GI420 Serials

High Precision MEMS Integrated Navigation System

Technical Manual

GI420

High Precision MEMS Integrated Navigation System

Introduction

BW-GI420 is a high-precision MEMS sensor with high reliability and stability.It also has the measurement accuracy of the medium and low precision fiber optic gyroscope and the excellent environmental characteristics of the MEMS system.It is coupled with high precision GPS system to provide high-precision position information.

BW - GI420 carry the newest integrated navigation sensor fusion algorithm engine. And this optimal design is developed for solving the multipath interference. It can meet the requirements of long time, high precision and high reliability navigation application in the complex environment of city and field. Our product has good expansibility, BW-GI420 can be added an external GNSS/ odometer/DVL/barometric altitude meter and other many kinds of sensors. Because of this, we can use the multi-sensor data fusion technology to combine the info of inertial measurement, satellite navigation, odometer and other senors' data to improve the adaptability and diversity of the system.

BW - GI420 integrated navigation system use tight coupling technique to combine the high precision, professional level, double antenna, multi-channel single frequency carrier phase and pseudo - range GPS receiver and high precision MEMS inertial measurement unit, so it has smaller volume, lighter weight, higher performance, lower cost and other advantages.

Applications

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

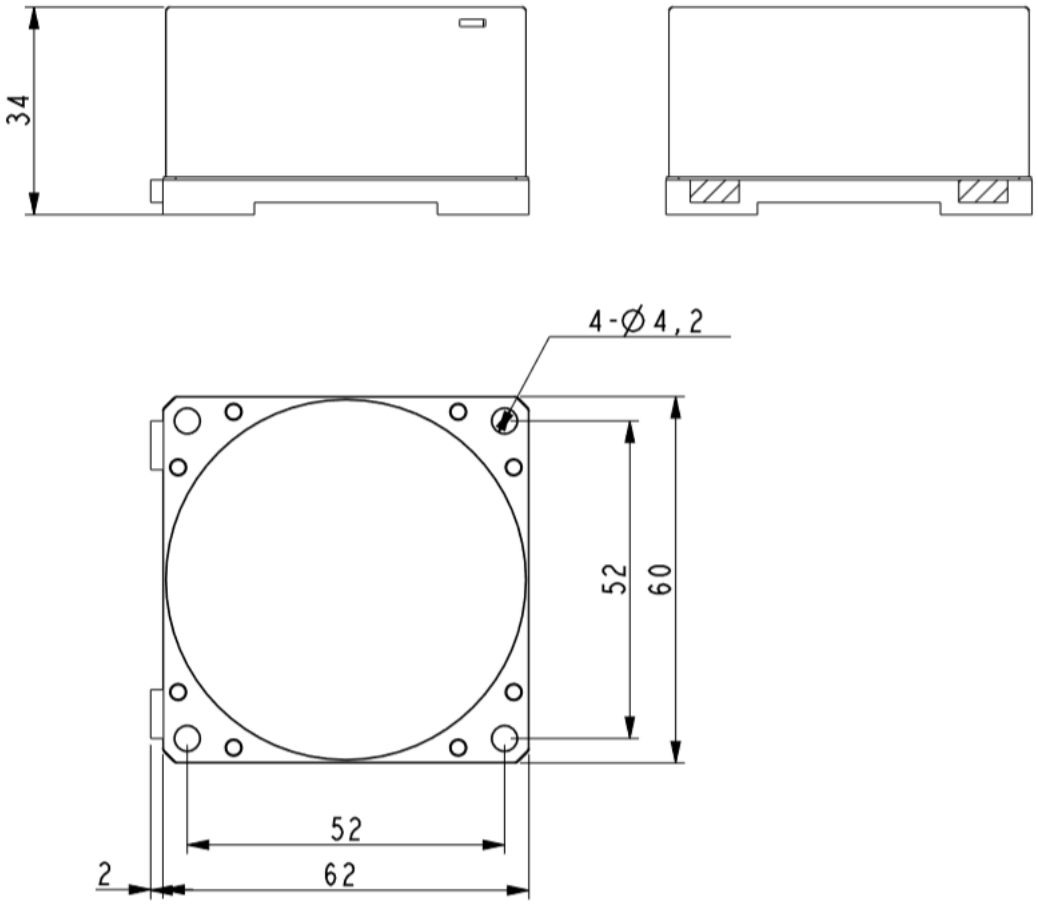
Specifications

Performance Specifications

Attitude accuracy	(2m baseline)	0.1 deg
	Satellite signal loss	1 deg /5min
	Rolling attitude accuracy	≤0.2 deg
	Pitch attitude accuracy	≤0.2 deg
Combined external GPS	Speed accuracy	0.1m/s
	Single point positioning accuracy	DGPS accuracy 0.5m /RTK accuracy 2cm
	Directional accuracy	0.1deg, (2m baseline)
Measuring range	Azimuth	±180 deg
	Roll angle	±90 deg
	Pitch angle	±90 deg
	Angular velocity	±300 deg/s
	Acceleration	±4 g
Interface characteristics	Power supply	9~36 VDC, ≤3 W @ 24VDC
	Electrical interface	RS422
	Data update rate	100 Hz @ 115,200 baud rate
Environment	Operating temperature	-40°C ~ +60°C
	Storage temperature	-55°C ~ +85°C
Physical characteristics	Size	60×62× 34 mm
	Weight	≤100 g
	Connector	J30J-15TJL

Product Size

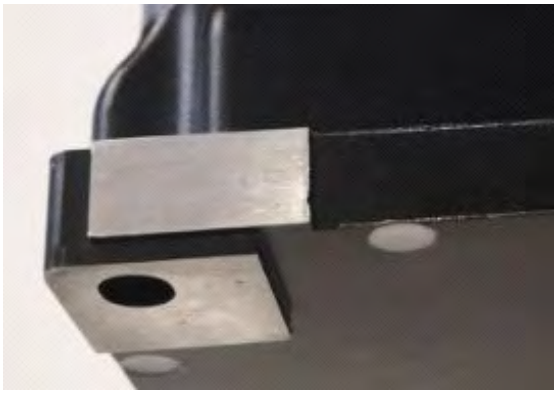
Product Size：L60×W62×H34 （mm)



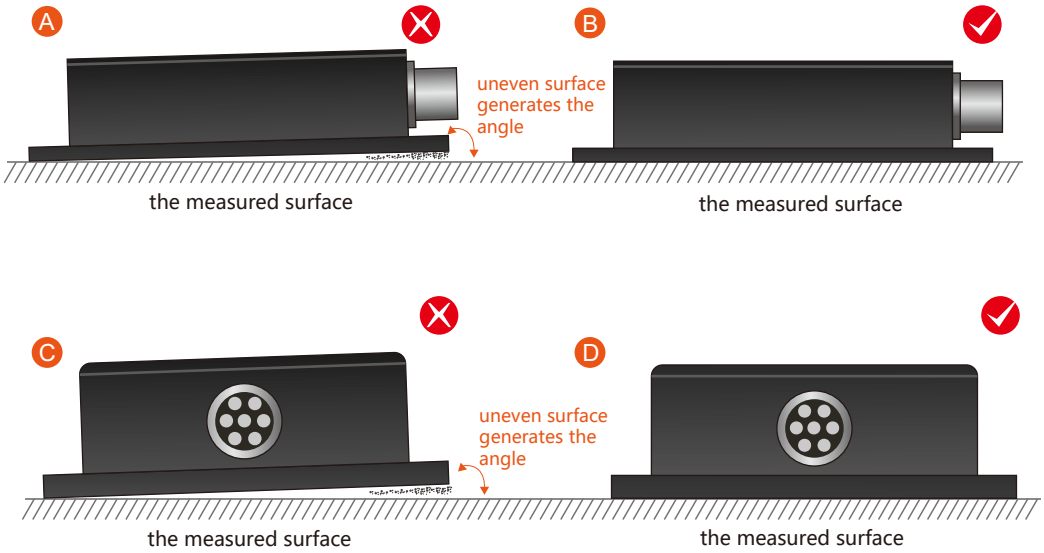
Note: Unfilled dimensional tolerances are performed in accordance with GB/T1804-2000 Class C.

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 -

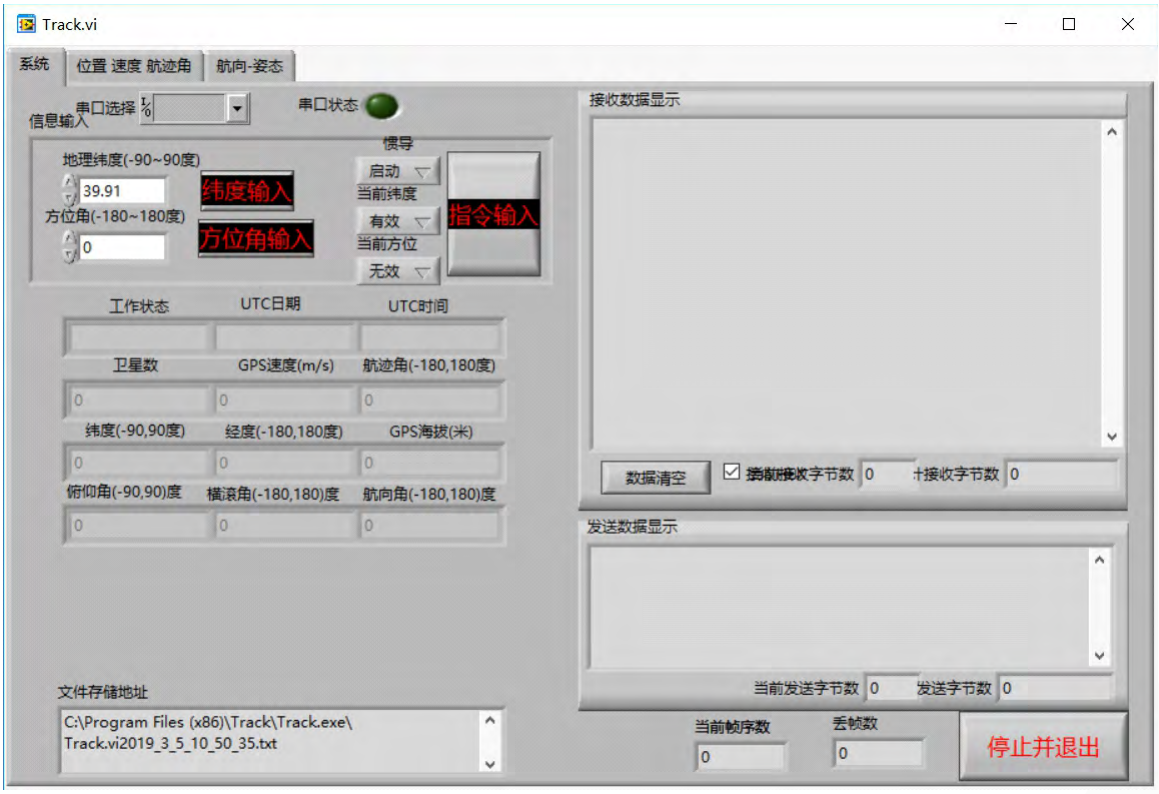
Debugging software

Software usage steps:

① 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.



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:

Navigation data			
Byte number	Content	Data type	Byte count
1-2	Frameheader: 0X5A0X A5	Byte	2
3	Workingstatus:0- Monitoring status,1-Staticalignment,2-INS navigation	Byte	1
4-5	Inertialpitchangle([-90,90] degrees) in units of 0.01 degrees	Short int (low byte first, high byte last)	2
6-7	Inertialguiderollangle ([-180,180] degrees), unit 0.01 degree		2
8-9	Inertialazimuth([-180,180] degrees), northto eastis -, north to west is +, unitis 0.01degrees		2
10-11	nertialX-axisangularvelocity Wx(degree/s) in units of 0.01 deg/s		2
12-13	nertial Y-axis angular velocity Wy(degree/s) in units of 0.01 deg/s		2
14-15	nertial Z-axis angular velocity Wx(degree/s) in units of 0.01 deg/s		2
16-17	Inertial X-axis acceleration Ax(m/s/s), unit0.01m/s/s		2
18-19	Inertial Y-axisaccelerationAy (m/s/s), unit 0.01m/s/s		2
20-21	Inertial Z-axis acceleration Az (m/s/s), unit0.01m/s/s		2
22-23	Speed after GPS satellite positioning, unit0.1m/sec		2
24-25	GPS trackangle([-180,180] degrees), north to the east is -, north to west is +, the unit is 0.1 degrees		2
26-27	GPS satellite number		2
28-29	GPS altitude, unit 0.1m		2
30-33	Latitude after GPS satellite positioning, unit degree	Float(low byte first, high byte after), value range [-90,90] degrees, the north latitude is + and the south latitude is -.	4
34-37	Longitude after GPS satellite positioning, unit degree	Float (low byte first, high byte after), value range[-180,180] degrees, east longitude is +, west	4

Executive standard

- 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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