Ellipse Series

MINIATURE HIGH PERFORMANCE Inertial Sensors

Navigation, Motion & Heave Sensing

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.
## ACCURACY
- 0.1° Real-time Attitude
- Up to 2 cm RTK GNSS Position
- 5 cm Auto-Adapative Heave

## KEY FEATURES
- High quality sensors
- GNSS receiver
- DGPS corrections
- IP 68 enclosure
- 200 Hz output rate

Ellipse inertial sensors provide outstanding orientation and position data in a small, light-weight, and rugged enclosure. Incredibly versatile, you can connect your own GPS/GNSS receiver or use the internal one, connect an odometer, receive differential GPS corrections, etc.

### 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>Roll, Pitch</td>
<td>0.1°</td>
<td>0.1°</td>
<td>0.1°</td>
<td>0.1°</td>
</tr>
<tr>
<td>Heading</td>
<td>0.8° (Magnetic based)</td>
<td>0.5° (GNSS-based)</td>
<td>0.5° (GNSS-based)</td>
<td>0.2° (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>✦</td>
<td>✦</td>
<td>✦</td>
<td>✦</td>
</tr>
<tr>
<td>DGPS corrections</td>
<td>✦</td>
<td>✦</td>
<td>✦</td>
<td>✦</td>
</tr>
<tr>
<td>Navigation</td>
<td>Navigation with external GNSS receiver</td>
<td>Internal GNSS receiver 2 m GNSS accuracy</td>
<td>Survey-grade L1/L2 GNSS receiver 2 cm RTK GNSS Accuracy</td>
<td>N/A</td>
</tr>
<tr>
<td>Post-Processing</td>
<td>✦</td>
<td>✦</td>
<td>✦</td>
<td>✦</td>
</tr>
</tbody>
</table>

### GNSS-based Heading Immune to magnetic disturbances

Motion & Heave Monitoring | Payload Orientation & Positioning | Data Georeferencing
Features Inherited from High End INS/GNSS

Advanced Filtering

- Efficient vibration rejection
- Real time fusion of inertial, GNSS, and aiding data (DMI, RTCM, etc.)
- False GPS measurements rejection

Calibration

- Extensive test and calibration from -40 to 85°C
- Easy hard and soft magnetic disturbances compensation

Motion Profiles

Select your motion profile (helicopter, car, etc.) and Kalman Filter, vibration level, dynamics, magnetic disturbance immunity are automatically adjusted.

High Accuracy Heave

Ellipse (A2 option) 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.
Development Kit, all-in-one package for easy integration

Hardware

The Development kit comes with your Ellipse. It contains:

- A quick start guide and the user manual,
- The calibration report,
- A USB cable,
- A USB Key including software and tools

All Ellipse models come with a two-year warranty.

Software

The windows-based sbgCenter software allows:

- Real-time data visualization
- Easy configuration through motion profiles
- Data Analysis by zooming through time
- Export into Excel, Matlab, Google Earth formats

A C library, and some code source examples are provided.

Support

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, support answers archive, documentation, etc.)
- Custom Training on demand
Specifications

**ACCURACY (RMS)**

360° sensing in all axes, no mounting limitation

<table>
<thead>
<tr>
<th>Model</th>
<th>A</th>
<th>E/N</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roll / Pitch</td>
<td>0.1°</td>
<td>0.1°</td>
<td>0.1° / 0.05° (PPK)</td>
</tr>
<tr>
<td>Heading</td>
<td>0.8°</td>
<td>&lt; 0.5° GPS**:</td>
<td>&lt; 0.2° Dual GPS*** (&gt;1 m baseline)</td>
</tr>
<tr>
<td>Velocity**</td>
<td>-</td>
<td>0.1 m/s</td>
<td>0.03 m/s</td>
</tr>
<tr>
<td>Position**</td>
<td>-</td>
<td>2 m</td>
<td>Single point L1/L2: 1.2 m</td>
</tr>
</tbody>
</table>

**Heave accuracy** 5 cm or 5% Valid for A2 version

**Heave period** Up to 15 s Automatically adjusts to the wave period

*Under homogenous magnetic field
**Under regular acceleration, or automotive motion
***Under good GNSS availability
PPK = Post-processing Kinematic. Post-processing with Inertial Explorer®.

**INTERFACES**

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

**Aiding sensors**
- GNSS, Odometer (DMI), 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 protocol, 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), Virtual DMI
- Model A & N: 2 inputs / 1 output
- Model E: 4 inputs / 2 outputs
- Model D: 3 inputs / 2 outputs

**INTERNAL GNSS**

**Engine, update rate**
- N: 72-channel, 10 Hz, L1 C/A GPS, GLONASS, QZSS, Beidou, SBAS, GALILEO
- D: 120-channel, 5 Hz
- STD: GPS L1/L2/L2C, SBAS, QZSS
- Option: GLONASS, Beidou, RTK, RAW

**Cold start / Hot start**
- N: 26 s / < 1 s
- D: < 50 s / < 35 s

**MECHANICAL**

**Size**
- models A/E/N:
  - 46 x 45 x 24 mm
  - 1.8 x 1.77 x 0.9" (model A)
  - 3.43 x 2.64 x 1.24" (model D)
- model D:
  - 87 x 67 x 31.5 mm
  - 3.43 x 2.64 x 1.24"

**Weight**
- A: 45 g / 0.1 lb
- N: 47 g / 0.1 lb
- E: 49 g / 0.1 lb
- D: 180 g / 0.4 lb

**IP Rating**
- IP68

**ELECTRICAL & ENVIRONMENTAL**

**Input voltage**
- A/E/N: 5 - 36 V
- D: 9 - 36 V

**Power consumption**
- A/E: < 460 mW
- N: < 650 mW
- D: < 2,500 mW

**Specified temperature**
- A/E/N: -40 to 85 °C, -40 to 185 °F
- D: -40 to 75 °C, -40 to 167 °F

**Shock limit**
- 2,000 g

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

**MTBF**
- 50,000 hours

**All parameters apply to full specified temperature range, unless otherwise stated.** Full specifications can be found in the Ellipse Hardware Manual available upon request.

**PRODUCT CODE**

*standard product options

<table>
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<th>A</th>
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<tbody>
<tr>
<td><strong>MODEL</strong></td>
<td></td>
<td></td>
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</table>
| E: | Externally Aided INS | INS with integrated GNSS
| D: | INS with integrated dual antenna GNSS |

**ELLIPSE2-#-G#A#-###-####**

**PACKAGING**

| B1 | Box * RS-232/422 |
| B2 | Box RS-232 + CAN |
| L1 | OEM TTL |
| L2 | OEM RS-232/422 + CAN |

**ACCELEROMETER**

- 8 g
- 16 g
- 40 g

**GYROSCOPE**

- 450 °/s
- 1,000 °/s

**MAGNETOMETERS**

- ± 50 Gauss

**SENSORS**

**Accelerometers**

- Gain stability: 1000 ppm
- Non-linearity: 1500 ppm
- Bias stability: ± 5 mg
- Random walk/Noise density: 57 µg/√Hz
- Bias in-run instability*: 14 µg
- VRE: 50 µg/g² RMS
- Alignment error: < 0.05°
- Bandwidth: 390 Hz

**Cyrosopes**

- Range: ± 16 g
- Gain stability: ± 450 °/s
- Non-linearity: ± 50 ppm
- Bias stability: ± 0.2°
- Random walk/Noise density: 0.15 °/√hr
- VRE: 1 °/h/g² RMS
- Alignment error: < 0.05°
- Bandwidth: 133 Hz

**Magnetometers**

- Range: ± 50 Gauss
- Gain stability: ± 500 ppm
- Non-linearity: < 0.5%
- Bias stability: ± 1 mGauss
- Random walk/Noise density: 3 mGauss
- VRE: ± 0.5°/g² RMS
- Alignment error: < 0.1°
- Bandwidth: 22 Hz

**PRESSURE SENSOR (models N & E)**

- Resolution: 1.2 Pa / 10 cm / 0.3 ft
- Pressure accuracy: ± 50 Pa / ± 200 Pa Relative / Absolute

**INTERNAL GNSS**

- Accuracy: < 0.05°
- Bandwidth: 390 Hz

**REFERENCES**

Contact your Representative

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* Allan Variance, @ 25 °C

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< All specifications are applicable within the 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 MEMS-based 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.

TEST RESULTS

VIDEO

Marine

Automotive

SBG Systems EMEA (Headquarters)
Phone: +33 1 80 88 45 00
E-mail: sales@sbg-systems.com

SBG Systems North America
Phone: +1 (657) 845-1771
E-mail: sales.usa@sbg-systems.com

www.sbg-systems.com