



BWK220 Series

Voltage output

Dual axis inclinometer

Technical Manual



Introduction

BWK220 is a low-cost dual-axis inclinometer with voltage output developed and produced by BWSENSING. It uses a mature industrial-grade MEMS accelerometer, with a measurement range of $\pm 180^\circ$, the highest accuracy of 0.2° , and an operating temperature of -40°C to $+85^\circ\text{C}$. 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 value through the current mode. It has the advantages of low cost, small temperature drift, simple use, and strong anti-interference ability. It is an ideal choice of photovoltaic power generation, pan-tilt control, tower monitoring and other industries inclination measurement!

Feature

- Dual axis inclination measurement
- Resolution: 0.02°
- Power supply: 12-36V
- Size: L90*W40.5*H26 (mm)
- Highest accuracy: 0.2°
- Range: $\pm 90^\circ$
- Output: 0-5V/0-10V optional
- IP67 protection level

Application

- Industrial automatic leveling
- Medical instruments
- Photovoltaic automatic tracking
- Tower tilt monitoring
- Special valve
- Oil drilling equipment
- Industrial converter
- Lifting equipment inclination control

Product Feature



Electrical index

Parameter	Condition	Min	Typ	Max
Power supply(V)		12		36
Operating current(mA)	No load	20	50	60
Output load(KΩ)	Resistive			500
Output load(nF)	Capacitive			
Operating temperature(°C)		-40		85
Storage temperature(°C)		-55		100



Performance index

Measurement Range (°)	Condition	±90
Measurement axis		X-Y
Accuracy (°)	Room temperature	0.2
Resolution (°)	Completely still	0.02
Cross-axis error (°)	-40~85°C	0.2
Start-up time		< 3s
Output frequency (Hz)		100
Current output at zero(V)		2.5(0~5 output); 5 (0-10 output)
Full-scale output current range (V)		0~5 (0-10)
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 (g)		230 (without package)

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.



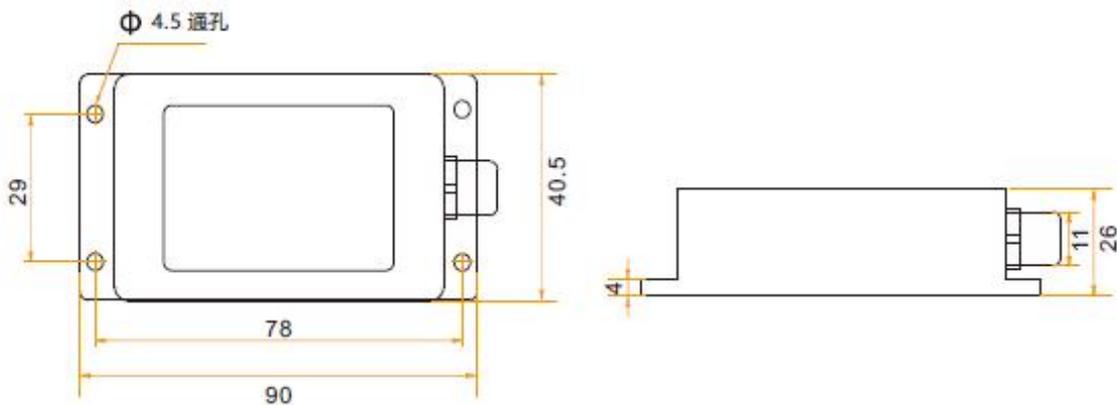
Mechanical Index

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



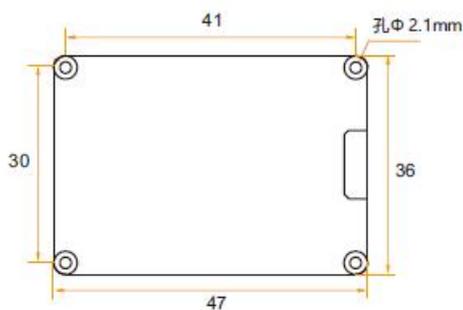
Package product size

Product size: L90*W40.5*H26 (mm)



PCBA size

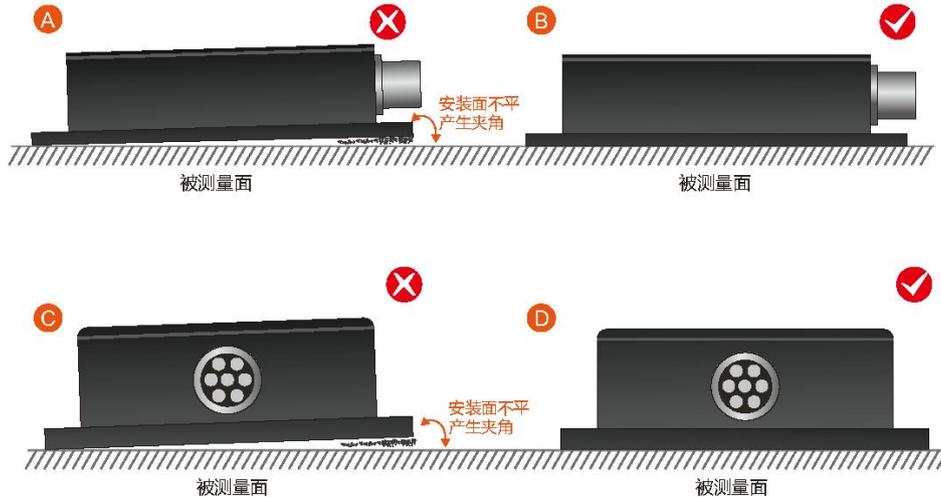
Size: L47*W36*H15 (mm) The length and width may have an error of ± 1 mm, please refer to the actual product



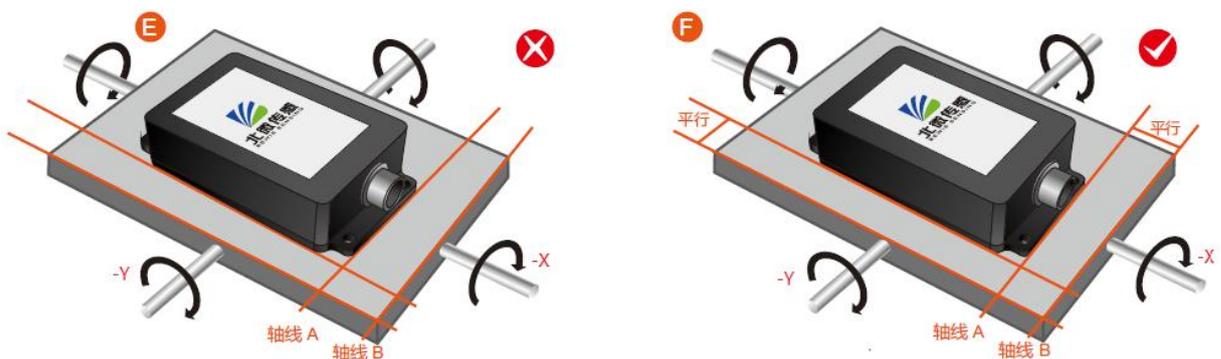
Installation

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.

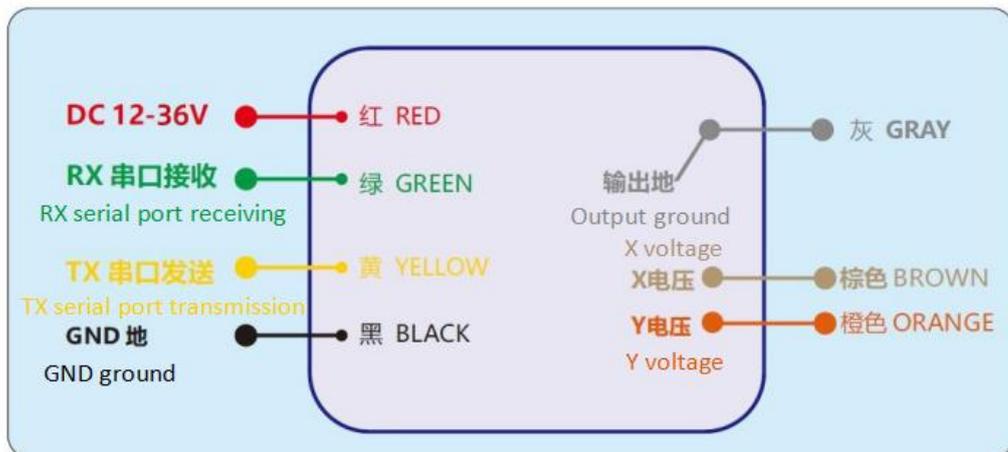


Finally, the mounting surface of the sensor and the surface to be measured must be tightly fixed, smooth in contact, and stable in rotation, and measurement errors due to acceleration and vibration must be avoided.

Electrical Interface

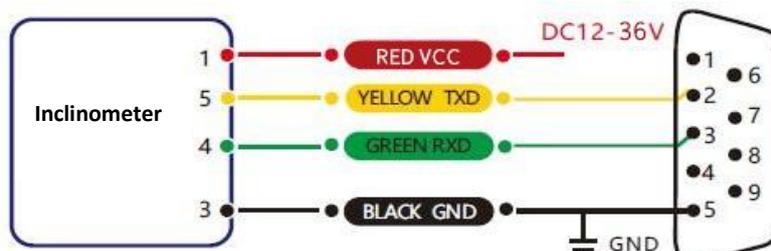
Wiring Definition

Colour function	1	3	4	5	8	9	10
	红色 RED	黑色 BLACK	绿色 GREEN	黄色 YELLOW	棕色 BROWN	橙色 ORANGE	灰色 GRAY
	1	3	4	5	8	9	10
Positive power supply	DC 12-36V	GND GROUND	Receive RXD	Send TXD	U XOUT	U YOUT	Output ground



RS232 Wiring definition

Wiring color function	RED	BLUE	BLACK	GREEN	YELLOW
	1	2	3	4	5
	VCC DC 12-36V	NC	GND	Receive RXD	Send TXD



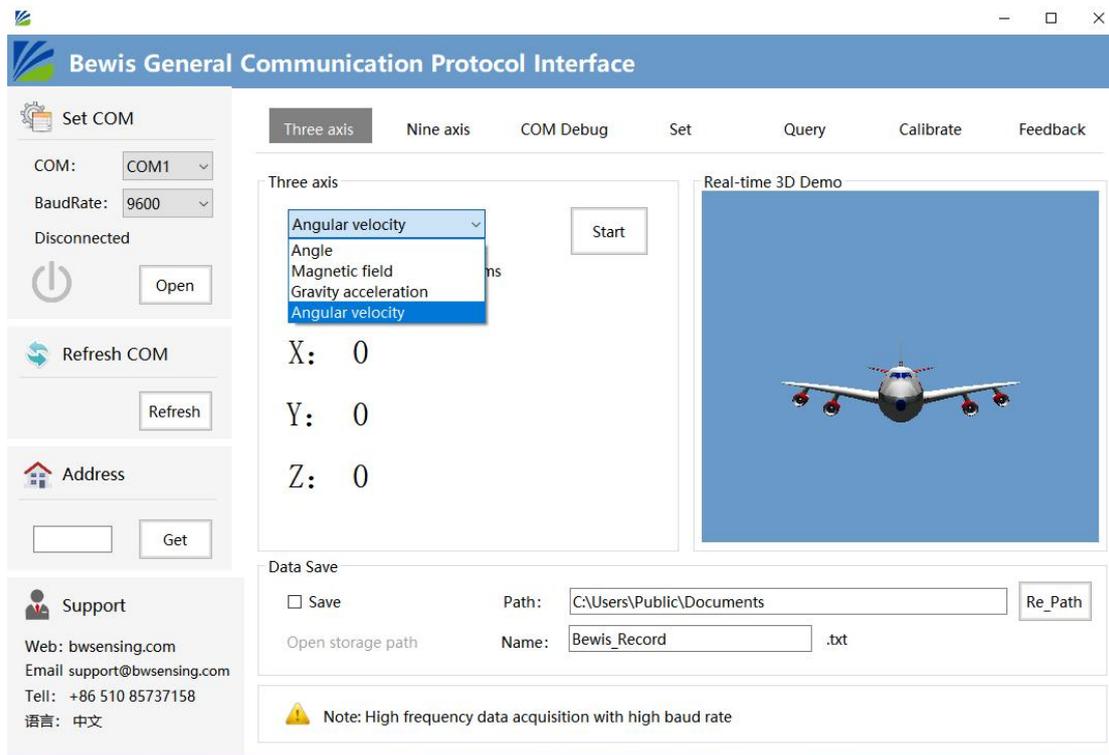
Debugging software

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.

BWK220 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.



Order information

Model	Communication mode	Package situation
BWK220-90-05	0-5V voltage/RS232	IP67 package/Metal joint
BWK220-90-010	0-10V voltage/RS232	IP67 package/ Metal joint

Executive standard

- National Standard (Draft) for Static Calibration of Biaxial Inclination Sensors
- GB/T 191 SJ 20873-2003 General Specification for Inclinometers and Levelling Devices

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