

## SKU:SEN0464 (<https://www.dfrobot.com/product-2446.html>)

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### Introduction

As an upgraded version of industrial Gravity: ORP Sensor Meter For Arduino ([https://wiki.dfrobot.com/Analog\\_ORP\\_Meter\\_SKU\\_SEN0165\\_](https://wiki.dfrobot.com/Analog_ORP_Meter_SKU_SEN0165_)), this new generation ORP probe employs platinum indicator electrode and silver-silver chloride reference electrode, which makes it available for 24-hour online ORP monitoring and greatly enhances product durability. The new signal converter adds a more stable voltage reference so that the sensor readings would be no longer affected by supply voltage fluctuations. Besides, there are screws, copper columns and waterproof connectors included in the accessory packet to help you conveniently build up ORP monitoring system.



ORP(Oxidation-Reduction Potential) is a measure of the ability of oxidation and reduction of an aqueous solution, which the relative degree of oxidizing or reducing. The unit is mV. If the oxidation reduction potential is high then chemical oxidation is strong , while if the potential is lower then oxidation is weaker. The positive potential means that solution shows a certain degree of oxidation, while the negative potential means that solution shows a certain degree of reduction. ORP is an important index of water quality detection, although it can not separate water quality independently, it can be combined with other water quality indexes to reflect the ecological environment better.

#### Note

- Don't short-circuit the two leads of ORP probe, otherwise, it may cause permanent damage to the probe. Connect to the terminal as soon as possible after removing the protective sleeve.
- ORP probe is a precision part whose glass bubble can't be touched by hard objects. Please put back the protective cover immediately after use.
- To ensure the measurement accuracy, it is recommended to provide a stable power and reference voltage for the ADC and ORP transmitter.

### Specification

#### ORP Signal Converter

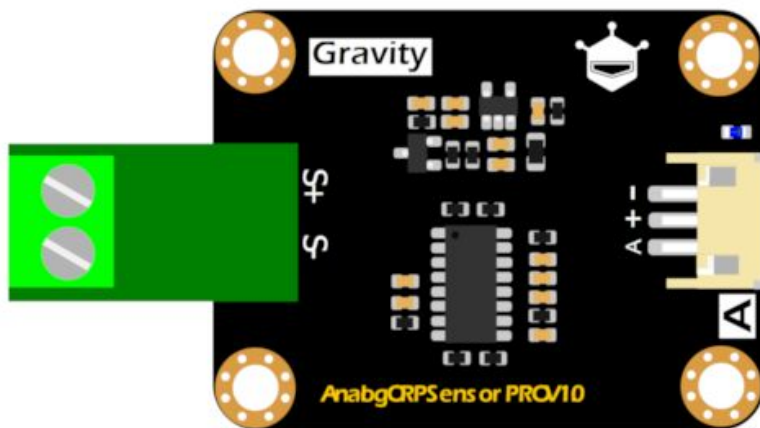
- Input Voltage: 5V
- Input Signal: 0.5V ~ 4.5V
- Input Interface: 5.08mm/0.20" Pluggable Connector
- Measuring Range: -2000mV ~ +2000mV
- Output Interface: PH2.0 - 3Pin
- MOdule Size: 42mm×32mm/1.65×1.26"

## Industrial ORP Probe

- Indicator Electrode: Platinum
- Reference Electrode: silver-silver chloride
- Suitable Temperature: 5-70°C
- Electrode Potential: 245mV ~ 270mV
- Reference Electrode Internal Resistance:  $\leq 10\text{K}\Omega$
- Electrode Stability:  $\pm 8\text{mV}/24\text{h}$

## Board Overview

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### Electrode Input

- S+: Electrode +
- S-: Electrode -

### Signal Output

- A: Analog Output
- +: Power Supply +
- -: Power Supply -

## Tutorial

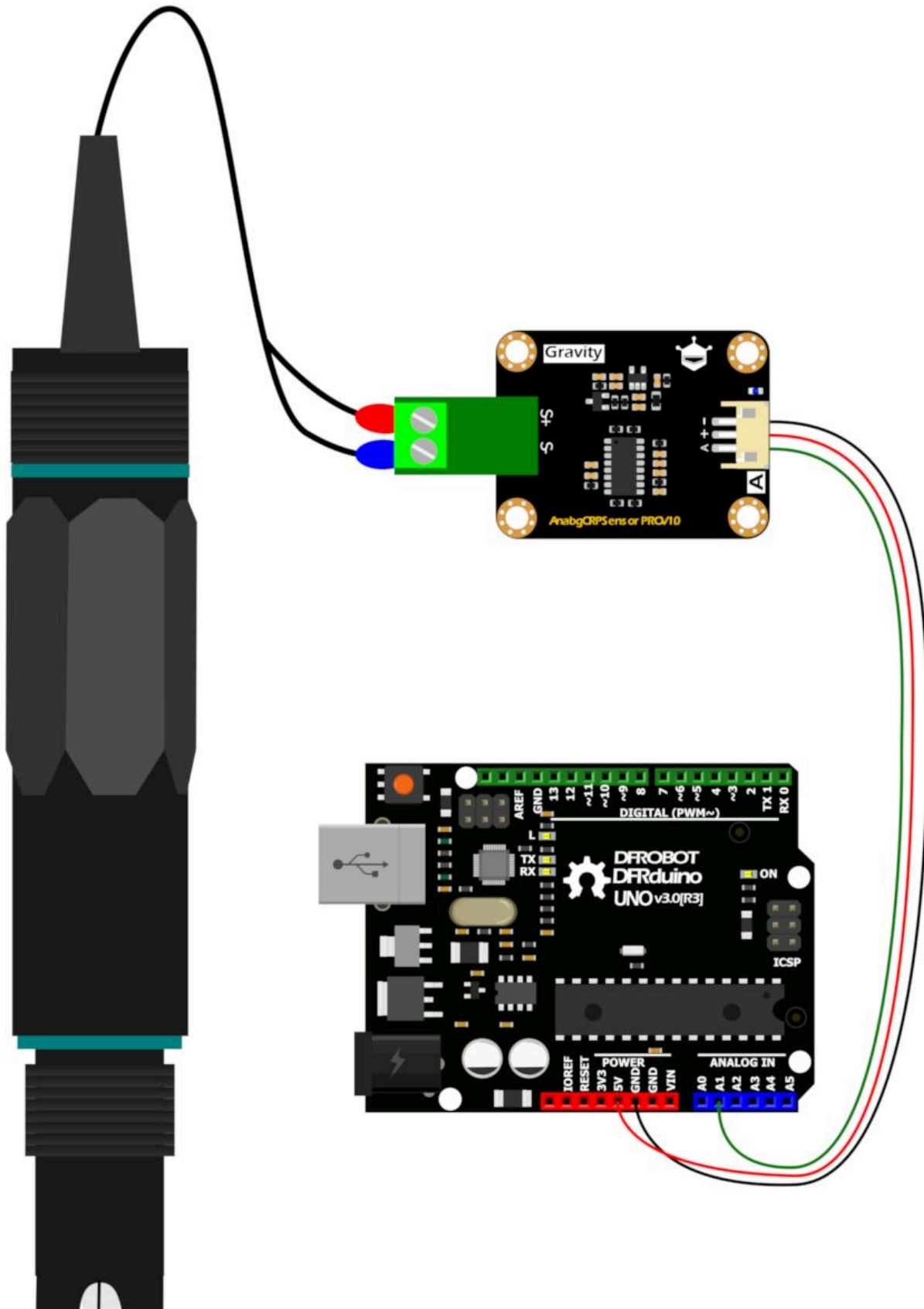
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### Requirements

- Hardware
  - DFRduino UNO Controller (<https://www.dfrobot.com/product-838.html>) x 1
  - Gravity Analog ORP Sensor PRO x 1
- Software

- o Arduino IDE (<https://www.arduino.cc/en/Main/Software>)
- o DFRobot\_ORP\_PRO Library ([https://github.com/cdjg/DFRobot\\_Analog\\_ORP\\_Sensor](https://github.com/cdjg/DFRobot_Analog_ORP_Sensor))

## Connection Diagram





## Operation

1. Connect modules according to the wiring diagram
2. Upload the sample code and insert the probe into the liquid to be tested

### Measurement Note

- Simply insert the terminal electrode into the measured liquid and read the data. ORP probes are not completely waterproof, so do not immerse the probe all the way into the liquid.
- It is recommended to use high-quality linear regulated power source or fully-charged lithium battery to supply power for Arduino. The closer the voltage is to 5V, the less the voltage changes, and the higher the measurement accuracy will be.
- ORP electrodes can be used directly without calibration. ORP standards can be used to detect if the probe or signal converter is damaged only when the test results are in doubt.

## Sample Code

```
#include "DFRobot_ORP_PRO.h"

#define PIN_ORP A1
#define ADC_RES 1024
#define V_REF 5000

float ADC_voltage;

DFRobot_ORP_PRO ORP(0);

void setup() {
  Serial.begin(115200);
}

void loop() {
  ADC_voltage = ((unsigned long)analogRead(PIN_ORP) * V_REF + ADC_RES / 2) / ADC_RES;
  Serial.print("ORP value is : ");
  Serial.print(ORP.getORP(ADC_voltage));
  Serial.println("mV");
  delay(1000);
}
```

## Result

Serial output ORP measurement data

```
ORP value is: 244 mV
ORP value is: 244 mV
ORP value is: 245 mV
ORP value is: 245 mV
ORP value is: 245 mV
```

## Accuracy Improvement

Due to differences among electronic components and interference from power supply, notable errors may be resulted in when measuring directly. The following methods are recommended to reduce errors and improve accuracy.

1. Provide a accurately stable 5V power supply or reference voltage for the MCU or ADC used to read the analog voltage
2. Calibrate ORP signal converter as follows:

### Zero Calibration

Although voltage reference chips can provide stable reference voltage, due to the differences of electronic components, there may be up to 50mV voltage differences among different chips. ORP measurement accuracy can be improved by measuring reference voltage in advance for correction.

1. Remove the ORP probe and use wire to short-circuit the S+ and S- pins of the ORP signal converter
2. Upload sample code -1 and turn on the serial port monitor to record the reference voltage
3. Revise sample code -2, set the 0 in DFRobot\_ORP\_PRO ORP(0); to the just recorded reference voltage value
4. Upload the sample code -2, the sensor readings will be corrected at the point

If the power supply or ORP signal converter is replaced, the correction value needs to be recalibrated.

### Sample Code -1

```
#define PIN_ORP A1
#define ADC_RES 1024
#define V_REF 5000

void setup()
{
  Serial.begin(115200);
}

void loop()
{
  Serial.println((((long)analogRead(PIN_ORP)*V_REF + ADC_RES / 2) / ADC_RES) - 2480);
  delay(1000);
}
```

### Sample Code -2

```
#include "DFRobot_ORP_PRO.h"

#define PIN_ORP A1
#define ADC_RES 1024
#define V_REF 5000

unsigned int ADC_voltage;

DFRobot_ORP_PRO ORP(-9);//set reference voltage mv

void setup() {
  Serial.begin(115200);

  Serial.print("calibration is: ");
  Serial.print(ORP.getCalibration());
  Serial.println(" mV");
}

void loop() {
  ADC_voltage = ((unsigned long)analogRead(PIN_ORP) * V_REF + ADC_RES / 2) / ADC_RES;
  Serial.print("ORP value is: ");
  Serial.print(ORP.getORP(ADC_voltage));
  Serial.println(" mV");
  delay(1000);
}
```

### Measurement results after calibration

```
ORP value is: -59.00 mV
ORP value is: -59.00 mV
ORP value is: -59.00 mV
ORP value is: -59.00 mV
ORP value is: -59.00 mV
```

## Fix Probe

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ORP industrial probes can be connected to the container by pipe threads of G3/4

## Waterproof Connection

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Gravity: Analog ORP Sensor PRO kits come with two types of waterproof connectors that make it easy to set up a waterproof measurement system.

## FAQ

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- Do the ORP probe need to be calibrated? How often?
  - The ORP probe generally don't need to be calibrated, but you can use ORP standards to detect if the probe or

signal converter is damaged only when the test results are in doubt.

- How to clean the ORP probe?
  - Rinse the probe with deionized water or potable water until the tested liquid attached to the electrode is completely removed. Don't use a stiffish brush to clean the probe.
- How long can ORP electrodes be used?
  - ORP electrodes are designed to have service life of one year, which may be shortened if the electrodes are operated in harsh environments with high temperature, thickness or strong corrosion. It is recommended to regularly use ORP standards for testing, and replace it in time when the error increases.

## More Documents

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