The Inertial Labs Single and Dual Antenna GPS-Aided Inertial Navigation System – INS is a new generation of fully-integrated, combined GPS, GLONASS, GALILEO, QZSS, BEIDOU and L-Band navigation and high-performance strapdown system, that determines position, velocity and absolute orientation (Heading, Pitch and Roll) for any device on which it is mounted. Horizontal and Vertical Position, Velocity and Orientation are determined with high accuracy for both motionless and dynamic applications.

The Inertial Labs INS utilizes advanced single and dual antenna GNSS receiver, barometer, 3-axes each of calibrated in full operational temperature range precision Fluxgate magnetometers, Accelerometers and Gyrosopes to provide accurate Position, Velocity, Heading, Pitch and Roll of the device under measure. INS contains Inertial Labs new on-board sensors fusion filter, state of the art navigation and guidance algorithms and calibration software.

KEY FEATURES AND FUNCTIONALITY

- Affordable price
- Excellent accuracy in GPS-Denied environments (up to 0.05 % DT)
- Tactical-grade IMU + Fluxgate compass + Aiding data
- Support: ROS, LabVIEW, Waypoint Inertial Explorer, QINSy
- GPS, GLONASS, GALILEO, BEIDOU, SBAS, DGPS, RTK supported signals
- Tactical-grade IMU (1 deg/hr gyroscopes and 5 micro g accelerometers Bias in-run stability)
- Fluxgate gyro-compensated compass to maintain free-inertial Heading (INS-P model)
- Single and Dual antenna GNSS receivers
- Compatibility with LiDARs (Velodyne, RIEGL, FARO) and optical cameras
- Odometry, Wheel sensor, Airspeed sensor, Wind sensor, Doppler shift from locator aiding data
- 1 cm + 1 ppm RTK Horizontal Position Accuracy or 2.5 cm TerraStar-C PRO Horizontal Position Accuracy
- 0.05 deg GNSS Heading and <0.4 deg Free-inertial Heading accuracy (3 sigma)
- Advanced, extendable, embedded Kalman Filter based sensor fusion algorithms
- State-of-the-art algorithms for different dynamic motions of Vessels, Ships, Helicopters, UAV, UUV, UGV, AGV, ROV, Gimbals and Land Vehicles
- Implemented ZUPT, GNSS tracking angle features
- Full temperature calibration, Environmentally sealed (IP67), compact design, MIL-STD-810G/DO-160E

Models & features

<table>
<thead>
<tr>
<th>INS-B</th>
<th>INS-P</th>
<th>INS-D</th>
<th>INS-DL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>Professional</td>
<td>Dual Antenna</td>
<td>Dual Antenna</td>
</tr>
<tr>
<td>Ideal solution for remote sensing (UAV, LiDAR, Optical Camera, Point Clouds)</td>
<td>High performance in long-term GPS-Denied environment</td>
<td>High precision Heading Tactical-grade IMU SP/SBAS/DGPS/RTK</td>
<td>High precision Heading Industrial-grade IMU 1 cm RTK position</td>
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</tbody>
</table>
### GENERAL

- **Available colors of enclosure:** Black (default), Desert Tan or Green
- **Data rate:** Hz
  - Up to 200 (INS data): Up to 2000 (IMU data)
  - Up to 200 (INS) & 2000 (IMU)
- **Start-up time:** sec
  - <1

### Positions, Velocity and Time

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>INS-B</th>
<th>INS-P</th>
<th>INS-D</th>
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<tbody>
<tr>
<td>Output signals</td>
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<tr>
<td>• Positions, Heading, Dual antenna Heading (D/DL), Pitch, Roll, Velocity, Accelerations, Angular rates, Barometer, PPS</td>
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<tr>
<td>• Direct AT&amp;TINS message with Position, Heading, Pitch &amp; Roll to COBHAM AVIATOR UAV 200</td>
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<tr>
<td>Input signals</td>
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<tr>
<td>• Marine application: DVOL (Doppler Velocity Log)</td>
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<tr>
<td>• Land application: Odometer, Wheel sensor, Encoder, DMI</td>
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<tr>
<td>• Aerial application: Wind sensor, Air Speed Sensor, Doppler shift from locator (for long-term GPS denied)</td>
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<tr>
<td>• All: External Stand Alone Magnetic Compass (SAR/AHRS)</td>
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<tr>
<td>Main features</td>
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<tr>
<td>Ideal solution for remote sensing (with LiDAR, Optical Camera)</td>
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<tr>
<td><strong>High performance in long-term GPS-Denied environment</strong></td>
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<td><strong>High precision Heading</strong></td>
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<tr>
<td>Tactical-grade IMU</td>
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<tr>
<td><strong>Affordable price</strong></td>
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<tr>
<td><strong>High precision Heading 1 cm RTK position</strong></td>
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</tbody>
</table>

### Navigation

- **Horizontal position accuracy (GPS L1) (2)**
  - meters, RMS
  - ±1.5 m

### GNSS

- **Horizontal position accuracy (GPS L1/L2) (2)**
  - meters, RMS
  - ±1.5 m

### Orientation

- **Horizontal position accuracy (GPS L2) (2)**
  - meters, RMS
  - ±1.5 m

### Navigation

- **Position accuracy (free inertial, land vehicles)**
  - %, DT
  - 0.2% DT (w/o odometer input)
  - 0.5% DT (w/ odometer input)

### Heading

- **Range:** deg
  - 0 to 360

### Pitch and Roll

- **Range:** Pitch, Roll deg
  - ±90, ±180

### GNSS

- **Number of GNSS Antennas**
  - Single
  - Single
  - Dual
  - Dual

### Gyroscopes

- **Measurement range:** deg/sec
  - ±150 to ±950

### Accelerometers

- **Bias in-run stability (RMS, Allan Variance):** deg/hr
  - <0.2 (0.08 optional)

### Magnetometers

- **Measurement range:** Gauss
  - ±16

### Pressure

- **Measurement range:** hPa
  - 300 to 1100

### Electrical

- **Supply voltage:** V DC
  - 9 to 36

### Physical

- **Size:**
  - 120 x 50 x 53

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**Notes:**

1. INS only
2. Requires a subscription to a Terrastar data service
3. RMS, incremental error growth from steady state accuracy
4. Post-processing results using third party software
5. Calibration in white operative temperature range, in homogeneous magnetic environment, for latitude up to ±65 deg
6. tracks up to 60 L1/L2 satellites; 50 m to 80 satellites while tracking up to 26 satellites.
7. 20 Hz position-update rate for Basic model of INS
8. Dynamic accuracy may depend on type of motion.
9. Time accuracy does not include biases due to RF or antenna delay.
Inertial Labs GPS-Aided INS key sensors (IMU) performance

![Graph showing sensor performance](image1)

Inertial Labs GPS-Aided INS key applications

![Images of various applications](image2)
**INS part numbers structure**

<table>
<thead>
<tr>
<th>Model</th>
<th>Gyro</th>
<th>Accel</th>
<th>Calibration</th>
<th>Connector</th>
<th>Color</th>
<th>GNSS receiver</th>
<th>Version</th>
<th>Interface</th>
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<td>VD9</td>
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</tbody>
</table>

**Example:** INS-B-G450-A8-TGA-C3D-O719-V0.1

- INS-B: Basic Model of GPS-Aided Inertial Navigation System
- INS-P: Professional Model of GPS-Aided Inertial Navigation System
- INS-D: Dual Antenna GPS-Aided Inertial Navigation System
- INS-DL: Dual Antenna GPS-Aided Inertial Navigation System

**Interface connector type:** Binder. Male receptacle, shielded, rear-mounting.

**GNSS antenna connector type:** TNC - Female

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**Notes:**

1. All dimensions are in millimeters.
2. All dimensions within this drawing are subject to change without notice. Customers should obtain final drawings before designing any interface hardware.

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**INS-D and INS-DL mechanical interface drawing**

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**INS-B and INS-P mechanical interface drawing**

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**Inertial Labs**

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