





GI620 Serials

High Precision FOG Integrated Navigation System

Technical Manual



GI620 High Precision FOG Integrated Navigation System



Introduction

BW-GI620 is a high-performance high-precision fiber micro-inertial navigation system developed by Bewis for aviation mapping, unmanned aerial vehicles, sea-based and roadbed fields. Built-in three-axis gyroscope (single-axis fiber, dual-axis MEMS) The three-axis accelerometer includes a BD/GPS/GLONAS three-mode receiver that measures the speed, position, and attitude of the carrier.

The BW-GI620 is equipped with a new integrated navigation sensor fusion algorithm engine. It is optimized for multipath interference and can meet the needs of long-term, high-precision and high-reliability navigation applications in urban and outdoor complex environments. The product supports a variety of sensors such as GNSS/odometer/DVL/barometric altimeter and has excellent scalability. It combines inertial measurement with satellite navigation and odometer information through multi-sensor data fusion technology. These can greatly improve the system's geographical adaptability.

BW-GI620 integrated navigation system adopts coupling technology. It combines high-precision, professional-grade, multi-channel, dual-antenna single-frequency carrier phase and pseudo-range GPS receivers with high-precision fiber inertial measurement units. It has the characteristics of small size, light weight and high performance.

Applications

- Antenna stabilization platform, drone flight control
- Navigation and control of AGV
- Attitude measurement and orientation reference



Specifications

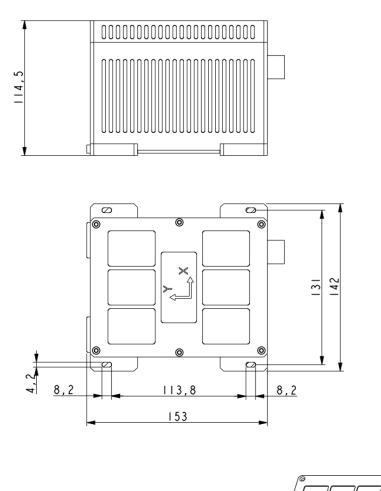
Performance Specifications

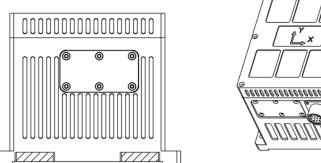
Attitude accuracy0.0.1 degAttitude accuracy0.015deg/5mir; 0.09 deg/1hRolling attitude accuracyPitch attitude accuracyPitch attitude accuracySpeed accuracySingle point positioning accuracyDGPS accuracy 0.5m /RTK accuracy 2cmPoincetional accuracyAzimuthAccelerationAngular velocityPhysical chracteristicsPower supplyPhysical chracteristicsAngular temperature chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsMeasuring responseAngular velocityPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chracteristicsPhysical chr				
Attitude accuracyRolling attitude accuracy<0.2 degPitch attitude accuracy<0.2 deg		(2m baseline)	0.1 deg	
Rolling attitude accuracy≤0.2 degPitch attitude accuracy<0.2 deg	Attitude accuracy	Satellite signal loss	0.015deg /5min; 0.09 deg /1h	
Combined external GPSSpeed accuracy0.1m/sCombined external GPSSingle point positioning accuracy Directional accuracyDGPS accuracy 0.5m /RTK accuracy 2cmDirectional accuracy0.1deg, (2m baseline)Dataunth±180 degMeasuring rangeAzimuth±90 degPitch angle±90 degAngular velocity±300 deg/sAcceleration±4 gInterface characteristicsPower supplyPower supply9~36 VDC, <8 W @ 24VDC		Rolling attitude accuracy	≤0.2 deg	
Combined external GPSSingle point positioning accuracy Directional accuracyDGPS accuracy 0.5m /RTK accuracy 2cmDirectional accuracy0.1deg, (2m baseline)Azimuth±180 degMeasuring rangeRoll anglePitch angle±90 degAngular velocity±300 deg/sAcceleration±4 gPower supply9~36 VDC, ≤8 W @ 24VDCInterface characteristicsData update rate100 Hz @ 115,200 baud ratePhysical characteristicsSizePhysical characteristicsSizePhysical characteristicsSizeNeight≤1000 g		Pitch attitude accuracy	≤0.2 deg	
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Azimuth±180 degMeasuring rangeRoll angle±90 degPitch angle±90 degAngular velocity±90 degAngular velocity±300 deg/sAcceleration±4 gPower supply9~36 VDC, ≤8 W @ 24VDCInterface characteristicsElectrical interfaceData update rate100 Hz @ 115,200 baud rateOperating temperature-40°C ~ +60°CEnvironmentStorage temperature-55°C ~ +85°CPhysical characteristicsWeight≤1000 g		Single point positioning accuracy		
Measuring rangeRoll angle±100 degMeasuring rangePitch angle±90 degPitch angle±90 degAngular velocity±300 deg/sAngular velocity±300 deg/sAcceleration±4 gPower supply9~36 VDC, ≤8 W @ 24VDCInterface characteristicsRS422Data update rate100 Hz @ 115,200 baud rateEnvironmentOperating temperature-40°C ~ +60°CStorage temperature-55°C ~ +85°CPhysical characteristicsWeight≤1000 g		Directional accuracy	0.1deg, (2m baseline)	
Measuring rangePitch angle $\pm 90 \text{ deg}$ Measuring rangePitch angle $\pm 90 \text{ deg}$ Angular velocity $\pm 300 \text{ deg/s}$ Acceleration $\pm 4 \text{ g}$ Acceleration $\pm 4 \text{ g}$ Interface characteristicsPower supply $9 \sim 36 \text{ VDC}, \leq 8 \text{ W} @ 24 \text{ VDC}$ Interface characteristicsElectrical interfaceRS422Data update rate $100 \text{ Hz} @ 115,200 \text{ baud rate}$ EnvironmentOperating temperature $-40^{\circ}\text{C} \sim +60^{\circ}\text{C}$ EnvironmentStorage temperature $-55^{\circ}\text{C} \sim +85^{\circ}\text{C}$ Physical characteristicsWeight $\leq 1000 \text{ g}$		Azimuth	±180 deg	
$\frac{1}{Physical characteristics} = \frac{1}{Power supply} = \frac{1}{Power suppl$	Combined external GPS Measuring range Interface characteristics Environment Physical	Roll angle	±90 deg	
Acceleration ± 4 gInterface characteristicsPower supply $9\sim36$ VDC, ≤ 8 W @ 24VDCInterface characteristicsElectrical interfaceRS422Data update rate100 Hz @ 115,200 baud rateOperating temperature $-40^{\circ}C \sim +60^{\circ}C$ EnvironmentStorage temperature $-55^{\circ}C \sim +85^{\circ}C$ Physical characteristicsWeight ≤1000 g		Pitch angle	±90 deg	
Interface characteristicsPower supply $9 \sim 36$ VDC, ≤ 8 W @ 24VDCInterface characteristicsElectrical interfaceRS422Data update rate100 Hz @ 115,200 baud rateOperating temperature Storage temperature $-40^{\circ}C \sim +60^{\circ}C$ Storage temperature $-55^{\circ}C \sim +85^{\circ}C$ Physical characteristicsWeight ≤ 1000 g		Angular velocity	±300 deg/s	
$\frac{1}{10000000000000000000000000000000000$		Acceleration	±4 g	
CharacteristicsElectrical interfaceK3422characteristicsData update rate $100 \text{ Hz} @ 115,200 \text{ baud rate}$ EnvironmentOperating temperature $-40^{\circ}\text{C} \sim +60^{\circ}\text{C}$ Storage temperature $-55^{\circ}\text{C} \sim +85^{\circ}\text{C}$ Physical characteristicsWeight $\leq 1000 \text{ g}$		Power supply	9~36 VDC, ≤8 W @ 24VDC	
Data update rate $100 \text{ Hz} @ 115,200 \text{ baud rate}$ EnvironmentOperating temperature $-40^{\circ}\text{C} ~ +60^{\circ}\text{C}$ Storage temperature $-55^{\circ}\text{C} ~ +85^{\circ}\text{C}$ Physical characteristicsWeight $153 \times 142 \times 115 \text{ mm}(\text{designable})$		Electrical interface	RS422	
EnvironmentStorage temperature-55°C ~ +85°CSize153×142×115mm(designable)Physical characteristicsWeight≤1000 g		Data update rate	100 Hz @ 115,200 baud rate	
Storage temperature-55°C ~ +85°CSize153×142×115mm(designable)Physical characteristicsWeight≤1000 g	Fue income and	Operating temperature	-40°C ~ +60°C	
Physical Weight ≤1000 g	Environment	Storage temperature	-55°C ~ +85°C	
characteristics <u>veight</u> <u>sites</u>		Size	153×142×115mm(designable)	
		Weight	≤1000 g	
		Connector	Y11P-1210ZK10	



Product Size

Product Size: L153 ×W142 × H115 (mm)





Note: Unfilled dimensional tolerances are performed in accordance with GB/T1804-2000 Class C.

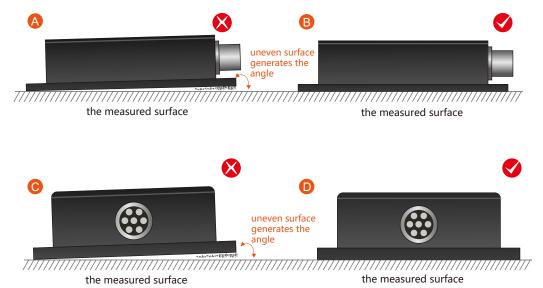
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Product installation

The correct installation method can avoid measurement error. The inertial measurement unit produces an absolutely smooth surface by grinding on the underside and measuring surface for installation .The following points should be made when installing the sensor:



First of all, to ensure that the sensor mounting surface and the measured surface completely close, the measured surface should be as horizontal as possible, so that we can reduce installation error. Secondly, when the product is installed, the bottom surface of the IMU and the body should be coincident, and it is gently pushed to make the measurement surface of the IMU coincide with that of the machine body, so that both surfaces are tightly attached, and there is no angle in Fig.A and Fig.C.The correct installation is shown in Fig.B and Fig.D.



Finally,after the product is tightly attached,screws should be used to fix the IMU to ensure tight fixation,smooth conduct and stable rotation.Measurement errors caused by acceleration and vibration should be voided.Bear in mind that the screw only plays a fixed role and doe not have a positioning function.The screw hole of the IMU is processed into an elliptical shape for easy adjustment.



Electrical connections

Data cable RS422 interface definition, DB9 female:

DB9 connector pin	Interface definition	Remarks	
1	R+ Receive +		
2	R-	Receive -	
3	T+	Transmit +	
4	T-	Transmit -	

Debugging software

Software usage steps:

- Ensure that the inertial navigation is absolutely static, correctly connect the serial port hardware of the integrated navigation, and connect the power supply.
- ② Select the computer serial port and baud rate and click to connect to the serial port.
- ③ Enter the correct geographic latitude, click Inertial Navigation Start→Command Input, the working status on the screen shows static alignment, and the working state becomes INS navigation. At this time, the inertial navigation enters the working state and can be used.

Track.vi 位置 速度 航迹角	航向-姿态		- 0
■口选择 2000-90度 小理纬度(-90~90度 139.91 方位角(-180~180度) 0	▼ ^{非口状} <mark> 纬度输入</mark> 方位角输入	(信动 当前纬度 有效 当前方位 无效	接收数据显示
工作状态	UTC日期 GPS速度(m/s)	UTC时间 航迹角(-180,180度)	
L'Est	0	0	
纬度(-90,90度)	经度(-180,180度)	GPS海拔(米)	
0	0	0	
俯仰角(-90,90)度	橫滾角(-180,180)度	航向角(-180,180)度	数据清空
0	0	0	发送数据显示
文件存储地址			▲ 当前发送字节数 0 发送字节数 0
	x86)\Track\Track.exe\	^	当前帧序数 丢帧数
Track.vi2019_3_5_1			

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Protocol

After the system is powered on, the normal operating time is 20Hz frequency, RS422 communication 115200bps, n, 8, 1 broadcast broadcast navigation data, 48 bytes per frame data as shown in the following table:

	-	tion data		
Byte number	Content	Data type	Byte count	
1-2	Frameheader: 0X5A0XA5	Byte	2	
	Workingstatus:0-Monitoring			
3	status,1-Staticalignment,2-INS	Byte	1	
	navigation			
4-5	Inertialpitchangle([-90,90]		2	
	degrees) in units of 0.01 degrees		2	
	Inertialguiderollangle			
6-7	([-180,180]degrees), unit 0.01		2	
	degree			
	Inertialazimuth([-180,180]			
8-9	degrees), northto eastis -, north		2	
	to west is +, unitis 0.01 degrees			
	nertialX-axisangularvelocity	Γ		
10-11	Wx(degree/s) in units of 0.01		2	
	deg/s			
	nertial Y-axis angular velocity			
12-13	Wy(degree/s) in units of 0.01		2	
	deg/s			
	nertial Z-axis angular velocity			
14-15	Wx(degree/s)in units of 0.01	Short int (low byte first, high byte	2	
	deg/s	last)		
16-17	Inertial X-axis acceleration Ax(m/		2	
10-17	s/s), unit0.01m/s/s		2	
18-19	Inertial Y-axisaccelerationAy (m /		2	
18-19	s/s), unit 0.01m/s/s		Ľ	
20-21	Inertial Z-axis acceleration Az (m /		2	
20-21	s / s), unit0.01m / s/ s		Z	
22-23	Speed after GPS satellite		2	
	positioning, unit0.1 m / sec		Z	
	GPS trackangle([-180,180]	Γ		
24 25	degrees), north to the east is -,		C	
24-25	north to west is +, the unit is 0.1		2	
	degrees			
26-27	GPS satellite number	F F	2	
28-29	GPS altitude, unit 0.1 m	F F	2	
		Float(low byte first, high byte		
30-33	Latitude after GPS satellite	after GPS satellite after), value range [-90,90]		
	positioning, unit degree	degrees, the north latitude is +	4	
		and the south latitude is		
		Float (low byte first, high byte		
34-37	Longitude after GPS satellite	after), value range[-180,180]	4	
	positioning, unit degree	degrees, east longitude is +, west		

Executive standard

E#SENSING

- Enterprise Quality System Standard: ISO9001:2008 Standard(Certificate No.:10114Q16846ROS)
- CE certification (certificate number: 3854210814)
- ROHS (certificate number: SO81426003)
- GJB 2426A-2004 Fiber Optic Gyro Test Method
- GBT 18459-2001 sensor main static performance index calculation method
- JF 1059-1999 Evaluation and Expression of Measurement Uncertainty
- GBT 14412-2005 mechanical vibration and shock mechanical installation of accelerometer
- General requirements for GJB 450A-2004 equipment reliability
- Quality control of key parts and important parts of GJB 909A
- GJB 899 Reliability Qualification and Acceptance Test
- GJB 150-3A high temperature test
- GJB 150-4A low temperature test
- GJB 150-8A rain test
- GJB 150-12A dust test
- GJB 150-16A vibration test
- GJB 150-18A impact test
- GJB 150-23A Tilt and Swing Test
- GB/T 17626-3A RF electromagnetic radiation immunity test
- GB/T 17626-5A surge (hit) impulse immunity test
- GB/T 17626-8A power frequency magnetic field immunity test
- GB/T 17626-11A voltage dips, short interruptions and voltage changes immunity
- GB/T 2423.22-2012 Environmental testing Part 2:test method Test N:temperature change (IEC 60068-2-14:2009,IDT)
- GB/T 10125-2012Artificial atmosphere corrosion test Salt spray test (ISO 9227:2006,IDT)

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