
ADVANCED
NAVIGATION
POSITIONING EVERYWHERE
LAND ROVER
ISAK

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POSITIONING
EVERYWHERE

Our relentless endeavour is to provide our customers with best in class accurate, compact and robust navigation solutions.

Advanced Navigation builds high quality navigation solutions for both defence and commercial markets. Our products are developed and manufactured in Australia. They are designed to deliver critical navigation information across sea, land and air platforms including surface, subsea assets, ground vehicles, and unmanned aerial vehicles applications.

Our team has world class expertise in the fields of inertial navigation, global navigation satellite systems, sensors, acoustics, artificial intelligence, and RF technologies.

MANY OF THE WORLD'S LEADING COMPANIES USE **ADVANCED NAVIGATION**

AEROSPACE & DEFENCE

AIRBUS · BAE SYSTEMS · BOEING · LEONARDO · LOCKHEED MARTIN · NASA JPL · Raytheon · THALES

AUTOMOTIVE

Ford · GM General Motors · nuTonomy · TESLA

TECHNOLOGY

BOSCH · facebook. · Google

ACCURATE POSITIONING UNDER **DEMANDING CONDITIONS**

01 | QUALITY

Our products are put through an intensive calibration process to optimise their performance and provide consistently accurate data over an extended temperature range of -40 °C to 85 °C. Advanced Navigation's custom calibration process is the only full sensor calibration that can provide dynamic ranging, allowing the user to select a sensor range for high accuracy or high accelerations on the fly. As part of this calibration, every single product unit spends a minimum of 8 hours in our specially built rotating temperature chambers. Advanced Navigation's quality management system is ISO 9001 accredited.

02 | RELIABILITY

Our solutions are designed from the ground up for mission critical control applications where reliability is essential. They are 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 protected from reverse polarity, overvoltage, surges, static and short circuits on all external interfaces. The GNSS contains RAIM (Receiver Autonomous Integrity Monitoring), which excludes both malfunctioning, and tampered satellite signals.

03 | ADVANCED FILTERS

All Advanced Navigation INSs feature a revolutionary sensor fusion filter. The filter is more intelligent than a typical extended Kalman filter and is able to extract significantly more information from the data by making use of human inspired artificial intelligence. It was designed for control applications and has a high level of health monitoring and instability prevention to ensure stable and reliable data.

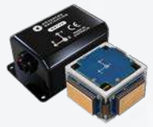
04 | CUSTOM SOLUTIONS

Advanced Navigation has a long-standing track record of developing bespoke hardware and software solutions ranging from the integration of encrypted military GNSS receiver to implementing motion analysis algorithms.

OUR RANGE OF **PRODUCTS**

INERTIAL NAVIGATION SYSTEMS



	ORIENTUS	SPATIAL	SPATIAL DUAL	MOTUS	SPATIAL FOG	SPATIAL FOG DUAL
Heading	0.5 °	0.2 °	0.1 °	0.05 °	0.05 °	0.01 °
Pitch & Roll	0.2 °	0.1 °	0.1 °	0.03 °	0.01 °	0.01 °
RTK	✗	✓	✓	✗	✓	✓
Positioning	✗	20 mm (RTK)	8 mm (RTK)	✗	8 mm (RTK)	8 mm (RTK)
Heave	✗	5 % or 0.05 m	5 % or 0.05 m	✗	2 % or 0.02 m	2 % or 0.02 m
North Seeking	✗	✗	✗	✗	✓	✓
Dual Antenna Heading	✗	✗	✓	✗	✗	✓
Dead Reckoning *	✗	0.3 %	0.2 %	0.2 %	< 0.1 %	< 0.1 %

* Percentage of distance travelled by a ground vehicle with odometer.

COMPASS

GNSS COMPASS
0.2 °
0.4 °
✓
8 mm (RTK)
5 % or 0.05 m
✗
✓
✗

SUBSEA

ACOUSTIC UNDERWATER NAVIGATION


SUBSONUS

SUBSONUS TAG

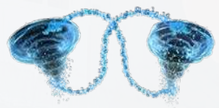
SUBSEA INS


SUBLOCUS

SUBLOCUS DVL

SOFTWARE

POST-PROCESSING



KINEMATICA

ACCESSORIES




LOGGING UNIT

AIR DATA UNIT

OBDII ODOMETER

SUBMERSIBLE ANTENNA

MEMS AHRS

ORIENTUS

Orientus is a ruggedised miniature sensor and AHRS that provides accurate orientation under the most demanding conditions.

It combines temperature calibrated accelerometers, gyroscopes and magnetometers in a sophisticated fusion algorithm to deliver accurate and reliable orientation.

PERFORMANCE

- 0.2 ° Roll and Pitch
- 0.5 ° Heading
- 3 °/hr MEMS Gyroscope
- 1000 Hz Update Rate
- 2000 g Shock Limit

KEY FEATURES

- Linear Acceleration Compensation
- Magnetic Interference Mitigation
- Low Weight : 25 grams
- Small Size : 30 x 30 x 24 mm
- Low Power : 65 mA @ 5V

APPLICATIONS

- AUV Orientation
- ROV Orientation

- Robotics Control & Orientation
- Stabilisation & Pointing
- Human Movement

- UAV Orientation
- Stabilisation & Pointing

SPECIFICATIONS

ORIENTATION

Roll & Pitch Accuracy (Static)	0.2 °
Heading Accuracy (Static)	0.5 °
Roll & Pitch Accuracy (Dynamic)	0.6 °
Heading Accuracy (Dynamic)	1.0 °
Orientation Range	Unlimited
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000 Hz
Latency	0.3 ms

SENSORS

SENSOR	ACCELEROMETERS	GYROSCOPES	MAGNETOMETERS
Range (dynamic)	± 2 g ± 4 g ± 16 g	± 250 °/s ± 500 °/s ± 2000 °/s	± 2 G ± 4 G ± 8 G
Bias Instability	20 ug	3 °/hr	-
Initial Bias	< 5 mg	< 0.2 °/s	-
Initial Scaling Error	< 0.06 %	< 0.04 %	< 0.07 %
Scale Factor Stability	< 0.06 %	< 0.05 %	< 0.09 %
Non-linearity	< 0.05 %	< 0.05 %	< 0.08 %
Cross-axis Alignment Error	< 0.05 °	< 0.05 °	< 0.05 °
Noise Density	100 ug/√Hz	0.004 °/s/√Hz	210 uG/√Hz
Bandwidth	400 Hz	400 Hz	110 Hz

HARDWARE

Operating Voltage	4 to 36 V
Input Protection	± 60 V
Power Consumption	0.325 W
Operating Temperature	-40 °C to 85 °C
Environmental Protection	IP68 MIL-STD-810G
MTBF	380,000 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	25 grams

COMMUNICATION

Interface	RS232
Speed	4800 to 1M baud
Protocol	AN Packet Protocol, NMEA or TSS
Peripheral Interfaces	2x GPIO and Auxiliary RS232
GPIO Level	5 V
GPIO Functions	NMEA input/output Novatel input AN Packet Protocol input/output Magnetometers disable Set zero orientation Packet trigger u-blox input TSS output Custom (contact us)

MEMS GNSS/INS

SPATIAL

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, Pitch
- 0.2 ° Heading (GNSS)
- 20 mm RTK Positioning
- 3 °/hr MEMS Gyroscope
- 1000 Hz Update Rate
- 2000 g Shock Limit

KEY FEATURES

- Multi-Constellation RTK
- Hot Start Time : 500 ms
- Low Weight : 30 grams
- Small Size : 30 x 30 x 24 mm
- Low Power : 65 mA @ 5V

APPLICATIONS

SEA

- AUV Navigation
- ROV Navigation
- Hydrography

LAND

- Ground Vehicle Navigation
- Georeferencing
- Robotics Control

AIR

- UAV Navigation
- Georeferencing
- Stabilisation & Pointing

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

GNSS

Model	u-blox M8P
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

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 24mm
Weight	37 grams

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

SENSORS

SENSOR	ACCELEROMETERS	GYROSCOPES	MAGNETOMETERS
Range (dynamic)	± 2 g ± 4 g ± 16 g	± 250 °/s ± 500 °/s ± 2000 °/s	± 2 G ± 4 G ± 8 G
Bias Instability	20 ug	3 °/hr	-
Initial Bias	< 5 mg	< 0.2°/s	-
Initial Scaling Error	< 0.06 %	< 0.04 %	< 0.07 %
Scale Factor Stability	< 0.06 %	< 0.05 %	< 0.09 %
Non-linearity	< 0.05 %	< 0.05 %	< 0.08 %
Cross-axis Alignment Error	< 0.05 °	< 0.05 °	< 0.05 °
Noise Density	100 ug/√Hz	0.004 °/s/√Hz	210 uG/√Hz
Bandwidth	400 Hz	400 Hz	110 Hz

MEMS GNSS/INS SPATIAL DUAL

Spatial Dual 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 a dual antenna RTK GNSS receiver. These are coupled in a sophisticated fusion algorithm to deliver accurate and reliable navigation and orientation.

PERFORMANCE

- 0.1 ° Roll and Pitch
- 0.1 ° Heading
- 8 mm RTK Positioning
- 3 °/hr MEMS Gyroscope
- 1000 Hz Update Rate
- 2000 g Shock Limit

KEY FEATURES

- Dual Antenna Heading
- Multi-Constellation RTK
- Hot Start Time : 500 ms

APPLICATIONS

- Hydrography
- Marine Navigation

- Ground Vehicle Navigation
- Georeferencing
- Antenna Targeting

- UAV Navigation
- Georeferencing
- Camera Pointing

SPECIFICATIONS

NAVIGATION

Horizontal Position Accuracy	1.2 m
Vertical Position Accuracy	2.0 m
Horizontal Position Accuracy (with SBAS)	0.5 m
Vertical Position Accuracy (with SBAS)	0.8 m
Horizontal Position Accuracy (with RTK or Kinematica PPK)	0.008 m
Vertical Position Accuracy (with RTK or Kinematica PPK)	0.015 m
Velocity Accuracy	0.007 m/s
Roll & Pitch Accuracy	0.1 °
Heading Accuracy (1m Antenna Separation)	0.1 °
Roll & Pitch Accuracy (Kinematica post processing)	0.03 °
Heading Accuracy (Kinematica post processing)	0.06 °
Slip Accuracy	0.1 °
Heave Accuracy (whichever is greater)	5 % or 0.05 m
Range	Unlimited
Hot Start Time	500 ms
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000Hz

GNSS

Model	Trimble BD982
Supported Navigation Systems	GPS L1, L2, L5 GLONASS L1, L2 GALILEO E1, E5 BeiDou B1, B2
Supported SBAS Systems	WAAS EGNOS MSAS GAGAN QZSS Omnistar HP/XP/G2 Trimble RTX
Update Rate	20 Hz
Hot Start First Fix	3 s
Cold Start First Fix	30 s
Horizontal Position Accuracy	1.2 m
Horizontal Position Accuracy (with SBAS)	0.5 m
Horizontal Position Accuracy (with RTK)	0.008 m
Velocity Accuracy	0.007 m/s
Timing Accuracy	20 ns
Acceleration Limit	11 g

HARDWARE

Operating Voltage	9 to 36 V
Input Protection	-40 to 100 V
Power Consumption (typical)	2.64 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	> 50,000 hrs
Shock Limit	75 g
Dimensions	90 x 127 x 33 mm
Weight	285 grams

COMMUNICATION

Interface	RS232 or RS422
Speed	4800 to 2M baud
Protocol	AN Packet Protocol or NMEA
Peripheral Interface	2x GPIO and 1x Auxiliary RS232
GPIO Level	5 V or RS232
GPIO Functions	1PPS Odometer Stationary Pitot Tube NMEA input/output Novatel GNSS input Trimble GNSS input AN Packet Protocol input/output Packet Trigger Input Event Input

SENSORS

SENSOR	ACCELEROMETERS	GYROSCOPES	MAGNETOMETERS	PRESSURE
Range (dynamic)	± 2 g ± 4 g ± 16 g	± 250 °/s ± 500 °/s ± 2000 °/s	± 2 G ± 4 G ± 8 G	10 to 120 KPa
Bias Instability	20 Ug	3 °/hr	-	10 Pa
Initial Bias	< 5 mg	< 0.2 °/s	-	< 100 Pa
Initial Scaling Error	< 0.06 %	< 0.04 %	< 0.07 %	-
Scale Factor Stability	< 0.06 %	< 0.05 %	< 0.09 %	-
Non-linearity	< 0.05 %	< 0.05 %	< 0.08 %	-
Cross-axis Alignment Error	< 0.05 °	< 0.05 °	< 0.05 °	-
Noise Density	100 ug/√Hz	0.004 °/s/√Hz	210 uG/√Hz	0.56 Pa/√Hz
Bandwidth	400 Hz	400 Hz	110 Hz	50 Hz

MEMS IMU

MOTUS

Motus is a miniature ultra high accuracy MEMS IMU. It features some of the highest accuracy MEMS accelerometers and gyroscopes currently available combined with magnetometers.

Motus is fully calibrated for all sensor errors over a wide temperature range and can be software upgraded to AHRS or INS functionality. It is available in both OEM and enclosed packages.

PERFORMANCE

- 0.03 ° Roll and Pitch
- 0.08 ° Heading
- 0.4 °/hr MEMS Gyroscope
- 1000 Hz Update Rate
- 2000 g Shock Limit

KEY FEATURES

- Hot Start Time : 2 seconds
- IMU, AHRS and INS options
- 2 versions : OEM or Rugged

APPLICATIONS

- AUV Navigation
- ROV Navigation
- Hydrography

- Gimbal Stabilisation
- Structural Monitoring
- Vehicle Navigation

- UAV Geopointing
- UAV Lidar
- Gimbal Stabilisation

SPECIFICATIONS

HARDWARE

Operating Voltage (OEM)	5 V
Operating Voltage (Enclosed)	5 to 36 V
Input Protection (Enclosed only)	± 60 V
Power Consumption (Typical)	0.95 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 (Enclosed)	IP67 MIL-STD-810G
MTBF	200,000 hrs
Shock Limit	2000 g
Vibration Limit	8 g
Dimensions (OEM)	31 x 31 x 24 mm
Dimensions (Enclosed)	42 x 55 x 30 mm
Weight (OEM)	26 grams
Weight (Enclosed)	72 grams

COMMUNICATION

Interface (OEM)	UART
Interface (Enclosed)	RS232 (RS422 version available)
Speed	4800 to 2M baud
Protocol	AN Packet Protocol or NMEA
Peripheral Interface	2x GPIO and Auxiliary RS232
GPIO Level	5 - 20 V
GPIO Functions	1PPS Input Sensor sync input Sensor sync output Odometer Stationary Air Data Input NMEA input/output Novatel GNSS input Trimble GNSS input AN Packet Protocol

SENSORS

SENSOR	ACCELEROMETERS	GYROSCOPES	MAGNETOMETERS
Range	± 10 g	± 475 °/s	± 8 G
Bias Instability	8 ug	0.4 °/hr	-
Initial Bias	< 1 mg	< 10 °/hr	-
Initial Scaling Error	< 0.03 %	< 0.02 %	< 0.07 %
Scale Factor Stability	< 0.04 %	< 0.03 %	< 0.09 %
Non-linearity	< 0.05 %	< 0.03 %	< 0.08 %
Cross-axis Alignment Error	< 0.05 °	< 0.05 °	< 0.05 °
Noise Density	12 ug/√Hz	7 °/hr/√Hz	210 uG/√Hz
Bandwidth	290 Hz	200 Hz	110 Hz

FOG GNSS/INS

SPATIAL FOG

Spatial FOG is a ruggedised GPS aided inertial navigation system and AHRS that provides accurate position, velocity, acceleration and orientation under the most demanding conditions. It combines ultra high accuracy accelerometers, magnetometers and a pressure sensor with an RTK GNSS receiver. These are coupled in a sophisticated fusion algorithm to deliver accurate and reliable navigation and orientation.

PERFORMANCE

- 0.01 ° Roll and Pitch
- 0.05 ° Heading
- 8 mm RTK Positioning
- 0.05 °/HR FOG Gyroscope
- Heave : 2 % or 0.02 m (whichever is greater)

KEY FEATURES

- L1/L2/L5 RTK/PPK
- Hot Start Time : 2 seconds
- Rapid North Seeking : 10 s from hot start
- Low size, Weight and Power

APPLICATIONS

- Hydrography
- Oil Rig Monitoring
- Marine Navigation

- Georeferencing
- Underground Navigation
- Ground Vehicle Navigation

- Georeferencing
- UAV Navigation
- Stabilisation & Pointing

SPECIFICATIONS

NAVIGATION

Horizontal Position Accuracy	0.8 m
Vertical Position Accuracy	1.5 m
Horizontal Position Accuracy (with SBAS)	0.5 m
Vertical Position Accuracy (with SBAS)	0.8 m
Horizontal Position Accuracy (with RTK or Kinematica PPK)	0.008 m
Vertical Position Accuracy (with RTK or Kinematica PPK)	0.015 m
Velocity Accuracy	0.007 m/s
Roll & Pitch Accuracy	0.01 °
Heading Accuracy	0.05 °
Roll & Pitch Accuracy (Kinematica post-processing)	0.005 °
Heading Accuracy (Kinematica post-processing)	0.01 °
Heave Accuracy (whichever is greater)	2 % or 0.02 m
Orientation Range	Unlimited
Hot Start Time	2 s
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000Hz

GNSS

Model	Trimble BD930
Supported Navigation Systems	GPS L1, L2, L5 GLONASS L1, L2 GALILEO E1, E5 BeiDou B1, B2
Supported SBAS Systems	WAAS EGNOS MSAS GAGAN QZSS
Update Rate	20 Hz
Hot Start First Fix	3 s
Cold Start First Fix	30 s
Horizontal Position Accuracy	1.2 m
Horizontal Position Accuracy (with SBAS)	0.5 m
Horizontal Position Accuracy (with RTK)	0.008 m
Velocity Accuracy	0.007 m/s
Timing Accuracy	20 ns
Acceleration Limit	11 g

HARDWARE

Operating Voltage	9 to 36 V
Input Protection	-40 to 100 V
Power Consumption (typical)	6.6 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 75°C
Environmental Protection	IP67 MIL-STD-810G
MTBF	> 36,000 hrs
Shock Limit	40 g
Vibration Limit	12 g
Dimensions	90 x 90 x 88 mm
Weight	655 grams

COMMUNICATION

Interface	RS422 (RS232 optional)
Speed	4800 to 10M 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 AN Packet Protocol input/output Packet Trigger Input Event Input

SENSORS

SENSOR	ACCELEROMETERS	GYROSCOPES	MAGNETOMETERS	PRESSURE
Range	± 10 g	± 490 °/s	± 8 G	10 to 120 KPa
Bias Instability	15 ug	0.05 °/hr	-	10 Pa
Initial Bias	< 1 mg	< 1 °/hr	-	< 100 Pa
Initial Scaling Error	< 0.03 %	< 0.01 %	< 0.07 %	-
Scale Factor Stability	< 0.04 %	< 0.02 %	< 0.09 %	-
Non-linearity	< 0.03 %	< 0.005 %	< 0.08 %	-
Cross-axis Alignment Error	< 0.04 °	< 0.02 °	< 0.05 °	-
Noise Density	120 ug/√Hz	0.7 °/hr/√Hz	210 uG/√Hz	0.56 Pa/√Hz
Bandwidth	200 Hz	440 Hz	110 Hz	50 Hz

FOG GNSS/INS

SPATIAL FOG DUAL

Spatial FOG Dual is a ruggedised GPS aided inertial navigation system and AHRS that provides accurate position, velocity, acceleration and orientation under the most demanding conditions. It combines ultra high accuracy fibre optic gyroscopes, accelerometers, magnetometers and a pressure sensor with a dual antenna RTK GNSS receiver. These are coupled in a sophisticated fusion algorithm to deliver accurate and reliable navigation and orientation.

PERFORMANCE

- 0.01 ° Roll and Pitch
- 0.01 ° Heading
- 8 mm RTK Positioning
- 0.05 °/HR FOG Gyroscope
- Heave : 2 % or 0.02 m (whichever is greater)

KEY FEATURES

- Dual Antenna Heading
- L1/L2 RTK/PPK
- Hot Start Time : 2 seconds
- Rapid North Seeking : 10 s from hot start
- Low size, Weight and Power

APPLICATIONS

SEA

- Hydrography
- Oil Rig Monitoring
- Marine Navigation

LAND

- Georeferencing
- Underground Navigation
- Ground Vehicle Navigation

AIR

- Georeferencing
- UAV Navigation
- Stabilisation & Pointing

SPECIFICATIONS

NAVIGATION

Horizontal Position Accuracy	0.8 m
Vertical Position Accuracy	1.5 m
Horizontal Position Accuracy (with SBAS)	0.5 m
Vertical Position Accuracy (with SBAS)	0.8 m
Horizontal Position Accuracy (with RTK or Kinematica PPK)	0.008 m
Vertical Position Accuracy (with RTK or Kinematica PPK)	0.015 m
Velocity Accuracy	0.005 m/s
Roll & Pitch Accuracy	0.01 °
Heading Accuracy	0.01 °
Roll & Pitch Accuracy (Kinematica post-processing)	0.005 °
Heading Accuracy (Kinematica post-processing)	0.007 °
Slip Accuracy	0.01 °
Heave Accuracy (whichever is greater)	2 % or 0.02 m
Orientation Range	Unlimited
Hot Start Time	2 s
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000 Hz

GNSS

Model	Trimble MB-Two
Supported Navigation Systems	GPS L1, L2 GLONASS L1, L2 GALILEO E1 BeiDou B1
Supported SBAS Systems	WAAS EGNOS MSAS GAGAN QZSS Trimble RTX
Update Rate	20 Hz
Hot Start First Fix	3 s
Cold Start First Fix	30 s
Horizontal Position Accuracy	1.2 m
Horizontal Position Accuracy (with SBAS)	0.5 m
Horizontal Position Accuracy (with RTK)	0.008 m
Velocity Accuracy	0.005 m/s
Timing Accuracy	20 ns
Acceleration Limit	11 g

HARDWARE

Operating Voltage	9 to 36 V
Input Protection	-40 to 100 V
Power Consumption (typical)	6.12 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 75 °C
Environmental Protection	IP67 MIL-STD-810G
MTBF	> 36,000 hrs
Shock Limit	40 g
Vibration Limit	12 g
Dimensions	94 x 94 x 95 mm
Weight	740 grams

COMMUNICATION

Interface	RS422 (RS232 optional)
Speed	4800 to 10M 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 AN Packet Protocol input/output Packet Trigger Input Event Input

SENSORS

SENSOR	ACCELEROMETERS	GYROSCOPES	MAGNETOMETERS	PRESSURE
Range	± 10 g	± 490 °/s	± 8 G	10 to 120 KPa
Bias Instability	15 ug	0.05 °/hr	-	10 Pa
Initial Bias	< 1 mg	< 1 °/hr	-	< 100 Pa
Initial Scaling Error	< 0.03 %	< 0.01 %	< 0.07 %	-
Scale Factor Stability	< 0.04 %	< 0.02 %	< 0.09 %	-
Non-linearity	< 0.03 %	< 0.005 %	< 0.08 %	-
Cross-axis Alignment Error	< 0.04 °	< 0.02 °	< 0.05 °	-
Noise Density	120 ug/√Hz	0.7 °/hr/√Hz	210 uG/√Hz	0.56 Pa/√Hz
Bandwidth	200 Hz	440 Hz	110 Hz	50 Hz

SATELLITE COMPASS

GNSS COMPASS

The GNSS Compass is a cost-effective all-in-one GNSS/INS navigation and heading solution. It provides accurate dual antenna GPS based heading that is not subject to magnetic interference and can maintain accurate heading during GNSS outages of up to 20 minutes.
It features high accuracy RTK positioning and is plug and play with NMEA 0183, NMEA 2000 and Ethernet interfaces.

PERFORMANCE

- 0.4 ° Roll and Pitch
- 0.2 ° Heading
- 8 mm RTK Positioning
- 7 °/hr MEMS Gyroscope

KEY FEATURES

- Fully Integrated Solution
- Dual Antenna Heading
- GPS, GLONASS, Galileo & BeiDou
- Low Size, Weight and Power
- Ethernet & Serial Options
- Easy to interface with hydrographic packages

APPLICATIONS

SEA

- Marine Navigation
- Hydrography

LAND

- Ground Vehicle Navigation
- Antenna Targeting

SPECIFICATIONS

NAVIGATION (low cost variant)

Horizontal Position Accuracy	2.0 m
Vertical Position Accuracy	3.0 m
Horizontal Position Accuracy (with DGNSS)	0.6 m
Vertical Position Accuracy (with DGNSS)	1.0 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	0.4 °
Heading Accuracy	0.2 °
Roll & Pitch Accuracy (Kinematica post-processing)	0.13 °
Heading Accuracy (Kinematica post-processing)	0.09 °
Heave Accuracy (whichever is greater)	5 % or 0.05 m
Range	Unlimited
Hot Start Time	500 ms
Internal Filter Rate	100 Hz
Output Data Rate	Up to 100Hz

NAVIGATION (high accuracy variant)

Horizontal Position Accuracy	0.8 m
Vertical Position Accuracy	1.5 m
Horizontal Position Accuracy (with RTK)	0.008 m
Vertical Position Accuracy (with RTK)	0.015 m
Horizontal Position Accuracy (Kinematica post-processing)	0.008 m
Vertical Position Accuracy (Kinematica post-processing)	0.015 m
Velocity Accuracy	0.02 m/s
Roll & Pitch Accuracy	0.4 °
Heading Accuracy	0.2 °
Roll & Pitch Accuracy (Kinematica post-processing)	0.13 °
Heading Accuracy (Kinematica post-processing)	0.09 °
Heave Accuracy (whichever is great)	5 % or 0.05 m
Range	Unlimited
Hot Start Time	500 ms
Internal Filter Rate	200 Hz
Output Data Rate	Up to 200 Hz

GNSS (low cost variant)

Model	2 x u-blox M8T
Supported Navigation Systems	GPS L1 GLONASS G1 GALILEO E1 BeiDou B1
Update Rate	10 Hz
Acceleration Limit	4 g
Hot Start Time	1 second

GNSS (high accuracy variant)

Model	Trimble MB-Two
Supported Navigation Systems	GPS L1, L2 GLONASS G1, G2 GALILEO E1, E5b BeiDou B1, B2
Update Rate	20 Hz
Acceleration Limit	11 g
Hot Start Time	3 seconds

HARDWARE (Ethernet variant)

Power Input	Power over Ethernet (PoE) 802.3af or 802.3at
Power Consumption (Low Cost Variant)	1.1 Watts
Power Consumption (High Accuracy Variant)	2.4 Watts
Hot Start Battery Capacity	> 24 hrs
Hot Start Battery Charge Time	30 mins
Hot Start Battery Endurance	10 years
Operating Temperature	-40 °C to 85 °C
Environmental Protection	IP68 MIL-STD-810G
Shock Limit	75 g
Dimensions	672 x 190 x 73.9 mm
Weight (Low Cost Variant)	1460 grams
Weigh (High Accuracy Variant)	1530 grams

HARDWARE (Serial Variant)

Operating Voltage	9 to 36 V
Input Protection	-40 to 60 V
Power Consumption (Low Cost Variant)	1.2 Watts
Power Consumption (High Accuracy Variant)	2.64 Watts
Hot Start Battery Capacity	> 24 hours
Hot Start Battery Charge Time	30 mins
Hot Start Battery Endurance	10 years
Operating Temperature	-40 °C to 85 °C
Environmental Protection	IP68 MIL-STD-810G
Shock Limit	75 g
Dimensions	672 x 190 x 73.9 mm
Weight (Low Cost Variant)	1480 grams
Weight (High Accuracy Variant)	1550 grams

COMMUNICATION (Ethernet variant)

Interface	Ethernet
Speed	10/100
Protocol	NMEA0183 AN Packet Protocol TSS1 Simrad
Ports	Up to 4 TCP or UDP ports
Timing	PTP Server NTP Server
Timing Accuracy (PTP)	50 ns
Timing Accuracy (NTP)	1 ms

COMMUNICATION (Serial Variant)

Interface	RS422 or RS232 CAN bus
Speed	2400 to 1M baud
Protocol	NMEA0183 NMEA2000 AN Packet Protocol TSS1 Simrad
Timing	1PPS Output
Timing Accuracy	20 ns

USBL/INS

SUBSONUS

Subsonus is a next generation USBL underwater acoustic positioning system that provides high accuracy position, velocity and heading at depths of up to 1000 metres.

The system features an industry leading calibrated hydrophone array combined with an internal tightly coupled INS, all packed into a miniature titanium enclosure small enough to fit in the palm of your hand.

PERFORMANCE

- 0.1 m Position Accuracy
- 0.1 ° Roll and Pitch
- 0.3 ° Acoustic Heading
- 1000 m Range and Depth

KEY FEATURES

- Sound Velocity Sensor
- Very Low Size, Weight and Power
- Multipath Rejection
- Acoustic Modem
- Integrated INS
- Speed of Sound Sensor

APPLICATIONS

SPECIFICATIONS

NAVIGATION

Position Accuracy (5 m range)	0.1 m
Position Accuracy (100 m range)	0.5 m
Position Accuracy (1000 m range)	5.0 m
Velocity Accuracy	0.01 m/s
Roll and Pitch Accuracy	0.1 °
Heading Accuracy	0.3 °
Heave Accuracy (whichever is greater)	5 % or 0.05 m
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000Hz
Latency	0.6 ms

ACOUSTICS

Hydrophones	8
Frequency	30 kHz (broadband)
Range	1000 m
Acoustic Coverage	300 ° hemispherical
Accuracy	0.25 % of slant range
Update Rate	Up to 10 Hz
Data Transfer Rate	Up to 10 kbit

SENSORS

Integrated GPS/INS	Yes
Integrated GPS Antenna	In top of hydrophone array
Pressure Sensor Range	1000 m
Pressure Sensor Accuracy	1.5 m

HARDWARE

Operating Voltage	9 to 60 V or Power over Ethernet
Power Consumption (Average)	10 W
Power Consumption (Peak)	25 W
Interface	Ethernet (RS232/RS422 through ILU)
Timing Synchronisation	PTP and NTP support
Depth Rating	1000 m
Operating Temperature	-20 °C to 40 °C
Storage Temperature	-40 °C to 85 °C
Shock Limit	25 g
Dimensions	106 x 106 x 93 mm
Weight in Air	1170 g
Weight in Water	650 g

TRANSPONDER SUBSONUS TAG

Subsonus Tag fully encapsulates all parts in a maintenance-free polymer composite to completely eliminate the risk of leaks. This ground-breaking, pressure tolerant design offers unmatched reliability and uncompromising value. The innovative design and use of materials mean that the Subsonus Tag has the highest battery density on the market, offering up to 18 months of autonomy on a single charge.

Since there are no connectors, fast charging is performed using readily available Qi wireless chargers. Highly scalable, with up to 65,000 Tags trackable using one surface Subsonus unit, this transponder is also easy to use with its pressure tolerant display and its Bluetooth compatibility. Subsonus Tag re-defines the transponder market, allowing it to be deployed in previously cost-prohibitive applications without sacrificing performance.

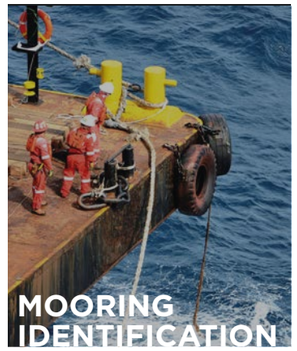
PERFORMANCE

- 0.25 m Position Accuracy
- 1000 m Range
- 2000 m Depth Rating

KEY FEATURES

- 18 Months Battery Life
- Very low size, Weight and Power
- No Maintenance
- Cost Effective
- Integrated Display

APPLICATIONS



SPECIFICATIONS

POSITIONING (with Subsonus USBL)

Position Accuracy (5 m range)	0.25 m
Position Accuracy (100 m range)	1.5 m
Position Accuracy (1000 m range)	15.0 m

ACOUSTICS

Frequency	30 kHz (broadband)
Range	1000 m
Beam pattern	Omnidirectional
Range Timing Accuracy	0.01 m
Maximum Update Rate	1.3 Hz
Transmit Power	Dynamic
Data Transfer	Yes
Remote Acoustic Configuration	Yes

SENSORS

Roll & Pitch Accuracy	1.0 °
Heading Accuracy	2.0 °
Heading Source	Magnetic
Water Temperature Accuracy	0.5 °C

DISPLAY

Display Type	Pressure Tolerant Electronic Paper Display (EPD)
Display Size	54 mm
Display Daylight Visibility	Direct Sunlight
Display Backlight	Yes (Configurable)

BATTERY

Battery Capacity	28 Wh
Battery Life (5 second ping rate)	48 hours
Battery Life (1 ping/hour)	12 months
Battery Life (listening)	18 months
Charging	Qi Wireless Charging v1.2
Battery recharge time	6 hours

HARDWARE

Interface	Bluetooth Low Energy v4.1
Material	Polymer Composite
Depth Rating	2000 m
Operating Temperature	-5 °C to 50 °C
Storage Temperature	-20 °C to 60 °C
Shock Limit	40 g
Dimensions	54 x 54 x 130 mm
Weight in Air	550 g
Weight in Water	250 g

SUBSEA INS

SUBLOCUS

Sublocus is an underwater inertial navigation system that provides accurate position, velocity and orientation at depths of up to 3000 metres.

It features high accuracy north seeking fibre optic gyroscopes, accelerometers, an internal GNSS receiver and a pressure depth sensor. It accepts external aiding from speed logs, propeller speeds, DVLs, USBLs, SBLs and LBLs.

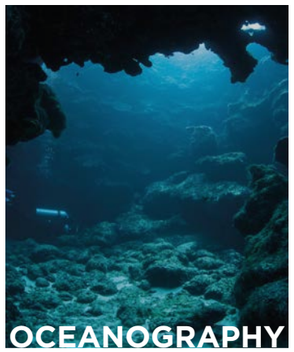
PERFORMANCE

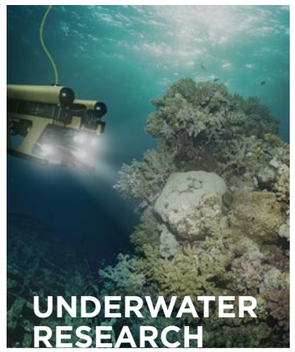
- 0.01 ° Roll and Pitch
- 0.25 ° Heading
- 5 % or 50 mm Heave
- 0.4 m Depth Accuracy
- 0.08 % of Distance Travelled

KEY FEATURES

- Built in Depth Sensor & GNSS
- Rapid North Seeking
- Low Maintenance
- Ruggedised Titanium Enclosure
- Depth Rating : 3000 m

APPLICATIONS





SPECIFICATIONS

NAVIGATION

Position Accuracy (with GPS)	0.8 m
Position Accuracy (with DVL)	0.08 % of distance travelled
Position Accuracy (with Log)	0.4% of distance travelled
Depth Accuracy	0.4 m
Roll & Pitch Accuracy	0.01 °
Heading Accuracy	0.25 ° secant latitude
Heave Accuracy (whichever is greater)	5 % or 0.05 m
Attitude Range	Unlimited
Hot Start Time	2 s
North Seeking Time	< 60 s
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000 Hz

SENSORS

Pressure Sensor Range	4000 m
Pressure Sensor Accuracy	0.4 m
Acceleration	± 10 g
Angular Velocity	± 490 °/s
Gyroscope Technology	FOG
Bias Instability	0.05 °/h

COMMUNICATION

Interface	RS232 or RS422
Speed	4800 to 10M baud
Protocol	AN Packet Protocol, NMEA or TSS
Peripheral Interface	2x GPIO and 1x Auxiliary RS232
GPIO Level	5 V or RS232
GPIO Functions	DVL Input SBL Input USBL Input LBL Input Log Input Odometer Stationary NMEA input/output AN Packet Protocol input/output Packet Trigger Input TSS Output Simrad 1000 Output Simrad 3000 Output Custom inputs/outputs as required

HARDWARE

Depth Rating	3000 m
Operating Voltage	18 to 50 V
Input Protection	-40 to 100 V
Power Consumption (typical)	6 W
Hot Start Battery Capacity	> 24 hrs
Hot Start Battery Charge Time	30 mins
Hot Start Battery Endurance	> 10 years
Operating Temperature	-40 °C to 75 °C
Storage Temperature	-40 °C to 75 °C
MTBF	> 50,000 hrs
Shock Limit	25 g
Dimensions	138 x 138 x 131 mm
Weight in Air	5.8 kg
Weight in Water	3.9 kg

SUBSEA INS

SUBLOCUS DVL

Sublocus DVL is an underwater acoustic and inertial navigation system that provides accurate position, velocity and orientation at depths of up to 3000 metres.
It features a doppler velocity log, high accuracy north seeking fibre optic gyroscopes, accelerometers, an internal GNSS receiver and a pressure depth sensor. It accepts external aiding from speed logs, propeller speeds, USBLs, SBLs and LBLs.

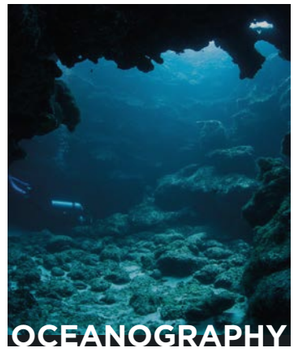
PERFORMANCE

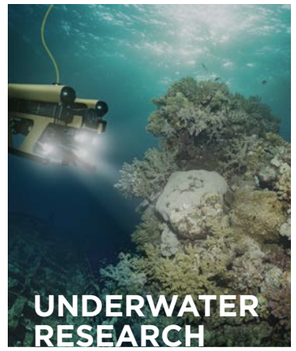
- 0.01 ° Roll and Pitch
- 0.25 ° Heading
- 5 % or 50 mm Heave
- 0.4 m Depth
- 0.08 % of Distance Travelled

KEY FEATURES

- Built in DVL depth sensor & GNSS
- Rapid North seeking
- Low Maintenance
- Ruggedised Titanium Enclosure
- Depth Rating : 3000 m

APPLICATIONS





SPECIFICATIONS

NAVIGATION

Position Accuracy (with GPS)	0.8 m
Position Accuracy	0.08 % of distance travelled
Depth Accuracy	0.4 m
Roll & Pitch Accuracy	0.01 °
Heading Accuracy	0.25° secant latitude
Heave Accuracy (whichever is greater)	5 % or 0.05 m
Attitude Range	Unlimited
Hot Start Time	2 s
North Seeking Time	< 60 s
Internal Filter Rate	1000 Hz
Output Data Rate	Up to 1000 Hz

SENSORS

Pressure Sensor Range	4000 m
Pressure Sensor Accuracy	0.4 m
Acceleration	± 10 g
Angular Velocity	± 490 °/s
Gyroscope Technology	FOG
Bias Instability	0.05 °/h
DVL Model	Teledyne RDI Workhorse Navigator
DVL Frequency	600 Khz

COMMUNICATION

Interface	RS232 or RS422
Speed	4800 to 10M baud
Protocol	AN Packet Protocol, NMEA or TSS
Peripheral Interface	2x GPIO and 1x Auxiliary RS232
GPIO Level	5 V or RS232
GPIO Functions	DVL Input SBL Input USBL Input LBL Input Log Input Odometer Stationary NMEA input/output AN Packet Protocol input/output Packet Trigger Input TSS Output Simrad 1000 Output Simrad 3000 Output Custom inputs/outputs as required

HARDWARE

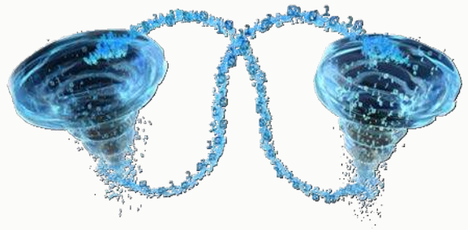
Depth Rating	3000 m
Operating Voltage	20 to 50 V
Input Protection	-36 to 100 V
Power Consumption (typical including DVL)	9 W
Hot Start Battery Capacity	> 24 hrs
Hot Start Battery Charge Time	30 mins
Hot Start Battery Endurance	> 10 years
Operating Temperature	-5 °C to 45 °C
Storage Temperature	-30 °C to 60 °C
MTBF	> 36,000 hrs
Shock Limit	25 g
Dimensions	225 x 225 x 306 mm
Weight in Air	16 kg
Weight in Water	7.1 kg

POST-PROCESSING

KINEMATICA

Kinematica is web based GNSS/INS post-processing software that allows users to process raw GNSS and inertial data after collection and achieve higher accuracy results than is possible in real time.

Kinematica supports all of Advanced Navigation's GNSS/INS products, is packed with features and provides market leading performance.



01

KINEMATIC GNSS POSITIONING

Kinematica features kinematic GNSS post-processing which provides a 200x increase in position accuracy over standard GNSS. Kinematica automatically downloads the closest RINEX base station data and outputs position to an accuracy of 8mm.

02

DUAL ANTENNA HEADING

For dual antenna systems, Kinematica supports tightly coupled dual antenna heading processing which significantly increases heading accuracy and results in up to 200% more dual antenna heading fix availability.

03

AUTOMATIC LOOSE & TIGHT COUPLING

Kinematica supports both loosely and tightly coupled GNSS/INS processing and automatically switches between them to provide the best accuracy results under the conditions at that point in time. At every epoch it tests up to 8 different processing methods and selects the best data. This results in up to 180% more kinematic fixes than competitors under typical conditions.

04

FORWARD & REVERSE PROCESSING

Kinematica can look forward and backwards in time to fill satellite outages and ignore errors that would normally affect a real time solution. Kinematica processes data in forwards and reverse six times to give the highest accuracy results. There is no initialisation time at the start of a log file and data is immediately at full accuracy.

APPLICATIONS

ACCESSORIES

LOGGING UNIT

The ILU (Interface and Logging Unit) is a device server that interfaces to any of Advanced Navigation's systems and provides data logging, a web interface, a time synchronisation server and a wide variety of different industry standard data input/output options.

OBDII ODOMETER

The OBDII Odometer is a plug & play interface cable that communicates with a vehicle's on-board computer to determine the current vehicle speed. It outputs real time vehicle speed over an RS232 serial data interface. When connected to one of Advanced Navigation's Spatial series of GNSS/INS products it allows for outstanding navigation accuracy when GNSS is not available.

POSEIDON

Poseidon is a subsea GPS/GLONASS/GALILEO/BeiDou antenna that is designed for use on underwater vehicles that require the ability to obtain a GNSS fix when surfaced. The antenna is also suitable for marine vessels that are exposed to harsh conditions that are too extreme for a normal GNSS antenna. The antenna is lightweight, compact, corrosion resistant and able to withstand depths of up to 3000 metres. L-Band reception allows reception from services such as Marinestar and Atlas.

AIR DATA UNIT

The Air Data Unit is used to measure pitot airspeed and barometric altitude in fixed wing aircraft. It features high accuracy temperature calibrated pitot and static air data sensors and outputs data over RS232. It can be used standalone or connected to one of Advanced Navigation's Spatial series of GNSS/INS products for outstanding navigation accuracy in fixed wing aircraft when GNSS is not available.

EASY INTEGRATION FOR
EACH APPLICATION

01 | GRAPHICAL USER INTERFACE

A comprehensive graphical user interface (GUI) that covers all applications is freely available for Windows and Android.

The GUI provides straightforward device configuration and an interface to data including real time position and attitude, raw sensor values, data logging and NTRIP Client functionality.

02 | INTEGRATION TOOLS

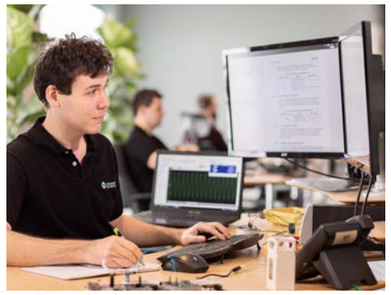
2.1. Hardware Evaluation Kit:
Contains a ruggedised device and the necessary cabling and accessories to facilitate rapid start-up for prototypes and one-off systems.

2.2. Hardware Development Kit:
Allow developers to quickly test and integrate our OEM devices into prototypes for high volume products. The included OEM development board provides the user with access to all the OEM device's interfaces with a number of convenient connection options.

2.3. Software Development Kit:
Provide comprehensive example source code for interfacing with our devices through the sophisticated Advanced Navigation Packet Protocol. Languages supported include C/C++, Java, .NET/C# and Matlab/ Octave. Full source code for a number of utilities such as NTRIP and ROS are also included.

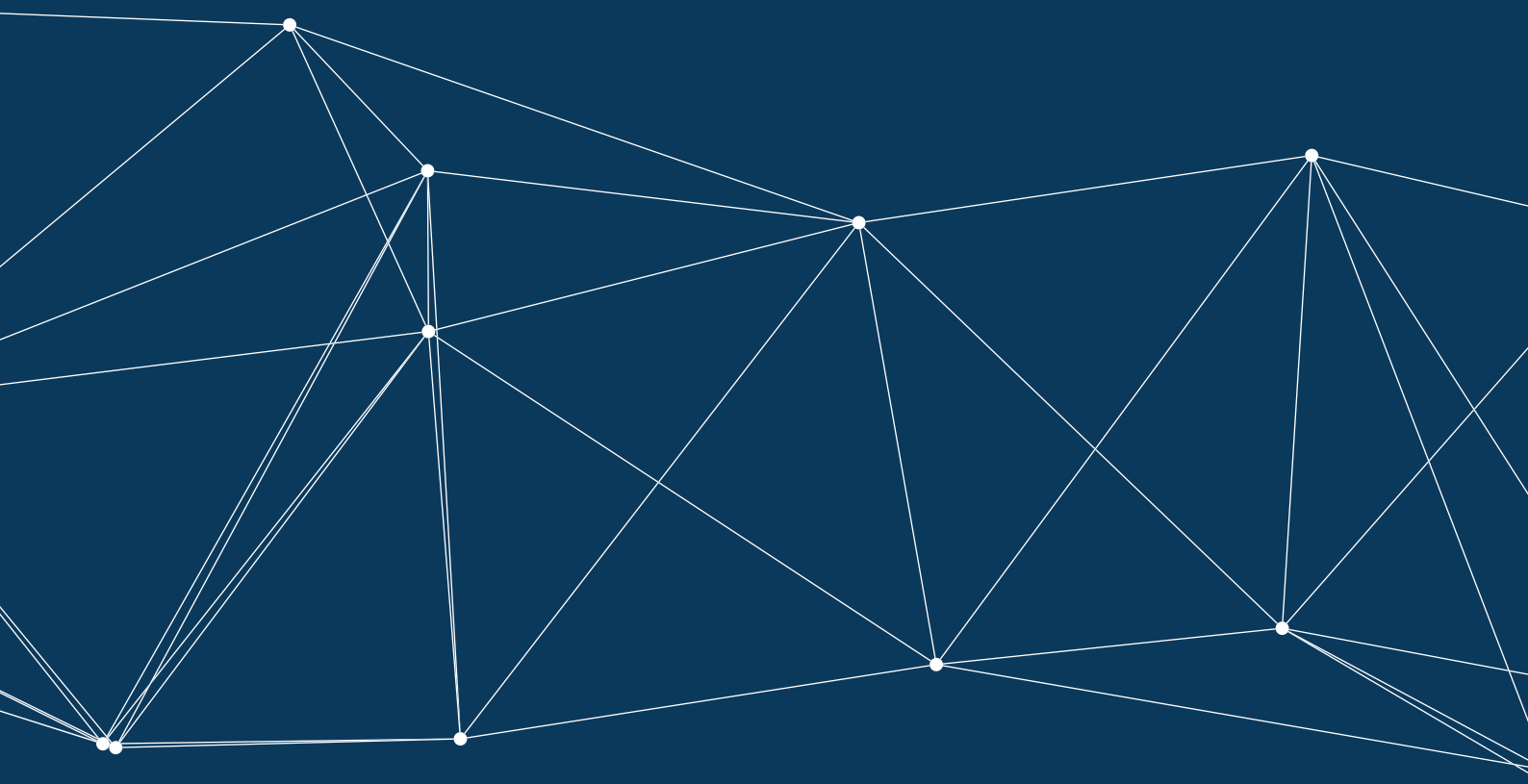
03 | SUPPORT

Our qualified engineers are standing by to assist you in integrating and operating Advanced Navigation solutions. They provide free technical support by phone, email and website ticket.



ADVANCED NAVIGATION

POSITIONING EVERYWHERE



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