



BW-VG520 Series

High precision Voltage

Dynamic Inclinometer

Technical Manual



Introduction

VG520 dynamic Inclinometer is a High precision inclinometer that measures the attitude parameters (roll and pitch) of the motion carrier. The attitude deviation is estimated by a 6-state Kalman filter with appropriate gain and is suitable for tilt measurement in motion or vibration.

The VG520 uses high-quality and reliable MEMS accelerometers and gyroscopes, and guarantees measurement accuracy through algorithms. At the same time, the seal design and strict process ensure that the product can accurately measure the roll angle and pitch angle of the carrier under harsh environment. 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 precision level can be improved. VG520 has a digital interface that can be 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
- 0-5V/0-10V output for optional(RS232)
- 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 (kΩ)	Resistive	10		
Output load (nF)	Capacitive			20
Operating temperature		-40		85
Storage temperature(°C)		-55		100

Performance Index

Attitude Parameter	Dynamic accuracy	0.1°
	Static accuracy	0.01°
	Resolution	0.01°
	Tilt margin	Pitch±90°, Role±180°
Physical properties	Dimension	L103.8 x W55.4 x H26 (mm)
	Weight (with wire)	320g
	Weight (With packaging)	400g
Interface characteristics	Voltage Output Range(V)	0-5V, 0-10V optional
	Start delay	<50ms
	Maximum sampling rate frequency	100Hz
	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	≥100MΩ	
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).



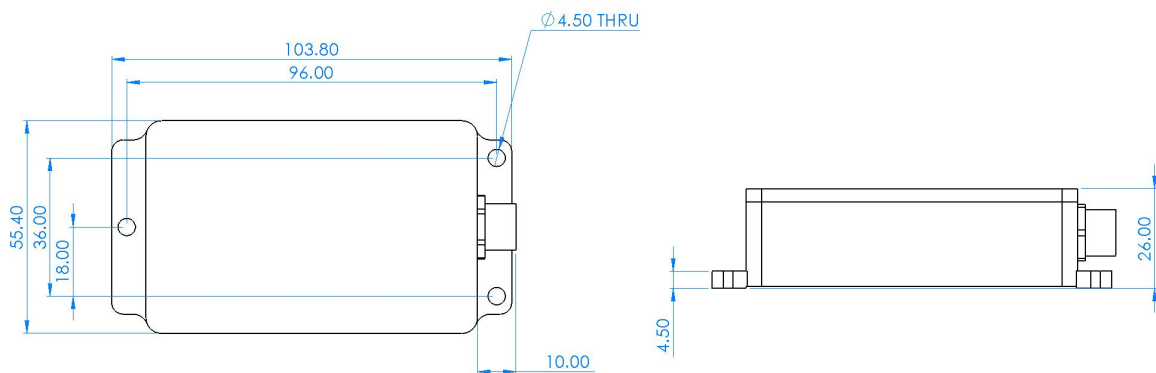
Mechanical properties

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



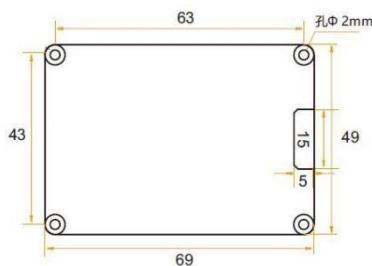
Package product size

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



Bare board product size

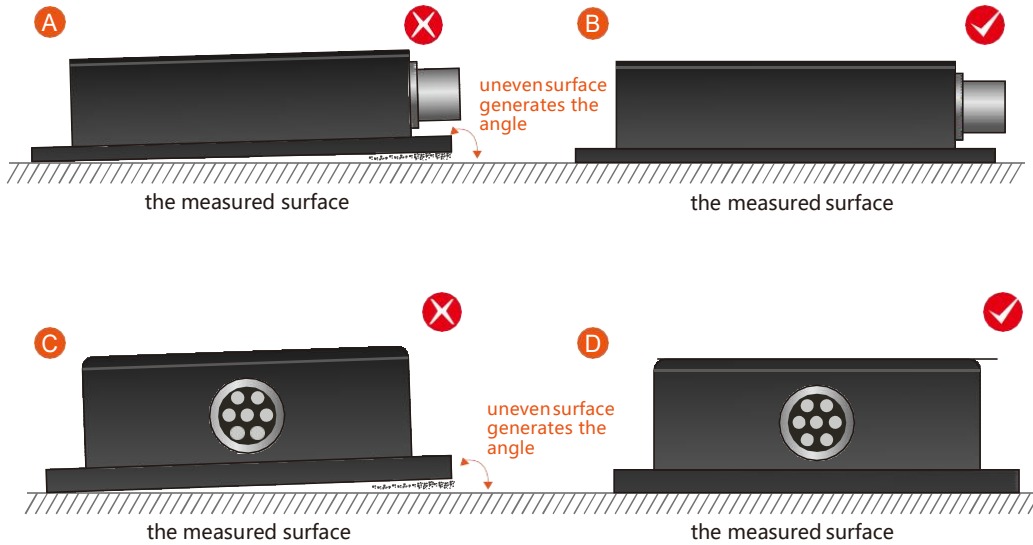
Product Size: L69*W49*H12 (mm) The length and width may have an error of ± 1 mm, please refer to the actual product



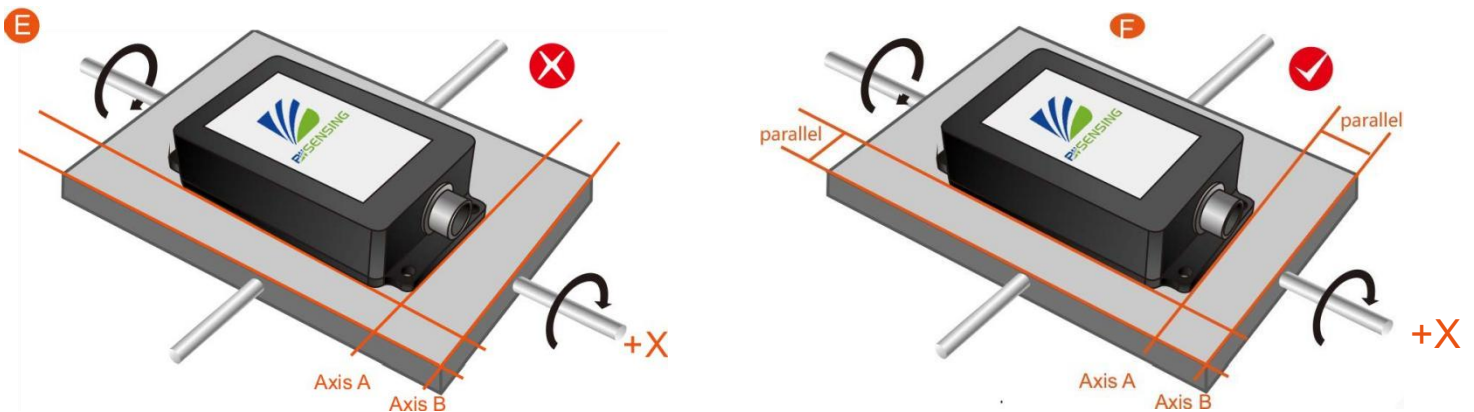
Installation

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.

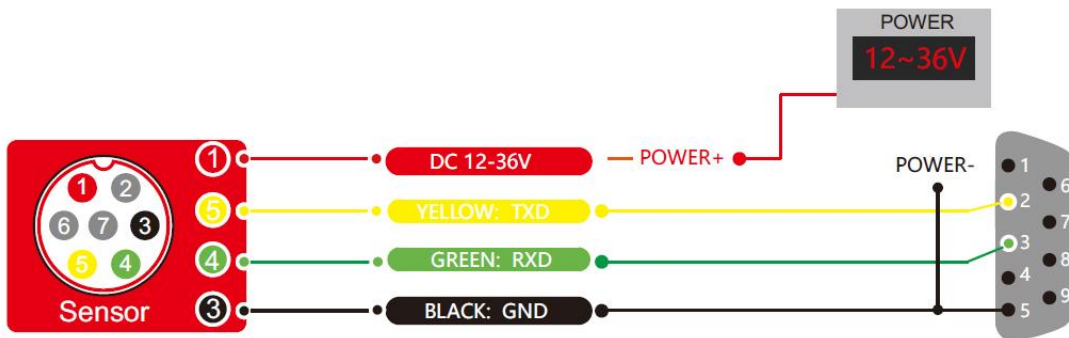


Finally, the mounting surface of the sensor and the surface to be measured must be tightly fixed, smooth in contact, and stable in rotation, and measurement errors due to acceleration and vibration must be avoided.

Electrical Interface

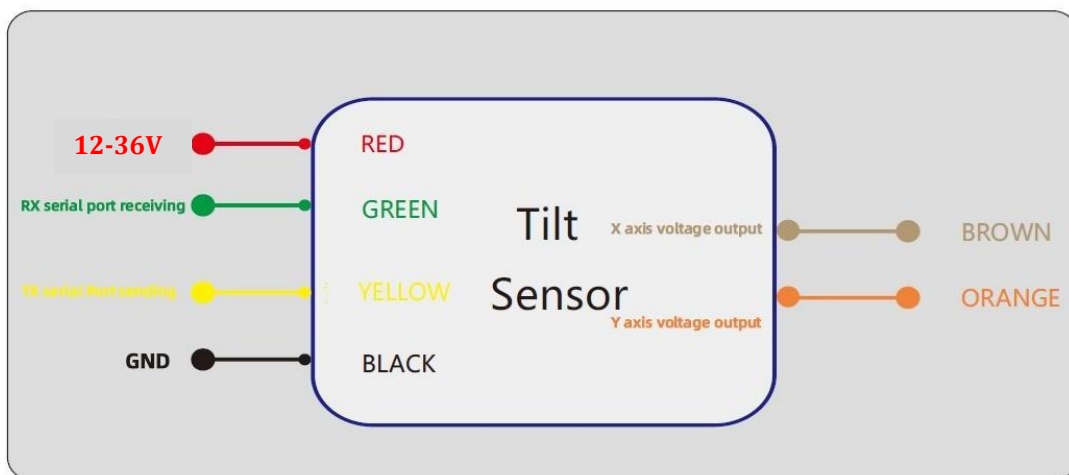
Wiring definition

	RED	BLUE	BLACK	GREEN	YELLOW
Line Color	1	2	3	4	5
Function	VCC 12-36VDC	NC	GND	Receive RXD	Send TXD



Wiring definition

Wire Color	RED	BLACK	GREEN	YELLOW	BROWN	ORANGE
function	1	3	4	5	8	9
function	VCC 12-36VDC	Power negative	Receive RXD	Send TXD	X axis voltage output	Y axis voltage output



Order Information

Model	Communication mode	Package situation
BW-VG520-05	0-5V/RS232	IP67/Metallic cable gland
BW-VG520-010	0-10V/RS232	IP67/Metallic cable gland

Executive standard

- Enterprise Quality System Standard: ISO9001:2015 Standard (Certificate No.064-21-Q-3290-RO-S)
- CE certification (certificate number: M.2019.103. U Y1151)
- ROHS (certificate Number: G 190930099)
- GB/T 191 SJ 20873-2003 General specification for inclinometer and level
- GBT 18459-2001 The calculation method of the main static performance index of the sensor
- JJF 1059-1999 Evaluation and expression of measurement uncertainty
- GBT 14412-2005 Mechanical vibration and shock Mechanical installation of accelerometer
- GJB 450A-2004 General requirements for equipment reliability
- GJB 909A Quality control of key parts and important parts
- GJB899 Reliability appraisal and acceptance test
- GJB150-3A High temperature test
- GJB150-4A Low temperature test
- GJB150-8A Rain test
- GJB150-12A Sand and dust experiment
- GJB150-16A Vibration test
- GJB150-18A Impact test
- GJB150-23A Tilt and rock test
- GB/T 17626-3A Radio frequency electromagnetic field radiation immunity test
- GB/T 17626-5A Surge (impact) immunity test
- GB/T 17626-8A Power frequency magnetic field immunity test
- GB/T 17626-11A Immunity to voltage dips, short-term interruptions and voltage changes

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Wuxi Bewis Sensing Technology LLC

Add: Building 30, NO. 58, Xiuxi Road, Binhu District, Wuxi City,
Jiangsu Province, China

Tel: +86 18921292620

Mail: sales@bwsensing.com

Web: www.bwsensing.com