USER MANUAL

SINVT(TTL)

IP67 Voltage-type Tilt Switch

Tutorial Link

Google Drive

Link to instructions DEMO:
WITMOTION Youtube Channel
SINVT Playlist

If you have technical problems or cannot find the information that you need in the provided documents, please contact our support team. Our engineering team is committed to providing the required support necessary to ensure that you are successful with the operation of our AHRS sensors.

Contact

Technical Support Contact Info

Application

- AGV Truck
- Platform Stability
- Auto Safety System
- 3D Virtual Reality
- Industrial Control
- Robot
- Car Navigation
- UAV
- Truck-mounted Satellite Antenna Equipment

Contents

1 Introduction

The MEMS inclinometer SINVT can directly output the inclination angle. The data can be viewed through the PC software or serial port tool.

SINVT is a small volume and low-cost dual-axis voltage output tilt sensor with an output voltage of 0～5V. Built-in high-precision tilt unit, low power consumption, it is a high-precision tilt switch. X-axis Y-axis two analog voltage outputs, angle range -90 degrees to +90 degrees. Real-time monitoring of data on PC Software.

• Dual axis Inclination Measuring: X-axis (-90 degree, 90 degree) Y-axis (-90 degree, 90 degree), Dual axis Analog 0-5V Voltage Output

• Kalman Filtering: Integrated Kalman Filtering Algorithm ensures high-stability of angle data output even in high dynamic environment

• 0.1 degree Precision, IP67 Waterproof Protection, Anti-vibration

1.1 Warning Statement

- Putting more than 36 Volt across the sensor wiring of the main power supply can lead to permanent damage to the sensor.
- VCC cannot connect with GND directly, otherwise it will lead to the burning of the circuit board.
- For proper instrument grounding: use WITMOTION with its original factory-made cable or accessories.
- For secondary developing project or integration: use WITMOTION with its compiled sample code.

2 Use Instructions with PC

2.1 Connection Method

PC software is only compatible with Windows system.

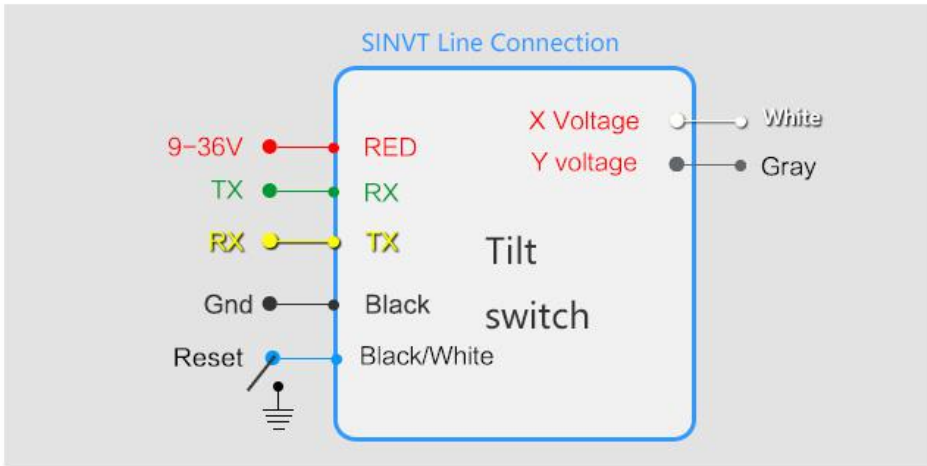
Link to SINVT's demo video

2.1.1 PIN Connection Instructions

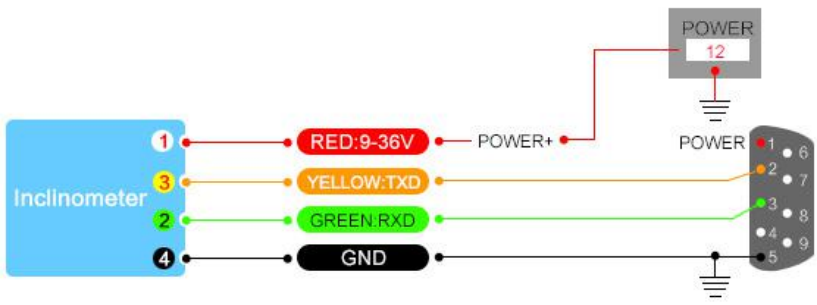
INSTRUCTIONS

Electrical connection

线色功能	RED	BLACK	GREEN	YELLOW	WHITE	GRAY
	1	2	3	4	5	6
	VCC	GND	TTL(RX) OR RS232（R）	TTL(TX) OR RS232（T）	OUT X	OUT Y



Notice:Reset connect to GND 2s,it will set current position to 0°



2.1.2 Connection with PC

Step 1. Prepare the sensor and serial cable

Recommended tools:

3-in-1 serial converter

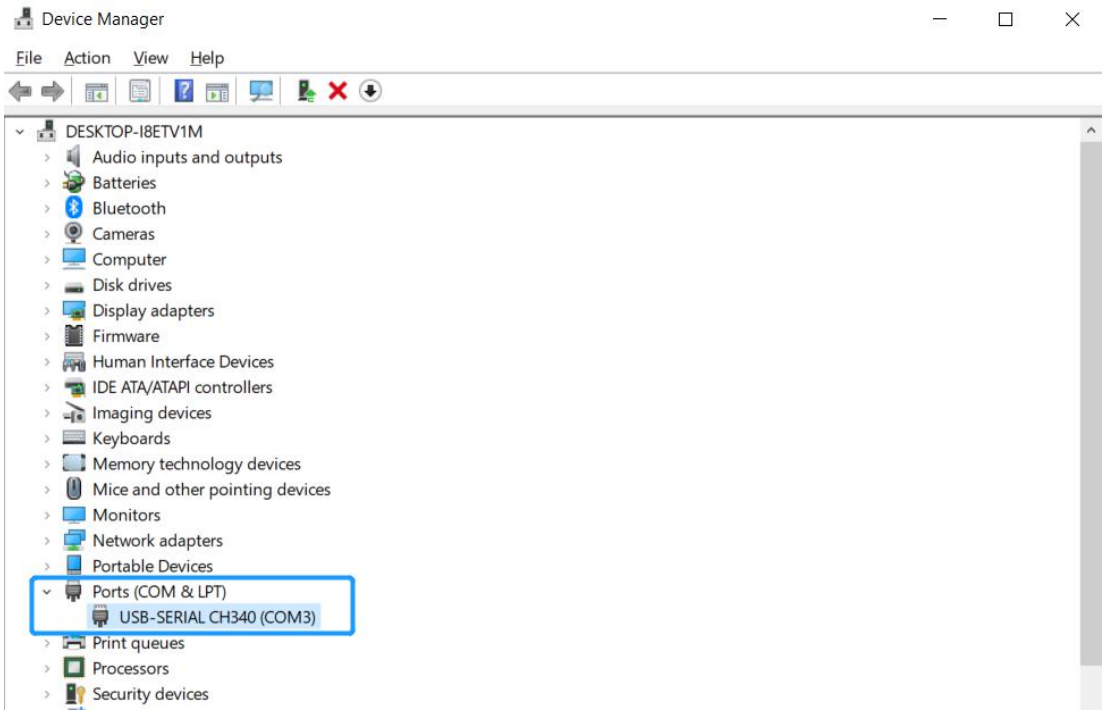
6-in-1 serial converter

Link to tutorial of 3-in-1 serial converter(CH340 driver)
Link to tutorial of 6-in-1 serial converter (CP2102 driver)

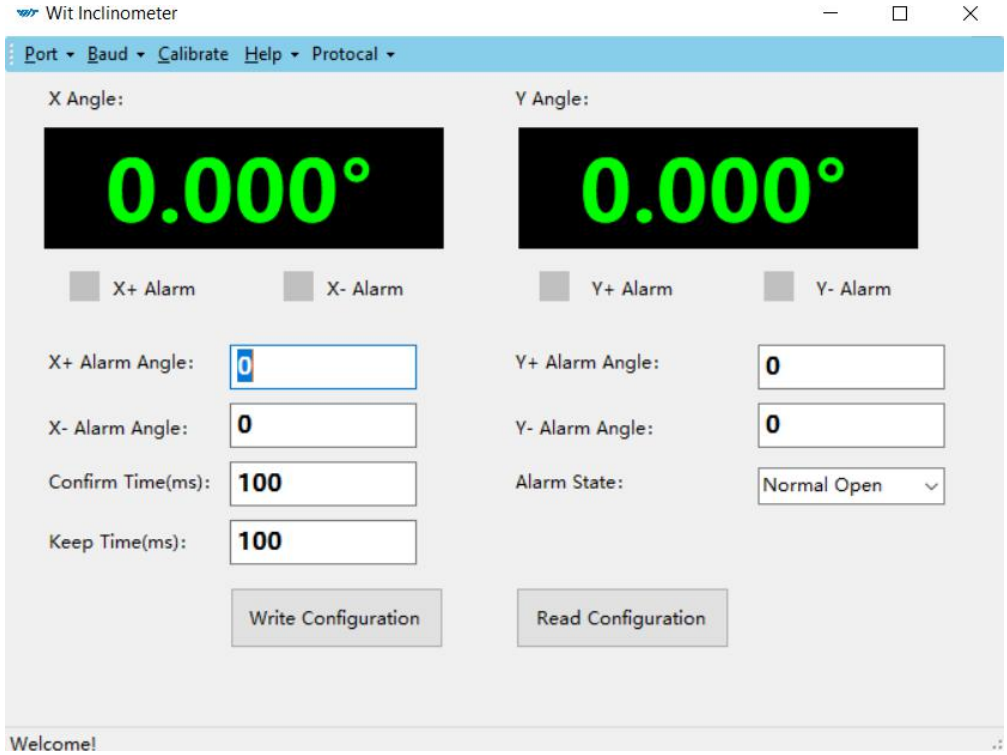
Step 2. Download whole tutorial from below link
Link to download software

Step 3. Unzip the software and install the driver CH340 or CP2102 (Depending on which accessory for usage.)

Step 4. Insert the converter to computer and confirm the “com port" in device manager.

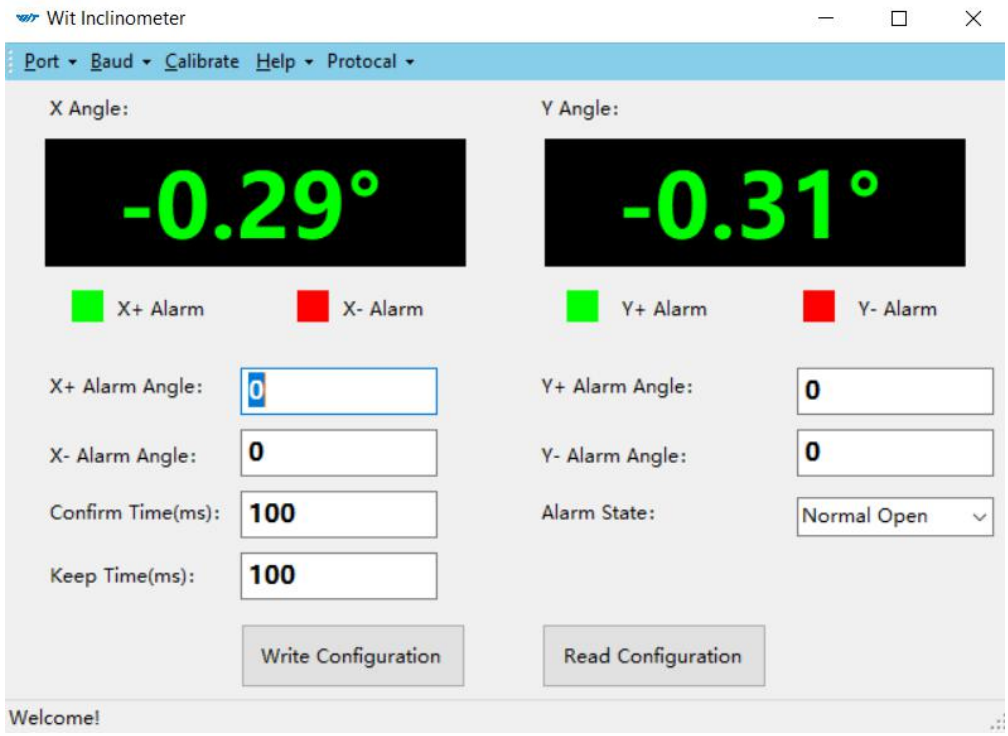


Step 5. Open the software, Inclinometer.exe



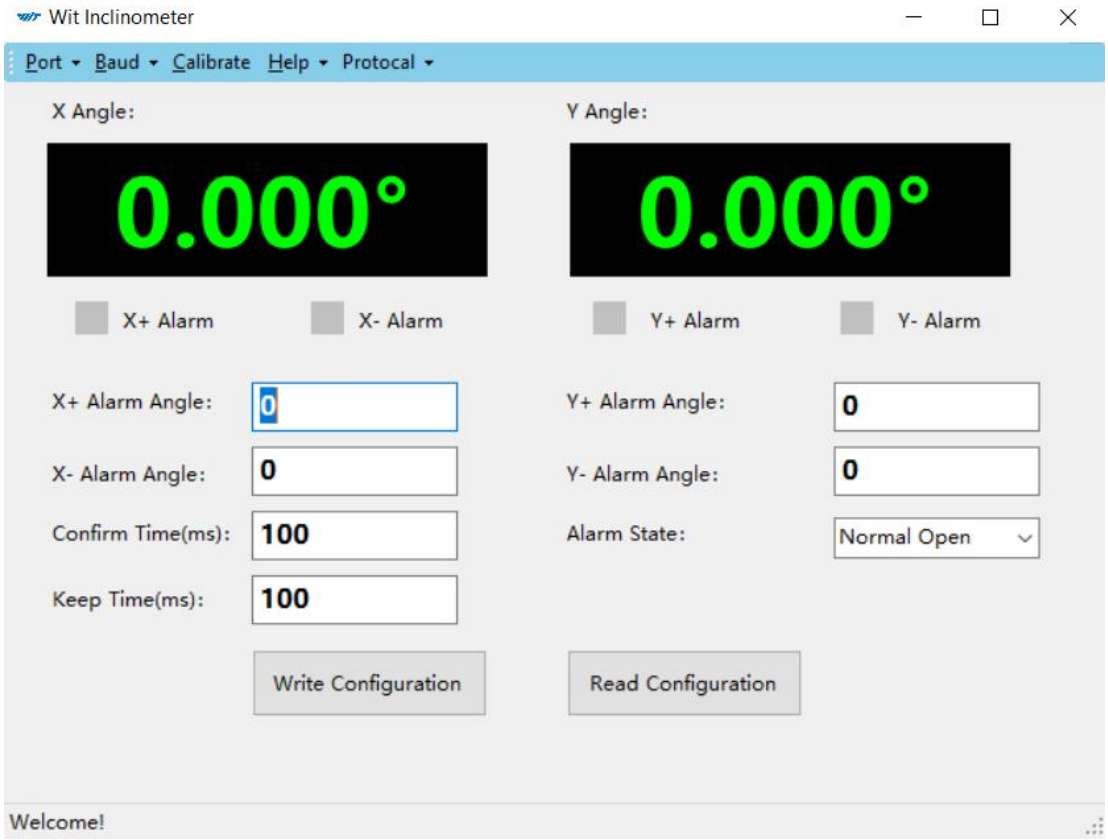
Step 6.

Select the com port and baud rate 9600, data will be shown on the software. Data will appear after auto-search finishes.



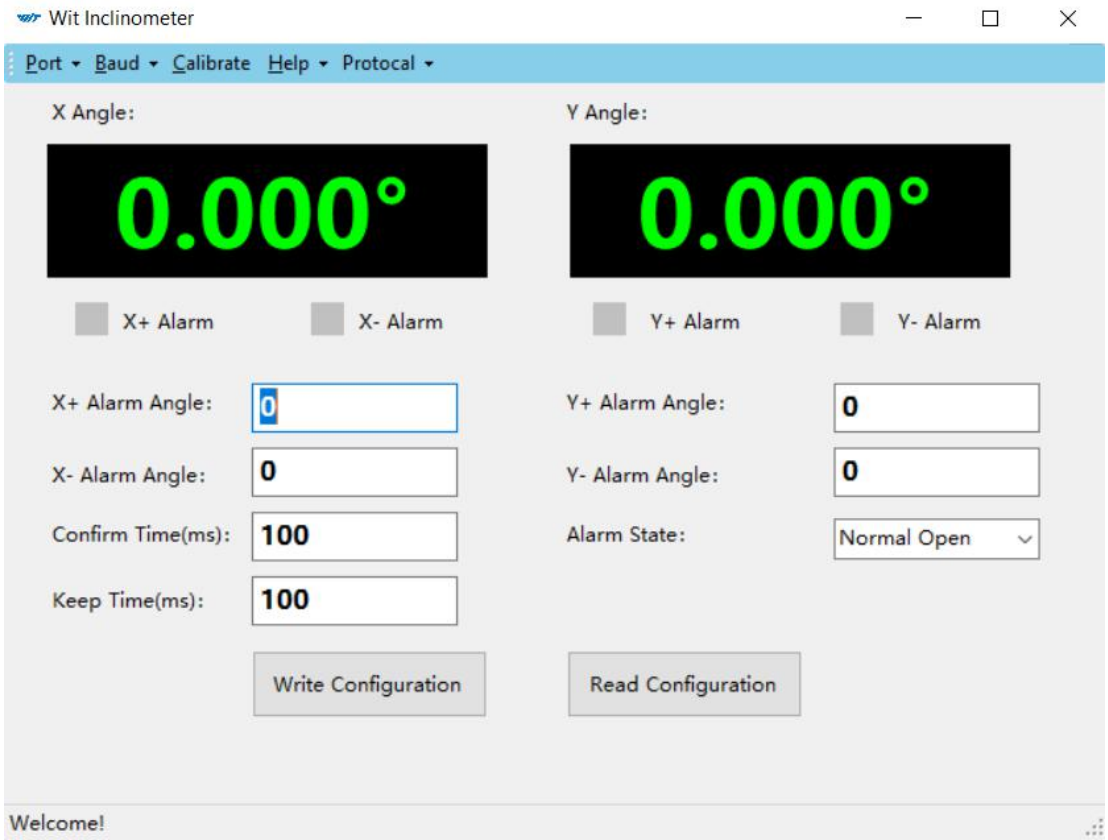
2.2 Software Introduction

2.2.1 Main Menu



Main Menu of software		
Content		Function
Port		Com port selection
Baud		Baud rate selection
Calibrate		Acceleration calibration
Help	Language	selection (English/ Chinese)
	Help	link to support team
	About	Info about Inclinometer.exe
Protocol		Normal or Modbus, TTL& RS232 is normal

2.2.2 User Interface



Menu of software	
Content	Function
X+ Alarm Angle	X+ Angle Trigger setting
X- Alarm Angle	X- Angle Trigger setting
Y+ Alarm Angle	Y+ Angle Trigger setting
Y- Alarm Angle	Y- Angle Trigger setting
Confirm Time	How long does the angle trigger the setting, the alarm will occur. To avoid the false alarm
Keep Time	How long the alarm will keep
Alarm State	Normal Open/ Close, only for relay-type tilt switch

2.3 Calibration

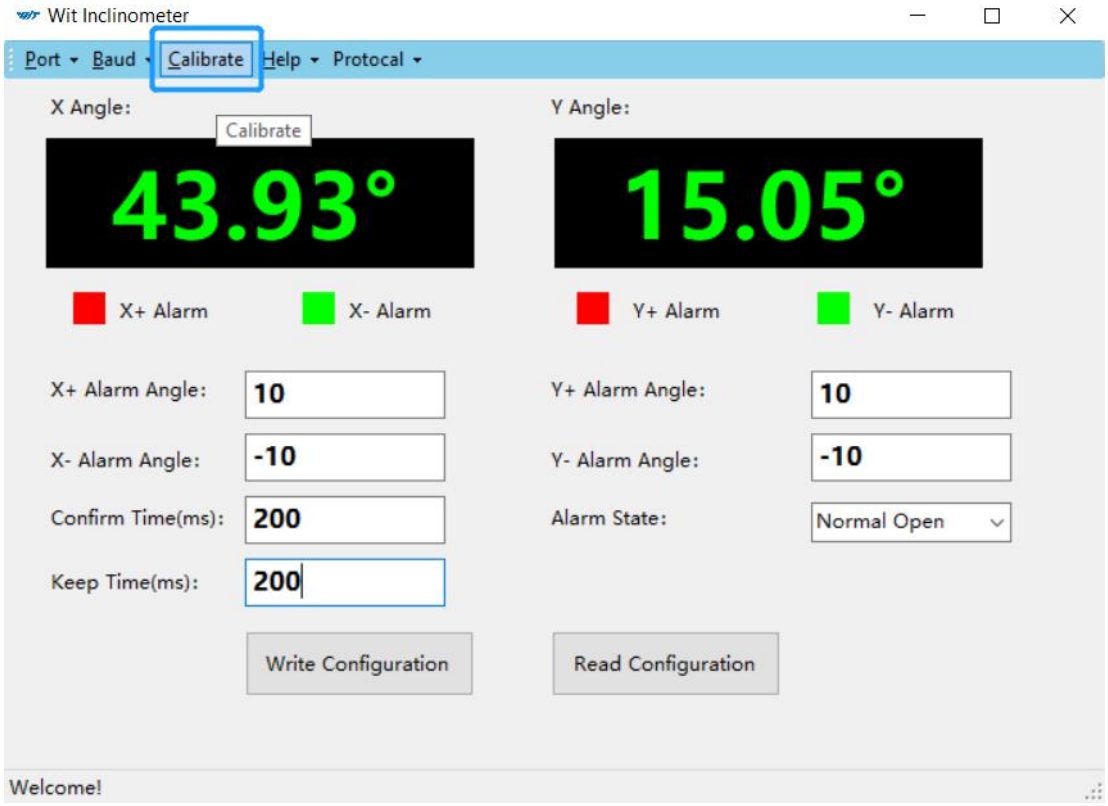
Preparation:
Make sure the sensor is "Online".

Calibration on PC software:

It is required to calibrate for the first time usage.
The accelerometer calibration is used to remove the zero bias of the accelerometer. Before calibration, there will be different degrees of bias error. After calibration, the measurement will be accurate.

Methods:
Step 1. Keep the sensor horizontally stationary

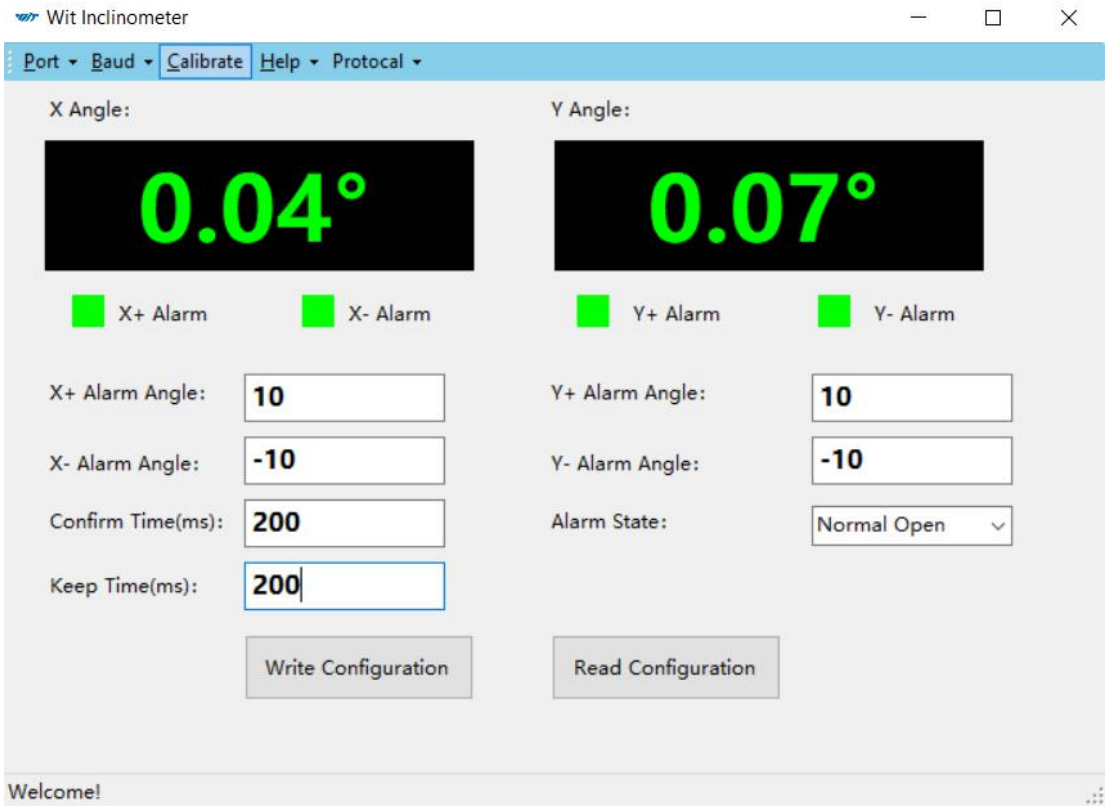
Step 2. Click the calibration button on the PC software, if a pop-up window is displayed, click "Yes". Calibration cannot be performed without unlocking.



Step 3. Check the result.

Then you can see that the X and Y axes are close to 0 degrees.

If the calibration is unsuccessful, you can try to send an instruction to perform the calibration. The calibration instruction is in the communication protocol of datasheet.

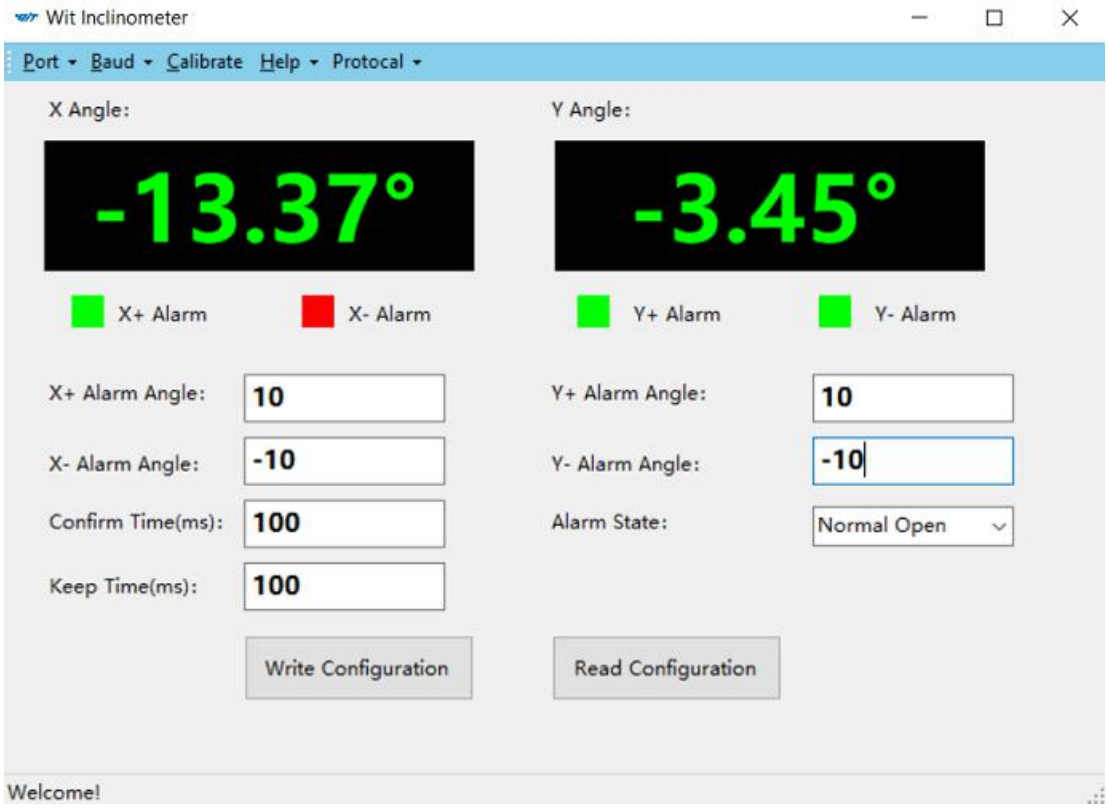


2.4 Configuration

2.4.1 Trigger Setting

As shown in the below picture:
The X+ alarm value is set to 10 degrees, X- alarm value is set to -10 degrees, Y+ alarm value is set to 10 degrees,

The Y-alarm value is set to -10 degrees. At this time, the X-axis angle is -13.37, which is less than -10 degrees, so the X-alarm is red. When it is greater than 10 degrees, X+ will alarm and display in red.



2.4.2 Confirm Time Setting

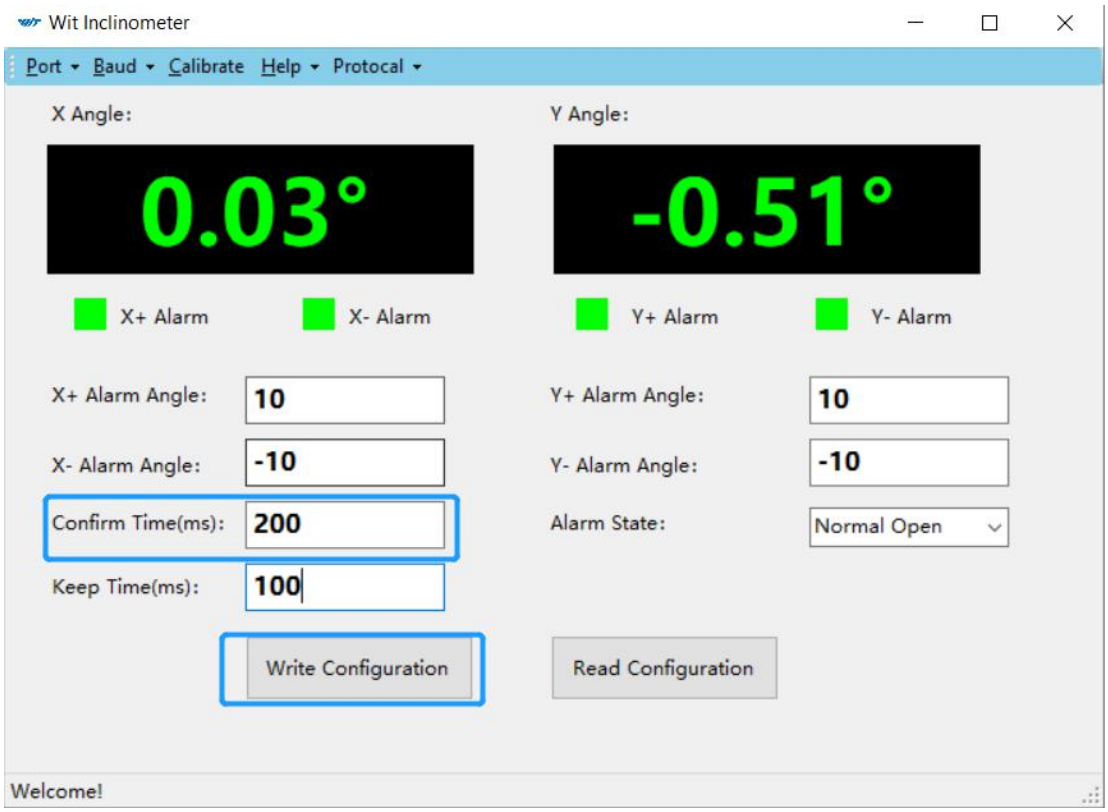
The “Confirm Time" is set for judge how long does the angle trigger the angle alarm setting. To avoid the false alarm.

For example, if X-angle reaching above -10 degree setting for 200ms, the alarm will occur. If less than 200ms, the alarm will not occur.

Step1. Edit the Confirm Time to the preferred setting

Step 2. Click “Write Calibration"

Step 3. Click “Read Calibration" to confirm if setting is done.



2.4.3 Keep Time Setting

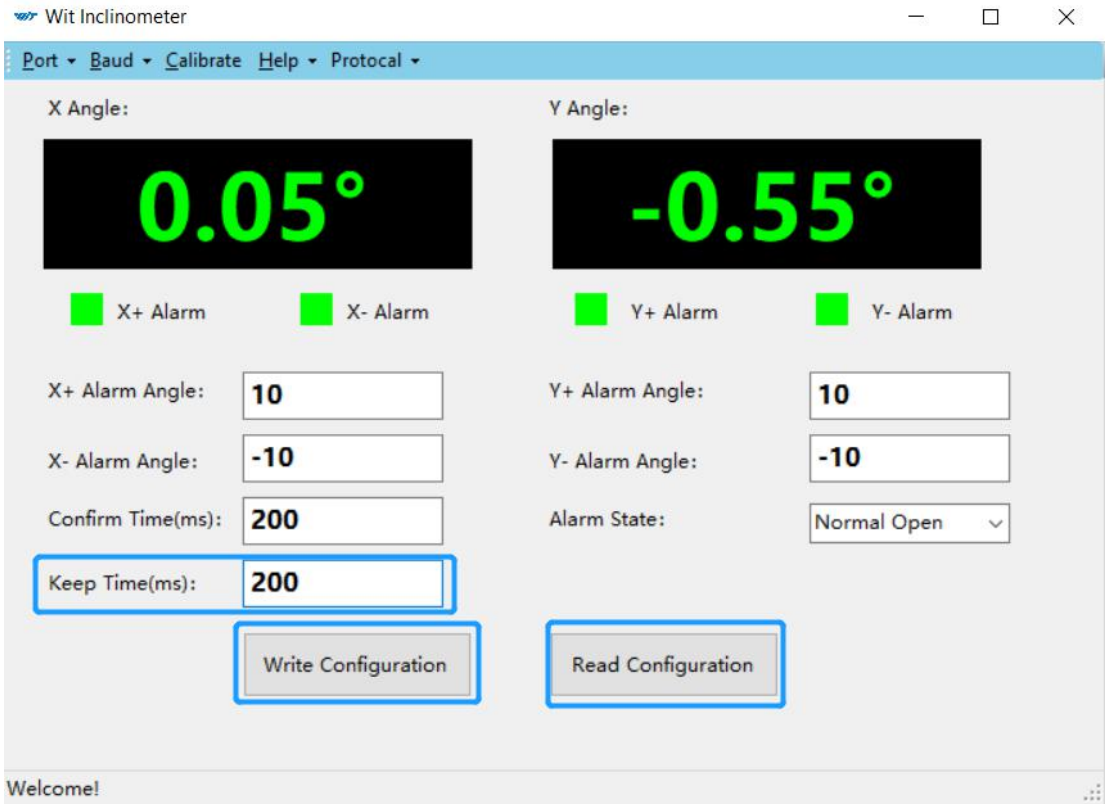
The “Keep Time" function means how long will the alarm keep.

For example, if angle triggers the setting, the alarm will remain for 200ms.

Step1. Edit the “Keep Time" to the preferred setting

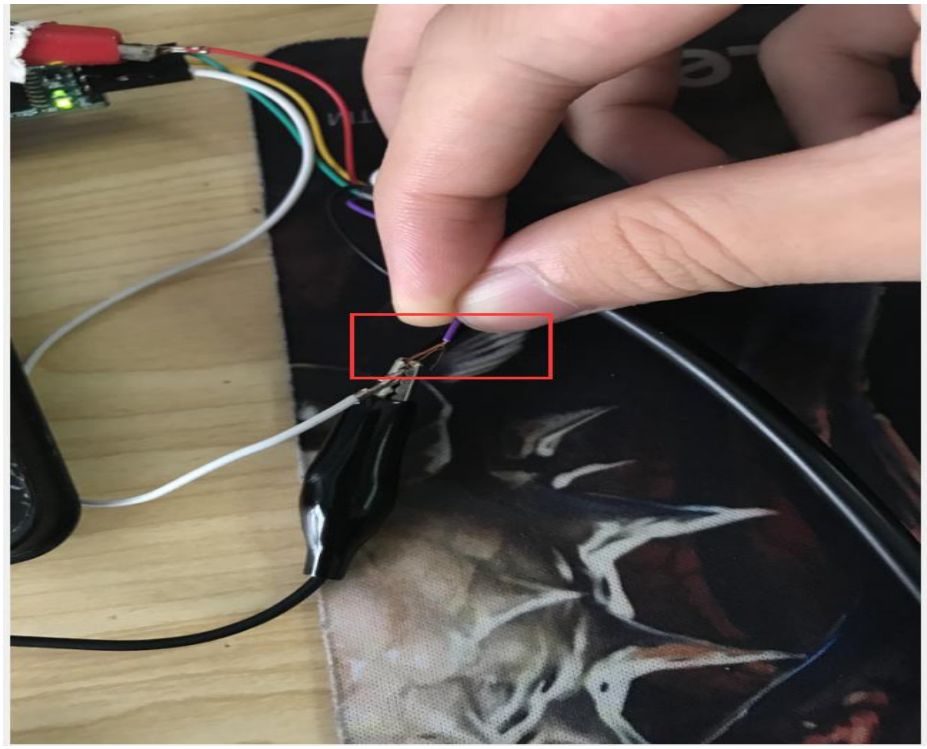
Step 2. Click “Write Calibration"

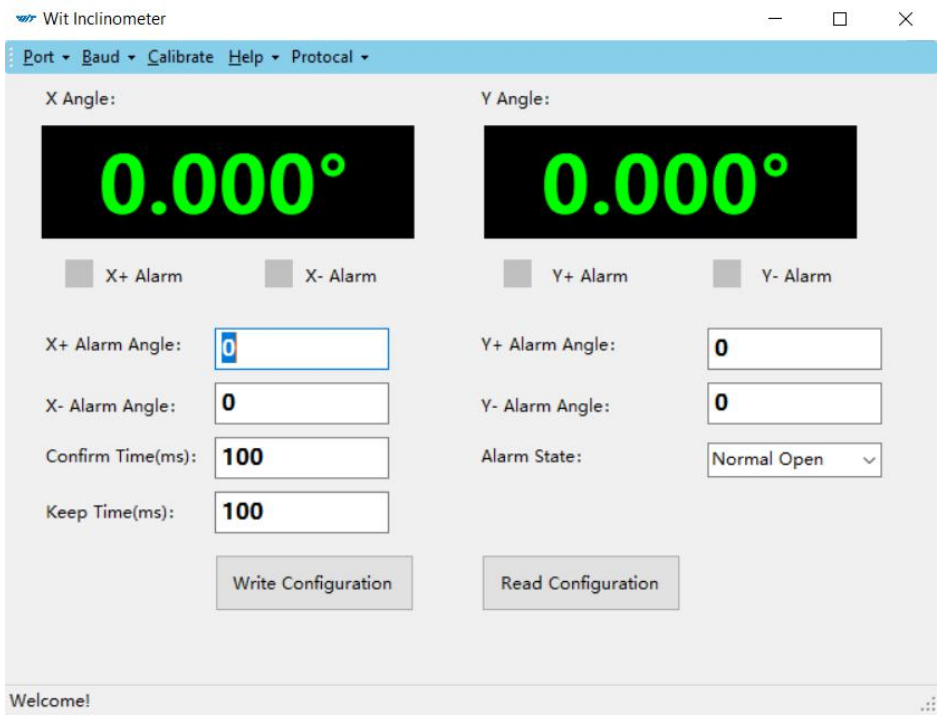
Step 3. Click “Read Calibration" to confirm if the setting is done.



3 Set the Relative Attitude Angle

After the signal wire (purple) is grounded for two seconds, you can set the current attitude to a relative angle of 0°.





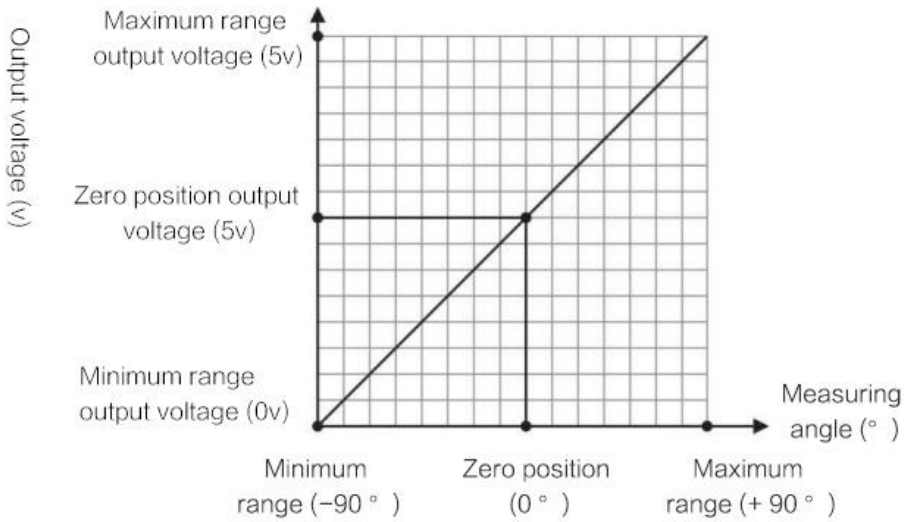
4 Voltage Output&Angle Calculation Formula

The SINVT output is a standard voltage of 0-5V, which corresponds to the minimum range and maximum range of the angle measurement; the calculated angle is to obtain the corresponding angle value as long as the ratio.

For example: SINVT-90 (0-5V): means ±90° measurement range, 0-5V output voltage

Sin VT output for the standard voltage 0–5v, the corresponding angle measurement of the minimum range and the maximum range; calculation angle is as long as According to the ratio you can get the corresponding angle value:

For example: sinVT (0–5v): that ± 90 ° measuring range, 0–5v output voltage



Voltage output and angle conversion formula:
Inclination angle = sensitivity* (vout- voffset)

Current tilt angle

Vout: Output voltage value of sensor zero position (notification is 2.5V)

Sensitivity: Sensor sensitivity: Sensor sensitivity is the proportion of voltage change corresponding to sensor inclination change.

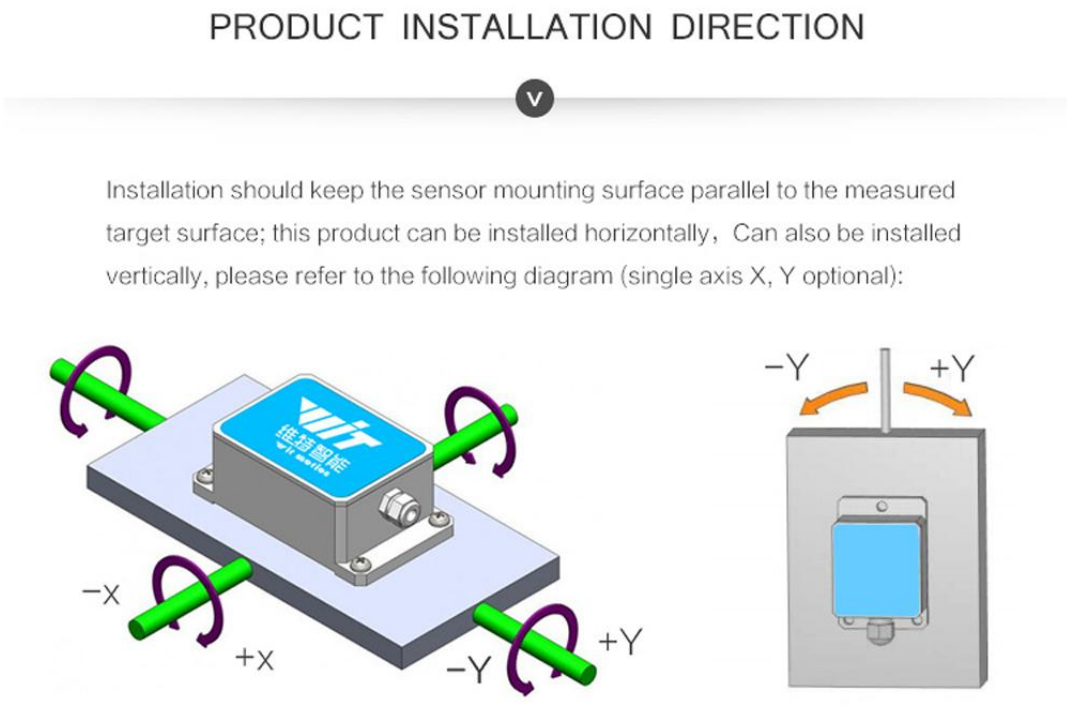
For example: if the range of the sensor is ±90° and the corresponding voltage change is 0-5V, the sensor sensitivity is 36
90-(-90) = sensitivity*(5-0)

If the current output voltage is 3.75V, the corresponding tilt angle is 45 degrees:
45=36* (3.75-2.5)

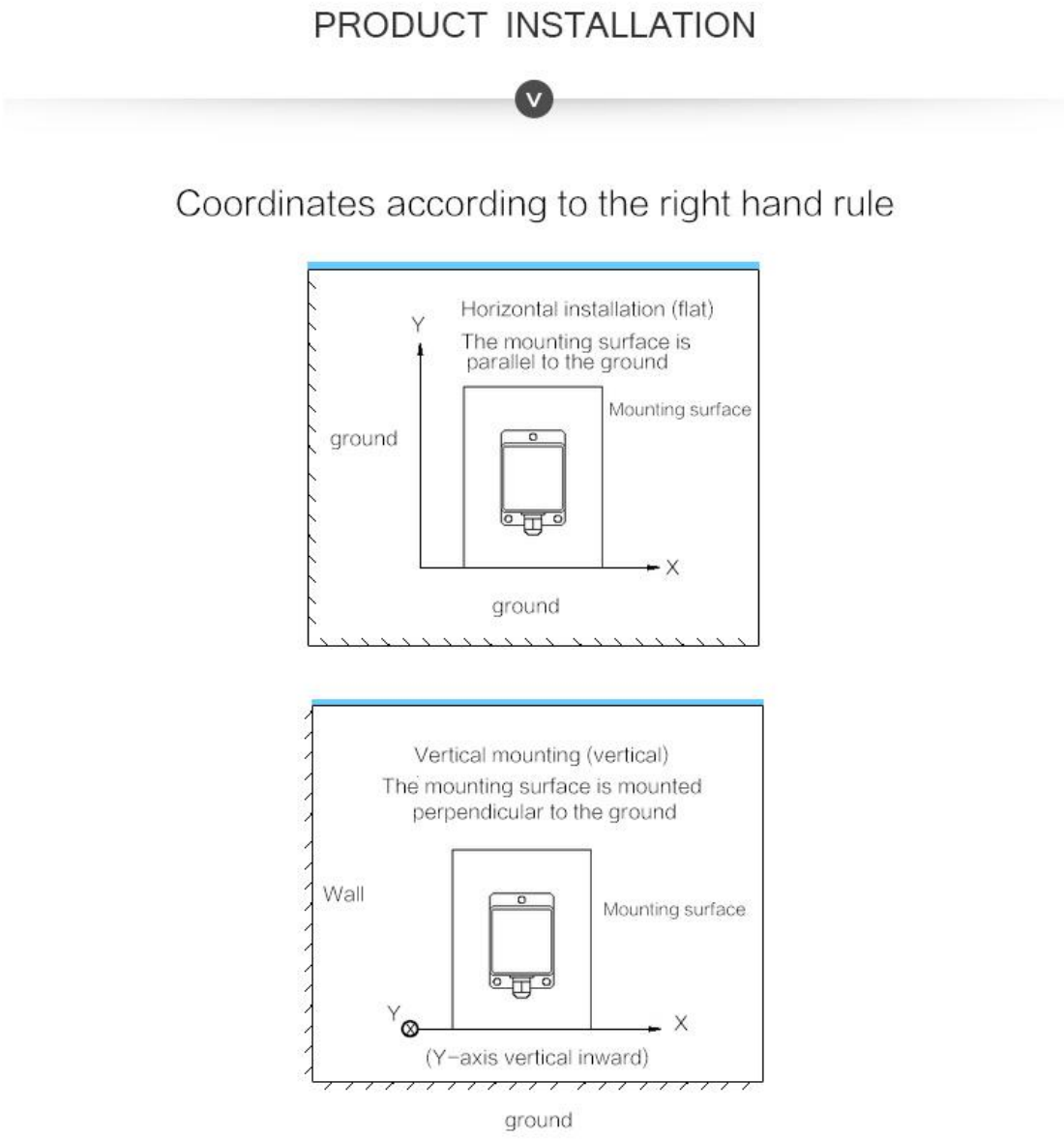
For example: The range of the sensor is ±30°, the corresponding voltage change is 0-5V, then the sensor sensitivity is 12.
30-(-30)= sensitivity*(5-0)

If the current output voltage is 3.75V, the corresponding tilt angle is 15 degrees:
15=12* (3.75-2.5)
Therefore, the sensitivity of the sensor corresponds to the range.

5 Angle Measurement Axial Display



6 Placement Direction



7 Installation Precautions

Product installation precautions

Please follow the correct method to install the tilt sensor, improper installation will lead to measurement error, with particular attention to the side, the second line

1) The mounting surface of the sensor must be close to the surface to be measured, smooth and stable. If the installation surface is uneven, it is easy to cause the error of the sensor measurement.

2) the sensor axis and the measured axis must be parallel, the two axes as far as possible not to produce the angle, see Figure 3, 4

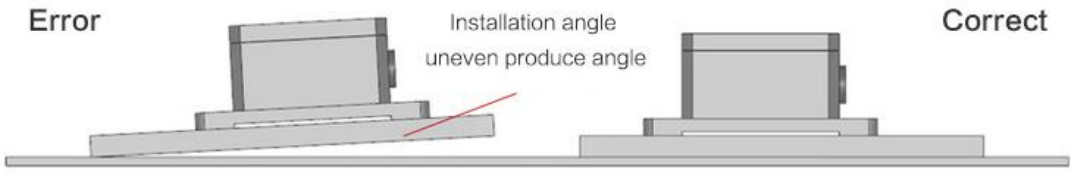


figure 1 Measured mounting surface figure 1

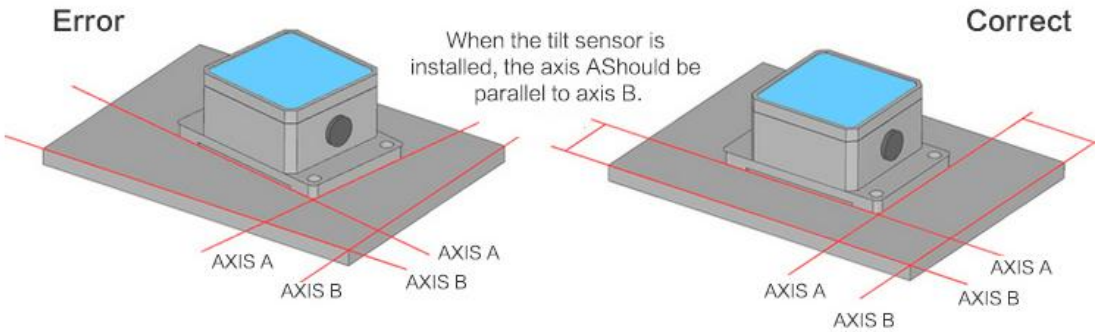
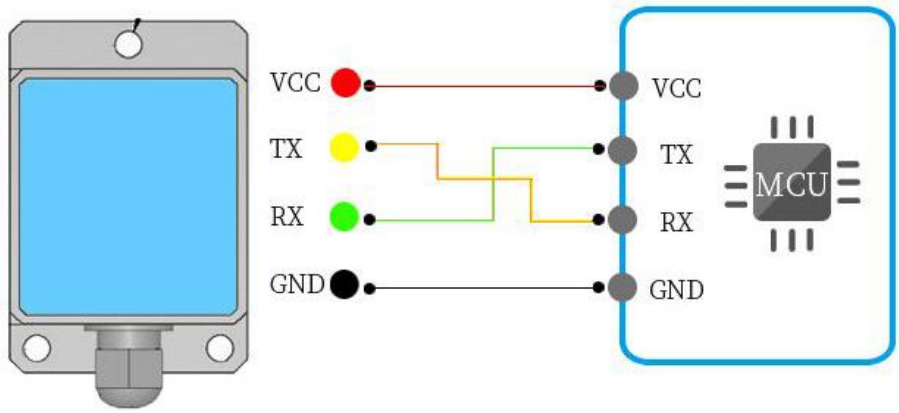


Figure 3 Figure 4

8 MCU Connection



Link to download all sample code

Link to sample code instructions demo
Notice: There is no sample code provided for Linux or Python system at present.

8.1 Arduino

Download link

Arduino UNO3 Demo Link

8.2 STM32

Download link

8.3 Raspberry pi

Tutorial link

8.4 C#

DEMO link

8.5 C++

DEMO link

8.6 Matlab

Receive Sample Code

Dataplot DEMO