FIBER OPTIC GYROSCOPE

VG910 SERIES

Information Guide

<table>
<thead>
<tr>
<th>Output</th>
<th>Model Name</th>
<th>Key Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>differential</td>
<td>H</td>
<td>Basic model</td>
</tr>
<tr>
<td></td>
<td>H1</td>
<td>Highly robust</td>
</tr>
<tr>
<td></td>
<td>H125C</td>
<td>+125°C operating</td>
</tr>
<tr>
<td>single-ended</td>
<td>F1</td>
<td>Highly reliable</td>
</tr>
<tr>
<td>digitized</td>
<td>D</td>
<td>Built-in ADC</td>
</tr>
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1. Introduction

1.1. Scope

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 robust and reliable design coupled with a choice of outputs (differential, single-ended, digitized).

The basic model of the series is the VG910H (for outline dimensions, pins assignment, axes definition see Annex 1, for product specifications see Annex 3).

1.3. Essential

The gyro housing is silicone sealed. It is not fully hermetic. Keep the product dry during its whole lifetime.

Do not drop. Excessive shock can damage the unit.

The gyro can be damaged by electrostatic discharge (ESD). Use standard ESD practices when handling the unit.

2. Electrical Characteristics

2.1. Powering

The gyro requires a clean single voltage 5Vdc power. Voltages greater than 5.5 volts (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 2.

2.2. Analog Output $U_{O} = SF \cdot \Omega$

Open-loop gyro features:

- instant proportional response on absolute rotation along its sensitivity axis;

Open-loop gyro does not exhibit:

- bias jumps, day-to-day change, cross-axis errors, dead zones, $g/g^2$ components inherent in other gyros.

Typical values of the bias and noise contributors are demonstrated by Allan variance plot in the Annex 4. For more information regarding the analog output refer to Open-loop Fiber Optic Gyroscope. Info Notes.

2.3. Differential Output

The gyro provides output voltages via two leads (OUT+, OUT-) each biased at $U_0=1V$ to Common lead (GND).

$$U(+) = U_0 + \frac{1}{2} SF \cdot \Omega$$

$$U(-) = U_0 - \frac{1}{2} SF \cdot \Omega$$

Output voltage $U(\Omega) = U(+) - U(-) = SF \cdot \Omega$

The output impedance is 1kOhm (to GND). 2nd order LPF cutoff frequency is ~1kHz.

Diagnostics. $U_0 \neq 1V$ indicates gyro failure.

2.4. Single-ended Output

Advanced processing electronics performs continuous bias calibration at frequency 2.4 kHz to eliminate electronic component of the drift. Output voltage is provided via two leads - OUTPUT, AGND (Analog Ground).

$$U(\Omega) = SF \cdot \Omega$$

The output impedance is low (amplifier direct output). 3rd order LPF cutoff is ~1kHz

Diagnostics. $|I - I^*| > 20mA$ indicates gyro failure.

$I$ – consumption current, $I^*$ - factory data.

2.5. Temperature Output

The gyro provides temperature data via TS lead:

$$V(TS) = 0.5 + t \degree C / 100 \ [V]$$

Temperature output is single-ended.

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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.
2.6. Digitized Output

Digital signal is delivered via lead/s RS232 TXD / RS422 TA (TB). For operating modes and digital data content see Fiber Optic Gyroscope Digital Output RS232/RS422.

3. Mounting Guidelines

The VG910 is typically screw mounted.

3.1. Mating Frame

Resonances of the mating frame should exceed vibration frequencies. Otherwise, an extra noise at the output is possible.

3.2. Cable Routing

Use flexible cables with a low weight per length. Make sure that cable bending does not result in contacts stress.
Annex 1. Outline Drawing, Axes Definition, Pin Assignment

Annex 2. 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).
### Annex 3. Product Specifications*

<table>
<thead>
<tr>
<th>MAIN PARAMETERS</th>
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<tbody>
<tr>
<td>Input range (°/s)</td>
<td>250</td>
</tr>
<tr>
<td>Frequency range (kHz)</td>
<td>0…1</td>
</tr>
<tr>
<td>Angle random walk (°/√h)</td>
<td>0.015</td>
</tr>
<tr>
<td>Bias stability / Bias repeatability**(RMS, °/h)</td>
<td>2</td>
</tr>
<tr>
<td>SF stability / SF repeatability**(RMS, %)</td>
<td>0.02</td>
</tr>
<tr>
<td>Start-up (s)</td>
<td>0.03</td>
</tr>
<tr>
<td>Powering (W)</td>
<td>0.5</td>
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<table>
<thead>
<tr>
<th>PHYSICAL PARAMETERS</th>
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<tbody>
<tr>
<td>Dimensions (mm)</td>
<td>82 x 82 x 20</td>
</tr>
<tr>
<td>Weight (gram)</td>
<td>120</td>
</tr>
<tr>
<td>Volume (cl)</td>
<td>10</td>
</tr>
<tr>
<td>Housing material</td>
<td>aluminum alloy</td>
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<table>
<thead>
<tr>
<th>ENVIRONMENT</th>
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<tbody>
<tr>
<td>Operating temperature (°C)</td>
<td>-40…+70</td>
</tr>
<tr>
<td>Endurance temperature (&gt;2 h,°C)</td>
<td>-55…+85</td>
</tr>
<tr>
<td>Vibration (RMS, 0.02 - 2 kHz, g)</td>
<td>12</td>
</tr>
<tr>
<td>Shocks (g, 1 ms)</td>
<td>500</td>
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<table>
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<th>RELIABILITY</th>
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<tbody>
<tr>
<td>MTBF (20°C, h)**</td>
<td>100 000</td>
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<tr>
<td>Lifetime (yrs)</td>
<td>15</td>
</tr>
</tbody>
</table>

* Basic model. See respective datasheets for other models of the series.
** Day-to-day repeatability at fixed temperature
*** Humidity conditions applied
Annex 4. Typical Test Data

Allan Variance Plot

SF vs Temperature

Bias vs Temperature

Output Components (AC, DC) vs SINE Vibration
(2 g normalized)
[the peak is due to shaker angular resonance]

Shock Test Record (Y Direction)
(~690g x 1.3ms)
Output Voltage vs Angular Rate

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