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## Information for the MH-Z16 CO<sub>2</sub> Sensor

### Introduction

- The MH-Z16 is a low-cost rod-shaped sensor that uses NDIR technology to measure CO<sub>2</sub>.
- Any microcontroller can control this sensor. However, this guide and the associative codes use an Arduino Uno to operate the device.
- It is compatible with three different communication methods: I<sup>2</sup>C, UART, and PWM.
- The sensor connects to a blue I<sup>2</sup>C/UART Interface board that easily connects to an Arduino or Raspberry Pi.

### Important Notes

- The sensor is sensitive to sunlight. Therefore, DO NOT place it in direct contact with sunlight.
- Do not expose the sensor to water or rainy conditions.

### Specifications

	Via I <sup>2</sup> C/UART	Via PWM
<b>Range</b>	0 – 10,000 ppm	0 – 5,000 ppm
<b>Accuracy</b>	± (100ppm+5% reading)	± (50ppm+5% reading)
<b>Resolution</b>	1 ppm	N/A
<b>Current</b>	60 mA (avg) 150 mA (max)	60 mA (avg) 150 mA (max)
<b>Voltage</b>	4.5 V - 5.5 V	4.5 V - 5.5 V
<b>Response Time</b>	60 sec (T90)	60 sec (T90)
<b>Lifespan</b>	> 5 years	> 5 years

### Links

- Product Info:  
<https://sandboxelectronics.com/?product=mh-z16-ndir-co2-sensor-with-i2cuart-5v3-3v-interface-for-arduino-raspberry-pi>
- Datasheet:  
<https://sandboxelectronics.com/wp-content/uploads/2018/08/Z16DS.pdf>
- Arduino Library:  
<https://github.com/SandboxElectronics/NDIR>
- Arduino Code for I<sup>2</sup>C:  
[https://github.com/RiceAllDay22/EGI\\_Arduino\\_Collection/tree/main/MH-Z16\\_w\\_I2C](https://github.com/RiceAllDay22/EGI_Arduino_Collection/tree/main/MH-Z16_w_I2C)
- Arduino Code for PWM:  
[https://github.com/RiceAllDay22/EGI\\_Arduino\\_Collection/tree/main/MH-Z16\\_w\\_PWM](https://github.com/RiceAllDay22/EGI_Arduino_Collection/tree/main/MH-Z16_w_PWM)

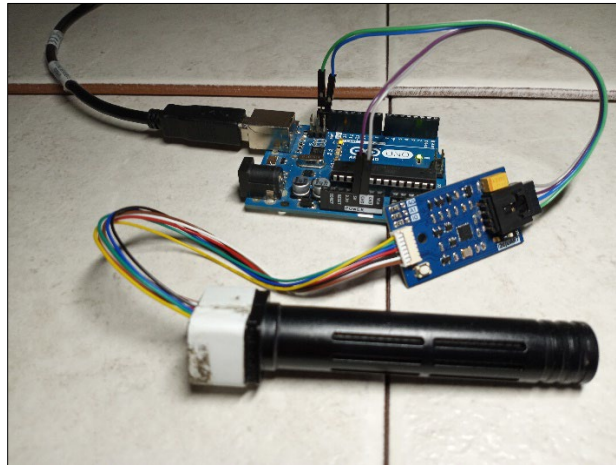


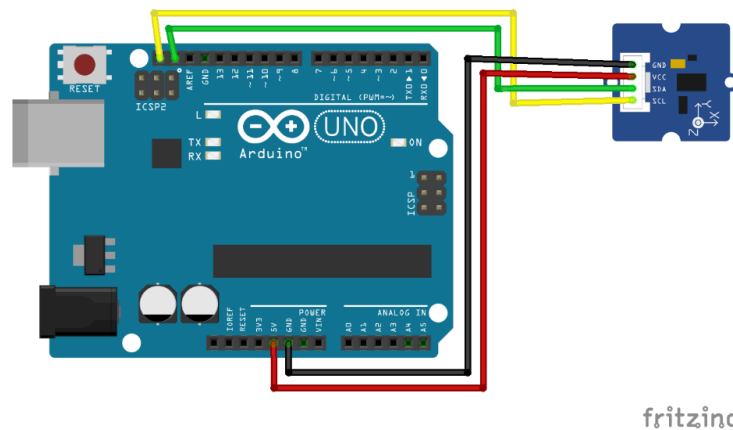
Figure 1. Picture of the sensor and the interface board connected to an Arduino Uno

### Wiring

- Communication with the sensor is performed via the I<sup>2</sup>C, UART, or PWM methods.
- The Interface board allows for the I<sup>2</sup>C and UART methods.
- The MH-Z16 sensor is still operable without an Interface board via the PWM method.
- This guide covers how to use the sensor through I<sup>2</sup>C and PWM.
- NEVER make wiring connections while the Arduino Uno is on.

### Wiring – Method # 1 (Recommended for ease and more accurate data)

- This method requires the Interface board so that I<sup>2</sup>C is used to communicate with the sensor.
- Connect the sensor rod to the interface board using the 7-wire Grove connector. Then connect the interface board to an Arduino Uno using four M/F jumper wires.
- The interface board has a switch. Ensure that it is set to I<sup>2</sup>C mode.
- Run the MH-Z16\_w\_I2C code to operate.
- Below is a wiring diagram and a schematic diagram of the circuit.



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Figure 2. Wiring Diagram between an Arduino Uno and the interface board

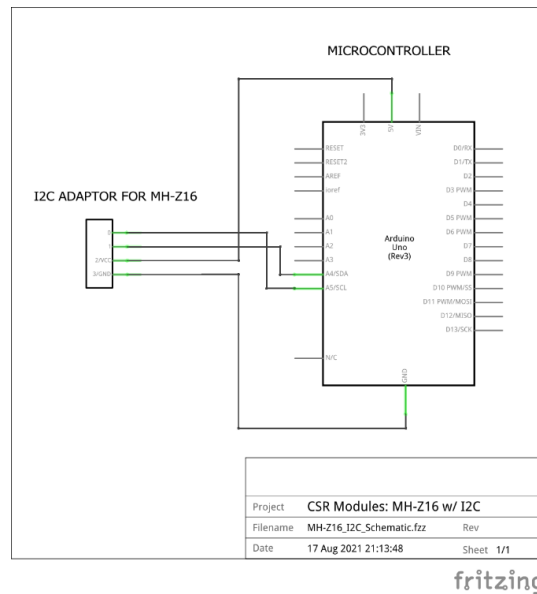


Figure 3. Schematic between an Arduino Uno and the interface board

### Wiring – Method #2 (Not recommended, but is usable)

- This method does not require the Interface board.
- Use this only if an Interface board is unavailable.
- Run the MH-Z16\_w\_PWM code to operate.

**[CURRENTLY UNFINISHED]**

### Calibration for I<sup>2</sup>C mode

- There is a white button on the blue adaptor.
- Once the sensor has been in a stable condition for a few minutes, hold the button for 10 seconds.
- The sensor starts giving readings around 400 ppm.
- The calibration point is always at 400 ppm and cannot be altered. The workaround to this limitation is to add offset values to a dataset.
- For example, if the gas used for calibration is 500 ppm, add 100 to every measurement after the calibration.

### Contact

For any questions or assistance, email Adriann Licalde at [adriann8399@gmail.com](mailto:adriann8399@gmail.com).