Project 22-MQ-2 Gas sensor alarm experiment

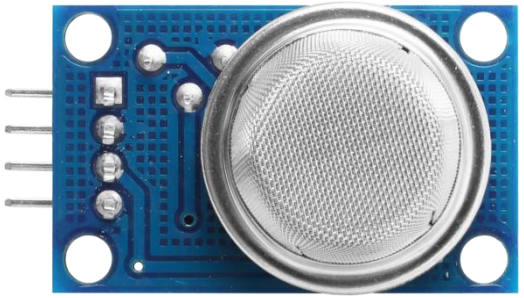
1. project description

In this project; we will learn how to detect smoke and combustible gases using MQ-2 sensor. You will read the sensor's analog output voltage when the smoke

When the fog reaches a certain concentration, it will sound a buzzer alarm.

2. Module introduction

2.1 MQ-2 gas sensor



The MQ2 gas sensor is an electronic sensor used to sense the concentration of gases such as liquefied petroleum gas, propane, methane, hydrogen, alcohol, smoke and carbon monoxide in the air. MQ2 gas sensors are also known as chemical

resistors. It contains a sensing material whose resistance changes when it comes into contact with gas. This change in resistance is used to detect gases . MQ2 is a metal oxide semiconductor type gas sensor. The gas concentration in the gas is measured using a network of voltage dividers present in the sensor. The sensor operates at 5V DC. It can detect gases with concentrations ranging from 200 to 10,000 ppm.

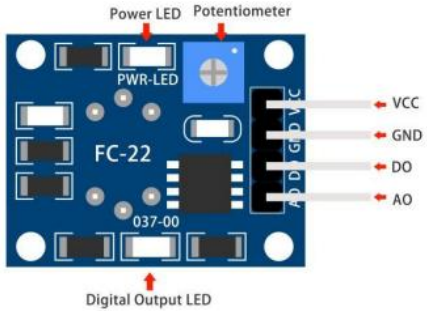
working principle

The sensor consists of a sensing element, primarily an alumina-based ceramic coated with tin dioxide, enclosed in a stainless steel mesh. The sensing element has six connecting legs. Two leads are responsible for heating the sensing element, and the other four are used for output signals.

Oxygen is adsorbed on the surface of the sensing material when heated in high-temperature air. The donor electrons present in the tin oxide are then attracted to this oxygen, preventing the flow of electricity.

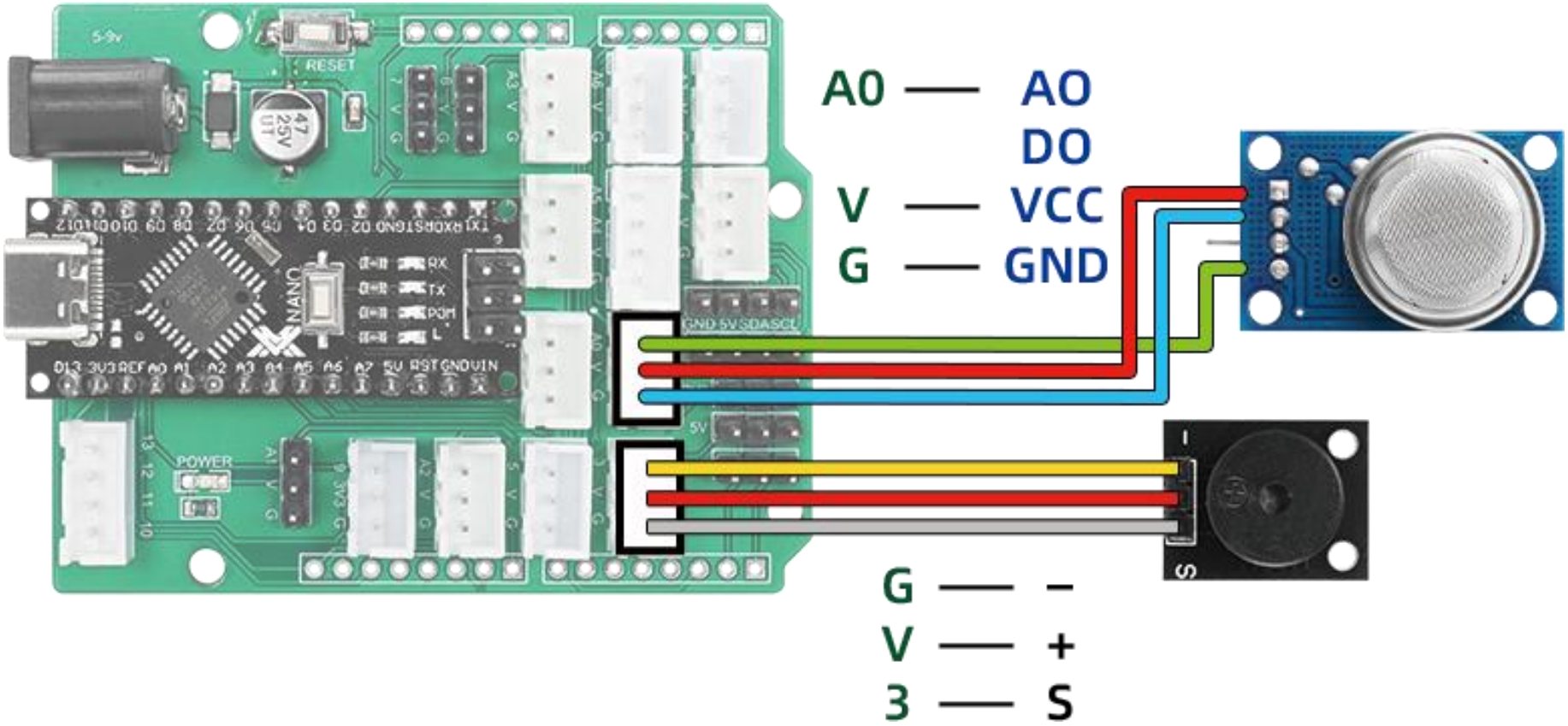
When reducing gas is present, these oxygen atoms react with the reducing gas, thereby reducing the surface density of adsorbed oxygen. Current can now flow through the sensor, producing an analog voltage value.

These voltage values are measured to understand the concentration of the gas. When the gas concentration is high, the voltage value is higher .



The voltage output by the sensor changes depending on the level of smoke/gas present in the atmosphere. The sensor outputs a voltage proportional to the smoke/gas concentration. That is to say, the relationship between voltage and gas concentration is as follows: The greater the gas concentration, the greater the output voltage. The lower the gas concentration, the lower the output voltage.

3. Project wiring diagram



4. Download Arduino code

Open the project Arduino code file (path: Project 22 MQ-2 Gas Sensor Alarm Experiment\project22\project22.ino)

Connect the main control board to the computer using USB, select the board type as Nano, select the newly displayed COM number, click "Download" to start compiling and downloading the program to the main control board.

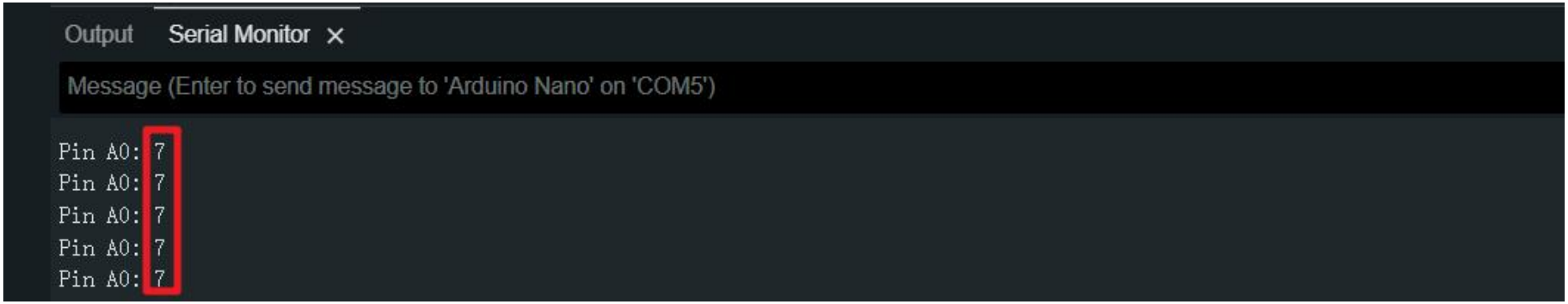
Code analysis:

After starting the project, when dangerous gas is detected and the variable value is greater than the set threshold, the buzzer alarm will sound. When no dangerous gas is detected, the sensor variable value analogSensor is relatively low and the buzzer stops .

```
2   int buzzer = 3;          //定义蜂鸣器引脚编号为Type-C Nano引脚3    Define the buzzer pin number to t
3   int smokeA0 = A0;        //定义MQ-2气体传感器引脚连接到Type-C纳米模拟端口的A0引脚     Define the MQ-
4   int sensorThres = 100;   //气体阈值     Your threshold value
5
6   void setup() {
7     pinMode(buzzer, OUTPUT);  //定义蜂鸣器引脚为输出    Define the buzzer pin as the output
8     pinMode(smokeA0, INPUT);  //定义气体传感器引脚为输入    Define the gas sensor pin as the input
9     Serial.begin(9600);
10  }
```

```
12  void loop() {
13    int analogSensor = analogRead(smokeA0); //MQ-2传感器检查值被分配给ALOG传感器变量    The MQ-2 sensor check va
14    Serial.print("Pin A0: ");
15    Serial.println(analogSensor);           //串口打印传感器数值    The serial port prints the sensor value
16    if (analogSensor > sensorThres)         //检查是否达到阈值    Checks if it has reached the threshold value
17    {
18      tone(buzzer, 1000, 200);              //蜂鸣器响    The buzzer sounded
19    }else{
20      noTone(buzzer);                       //蜂鸣器停    The buzzer stops
21    }
22    delay(100);
23  }
24
```

Gas threshold setting : When there is no dangerous gas, a lower value is obtained, and when a large amount of dangerous gas is detected, another higher value is obtained. The threshold can be set to the average of the above two values. In this example, 100 is set, and the size can be set according to actual conditions.



5. Download Mind+ graphical code

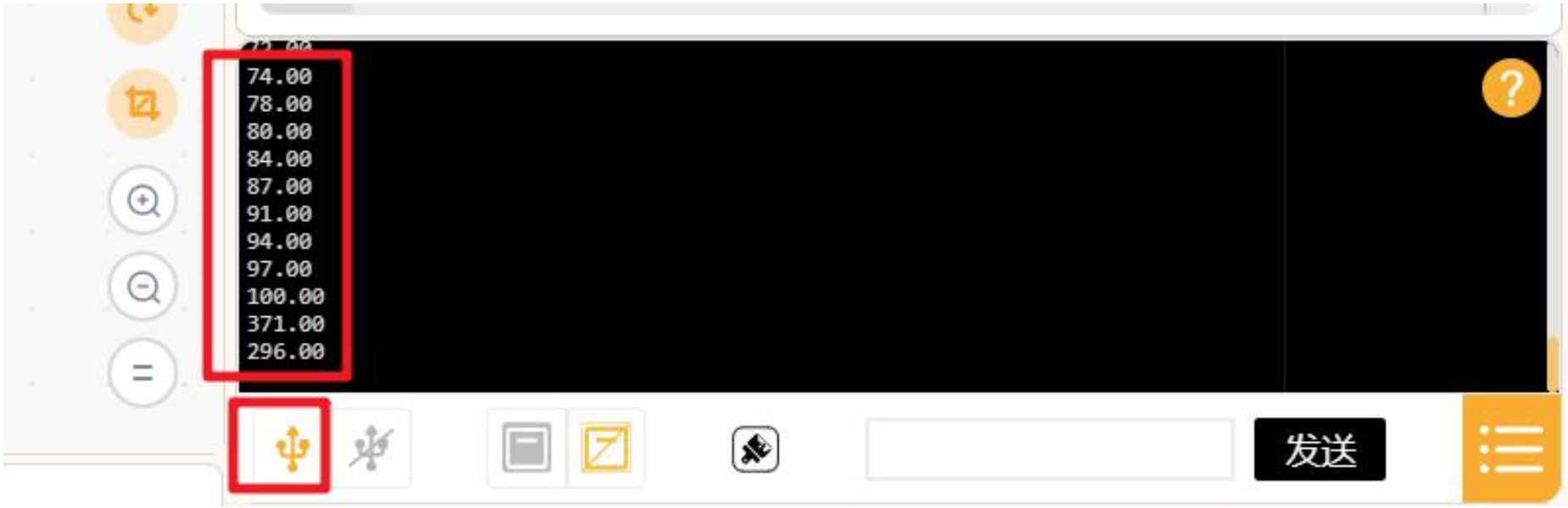
Open the project Mind+ code file (path: Project 22 MQ-2 gas sensor alarm experiment \ MQ-2_gas_sensor_alarm_experiment.mp)

Connect the main control board to the computer with a USB cable and select the newly appeared CH340 serial port COM number. Click "Upload to Device" to complete the code upload.

Programming analysis:

When the real-time reading value is greater than the set threshold, dangerous gas is detected, and a buzzer warning is activated.

Gas threshold setting: When there is no dangerous gas, a lower value is obtained, and when a large amount of dangerous gas is detected, another higher value is obtained. The threshold can be set to the average of the above two values. In this example, 100 is set, but the size can be changed according to actual conditions.



Total code:


Nano 主程序开始
设置 设定气体值 的值为 100
循环执行
设置 读取气体值 的值为 读取模拟引脚 A0
串口 字符串输出 变量 读取气体值 换行
如果 变量 读取气体值 >= 变量 设定气体值 那么执行
设置引脚 3 喇叭蜂鸣器音调为 1 低 C/C3 节拍为 1/2
等待 1 秒
设置数字引脚 3 输出为 低电平
等待 1 秒