AIT



TS-9827-R12 Series
Voltage Output High-Precision
Dual Axis Inclinometer

Technical Manual

V1.0

Product Features

- High accuracy: 0.001°
- Dual axis inclination measurement
- 0-5V, 0-10V optional, Output RS232
- Baud rate 2400~115200 adjustable
- IP67 protection level
- Wide voltage input: 12-36V DC
- Output frequency 100Hz
- Accept OEM customization

Applications

- Bridge deflection monitoring
- Building health monitoring
- Precision platform automatic leveling
- Military equipment automation
- Tunnel and dam monitoring
- Tower tilt monitoring
- Surveying and Mapping Instruments
- Wind turbine tower monitoring

Product Description

TS-9827-R12 is a dual-axis high-precision inclinometer with MEMS technology and digital output launched by AIT Sensing. It has a measurement range of ±30° and a maximum accuracy of 0.001°. It is currently the most accurate product in the industry. The sensor uses a high-resolution differential digital-to-analog converter with built-in automatic compensation and filtering algorithms to minimize errors caused by environmental changes. Convert the change of the static gravity field into the change of the inclination angle, and directly output the current roll angle and pitch angle through the digital method. The product is easy to install, simple to use, small in size, resistant to external electromagnetic interference, and strong in vibration and impact. It is an industrial automation, The recommended choice for inclination measurement in surveying and mapping industries!

Technical Specifications

Table 1. Performance Index

Measurement Range (°)	Condition	±5	±15	±30
Measurement axis	Mutually perpendicular	X-Y	X-Y	X-Y
Accuracy (°)	Room temperature	0.001	0.003	0.005
Cross-axis error (°)	-40~85℃	0.001	0.003	0.005
Resolution (°)	be completely still	0.0005		
Zero point temperature drift (°/℃)	-40~85℃	±0.0007		
Power-on start-up time		＜3s		
Output frequency (Hz)	100			
baud	tunable	2400~115200		
Mean time between failures MTBF	≥90000 h			
Electromagnetic compatibility	According to GBT17626			
Insulation resistance	≥100 MΩ			
Impact resistance	2000g，0.5ms，3 times/axis			

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.

Table 2. Electrical Index

Parameter	Condition	range of values
Voltage (V)		12-36
Current (mA)	No load	20-60
Output load (kΩ)	Resistive	≥10
Output load (nF)	Capacitive	≤20
Operating temperature(℃)		-40~+85
Storage temperature(℃)		-55~+100

Electrical Interface

Electrical interfaces

Cable color& Function	RED	BLACK	GREEN	YELLOW	BROWN	ORANGE	GRAY
	1	3	4	5	8	9	10
	VCC DC12-36V	GND	RXD	TXD	U XOUT	U YOUT	Output Ground

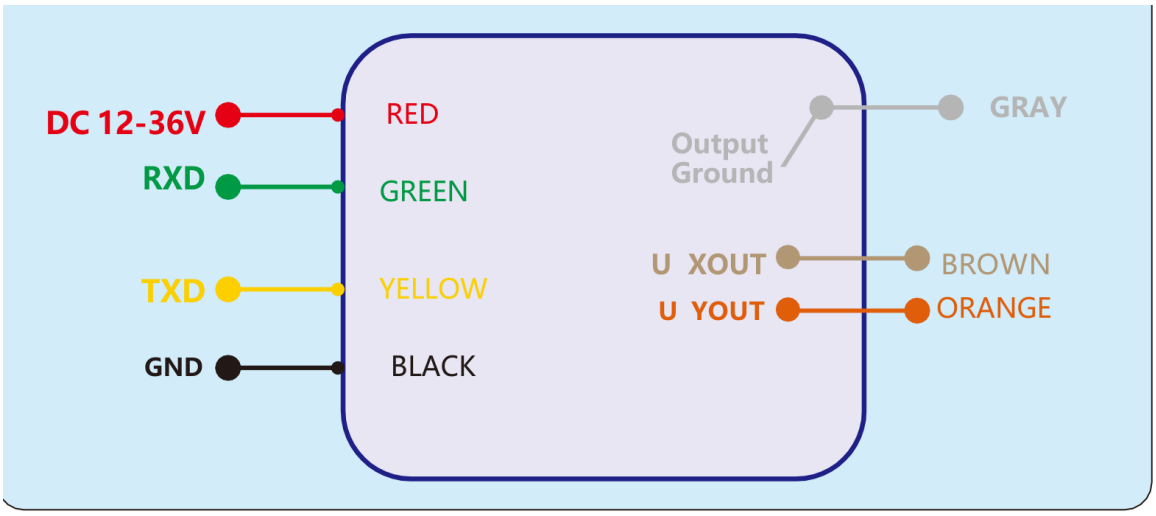


Figure 1. Electrical interfaces

RS232 Electrical interfaces

Cable color& Function	RED	BLUE	BLACK	GREEN	YELLOW
	1	2	3	4	5
	VCC DC 12-36V	NC	GND	RXD	TXD

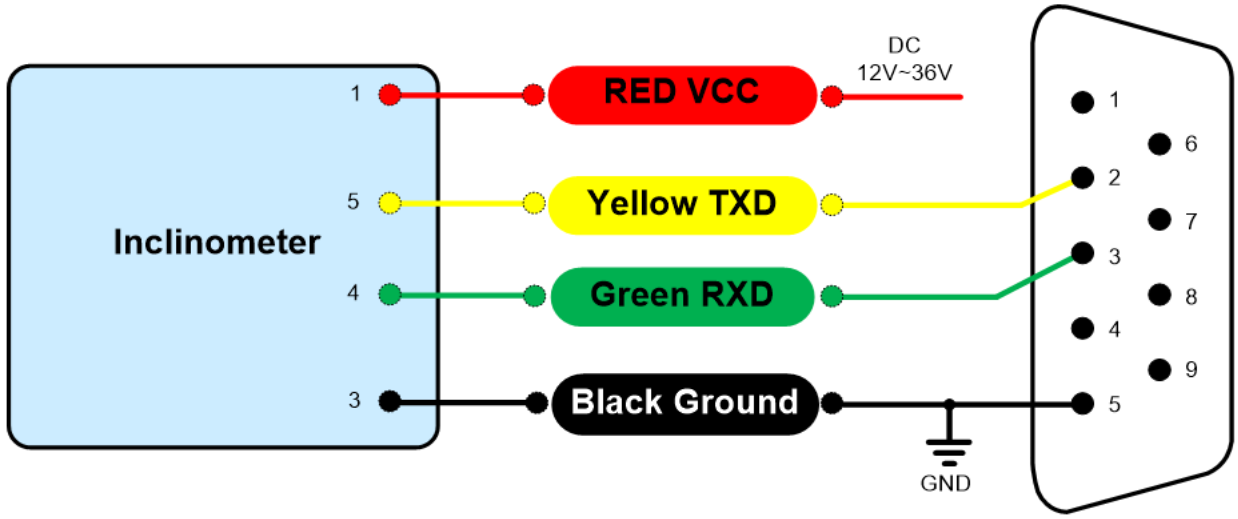


Figure 2. RS232 Electrical interfaces

Debugging and Testing

You can download the serial debugging assistant directly on the official website, or you can use the more convenient and intuitive host computer software.

TS-9827-R12 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.

Operating Steps:

①Connect the serial port hardware of the inclinometer correctly, and connect the power supply.

②Select computer serial port and baud rate and click connect serial port.

③Click start button and the current inclination Angle of the incliner in X and Y directions will be displayed on the screen.

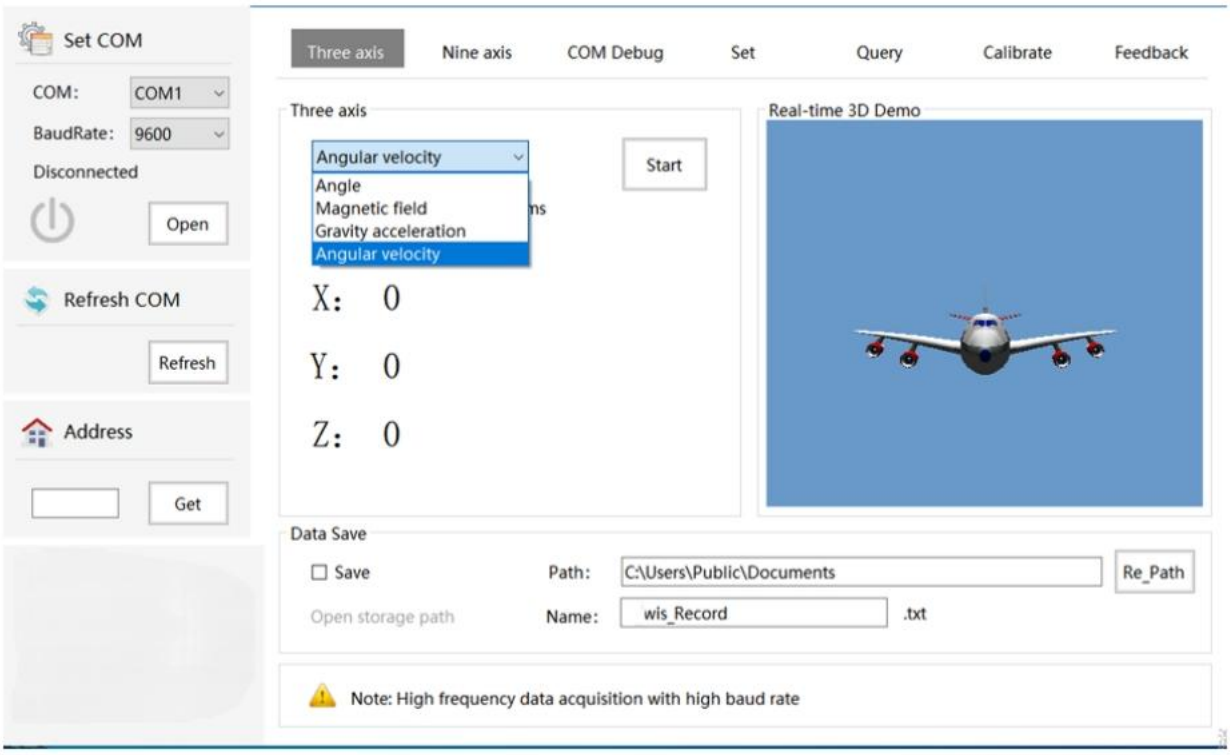


Figure 3. Software Debugging Interface

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.

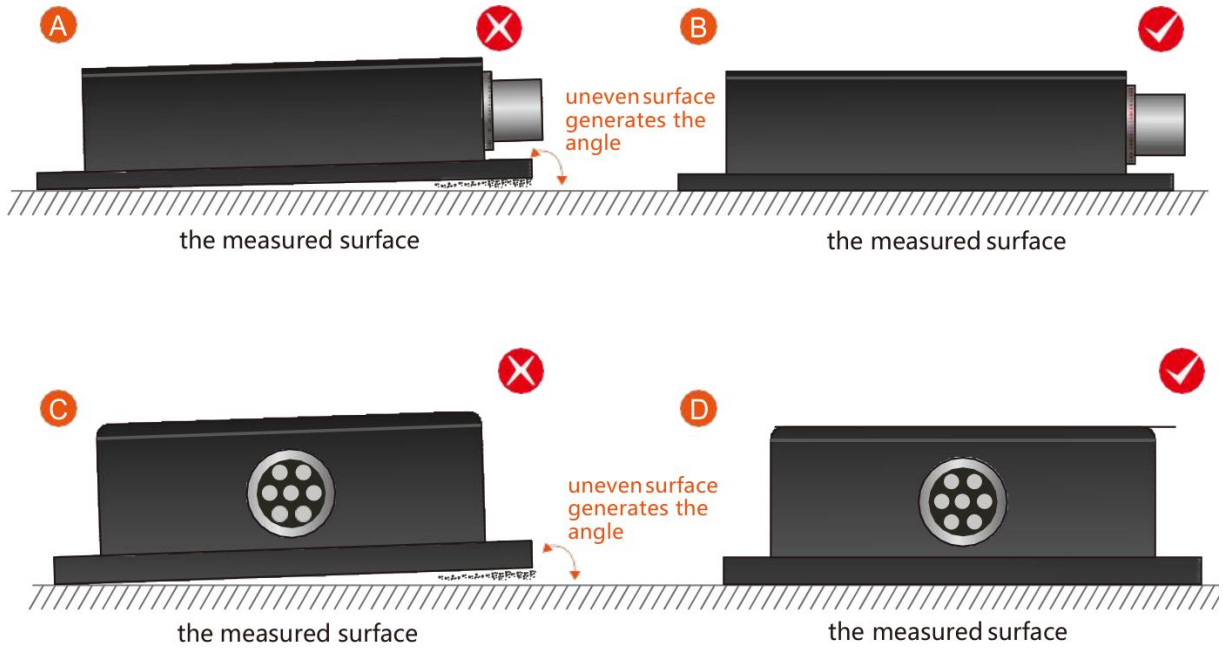


Figure 4. Correct and Incorrect Installation Methods (A/B/C/D)

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.

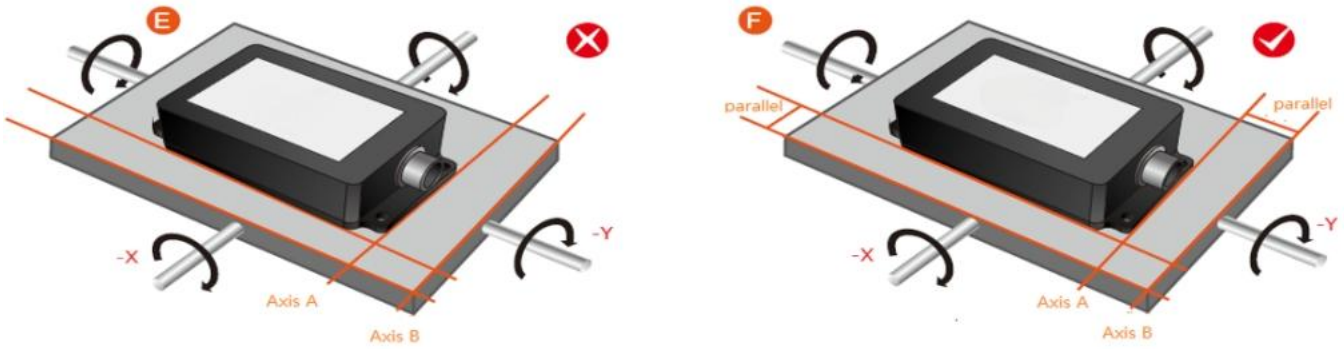


Figure 5. Installation Methods (E/F)

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

Overall Dimensions

Product size：L103.8*W55.4*H26（mm）

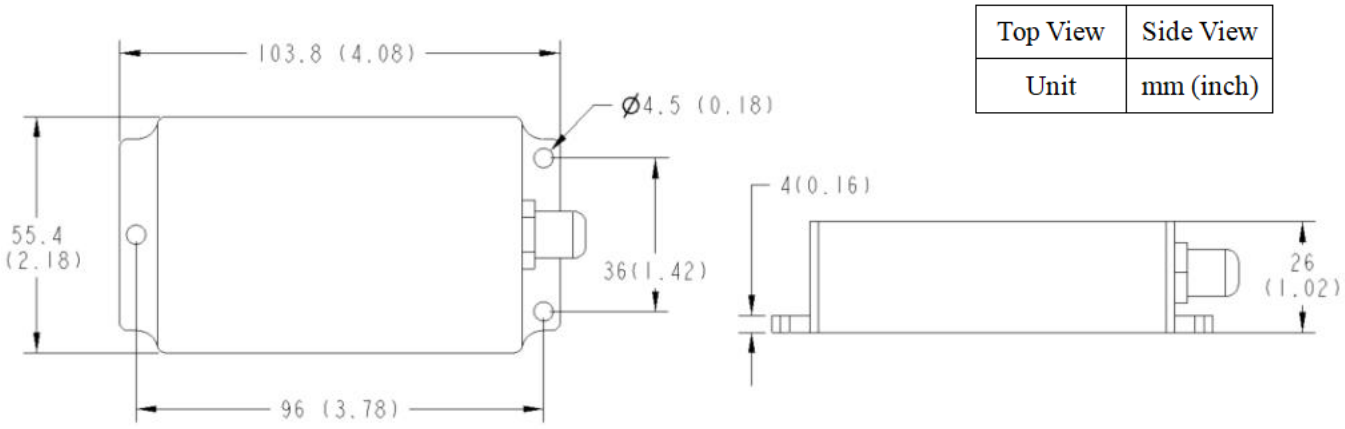


Figure 6. Overall Dimensions

PCB Dimensions

Product size: L69*W49*H12 (mm) The length and width may have an error of ±1mm, please refer to the actual product

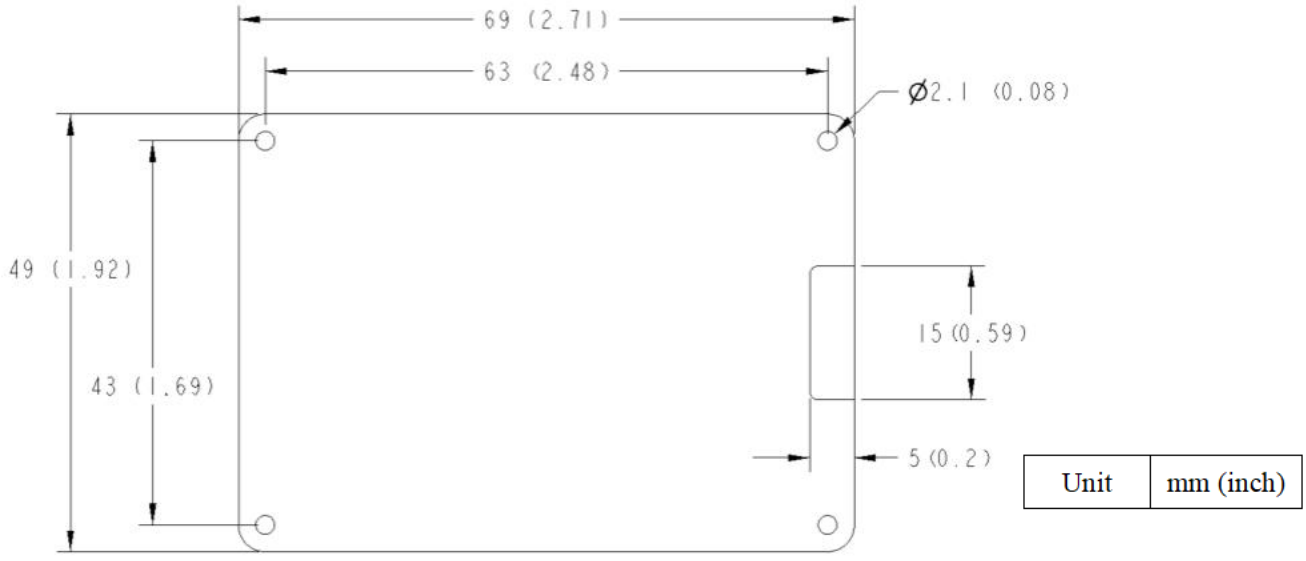


Figure 7. PCB Dimensions

Table 3. Mechanical Specifications

Connector	Metal joint（cable 1.5m)
Protect level	IP67*
Shell material	Magnesium aluminum alloy anodizing
Installation	Three M4 screws

*Waterproof to IP67 after gluing