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# SIX- AXIS INERTIAL PLATFORM FOG33AA

## Compact size version Top Accuracy

## Fiber Optic Gyro

- Angular rate $\omega_x$ $\omega_y$ $\omega_z$

  Acceleration $a_x$ $a_y$ $a_z$

- Operating mode:

  - IMU body frame motion
  - AHRS attitude and motion recovery

- FOG Angular rate gyros and accelerometers with long time stability

- Low pass filter integrated within FOG33AA


- Top Accuracy Requirements
- Motor sports applications
- Towing tank models

FOG33AA is a Strap-down Fiber optic inertial platform combines three solid state rate gyros and three accelerometers that form a body frame reference.
Made to meet top accuracy requirement FOG33AA, shows, compact size and and includes low pass filter (5 poles Bessel type), with selectable frequency to optimise S/N ratio depending on applications.
FOG33AA employs **high quality fiber optic gyroscopes** (Sagnac effect), with superb thermal stability, linearity and repeatability.
Accelerometers are micro-machined silicon devices, use capacitance technology (KBEAM) provide high sensitivity with low thermal drift and noise.
Electronic circuits are made using SMD technology and all I/O connections are design to prevent damage resulting from reversing the power leads or shortcut the output.
Performance of inertial platform FOG33AA, especially stability and bandwidth up to 700Hz, gives system the ability to be used as IMU (Inertial Measurement Unit).
In IMU operating mode, measurement of the motion (angular rates and accelerations), provides output in voltage mode that can be sampled together with other relevant quantities, avoiding limitations concerning the use of RS-232 (baud rate, time shift).
Second operating mode of FOG33AA inertial platform is AHRS (Attitude and Heading Reference System), performed by post-processing software available on request.
The full set of inertial navigation equation is solved (in post-processing) by software wich gives very safe attitude measurement results.
In AHRS mode, FOG33AA gives attitude of body frame with respect to inertial frame reference system, and therefore is the solid state equivalent of a Free Vertical Gyro mechanical system, integrated with directional gyro.
Software provides output that are compensated for deterministic error sources within the unit and gives angular rates and accelerations of body frame and local frame reference.

## FOG33AA **specification**

| | **Rate** | **Acceleration** |
|---|---|---|
| Range | ±50, 100, 200, 300 °/s | ±2, 5, 10 g |
| Output Voltage | 0.5-4.5 V | 0.5-4.5 V |
| Bias Voltage | 2.5 V DC | 2.5 V DC |
| Sensor Frequency range | 1000 Hz | 300 Hz |
| Low pass filter | 1, 2, 4, 8, 16, 32, 64 Hz or not filter | |
| Linearity | 0.1% fs | 0.2% fs |
| Threshold | 0.002 °/s | 0.3 mg rms |
| In Run Bias | 0.003 °/s | |
| Run to Run Bias | 0.01 °/s | |
| Bias over Temperature | 0.1 °/s (-40 ÷ 80°C) | 0.2 mg/ °C |
| Noise | 0.0014 °/s/√Hz | 30μg /√Hz |
| Temperature output | 10 mV/ K available for external compensation | |

**Software**

| | | | |
|---|---|---|---|
| Compensation | | Bias, Random Bias, Scale factor | |
| Configuration | IMU Body frame | Angular rate | $\omega_x$ $\omega_y$ $\omega_z$ |
| | | Acceleration | $a_x$ $a_y$ $a_z$ |
| | AHRS Inertial frame | Angular rate | $\Omega_x$ $\Omega_y$ $\Omega_z$ |
| | | Acceleration | $A_x$ $A_y$ $A_z$ |
| | | Attitude Roll | $\rho$ Pitch $\beta$ Yaw $\sigma$ |

**Environmental**

| | |
|---|---|
| Operating Temperature | -40 to +80 °C |
| Vibration Survival | 10 g rms (20 to 2kHz all axes) |
| Shock | 500 g (3 ms half sine) |
| **Physical** | |
| Mass | 0.59 kg |
| Dimensions | 113 x 114 x 85 mm |
| **Electrical** | |
| Supply Voltage | 10 to 30 V DC |
| Operating Power | < 7.5 Watt |
| Start-up Time | 0.1 s |

# ANALYSIS SOFTWARE

The software, working in Matlab language, provides the AHRS operating mode of inertial platform FOG33AA.
The full set of inertial navigation equation is solved by algorithms meeting configuration and application requirements.

- Quaternion
- Euler angles
- Infinitesimal rotation

Analysis software provides output that are compensated for deterministic error sources and use accelerometers as Internal Augmentation:

- Offset run to run compensation
- Scale factors and in run bias compensation
- Initial attitude of inertial platform
- Numerical filtering of angular rates and accelerations

Graphical results provided by software:

- Roll, Pitch and Yaw angle
- Body frame and Inertial frame angular rates and accelerations
- Frequency domain analysis of relevant quantities

Software based on Labview and Fortran language will be also available.