



BW-VG228 Series

**Low Cost Current Dynamic Inclination
Sensor**

Technical Manual

V3.0



Introduction

The VG228 Dynamic Inclination Sensor product is a low-cost attitude measurement device that measures inertial attitude parameters of roll and pitch as well as angular velocity and acceleration of moving carriers. Attitude deviations are estimated by a 6-state Kalman filter with appropriate gain for inclination measurements in motion or vibration. The VG228 utilizes high quality and reliable MEMS accelerometers and gyroscopes with algorithms to ensure measurement accuracy, and a hermetically sealed design and rigorous workmanship to ensure that the product can accurately measure carrier attitude parameters even in harsh environments. Through non-linear compensation, quadrature compensation, temperature compensation and drift compensation and other compensation, can greatly eliminate the error generated by the interference, improve the level of accuracy of the product. VG228 has a digital interface, can be very easily integrated into the user's system.

Feature

- Non-linear compensation, quadrature compensation
- Dynamic and static measurement
- Gyro drift compensation
- Special offset tracking algorithm to eliminate drift
- 0-20mA/4-20mA/0-24mA current output optional
- Wide temperature range: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
- High-performance Kalman filter algorithm
- Small Size: L103.8 x W55.4 x H26 (mm)

Application

- Marine vessels
- Construction Machinery
- Platform stability
- Agricultural machinery
- ROV underwater robot navigation
- Unmanned Drive
- Robot
- Unmanned Craft

Feature



Electrical indicators

Parameters	Condition	Minimum	Typical value	Maximum
Voltage (V)		12		36
Working current(mA)	No load	20	50	60
Output load (Ω)		0		500
Operating temperature		-40		85
Storage temperature($^{\circ}\text{C}$)		-55		100



Performance Index

Attitude Parameter	Dynamic accuracy	0.5°
	Static accuracy	0.01°
	Resolution	0.01°
	Tilt margin	Pitch $\pm 90^{\circ}$, Roll $\pm 180^{\circ}$
Physical properties	Dimension	L103.8 x W55.4 x H26 (mm)
	Weight (with wire)	320g
	Weight (With packaging)	400g
Interface characteristics	Range of output current (mA)	4-20 (optional) (0-20 optional) (0-24 optional)
	Start delay	<50ms
	Serial communication rate	2400 to 115200 bps
	Digital output format	Binary high-performance protocol
Trouble-free work on average	≥ 90000 hours	
EMC	According to GBT17626	
Insulation Resistance	$\geq 100 \text{ M}\Omega$	
Surge suppression	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).



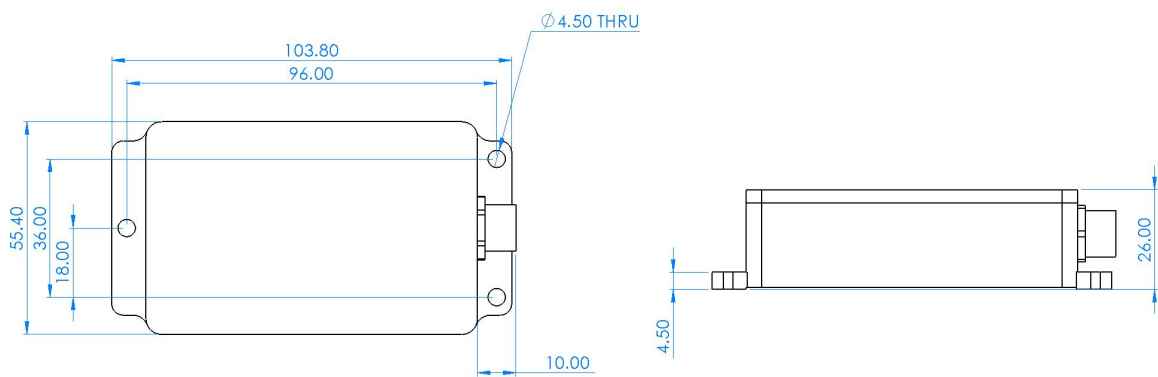
Mechanical properties

Connector	Metallic cable gland (Cable 1.5m)
Protection level	IP67
Shell material	Magnesium aluminum alloy oxidation
Installation	Three M4 screws



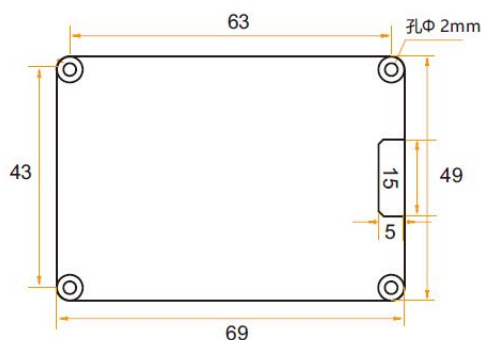
Package product size

Product Size: L103.8*W55.4*H26 (mm)



Bare board product size

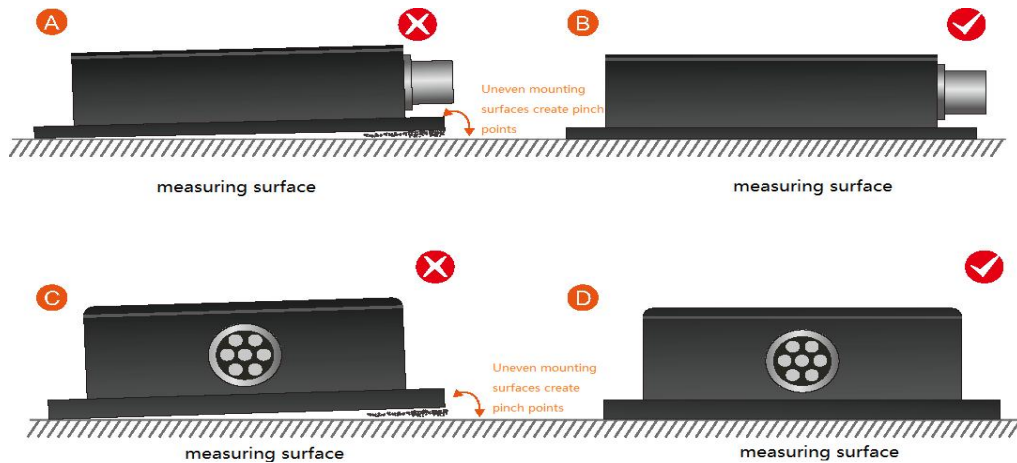
Product Size: L69*W49*H12 (mm) The length and width may have an error of ± 1 mm, please refer to the actual product



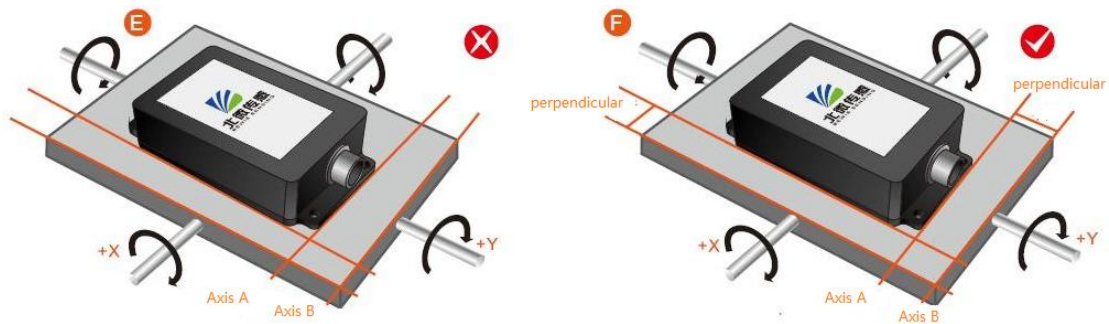
Installation

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

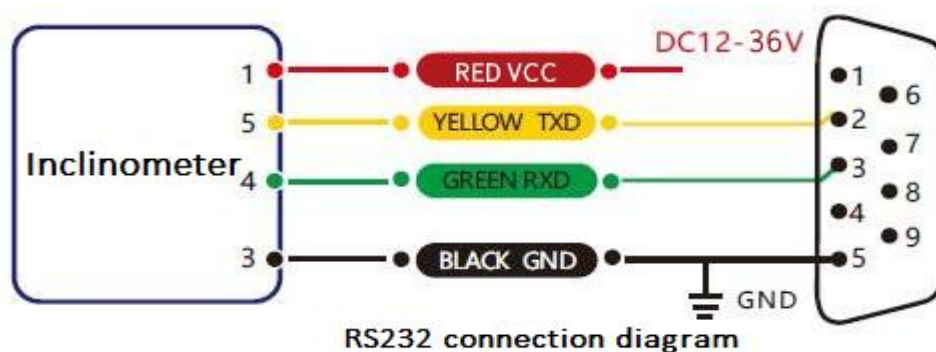
Wiring Definition

Wire color function	RED	BLACK	GREEN	YELLOW	WHITE	PURPLE	GRAY
	1	3	4	5	6	7	10
	VCC DC 12-3 6V	GND place	Receive RXD	Send TXD	I XOUT	I YOUT	Output place



RS232 Wiring definition

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



Order Information

Model	communication mode	Package situation
BW-VG228-020	0-20mA current/RS232	IP67/ Metal interface
BW-VG228-420	4-20mA current/RS232	IP67/ Metal interface
BW-VG228-024	0-24mA current/RS232	IP67/ Metal interface

Executive standard

- National Standard (Draft) for Static Calibration of Biaxial Inclination Sensors
- GB/T 191 SJ 20873-2003 General Specification for Tiltmeters and Leveling Devices
- GJB150-3A High temperature test
- GJB150-3A High temperature test • GJB150-4A Low temperature test

BW-VG228 Series

Low-cost Current Dynamic Inclinometer

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