



BW-VG225E Series

**Low-cost CAN bus dynamic
inclination sensor**

Technical Manual

V4.0



Introduction

The VG225E is a low-cost attitude measurement device that can measure the inertial attitude parameters of moving carrier's roll and pitch, angle velocity and acceleration. The attitude deviation is estimated by the 6-state Kalman filter with appropriate gain, which is suitable for inclination measurement in motion or vibration state. VG225E uses high-quality and reliable MEMS accelerometers and gyroscopes, and ensure measurement accuracy with algorithm. At the same time, the sealing design and strict process ensure that it can accurately measure the carrier's attitude parameters in harsh environments. Through various compensations such as nonlinear compensation, quadrature compensation, temperature compensation and drift compensation, the error caused by interference can be greatly eliminated, and the product accuracy level can be improved. VG225E has a digital interface, which can be easily integrated into the user's system.

Feature

- High level EMC protection
- Dynamic accuracy of 0.5°
- Static accuracy of 0.01°
- Special offset tracking algorithm eliminates drift
- CAN bus output
- Wide temperature range: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- High performance Kalman filtering algorithm
- Small form factor: $L97*W63*H27.2$ (mm)

Application

- Special vehicles
- Construction Machinery
- Platform stability
- Agricultural machinery
- ROV underwater robot navigation
- Unmanned Drive
- Robot
- Unmanned Craft

Product Feature



Electrical indicators

Voltage	9-36V DC
Working current	30mA (40mA Max)
Temperature in use	-40~85°C
Temperature in store	-55~100°C



Performance Index

Attitude Parameter	Dynamic Accuracy	0.5°
	Static Accuracy	0.01°
	Resolution	0.01°
	Tilt range	Pitch $\pm 90^\circ$, Roll $\pm 180^\circ$
Physical properties	Dimension	L97*W63*H27.2(mm)
	Weight (with cable)	400g
	Weight (with package)	480g
Interface characteristics	Start-up delay	<50ms
	Maximum Output	500Hz
Electrostatic	IEC 61000-4-2 Class IV	Contact discharge 8KV, air
Fast transient pulse	IEC 61000-4-4 Class IV	Repetition frequency 5kHz, power
	IEC 61000-4-5 Class IV	Positive and negative power
Surge (shock)	$\geq 90,000$ hours/time	
Mean Time Between	According to GBT17626	
Electromagnetic	≥ 100 megohm	
Insulation resistance	2000g, 0.5ms, 3 times/axis	

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

Accuracy: The root mean square error between the actual angle and the angle measured by the sensor for multiple times (≥ 16 times).



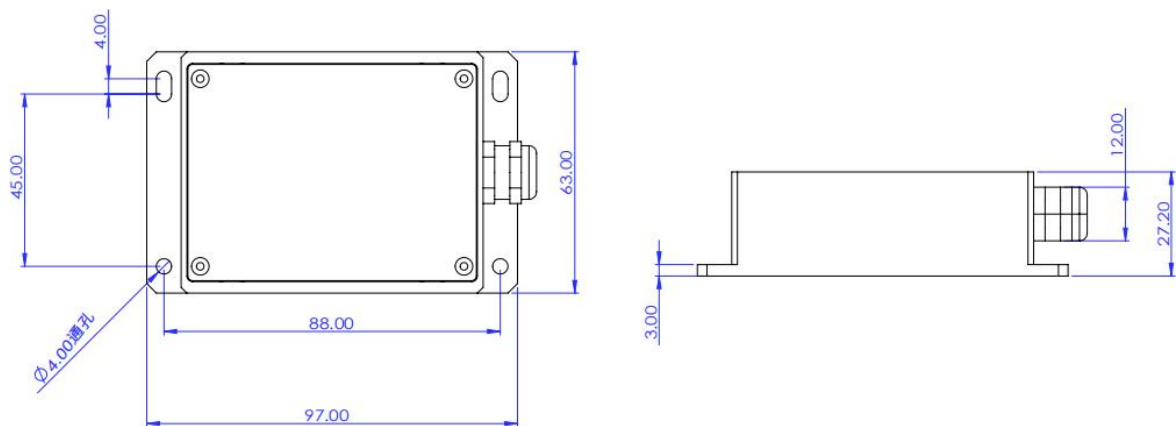
Mechanical properties

Connector	M12 Air Plug
Protection level	IP67
Shell material	Magnesium aluminum alloy oxidation
Installation	Four M4 screws



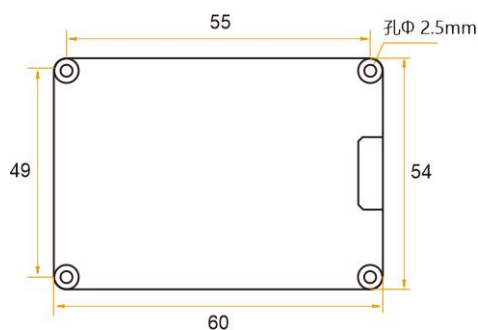
Package product size

Product Size: L97*W63*H27.2 (mm)



Bare board product size

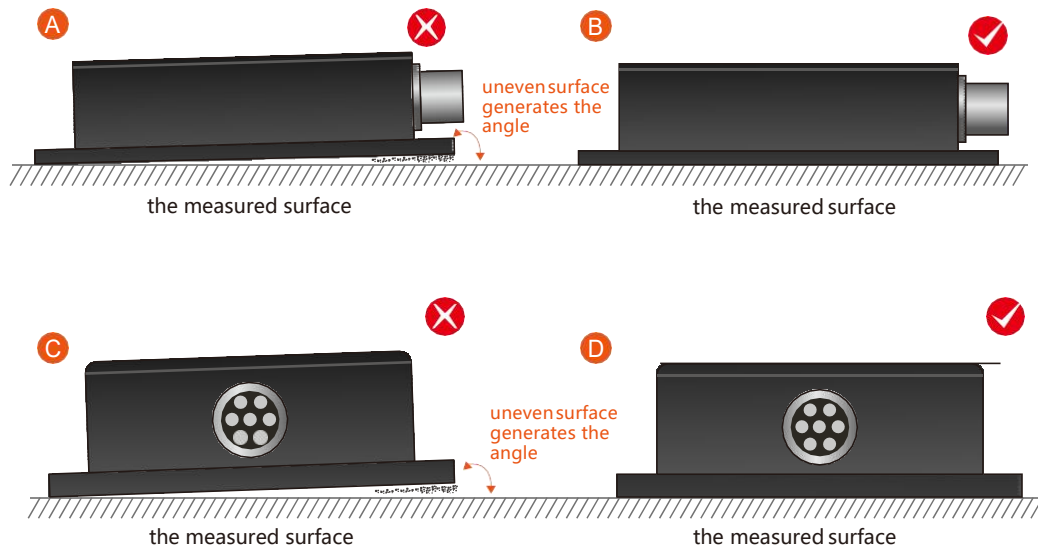
Product Size: L60*W54*H6 (mm) The length and width may have an error of ± 1 mm, please refer to the actual product



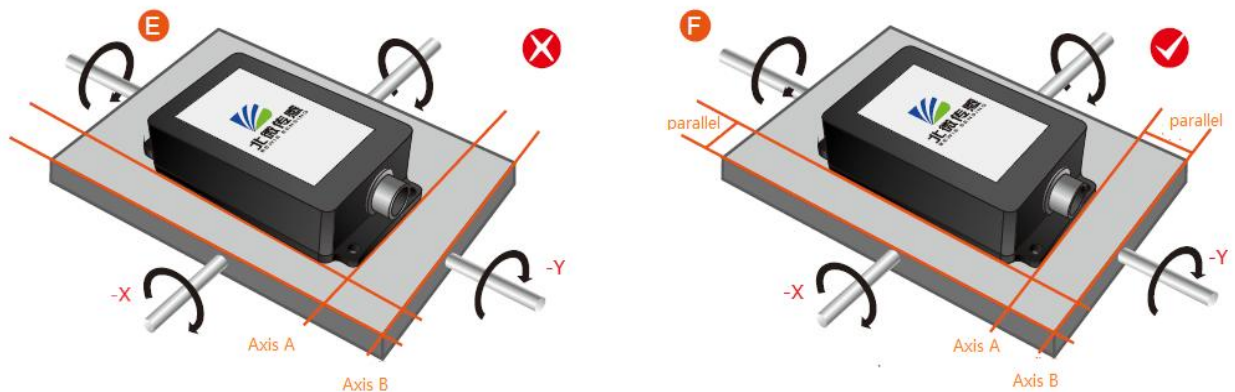
Installation

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.

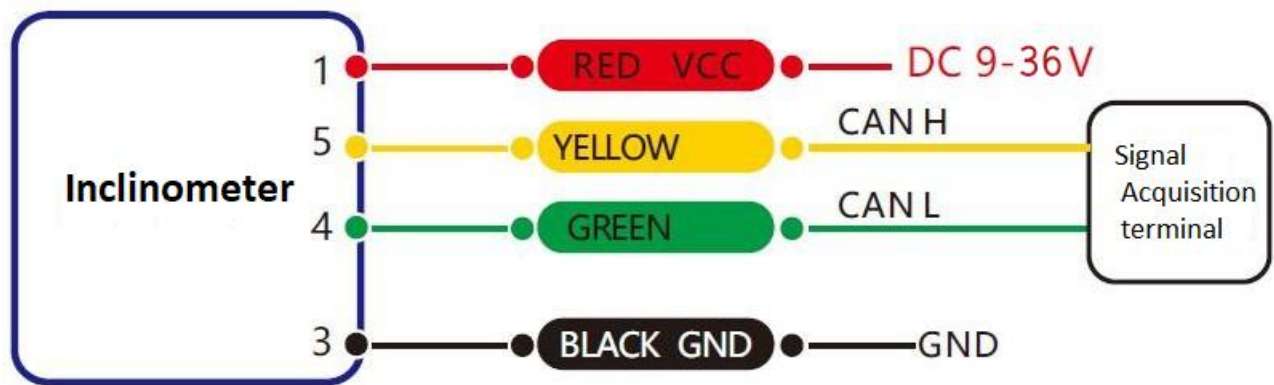


Finally, the mounting surface of the sensor and the surface to be measured must be tightly fixed, smooth in contact, and stable in rotation, and measurement errors due to

Electrical Interface

Wiring definition

	RED	BLUE	BLACK	GREEN	YELLOW
Line Color	1	2	3	4	5
Function	VCC DC 9-36V	PE	GND	CAN L	CAN H



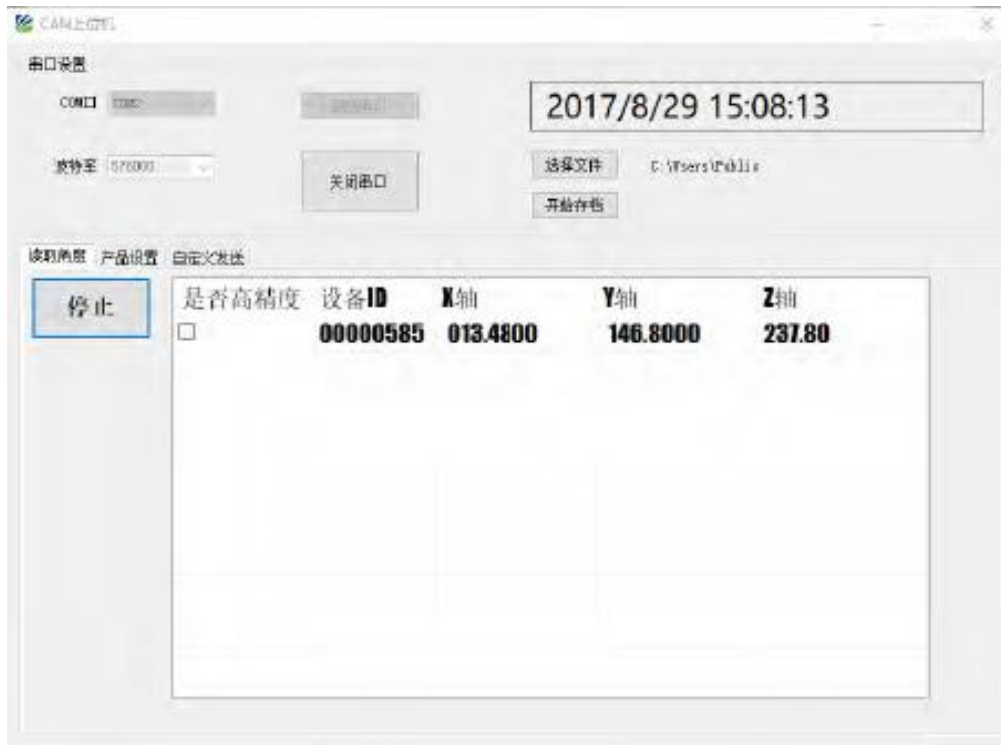
CAN bus wiring diagram

Testing 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. The BW-VG127 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 easily display the current X and Y directions, and you can also modify and set other parameters.

Step:

- ① Connect the serial port hardware of the inclinometer correctly, and connect the power supply.
- ② Select correct device Type (Select Azimuth series).
- ③ Select computer serial port and baud rate and click connect serial port.
- ④ Click start button and the current inclination Angle of the incliner in X and Y directions will be displayed on the screen.



Order Information

Model	communication mode	Package situation
BW-VG225E-CAN	CAN	IP67/ Metal interface

Executive standard

- Specification for static calibration of dual-axis inclination sensors National standard (draft)
- GB/T 191 SJ 20873-2003 General specification for inclinometers and levels

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**Low-cost CAN bus dynamic inclination
sensor**

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