FIBER OPTIC GYROSCOPE

VG103 SERIES

Information Guide

Output	*VG103*		*Key Features*	*Fiber length, m*
differential		*PT*	*Basic model*	*100*
		LN	*Low noise*	*200*
		E	*Economy design*	*50*
digital		*D*	*Built-in ADC*	*100*
		LND	*Built-in ADC*	*200*

Table of Contents

1. Introduction

1.1. Scope[1]

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

1.2. Product Description

The Fizoptika gyro 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.

The series features compact fully plastic design (no metal parts) coupled with a choice of outputs (differential, single-ended, digital) at affordable price.

The basic model VG103PT offers the best combination of excellent performance and superb shock/vibration endurance.

See Product main parameters in Annex 1 (analog models) / Annex 2 (digital models), Outline dimensions, pins assignment, axes definition in Annex 3.

With an exclusive technology of precise polarization control the models acquire Minimum Magnetic Sensitivity about 1°/h/Gauss. For many applications the gyros may be used without heavy magnetic shielding.

1.3. Essential

The gyro 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 gyro 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 diagram in Annex 4 (analog models) / Annex 5 (digital models).

2.2. Differential Output

The gyro provides output voltages via two leads (OUT+, OUT-) each biased at **U0=1V** to Common lead (GND).

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

Output voltage **U(Ω)** = **U(+)**- **U(-)** = **SF·Ω**
The output voltage range is ±2V.
The output impedance is 1kOm (to GND).

2nd order LPF cutoff frequency is ~1kHz (see the diagram in Annex 7).

Diagnostics. If gyro 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 gyro 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.*

2.4. Digital Output

The digital model incorporates an additional PCB to read and convert the gyro analog output into digital signal RS232 (default) / RS422.

Read more in Fiber Optic Gyroscope Digital Output.

2.5. Effect of Environment

♦ **Temperature**

· **Bias** ~ 0.1-1 µV / °C (temperature sensitivity of the components of analog processing circuit)

· **SF** ~ 0.02 -0.04% / °C (temperature dependence of SLD spectrum – optical sensor natural feature - **NF**)

♦ **Magnetic field**

· **Bias** ~ 5-20°/h/Gauss

· **SF** is not sensitive (**NF**)

♦ **Vibration**

· **Bias** is not sensitive (no g and g^2 components - **NF**)

· **Noise** spectrum factor 1-20 µV/ g*Hz (direction dependent)

· **SF** is not sensitive (**NF**)

Typical plots of the bias and noise contributors - in Annex 6.

3. Mounting Guidelines

The VG103 is lightweight. There is no need for a strong joint to a mating frame (object). There is a variety of simple methods to attach the gyro not deforming its housing.

3.1. Screw Mounting

- The mounting surface should be clean, smooth and flat.
- Plastic washers are preferable to avoid temperature induced stress.
- Torque screws M3 max to 3 Ncm limits. Use a manual torque wrench.

3.2. Adhesive Mounting

- Apply silicon adhesive to the bottom of the gyro.
- The mating surface should be flat and clean.
- Aim for an adhesive thickness of 0.2-0.4 mm.

3.3. 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.

3.4. Cable Routing

Use flexible cables with a low weight per length. Make sure that cable bending does not result in contacts stress.

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 500kOhm referred to ground. The amplifier should also have a good common mode rejection and a suitable bandwidth for the application.

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Annex 1. Product Main Parameters (analog models)

PERFORMANCE	VG103PT / VG103LN / VG103E
Input range (°/s)	350 / 170 / 350
Bias stability / Bias repeatability* (RMS, °/h)	1
Angle random walk (°/√h)	0.02 / 0.01 / 0.02
Bandwidth (kHz)	1
SF stability / SF repeatability* (RMS, %)	0.02
ELECTRICAL PARAMETERS	
Start-up (s)	0.03
Powering (W)	0.5
PHYSICAL PARAMETERS	
Dimensions (mm)	63 x 63 x 22
Weight (gram)	60
Volume (cl)	7
Housing material	plastic
ENVIRONMENT	
Temperature (operating, °C)	-40…+70
Temperature (endurance, 2 h,°C)	-55…+85
Vibration (RMS, 0.02 - 2 kHz, g)	18
Shocks (g, 1 ms)	750 / 750 / 350
RELIABILITY	
MTBF (20°C) / Lifetime (yrs)**	15 / 15 / 10

*** Day-to-day repeatability at fixed temperature**
**** Humidity conditions applied**

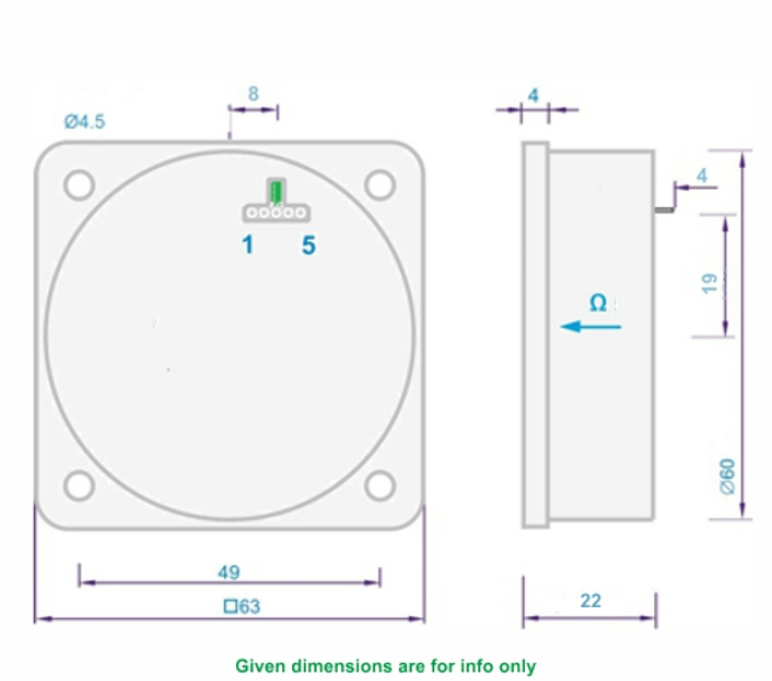
Annex 2. Product Main Parameters (digital models)

PERFORMANCE	VG103D / VG103LND
Input range (°/s)	350 / 170
Bias stability / Bias repeatability* (RMS, °/h)	1
Angle random walk (°/√h)	0.02 / 0.01
Bandwidth (kHz)	0.3 (default) / 1
SF stability / SF repeatability* (RMS, %)	0.02
ELECTRICAL PARAMETERS	
Data rate (kHz)	1.2 (default) / 4.8
Initialization (s)	1
Powering (W)	0.8
PHYSICAL PARAMETERS	
Dimensions (mm)	63 x 63 x 22
Weight (gram)	60
Volume (cl)	7
Housing material	plastic
ENVIRONMENT	
Temperature (operating, °C)	-40…+70
Temperature (endurance, 2 h,°C)	-55…+85
Vibration (RMS, 0.02 - 2 kHz, g)	12
Shocks (g, 1 ms)	350
RELIABILITY	
MTBF (20°C) / Lifetime (yrs)**	15

*** Day-to-day repeatability at fixed temperature**
**** Humidity conditions applied**

Annex 3. Outline Drawings, Axes Definition, Pin Assignment

(Ω) –sensing axis (±10')



PLS2-5S

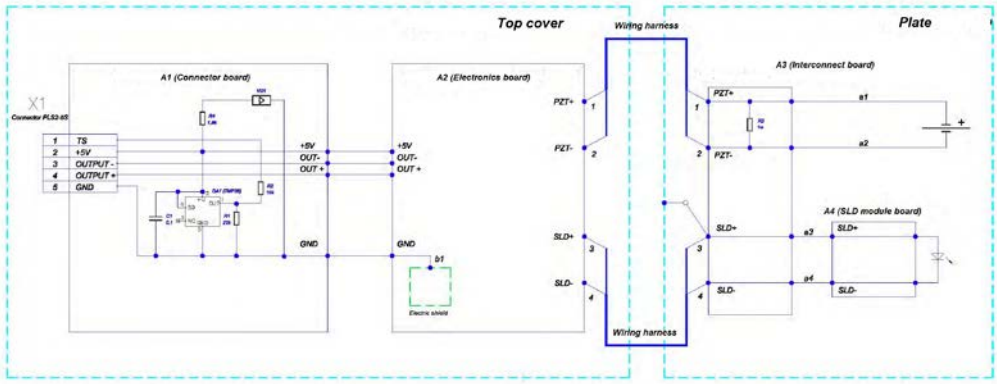
1	TS
2	+5V
3	OUT-
4	OUT+
5	GND

VG103PT, VG103E, VG103LN

1	RS 232 TXD /RS422 TA
2	+5V
3	NC / RS422 TB
4	G_GND
5	GND

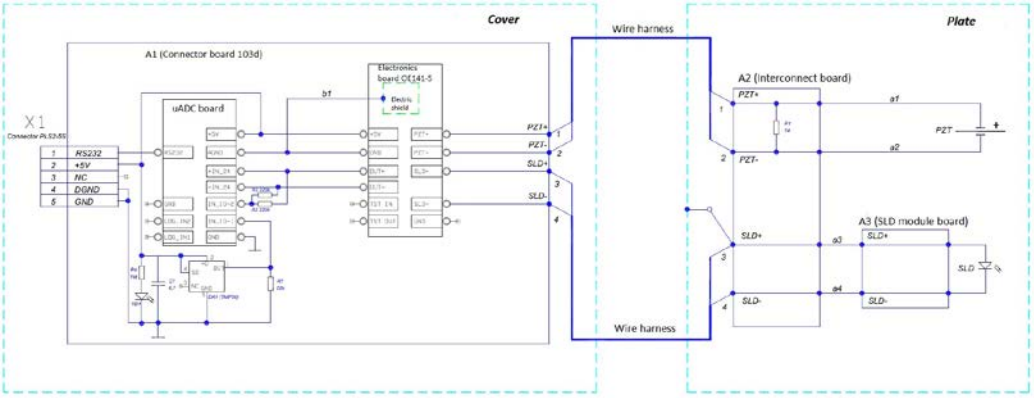
VG103D, VG103LND

Annex 4. Electrical Diagram (analog models)



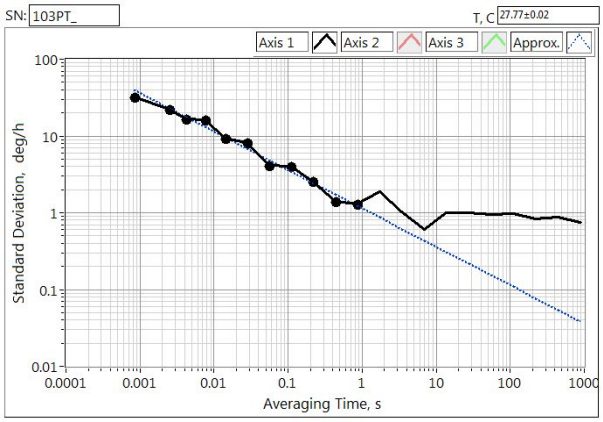
VG103PT, VG103E, VG103LN

Annex 5. Electrical Diagram (digital models)

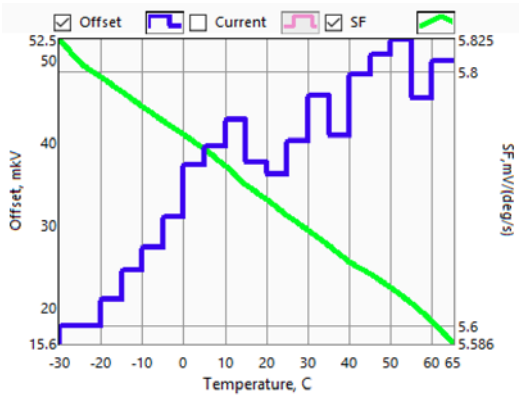


VG103D, VG103LND

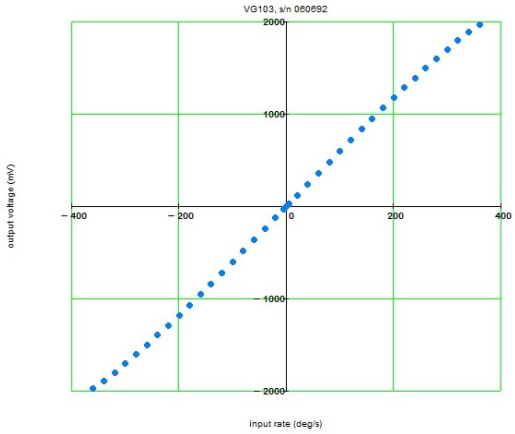
Annex 6. Typical Test Data



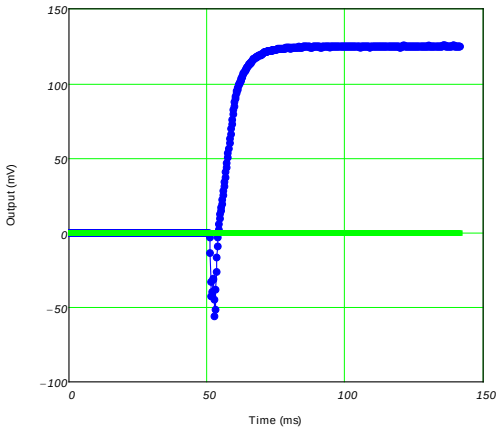
Allan Variance Plot



Main Parameters (Bias, SF) vs Temperature (output is non-compensated)



Output Voltage vs Angular Rate



Power-on Transient (ms) as Gyro Rotates 20 deg/s, time resolution 0.2ms

Annex 7. Output LP filter diagram