# VN-100 IMU/AHRS

High-Performance Embedded Navigation

PRODUCT OVERVIEW

The VN-100 is a miniature, light weight, low power, high-performance Inertial Measurement Unit (IMU) and Attitude and Heading Reference System (AHRS) available in a surface mount package or aluminum encased Rugged module. Incorporating the latest in MEMS technology, the VN-100 combines 3-axis accelerometers, gyros, magnetometers, a barometric pressure sensor and a 32-bit microprocessor into an extremely compact design.

The VN-100 computes and outputs a real-time, drift-free attitude solution (i.e. 3D orientation) that is continuous over a complete range of 360° motion. All VN-100 sensors go through a rigorous calibration process at the VectorNav production facility to ensure the highest quality inertial measurements and attitude estimates. The small size, high performance, and cost-effectiveness of the VN-100 provides unprecedented opportunities for embedded navigation.
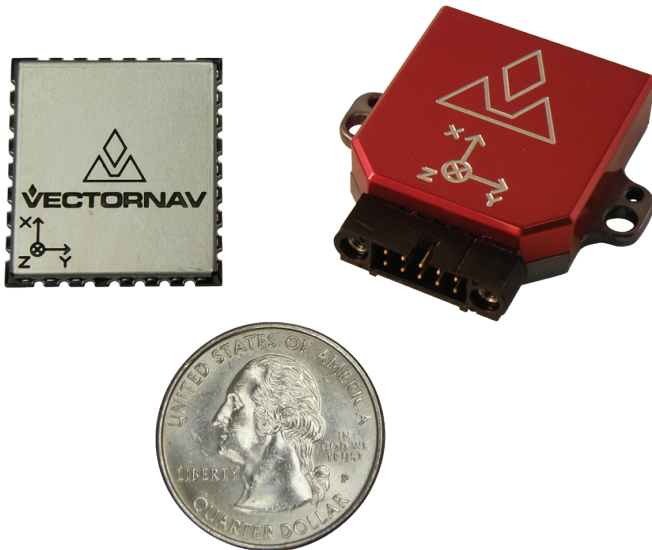
HIGHLIGHTS

➤ On-board Extended Kalman filter running at 400 Hz, IMU Data available at 1 kHz
➤ Continuous attitude solution over the complete 360° range of motion
➤ Static accuracy better than 0.5° in pitch/roll, 2° in heading
➤ Individually calibrated for bias, scale factor, misalignment, & gyro g-sensitivity
➤ Available with standard (at +25°C) or full temperature compensation (-40°C to +85°C)
➤ Surface mount package (30-pin LGA)
  Dimensions: 24 x 22 x 3 mm; Weight: 3.5 grams
➤ Rugged package (10-pin Harwin connector)
  Dimensions: 36 x 33 x 9 mm; Weight: 15 grams

FEATURES

➤ Vector Processing Engine (VPE) 1.0 Toolboxes
  Real-time magnetic & acceleration disturbance rejection
  Adaptive signal filtering
  Dynamic filter tuning
  On-board Hard & Soft Iron compensation
➤ Coning & sculling integrals (ΔV's, Δθ's)
➤ User configurable messages using simple VectorNav binary protocol
➤ On-board World Magnetic and Gravity Reference Models
➤ On-board gyro drift compensation
➤ Multi-sensor synchronization
➤ Inputs for external magnetometers or velocity measurements (Airspeed, GPS)
➤ Barometric pressure sensor

Attitude & Heading

Range (Heading/Roll):	±180 °
Range (Pitch):	±90 °
Static Accuracy (Heading, Magnetic)[1]:	2.0 ° RMS
Static Accuracy (Pitch/Roll):	0.5 ° RMS
Dynamic Accuracy (Heading, Magnetic)[1]:	2.0 ° RMS
Dynamic Accuracy (Pitch/Roll)[2]:	1.0 ° RMS
Angular Resolution:	< 0.05 °
Repeatability:	< 0.2°
Output Rate (IMU Data)[3]:	1 kHz
Output Rate (Attitude Data):	400 Hz

Gyro

Range:	±2000 °/s
In-Run Bias Stability:	< 10 °/hr
Linearity:	< 0.1 % FS
Noise Density:	0.0035 °/s /√Hz
Bandwidth:	256 Hz
Alignment Error:	±0.05 °

Accelerometer

Range:	±16 g
In-Run Bias Stability:	< 0.04 mg
Linearity:	< 0.5 % FS
Noise Density:	0.14 mg/√Hz
Bandwidth:	260 Hz
Alignment Error:	±0.05 °

Magnetometer

Range:	±2.5 Gauss
Linearity:	< 0.1 %
Noise Density:	140 µGauss/√Hz
Bandwidth:	200 Hz
Alignment Error:	±0.05 °

Pressure Sensor

Range:	10 to 1200 mbar
Resolution:	0.042 mbar
Accuracy:	±1.5 mbar
Error Band:	±2.5 mbar
Bandwidth:	200 Hz

Environment

Operating Temp:	-40°C to +85°C
Storage Temp:	-40°C to +85°C

Electrical:

Electrical:	SMD	Rugged
Input Voltage:	3.2 V to 5.5 V	4.5 V to 5.5 V
Current Draw:	45 mA @ 3.3V	40 mA @ 5 V
Max Power Consumption:	185 mW	220 mW
Digital Interface:	Serial TTL, SPI	Serial TTL, RS-232

Physical:

Physical:	SMD	Rugged
Size:	24 x 22 x 3 mm	36 x 33 x 9 mm
Weight:	3.5 g	15 g
Interface:	30-pin LGA	10-pin Harwin

[1] With proper magnetic declination, suitable magnetic environment and valid hard/soft iron calibration.
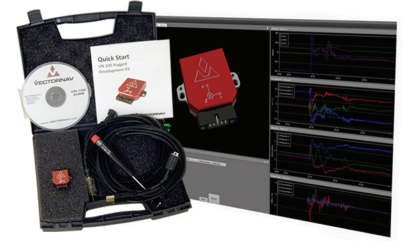[2] Typical, Velocity Aiding required for applications with sustained linear accelerations.
[3] Default 800 Hz.

DEVELOPMENT KITS

VN-100 Development Board
- Pre-Soldered VN-100 Surface Mount Part with USB & RS-232 Interfaces
- 30-Pin Header
- Software Development Kit

VN-100 Rugged Development Kit
- USB & Serial Adapter Cables
- Cable Connection Tool
- Carrying Case
- Software Development Kit

APPLICATIONS

- UAVs, UAS, Manned Aircraft
- Heavy Machinery Monitoring
- Robotics
- ROVs
- Smart Weapons
- Body Motion Capture
- Head Mounted Displays

DEVELOPMENT TOOLS

- **Sensor Explorer GUI**: Powerful and user-friendly GUI allows you to display sensor output as a 3D object, graph inertial data, configure sensor settings, perform data-logging, & more.
- **Software Development Kit**: Interface via C/C++, .NET & MATLAB development environments.
- **Online Library**: A large collection of inertial navigation knowledge and application notes is available on our website to help maximize VN-100 performance for your application.
- **Engineering Support**: Dedicated and responsive engineering support team with combined experience in sensing, guidance, navigation, and controls.
- **Custom Solutions Available**: Application-specific modeling & algorithm development; controls & closed-loop navigation solutions; custom form-factors & packaging; integration with other external sensors; displays, GUIs & other software packages; tailored calibrations; custom communication protocols.