

# Ellipse Series

# NEW

## MINIATURE HIGH PERFORMANCE Inertial Sensors



ITAR  
Free

0.1°  
RMS

IMU  
AHRs  
MRU  
INS  
VG



### 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.

 **SBG SYSTEMS**

# Ellipse Series - The Most Advanced Miniature Inertial Sensors



## ACCURACY

- » 0.1° Real-time Attitude
- » Up to 2 cm RTK GNSS Position
- » 5 cm Auto-Adaptive 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



Ellipse-A



Ellipse-E



Ellipse-N



Ellipse-D

GNSS-based Heading  
Immune to magnetic disturbances

	Ellipse-A	Ellipse-E	Ellipse-N	Ellipse-D
Roll, Pitch	0.1°	0.1°	0.1°	0.1°
Heading	0.8° (Magnetic based)	0.5° (GNSS-based)	0.5° (GNSS-based)	0.2° (Dual-antenna GNSS)
Heave: 5 cm or 5%	●	●	●	●
Odometer aiding		●	●	●
DGPS corrections			●	●
Navigation		Navigation with external GNSS receiver	Internal GNSS receiver 2 m GNSS accuracy	Survey-grade L1/L2 GNSS receiver 2 cm RTK GNSS Accuracy
Post-Processing				●

Motion & Heave Monitoring



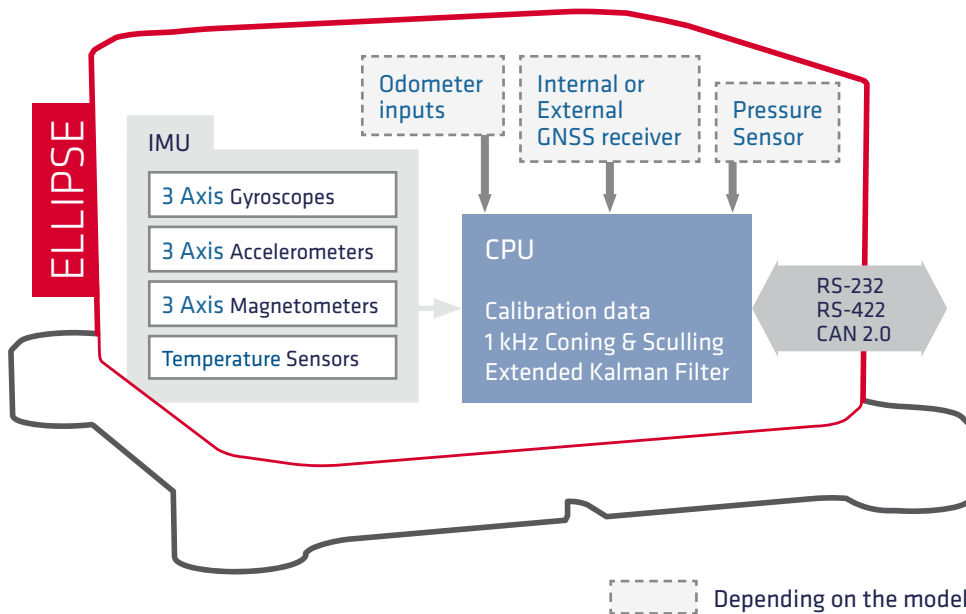
Payload Orientation & Positioning



Data Georeferencing



# Features Inherited from High End INS/GNSS



OEM version available for Ellipse-A/E/N models

## 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.

HEAVE ACCURACY

5 CM



AUTO-ADJUSTING HEAVE

## 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.

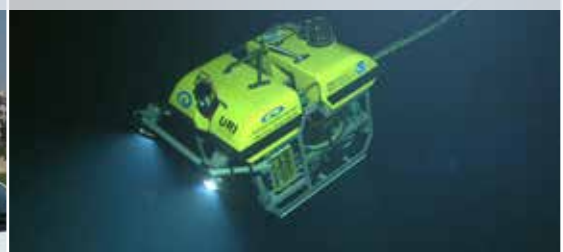
Helideck Monitoring System



Pointing & Stabilization



Orientation





# Development Kit, all-in-one package for easy integration



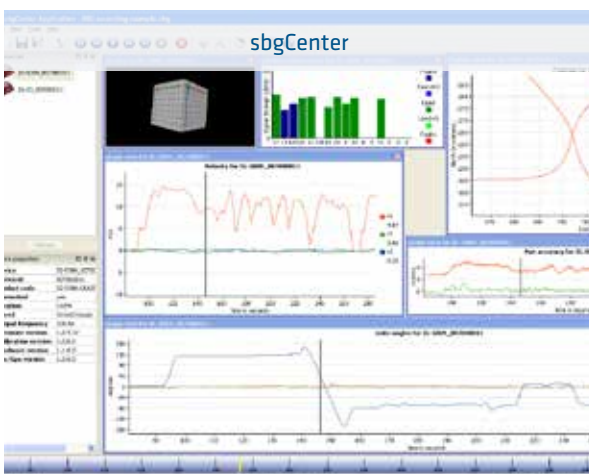
## Hardware

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.

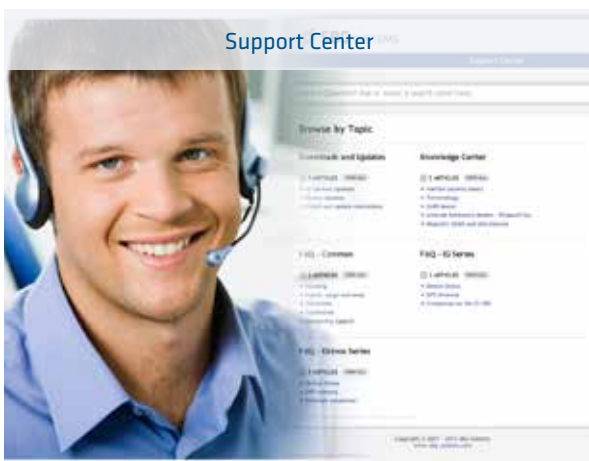


## Software

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

### Navigation



### Dynamics Analysis



### Avionics



# Specifications

## ACCURACY (RMS)

360 ° sensing in all axes, no mounting limitation

Model	A	E/N	D
Roll / Pitch	0.1 °	0.1 °	0.1 ° / 0.05 ° (PPK)
Heading	0.8 ° Magnetometers*	< 0.5 ° GPS**	< 0.2 ° Dual GPS*** (> 1 m baseline)
Velocity***	-	0.1 m/s	0.03 m/s
Position***	-	2 m	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)

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.
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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, Galileo, Beidou, RTK, RAW
Cold start / Hot start	N: 26 s / < 1 s D: < 50 s / < 35 s

## MECHANICAL

	Box	OEM model
Size	models A/E/N: 46 x 45 x 24 mm 1.8 x 1.77 x 0.9 "	34 x 34 x 13 mm 1.34 x 1.34 x 0.51 "
	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	12 g / 0.02 lb 12 g / 0.02 lb 12 g / 0.02 lb -
IP Rating	IP68	-

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

Ellipse-D GNSS OPTIONS  
Contact your Representative

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

### MODEL

A: AHRIS  
E: Externally Aided INS  
N: INS with integrated GNSS  
D: INS with integrated dual antenna GNSS

### PACKAGING

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

### GYROSCOPE

4: 450 °/s ▪

5: 1,000 °/s

### ACCELEROMETER

2: 8 g

3: 16 g ▪

4: 40 g

## SENSORS

	Accelerometers	Gyroscopes	Magnetometers
Range	± 16 g	± 450 °/s	± 50 Gauss
Gain stability	1000 ppm	500 ppm	< 0.5 %
Non-linearity	1500 ppm	50 ppm	< 0.1 % FS
Bias stability	± 5 mg	± 0.2 °/s	± 1 mGauss
Random walk/ Noise density	57 µg/√Hz	0.15 °/√hr	3 mGauss
Bias in-run instability*	14 µg	7 °/h	1.5 mGauss
VRE	50 µg/g <sup>2</sup> RMS	1 °/h/g <sup>2</sup> RMS	-
Alignment error	< 0.05 °	< 0.05 °	< 0.1 °
Bandwidth	390 Hz	133 Hz	22 Hz

\* Allan Variance, @ 25 °C

## PRESSURE SENSOR (models N & E)

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

## 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 k Hz per MIL-STD 810G)
MTBF	50,000 hours



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



Marine



Automotive

#### VIDEO



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

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

[www.sbg-systems.com](http://www.sbg-systems.com)