



FORSENSE
原极科技

Tactical level single-axis MEMS Gyroscope sensor

FSS-G200 Product manual

Features

Tactical grade MEMS Gyroscope

- 5.0°/h Bias instability
- Better than 0.1°/s Bias Repeatability;
- 0.08/s ultra-low output noise°

Withstand high intensity conditions

- Strong impact tolerance: 2000g (0.5ms, half sine, 3 axis)
- Strong vibration tolerance: 10g (10~2KHz, 3 axis)
- Full temperature environment stable operation: -40°C ~ 85°C
- 100% magnetic shielding

Real-time and flexible digital interface, small size

- Configurable output sampling rate up to 400Hz
- Support RS232, CAN mainstream agricultural machine controller interface
- 45*45*22.8mm, weight only 50g

Product Overview

FSS-G200 is a single-axis MEMS inertial

sensor module built by FORSENSE

Technology.

With high precision and high resolution, it can capture subtle vibration and tilt.

Large range output makes motion

perception possible under large dynamics.

All modules are equipped with ultra-wide

temperature range of fine warming and

independent calibration before delivery,

so that each module can play stably in

various extreme conditions, while

ensuring the performance of all products

is highly consistent.

The reserved integrated navigation

interface can be compatible with the

current mainstream satellite navigation

solutions.

Application Areas

- Autonomous driving: vehicle, agricultural machinery, engineering vehicles, underwater
- Precision measurement: underground, tunnel, vibration, tilt
- Stable platform: PTZ, mobile communication, UAV



FSS-G200 Product Sheet

- Automatic control: large industrial equipment, automatic control system
- On the basis of standard performance and output parameters, FORSENSE also provides customized software and LOGO customization services for your special needs, to help you in the product!



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1. Performance parameters

1.1 Key indicators of gyroscope

Table 1 Key indicators of gyroscope

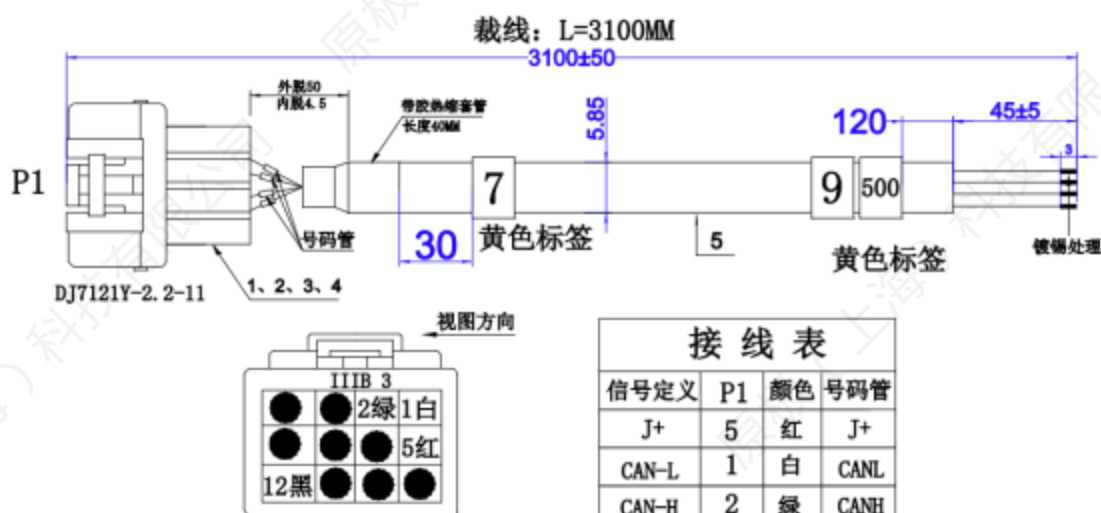
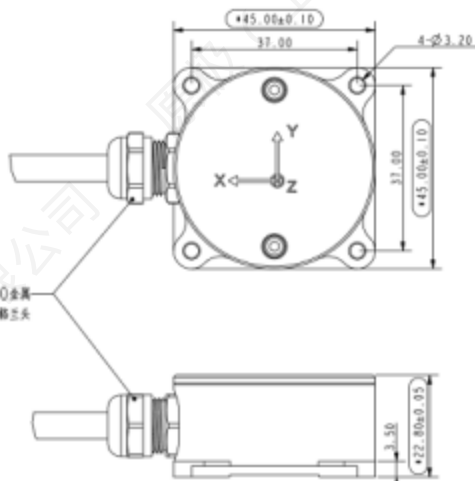
Parameters	Test conditions/Remarks	Minimum value	Typical value	Maximum value	unit
Measuring range			+ 500		°/s
Zero bias instability	@,ALLAN variance, 1σ25°C		5.0		°/hr
Zero bias repeatability	@,ALLAN variance, 1σ25°C		0.1		°/s
Internal low-pass cutoff frequency	Software adjustable	1.0	15	47	Hz
ODR2		1	100	400	Hz
Measuring delay			7.0		ms
Random Walk	@,ALLAN variance, 1σ25°C		0.3		°/√hr

Note 1: IEEE standard, Allan variance curve given at static 25 ° C environment

Note 2: The maximum output update rate is not greater than 100Hz@115200bps

2. External structure

Figure 1 Outline structure and dimensions (unit: mm)



3. Electrical characteristics

Table 2 Electrical characteristics

Parameters	Symbols	Minimum value	Typical value	Maximum value	Units
Supply voltage	VCC	4.5	5	12	V
VCC maximum ripple	V _{rpp}	0		40	mV
Power Consumption	P		0.25		W
Use temperature	T	-40		85	°C
Storage temperature	T	-40		85	°C

Table 3 Pin definitions

Parameters	Line color	remark
Power input	red	5V DC input
Electrically	black	
RS232_TX	yellow	RS232 level
RS232_RX	white	
CAN_L	brown	CAN BUS
CAN_H	green	

Note: CAN communication baud rate is 1MHZ, built-in matching resistance 120 Ohms

4. Communication protocol

4.1 CAN communication protocol

Example of CAN host read driver based on STM32:

<https://www.forsense.cn/download/>

DBC file (located in FORSENSE official website - Download page - Driver and Sample code - column)

614E-AG.dbc	下载
G200.dbc	下载
680D-CAN.dbc	下载

4.1.1 Communication parameters

Interface form: CAN, standard frame

CAN rate: 250Kbps~1Mbps (configurable)

4.1.2 Standard frame format

Table 4 CAN Standard Frame Format 101

Standard Frame ID	1	2	3	4	5	6	7	8
101	ROLL				PITCH			

Table 5 CAN Standard Frame Format 102

Standard Frame ID	1	2	3	4	5	6	7	8
102	YAW				Gx			

Table 6 CAN Standard Frame Format 103

Standard Frame ID	1	2	3	4	5	6	7	8
103	Gy				Gz			

Table 7 CAN Standard Frame Format 104

Standard Frame ID	1	2	3	4	5	6	7	8
104	Ax				Ay			

Table 8 CAN Standard Frame Format 105

Standard Frame ID	1	2	3	4	5	6	7	8
105	Az				TEMP		INDEX	

Note 1: Attitude Angle, gyro, accelerometer data is expressed as float, temperature, meter value data is expressed as int16

Note 2: The unit of TEMP is 100* °C, the unit of Gyroscope output is °/s, the unit of Accelerometer output is g, and the unit of attitude output is degree

4.1.3 Configuring the CAN Parameter Instruction

1. Configure the CAN baud rate

Send instructions:

ID=0x619, DATA=0x20 0x21 0x22 0x23 0xFF 0x00 0x00 0x00

The IMU responds as follows:

ID=0x519, DATA=0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF

Query the CAN baud rate

Send instructions:

ID=0x619, DATA=0x20 0x21 0x22 0x23 0x0A 0x00 0x00 0x00

The IMU responds as follows:

ID=0x519, DATA= 0xFF 0x0A 0xFF 0xFF 0xFF 0xFF 0xFF 0xF

Where:

XX=01 baud rate is 250Kbps

XX=02 baud rate is 500Kbps

XX=03 baud rate is 1000Kbps

2. Configure the CAN node ID

Example: Set the node ID to 0X0102

Send instruction:

ID=0x61A, DATA=0x30 0x31 0x32 0x33 0x01 0x02 0x00 0x00

The IMU responds as follows:

ID=0x51A, DATA=0x01 0x02 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF

3 Configure the output frequency

To set the output frequency:

ID=0x61C, DATA=0x10 0x11 0x12 0x13 0xFF 0xFF 0xFF

The IMU responds as follows:

ID=0x51C, DATA=0xXX 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF

Query output frequency:

Send command:

ID=0x61C, DATA=0x10 0x11 0x12 0x13 0x0A 0xFF 0xFF 0xFF

The IMU responds as follows:

ID=0x51C, DATA=0xXX 0x0A 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF

Among them:

XX=01 The output frequency is 1HZ

XX=02 The output frequency is 10HZ

XX=03 The output frequency is 50HZ

XX=04 The output frequency is 100HZ

XX=05 The output frequency is 200HZ

4 Query the version number

Send instructions:

ID=0x618, DATA=0x10 0x11 0x12 0x13 0x00 0x00 0x00 0x00 0x00

The IMU responds as follows:

ID=0x518, DATA=0x00 0xC9 0xBB 0xE9 0xFF 0xFF 0xFF 0xFF

The version number is 0x00C9BBE9, which means the firmware version is 13220841

5 Save the parameters

Send instructions:

ID=0x6FF, DATA=0x10 0x11 0x12 0x13 0xFF 0xFF 0xFF 0xFF

The IMU responds as follows:

ID=0x5FF, DATA=0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF 0xFF

It takes time to save, and the packet is returned only after the saving is successful

5. CRC table lookup calculation

```
static const uint32_t crc32_tab [ ] = [
0x00000000, 0x77073096, 0xee0e612c, 0x990951ba, 0x076dc419, 0x706af48f,
0xe963a535, 0x9e6495a3, 0x0edb8832, 0x79dcb8a4, 0xe0d5e91e, 0x97d2d988,
0x09b64c2b, 0x7eb17cbd, 0xe7b82d07, 0x90bf1d91, 0x1db71064, 0x6ab020f2,
0xf3b97148, 0x84be41de, 0x1adad47d, 0x6ddde4eb, 0xf4d4b551, 0x83d385c7,
0x136c9856, 0x646ba8c0, 0xfd62f97a, 0x8a65c9ec, 0x14015c4f, 0x63066cd9,
0xfa0f3d63, 0x8d080df5, 0x3b6e20c8, 0x4c69105e, 0xd56041e4, 0xa2677172,
0x3c03e4d1, 0x4b04d447, 0xd20d85fd, 0xa50ab56b, 0x35b5a8fa, 0x42b2986c,
0xdbbbc9d6, 0xacbcf940, 0x32d86ce3, 0x45df5c75, 0xdcd60dcf, 0xabd13d59,
0x26d930ac, 0x51de003a, 0xc8d75180, 0xbf706116, 0x21b4f4b5, 0x56b3c423,
0xcfba9599, 0xb8bda50f, 0x2802b89e, 0x5f058808, 0xc60cd9b2, 0xb10be924,
0x2f6f7c87, 0x58684c11, 0xc1611dab, 0xb6662d3d, 0x76dc4190, 0x01db7106,
0x98d220bc, 0xefd1012a, 0x71b18589, 0x06b6b51f, 0x9fbfe4a5, 0xe8b8d433,
0x7807c9a2, 0x0f00f934, 0x9609a88e, 0xe10e9818, 0x7ff6a0dbb, 0x086d3d2d,
0x91646c97, 0xe6635c01, 0xb6b51f4, 0xc1c66162, 0x856530d8, 0xf262004e,
0x6c0695ed, 0x1b01a57b, 0x8208f4c1, 0xf50fc457, 0x65b0d9c6, 0x12b7e950,
0x8bbeb8ea, 0xfcb9887c, 0x62dd1ddf, 0x15da2d49, 0x8cd37cf3, 0xfbdb44c65,
0x4db26158, 0x3ab551ce, 0xa3bc0074, 0xd4bb30e2, 0xa4adfa541, 0x3dd895d7,
0xa4d1c46d, 0xd3d6f4fb, 0x4369e96a, 0x346ed9fc, 0xad678846, 0xda60b8d0,
0x44042d73, 0x33031de5, 0xaa0a4c5f, 0xdd0d7cc9, 0x5005713c, 0x270241aa,
0xbe0b1010, 0xc90c2086, 0x5768b525, 0x206f85b3, 0xb966d409, 0xce61e49f,
0x5edef90e, 0x29d9c998, 0xb0d09822, 0xc7d7a8b4, 0x59b33d17, 0x2eb40d81,
0xb7bd5c3b, 0xc0ba6cad, 0xedb88320, 0x9abfb3b6, 0x03b6e20c, 0x74b1d29a,
0xe5d54739, 0x92dd27af, 0x04db2615, 0x73dc1683, 0xe3630b12, 0x94643b84,
0x0d6d6a3e, 0x7a6a5aa8, 0xe40ecf0b, 0x9309ff9d, 0x0a00ae27, 0x7d079eb1,
0xf00f9344, 0x8708a3d2, 0x1e01f268, 0x6906c2fe, 0xf762575d, 0x806567cb,
0x196c3671, 0x6e6b06e7, 0xfed41b76, 0x89d32be0, 0x10da7a5a, 0x67dd4acc,
0xf9b9df6f, 0x8ebeeff9, 0x17b7be43, 0x60b08ed5, 0xd6d6a3e8, 0xa1d1937e,
0x38d8c2c4, 0x4fdff252, 0xd1bb67f1, 0xa6bc5767, 0x3fb506dd, 0x48b2364b,
0xd80d2bda, 0xaf0a1b4c, 0x3603aaf6, 0x41047a60, 0xdf60efc3, 0xa867df55,
0x316e8eef, 0x4669be79, 0xcb61b38c, 0xbc66831a, 0x256fd2a0, 0x5268e236,
0xcc0c7795, 0xbb0b4703, 0x220216b9, 0x5505262f, 0xc5ba3bbe, 0xb2bd0b28,
0x2bb45a92, 0x5cb36a04, 0xc2d7ffa7, 0xb5d0cf31, 0x2cd99e8b, 0x5bdeae1d,
0x9b64c2b0, 0xec63f226, 0x756aa39c, 0x026d930a, 0x9c0906a9, 0xeb0e363f,
0x72076785, 0x05005713, 0x95bf4a82, 0xe2b87a14, 0x7bb12bae, 0x0cb61b38,

0x92d28e9b, 0xe5d5be0d, 0x7cdcefb7, 0x0bdbdf21, 0x86d3d2d4, 0xf1d4e242,
0x68ddb3f8, 0x1fda836e, 0x81be16cd, 0xf6b9265b, 0xf6b077e1, 0x18b74777,
0x88085ae6, 0xff0f6a70, 0x66063bca, 0x11010b5c, 0x8f659eff, 0xf862ae69,
0x616bfff3, 0x166ccf45, 0xa00ae278, 0xd70dd2ee, 0x4e048354, 0x3903b3c2,
0xa7672661, 0xd06016f7, 0x4969474d, 0x3e6e77db, 0xaed16a4a, 0xd9d65adc,
```

```

0x40df0b66, 0x37d83bf0, 0xa9bcae53, 0xdebb9ec5, 0x47b2cf7f, 0x30b5ffe9,
0xbdbdf21c, 0xcabac28a, 0x53b39330, 0x24b4a3a6, 0xbad03605, 0xcdd70693,
0x54de5729, 0x23d967bf, 0xb3667a2e, 0xc4614ab8, 0x5d681b02, 0x2a6f2b94,
0xb40bbe37, 0xc30c8ea1, 0x5a05df1b, 0x2d02ef8d,
}
uint32_t crc_crc32 (uint32_t crc, const uint8_t *buf, uint32_t size) {
for (uint32_t i=0; i<size; i++) {
crc = crc32_tab [ (crc ^ buf [i]) & 0xff] ^ (crc >> 8);
}
return crc;
}
    
```

6. Select accessories



USB to CAN power +CAN harness

7. Update your records

Versions	Dates	Status/Comments
Version 1.0	2023.07.18	First issue
Version 1.1	2023.12.14	Add attachment
Version 1.2	2024.6.17	Delete the serial port section