt, halogen pollution
       The sensors performance will be changed badly if sensors be sprayed polluted by alkali metals salt
       especially brine, or be exposed to halogen such as fluorine.
   1.4 Touch water
       Sensitivity of the sensors will be reduced when spattered or dipped in water.
   1.5 Freezing
       Do avoid icing on sensor’s surface, otherwise sensing material will be broken and lost sensitivity.
   1.6 Applied higher voltage
       Applied voltage on sensor should not be higher than stipulated value, even if the sensor is not
       physically damaged or broken, it causes down-line or heater damaged, and bring on sensors' sensitivity
       characteristic changed badly.
   1.7 Pins connection
       When the sensor is connecting to the circuit, one of detection part pins and one of compensation part
       pins connects as the signal output. The other one of detection part pins connects negative electrode,
       while the other one of compensation part pins connects positive electrode. The part with “■” mark is the
       detection part( for the separate type sensor, the one part with bigger hole is detector part),the other part
       is the compensation part.

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 is 24 hours at least if the storage time is more
       than half an year.
   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.
   2.5 Vibration
       Continual vibration will result in sensors down-lead response then break. In transportation or
       assembling line, pneumatic screwdriver/ultrasonic welding machine can lead this vibration.
   2.6 Concussion
       If sensors meet strong concussion, it may lead its lead wire disconnected.
   2.7 Usage Conditions
       2.7.1 For sensor, handmade welding is optimal way. The welding conditions as follow:
Soldering flux: Rosin soldering flux contains least chlorine
Homothermal soldering iron
Temperature: 250°C
Time: less than 3 seconds

2.7.2 If users choose wave-soldering, the following conditions should be obeyed:

- Soldering flux: Rosin soldering flux contains least chlorine
- Speed: 1-2 meter per minute
- Warm-up temperature: 100±20°C
- Welding temperature: 250±10°C
- One time pass wave crest welding machine

If disobey the above using terms, sensors sensitivity will be reduced.