# 🚨 Arduino-Based Gas Detector with Alarm & Display

## 🧠 Project Goal

To design a smart gas detection system that:

- Detects presence of gas using MQ sensor
- Displays the gas level on an LCD
- Sounds an alarm and turns on a fan & red light when gas is detected above a danger threshold
- Keeps green light ON when gas levels are safe

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## 🧾 Project Overview

| Feature | Description |
|---|---|
| Microcontroller | Arduino UNO |
| Display | 16x2 LCD Display |
| Sensor | MQ-2 Gas Sensor (Detects LPG, Smoke, CO, Methane, etc.) |
| Alarm | Buzzer for sound alert |
| Visual Indicators | Red LED (Danger), Green LED (Safe) |
| Fan | Acts as a gas exhaust (DC Motor used in simulation) |
| Simulation Tool | Wokwi Simulator or VS Code Wokwi Extension |

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## ⚙️ Circuit Components

| Component | Quantity | Purpose |
|---|---|---|
| Arduino UNO | 1 | Main controller |

| | | |
|---|---|---|
| MQ-2 Sensor | 1 | Gas detection |
| 16x2 LCD | 1 | Display gas levels |
| Red LED | 1 | Shows danger |
| Green LED | 1 | Shows safety |
| Buzzer | 1 | Alarm in danger |
| Fan (DC Motor) | 1 | Exhaust system |
| Jumper Wires | many | Circuit connections |

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## 📟 Arduino Code

cpp
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```
#include <LiquidCrystal.h>

LiquidCrystal lcd(12, 11, 10, 9, 8, 7);
int BuzzerPin = 2;
int ledgreen = 3;
int ledred = 4;
int fan = 5;
int sensor = A0;
float gas = 0;

void setup() {
  pinMode(ledgreen, OUTPUT);
  pinMode(ledred, OUTPUT);
  pinMode(fan, OUTPUT);
  pinMode(BuzzerPin, OUTPUT);
  lcd.begin(16, 2);
  lcd.setCursor(2, 0);
  lcd.print("GAS DETECTOR");
  delay(1500);
  lcd.clear();
}

void loop() {
```

```
  gas = analogRead(sensor);
  gas = gas * 100 / 1023;

  lcd.setCursor(0, 0);
  lcd.print("GAS = ");
  lcd.print(gas);
  lcd.print(" %   ");

  if (gas > 50) {
    digitalWrite(BuzzerPin, HIGH);
    digitalWrite(ledred, HIGH);
    digitalWrite(ledgreen, LOW);
    digitalWrite(fan, HIGH);
    lcd.setCursor(0, 1);
    lcd.print("<< DANGER !!! >>");
  } else {
    digitalWrite(BuzzerPin, LOW);
    digitalWrite(ledred, LOW);
    digitalWrite(ledgreen, HIGH);
    digitalWrite(fan, LOW);
    lcd.setCursor(0, 1);
    lcd.print("<OUT OF DANGER.>");
  }
  delay(200);
}
```

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## 🧪 Working Explanation

1. **Gas Detection**:
    - The MQ-2 sensor reads the analog gas level from the air.
    - The value is converted to a percentage for better understanding.
2. **Display**:

- The LCD displays the gas percentage and shows the current status (`DANGER` or `OUT OF DANGER`).

3. **Alarm System**:
    - If the gas % is **greater than 50%**, the buzzer and red LED are turned ON and fan is started.
    - If the gas % is **safe**, the green LED stays ON and others are OFF.

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## 🖼️ Simulation Circuit (`diagram.json`)

Here's your full **Wokwi `diagram.json`** file:

json
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```
{
  "version": 1,
  "author": "Krish Satasiya",
  "editor": "wokwi",
  "parts": [
    { "type": "wokwi-arduino-uno", "id": "uno" },
    { "type": "wokwi-lcd1602", "id": "lcd", "top": -130, "left": 120
},
    { "type": "wokwi-gas-sensor", "id": "gas", "top": 150, "left": 270
},
    { "type": "wokwi-led", "id": "ledred", "top": 40, "left": 300,
"attrs": { "color": "red" } },
    { "type": "wokwi-led", "id": "ledgreen", "top": 40, "left": 350,
"attrs": { "color": "green" } },
    { "type": "wokwi-buzzer", "id": "buzzer", "top": 170, "left": 110
},
    { "type": "wokwi-dc-motor", "id": "fan", "top": 170, "left": 40 }
  ],
  "connections": [
    [ "lcd:RS", "uno:12", "green" ],
    [ "lcd:E", "uno:11", "green" ],
```

```
    [ "lcd:D4", "uno:10", "green" ],
    [ "lcd:D5", "uno:9", "green" ],
    [ "lcd:D6", "uno:8", "green" ],
    [ "lcd:D7", "uno:7", "green" ],
    [ "lcd:VSS", "uno:GND", "black" ],
    [ "lcd:VDD", "uno:5V", "red" ],
    [ "lcd:RW", "uno:GND", "black" ],
    [ "lcd:A", "uno:5V", "red" ],
    [ "lcd:K", "uno:GND", "black" ],

    [ "gas:AO", "uno:A0", "blue" ],
    [ "gas:VCC", "uno:5V", "red" ],
    [ "gas:GND", "uno:GND", "black" ],

    [ "ledred:A", "uno:4", "red" ],
    [ "ledred:C", "uno:GND", "black" ],
    [ "ledgreen:A", "uno:3", "green" ],
    [ "ledgreen:C", "uno:GND", "black" ],

    [ "buzzer:1", "uno:2", "blue" ],
    [ "buzzer:2", "uno:GND", "black" ],

    [ "fan:1", "uno:5", "orange" ],
    [ "fan:2", "uno:GND", "black" ]
  ]
}
```

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## 📌 Future Improvements

- Add **MQ-135** to detect more gases (ammonia, alcohol, etc.)
- Send gas data to **IoT platform** like ThingSpeak
- Add **SMS alert** via GSM module
- Show exact gas type (requires advanced sensor calibration)