KVH E•Core™ 2000 Series
Affordable, High Performance Fiber Optic Gyros

A precision Fiber Optic Gyro Sensor for the most demanding stabilization and positioning applications.
KVH E•Core™ 2000 Series – Ruggedized, High Performance Fiber Optic Gyros

The KVH E-Core 2000 fiber optic gyro (FOG) is the perfect replacement for troublesome mechanical gyroscopes in applications such as antenna and optical stabilization, navigation, positioning, robotics, and instrumentation. Wide bandwidth, excellent resolution, and bias stability combined with resistance to shock and vibration make the KVH E-Core 2000 the ideal upgrade and state-of-the-art solution for tracking, stabilization and GPS/FOG navigation.

Based on KVH’s exclusive E-Core fiber and precision fiber optic gyro technology, the device precisely measures angular rates up to 100 degrees per second with a resolution of 0.01 degrees/sec in 100 Hz bandwidth. This exceptional dynamic rate is complemented by bias stabilities of 2° per hour. The unit never requires recalibration and has excellent time and temperature characteristics.

The Economical Alternative to Mechanical Gyros for a Myriad of Applications

The E-Core 2000 FOG is an extremely economical alternative to mechanical gyroscopes for a variety of applications. Whether replacing a mechanical gyro or being integrated into a new system design, the E-Core 2000 series provides precision measurement of rotation with high reliability, ease of interface, and freedom from preventive maintenance.

Precision Performance and Price

Fabricated from KVH’s proprietary E-Core polarization-maintaining fiber, the KVH E-Core 2000 delivers superior fiber optic precision and reliable performance for the most demanding stabilization and positioning applications. Unlike mechanical gyros, the E-Core 2000 is a true single-axis rotation rate sensor insensitive to cross axis motion and errors. Its high bandwidth makes it particularly suitable for high dynamic applications. Additionally, the noise spectrum of the E-Core 2000 is exceptionally flat, lacking the discrete components of mechanical gyros. Aided by the unique properties of E-Core fiber, the KVH E-Core 2000 is intrinsically broadband and easily integrated into existing mechanical gyro applications. With no moving parts to maintain or replace, it lasts longer, functions better, and yields significant savings over the life of the product.

Applications

- Positioning
- Gun and Turret Stabilization
- Antenna Stabilization
- Optical/Camera Stabilization
- Industrial Robotics
- Training Simulator Stabilization
- Avionics – Attitude/Heading

KVH’s E-Core 2000 is a principal component in Xybion’s high accuracy positioning systems for optical and millimeter wave RF applications.
**Key Features and Advantages**

- **Fiber Optic Technology** – Proprietary E-Core elliptical fiber used in KVH FOGs exhibits low light loss and high polarization-maintaining ability. FOGs provide long life, stable operation, and insensitivity to vibration from rotation or acceleration in other axes.

- **Low Noise** – Angle Random Walk (ARW) factor of 5°/hr/rt-Hz for improved accuracy.

- **Temperature Stable** – Calibrated signal processing electronics feature low sensitivity to temperature variations and never require recalibration.

- **Rugged Aluminum Housing** – Features weather-resistant gasketing for optimum reliability.

- **Multiple Interfaces** – Analog or digital output.

- **Easy Integration** – Configured to easily integrate into your existing applications with no additional costs associated with switching from mechanical units to KVH fiber optic devices.

- **Affordable Design** – Flexible, maintenance-free design makes the E-Core 2000 an affordable off-the-shelf alternative to traditional units.

- **CE Marked** – Complies with the EC Electromagnetic Compatibility Directive.

- **EMI/RFI** – Units have been tested for radiated emissions, electromagnetic susceptibility and electrostatic discharge immunity. The circuits are protected against transients and reverse voltage polarity.

**KVH E-Core™ Technology**

The KVH E-Core series fiber optic gyros employ an open-loop optical configuration consisting of a broadband solid state optical source and polarization-maintaining fiber components fabricated from KVH E-Core elliptical-core fiber. The light energy passes through a first directional coupler that isolates the detector and a polarizer to ensure a single polarization state. The light is then split in two by the second directional coupler and fed into opposite ends of a coil of polarization-maintaining fiber. This coil serves as the sensing element. The operating principle is the Sagnac effect, which is also the basis of the ring laser gyro. When the coil is not rotating, the light path in either direction is the same length and the light adds in phase as it returns to the directional coupler and passes through the polarizer to the detector. Rotating the coil introduces a path length difference in the counter-rotating light paths. The phase difference in the two paths results in a change in amplitude of the recombined signals, proportional to the input rate.

The gyro has no moving parts, resulting in enhanced reliability. There are no cross-axis sensitivities to vibration, acceleration or shock and the gyro is stable with temperature and time, making it useful in a wide variety of applications.
**E•Core 2000 Series Fiber Optic Gyros Technical Specifications**

<table>
<thead>
<tr>
<th>Performance</th>
<th>RA2030</th>
<th>RA2100</th>
<th>RD2030</th>
<th>RD2100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Rate (max)</td>
<td>± °/sec</td>
<td>30</td>
<td>100</td>
<td>30</td>
</tr>
<tr>
<td>Resolution Rate</td>
<td>°/sec</td>
<td>0.014</td>
<td>0.014</td>
<td>0.004</td>
</tr>
<tr>
<td>Scale Factor</td>
<td>mv/°/sec</td>
<td>66.7</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Nonlinearity</td>
<td>%, rms</td>
<td>0.2</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Full Temp</td>
<td>%, p-p</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Bias Stability</td>
<td>°/sec, 1σ</td>
<td>0.0006</td>
<td>0.002</td>
<td>0.0006</td>
</tr>
<tr>
<td>Full Temp</td>
<td>°/sec, p-p</td>
<td>0.06</td>
<td>0.2</td>
<td>0.06</td>
</tr>
<tr>
<td>Repeatability</td>
<td>°/sec, typ.</td>
<td>0.012</td>
<td>0.04</td>
<td>0.012</td>
</tr>
</tbody>
</table>

10 Hz Update Rate

**Performance**
- Angle Random Walk (noise): 5 °/hr/rt-Hz
  0.08 °/rt-hr
- Instantaneous Bandwidth: 100 Hz
- Turn-on Time: 1 sec

**Output**
- Analog: +2.5 VDC (zero rotation)
  ±2 V, into ≥10K Ohm
- Digital: 16 bits, serial, RS232 (RS422 optional)
  9600 Baud
- Update Rate: 10 Hz (optional 100 Hz)

**Physical**
- Input Voltage: 12 VDC nominal (24 VDC optional)
  transient & reverse voltage protected
- Power Consumption: 2 watts (analog)
  3 watts (digital)
- Weight: 0.75 lbs. (0.34 kg)
- Size: 4.40" x 4.27" x 1.63" (112 x 108 x 41mm)
- Connector Type: 15-pin subminiature D-sub (DA15P)

**Environmental**
- Operating Temperature: -40°C to +75°C
- Storage Temperature: -50°C to +85°C
- Shock: 90 G
- EMI/RFI: CE, IEC 9081-2,3,4
- MTBF: 50,000 hour

© Copyright 1998, KVH Industries, Inc. KVH® and E•Core™ are trademarks of KVH Industries, Inc. Specifications subject to change without notice.