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**BS-FL5x-5-D1EC type**

**Medium and low precision fiber  
optic gyroscope**

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# BS-FL5x-5-D1EC Medium and Low Precision Fiber Optic Gyroscope Specifications

## 1 Brief introduction

Fiber optic gyroscope, as a new type of all solid-state gyroscope, has the advantages of fast start-up, wide measurement range, and high reliability. BS-FL5x-5-D1EC single axis medium and low precision fiber optic gyroscope can be applied to the application requirements of medium and high precision inertial navigation systems such as land positioning and orientation, vehicle mounted north finder, airborne heading and attitude, and marine gyrocompass.

### 1.1 Application scope

This manual is only applicable to BS-FL5x-5-D1EC products and includes performance indicators, technical conditions, external dimensions, and installation and use. Among them, the technical conditions include the environmental range, electrical performance, and physical characteristics of the product

### 1.2 Parameters

#### 1.2.1 Main performance indicators of fiber optic gyroscope:

Table 1 Main Performance Indicators of the Product

	BS-FL5A-5-D1EC	BS-FL5B-5-D1EC	BS-FL5C-5-D1EC	
<b>Zero bias stability °/hr(1<math>\sigma</math>,10s)</b>	<b>≤0.20</b>	<b>≤0.10</b>	<b>≤0.05</b>	
<b>stability time s</b>	<b>&lt;10</b>	<b>&lt;10</b>	<b>&lt;10</b>	
<b>Zero bias repeatability °/hr(1<math>\sigma</math>)</b>	<b>≤0.30</b>	<b>≤0.20</b>	<b>≤0.10</b>	
<b>Full temperature zero bias repeatability °/hr</b>	<b>≤0.6</b>	<b>≤0.4</b>	<b>≤0.3</b>	
<b>random walk coefficient °/<math>\sqrt{hr}</math></b>	<b>≤0.02</b>	<b>≤0.02</b>	<b>≤0.01</b>	
<b>Scale factor nonlinearity ppm(1<math>\sigma</math>)</b>	<b>≤50</b>	<b>≤30</b>	<b>≤20</b>	
<b>Scale factor repeatability</b>	<b>≤50</b>	<b>≤30</b>	<b>≤30</b>	

<i>ppm</i> (1 $\sigma$ )				
dynamic range	$\pm 500^\circ/s$			
Magnetic field sensitivity	$\leq 0.05^\circ/hr/Gs$			
operation temperature	$-40^\circ C \sim +70^\circ C$			
storage temperature	$-50^\circ C \sim +70^\circ C$			
vibration conditions	$4.2g, 20Hz \sim 2000Hz$			

## 1.2.2 Mechanical testing

### 1.2.2.1 Sinusoidal scanning vibration

The gyroscope is fixed on the vibration table through tooling in the vibration direction, and the gyroscope performs sine scanning in three directions, corresponding to the X axis, Y axis, and Z axis directions. Vibration steps; Excitation is applied to the vibration table, and the gyroscope is powered on. After preheating for a certain time (starting time of the gyroscope), the output value of the gyroscope is tested for about 5 minutes; Perform sinusoidal vibration. Vibration conditions: 20Hz-2000Hz, scanning time 5 minutes, amplitude 4.2g. During the vibration process, record the output of the gyroscope.

random vibration

Vibration frequency: 20Hz~2000Hz

Vibration time: 5 minutes for each axis

Vibration direction: X, Y, Z axis

Vibration spectrum diagram: see Figure

1

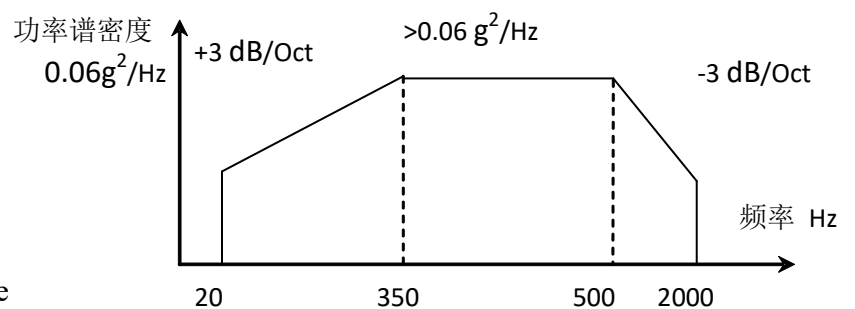


Figure 1 Vibration Spectrum

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Indicator requirements:

Fiber optic gyroscope has no resonance during sine sweep frequency scanning in the range of 20Hz to 2000Hz;

Random vibration: The absolute value between the zero deviation value at the center of the vibration and the average zero deviation value before and after the vibration should be less than  $0.3 \text{ } ^\circ/\text{h}$ .

**1.2.2.2 Mechanical shock shall comply with the requirements in Table 2.**

Table 2 Impact Test Conditions

peak acceleration (g)	30
duration (ms)	10
Number of impacts	3 times in each direction
wave form	Half sine wave
direction	X、 Y、 Z
	Note: The interval between two impacts shall not be less than 1.5 seconds

During the impact process, the product is in the power on state. After mechanical shock, the product should be able to work normally, and the zero change value before and after the impact is less than  $0.2 \text{ } ^\circ/\text{h}$ .

**2 communication protocol**

**2.1 Fiber optic gyroscope communication protocol**

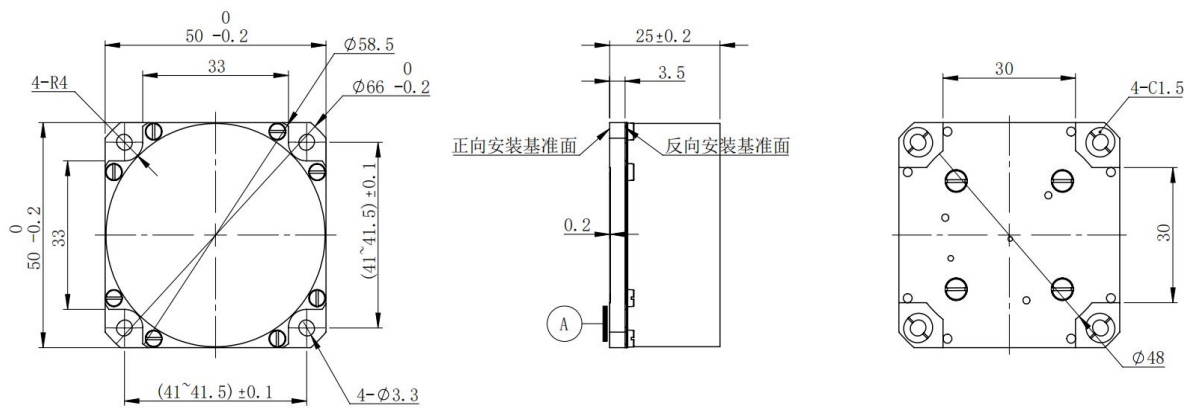
Communication protocol

2.1 RS-422 mode (bidirectional)

- 1) Bidirectional serial communication, compliant with RS-422 interface standard;

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- 2) External trigger signal, 1000HZ square wave;
  - 3) After the gyroscope detects the falling edge of the external trigger signal, it begins to send data outward;陀螺有效数据为 32 位;
  - 4) The effective temperature data is 14 digits;
  - 5) The baud rate for data transmission is 460.8kbps;
  - 6) data format:
    - a) Data transmission format: Each frame of data has 11 bits, including: the first bit is the start bit (0), the 2nd to 9th bits are the data bits, the 10th bit is the even parity bit, and the 11th bit is the stop bit;
    - b) Verification method: even verification;
    - c) The effective data of the gyroscope is 32 bits (the highest bit is the sign bit, 0 is "+", 1 is "-"), and the effective data of temperature is 14 bits (the highest bit is the sign bit, 0 is "+", 1 is "-");
    - d) Packet format: Each transmission includes a total of 10 bytes, with the first byte being the frame header (80H); The second byte is the first byte data of the gyroscope (low byte); The third byte is the second byte data of the gyroscope; The fourth byte is the third byte data of the gyroscope; The 5th byte is the fourth byte data of the gyroscope; The 6th byte is the fifth byte data of the gyroscope (high byte); The 7th byte is the check bit, which is the XOR value of the first 5 bytes (gyroscope data) in the data packet; The 8th byte is the low byte of temperature data; The 9th byte is the high byte of temperature data; The 10th bit is the check bit, which is the XOR value of the first 8 bytes (gyroscope data) in the data packet;
    - e) Data storage method.

	HI				LOW			
第 1 字 (帧头):	1	0	0	0	0	0	0	0
第 2 字节:	0	D6	D5	D4	D3	D2	D1	D0
第 3 字节:	0	D13	D12	D11	D10	D9	D8	D7
第 4 字节:	0	D20	D19	D18	D17	D16	D15	D14
第 5 字节:	0	D27	D26	D25	D24	D23	D22	D21
第 6 字节:	0	0	0	0	D31	D30	D29	D28
第 7 字节:	0	X	X	X	X	X	X	X
第 8 字节:	0	T6	T5	T4	T3	T2	T1	T0
第 9 字节:	0	T13	T12	T11	T10	T9	T8	T7
第 10 字节:	0	X	X	X	X	X	X	X



**Figure 2 Outline Dimension Drawing of BS-FL5x-5-D1EC Type**

The fiber optic gyroscope is led out to the J30-15ZK socket, and the contact definition is shown in

Table 1.

Table 1 Electrical characteristics of gyroscope output socket

Contact number	Pin Definition	MARK	COLOR
1	Serial port T+	TX+	YELLOW
2	Serial port T-	TX-	ORANGE
3	Serial port R+	RX+	BLUE
4	Serial port R-	RX-	GREEN
5、13	POWER +5V	+5V	RED
6、7	POWER GROUD	GND	BLACK