

Air-Environmental-Monitoring (/Air-Environmental-Monitoring)

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Air-Gas-Environmental-Monitoring

Arduino can measure or monitor many different gases, including molecules in air such as smoke, solvents, alcohol, propane, butane, etc.



MQ-2 Gas Sensor Module



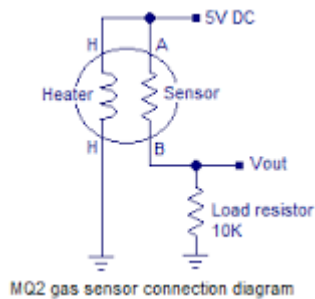
MQ-3 Gas Sensor Module



MQ-2 Gas Sensor

The most common low-cost monitoring devices are the "MQ" series of gas sensors. Examples are shown on the right. A fine metal screen protects the sensor. The leftmost image is of a sensor alone; most have 6 pins on the bottom.

A basic sensor is usually wired as shown on the left. However, most gas sensors used with Arduino are easier to use because they are mounted on a small printed circuit board with a comparator chip and



an adjustment potentiometer that can set a digital "alarm" point. An analog output is also available.

These are "Taguchi Gas Sensors" ([Wikipedia](#)), abbreviated TGS, which are a type of electro-chemical sensor that consists of a small pellet or bead with a chemical composition that will oxidize or reduce gases that come in contact with it. This reaction causes an increased electrical signal from electrodes embedded in the pellet. A heating element embedded in the sensor element is needed to drive off contaminants and make it sensitive to the desired gases. The heater needs to be on for about 3 minutes (tested with MQ-2) before the readings become stable.

There are several different available sensors that are sensitive to different gases: (Details on the [Arduino site HERE](#))

Available Sensor Types:

- MQ-2 Sensitive for Methane, Butane, LP Gas, smoke. Available [HERE](#)
- MQ-3 Sensitive for Alcohol, Ethanol, smoke [Available HERE](#)
- MQ-4 Sensitive for Methane, CNG Gas
- MQ-5 Sensitive for Natural gas, LPG [Available HERE](#)
- MQ-6 Sensitive for LPG, butane gas
- MQ-7 Sensitive for Carbon Monoxide [Available HERE](#)
- MQ-8 Sensitive for Hydrogen Gas
- MQ-9 Sensitive for Carbon Monoxide, flammable gasses.
- MQ-135 Sensitive to Air Pollution [Available HERE](#)

Connections:

SENSOR	ARDUINO
GND	GND
VCC	+5V
DO	2
AO	A0

TESTING SENSORS:

Load the test Software Sketch below into a blank Arduino IDE Window. Verify and then upload to your board. Unplug the USB connection, connect the Gas Sensor module as shown above. Then reconnect the USB.

Open the Arduino IDE [Serial Monitor \(Info\)](#) Check that it's set to 9600 baud (Lower right). You should see output like the listing at the end of this page.

STARTUP: When a new sensor is first connected you will see larger Analog values such as 500. Then the values will slowly decrease over 5 or 10 minutes. When the number is stable, use a small screwdriver to adjust the potentiometer. First turn it fully clockwise. The Arduino pin 13 should light and "ALARM" should be displayed. Slowly turn the potentiometer counterclockwise until the LED goes out, then a little more. Now an increase in the gas the detector is designed for will increase the analog value and turn the alarm digital output on (it is active LOW).

A sip of wine then a breath toward many sensors will cause a value change (especially the MQ-3). Some cigarette smoke will cause the MQ-2 and MQ-135 to react. A typical butane cigarette lighter, (lit and then blown out but held down) will trigger the LP Gas sensitive sensors. Hey, these sensors are SUPPOSED to go off when they

sense "*Stuff That Is Bad For You*"..

EXAMPLE Software Sketch

(Copy and paste into blank Arduino IDE window)

```

/* YourDuino.com Electronic Bricks Set - MQ Gas Sensors
See it here: http://yourduino.com/sunshop2/index.php?l=product_detail&p=364
Starter Example: Sketch Template
- MQ Gas Sensor Brick with an LM393 and both digital and analog outputs.
- SEE the comments after "/" on each line below
- CONNECTIONS:
  - GND - GND
  - +5V - VCC
  - DOUT - 2
  - AOUT - A0
- V1.00 04/12/2015
Questions: terry@yourduino.com */

/*-----( Import needed libraries )-----*/
//NONE YET
/*-----( Declare Constants and Pin Numbers )-----*/
#define LED_PIN 13          // define on-board LED
#define DIGITAL_IN_PIN 2   // define the digital input pin
#define ANALOG_IN_PIN  A0  // define the analog input pin

/*-----( Declare objects )-----*/
//NONE YET

/*-----( Declare Variables )-----*/
int digitalValue ; // read digital value
float sensorValue; // read analog value

void setup()  /****** SETUP: RUNS ONCE *****/
{
  pinMode (LED_PIN, OUTPUT) ;          // Onboard LED
  pinMode (DIGITAL_IN_PIN, INPUT) ;// digital input signal (Not actually required; INPUT
  pinMode (ANALOG_IN_PIN, INPUT) ;// analog input signal (Not actually required; INPUT
  Serial.begin(9600);                  // Start the Serial Monitor connection
  delay(100);
  Serial.println("YourDuino.com MQ Gas Sensor Test ");
}

void loop()  /****** LOOP: RUNS CONSTANTLY *****/
{
  sensorValue = analogRead(ANALOG_IN_PIN);
  Serial.print("Analog value = ");
  Serial.print(sensorValue), DEC; // display analog value
}

```

```
digitalValue = digitalRead (DIGITAL_IN_PIN) ;

Serial.print("  Digital value = ");
Serial.print(digitalValue), DEC; // display digital value

if (digitalValue == LOW) // Gas Sensor Module is active LOW when alarmed
{
  digitalWrite (LED_PIN, HIGH);
  Serial.println(" ALARM! ");
}
else
{
  digitalWrite (LED_PIN, LOW);
  Serial.println();
}

delay(1000);

} //--(end main loop )---

/*-----( Declare User-written Functions )-----*/

//***** ( THE END )*****
```

Expected Program output on Serial Monitor:

YourDuino.com MQ Gas Sensor Test

A


YourDuino.com MQ Gas Sensor Test

```
Yourduino.com MQ Gas Sensor Test
Analog value = 115.00   Digital value = 1
Analog value = 114.00   Digital value = 1
Analog value = 115.00   Digital value = 1
Analog value = 116.00   Digital value = 1
Analog value = 116.00   Digital value = 1
Analog value = 133.00 ALARM!   Digital value = 0
Analog value = 155.00 ALARM!   Digital value = 0
```

```
Analog value = 141.00 ALARM!   Digital value = 0
Analog value = 135.00 ALARM!   Digital value = 0
Analog value = 128.00 ALARM!   Digital value = 0
Analog value = 125.00 ALARM!   Digital value = 0
Analog value = 123.00 ALARM!   Digital value = 0
Analog value = 122.00 ALARM!   Digital value = 0
Analog value = 121.00 ALARM!   Digital value = 0
Analog value = 120.00 ALARM!   Digital value = 0
Analog value = 119.00 ALARM!   Digital value = 0
Analog value = 118.00 ALARM!   Digital value = 0
Analog value = 117.00   Digital value = 1
Analog value = 117.00   Digital value = 1
Analog value = 116.00   Digital value = 1
Analog value = 116.00   Digital value = 1
Analog value = 115.00   Digital value = 1
Analog value = 115.00   Digital value = 1
```

ZZ

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