Gravity: Analog pH Sensor/Meter Kit V2

SKU:SEN0161-V2

DFRobot Gravity: Analog pH meter V2 is specifically designed to measure the pH of the solution and reflect the acidity or alkalinity. It is commonly used in various applications such as aquaponics, aquaculture, and environmental water testing.

As an upgraded version of pH meter V1, this product greatly improves the precision and user experience. The onboard voltage regulator chip supports the wide voltage supply of 3.3~5.5V, which is compatible with 5V and 3.3V main control board. The output signal filtered by hardware has low jitter. The software library adopts the two-point calibration method, and can automatically identify two standard buffer solutions(4.0 and 7.0), so simple and convenient.

With this product, main control board (such as Arduino) and the software library, you can quickly build the pH meter, plug and play, no soldering. DFRobot provides a variety of water quality sensor products, uniform size and interface, not only meet the needs of various water quality testing but also suitable for the DIY of multi-parameter water quality tester.

The pH is a value that measures the acidity or alkalinity of the solution. It is also called the hydrogen ion concentration index. The pH is a scale of hydrogen ion activity in solution. The pH has a wide range of uses in medicine, chemistry, and agriculture. Usually, the pH is a number between 0 to 14. Under the thermodynamic standard conditions, pH=7, which means the solution is neutral; pH<7, which means the solution is acidic; pH>7, which means the solution is alkaline.

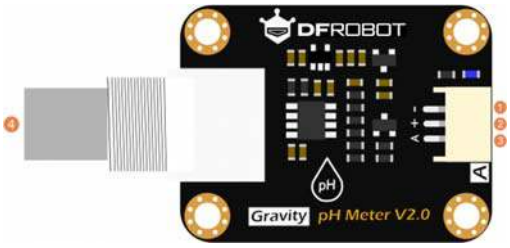
1. The BNC connector and the signal conversion board must be kept dry and clean, otherwise, it will affect the input impedance, resulting in an inaccurate measurement. If it is damp, it needs to be dried.
2. The signal conversion board cannot be directly placed on a wet or semiconductor surface, otherwise, it will affect the input impedance, resulting in the inaccurate measurement. It is recommended to use the nylon pillar to fix the signal conversion board, allow a certain distance between the signal conversion board and the surface.
3. The sensitive glass bubble in the head of the pH probe should avoid touching with the hard material. Any damage or scratches will cause the electrode to fail.
4. After completing the measurement, disconnect the pH probe from the signal conversion board. The pH probe should not be connected to the signal conversion board without the power supply for a long time.

Specification

- **Signal Conversion Board (Transmitter) V2**
- Supply Voltage: 3.3~5.5V
- Output Voltage: 0~3.0V
- Probe Connector: BNC
- Signal Connector: PH2.0-3P
- Measurement Accuracy: ±0.1@25℃
- Dimension: 42mm*32mm/1.66*1.26in

- **pH Probe**
- Probe Type: Laboratory Grade
- Detection Range: 0~14
- Temperature Range: 5~60°C
- Zero Point: 7±0.5
- Response Time: <2min
- Internal Resistance: <250MΩ
- Probe Life: >0.5 year (depending on frequency of use)
- Cable Length: 100cm

Board Overview



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Num	Label	Description
1	-	Power GND(0V)
2	+	Power VCC(3.3~5.5V)
3	A	Analog Signal Output(0~3.0V)
4	BNC	pH Probe Connector

Tutorial

This tutorial will demonstrate how to use this pH meter for calibration and measurement. Please read each step carefully.

> Before measuring another solution, be sure to wash the probe and absorb residual water-drops with paper to prevent cross-contamination between solutions. The probe can be washed with distilled water.

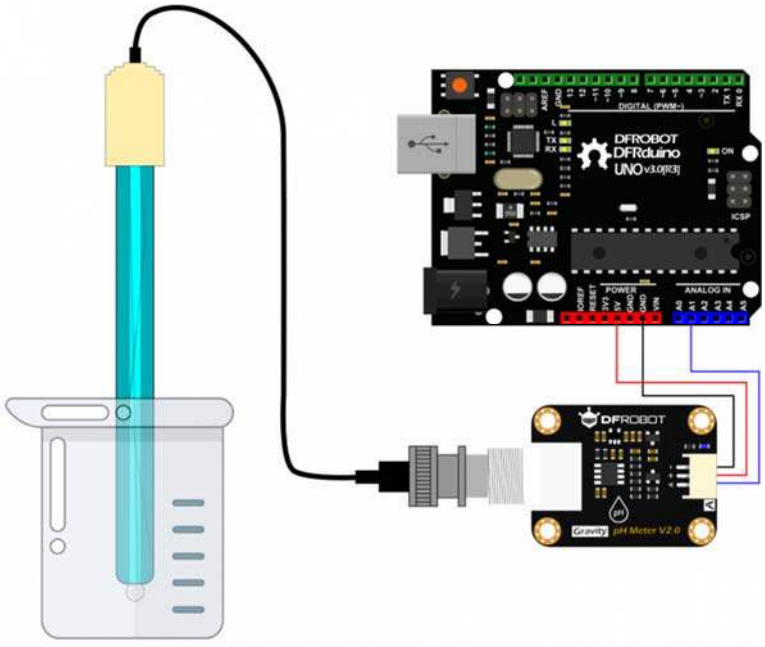
Requirements

- **Hardware**
- DFRduino UNO R3 (or similar) x1
- pH Signal Conversion Board V2 x1
- pH Probe x1
- Standard Buffer Solution 4.0 x1
- Standard Buffer Solution 7.0 x1
- Gravity 3pin Sensor Cable (or several DuPont cables) x1
- Test Solution x1

- **Software**
- Arduino IDE (Version requirements: V1.0.x or V1.8.x), Click to Download Arduino IDE from Arduino®

Connection Diagram

Before using the pH probe, pull out the probe from the protective cap, then wire as shown below. After completing measurement, clean the probe, then insert it into the protective cap.

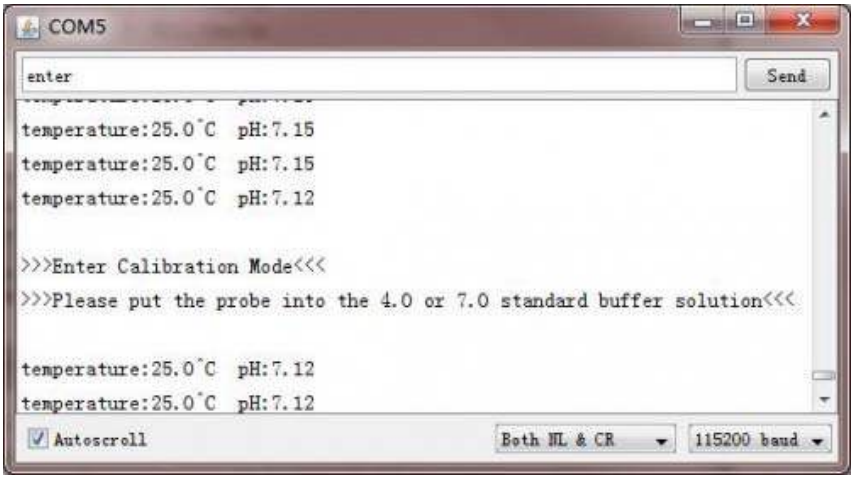


Calibration

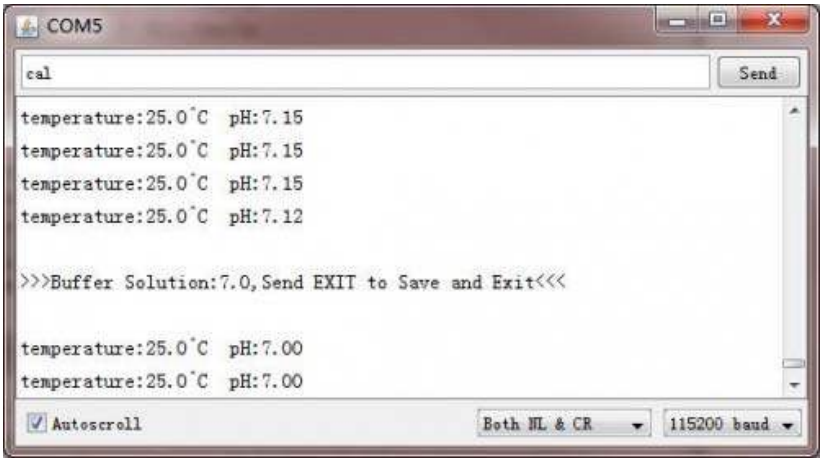
To ensure accuracy, the probe used for the first time, or used for a period of time, needs to be calibrated.
This tutorial uses two-point calibration and therefore requires standard buffer solutions of 4.0 and 7.0.
The following steps show how to operate two-point calibration.

- **1.Upload the sample code to the Arduino board, then open the serial monitor, you can see the temperature and pH. If you added a temperature sensor, be sure to write the corresponding function and call it.**
- **2.Wash the probe with distilled water, then absorb the residual water-drops with paper. Insert the pH probe into the standard buffer solution of 7.0, stir gently, until the values are stable.**
- **3.After the values are stable, the first point can be calibrated. Specific steps are as follows:**

1. Input ENTER command in the serial monitor to enter the calibration mode.

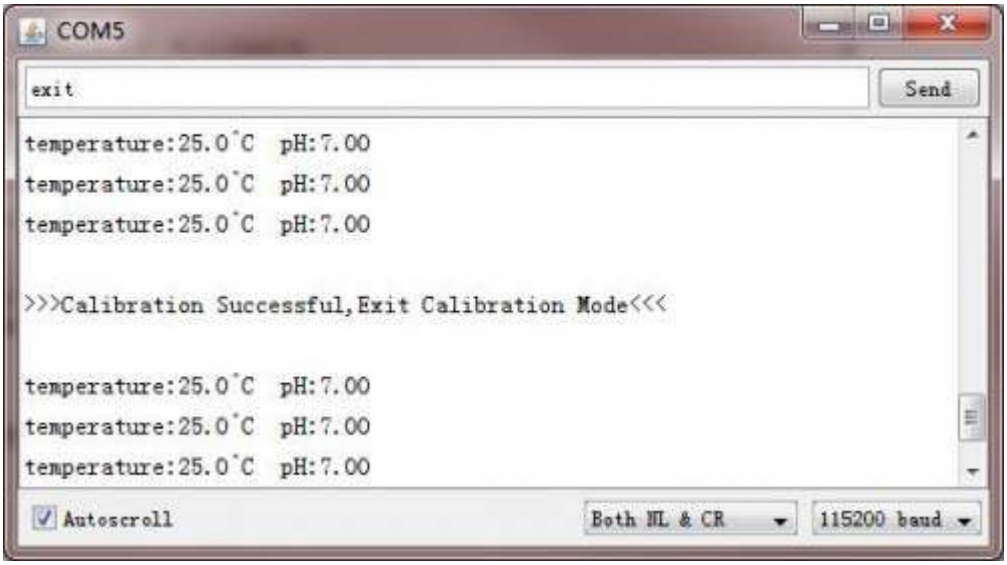


2.Input CAL commands in the serial monitor to start the calibration. The program will automatically identify two kinds of standard buffer solutions: 4.0 and 7.0. In this step, the standard buffer solution of 7.0 will be identified.



3. After the calibration, input EXIT command in the serial monitor to save the relevant parameters and exit the calibration mode.

Note: Only after input EXIT command in the serial monitor can the relevant parameters be saved.



4.After the above steps, the first point calibration is completed. The second point calibration will be performed below.

- **4. Wash the probe with distilled water, then absorb the residual water-drops with paper. Insert the pH probe into the standard buffer solution of 4.0, stir gently, until the values are stable.**
- **5.After the values are stable, the second point can be calibrated. As same with the first calibration step, the specific steps are as follows:**

1. Input ENTER command in the serial monitor to enter the calibration mode.

2.Input CAL commands in the serial monitor to start the calibration. The program will automatically identify two kinds of standard buffer solutions: 4.0 and 7.0. In this step, the standard buffer solution of 4.0 will be identified.

3. After the calibration, input EXIT command in the serial monitor to save the relevant parameters and exit the calibration mode.

Note: Only after input EXIT command in the serial monitor can the relevant parameters be saved.

4.After the above steps, the second point calibration is completed.

- **6.After completing the above steps, the two-point calibration is completed, and then it can be used for actual measurement. The relevant parameters in the calibration process have been saved to the EEPROM of the main control board.**

Sample Code

Please download DFRobot_PH Library first,then install it.
How to install Libraries in Arduino IDE

```
/*
 * file DFRobot_PH.ino
 * @ https://github.com/DFRobot/DFRobot_PH
 *
 * This is the sample code for Gravity: Analog pH Sensor / Meter Kit V2, SKU: SEN0161-V2
 * In order to guarantee precision, a temperature sensor such as DS18B20 is needed, to execute automatic temperature compensation.
 * You can send commands in the serial monitor to execute the calibration.
 * Serial Commands:
 *   enter -> enter the calibration mode
 *   cal -> calibrate with the standard buffer solution, two buffer solutions (4.0 and 7.0) will be automaticlly recognized
 *   exit -> save the calibrated parameters and exit from calibration mode
 *
 * Copyright   [DFRobot](http://www.dfrobot.com), 2018
 * Copyright   GNU Lesser General Public License
 *
 * version  V1.0
 * date  2018-04
 */

#include "DFRobot_PH.h"
#include <EEPROM.h>

#define PH_PIN A1
float voltage,phValue,temperature = 25;
DFRobot_PH ph;

void setup()
```

```
{
  Serial.begin(115200);
  ph.begin();
}

void loop()
{
    static unsigned long timepoint = millis();
    if(millis()-timepoint>1000U)  //time interval: 1s
    {
      timepoint = millis();
      voltage = analogRead(PH_PIN)/1024.0*5000;  // read the voltage
      //temperature = readTemperature();  // read your temperature sensor to execute temperature compensation
      phValue = ph.readPH(voltage,temperature);  // convert voltage to pH with temperature compensation
      Serial.print("temperature:");
      Serial.print(temperature,1);
      Serial.print("^C  pH:");
      Serial.println(phValue,2);
    }
    ph.calibration(voltage,temperature);  // calibration process by Serail CMD
}

float readTemperature()
{
  //add your code here to get the temperature from your temperature sensor
}
```