LamaPLC: GM MEMS Gas-sensors

"**GM MEMS sensors**" can refer either to Micro-Electro-Mechanical Systems sensors used by General Motors in their vehicles or to a specific line of MEMS gas sensors produced by Winsen, such as the GM-102B or GM-602B.

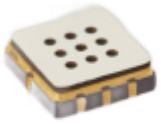
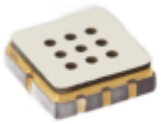
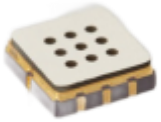
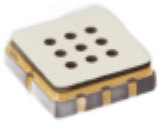
GM (General Motors) Automotive MEMS Sensors

General Motors employs a variety of MEMS sensors across its vehicles to support essential safety, performance, and comfort functions. These sensors are typically supplied by leading manufacturers such as Bosch, NXP (now STMicroelectronics), and TDK.

Winsen GM Series MEMS Gas Sensors

"GM" may also refer to a specific product line of gas sensors from the manufacturer Winsen, designed using MEMS technology.

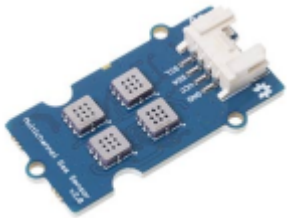
- **GM-102B:** Designed for detecting NO_2 gas.
- **GM-302B:** Used for alcohol gas detection.
- **GM-402B:** A combustible gas sensor.
- **GM-602B:** For monitoring H_2S (Hydrogen Sulfide).
- **GM-702B:** For Carbon Monoxide/Hydrogen gas detection.

Type of measurement	Model	Power voltage	Measurement, range, accuracy
G NO_2	MEMS **GM-102b** 	**5V**	Detection Range: 0.1~10ppm (NO_2) Heater Resistance: 80Ω±20Ω□room temperature
G alcohol gas	MEMS **GM-302b** 	**5V**	Detection Range: 1..500ppm (Ethanol vapor) 80Ω±20Ω□room temperature
G Alcohol (C_2H_5OH) Hydrogen(H_2) Formaldehyde(CH_2O)	MEMS **GM-502b** 	**5V**	Detection: Alcohol (C_2H_5OH), 10..500ppm Detection: Hydrogen(H_2), 1..1000ppm Detection: Formaldehyde(CH2O), 10..100ppm
G Carbon monoxide (CO) Hydrogen (H_2)	MEMS **GM-702b** 	**5V**	Detection: Carbon monoxide sensor (CO) : 10..5000ppm Hydrogen sensor (H_2): 10..500ppm

Moduls

Seeed Studio Grove Multichannel Gas Sensor V2

The **Grove Multichannel Gas Sensor V2** is a single module that integrates four independent MEMS gas sensors to detect a range of common gases via an I²C interface. It is designed for qualitative measurement of gas presence and relative concentration changes, rather than high-precision quantitative analysis.



Key Features and Specifications

The module uses specific Winsen GM-series sensors:

- **Integrated Sensors:** GM-102B (NO_2), GM-302B (Ethanol/Alcohol), GM-502B (VOCs), and GM-702B (CO).
- **Interface:** I2C (I²C address is typically 0x08, though some documentation lists 0x55).
- **Supply Voltage:** Operates from 3.3V to 5V DC.
- **Gases Detected:** Carbon Monoxide (CO), Nitrogen Dioxide (NO_2), Ethyl Alcohol (C_2H_5CH), Volatile Organic Compounds (VOCs), among others.
- **Function:** Provides four sets of data simultaneously, allowing for differentiation between gas types based on the response profile of each sensor.
- **Measurement Type:** More suitable for qualitative detection (detecting presence/change) than precise quantitative measurement (exact ppm values).
- **Preheat Requirement:** A warm-up time of at least 24 hours is required for chemical balance and stable readings, especially after prolonged storage.
- **All 4 sensors in one platform:**
  GM-102b (NO_2)
  GM-302b (alcohol gas)
  GM-502b (Alcohol (C_2H_5OH), Hydrogen(H_2), Formaldehyde(CH_2O))
  GM-702b (Carbon monoxide (CO), Hydrogen (H_2))

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Arduino & Seeed Studio Grove Multichannel Gas Sensor V2

To read from the Seeed Studio Grove Multichannel Gas Sensor V2 (which features the GM-102B, GM-302B, GM-502B, and GM-702B sensors), you must use the **Seeed_Arduino_MultiGas** library.

Hardware Connections

This sensor uses I2C communication:

- **VCC:** 3.3V or 5V
- **GND:** Ground
- **SDA:** Arduino SDA (Pin A4 on Uno)
- **SCL:** Arduino SCL (Pin A5 on Uno)
- **I²C Address:** The default address for Version 2 is 0x08.

Arduino Example Code

This sketch reads all four GM-series sensors and prints their raw values to the Serial Monitor.

```
#include <Multichannel_Gas_GMXXX.h>
#include <Wire.h>

GAS_GMXXX<TwoWire> gas;

void setup() {
  Serial.begin(9600);

  // Initialize the sensor with the I2C address 0x08
  gas.begin(Wire, 0x08);
  Serial.println("Grove Multichannel Gas Sensor V2 Initialized");
}

void loop() {
  // GM102B: Nitrogen Dioxide (NO2) sensor
  uint32_t valNO2 = gas.getGM102B();

  // GM302B: Ethanol (C2H5OH) sensor
  uint32_t valEthanol = gas.getGM302B();

  // GM502B: VOC (Volatile Organic Compounds) sensor
  uint32_t valVOC = gas.getGM502B();

  // GM702B: Carbon Monoxide (CO) sensor
  uint32_t valCO = gas.getGM702B();

  // Print results
  Serial.print("NO2: "); Serial.print(valNO2);
  Serial.print(" | Ethanol: "); Serial.print(valEthanol);
  Serial.print(" | VOC: "); Serial.print(valVOC);
  Serial.print(" | CO: "); Serial.println(valCO);

  delay(1000);
}
```

Critical Usage Notes

- **Preheating:** For accurate readings, the sensor requires a *“warm-up”* period. It is recommended to leave the sensor powered on for 24 hours before its first stable measurement.

- **Raw vs. PPM:** The standard library functions like *getGM102B()* return a raw ADC value. To convert these to parts-per-million (ppm), you must use specific calibration curves provided in the Seeed Studio Wiki.
- **Voltage Conversion:** You can use *gas.calcVol(val)* to convert the raw reading into a voltage for easier cross-referencing with sensor datasheets.

GM-102b, GM-302b, GM-502b, GM-702b, MEMS, Gas-quality, sensor, arduino, code, Nitrogen Dioxide, NO_2, Volatile Organic Compounds, VOC, Carbon Monoxide, CO, Ethyl Alcohol, C_2H_5CH, NO_2, Formaldehyde, CH_2O, Alcohol, C_2H_5OH