

## High Performance Inertial Measurement Unit Test Report

**S488B-IMU**

**S488B-IMU** is a high performance, small size, high overload resistant inertial measurement device. The **S488B-IMU** inertial measurement unit is a localised high-performance device. The gyroscope zero offset stability is  $2^\circ/\text{h}$  (Allan) and the accelerometer zero offset stability is  $50\mu\text{g}$  (Allan).

The product is fully compatible with the ADIS16488BMLZ in terms of performance, size, protocol, etc.

### Main parameters:

- 1 Range:  $\omega_x = \omega_y = \omega_z = \pm 400^\circ/\text{s}$ ;  $A_x = A_y = A_z = \pm 10\text{g}$
- 2 Power supply: +12 V
- 3 Bias Stability: Gyro:  $2^\circ/\text{h}$ , Acc  $50\mu\text{g}$  (Allan)
- 4 Working temperature:  $-40 \dots +70^\circ\text{C}$

### Experimental setup:

TS-106E single-axis rate table, precision multi-tooth indexing table, DH1715A-3 dual regulated power supply, digital multi-meter 34970A, computerized data acquisition system.

### Experimental process:

(1) The gyro combination is fixed on the position rotary table or rate rotary table, the sensitive axis should be parallel to the rotary table axis. **Note:** All the index parameters are derived in accordance with the national military standard in the gyroscope test specification of the method.

(2) The sensor is fixed on the plane of the indexing table during the four-position test, and the product shall not be moved during the test.

#### 1. Zero Stability

The IMU is fixed on a stable platform and the product is powered on for 1h of data collection. Gyro accelerometer data was calculated every 1s for the mean square deviation. The results are as follows:

**Table 1. Gyro zero stability**

Product number	Gyro X direction ( $^\circ/\text{h}$ )	Gyro Y direction ( $^\circ/\text{h}$ )	Gyro Z direction ( $^\circ/\text{h}$ )
201904035	6.8	3.7	3.6

**Table 2. Accelerometer Zero Stability**

Product number	(mg)	(mg)	Add table Z direction (mg)
201904035	0.25	0.26	0.79

## 2. Noises

The product outputs 1000Hz and the actual test data is shown in Fig. 1. From the figure, it can be known that the gyro at 1000Hz data rate, the noise peak value  $< 0.3^\circ / s$ . Accelerometer peak value  $< 4mg$ .

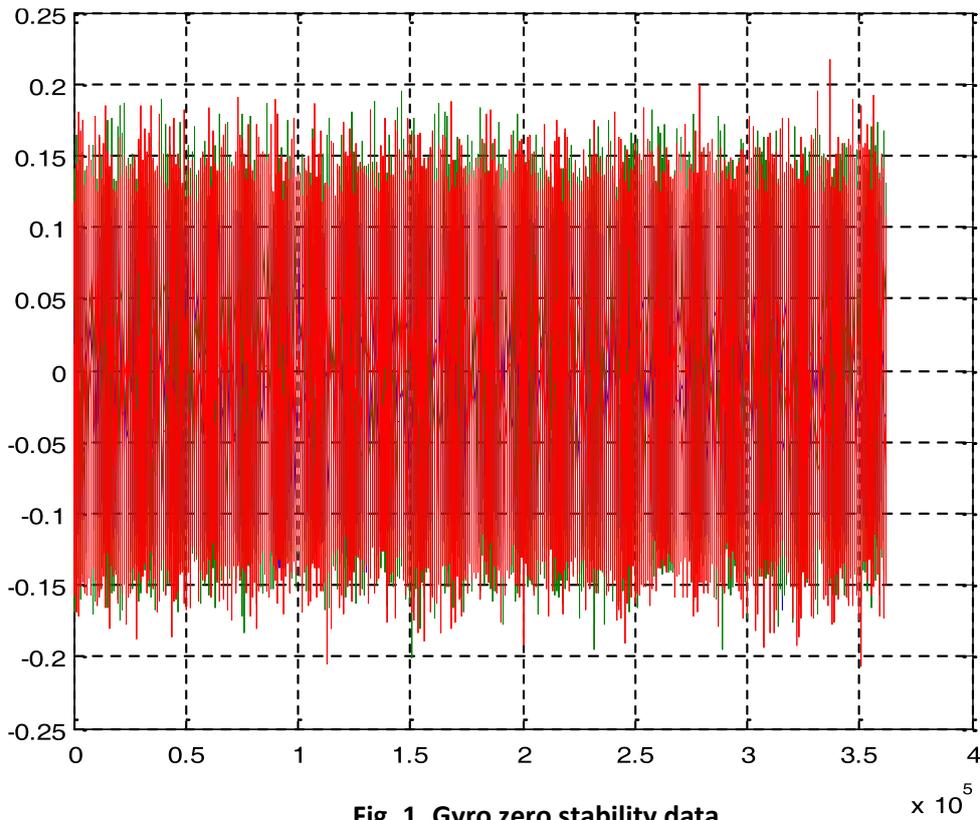


Fig. 1. Gyro zero stability data

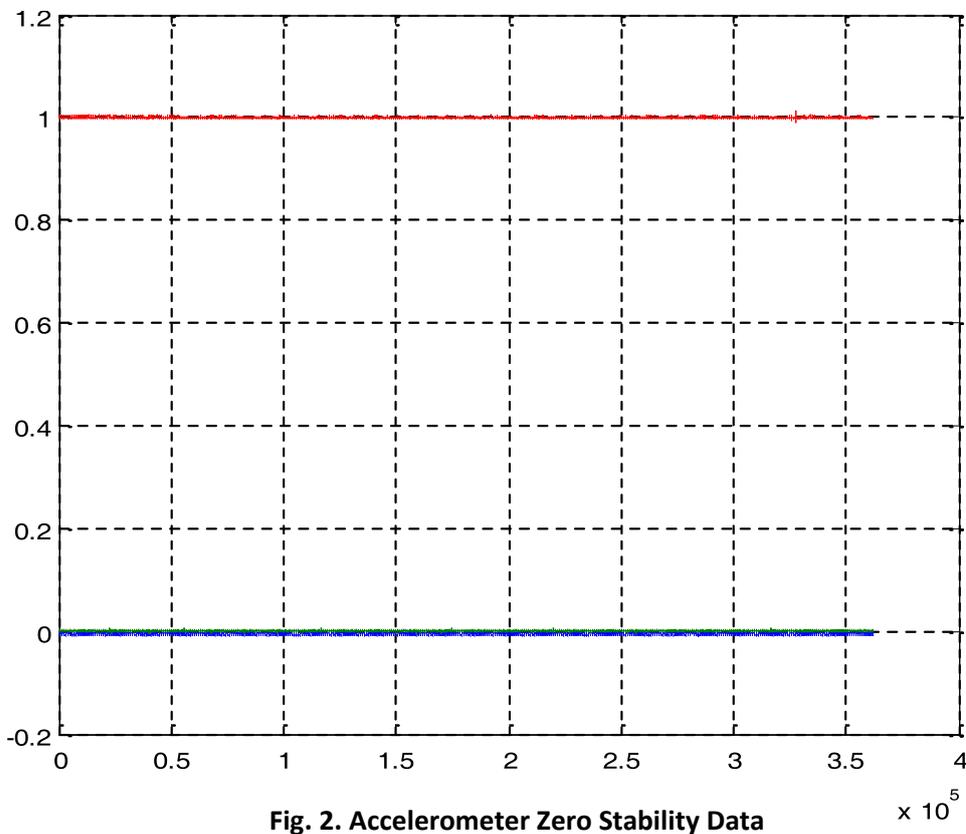
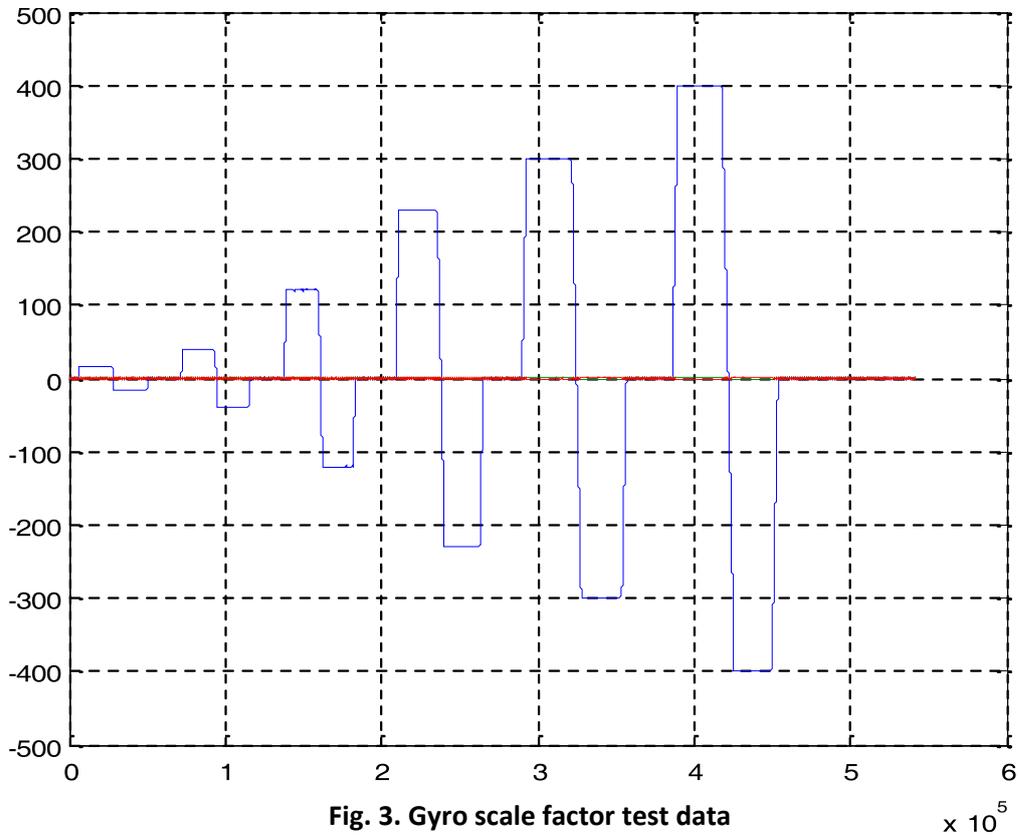


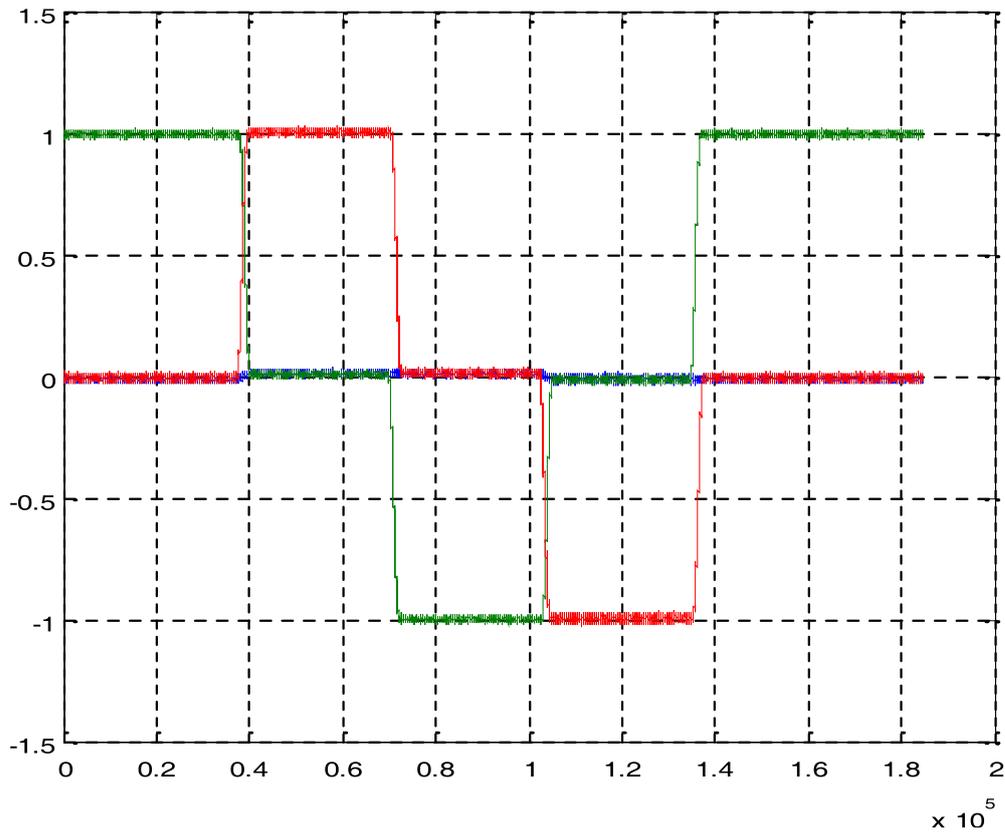
Fig. 2. Accelerometer Zero Stability Data

### 3. Scale factor nonlinearity

The product is fixed on a 3-axis rotary table with a rotary table output from 0 to  $\pm 400^\circ/\text{s}$ . The data image is shown below. The gyro scale factor nonlinearity is less than 100ppm.



The product is fixed on a three-axis rotary table, which outputs an accelerometer from 0 to  $\pm 1g$ , and the data image is shown below. The scale factor nonlinearity of the accelerometer is less than 500ppm.



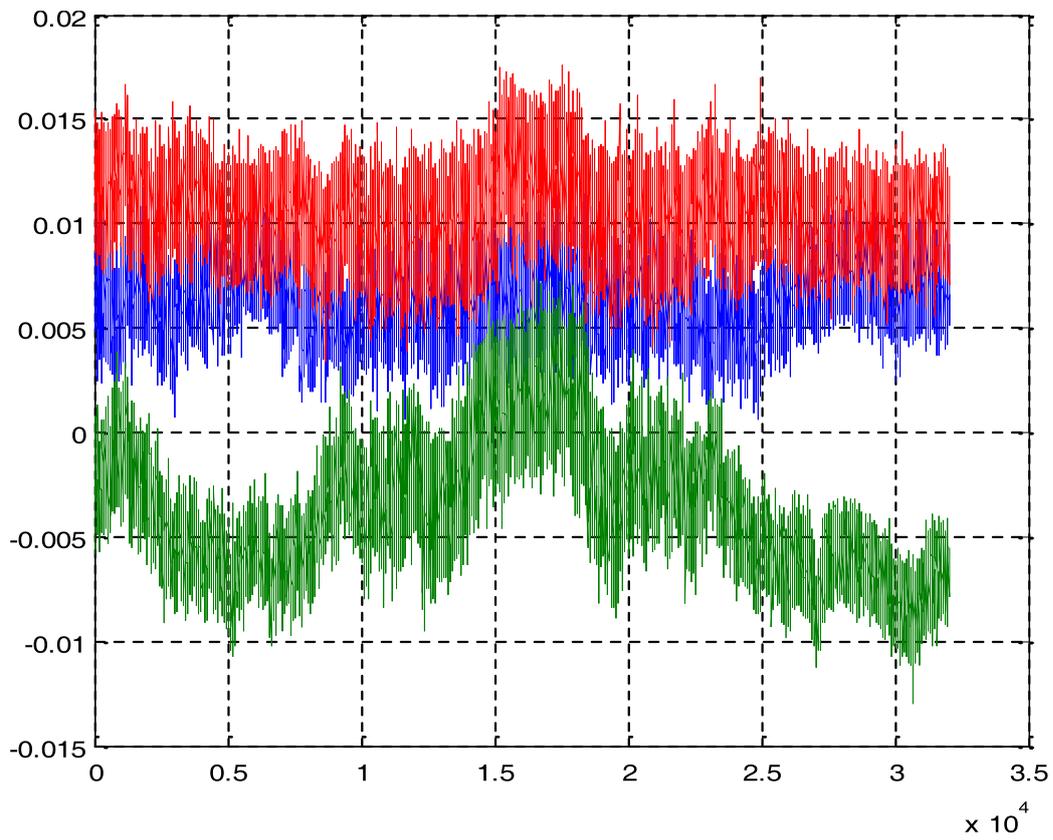
**Fig. 4. Accelerometer scale factor test data**

#### 4. Full Temperature Verification

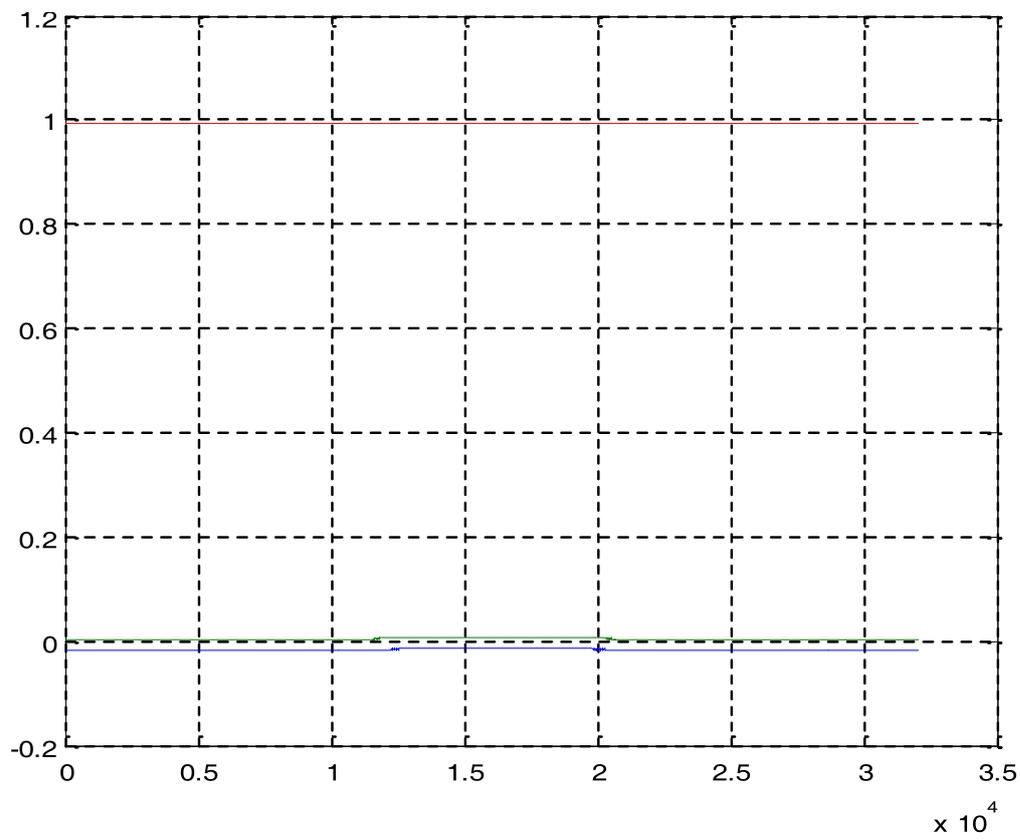
The product is fixed on a single-axis rotary table with a temperature box.

The temperature range of the temperature box is set as +70 ... -40 ... +70°C, the temperature change rate is 1°C/min, and the data of the product is saved as 1Hz data, and the image is as follows.

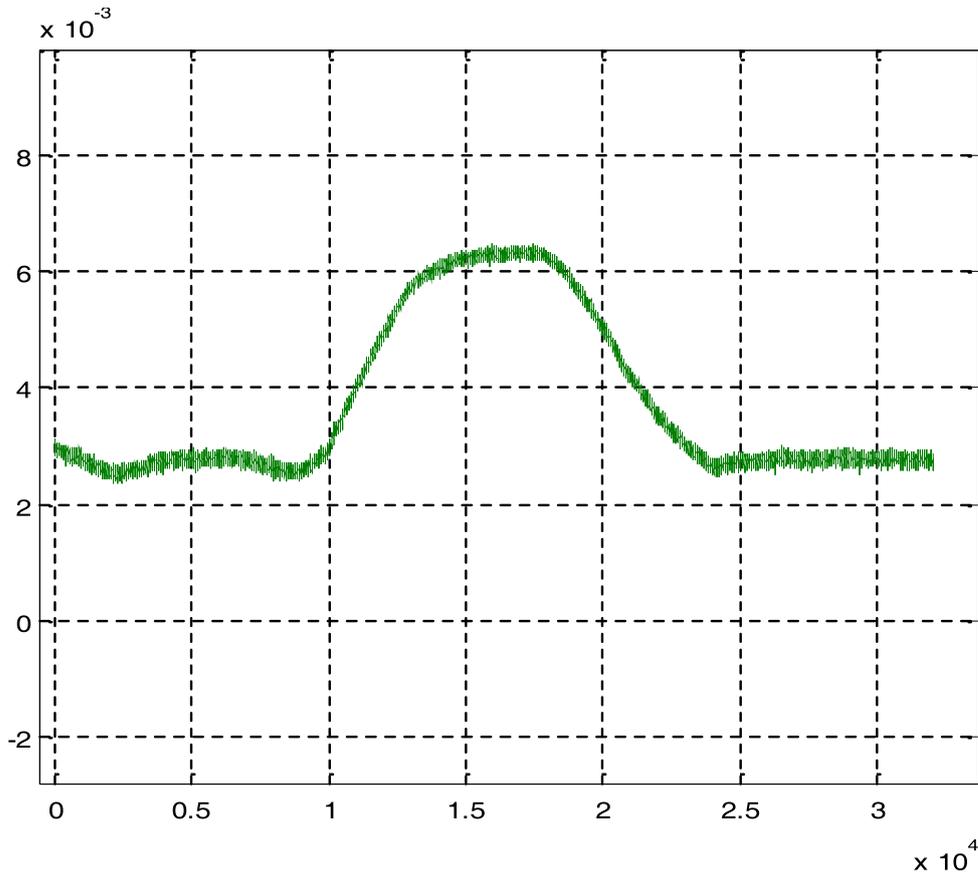
The change of zero relative value of gyro is less than 0.02°/s, and the stability of zero deviation is less than 20°/h. The relative value of zero deviation of Accelerometer is less than 5mg, and the stability of zero deviation is less than 2mg.



**Fig. 5. Gyro full temperature zero test data**

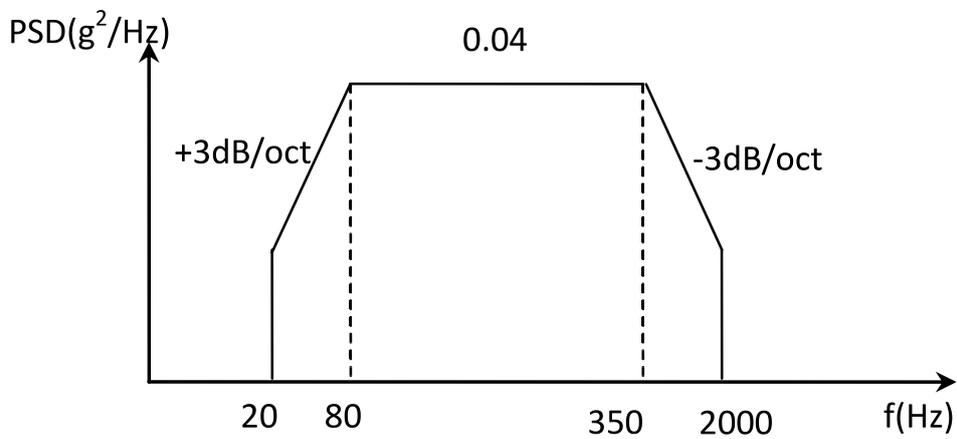


**Fig. 6. Accelerometer Full Temperature Zero Test Data**



**Fig. 7. Zoomed Y-axis data graph of Accelerometer full temperature zero position**

**5. Vibration data**



**Fig. 8. Random vibration test**

Note (vibrations in 3 directions for 5 min in each direction):

The vibration data are as follows, and it can be seen from the graph that the gyro and accelerometer positions did not change during vibration.

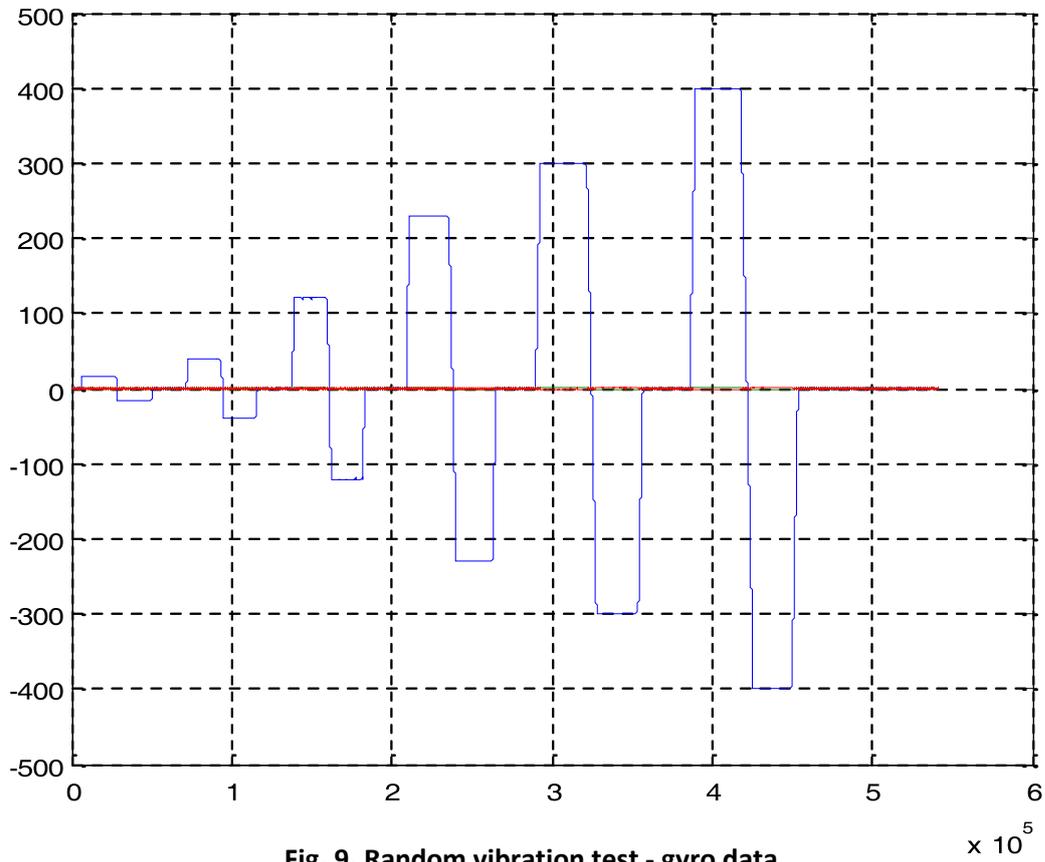


Fig. 9. Random vibration test - gyro data

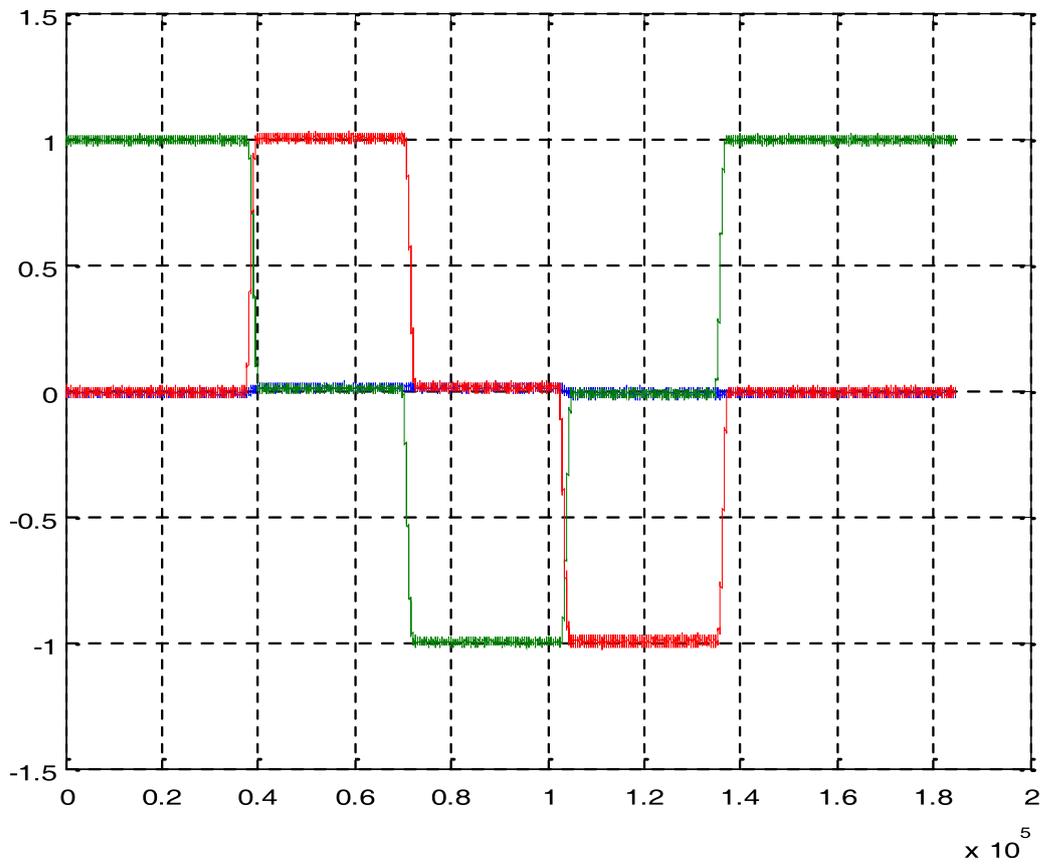


Fig. 10. Random vibration test - accelerometer data