

Technical Product Description



SmartIMU

6DOF Gyro Stabilized Orientation Sensor with Integrated GPS

Features

- Digital Outputs
- Dynamic Calibration
- RS-232 Serial Interface
- GPS Integration
- 9V-24V Supply Power

Applications

- Unmanned Applications
- Motion Control
- 3D Sensing/Mapping

Introduction

The SmartIMU provides an intelligent orientation and positioning solution in a compact footprint. The combination of a tri-axial magnetometer, three orthogonal rate gyros, a tri-axial accelerometer, and a GPS module accurately measures position and orientation in static and dynamic environments.

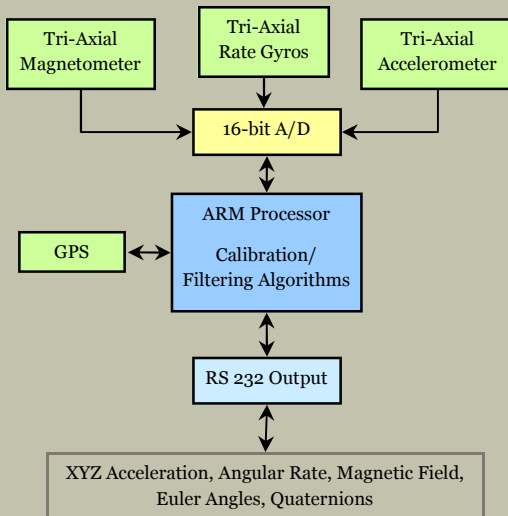
SmartIMU—6DOF Gyro Stabilized Orientation Sensor with Integrated GPS

The SmartIMU utilizes the sensor suite for robust and accurate orientation estimates in static and dynamic environments. The addition of a GPS module with an integrated antenna provides supplemental position information. The novel filtering, adaptation, and calibration algorithms combine all sensor data into an accurate position and orientation solution.

The programmable output format provides flexible integration into UAV, UGV, and other unmanned systems.



SmartIMU Block Diagram



Specifications

Processor	
Type	Philips ARM 7
Speed	60 MHz
Rate Gyros	
Axes	3 DOF
Full-Scale Range	$\pm 320^\circ/\text{sec}$
Magnetometer	
Axes	3 DOF
Full-Scale Range	± 11 gauss
Sensitivity	.00015 gauss
Accelerometer	
Axes	3 DOF
Full-Scale Range	± 3.6 g
Sensitivity	300 mV/g
Operation & Storage	
Input Supply Voltage	9V–24V (5W max)
Package Dimensions, Weight	3.3" x 2.2" x 1.4", < 5 oz.
Operating/Storage Temperature	-20C to 70C, -40C to 85C
Humidity	85% Non-Condensing RH
Powered/Unpowered Shock Rating	30G/200G

Ordering Information

Model	Description	Gyro ($^\circ/\text{sec}$)
SmartIMU 300-1.2	6DOF IMU & GPS	± 320

SmartIMU—6DOF Gyro Stabilized Orientation Sensor with Integrated GPS

Detailed Specifications

GPS	
Receiver Type	50-channel L1 frequency, C/A Code GALILEO Open Service L1
GPS Update Rate	4 Hz
Horizontal Position Accuracy	Autonomous <2.5m SBAS <2.0m
Time to First Fix	29s (Cold Start) 29s (Warm Start) <1s (Hot Start)
Sensitivity	-160 dBm (Tracking & Navigation/ Reacquisition) -144 dBm (Cold Start)
Timing Accuracy	30 ns RMS
Velocity Accuracy	0.1m/s (50% @30m/s)
Heading Accuracy	0.5 degrees (50% @30m/s)
Attitude and Heading	
Angular Resolution	0.005 degrees
Roll	±180 degrees
Pitch	±90 degrees
Yaw	±180 degrees
Static Accuracy	±1.0 degrees (Roll, Pitch)
Static Accuracy	±5.0 degrees (Yaw) ¹
Dynamic Accuracy	±2.0 degrees (Roll, Pitch) ²
Dynamic Accuracy	±10.0 degrees (Yaw) ²
Max Update Rate	100 Hz

¹Under uniform magnetic field and proper calibration procedure

²Within angular rate saturation limits

IMU Sensor Performance	
Rate Gyros	
Linearity	0.1% of FS
Bias Stability	0.016 degrees/sec (1 σ)
Noise	0.48 degrees/sec RMS
Bandwidth	50 Hz (3 dB)
Max Update Rate	250 Hz
Accelerometer	
Linearity	0.3% of FS
Noise Density	≤350 $\mu\text{g}/\sqrt{\text{Hz}}$ RMS
Bandwidth	50 Hz
Max Update Rate	1 kHz
Magnetometer	
Linearity	0.6% of FS
Noise Density	≤350 $\mu\text{g}/\sqrt{\text{Hz}}$ RMS
Bandwidth	50 Hz
Max Update Rate	2 kHz