



Overview

The **μIMU™** is a miniature calibrated sensor module consisting of an Inertial Measurement Unit (IMU), magnetometer, barometer, and onboard L1 GPS (GNSS) receiver. Data out includes angular rate, linear acceleration, magnetic field, barometric altitude, and GPS.

The **μAHRs™** is an Attitude Heading Reference System (AHRs) that includes all functionality of the μIMU™ and fuses IMU and magnetometer data to estimate roll, pitch, and heading.

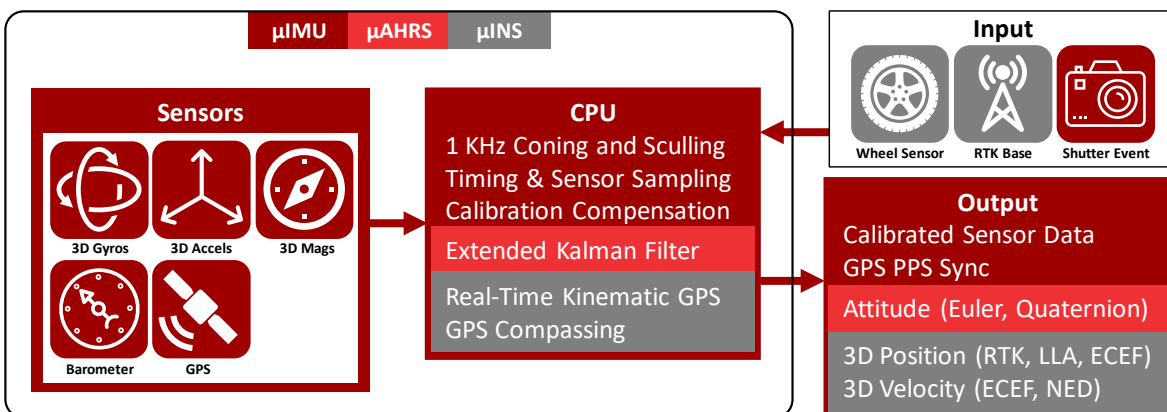
The **μINS™** is a GPS (GNSS) aided Inertial Navigation System (GPS-INS) module that includes all functionality of the μAHRs™ and provides orientation, velocity, and position. Sensor data from MEMs gyros, accelerometers, magnetometers, barometric pressure, and GPS/GNSS is fused to provide optimal estimation.

Applications

- Drone Navigation
- Unmanned Vehicle Payloads
- Aerial Survey
- Stabilized Platforms
- Antenna and Camera Pointing
- First Responder and Personnel Tracking
- Health, Fitness, and Sport Monitors
- Robotics and Ground Vehicles
- Maritime

Features

- **NEW** – Rugged Enclosure
- **NEW** – Precision RTK GNSS
- Up to 1KHz IMU, 500Hz INS Update Rate
- Attitude (Roll, Pitch, Yaw, Quaternions), Velocity, and Position UTC Time Synchronized
- Dual Redundant IMUs Calibrated for Bias, Scale Factor, and Cross-Axis Alignment
- On-Board u-Blox L1 GPS (GNSS) Receiver(s)
- Barometric Pressure and Humidity
- -40°C to 85°C Sensor Temperature Calibration
- Onboard World Magnetic and Gravity Models
- Binary and NMEA ASCII Protocol
- Strobe In/Out Data Sync (Camera Shutter Event)
- Fast Integration with SDK and Example Software
- Data Logging (SDK and Application Software)





Specifications

| Performance (μINS, μAHRS) | Typ | RTK-GPS |
|------------------------------|------|---------|
| Roll/Pitch (RMS) | 0.1° | |
| Static Heading* (RMS) | 2.0° | |
| μINS Dynamic Heading** (RMS) | 0.3° | |

*Position is stationary. **Requires GPS lock with periodic >0.8 m/s² acceleration and >2 m/s velocity.

| Performance | Typ | RTK-GPS |
|---|---------------|---------|
| Horizontal Position (w/ SBAS) | 2.5 m (2.0 m) | 3 cm |
| Vertical Position | 2.5 m | 5 cm |
| Velocity | 0.05 m/s | |
| Angular Resolution | 0.05° | |
| Operation Limits | | |
| Velocity | 500 m/s | |
| Altitude (GPS) | 50 Km | |
| Altitude (Barometric) | 10 Km | |
| Startup Time | 0.8 sec | |
| GPS Lock Time | | |
| Hot Start | 1 sec | 10 sec |
| Cold Start | 30 sec | 2-4 min |
| GNSS Receiver Sensitivity | | |
| Tracking & Navigation | -164 dBm | |
| Cold Start | -147 dBm | |
| Hot Start | -156 dBm | |
| GPS Update Rate | 5 Hz | |
| Max Output Data Rate (IMU, INS) | 1 KHz, 500 Hz | |
| GPS_PPS Time Sync. Pulse (10% duty cycle) | 1 Hz | |
| RMS Accuracy | 30 ns | |
| 99% Accuracy | 60 ns | |
| IMU signal latency | 4 ms | |
| Humidity Sensor Relative Accuracy | ±3 % | |

| Absolute Maximum Ratings | MAX | |
|----------------------------|---|----------------------|
| Acceleration | 10,000 g | |
| Storage Temperature (μINS) | -45 to 85 °C | Barometer limitation |
| Overpressure | 600 kPa | |
| ESD rating | ± 2 kV | Human body model |
| Soldering Temperature | Hand Solder ONLY. Do NOT solder reflow. | |

| Sensors | IMU - Gyros | IMU - Accels | Mags | Pressure |
|-----------------------------|---------------|--------------------------|----------|------------|
| Operating Range | ±2000 °/sec | ±16 g | ±4800 μT | 30–120 kPa |
| Bias Repeatability | < 0.2 °/sec | < 5 mg | | |
| In-Run Bias Stability | < 10 °/hr | < 40 μg | | |
| Random Walk | 0.15 °/Vhr | 0.07 m/s/Vhr | | |
| Non-linearity | < 0.1 % FS | < 0.5 % FS | | |
| Noise Density | 0.01 °/s/VHz | 300 μg/VHz | | Pa/VHz |
| Bias Error over -40C to 85C | 0.7 °/s RMS | 0.4 m/s ² RMS | | |
| Max Output Rate | 1 KHz | 1 KHz | 100 Hz | 50 Hz |
| Bandwidth | 250 Hz | 218 Hz | 50 Hz | 5 Hz |
| Alignment Error | 0.05° | 0.05° | 0.05° | |
| Sampling Rate | 8 KHz | 4 KHz | 100 Hz | 250 Hz |
| Resolution | *0.0076 °/sec | *122 μg | 0.6 μT | 0.0016 kPa |

*1KHz resolution after oversampling (13 cm)

| Data Output | μIMU™ | μAHRS™ | μINS™ |
|------------------------------------|-------|--------|-------|
| GPS, GPS Raw, UTC Time | • | • | • |
| IMU (Gyro & Accelerometer) | • | • | • |
| Magnetometer & Barometer | • | • | • |
| Attitude (Quaternions, Euler, DCM) | | • | • |
| Inertial Velocity & Position | | | • |

| Electrical (μINS, μAHRS, μIMU) | Min | Typ | Max | Units |
|--------------------------------|------|-----|-----|-------|
| Power Consumption | | | | |
| μIMU @ 1KHz | | 340 | | mW |
| μINS, μAHRS @ 250Hz | | 412 | | mW |
| Supply Voltage (Vcc) | 3.0 | 3.3 | 3.6 | V |
| GPS VBAT Voltage | 1.4 | 3.3 | 3.6 | V |
| GPS VBAT Current @ 3.0V | | 15 | | μA |
| GNSS Antenna Supply Voltage | 2.7 | 2.9 | 3.0 | V |
| I/O Pin MAX Voltage Range | -0.5 | | 3.6 | V |
| Total Output Current, All Pins | | | 120 | mA |
| I/O Pin Input low-level | 0.99 | | | V |
| I/O Pin Input high-level | 2.31 | 3.3 | 3.6 | V |
| I/O Pin Output high-level | | 3.3 | | V |
| STROBE pulse duration | 1 | | | ms |
| STROBE pulse period | 5 | | | ms |

| Electrical (μINS with Rugged/EVB) | Min | Typ | Max | Units |
|-----------------------------------|-----|-----|-----|-------|
| Supply Voltage (VIN) | 4.0 | | 20 | V |
| *Rising Slope of VIN | 2.4 | | | V/ms |
| μINS with Rugged or EVB | | | | |
| Current Draw @ 5V, 250Hz** | | 125 | | mA |
| Power Consumption @250Hz** | | 625 | | mW |
| Power Consumption @100Hz** | | 575 | | mW |

*The supply rising slope must be higher than minimum rating for proper function.

**Navigation filter update rate.

| Mechanical (μINS, μAHRS, μIMU) | | Units |
|--------------------------------|-------------------|-------|
| Size | 16.5 x 12.6 x 4.6 | mm |
| Weight | 1.3 | grams |

| Mechanical (Rugged μINS) | | Units | Conditions |
|-------------------------------------|--------------------|-------|-------------------|
| Size | 25.4 x 25.4 x 11.2 | mm | W/o mounting tabs |
| | 35.9 x 25.4 x 11.2 | | W/ mounting tabs |
| Distance Between Mounting Tab Holes | 30.836 | mm | |
| Weight | 10.5 | grams | |

| Communications | |
|-------------------------------|------------------------------------|
| Interface | TTL, SPI*, I2C* |
| Rugged Interface (IS-RUG-1.x) | USB, TTL, RS232, RS485, CAN*, I2C* |
| Max Baud Rate: | |
| TTL, RS422, RS485 | 3 Mbps |
| RS232 | 500 Kbps |

*Available in future firmware update.



Development Kits available on our website.

