ELLIPSE SERIES sets up new standard for miniature and cost-effective inertial systems with an extremely rugged design, cutting-edge sensors, enhanced capabilities, and advanced algorithms.
Ellipse Series - High-end Technology in the Smallest Package

**Robust L1/L2 RTK**
with no extra charge

**New 64bit processor**
for maximum performance

**Best performance and SWaP of its category**

**Easy integration**
Get more out of your Ellipse with Qinertia
Post-processing software (INS)

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Ellipse Series is a successful line of industrial-grade inertial sensors known for their high level of robustness. This 3rd generation embeds a 64Bit microprocessor running latest generation algorithms. All the INS/GNSS are now provided with multi-band RTK receiver for centimetric position and more accurate orientation.

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**Product Line**

<table>
<thead>
<tr>
<th></th>
<th>Ellipse-A</th>
<th>Ellipse-E</th>
<th>Ellipse-N</th>
<th>Ellipse-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Motion Sensor</td>
<td>INS with your own GNSS receiver</td>
<td>INS for dynamic and automotive applications</td>
<td>INS for low dynamics and robust heading</td>
</tr>
<tr>
<td>Heading</td>
<td>Magnetic</td>
<td>Magnetic or GNSS</td>
<td>Magnetic or Mono-antenna GNSS</td>
<td>Dual antenna GNSS</td>
</tr>
<tr>
<td>Heave: 5 cm or 5%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odometer aiding</td>
<td>Pulse / CAN OBD-II</td>
<td>Pulse / CAN OBD-II</td>
<td>Pulse / CAN OBD-II</td>
<td></td>
</tr>
<tr>
<td>Navigation</td>
<td>Navigation with external GNSS receiver</td>
<td>L1/L2 GNSS receiver 1 cm RTK GNSS Accuracy</td>
<td>L1/L2 GNSS receiver 1 cm RTK GNSS Accuracy</td>
<td></td>
</tr>
<tr>
<td>Post-Processing</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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**Motion & Heave Monitoring**

**Data Georeferencing**

**Payload Orientation & Positioning**

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Robust Heading within seconds
Immune to magnetic disturbances
Very short baseline down to 50 cm
Features Inherited from High End INS/GNSS

Best-in-class IMU | Advanced Algorithms | Easy Integration

» Industrial grade MEMS, superior vibration rejection  
» Extensive test and calibration from -40 to 85°C with individual calibration report  
» Integrated hard & soft magnetic disturbances calibration tools  

» Real-time fusion of inertial with aiding sensors (GNSS, RTK, DMI, DVL, etc.)  
» Robust position with invalid GNSS measurements detection and RAIM  

» Select your motion profile to automatically adjust Kalman filter and dynamic constraints for optimal performance  
» Automatic lever arm estimation (Enter rough lever arms, Ellipse will refine them automatically)

High Accuracy Heave

Ellipse Marine version delivers a 5-cm accurate heave which automatically adjusts to the wave period.

Ellipse is a cost-effective alternative solution for instrumented buoys, helideck, or boat motion monitoring applications.
All you need to quickly get started

**Development Kit**

The Development kit comes with your first Ellipse. It contains:
- Your Ellipse sensor calibration report
- A Quick start guide
- All required accessories depending on the chosen model (USB cable, Antenna(s), Development boards)

The SDK contains the sbgcenter which allows visualization, configuration, analysis, and export to Excel, Matlab, Google Earth formats as well as code examples for easy integration.

**Services**

As expert of inertial navigation, we are at your side, helping you to get the most of your sensor:
- Free technical support by phone and email
- Unlimited firmware updates
- Dedicated support platform (Knowledge center, documentation, etc.)
- Custom remote initiation or on-site training on demand

**Qinertia**

Get more with your Ellipse INS using Qinertia (in option):
- Detailed analysis after the mission
- Replay the sensor data with different configuration
- Refine the mechanical installation (GNSS lever arm) to the centimeter level for improved real time behavior
- Reach ultimate sensors performance using Forward/Backward/Merge processing

**Dynamics Analysis**

**Navigation**

**Autonomous Industrial Vehicles**
ORDERING INFORMATION
Pick one of each category

MODEL
A: AHRS
E: Externally Aided INS
N: INS with integrated RTK GNSS
D: INS with dual antenna RTK GNSS

VERSION
Marine: 8 g – 450°/s
Land Air: 20 g – 450°/s
High Dynamics: 40 g – 1000°/s

PACKAGE
BOX RS-232 / 422
BOX RS-232 / CAN
OEM TTL

INTERNAL GNSS (N & D MODELS)
Features
SBAS, RTK, RAW

Signals
GPS: L1C/A, L2C
GLONASS: L1OF, L2OF
GALILEO: E1, E5b,
BEIDOU: B1/B2

Update rate
< 5 Hz

Cold start / Hot start
< 24 s / < 2 s

PRESSURE SENSOR (models E/N/D)
Resolution
1.2 Pa / 10 cm / 0.3 ft

Pressure accuracy
± 50 Pa / ± 200 Pa Relative / Absolute

ELECTRICAL & ENVIRONMENTAL
Input voltage
5 - 36 V

Power consumption
A/E: < 300 mW
N/D: < 600 mW
D: < 900 mW

Specified temperature
-40 to 85 °C

Shock limit
500 g

Operating vibration
8 g RMS (20 Hz to 2 k Hz per MIL-STD 810G)

MTBF
218,000 hours

(1) Without GNSS antenna

Specifications

ACURACY (RMS)  360° sensing in all axes, no mounting limitation

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>E / N / D</th>
</tr>
</thead>
</table>
| Roll / Pitch | 0.1° | 0.1° SP
| | | 0.05° RTK
| | | 0.03° PPK(1)
| Heading | 0.8° Magnetic(2) | 0.2° Dual antenna 2m
| | 0.2° Single antenna with dynamics | 0.1° PPK(3)
| Velocity(2) | - | 0.03 m/s
| Navigation(2) | - | 1.2 m Single Point
| | 1 m SBAS
| | 1 cm RTK / PPK(2) + 1 ppm
| Heave accuracy | 5 cm or 5% - Valid for Marine version |
| Heave period | Up to 15 s - Automatically adjusts to the wave period |

(1) With Supported GNSS receiver
(2) Under homogenous magnetic field
(3) Optional PPK = Post-processing Kinematic
(4) Under good GNSS availability

INTERFACES
Available data
Euler angles, quaternion, velocity, position, heave, calibrated sensor data, delta angles, velocity, barometric data, status, GPS data, UTC time, GNSS raw data (Post-processing), etc.

Aiding sensors
GNSS, Odometer, RTCM

Output rate
200 Hz, 1,000 Hz (IMU data)

Main Serial Interface
RS-232, RS-422, USB - up to 921,600 bps

Serial protocols
Binary eCom, NMEA, ASCII, TSS

CAN interface
CAN 2.0A/B - up to 1 Mbit/s

Pulses
Inputs: Events, PPS, DMI (Direction or quadrature)
Outputs: Synchronization (PPS)
Model A/N/D: 2 inputs / 1 output
Model E: 4 inputs / 2 outputs

SENORS

<table>
<thead>
<tr>
<th></th>
<th>Accelerometers</th>
<th>Gyroscopes</th>
<th>Magnetometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain stability</td>
<td>1000 ppm</td>
<td>500 ppm</td>
<td>&lt; 0.5 %</td>
</tr>
<tr>
<td>Non-linearity</td>
<td>1500 ppm</td>
<td>50 ppm</td>
<td>&lt; 0.1 % FS</td>
</tr>
<tr>
<td>Bias stability</td>
<td>± 5 mg</td>
<td>± 0.2 °/s</td>
<td>± 1 mGauss</td>
</tr>
<tr>
<td>Random walk Noise density</td>
<td>57 µg/√Hz</td>
<td>0.15 °/√hr</td>
<td>3 mGauss</td>
</tr>
<tr>
<td>Bias in-run instability(1)</td>
<td>14 µg</td>
<td>7 °/h</td>
<td>1.5 mGauss</td>
</tr>
<tr>
<td>VRE</td>
<td>100 µg/g² RMS</td>
<td>1 °/g² RMS</td>
<td>-</td>
</tr>
<tr>
<td>Alignment error</td>
<td>&lt; 0.05 °</td>
<td>&lt; 0.05 °</td>
<td>&lt; 0.1 °</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>390 Hz</td>
<td>133 Hz</td>
<td>22 Hz</td>
</tr>
</tbody>
</table>

(1) Allan Variance, @ 25 °C

MECHANICAL
Box version are IP68, resistant to dust and water.
OEM version are PCB mounted for tight integration.

<table>
<thead>
<tr>
<th>Model</th>
<th>Box</th>
<th>A</th>
<th>E</th>
<th>N</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>46 x 45 x 24 mm</td>
<td>46 x 45 x 24 mm</td>
<td>46 x 45 x 24 mm</td>
<td>46 x 45 x 32 mm</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>45 g</td>
<td>47 g</td>
<td>49 g</td>
<td>65 g</td>
<td></td>
</tr>
</tbody>
</table>

OEM

| | Size | 29.5 x 25.5 x 11 mm | 29.5 x 25.5 x 11 mm | 29.5 x 25.5 x 16 mm | 29.5 x 25.5 x 16 mm |
| | Weight | 8 g | 8 g | 17 g | 17 g |

All parameters apply to full specified temperature range, unless otherwise stated. Full specifications can be found in the Ellipse Hardware Manual available upon request.
SBG Systems is a leading supplier of inertial motion sensing solutions. The company provides a wide range of inertial solutions from miniature to high accuracy. Combined with cutting-edge calibration techniques and advanced embedded algorithms, SBG Systems products are ideal solutions for industrial & research projects such as unmanned vehicle control, antenna tracking, camera stabilization, and surveying applications.

PRODUCT LINES

Ellipse Micro
Ekinox Series
Apogee Series

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