# MQ-9 Gas Sensor: What It Is and How It Works

The **MQ-9** gas sensor is designed to detect **carbon monoxide (CO), methane (CH$_4$), and liquefied petroleum gas (LPG)** in the air. It is widely used in industrial applications, gas leak detectors, and environmental monitoring.

## How It Works

The **MQ-9 sensor** operates using a **metal oxide semiconductor (MOS) technology**, which changes resistance when exposed to specific gases. It features a **heater element** that cycles between **high and low temperatures** to detect different gases effectively:

1. **High Temperature (~5V Heating)**
   - At high temperatures, the sensor primarily detects **CO (carbon monoxide)**.
   - CO is oxidized on the sensor's tin dioxide (SnO$_2$) surface, reducing resistance.
2. **Low Temperature (~1.5V Heating)**
   - At lower temperatures, the sensor becomes more sensitive to **methane (CH$_4$) and LPG**.
   - The reduced temperature allows the sensor to detect combustible gases with better accuracy.

The sensor outputs an **analog voltage** that corresponds to the gas concentration. The higher the gas concentration, the lower the resistance, and the higher the output voltage.

## Key Features

- Detects **carbon monoxide (CO), methane (CH$_4$), and LPG**.
- Uses a **dual heating cycle** to improve gas detection.
- Analog output that can be read using an **Arduino or microcontroller**.
- Requires **calibration** for accurate gas concentration measurements.
- Operating voltage: **5V (logic) with heating voltage cycling between 5V and 1.5V**.

## Gases Detected by MQ-9 Sensor

| Gas | Detection Condition | Sensitivity |
|---|---|---|
| Carbon Monoxide (CO) | High temperature (~5V heating) | High |
| Methane (CH$_4$) | Low temperature (~1.5V heating) | Moderate |
| Liquefied Petroleum Gas (LPG) | Low temperature (~1.5V heating) | Moderate |

## Applications

- **CO and gas leak detectors**.
- **Industrial and home safety monitoring**.
- **Combustible gas alarms**.
- **Environmental air quality monitoring**.

## Summary

The **MQ-9 gas sensor** is designed to detect **carbon monoxide (CO), methane (CH$_4$), and liquefied petroleum gas (LPG)**. It is widely used in gas leak detectors, industrial safety applications, and environmental monitoring systems.

[Interface the MQ9 Gas Sensor with Arduino](#)

[LPG GAS leakage detector project using MQ9 gas sensor, Arduino 0.96" oled display, buzzer and LED](#)