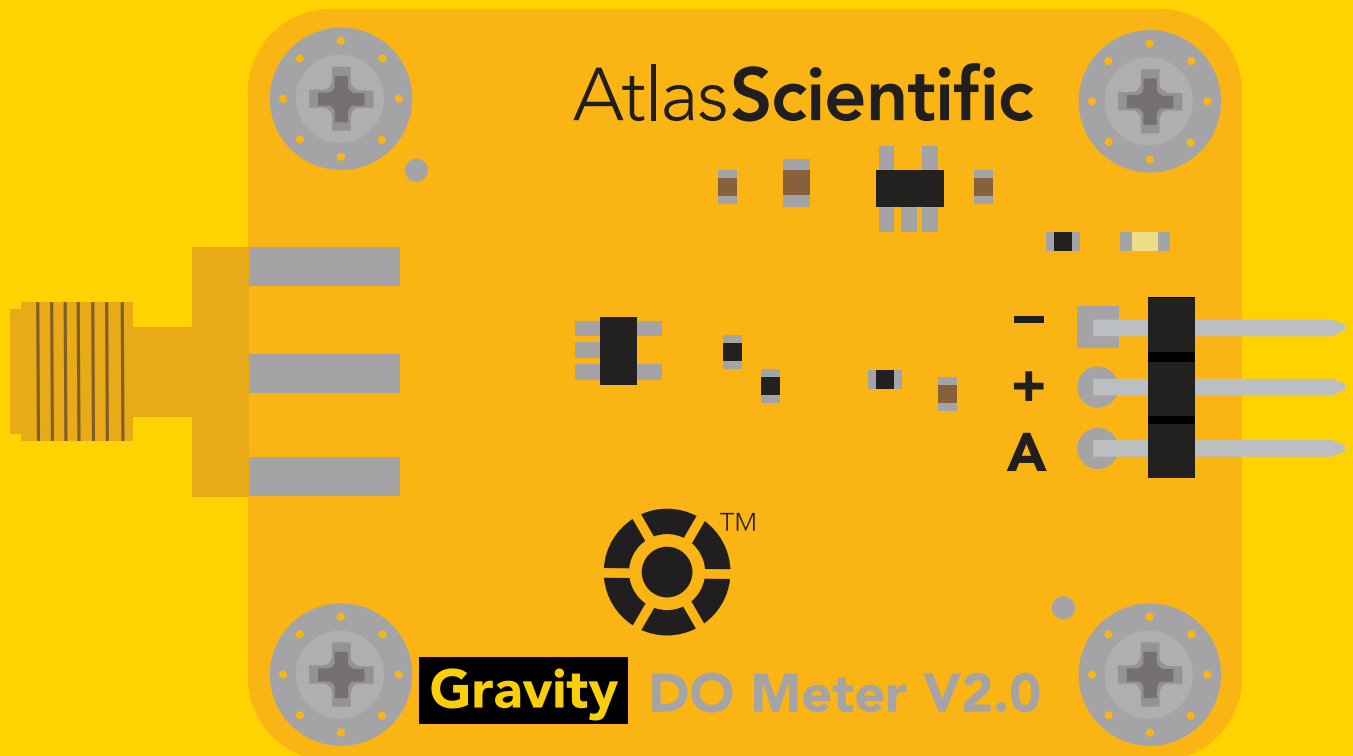


# Gravity<sup>TM</sup>

## Analog Dissolved Oxygen Meter

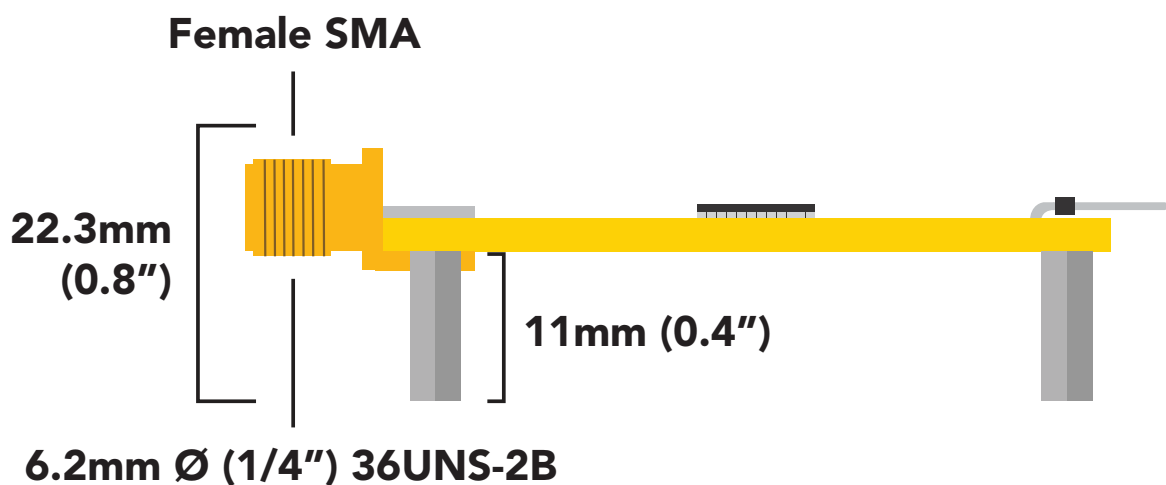
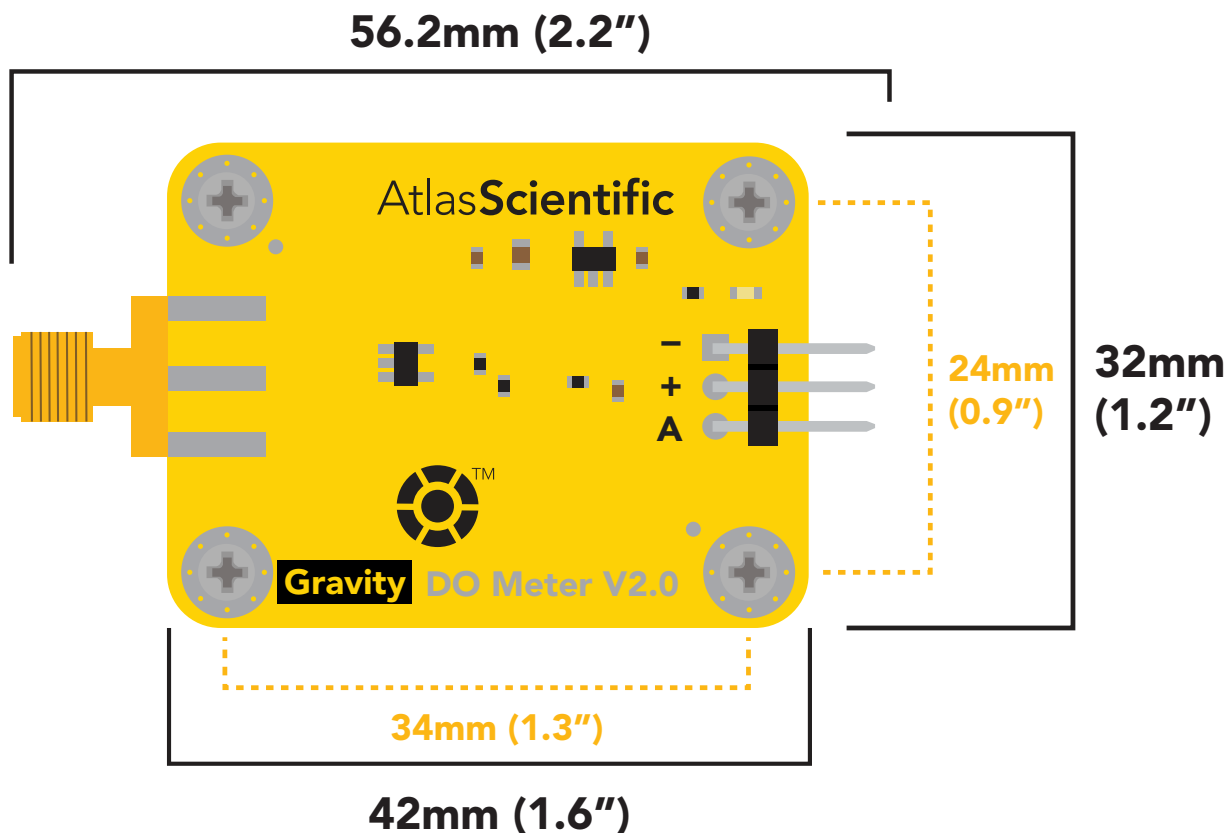


**Percent saturation only**



**PATENT PROTECTED**

# Gravity dimensions



## Power consumption

**5V = 0.3mA**  
**3.3V = 0.3mA**

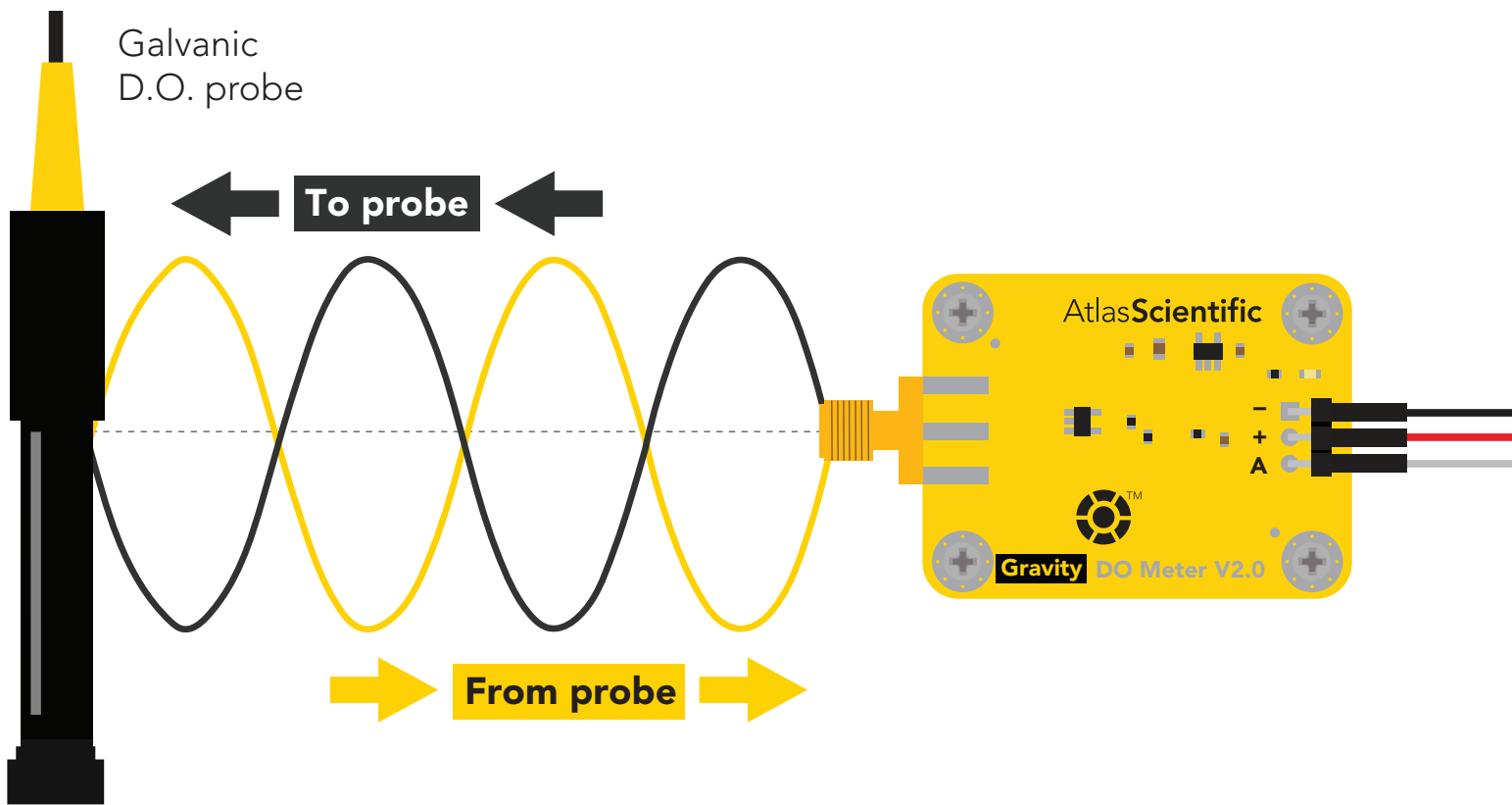
## Absolute max ratings

Parameter	MIN	TYP	MAX
Storage temperature	-65 °C		125 °C
Operational temperature	-40 °C	25 °C	50 °C
VCC	3.3V	5V	5.5V

# Operating principle

The Gravity™ Analog class of meters offers the electrical engineer a low-cost solution to traditionally expensive measurements. This device gives the engineer access to the analog front end (AFE) of Atlas Scientific Dissolved Oxygen sensing technology without the added cost that comes with complex mathematical processing.

The Gravity™ Analog Dissolved Oxygen meter has been specially designed to read the voltage coming off a galvanic D.O. probe without damaging the probe; this is done through a combination of high impedance reading and charging events. Where a voltage is read from the probe, and then a voltage is sent to the probe. This back and forth processes dramatically extends the life of the probe from a few months to a few years.



**Dissolved oxygen is expressed in two ways:**

- 1 Percent saturation (% Sat)
- 2 Milligrams per liter (mg/L)

**Reading oxygen levels in mg/L requires very significant mathematical processing and smoothing. Such complex readings can not be done with this device. The Atlas Scientific Gravity™ Analog Dissolved Oxygen Meter *is designed to read percent saturation only.***

# Percent saturation

A D.O. probe reads the partial pressure of oxygen. Using the percent saturation method, we can compare the partial pressure of oxygen in the atmosphere to the partial pressure of oxygen in the water and derive some information about its presence in the water. Because a dissolved oxygen probe can only read the partial pressure of oxygen, we are not able to determine the exact O<sub>2</sub> content using this method. However, we can clearly determine its presence and partial pressure.

**Max O<sub>2</sub>**  
**(100% saturation)**

**42mV**

**Partial  
Pressure = 160mmHG**



**(90% saturation)**

**37.8mV**

**Partial  
Pressure = 144mmHG**



**(73% saturation)**

**30.66mV**

**Partial  
Pressure = 116.8mmHG**



**(47% saturation)**

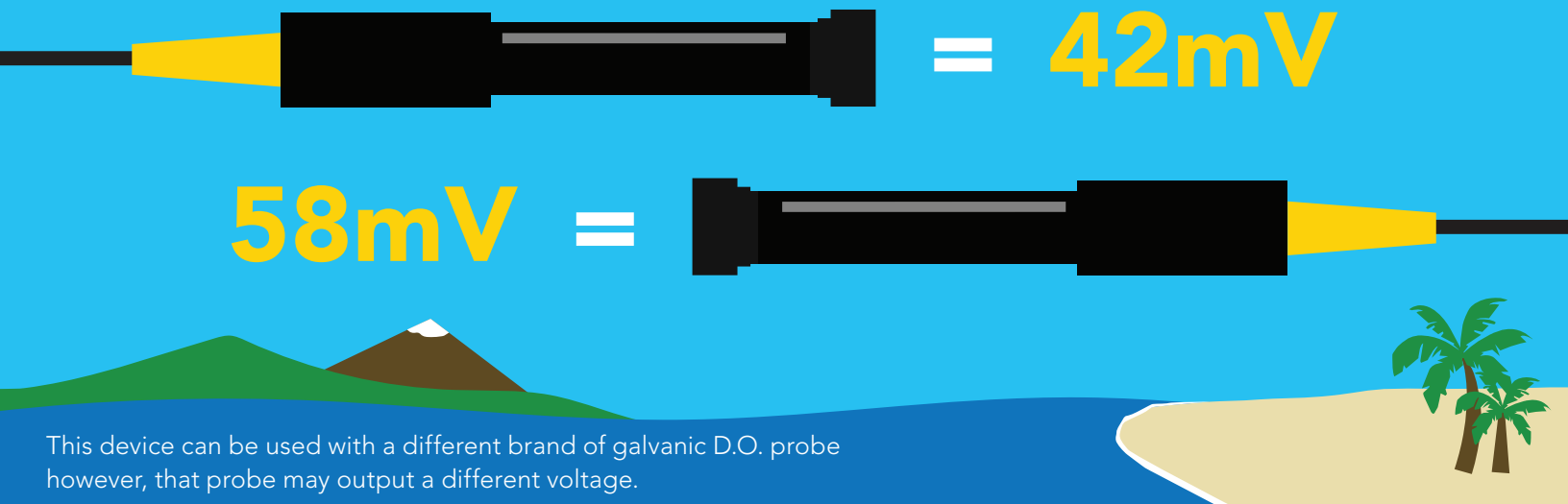
**19.74mV**

**Partial  
Pressure = 75.2mmHG**



# Converting the analog signal into percent saturation

Every dissolved oxygen probe will output a slightly different voltage. Atlas Scientific's galvanic dissolved oxygen probe outputs ~40 – 60mV in air.

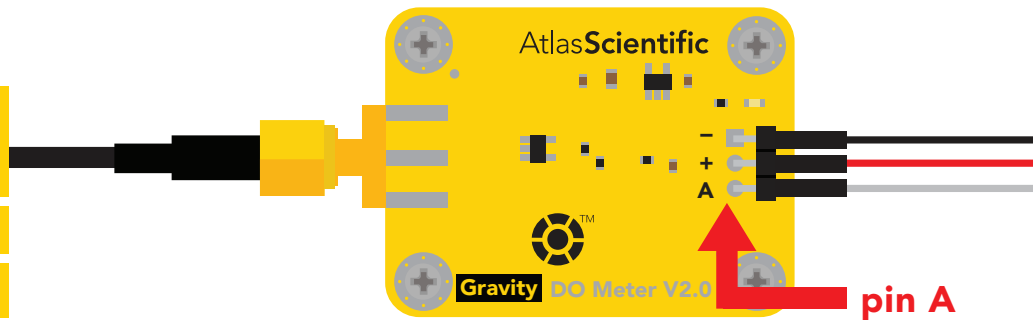


This device can be used with a different brand of galvanic D.O. probe however, that probe may output a different voltage.

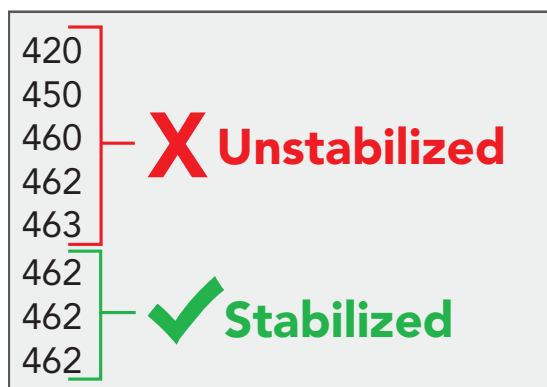
The analog voltage coming off **pin A** is the voltage from the probe + an 11x gain. This means the analog voltage read on **pin A** is the voltage from the probe x11.

## Example

Probe output	Gravity pin A output
1mV	11mV
42mV	462mV
12.63mV	138.93mV



With the probe sitting in the air, watch the voltage coming into your ADC. Wait until the readings stabilize.

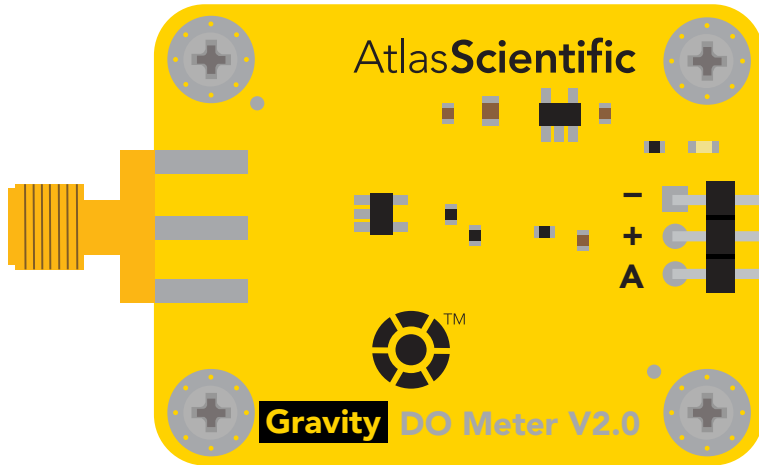


Once the readings stabilize, capture the reading and store it in permanent memory such as EEPROM. This is your calibration value; you don't want to lose it.

### Percent Saturation equation

$$\frac{\text{Reading in water}}{\text{Calibration value}} \times 100 = \text{Percent Saturation}$$

# Connection pins

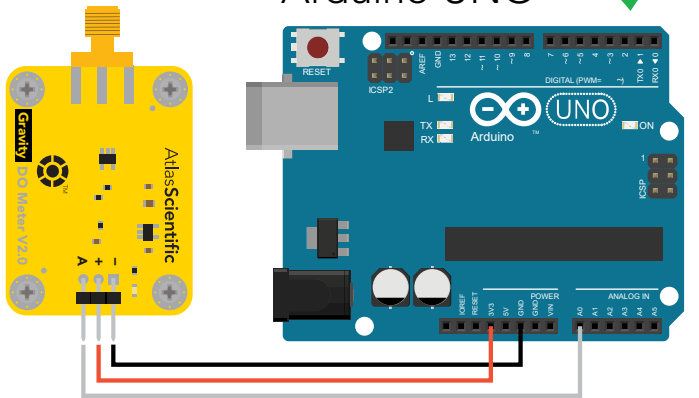


Connect - to GND

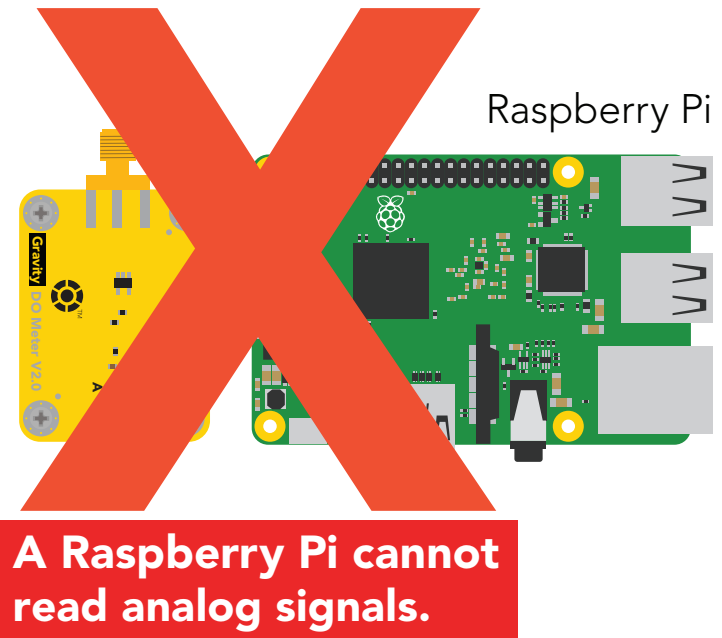
Connect + to 3.3V or 5V

Connect to analog pin / ADC

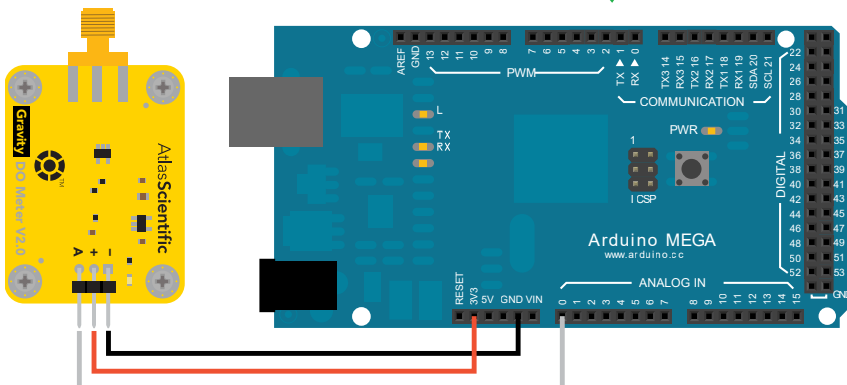
Arduino UNO



Raspberry Pi



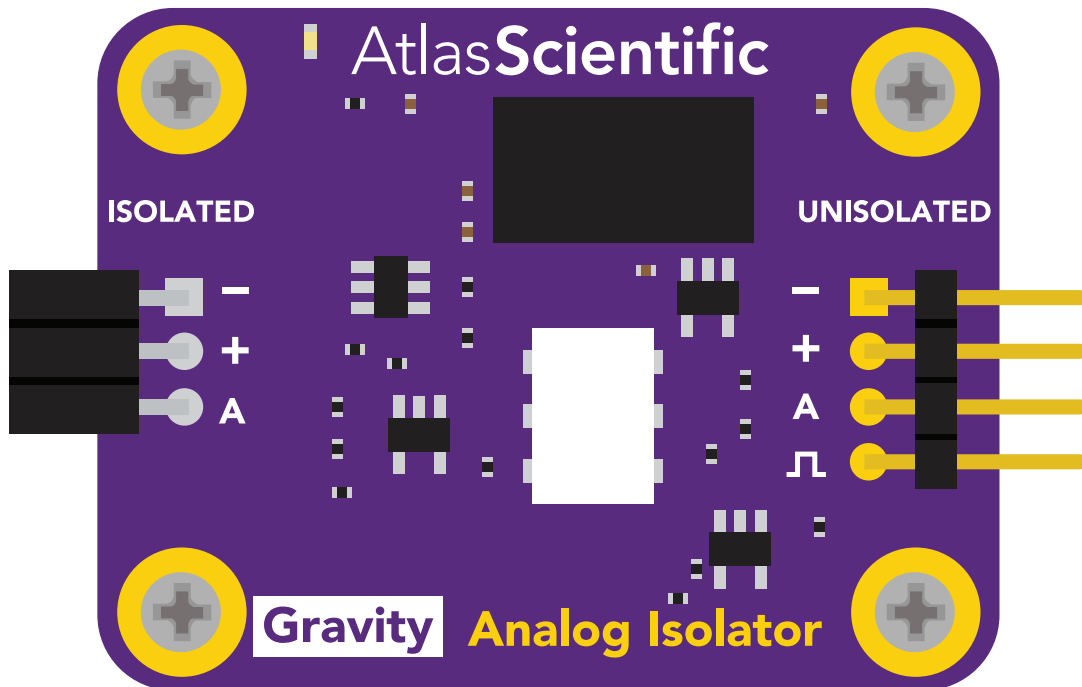
Arduino MEGA



# Electrical isolation

The Atlas Scientific Gravity™ Analog Dissolved Oxygen Meter is a very sensitive device and is susceptible to electrical interference from external sources. This interference is caused by micro-voltages entering the water from unnatural sources such as pumps, solenoid valves, or other probes / sensors. When electrical interference is affecting the D.O. readings, it is common to see rapidly fluctuating readings or readings that are consistently off. To verify that electrical noise is causing inaccurate readings, place the D.O. probe in a cup of water by itself. The readings should stabilize quickly, confirming that electrical noise was the issue.

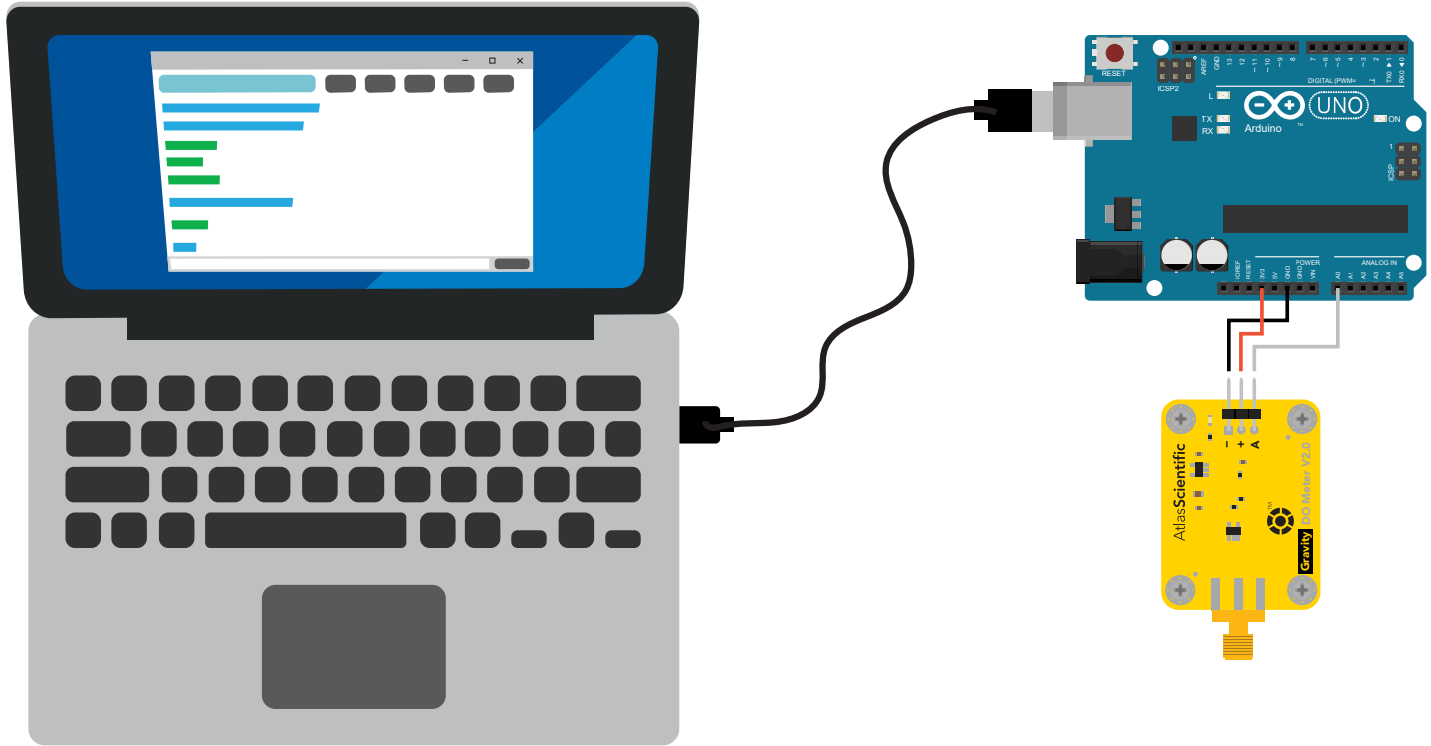
To stop electrical interference from affecting the readings, Atlas Scientific **strongly recommends** using our [Gravity™ Analog Isolator](#). It is 100% effective at preventing electrical currents in the water from entering the probe and interfering with the readings.



Refer to the [Gravity™ Analog Isolator datasheet](#) for more information about how the isolator works and how to use it.

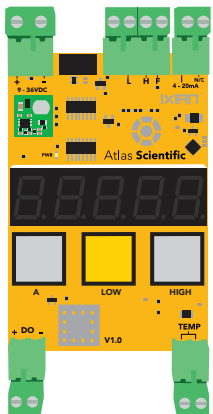
# Sample code

Using the [free downloadable arduino sample code](#), a one point calibration can be performed. The calibration procedure does not use any chemical buffer solution, instead you use the open air to calibrate your probe to 100% saturation.

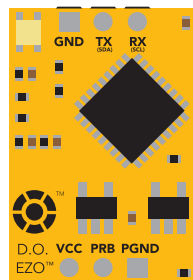


# Higher accuracy

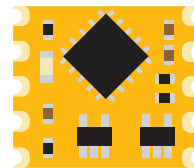
If more accuracy is required, Atlas Scientific offers a wide range of embedded D.O. monitoring products that are significantly more accurate than this device.



**IXIAN-D.O.™**  
D.O. Transmitter



**EZO-D.O.™**  
Embedded D.O. Circuit



**OEM-D.O.™**  
Embedded D.O. Circuit