

# **Product Specifications**

Model: TX721-A1B

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Taiyuan Tengxing sensor technology Co., Ltd

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#### **1.Product Feature:**



TX721-A1B is a type of gas sensor developed based on non-dispersive infrared spectroscopy (NDIR) technology. It can detect gases such as methane and propane hydrocarbons. It adopts a diffuse air intake method and is suitable for gas detection and early warning in the industrial field. At the same time, it meets the requirements of intrinsically safe explosion-proof certification. The internal temperature/humidity compensation algorithm is added to adapt to different temperature environments. It has the characteristics of high sensitivity, anti-poisoning, long life, and use in hypoxic environments.

The TX721-A1B gas sensor is equipped with an ultra-low power light source and detector. At the same time, the single light source and dual detector differential measurement principle is used to correct the test channel through the reference channel, which can effectively solve the influence of light source attenuation and environmental factors. The optical path part adopts coating processing technology to minimize the loss of infrared light during the reflection process and the problem of optical path oxidation. At the same time, the body is made of SUS304 material, which is non-toxic and not easy to get dusty or oily, with a strong texture and safe and healthy.

#### 2.Sensor features:

1)High sensitivity, high resolution, fast response time

②Anti-poisoning

③Long lifespan

(4) Can be used in oxygen-deficient environments

## **3.Scope of application:**

TX721-A1B gas sensor can work reliably under the following conditions:

① Atmospheric pressure is 86kPa~106kPa;

②Altitude: <2000m;</pre>

(3)Relative humidity:  $0 \sim 95\%$ RH (no condensation);

(4)Operating environment temperature is  $-20^{\circ}$ C  $\sim 60^{\circ}$ C (can be extended

to  $-40^{\circ}\text{C} \sim 70^{\circ}\text{C}$ )

## **4.**Technical specifications

| Test parameters           | Technical Index                             |  |
|---------------------------|---|--|
| Operating voltage         | DC3.0~5.5V                                  |  |
| Operating current         | Average current<1.0mA, peak current<60mA    |  |
| Average power consumption | <3.3mW@3.3V                                 |  |
| Output format             | Figure, UART                                |  |
| Operating temperature     | -20-60 °C, expandable temperature -40-70 °C |  |
| Operating humidity        | 0-95% RH (no condensation)                  |  |
| Storage temperature       | 0-40 °C (recommended temperature)           |  |

| Operating pressure   | 800~1200mbar   |  |
|--|--|--|
| Weight   | ≤10g   |  |
| Dimensions   | φ20*16.6mm   |  |
| Service life   | 5 years (in a clean room temperature environment)  |  |
| Optical coating  | High reflection film   |  |
| Detection gas  | Methane, CH4, propane, C3H8, carbon dioxide,<br>CO2, etc<br>Methane 0-5.0% Vol (0-100% LEL) Methane<br>0-100% Vol (optional)<br>Propane 0-2.2% vol (0-100% LEL) Carbon dioxide<br>0-100% vol (optional)  |  |
| Resolution   | Methane 50ppm<br>Propane 20ppm<br>Carbon dioxide 10ppm   |  |
| Warm-up time   | ≤5s  |  |
| Response time  | T90≤10s  |  |
| Repeatability  | $\pm$ 1% full range or $\pm$ 2% indication   |  |
| Linear accuracy  | $\pm$ 3% full range or $\pm$ 5% indication   |  |
|  | Relative to 50% RH reading deviation:<br>$\pm$ 2% full range or $\pm$ 15% indication   |  |
| Humidity characteristics   | Relative to 50% RH reading deviation:<br>$\pm$ 2% full range or $\pm$ 15% indication   |  |
| Humidity characteristics<br>Temperature characteristics  | Relative to 50% RH reading deviation:± 2% full range or ± 15% indicationRelative to 25 °C reading deviation:± 2% of the full range or ± 10% of the indicationwithin the range of - 20 ° C to 50 ° C;± 4% of full range or ± 20% of indication in otheroperating temperature ranges   |  |
| Humidity characteristics<br>Temperature characteristics<br>Long-term stability   | <ul> <li>Relative to 50% RH reading deviation:</li> <li>± 2% full range or ± 15% indication</li> <li>Relative to 25 °C reading deviation:</li> <li>± 2% of the full range or ± 10% of the indication</li> <li>within the range of - 20 ° C to 50 ° C;</li> <li>± 4% of full range or ± 20% of indication in other</li> <li>operating temperature ranges</li> <li>Monthly drift ± 2% of full range or ± 5% of</li> <li>indication</li> </ul>  |  |
| Humidity characteristics Temperature characteristics Long-term stability Automatic baseline calibration  | <ul> <li>Relative to 50% RH reading deviation:</li> <li>± 2% full range or ± 15% indication</li> <li>Relative to 25 °C reading deviation:</li> <li>± 2% of the full range or ± 10% of the indication</li> <li>within the range of - 20 ° C to 50 ° C;</li> <li>± 4% of full range or ± 20% of indication in other</li> <li>operating temperature ranges</li> <li>Monthly drift ± 2% of full range or ± 5% of</li> <li>indication</li> <li>Automatic baseline calibration: default enabled,</li> <li>with a cycle of 168 hours; The cycle can be closed</li> <li>or adjusted according to the protocol instructions;</li> <li>Please indicate when placing an order if it needs to</li> <li>be closed by default; If the target gas is present in</li> <li>the environment for a long time, it is recommended</li> <li>to turn off this function.</li> </ul>  |  |
| Humidity characteristics         Temperature characteristics         Long-term stability         Automatic baseline calibration         Measurement interval   | <ul> <li>Relative to 50% RH reading deviation:</li> <li>± 2% full range or ± 15% indication</li> <li>Relative to 25 °C reading deviation:</li> <li>± 2% of the full range or ± 10% of the indication</li> <li>within the range of – 20 ° C to 50 ° C;</li> <li>± 4% of full range or ± 20% of indication in other</li> <li>operating temperature ranges</li> <li>Monthly drift ± 2% of full range or ± 5% of</li> <li>indication</li> <li>Automatic baseline calibration: default enabled,</li> <li>with a cycle of 168 hours; The cycle can be closed</li> <li>or adjusted according to the protocol instructions;</li> <li>Please indicate when placing an order if it needs to</li> <li>be closed by default; If the target gas is present in</li> <li>the environment for a long time, it is recommended</li> <li>to turn off this function.</li> <li>One sampling point per second (1Hz)</li> </ul>   |  |
| Humidity characteristics         Temperature characteristics         Long-term stability         Automatic baseline calibration         Measurement interval         Serial port baud rate                               | <ul> <li>Relative to 50% RH reading deviation:</li> <li>± 2% full range or ± 15% indication</li> <li>Relative to 25 °C reading deviation:</li> <li>± 2% of the full range or ± 10% of the indication</li> <li>within the range of – 20 ° C to 50 ° C;</li> <li>± 4% of full range or ± 20% of indication in other</li> <li>operating temperature ranges</li> <li>Monthly drift ± 2% of full range or ± 5% of</li> <li>indication</li> <li>Automatic baseline calibration: default enabled,</li> <li>with a cycle of 168 hours; The cycle can be closed</li> <li>or adjusted according to the protocol instructions;</li> <li>Please indicate when placing an order if it needs to</li> <li>be closed by default; If the target gas is present in</li> <li>the environment for a long time, it is recommended</li> <li>to turn off this function.</li> <li>One sampling point per second (1Hz)</li> <li>9600,19200,38400,57600 (default)</li> </ul>   |  |
| Humidity characteristics         Temperature characteristics         Long-term stability         Automatic baseline calibration         Measurement interval         Serial port baud rate         Explosion-proof level | <ul> <li>Relative to 50% RH reading deviation:</li> <li>± 2% full range or ± 15% indication</li> <li>Relative to 25 °C reading deviation:</li> <li>± 2% of the full range or ± 10% of the indication</li> <li>within the range of – 20 ° C to 50 ° C;</li> <li>± 4% of full range or ± 20% of indication in other</li> <li>operating temperature ranges</li> <li>Monthly drift ± 2% of full range or ± 5% of</li> <li>indication</li> <li>Automatic baseline calibration: default enabled,</li> <li>with a cycle of 168 hours; The cycle can be closed</li> <li>or adjusted according to the protocol instructions;</li> <li>Please indicate when placing an order if it needs to</li> <li>be closed by default; If the target gas is present in</li> <li>the environment for a long time, it is recommended</li> <li>to turn off this function.</li> <li>One sampling point per second (1Hz)</li> <li>9600,19200,38400,57600 (default)</li> <li>Intrinsic safety ia (ExiaICT4Ga)</li> </ul> |  |



# 5. Product appearance and structural dimensions

## 6.Pin Definition



| Pin name | Name | Pin notes              |
|----------|------|------------------------|
| 1        | VCC  | Power supply 3.0~5.5V  |
| 2        | TXD  | TTL level signal, 2.8V |
| 3        | RXD  | TTL level signal, 2.8V |
| 4        | GND  | Ground signal          |
| 5        | DAC  | Analog signal output   |

## 7. Characteristic curves

The following figure is the sensor temperature, repeatability, linearity and accuracy characteristic curve, as shown in the figure:



# 8.Design reference:

Because different industries have different requirements for sensors, in

order to meet the requirements of various industries, the TX721-A1B sensor has many configuration parameters to solve some problems that may be encountered in different industries. A brief explanation is as follows:

(1) About the problem of automatic calibration at power on:

Low-power LED infrared sensors are prone to zero drift (during transportation and installation) due to various reasons, such as deformation caused by temperature changes/shell extrusion (installation process), regional changes (pressure/humidity changes), so some customers find that the sensor has zero drift after the instrument is installed on site. It is recommended that customers perform the automatic power-on zero calibration function on their own instruments according to the protocol and their own situation. Customers who use analog quantities are recommended to directly turn on the power-on zero automatic calibration function of the sensor itself. It should be noted that after turning on this function, the power-on operation must be performed in clean air. If the power-on operation is performed under the condition of target gas, a huge negative value will be displayed after the sensor returns to the air. At this time, the sensor will determine that the previous zero calibration operation is wrong and will automatically re-mark back to zero.

(2) Regarding the ABC cycle (long-term zero drift automatic

fine-tuning):

During long-term use, the sensor drifts due to factors such as light source attenuation and optical path contamination and deformation. Therefore, the TX721-A1B sensor has two parameters, ABC and ABC factor. This function can be triggered under uninterrupted power supply conditions. Within a certain period (multiples of 8 hours), the sensor will record multiple sets of values for zero point correction. If the sensor's on-site environment is relatively harsh, the ABC factor (the absolute value of the sensor zero point reading corrected in each calibration cycle) can be set larger. Through setting, the maximum can reach 12% LEL.

(3) Regarding the false alarm problem caused by the rapid increase in humidity:

TX721-A1B is an infrared sensor that determines the gas concentration by the absorption of light of a specific wavelength by methane. If there is condensation in the optical path, the receiver will think that the light is absorbed by methane, thereby falsely alarming. In order to solve the problem of high humidity condensation in a rainy environment, our TX721-A1B sensor is equipped with a humidity sensor. Through the algorithm, the false alarm problem in a rainy environment is solved as much as possible without affecting the reliability of the sensor. Since the laboratory environment is quite different from the real natural environment, such as the sudden increase in temperature and humidity in the actual natural environment, the hot water shower in the shower room, etc., the sensor cannot fully take into account the extreme conditions. Therefore, the false alarm of the sensor under such extreme conditions is inevitable and is also a reasonable response. If there is no alarm under this condition, the reliability of the sensor will be greatly reduced. The manufacturer is expected to take this into consideration.

(4) The problem of unstable sensor power supply caused by wireless signal transmission and sound and light alarm: Generally, the TX721-A1B sensor is used by battery-powered users. When the wireless gas detector transmits wireless signals or sound and light alarms, it is easy to affect the sensor power supply, resulting in insufficient power supply for the sensor to work normally. Attention should be paid during the development stage.

(5) Regarding the intermittent power supply problem: The TX721-A1B sensor needs to be under the premise of automatic zeroing to ensure long-term zero stability and linear accuracy. In addition, the sensor has a humidity algorithm to ensure that the sensor does not have false alarms in the case of condensation. The sensor needs to be powered continuously to trigger the function, so the sensor cannot work with intermittent power supply.