



MP6 Multi Gas Sensor Module Manual

General Information

This user manual applies to the MP6 Multi Gas Sensor Module.

Safety Warnings

- Ensure that you have read and understood this manual before powering on or operating the device, and follow relevant industry standards during use. If an irreparable malfunction occurs, stop using the device immediately and prevent unauthorized troubleshooting. Failure to follow these instructions may result in device damage, abnormal detection, or system failure.
- This product is designed for use under various environmental conditions. However, due to the principles and characteristics of sensors, proper handling is critical during storage, assembly, and operation. To ensure normal usage, users must strictly follow this document and general application guidelines for gas sensor modules. Misuse is not covered under warranty. Although our products are highly reliable, we strongly recommend testing the module's response to target gases before use in the field.
- Before performing any work, make sure to comply with local regulations and site procedures.
- Do not disassemble circuit components or the sensor in any manner.
- Do not expose the device to temperatures outside the recommended range.
- To avoid clogging the sensor's air inlet with dust from the environment, ensure that the inlet is facing downward during installation.
- At the end of the product's life, do not dispose of any components with household waste. Please follow local regulations for electronic waste disposal. Do not incinerate the electrochemical sensor, as doing so may release toxic fumes from the battery.

Warnings

- This product must be operated by trained personnel only!
- If a malfunction occurs during initial use and cannot be resolved, it can be returned to the manufacturer for repair or replacement!
- Damage caused by forced disassembly resulting in permanent sensor failure is not covered under warranty!
- It is strictly forbidden to power on and operate this product in hazardous locations!
- It is strictly forbidden to alter the circuitry of this product or change the model, specification, or parameters of related components!
- Key components related to safety performance must use parts provided by our company; substitution is strictly prohibited!
- It is recommended to perform regular calibration once every 6 to 12 months.
- The module must not be used in environments with high concentrations of volatile fuels or chemicals, or near such environments.
- Prolonged exposure to toxic gases may require sensor recalibration.

Overview

The MP6 Multi Gas Sensor Module is an intelligent module that monitors six parameters. They include four types of gases, together with an onboard temperature and humidity chip for detecting the temperature and humidity inside the housing. There is also an optional external digital temperature and humidity sensor for monitoring the ambient temperature and humidity.

The MP6 module supports the simultaneous connection of up to four DS4 digital intelligent gas sensors (which can be a combination of toxic and combustible gases) and can detect various types of gases. It offers high-precision gas detection, temperature and humidity monitoring, calibration, low-power operation modes, and more. It is widely used in fields such as industrial safety, energy monitoring, laboratories, and environmental monitoring.

The MP6 module uses the standard RS485 Modbus-RTU communication protocol, allowing real-time reading of monitoring data from each sensor and is compatible with various signal acquisition systems like PLC, DCS, and HMI.

With its modular design, the MP6 module can quickly form an integrated instrument solution by selecting different housing. It greatly shortens the development cycle for instruments and eliminates complex calibration processes, making it simple and easy to use.



Product Design Standards:

GB12358-2006 General Technical Requirements for Gas Detection and Alarm Devices for Workplace Environments

EN 61326-1:2013 Electrical Equipment for Measurement, Control and Laboratory Use – EMC Requirements – Part 1: General Requirements

Principle

Electrochemical sensing technology is based on the principle of electrochemical catalytic reactions. It detects the electrochemical reaction output signals of different gases and accurately measures gas concentrations through signal magnitude.

The sensor consists of three catalytic electrodes, an electrolyte, and a gas diffusion hole. Gas reaches the sensor's working electrode through the diffusion hole and undergoes an electrochemical redox reaction on the porous microscopic surface of the electrode. The electrolyte facilitates electron transfer, generating an output current signal. The magnitude of this current signal represents the gas concentration.

Technical Parameters

Gas Sensors Parameters

Adapted Sensors	4 DS4 smart digital gas sensors (1-4 gas types, any combination).
	1 MEMS temperature and humidity sensor (Standard)
	1 External digital temperature and humidity sensor (optional)
Principle	The DS4 toxic gas smart digital sensor uses the solid-state polymer electrochemical principle.
	The DS4-LEL combustible gas digital sensor uses the catalytic combustion principle.
	Onboard and external temperature and humidity sensors use MEMS sensors.
Error Range	± 5% of the reading (measurement value error)
Repeatability	< 2% of the reading (measurement value repeatability error)
Linearity	Linear
Sensor Long-term Drift	< 5%/year
Gas Concentration Unit	Three different units (ppm / ppb / %vol) can be read through communication commands.
Sensor Expected Lifespan	Toxic gas sensor > 3 years
	Combustible gas sensor > 3 years

Temperature and Humidity Sensor Performance Parameters

(The following parameters apply to onboard and external temperature and humidity sensors)

Parameter	Range	Resolution	Accuracy Error	Repeatability	Response Time	Long-term Drift
Temperature	-40 °C to +120 °C	0.01 °C	± 0.3 °C	± 0.1 °C	5s to 30s @ t63%	< 0.1 °C/year
Humidity	0-100% RH	0.024% RH	± 2% RH	± 0.1% RH	< 8s @ t63%	< 0.1% RH/year

Electrical Performance Parameters

Working Voltage	5-24V DC (24V DC recommended)
	Standard RS485 Modbus-RTU, Baud Rate 9600
Output Signal Interface	Default Address: 0 x 01 (can be modified by user through the register)
	Four-wire output (V+, V-, RS485+, RS485-, GND), wire size (1.5mm ² , 28-16 AWG).

Note: This module does not include signal wires. Users should select and configure according to demand.

Mechanical Parameters

Size (including sensor)	85.5×50×21mm
Size (excluding sensor)	85.5×50×11.5mm
Weight (excluding sensor)	22g

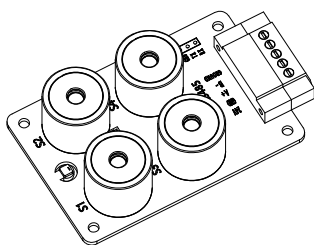
Lifetime

Warranty	12 Months from the date of shipment.
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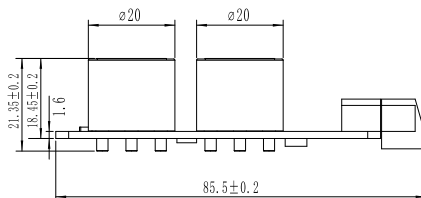
Environmental Parameters

Operating Temperature Range	-40 °C to +55 °C
Operating Humidity Range	15-95% RH, non-condensing
Operating Pressure Range	Atmospheric pressure ± 10%
Storage Temperature Range	0 °C to 20 °C

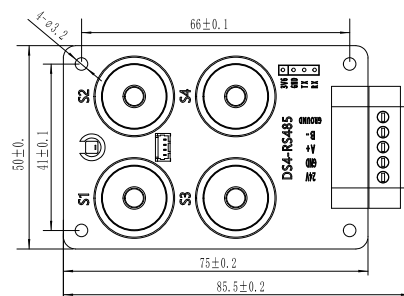
Mechanical Drawing Unit: mm



Product Schematic



Side View



Top View

Application

Application Method Selection

- To ensure that the module is protected from performance degradation or damage to the circuit board caused by dust, corrosive gases, and physical impact, it is recommended to select or customize a suitable enclosure for the module. If an enclosure that only accommodates the module body is selected, it must ensure that the gas sensor inlet at the front of the module is fully exposed to the external environment, and the path for the measured gas to reach the sensor should be as short as possible. In other words, the gas sensor inlet should be as close as possible to the inner wall of the enclosure.

- If the module is placed inside a large space in a combined instrument or device, a gas pump should be used to guide the external gas to the gas sensor inlet. In this case, the gas flow should be controlled at 100 mL/min, and the airflow should not be directed vertically toward the gas sensor inlet.
- Regardless of the type of enclosure used, it must ensure that the module is firmly secured inside the enclosure.

Installation Location Selection

- The preferred installation position is with the sensor face facing downward and the sensor module positioned vertically to the ground, as this can best protect the sensor from water and dust ingress. If this is not possible due to site conditions, the sensor face can be tilted downward or the sensor module can be installed horizontally.
- The installation location of the sensor module should be as close as possible to the source of the leak.
- If there is natural wind or a fan at the installation location of the sensor module, it should be installed in the downwind direction or in a possible gas accumulation area.
- The installation height of the sensor module should be determined based on the density of the target gas. In an outdoor open space, for gases lighter than air, it is recommended to install the sensor module about 30 cm above the potential gas leak point. For gases heavier than air, it is recommended to install the sensor module about 30 cm below the leak point. For gases with a density similar to air, the sensor module should be installed at a height of 1.5 meters above the ground. For indoor use, in addition to the above installation location choices, the sensor module can also be installed on the wall closest to the leak source. According to the three situations mentioned above, it can be installed 30 cm below the ceiling, 30 cm above the floor, or 1.5 meters above the floor.

Installation Precautions

- The sensor module should be avoided from being installed directly above liquids such as water, solvents, or reagents.
- Consider potential splashes of liquids, for example, when installing near the ground, where mud splashes may cover the gas diffusion membrane, leading to blockage of the gas inlet.
- It is not recommended to install the sensor facing upward.
- Installation should not only consider the optimal position related to potential gas leak points, gas characteristics, and ventilation, but also take into account the potential for mechanical damage and how to avoid or minimize such situations.
- Do not install the sensor in direct sunlight.

Electrical Wiring

Electrical wiring should be carried out by qualified installation personnel with the power supply turned off.

Cable Selection

The transmission performance of the RS485 four-wire (full-duplex) system is influenced by factors such as the wire gauge, resistance, transmission distance, and the module's transmission rate. Below are the key parameters for reference:

Cable Type

It is recommended to use twisted pair shielded cables (such as RVVP or STP cables) to avoid external interference.

- Short distance (< 500 m): 0.5 mm² or 0.75 mm² cables (e.g., RVVP 4×0.5 mm²).
- Medium distance (500~1500 m): Use 1.0 mm²~1.5 mm² cables (e.g., RVVP 4×1.5 mm²).
- Long distance: As the distance increases, the resistance rises, and the signal amplitude decreases, which may cause bit errors at the receiving end.

Resistance Requirements

For long distances, resistance increases, signal amplitude decreases, which may lead to reception errors at the receiving end. The RS485 standard requires that the minimum detectable signal at the receiving end be ± 200 mV. If the total resistance of the cable is too high, the signal may drop below the detectable range.

Impedance Matching: RS485 bus requires a 120 Ω terminating resistor. Mismatched impedance may cause signal reflections, affecting communication quality.

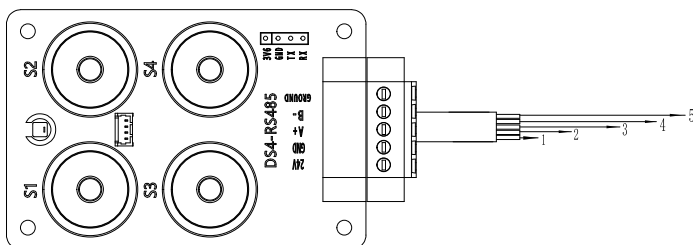
Selectable wire size resistance values (one-way):

Wire Size (mm ²)	Diameter (mm)	Resistance (Ω /km, one-way)
0.5 mm ²	0.8 mm	≈ 35 Ω /km
0.75 mm ²	1.0 mm	≈ 24 Ω /km
1.0 mm ²	1.13 mm	≈ 18 Ω /km
1.5 mm ²	1.38 mm	≈ 12 Ω /km

Other Requirements

- Grounding: Proper grounding can reduce common-mode interference and improve communication stability.
- Wiring Method: Avoid running parallel to high-voltage power lines to prevent electromagnetic interference (EMI).

Definition of Terminal Block



Item	Color	Name	Wiring
1	Red	24V	DC 24V
2	Black	GND	GND
3	White	A+	RS485 A+
4	Grey	B-	RS485 B-
5	/	GROUND	/

Warm-up and Operation

Warm-up

When the sensor module is powered on for the first time, it needs to be continuously powered on for warm-up. Generally, the warm-up process takes between 10 and 120 minutes. During this process, the sensor module can output measurement values, but these values will typically fall outside the normal error range. The warm-up process is also the period during which the sensor module's measurements gradually approach the true values.

Gas Flow Test

If the sensor module has been stored in a warehouse or has been powered off at the installation site for more than 3 months, it is recommended to perform a gas flow test before operation.

Gas Concentration

It is recommended to use 50% of the full-scale target gas concentration for testing.

For example, if the carbon monoxide range is 0-1000 ppm, the test gas concentration should be 500 ppm.

Oxygen can be placed in the atmospheric environment at 20.9% vol or introduced with 99.99% vol nitrogen.

Gas Flow Duration

For conventional gases: continuous flow for 3 minutes. For adsorptive gases: 5 minutes.

For gases below the 10 ppm range: continuous flow for 10 minutes.

Note: For strongly adsorptive gases such as hydrogen chloride, chlorine, hydrogen fluoride, and fluorine, the gas supply system should be purged for at least 30 minutes (ideally 60 minutes) to allow the system to reach adsorption saturation before introducing the test gas. During this time, the sensor module should not be exposed to the test gas.

Flow Rate

100 mL/min

Product Calibration

The sensor module has been calibrated and rechecked before leaving the factory and can be installed and used directly. The module needs to be recalibrated under the following circumstances:

- The sensor module has been in continuous use for more than 6 months.
- There is a deviation between the sensor's measurement values and the true values that exceeds the normal error range.

Calibration Method:

- Calibration using EC Sense calibration software, connected via RS485 communication for calibration. Detailed calibration instructions can be found in the "MP6 Multi Gas Sensor Module Modbus-RTU Communication Protocol" document.
- Calibration using a controller, which can set the calibration function in the PLC, DCS, or HMI system software to calibrate the displayed output measurement values.

Note: If you lack experience in calibrating similar products, or if you have questions about the functions of the accompanying calibration software, please proceed with caution or contact us for training!

Maintenance

- Regularly calibrate the sensor module.
- Cleaning of the sensor module is limited to the outer surface and the sensor's filter mesh. Do not disassemble the sensor module or touch the internal circuit board.
- Use a dry soft brush to clean the dust from the sensor filter mesh. Do not use high-pressure air to directly blow the filter mesh or sensor surface.
- The waterproof measures of the sensor module apply to the cable outlet and the junctions of the housing structure. Do not submerge the entire sensor module in liquid.
- During any on-site construction work, avoid exposing the sensor module to misty solvents (such as spray paint) and keep it away from heat sources and vibration sources.
- Avoid cleaning with alcohol.

Storage and Transportation

- The sensor module should be stored in a well-ventilated, dry, and clean indoor environment with a temperature range of 0 °C to 25 °C. The stacking height should not exceed 1 meter.
- During transportation and storage before installation, the sensor module should always be placed in the designated packaging box. Handle with care to avoid severe vibration.
- Avoid storing in environments with alcohol, alcohol-based, or ketone gases.

Order Information

Based on the MP6 multi gas sensor module, you can select any digital sensor from the external temperature and humidity sensor selection table, toxic gas sensor selection table, and combustible gas sensor selection table for customized combination.

MP6 Product List

Product Name	Order Number
MP6 Multi Gas Sensor Module	04-MP6-01

Note: The basic parameters of this module include the onboard MEMS temperature and humidity sensor. The digital smart gas sensors and external temperature and humidity sensors can be selected from the table below.

External Temperature and Humidity Sensor Product List

Product Name	Order Number
Digital Temperature and Humidity Sensor	04-DS-TH-01

Digital Gas Sensor Product List

Product Name	Formula	Order Number	Range	Resolution	Response Time
DS4 Smart Digital Arsine Gas Sensor	AsH ₃	04-DS4-AsH ₃ -1-01	0-1 ppm	0.001 ppm	< 3 s (T90 < 80 s)
DS4 Smart Digital Diborane Gas Sensor	B ₂ H ₆	04-DS4-B ₂ H ₆ -1-01	0-1 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-DS4-CH ₄ S-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 80 s)
DS4 Smart Digital Methyl Mercaptan Gas Sensor	CH ₄ S	04-DS4-CH ₄ S-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 80 s)
		04-DS4-CH ₄ S-5000-01	0-5000 ppm	0.1 ppm	< 3 s (T90 < 80 s)
DS4 Smart Digital Chlorine Gas Sensor	Cl ₂	04-DS4-Cl ₂ -100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-CO-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 80 s)
DS4 Smart Digital Carbon Monoxide Gas Sensor	CO	04-DS4-CO-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-CO-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-CO-2%-01	0-2% vol.	0.001% vol.	< 3 s (T90 < 30 s)
		04-DS4-ETO-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
DS4 Smart Digital Ethylene Oxide Gas Sensor	ETO (C ₂ H ₄ O)	04-DS4-ETO-200-01	0-200 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-ETO-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
DS4 Smart Digital Germane Gas Sensor	GeH ₄	04-DS4-GeH ₄ -5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
DS4 Smart Digital Hydrogen Gas Sensor	H ₂	04-DS4-H ₂ -1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-H ₂ -5000-01	0-5000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-H ₂ -5%-01	0-5% vol.	0.001% vol.	< 35 s (T90 < 90 s)
DS4 Smart Digital Hydrogen Sulfide Gas Sensor	H ₂ S	04-DS4-H ₂ S-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-DS4-H ₂ S-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-H ₂ S-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-H ₂ S-5000-01	0-5000 ppm	0.1 ppm	< 3 s (T90 < 30 s)

Digital Gas Sensor Product List

Product Name	Formula	Order Number	Range	Resolution	Response Time
DS4 Smart Digital Formaldehyde Gas Sensor	HCHO	04-DS4-HCHO-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-DS4-HCHO-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 60 s)
DS4 Smart Digital Hydrogen Cyanide Gas Sensor	HCN	04-DS4-HCN-50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
DS4 Smart Digital Ammonia Gas Sensor	NH ₃	04-DS4-NH ₃ -10-01	0-10 ppm	0.001 ppm	< 3 s
		04-DS4-NH ₃ -100-01	0-100 ppm	0.01 ppm	< 3 s
DS4 Smart Digital Nitrogen Dioxide Gas Sensor	NO ₂	04-DS4-NO ₂ -50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-NO ₂ -100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-NO ₂ -1000-01	0-1000 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-NO ₂ -2000-01	0-2000 ppm	0.01 ppm	< 3 s (T90 < 30 s)
DS4 Smart Digital Oxygen Gas Sensor	O ₂	04-DS4-O ₂ -25%-01	0-25% vol.	0.01% vol.	< 3 s (T90 < 30 s)
DS4 Smart Digital Ozone Gas Sensor	O ₃	04-DS4-O ₃ -5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-DS4-O ₃ -50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-O ₃ -100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
DS4 Smart Digital Phosphine Gas Sensor	PH ₃	04-DS4-PH ₃ -5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-DS4-PH ₃ -20-01	0-20 ppm	0.01 ppm	< 3 s (T90 < 80 s)
		04-DS4-PH ₃ -100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 80 s)
		04-DS4-PH ₃ -2000-01	0-2000 ppm	0.1 ppm	< 3 s (T90 < 80 s)
DS4 Smart Digital Silane Gas Sensor	SiH ₄	04-DS4-SiH ₄ -10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 80 s)
DS4 Smart Digital Odor Gas Sensor	SMELL	04-DS4-SMELL-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-DS4-SMELL-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-DS4-SMELL-200-01	0-200 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-SMELL-500-01	0-500 ppm	0.1 ppm	< 3 s (T90 < 30 s)
DS4 Smart Digital Sulfur Dioxide Gas Sensor	SO ₂	04-DS4-SO ₂ -50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-SO ₂ -100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-DS4-SO ₂ -1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-SO ₂ -2000-01	0-2000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
DS4 Smart Digital Volatile Organic Compounds Gas Sensor	TVOC	04-DS4-TVOC-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-DS4-TVOC-200-01	0-200 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-TVOC-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-DS4-TVOC-2000-01	0-2000 ppm	0.1 ppm	< 3 s (T90 < 30 s)

Digital Combustible Gas Sensor Product List

Product Name	Order Number	Description
Digital Combustible Gas Sensor	04-DS4-LEL-100%-01	Suitable for combustible gas monitoring in civilian and commercial fields.
Digital Combustible Gas Sensor	04-DS4-LEL-100%-PR-01	Suitable for combustible gas monitoring in industrial fields.



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