

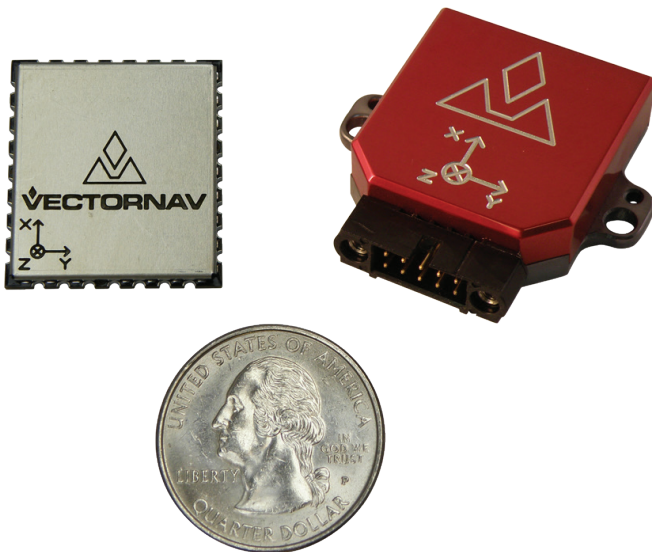
VN-100 IMU/AHRS

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, $\Delta \theta$'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

TECHNICAL SPECIFICATIONS

Attitude & Heading

Range (Heading/Roll):	$\pm 180^\circ$
Range (Pitch):	$\pm 90^\circ$
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:	$< 0.05^\circ$
Repeatability:	$< 0.2^\circ$
Output Rate (IMU Data) ³ :	1 kHz
Output Rate (Attitude Data):	400 Hz

Gyro

Range:	$\pm 2000^\circ/\text{s}$
In-Run Bias Stability:	$< 10^\circ/\text{hr}$
Linearity:	$< 0.1\% \text{ FS}$
Noise Density:	$0.0035^\circ/\text{s}/\sqrt{\text{Hz}}$
Bandwidth:	256 Hz
Alignment Error:	$\pm 0.05^\circ$

Accelerometer

Range:	$\pm 16 \text{ g}$
In-Run Bias Stability:	$< 0.04 \text{ mg}$
Linearity:	$< 0.5\% \text{ FS}$
Noise Density:	$0.14 \text{ mg}/\sqrt{\text{Hz}}$
Bandwidth:	260 Hz
Alignment Error:	$\pm 0.05^\circ$

Magnetometer

Range:	$\pm 2.5 \text{ Gauss}$
Linearity:	$< 0.1\%$
Noise Density:	$140 \mu\text{Gauss}/\sqrt{\text{Hz}}$
Bandwidth:	200 Hz
Alignment Error:	$\pm 0.05^\circ$

Pressure Sensor

Range:	10 to 1200 mbar
Resolution:	0.042 mbar
Accuracy:	$\pm 1.5 \text{ mbar}$
Error Band:	$\pm 2.5 \text{ mbar}$
Bandwidth:	200 Hz

Environment

Operating Temp:	-40°C to $+85^\circ\text{C}$
Storage Temp:	-40°C to $+85^\circ\text{C}$

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

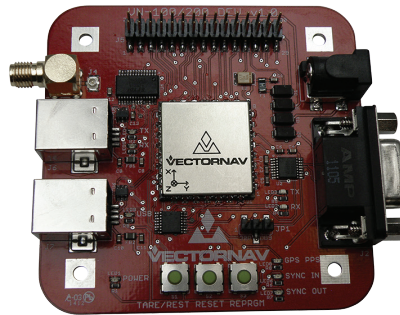
Physical:	SMD	Rugged
Size:	24 x 22 x 3 mm	36 x 33 x 9 mm
Weight:	3.5 g	15 g
Interface:	30-pin LGA	10-pin Harwin

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.

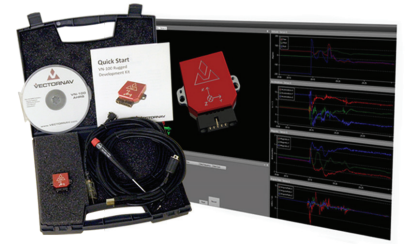
³ Default 800 Hz.

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.