Spatial is a ruggedised miniature GPS aided inertial navigation system and AHRS that provides accurate position, velocity, acceleration and orientation under the most demanding conditions.

It combines temperature calibrated accelerometers, gyroscopes, magnetometers and a pressure sensor with an advanced GNSS receiver. These are coupled in a sophisticated fusion algorithm to deliver accurate and reliable navigation and orientation.

### PERFORMANCE

- 0.1 ° Roll and Pitch
- 0.2 ° Heading (GNSS)
- 20 mm RTK Positioning
- 3 °/hr MEMS Gyroscope
- 1000 Hz Update Rate

### KEY FEATURES

- Multi-Constellation RTK
- Hot Start Time : 500 ms
- Low Weight : 37 grams
- Small Size : 30 x 30 x 24 mm
- Low Power : 0.5 W

### APPLICATIONS

**AIR**
- UAV Navigation
- Georeferencing
- Stabilisation & Pointing

**LAND**
- Ground Vehicle Navigation
- Georeferencing
- Robotics Control

**SEA**
- AUV Navigation
- ROV Navigation
- Hydrography
Spatial has been designed from the ground up for mission critical control applications where reliability is very important. It is built on top of a safety oriented real time operating system and all software is designed and tested to safety standards with fault tolerance in mind. The hardware is designed and manufactured to mil standards.

Spatial’s internal filter runs at 1000 Hz and data can also be output at this rate over high speed RS232. This allows for control of dynamically unstable platforms. Spatial is also highly tolerant of dynamic movement and vibration with advanced filters designed for these applications.

### AI NAVIGATION ALGORITHM
Spatial features Advanced Navigation’s revolutionary AI neural network sensor fusion algorithm. This provides accuracy of up to 10 times that of a traditional kalman filter. It was designed for control applications and has a high level of health monitoring and instability prevention to ensure stable and reliable data.

### HIGH PERFORMANCE MEMS
Spatial contains high performance MEMS sensors that are put through Advanced Navigation’s intensive 8 hour temperature calibration process. This provides the highest accuracy possible from this sensor class and outputs consistent accuracy over the full temperature range from -40°C to 85°C.

### RELIABILITY
Spatial has been designed from the ground up for mission critical control applications where reliability is very important. It is built on top of a safety oriented real time operating system and all software is designed and tested to safety standards with fault tolerance in mind. The hardware is designed and manufactured to mil standards.

### MULTI CONSTELLATION RTK GNSS
Spatial’s GNSS receiver supports GPS, GLONASS and BeiDou. The extra constellations provides higher availability of GNSS reception and better performance in difficult environments such as urban canyons. It supports RTK for real time 2 cm position accuracy as well as PPK for post processed 1 cm position accuracy.

### HIGH SAMPLING RATE
Spatial’s internal filter runs at 1000 Hz and data can also be output at this rate over high speed RS232. This allows for control of dynamically unstable platforms. Spatial is also highly tolerant of dynamic movement and vibration with advanced filters designed for these applications.
**SPECIFICATIONS**

**NAVIGATION**

- Horizontal Position Accuracy: 2.0 m
- Vertical Position Accuracy: 3.0 m
- Horizontal Position Accuracy (with RTK): 0.02 m
- Vertical Position Accuracy (with RTK): 0.03 m
- Horizontal Position Accuracy (Kinematica post processing): 0.01 m
- Vertical Position Accuracy (Kinematica post processing): 0.02 m
- Velocity Accuracy: 0.05 m/s
- Roll & Pitch Accuracy: 0.1 °
- Heading Accuracy (Dynamic with GNSS): 0.2 °
- Heading Accuracy (Magnetic Only): 0.8 °
- Roll & Pitch Accuracy (Kinematica post processing): 0.04 °
- Heading Accuracy (Kinematica post processing): 0.08 °
- Heave Accuracy (whichever is greater): 5% or 0.05 m
- Orientation Range: Unlimited
- Hot Start Time: 500 ms
- Internal Filter Rate: 1000 Hz
- Output Data Rate: Up to 1000 Hz
- Latency: 0.4 ms

**HARDWARE**

- Operating Voltage: 5 to 36 V
- Input Protection: ± 60 V
- Power Consumption (typical): 0.5 W
- Hot Start Battery Capacity: > 48 hrs
- Hot Start Battery Charge Time: 30 mins
- Hot Start Battery Endurance: > 10 years
- Operating Temperature: -40 °C to 85 °C
- Environmental Protection: IP67, MIL-STD-810G
- MTBF: 310,000 hrs
- Shock Limit: 2000 g
- Dimensions (excluding tabs): 30 x 30 x 24 mm
- Dimensions (including tabs): 30 x 40.6 x 24 mm
- Weight: 37 grams

**SENSORS**

**SENSOR**

**ACCELEROMETERS**

- Range (dynamic): ± 2 g
- ± 4 g
- ± 16 g
- Bias Instability: 20 ug
- Initial Bias: < 5 mg
- Initial Scaling Error: < 0.06 %
- Scale Factor Stability: < 0.06 %
- Non-linearity: < 0.05 °
- Cross-axis Alignment Error: < 0.05 °
- Noise Density: 100 uG/√Hz
- Bandwidth: 400 Hz

**GYROSCOPES**

- ± 250 °/s
- ± 500 °/s
- ± 2000 °/s
- 3 °/hr
- < 0.2% /s
- < 0.04 %
- < 0.06 %
- < 0.05 %
- < 0.05 °
- < 0.07 %
- < 0.05 °
- 210 uG/√Hz
- 400 Hz

**MAGNETOMETERS**

- ± 2 G
- ± 4 G
- ± 8 G

**GNSS**

- Model: u-blox MBP
- Supported Navigation Systems: GPS L1, GLONASS L1, GALILEO E1, BeiDou L1
- Update Rate: 10 Hz
- Cold Start Sensitivity: -148 dBm
- Tracking Sensitivity: -160 dBm
- Hot Start First Fix: 1 s
- Cold Start First Fix: 26 s
- Horizontal Position Accuracy: 2.5 m
- Horizontal Position Accuracy (with L1 RTK): 0.02 m
- Velocity Accuracy: 0.05 m/s
- Timing Accuracy: 30 ns
- Acceleration Limit: 4 g

**COMMUNICATION**

- Interface: RS232
- Speed: 4800 to 2M baud
- Protocol: AN Packet Protocol or NMEA
- Peripheral Interface: 2x GPIO and 2x Auxiliary RS232
- GPIO Level: 5 V or RS232
- GPIO Functions: 1PPS, Odometer, Stationary, Pitot Tube, NMEA input / output, Novatel GNSS input, Trimble GNSS input, Packet Trigger Input, Event Input