Fizoptika Malta

OPEN-LOOP
FIBER OPTIC GYROSCOPES
VG220 SERIES

Information Guide

Model	*Key Features*	*Fiber length, m*
VG221	*0.3 W*	*100*
VG221- MS	*Shielded*	*100*
VG221LN	*0.025 °/√h*	*100*
VG221LN-MS	*Shielded*	*100*

Contents

1. Introduction

1.1. Scope[1]

This guide describes the VG220 fiber optic gyroscope's main features. Suggestions on product use, handling and installation are given.

1.2. Product Description

The Fizoptika gyroscope is a complete gyro system which comprises a fiber optic sensing assembly and analog processing electronics. The sensing assembly (an open-loop minimum configuration) is fabricated from a single length of optical fiber by a fusion-tapering technique. Special polarization tuning provides the gyroscope with Minimum Magnetic Sensitivity of ~4°/h/Gauss (unshielded).

The series features ultra-compact lightweight design combined with high shock and vibration immunity.

The basic gyroscope model VG221 is an extremely low weight and low power unit.

See product main parameters in **Annex 1**, pins assignment, axes definition in **Annex 2**.

1.3. Essential

The gyroscope housing is silicone sealed. Keep the product dry during its whole lifetime.

Do not drop. Excessive shock can damage the unit.

Use standard ESD practices when handling the unit.

2. Electrical Characteristics

2.1. Powering

The gyroscope requires a clean and stable 5Vdc (±5%) power supply. Voltages greater than 5.5V (or reversing polarity) can cause some components to heat and eventually fail. Smooth voltage transient at power-on is recommended.

See the electrical diagrams in **Annex 3**.

2.2. Differential Output

The gyroscope has two output leads (OUT+, OUT-)

U(+) = U0 + ½ SF · Ω
U(-) = U0 - ½ SF · Ω

Each lead is an independent fully functional signal channel with its own LPF (~1kHz) and output amplifier. See Output Circuit Diagram in **Annex 3**. Serial 1KOhm resistors are to protect the amplifiers from wrong load. Both outputs are biased at **U0=1V** to Common (GND). **U0** is in fact internal signal virtual ground.

The gyroscope "differential" output is defined as the voltage between outputs (OUT+ and OUT-)

U(Ω) = U(+)- U(-) = SF·Ω

The output voltage range is ±2V.

Diagnostics. If gyroscope fails**, U0 ≠ 1V**.

The SF and bias are slightly sensitive to supply voltage. The sensitivity coefficients are individual for each unit. Values for reference**:** SF – 0.05%/V, bias – 0.1 mV/V.

2.3. Temperature Output

The gyroscope provides temperature data via TS lead:

V(TS) = 0.5 + t°C/100 [V]

Temperature output is single-ended.

[1] *The information presented in this document is believed to be correct. Fizoptika accepts no liability for any errors it might contain and reserves the right to alter specifications without prior notice.*
All pictures shown are for illustration purpose only. The actual product may vary due to the ongoing product enhancement. All dimensions given are for info only.

2.4. Effect of Environment

♦ **Temperature**

· **Bias** ~ 0.1-1 µV / °C (analog processing circuit)

· **SF** ~ 0.02 -0.04% / °C (SLD spectrum temperature effect)

♦ **Magnetic field** (minimized response)

· **Bias** ~ 4 deg/h/Gauss

~0.1deg /h/Gauss (shielded)

· **SF** – no effect

♦ **Vibration**

· **Bias** – no effect, **VRE = 0**

· **Noise** - typical factor 1 µV/ g*Hz

· **SF** – no effect

♦ **Acceleration (gravity)**

· **Bias** – no effect (zero g component)

· **SF** – no effect

Test data samples are in **Annex 4**.

3. Mounting Guidelines

The VG221 is extremely lightweight. There is no need for a strong joint to a mating frame (object). There is a variety of simple methods to attach the gyroscope not deforming its housing. The adhesive mounting is most recommended as it does not deliver any stress to the gyroscope and is quite reliable. It also provides sufficiently high resonance of the joint with low Q-factor.
Clamping is another possible method.

3.1. Adhesive Mounting

- Apply silicon adhesive to the side surface of the gyro.
- Aim for an adhesive thickness of 0.2-0.4 mm.

3.2. Mating Frame

Resonances of the mating frame and the gyro to frame joints (adhesive or mechanical) should exceed vibration frequencies. Otherwise, an extra noise at the output is possible because the gyro may acquire much higher levels of vibration compared to the mating frame.

4. Analog output reading

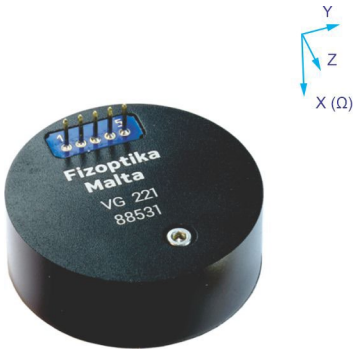
The outputs are DC-coupled and can be used in either single-ended or differential mode. Differential mode offers the best performance since the common mode errors and noise are minimized. The positive and negative outputs of the unit should be connected to differential input amplifiers with an input impedance of at least 500 kOhm referred to ground. The amplifier should also have a good common mode rejection and a suitable bandwidth for the application.

Annex 1. Product Main Parameters

PERFORMANCE	VG221	VG221LN
Input range (°/s)	400	400
Bias stability / Bias repeatability (RMS, °/h)	3 / 1*	3 / 1*
Angle random walk (°/√h)	0.05	0.025
Bandwidth (kHz)	1	1
SF stability / SF repeatability (RMS, %)	0.03	0.03
Magnetic response (°/h/Gauss)	4 / 0.1*	4 / 0.1*
ELECTRICAL INTERFACE		
Start-up (s)	0.05	0.05
Powering (W)	0.3	0.5
PHYSICAL PARAMETERS		
Dimensions (mm)	Ø33x12	Ø33x12
Weight (gram)	15 / 25*	15 / 25*
Volume (cl)	1	1
Housing material	Al alloy / µ-metal*	Al alloy / µ-metal*
ENVIRONMENT		
Operating temperature (°C)	-40…+70	-40…+70
Endurance temperature (> 2 h,°C)	-55…+85	-55…+85
Vibration (RMS, 0.02 - 2 kHz, g)	12	12
Shocks (g, 1 ms)	750	750
	1 200 (optional)	
RELIABILITY		
MTBF (h)**	150 000	70 000
Lifetime (yrs) **	15	15

*** Magnetically shielded**
**** Humidity conditions applied**

Annex 2. Pins Assignment, Axes Definition



(Ω) –sensing axis (±0.5°)

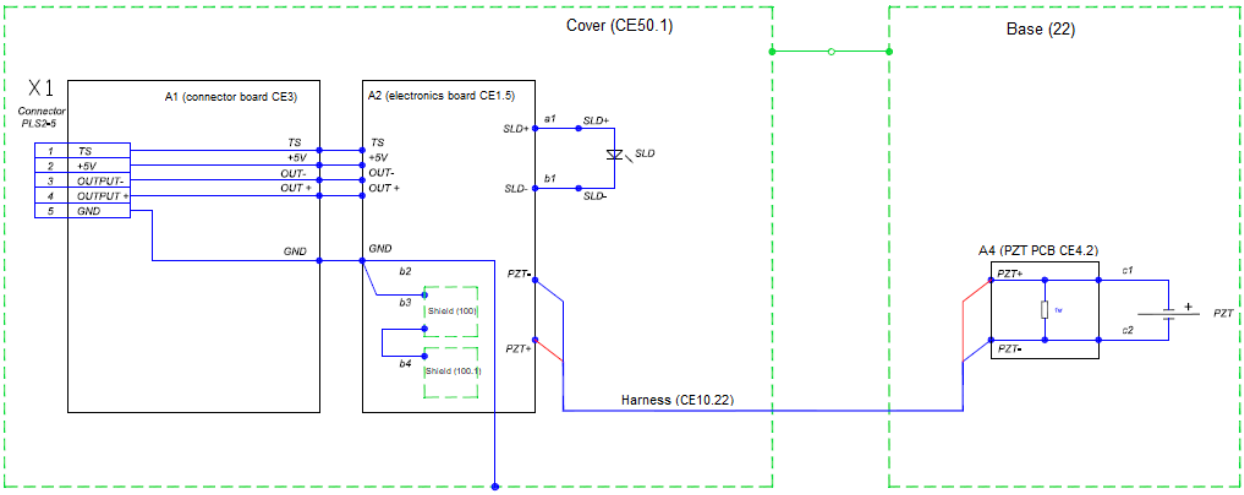
1	TS
2	+5V
3	OUT-
4	OUT+
5	GND

PLS2-5S

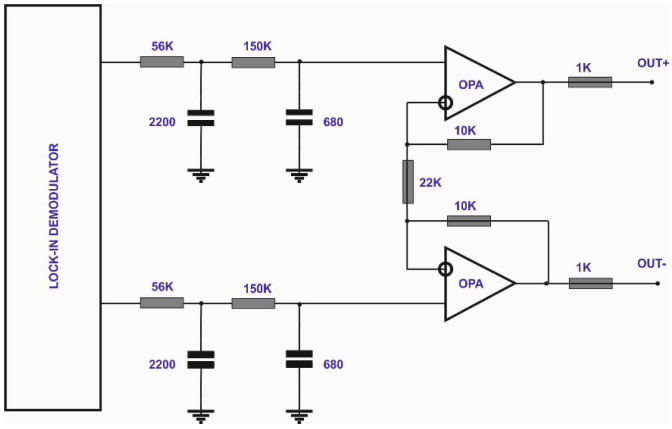
VG221(MS), VG221LN(MS)

Annex 3. Electrical Diagrams

The minimal configuration electronics drives the internal light diode (SLD) and phase modulator (PZT) for signal conditioning. It performs precise demodulation of the optical signal to form gyroscope raw output (no error compensation).

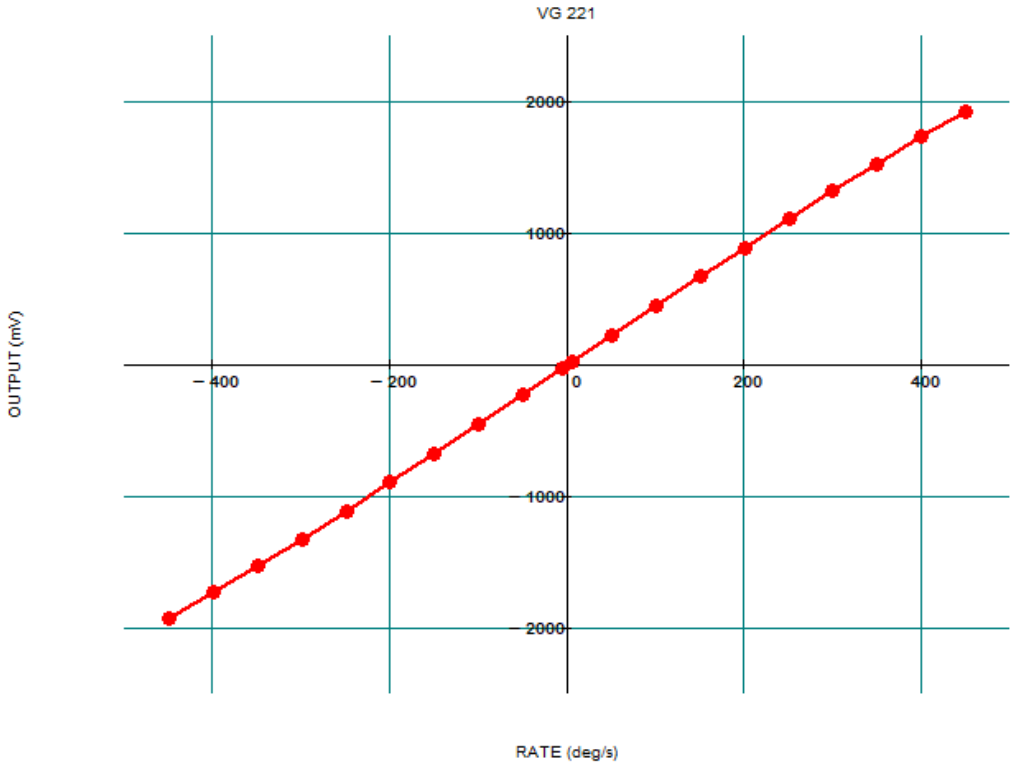


VG221(MS), VG221LN (MS)

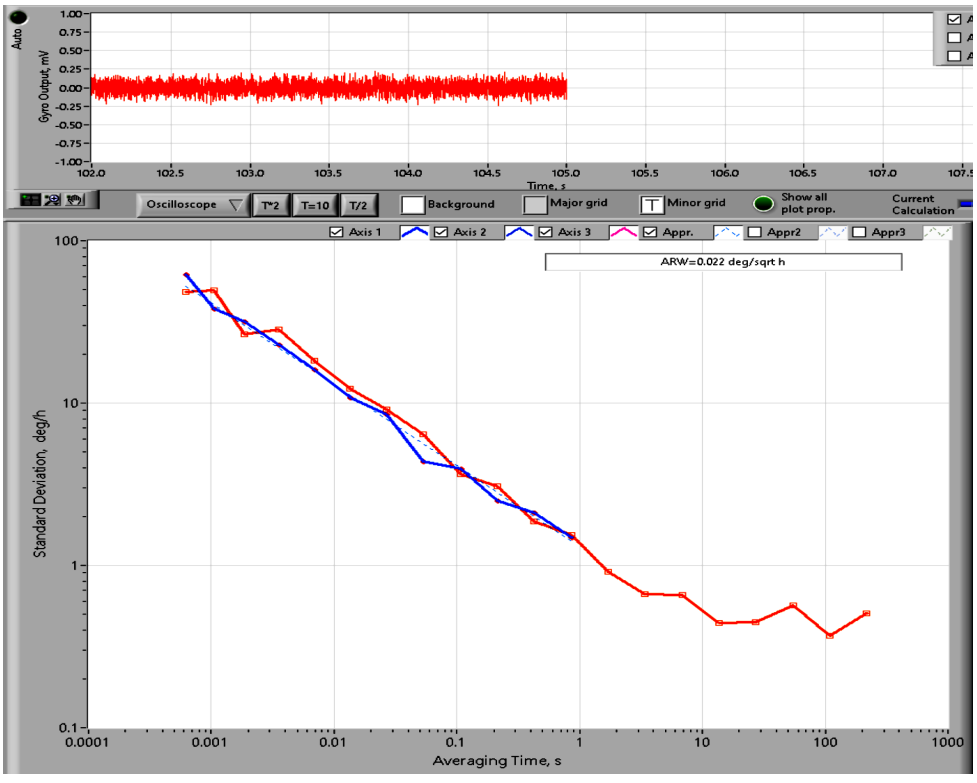


Output Circuit Diagram

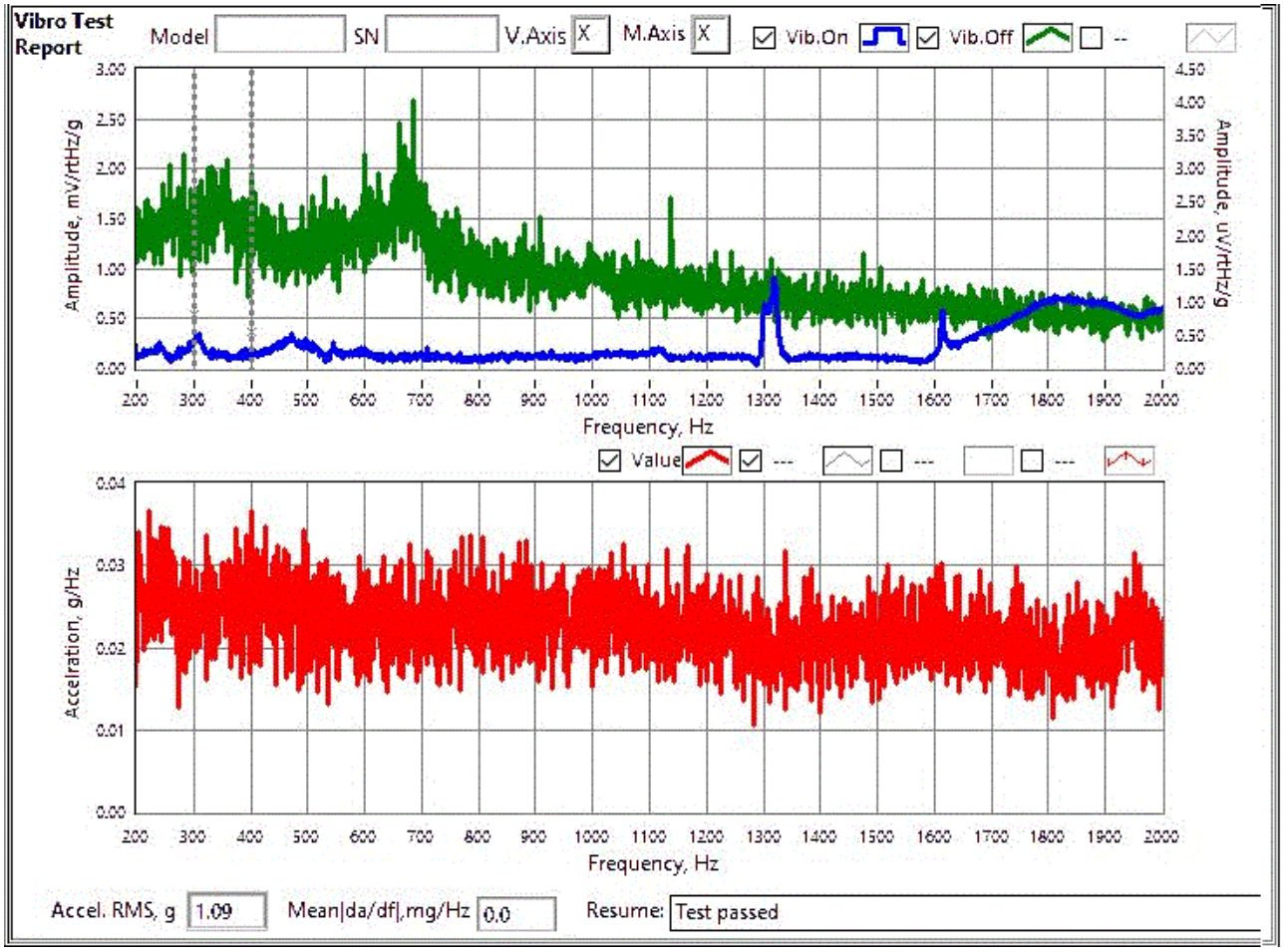
Annex 5. Test Data Samples



Output Voltage vs Angular Rate



Allan Variance Plot



Random vibration test