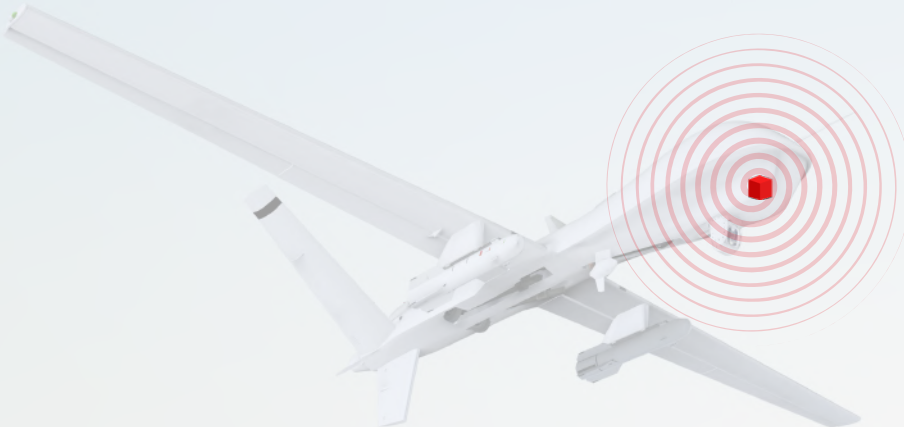


Navigation Systems for Drones, Land Vehicles
and Autonomous Systems

ArNav S Series



ArNav M Series



Integrated Navigation and Guidance System Technologies

ArdicLabs is the leading innovator of high-end critical technology in guidance, navigation, control and image processing applications. The company manufactures a wide range of embedded navigation systems for air, land, sea, and space applications.

Our team has highly experienced and motivated professionals to accomplish our vision of becoming a globally recognized establishment providing guidance, navigation and control for autonomous systems and aerospace industry.



ArNav M Series

KEY FEATURES

- MEMS based alternative to the tactical systems
- GNSS/INS with RTK and Dual Antenna capabilities
- Ruggedized packaging and robust calibration

■ **ArNav M** is the high performance series of the **ArNav** family. **ArNav M** series consist of GNSS/INS (ArNav M2G or ArNav M1G), real-time kinematic GNSS/INS (ArNav M2GR) and double antenna GNSS/INS (ArNav M2HDR) products.

■ **ArNav** incorporates enhanced calibration techniques and a sophisticated Kalman filter to provide consistent performance under challenging dynamic conditions over a wide temperature range. The systems output high frequency position, velocity and attitude information in addition to calibrated 3D acceleration, rotation, magnetic field and pressure data. GNSS/INS systems yield optimal position, velocity and attitude data even under high dynamic conditions. Double antenna systems yield accurate heading data even under static conditions.

■ Onboard Sensor Calibration

Highly sophisticated filters running on the system continuously, estimate the errors of inertial sensors in an optimal manner to output highly accurate navigation solutions.

■ Magnetometer Calibration

Easy to use hard-iron and soft-iron calibration procedure for magnetometers.

■ Multi-Measurements

Various type of measurements may be switched on or off with respect to the needs of specific application.



ArNav S Series

KEY FEATURES

- GNSS/INS with size 33mm x 33mm x 15.8mm
- Cost effective AHRS, GNSS/INS and RTK
- Easy integration and use

■ **ArNav S** series is the MEMS-based low cost, miniaturized form of the **ArNav** family. **ArNav S** series consist of AHRS (ArNav S1A), GNSS/INS (ArNav S1G) and real-time kinematic GNSS/INS (ArNav S1GR) products.

■ Multi-band GNSS

GNSS/INS with 184 channels (L1C/A, L1OF, E1, B1I, L2C, L2OF, E5b, B2I) and various constellations (GPS, GLONASS, Galileo, BeiDou, QZSS, SBAS)

■ Double Antenna GNSS Based Heading

Two GNSS antenna based heading estimations maintain highly accurate heading data even under low dynamic situations.

■ Easy to Use

Hex and binary messages. ArView User Interface.

Technical Specifications

| Capabilities | M2G | M2GR | M2HDR | S1A | S1G | S1GR |
|-------------------------------|-----|------|-------|-----|-----|------|
| Inertial Measurement | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Magnetic Heading | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Attitude | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Pressure Altitude | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Position & Velocity | ✓ | ✓ | ✓ | | ✓ | ✓ |
| GPS, GLONASS, Galileo, BeiDou | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Multiple Band | | ✓ | ✓ | | | ✓ |
| Real Time Kinematic | | ✓ | ✓ | | | ✓ |
| Double Antenna | | | ✓ | | | |

| Performance | M2 Series | S Series |
|--|--|---------------------------|
| Accelerometer Full Range ¹ | ±40 g | ±6 g |
| Gyroscope Full Range ² | ±500°/s | ±250°/s |
| Output Update Rate | 100 Hz | 100 Hz |
| Roll, Pitch Accuracy | 0.1° | 0.2° |
| Heading Accuracy (GNSS & Dynamic) | 0.2° | 0.4° |
| Heading Accuracy (Magnetometer/Double Antenna) | 1° / 0.1° (2 meter antenna separation) | 1° |
| Pressure Altitude Accuracy | < 10 m (with baro setting) | < 10m (with baro setting) |
| Position Accuracy (Horizontal-Vertical) | 2.0 m -2.5 m | 2.0 m -2.5 m |
| Position Accuracy (with L1\L2 RTK) | 2 cm -3 cm | 2 cm -3 cm |
| Velocity Accuracy | 0.05 m/s | 0.05 m/s |
| Velocity Accuracy (with L1\L2 RTK) | 0.007 m/s | 0.007 m/s |

¹ Optional Accelerometer Range : 8g, 16g for M2 Series & 3g, 10g, 20g for S1 Series

² Optional Gyroscope Range : 125°/s, 2000°/s for M2 Series & 125°/s, 500°/s, 2000°/s for S1 Series

| | M Series Gyroscope | M Series Accelerometer | S Series Gyroscope | S Series Accelerometer |
|--------------------|--------------------|------------------------|--------------------|------------------------|
| Dynamic range | ±500 °/s | ±40 g | ±250 °/s | ±6 g |
| Bias repeatability | 0.14 °/s | 1.5 mg | 1°/s | 20 mg |
| Bias stability | 2.7 °/hr | 13 µg | 0.015°/s/°C | 0.2 mg/°C |
| Noise density | 0.004°/s/√Hz | 70 µg/√Hz | 0.014 °/s/√Hz | 190 µg/√Hz |
| Alignment error | 1 mrad | 1 mrad | 10 mrad | 8 mrad |
| Bandwidth | 140 Hz | 140 Hz | 47 Hz | 40 Hz |

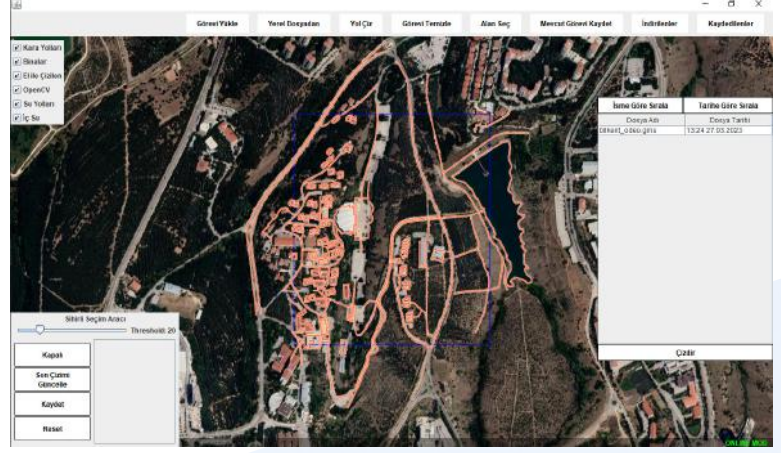
| Mechanical & Electrical | M2 Series | S1 Series |
|-------------------------|------------------------------|------------------------------|
| Size(mm) | 62 x 60 x 30 | 33 x 33 x 15.75 |
| Weight | < 200 g | < 40 g |
| Data & Power Connector | Fischer Ultimate Series | Harting har-flex 16 pin |
| GNSS RF Connectors | SMA/SMA | MMCX |
| Interface | RS232 & RS422 (optional TTL) | RS232 & RS422 (optional TTL) |
| Input Voltage | 5V to 36V | 5V to 36V |
| Power Consumption | < 1 W | < 0.75 W |
| Operating Temperature | -40°C to +85°C | -40°C to +85°C |

ArlmNav – Image Based Navigation

ArlmNav provides accurate position, velocity and attitude data in GNSS denied environments via on-board image sensors. **ArlmNav** registers on-board video to pre-processed aerial images of the mission region in order to compensate the drift of the inertial sensors. Even under harsh jamming scenarios, **ArlmNav** horizontal accuracy stands less than 15 meters. The system is able to cope with short and long term GPS fallouts.



Image-Model Matching

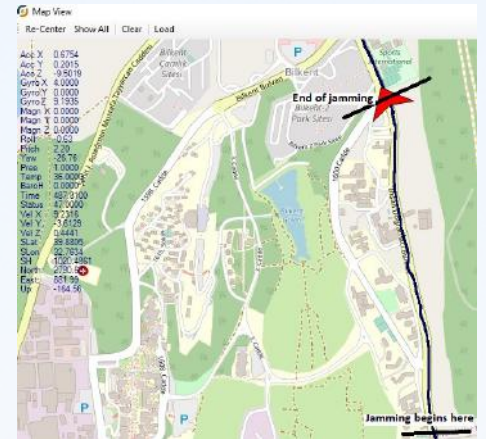


Mission Planner Software

Jamming Resistant Odometer Aided GNSS/INS

Autonomous platforms generally use GNSS/INS integrated systems to provide position, speed and orientation. However, GNSS signals are vulnerable to signal interference and jamming. Early detection of jamming is critical for safe navigation.

Jamming Resistant Odometer Aided GNSS/INS applies a two-stage approach to operate under GNSS signal jamming. The system first detects interference in an early phase. After detection of spoofing/jamming, the system switches to odometer aided dead-reckoning methods.



Navigation Under Jamming

Assured Position, Navigation and Timing (APNT)

Satellite navigation systems (GNSS) are used in defense systems, infrastructures and end-consumer products due to the precise position-navigation-time (PNT) capability. Infrastructures and industries operate with the assumption that GNSS signals are reliable, accurate and sensitive. Despite this, especially in conflict areas, the security vulnerabilities of GNSS have been widely observed in recent years.

Assured PNT (APNT) system has the ability to integrate PNT information from different navigation systems. APNT solutions provided by the combination of different systems are more reliable and more accessible than solutions provided by any single navigation system. APNT provides not only position and navigation data, but also precise time output even when GNSS is not available.

