AIT



TS-2312-R03 Series
Modbus Single Axis Inclinometer

Technical Manual

V1.0

FEATURES

- Single Axis Inclination Measurement
- Resolution: 0.02°
- Power Supply: 9-36V
- Size: 2.165 × 1.46 × 0.95 (inch)
  55 × 37 × 24 (mm)
- Highest Accuracy: 0.2°
- Measurement Range: ±180°
- Output: RS232/RS485/TTL Optional Modbus
- IP67 Protection Level

APPLICATIONS

- Industrial Automatic Leveling
- Medical Instruments
- Photovoltaic Automatic Tracking
- Tower Tilt Monitoring
- Special Valve
- Oil Drilling Equipment
- Industrial Converter
- Lifting Equipment Inclination Control

DESCRIPTION

The TS-2312-R03, developed and manufactured by AIT Sensing, is a cost - effective single - axis inclinometer. It offers RS232/RS485/TTL Optional Modbus output. It incorporates a well - established industrial - grade MEMS accelerometer, with a measurement range of ±180° and a maximum accuracy of 0.2°. The operating temperature range extends from −40°C to + 85°C.

Compact and lightweight, the TS-2312-R03 is well - suited for applications with space constraints. It converts variations in the static gravity field into changes in the inclination angle， and directly provides the horizontal inclination value digitally.

This inclinometer has numerous advantages, such as low cost, minimal temperature drift, ease of use, and strong anti - interference capabilities. Thus, it is an ideal choice for inclination measurement in industries like photovoltaic power generation, pan - tilt control, and tower monitoring.
During installation, users can employ the AIT serial port debugging assistant tool or AIT test and calibration software for on - site calibration. This helps correct any angle misalignment at the installation site.

SPECIFICATIONS

Table 1.

Parameter	Test Conditions	Min.	Typ.	Max.	Unit/Note
Power Supply Voltage		9	12	36	V
Operating Current	No load	20	30	40	mA
Operating Temperature Range		−40		85	°C
Storage Temperature Range		−55		100	°C
Measurement Range			±180		°
Measurement Axis		X			
Accuracy	Room temperature		0.2		°
Resolution	Completely still		0.02		°

Parameter	Test Conditions	Min.	Typ.	Max.	Unit/Note
Start-Up Time				3	s
Output Frequency		5		100	Hz
Mean Time Between Failures MTBF		90000			h
Electromagnetic Compatibility		According to GBT17626			
Insulation Resistance		100			MΩ
Impact Resistance		2000g, 0.5ms, 3 times/axis			
Weight			210		g
			0.47		lbs
			7.41		Oz

*Resolution: The smallest change value of the measured value that the sensor can detect and distinguish within the measurement range.

*Accuracy: The root mean square error of the actual angle and the sensor measuring angle for multiple (≥16 times) measurements.

ELECTRICAL INTERFACE

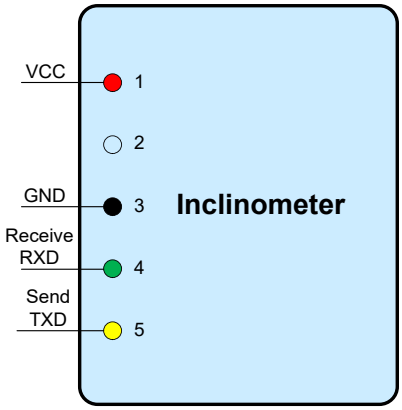


Figure 1. Pin Names

Table 2. Pin Number, Colors and Functions

No.	Color		Functions
1		Red	VCC: DC 9V ~ 36V
2		Blue	NC
3		Black	Ground
4		Green	Receive RXD (B,D-)
5		Yellow	Send TXD (A,D+)

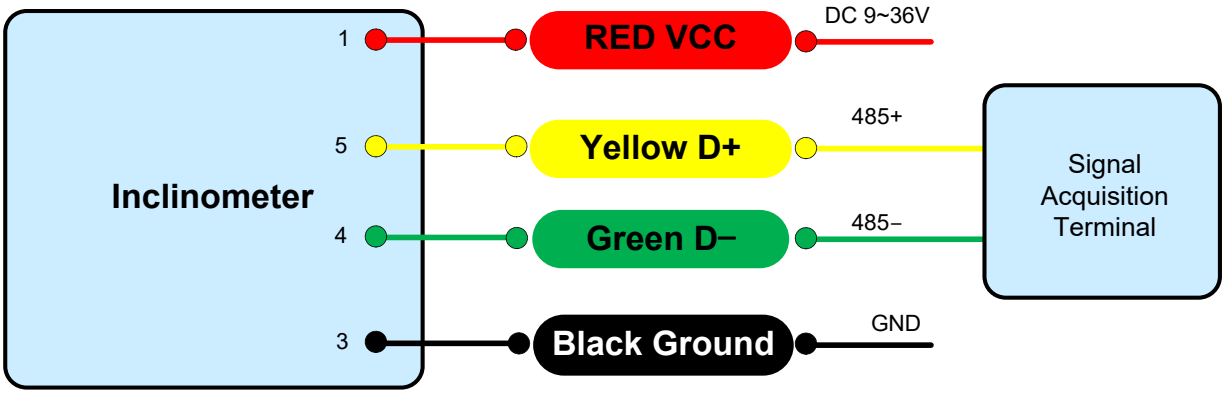


Figure 2. RS 485 Wiring Diagram

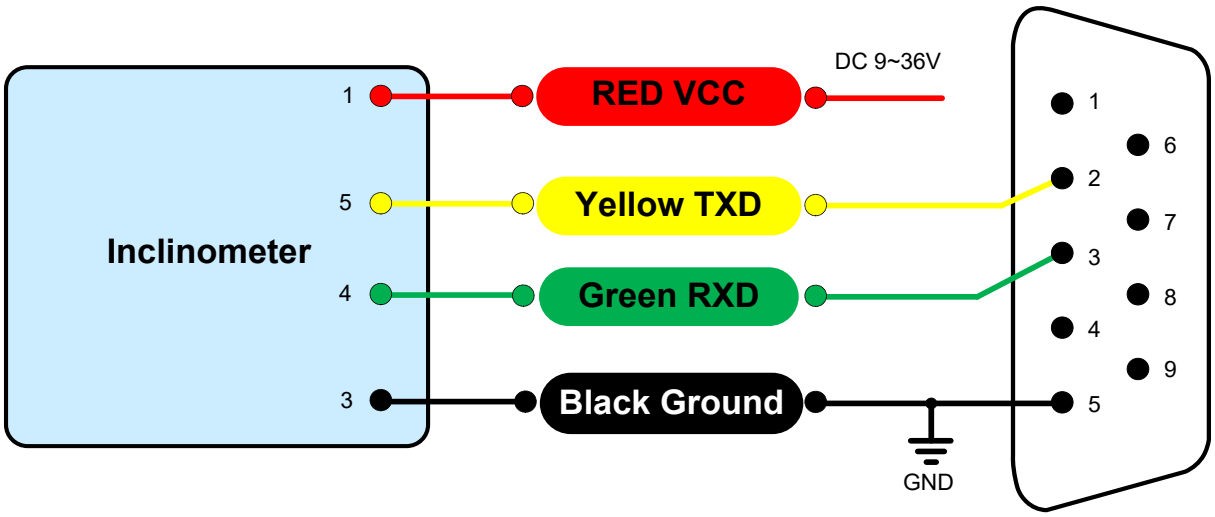


Figure 3. RS232 Wiring Diagram

DEBUGGING SOFTWARE

You can download the serial debugging assistant directly on the official website (technical service -> download area), or you can use the more convenient and intuitive host computer software.

TS-2312-R03 supporting serial port debugging software can connect the inclination sensor on the computer to display the angle. The software debugging interface is shown in the figure below. Using the tilt angle to debug the host computer, you can conveniently display the current X direction tilt angle, and you can also modify and set other parameters.

Steps:

(1). Correctly connect the serial port hardware of the inclinometer and connect the power supply.

(2). Select the computer serial port and baud rate and click to connect to the serial port.

(3). Click Start, the current tilt angle of the inclinometer in the X direction will be displayed on the screen.

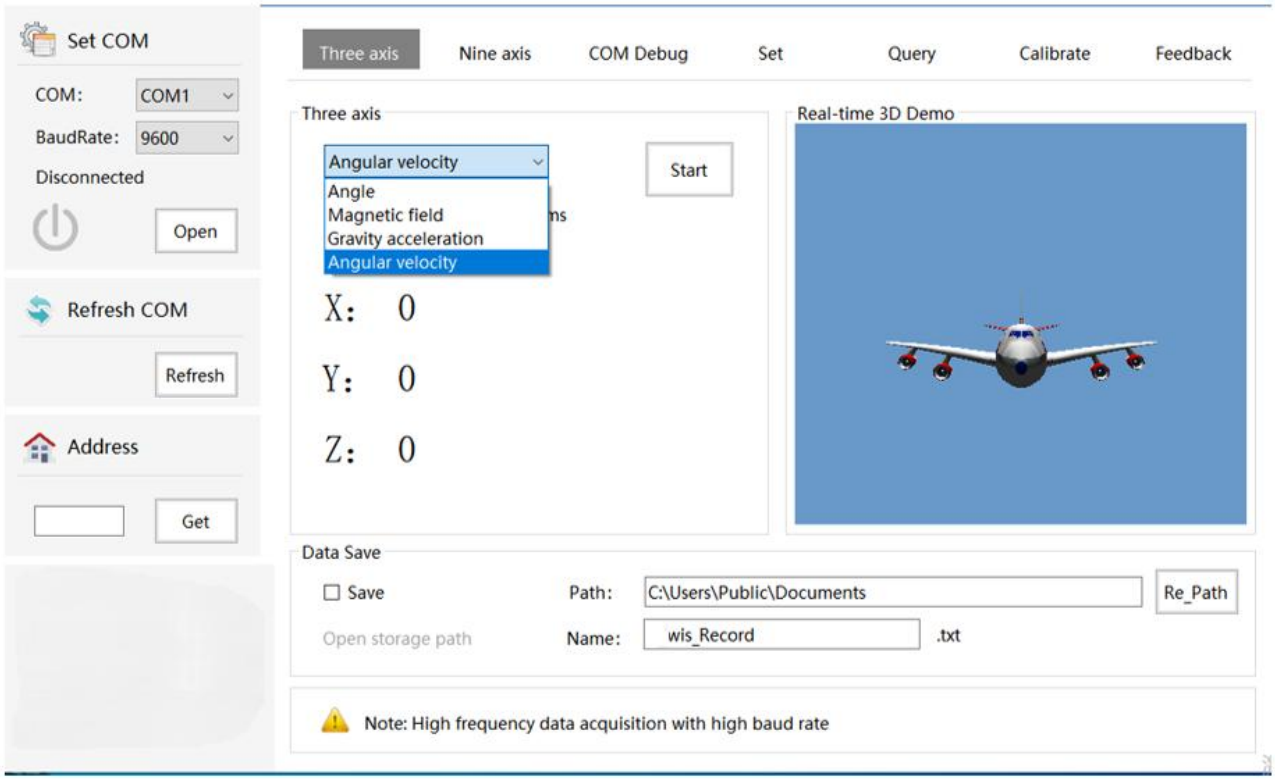
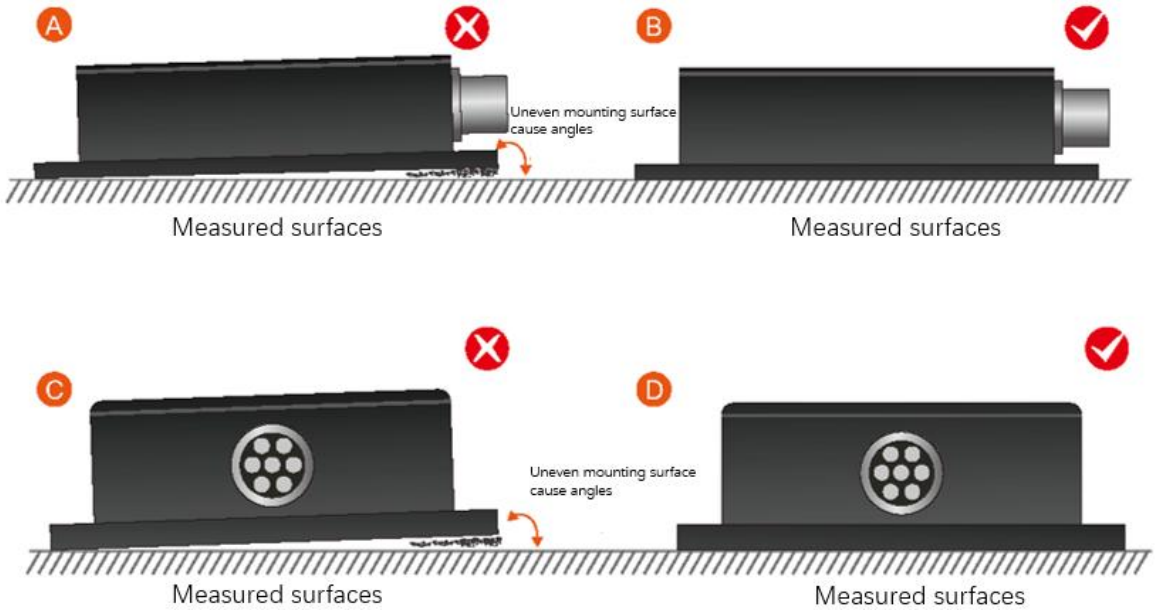


Figure 4. Software Debugging Interface

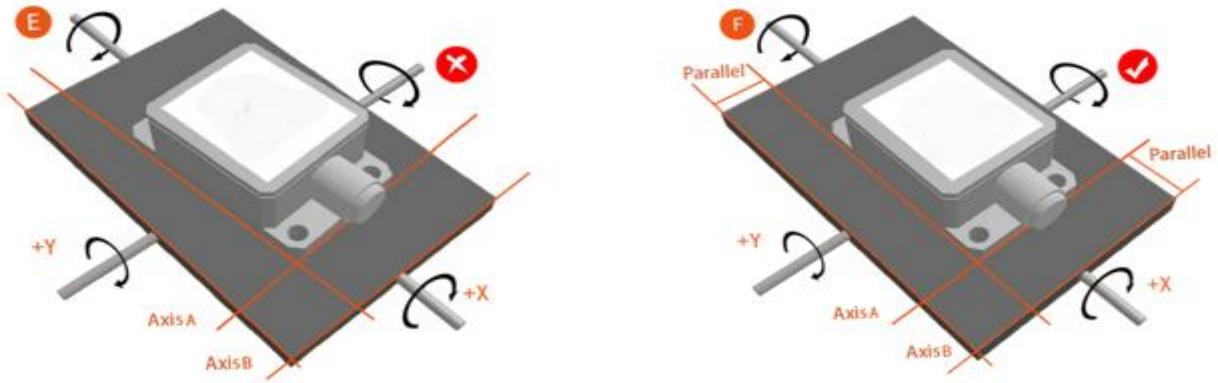
INSTALLATION

The correct installation method can avoid measurement errors. When installing the sensor, please do the following:

First of all, make sure that the sensor mounting surface is completely close to the measured surface, and the measured surface should be as level as possible. There should be no included angles as shown in Figure A and Figure C. The correct installation method is shown in Figure B and Figure D.



Secondly, the bottom line of the sensor and the axis of the measured object cannot have an angle as shown in Figure E, and the bottom line of the sensor should be kept parallel or orthogonal to the axis of rotation of the measured object during installation. This product can be installed horizontally or vertically (vertical installation needs to be customized), and the correct installation method is shown in Figure F.



Finally, the mounting surface of the sensor and the surface to be measured must be tightly fixed, smooth in contact, and stable in rotation, and measurement errors due to acceleration and vibration must be avoided.

DIMENSIONS

Outline Dimensions

Top View	Side View
Unit	mm (inch)

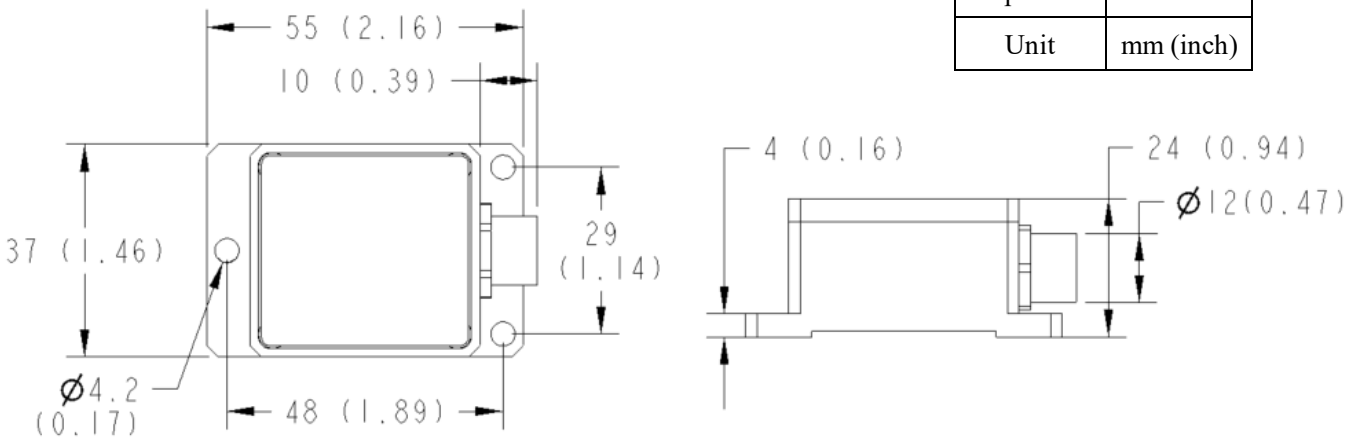
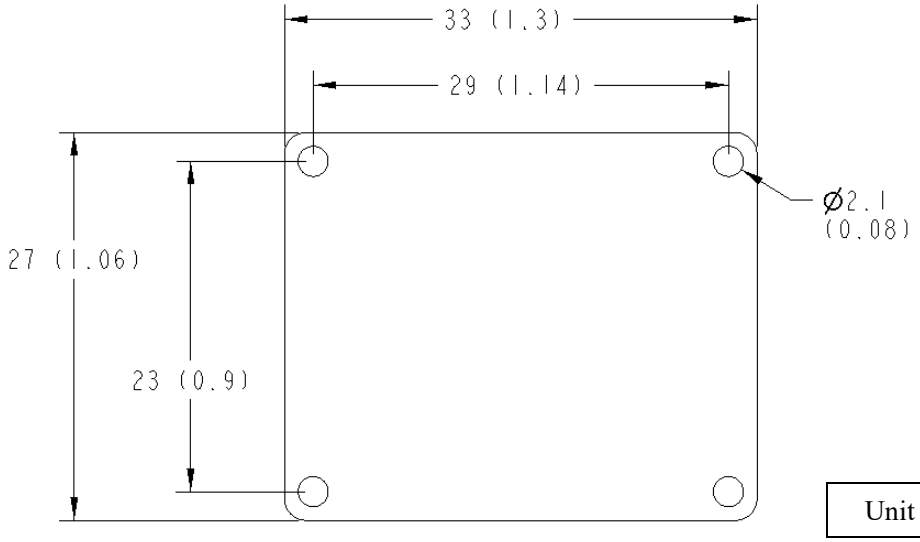


Figure 5. Outline Dimensions

PCB Dimensions

The length and width may have an error of ±1mm, please refer to the actual product.



Unit	mm (inch)

Figure 6. PCB Dimensions



Figure 7 . Top View of TS-2312-R03

Table 3. Mechanical Index

Connector	Metal joint（Cable 1.5m)
Protection level	IP67
Shell material	Magnesium aluminum alloy oxidation
Installation	Three M4 screws