AIT



TS-3420-R03 Series
Modbus Output Dual Axis Inclinometer

Technical Manual

V1.0

Modbus Output Dual Axis Inclinometer

TS-3420-R03

FEATURES

- Dual Axis Inclination Measurement
- Resolution: 0.01°
- Power Supply: 9-36V
- Size: 2.165 × 1.46 × 0.94 (inch)
  55 × 37 × 24 (mm)
- Highest Accuracy: 0.1°
- Measurement Range: ±90°
- Output: RS232/RS485/TTL for 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-3420-R03 , developed and manufactured by AIT Sensing, is a cost - effective dual - axis inclinometer. It uses a mature industrial-grade MEMS accelerometer, with a measuring range of±90°, the highest accuracy of 0.1°, and an operating temperature of -40℃ to +85 ℃.

This product is small in size and light in weight, which can meet the application requirements with limited space. It converts the change of the static gravity field into the change of the inclination angle, and directly outputs the horizontal inclination angle value through the voltage mode. It has the advantages of low cost, small temperature drift, simple use, and strong anti-interference ability. It is photovoltaic power generation, pan-tilt control, tower ideal for inclination measurement in industries such as rod 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
Storage Temperature Range		−55		100	℃
Operating Temperature Range		-40		85	℃
Measurement Range			±90		°
Measurement Axis		X-Y			
Accuracy （@RT）	Measure Range ±60°		0.1		°
Accuracy （@RT）	Measure Range ±90°		0.2		°
Resolution	Completely still				0.01
Cross-Axis Error	−40℃ ~ 85℃		0.1		°

Start-Up Time				50	ms
Output Frequency	5-100Hz adjustable			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
			0.46		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

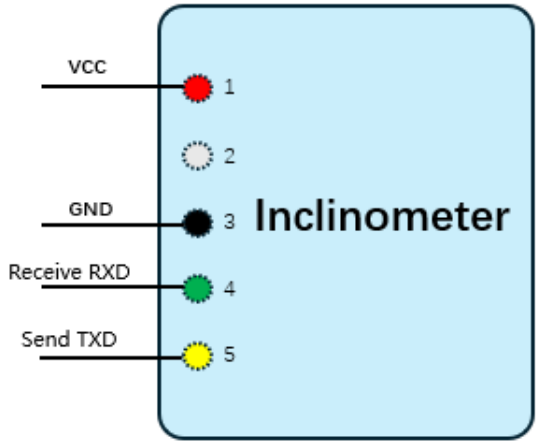


Figure 1. Pin Names

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
5		Yellow	Send TXD

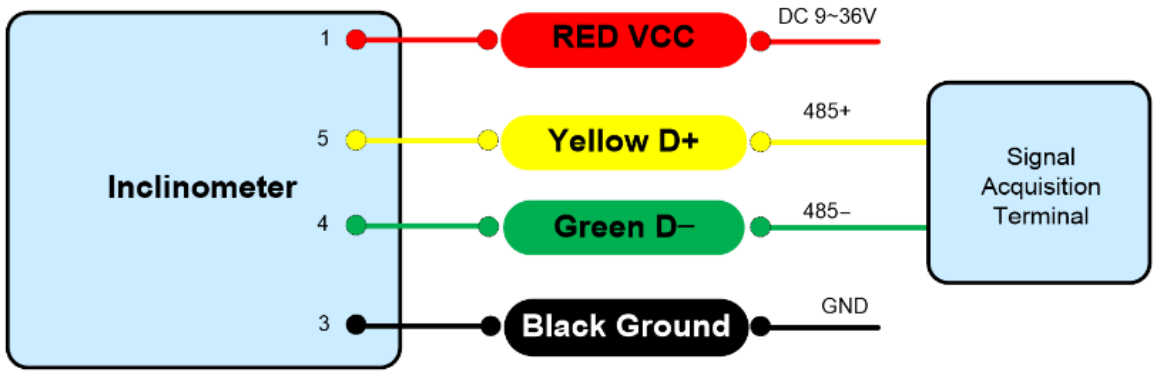


Figure 2. RS 485 Wiring Diagram

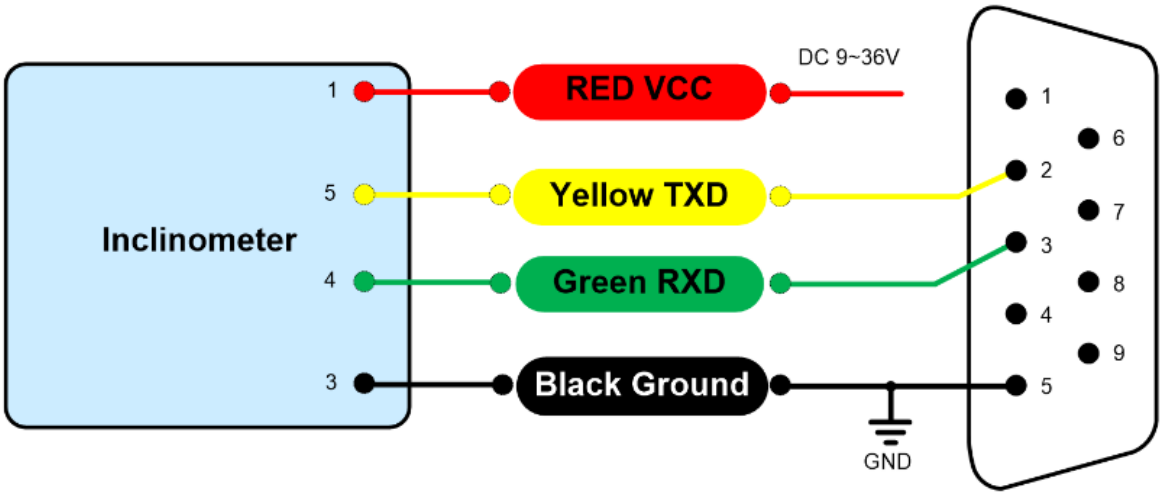
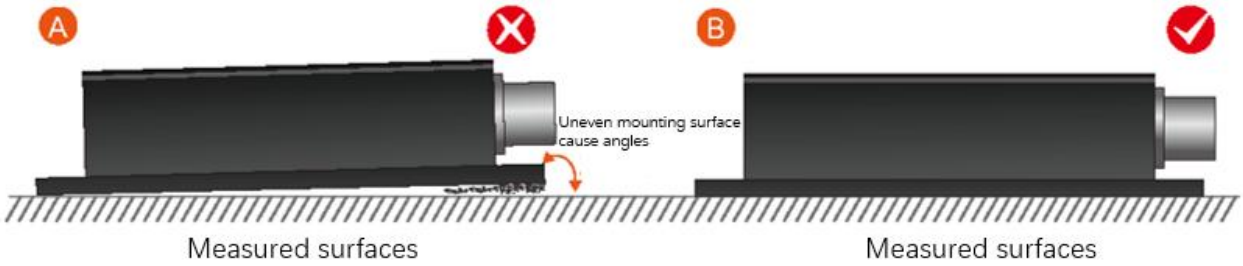


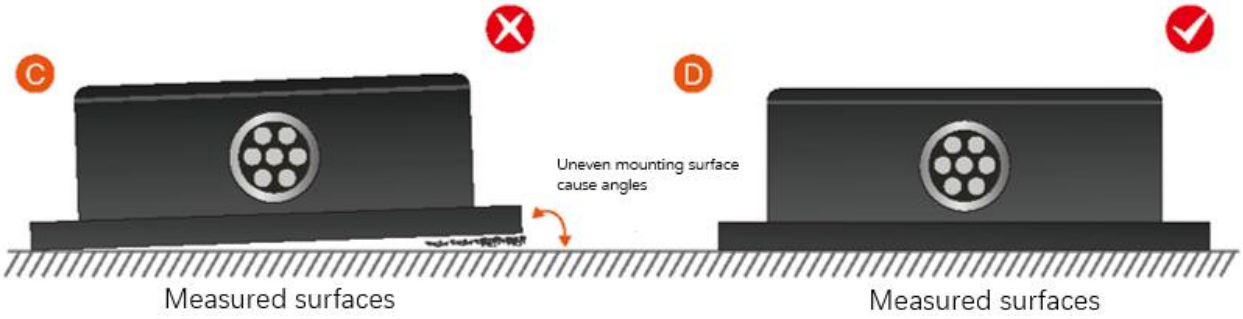
Figure 3. RS 232 Wiring Diagram

INSTALLATION

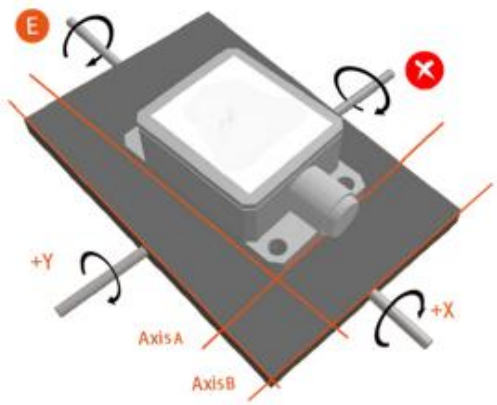
The correct installation method can avoid measurement errors. When installing the sensor, please do the following:

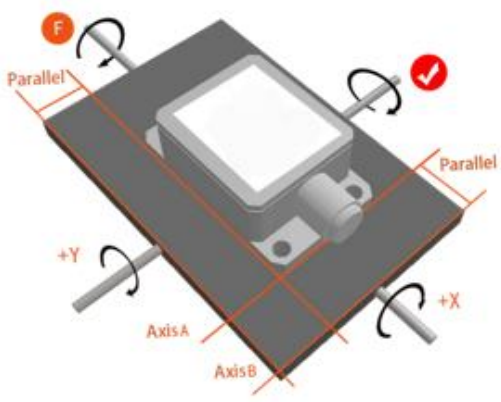
First of all, make sure that the sensor mounting surface is completely close to the measured surface, and the measured surface should be as level as possible. There should be no included angles as shown in Figure A and Figure C. The correct installation method is shown in Figure B and Figure D.





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

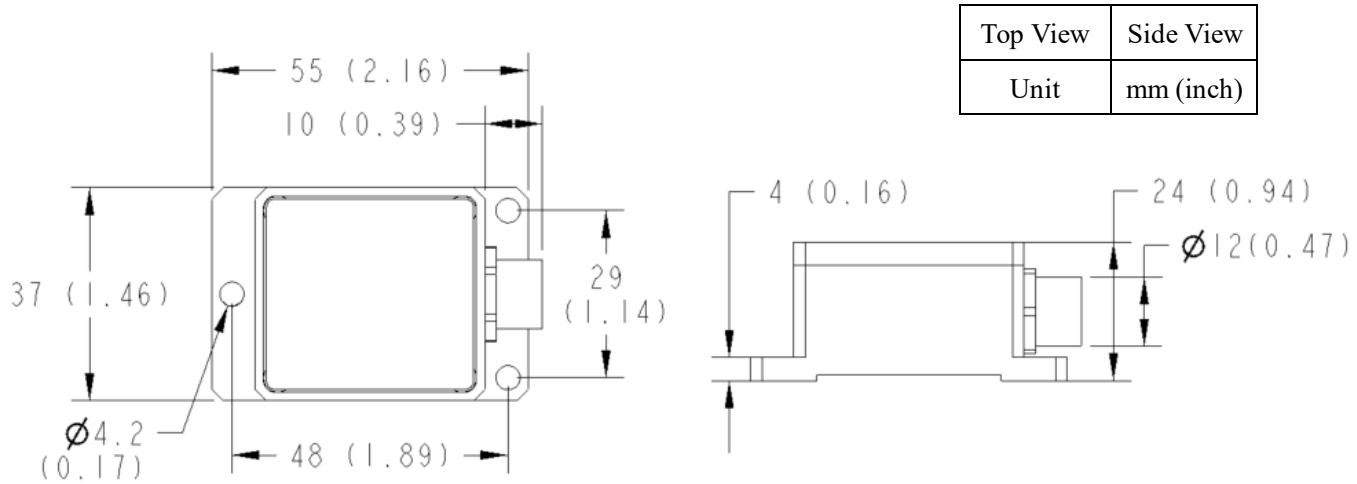


Figure 4. Outline Dimensions

PCB Dimensions

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

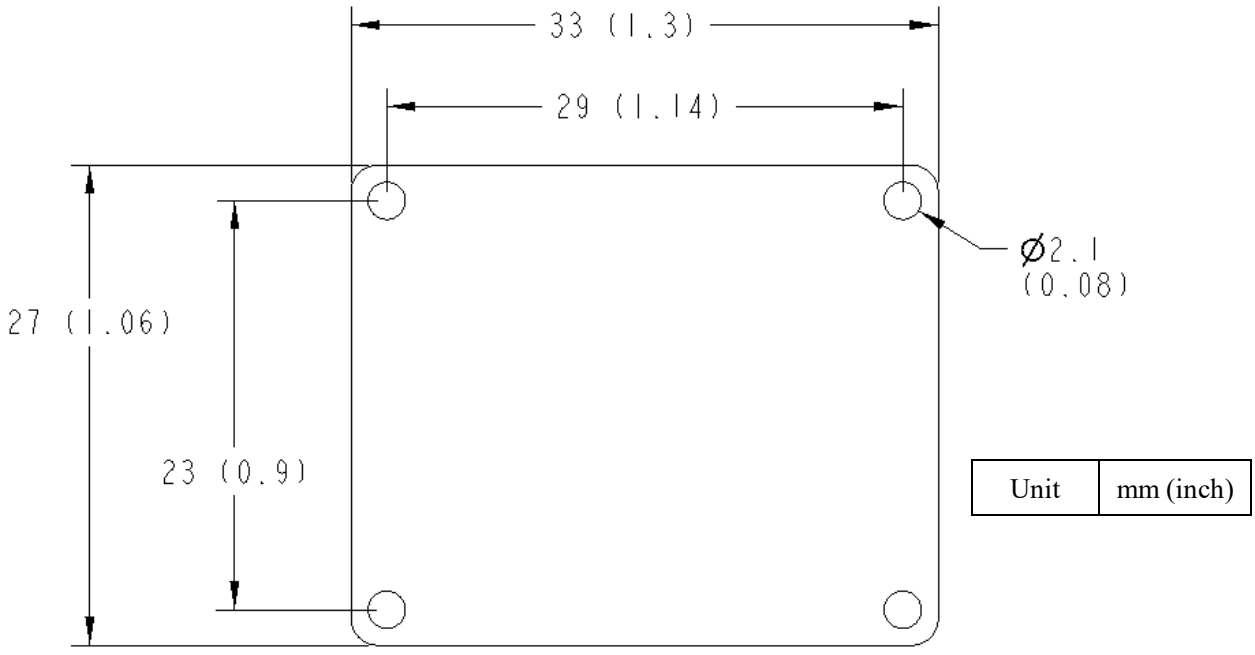


Figure 5. PCB Dimensions



Figure 6. Top View of TS-3420-R03

Mechanical Index

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

ORDERING INFORMATION

Part Number	Communication Mode	Package Situation
TS-3420-R03 -90-485	RS485	IP67 Package/Metal joint
TS-3420-R03 -90-232	RS232	IP67 Package/Metal joint
TS-3420-R03 -90-TTL	TTL	IP67 Package/Metal joint

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-3420-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 and Y 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 and Y directions will be displayed on the screen.

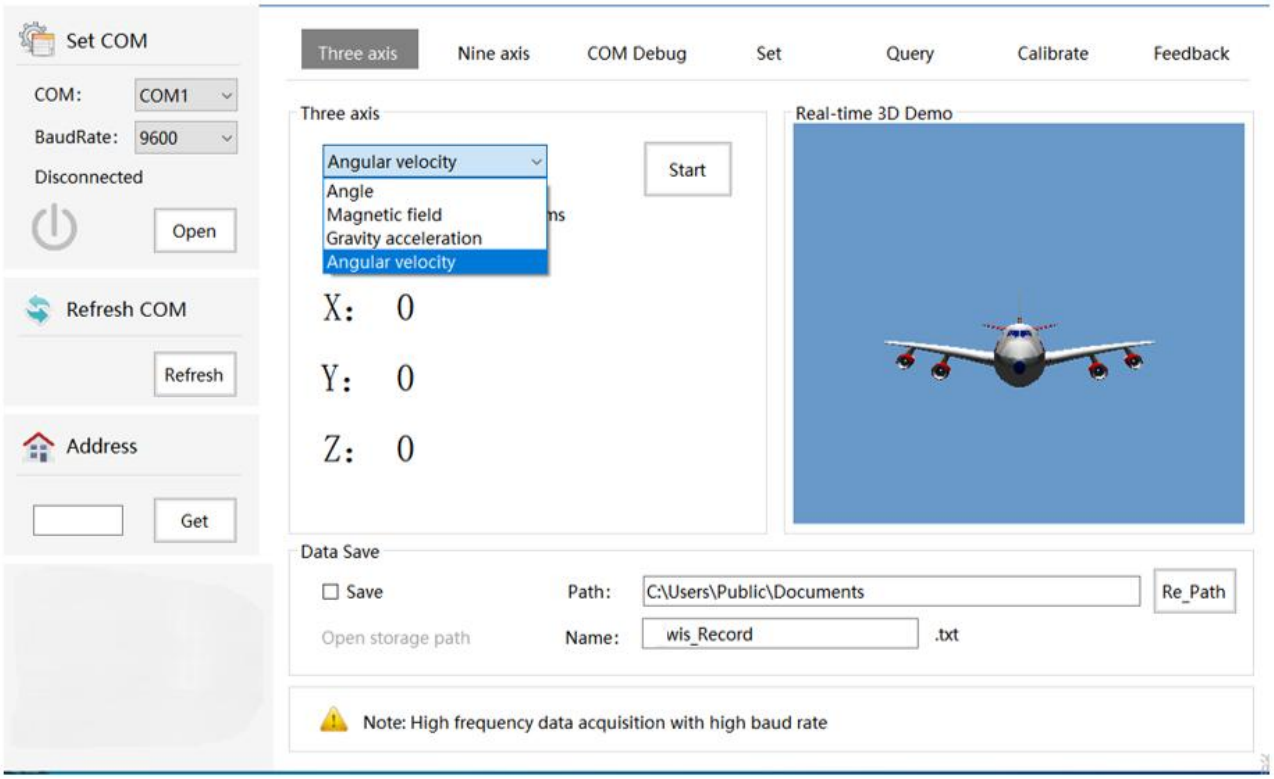


Figure 7. Software Debugging Interface