FIBER OPTIC GYROSCOPES

VG1703 SERIES

Information Guide

VG1703	Extension	Key Features	Fiber length, m
		1200 g	200
	S	20 gram, 1.5 cl	160
	SPE	0.25 Watt	160

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 ultra-compact lightweight design combined with super shock and vibration immunity.

The basic gyro model VG1703 offers enhanced precision due to the increased fiber length.

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

With an exclusive technology of precise polarization control all the models acquire Minimum Magnetic Sensitivity about 3°/h/Gauss and for most of applications can be used without heavy magnetic shielding.

To achieve ultimate magnetic immunity an optional shield for VG1703 model is available at extra cost (see Annex 3).

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. For electrical diagram see Annex 4.

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 cut-off frequency is ~1kHz (see the diagram in Annex 6).

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.

2.4. 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** (minimized response, non-shielded)
· **Bias** ~ 3°/h/Gauss (along X axis, nonadjustable response -**NF**)
· **SF** is not sensitive (**NF**)

♦ **Vibration**
· **Bias** is not sensitive (no g and g² 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 5.

[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.

3. Mounting Guidelines

The VG1703 is extremely lightweight. There is no need for a strong joint to a mating frame (object). There is a variety of simple methods how to attach the gyro not deforming its housing. The adhesive mounting is most recommended as it does not deliver any stress to the gyro and is quite reliable. It also provides sufficiently high resonance of the joint with low Q-factor.

The clamping is another possible method. Using plastic tighteners, ties, adhesive tapes, etc. is proved to be practical.

3.1. 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.

3.2. 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

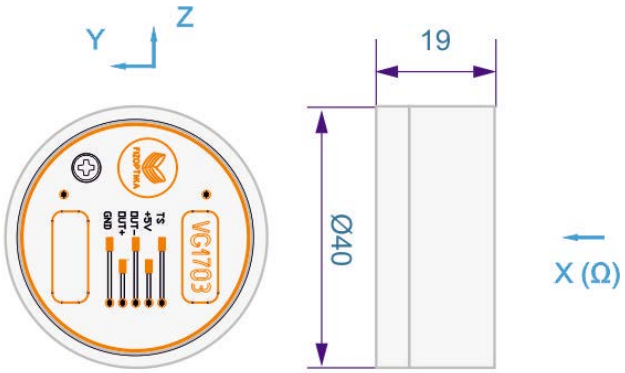
The outputs are DC-coupled and can be used in either single-ended or differential mode. Differential mode offers the best performance since the common mode errors and noise are minimized. The positive and negative outputs of the unit should be connected to differential input amplifiers with an input 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.

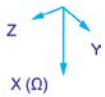
Annex 1. Product Main Parameters

PERFORMANCE	VG1703	VG1703S	VG1703SPE
Input range (°/s)	130	160	300
Bias stability / Bias repeatability* (RMS, °/h)	1	1	3
Angle random walk (°/√h)	0.008	0.01	0.025
Bandwidth (kHz)		1	
SF stability / SF repeatability* (RMS, %)		0.02	
ELECTRICAL INTERFACE			
Start-up (s)		0.03	
Powering (W)	0.5	0.5	0.25
PHYSICAL PARAMETERS			
Dimensions (mm)	Ø40 x 19	Ø40 x 12	Ø40 x 12
Weight (gram)	35	20	18
Volume (cl)	2.4	1.5	1.5
Housing material	Al	Al	Al & plastic
ENVIRONMENT			
Operating temperature (°C)		-40…+70	
Endurance temperature (> 2 h,°C)		-55…+85	
Vibration (RMS, 0.02 - 2 kHz, g)	30	12	12
Shocks (g, 1 ms)	1 200	350	350
RELIABILITY			
MTBF / Lifetime (yrs)**	15	15	30

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

Annex 2. Outline Drawings, Axes Definition, Pins Assignment

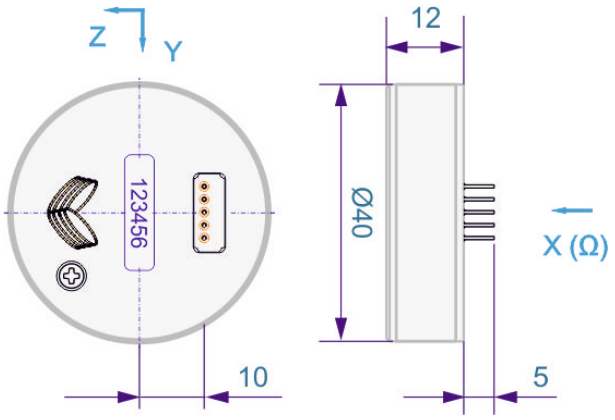




1	TS
2	+5V
3	OUT-
4	OUT+
5	GND

(Ω) –sensing axis (±10')

VG1703



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

PLS2-5S

(Ω) –sensing axis (±10')

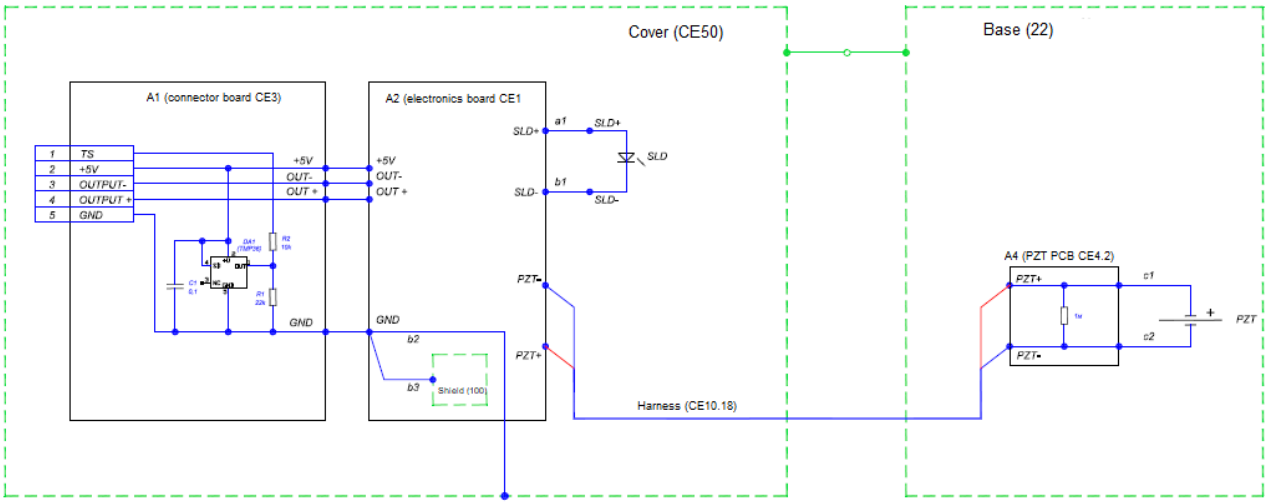
VG1703S (SPE)

Annex 3. Optional Magnetic Shield (VG1703)

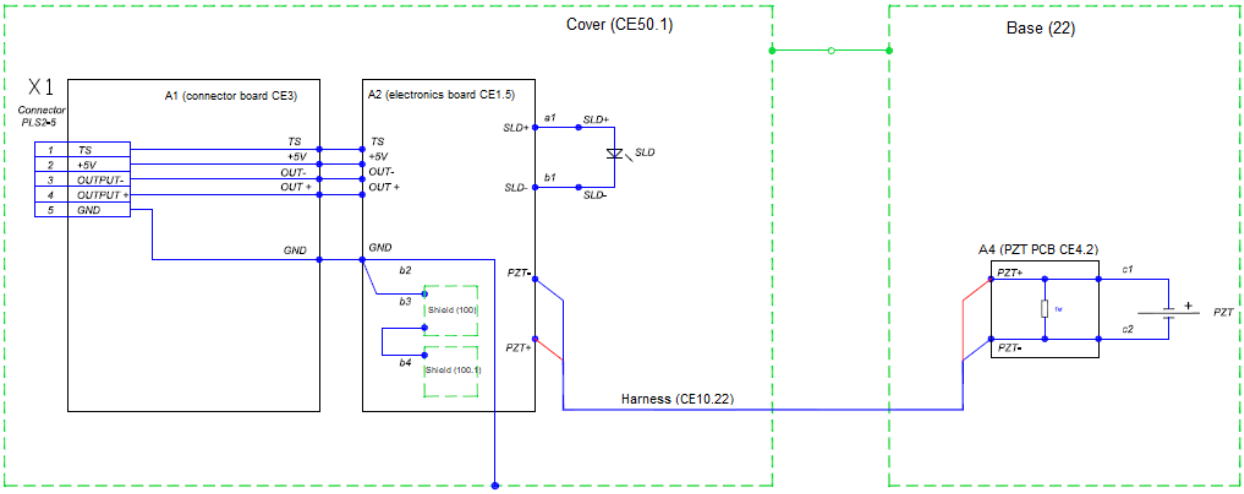
Parameter	Value
Dimensions (mm)	ø41.5 x 22
Weight (gram)	33
Shielded gyro magnetic response (°/h/Gauss)	0.03 typ

Annex 4. Electrical Diagram

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 gyro raw output (no error compensation).

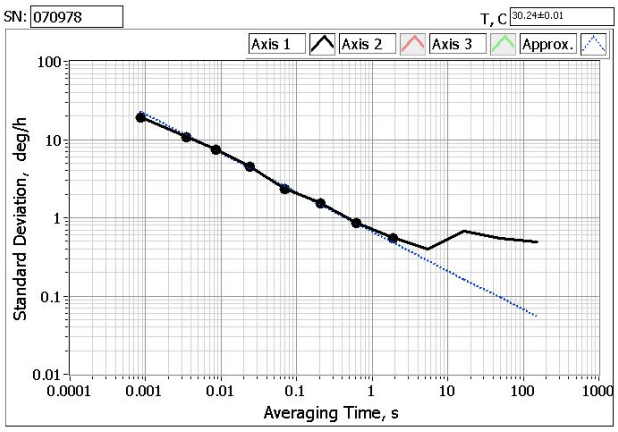


VG1703

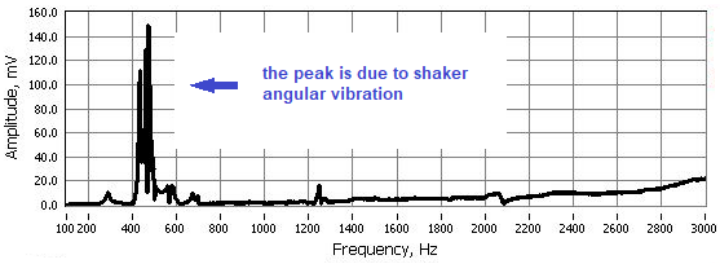


VG1703S (SPE)

Annex 5. Typical Test Data

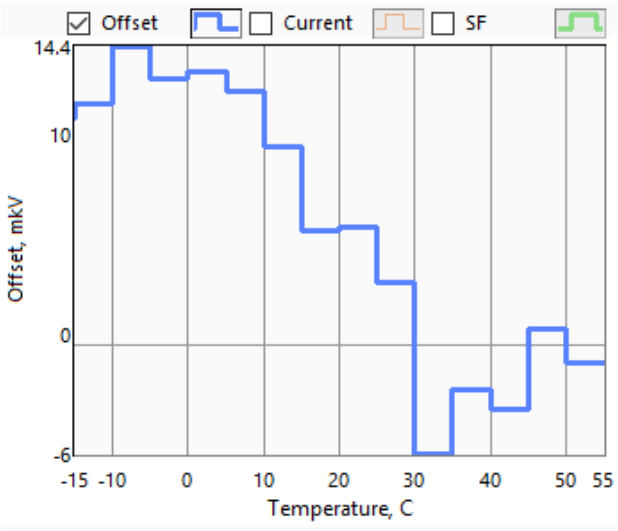


Allan Variance Plot

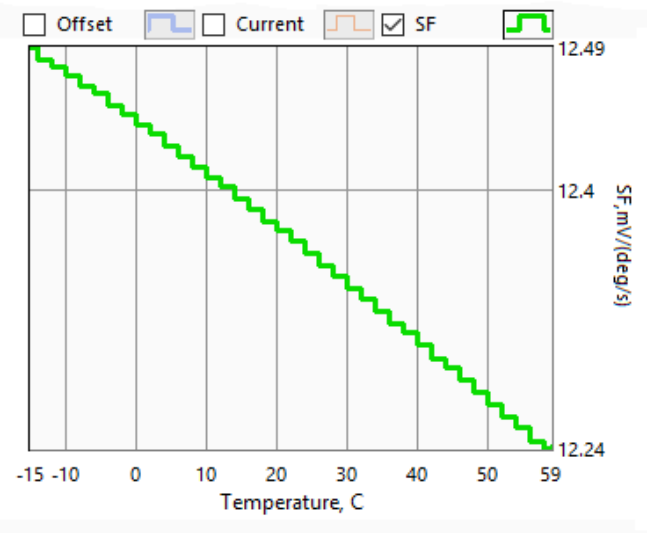


Output Component (AC) vs SINE Vibration

(2 g normalized)



Bias vs Temperature



SF vs Temperature

Annex 6. Output LP filter diagram