MINIATURE HIGH PERFORMANCE Inertial Sensors

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** - The Most Advanced Miniature Inertial Sensors

### ACCURACY
- Up to 0.1° real-time attitude
- Up to 2 cm RTK GNSS Position
- 10 cm Auto-Adaptative Heave

### KEY FEATURES
- Very low noise gyroscopes
- 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.

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**Extreme Flexibility for High Demanding Applications**

<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>0.2°</td>
<td>0.2°</td>
<td>0.2°</td>
<td>0.1°</td>
</tr>
<tr>
<td>Heading</td>
<td>1°</td>
<td>0.5°</td>
<td>0.5°</td>
<td>0.2° (Dual-antenna)</td>
</tr>
<tr>
<td>Heave: 10 cm or 10 %</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 GPS / 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></td>
</tr>
</tbody>
</table>

**Motion & Heave Monitoring**

**Payload Orientation & Positioning**

**Data Georeferencing**
Features Inherited from High End INS/GNSS

Ellipse Series comes with features inspired from high end inertial systems such as GNSS receiver, FIR and rejection filtering, extensive temperature calibration, and motion profiles that adjust the sensor to the application constraints.

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.

Ellipse-D, the Most Powerful Model
- Immune to magnetic disturbances
- Accurate heading even under low dynamics
- L1/L2 GNSS receiver

Ellipse-D integrates a Survey-grade GNSS receiver with two antennas for unmatched heading, attitude, and position accuracy in real-time and post-processing.

This is the ideal sensor for antenna tracking, payload orientation, and cost-effective survey.
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

**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

**PRODUCT CODE**
- ELLIPSE-#-G#A#-##

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

**ACCELEROMETER**
- 2: 8 g
- 3: 16 g

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

**ACCELEROMETER**
- 2: 8 g
- 3: 16 g

**MAGNETOMETERS**
- 2: 100 °/s
- 3: 200 °/s
- 4: 450 °/s
- 5: 1,000 °/s

**INTERFACES**

<table>
<thead>
<tr>
<th>Available data</th>
<th>Euler angles, quaternions, velocity, position, heave, calibrated sensor data, delta angles &amp; velocity, barometric data, status, GPS data, UTC time, GPS raw data (Post-processing).</th>
</tr>
</thead>
</table>

**SENSORS**

<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>0.2 °</td>
<td>0.2 °</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 (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, SBAS: 0.6 m, DGPS: 0.4 m, RTK: 2 cm + 2 ppm (option), PPK: 1 cm (option)</td>
</tr>
</tbody>
</table>

**INTERNAL GNSS**

| Engine, update rate | Model N: 72-channel, 10 Hz, L1/C/A GPS, GLONASS, QZSS, BeiDou, SBAS
|---------------------| Model D: 120-channel, 5 Hz, STD: GPS L1/L2/L5C, SBAS, QZSS, Option: GLONASS, Calliope, BeiDou |
| Cold start / Hot start | Model N: 26 s / < 1 s
| Model D: < 50 s / < 35 s |

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

<table>
<thead>
<tr>
<th>Resolution</th>
<th>1.2 Pa / 10 cm / 0.3 ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pressure accuracy</td>
<td>± 50 Pa / ± 200 Pa</td>
</tr>
</tbody>
</table>

**MECHANICAL**

<table>
<thead>
<tr>
<th>Size models A/E/N</th>
<th>46 x 45 x 24 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>34 x 34 x 13 mm</td>
</tr>
<tr>
<td></td>
<td>1.8 x 1.7 x 0.9</td>
</tr>
<tr>
<td></td>
<td>1.3 x 1.3 x 0.5</td>
</tr>
<tr>
<td></td>
<td>87 x 67 x 31.5 mm</td>
</tr>
<tr>
<td></td>
<td>3.43 x 2.64 x 1.24</td>
</tr>
</tbody>
</table>

**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**

| A | 68 |

**ACCURACY (RMS)**

360 ° sensing in all axes, no mounting limitation

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

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**PRODUCT CODE**

- standard product options

**PACKAGING**

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

**ACCELEROMETER**

- 2: 8 g
- 3: 16 g

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**SENSORS**

<table>
<thead>
<tr>
<th>Accelerometers</th>
<th>Gyroscopes</th>
<th>Magnetometers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>± 8 g</td>
<td>± 450 °/s</td>
</tr>
<tr>
<td>Gain stability</td>
<td>&lt; 0.1 %</td>
<td>&lt; 0.05 %</td>
</tr>
<tr>
<td>Non-linearity</td>
<td>&lt; 0.2 % FS</td>
<td>&lt; 0.05 % FS</td>
</tr>
<tr>
<td>Bias stability</td>
<td>± 5 mg</td>
<td>± 0.2 °/s</td>
</tr>
<tr>
<td>Bias in-run instability*</td>
<td>20 µg</td>
<td>8 µg/h</td>
</tr>
<tr>
<td>VRE</td>
<td>7 mg/g^2 RMS</td>
<td>0.001 °/s^2 RMS</td>
</tr>
<tr>
<td>Alignment error</td>
<td>&lt; 0.05 °</td>
<td>&lt; 0.05 °</td>
</tr>
<tr>
<td>Bandwidth</td>
<td>250 Hz</td>
<td>133 Hz</td>
</tr>
</tbody>
</table>

* Allan Variance, @ 25 °C

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**PRESSURE SENSOR**

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**ELECTRICAL & ENVIRONMENTAL**

| Input voltage | Model A/E/N: 5 - 36 V
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model D: 9 - 36 V</td>
</tr>
<tr>
<td>Power consumption</td>
<td>Model A/E: &lt; 460 mW</td>
</tr>
<tr>
<td></td>
<td>Model N: &lt; 650 mW</td>
</tr>
<tr>
<td></td>
<td>Model D: &lt; 2,500 mW</td>
</tr>
<tr>
<td>Specified temperature</td>
<td>Model A/E/N: -40 to 85 °C, -40 to 185 °F</td>
</tr>
<tr>
<td></td>
<td>Model D: -40 to 75 °C, -40 to 167 °F</td>
</tr>
<tr>
<td>Shock limit</td>
<td>2,000 g</td>
</tr>
<tr>
<td>Operating vibration</td>
<td>3 g RMS (20 Hz to 2 kHz per MIL-STD 810G)</td>
</tr>
<tr>
<td>MTBF</td>
<td>50,000 hours</td>
</tr>
</tbody>
</table>

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**Specifications**

Preliminary

All parameters apply to full specified temperature range, unless otherwise stated. Full specifications can be found in the Ellipse User 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

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