VN-310 DUAL GNSS/INS

Tactical-Grade GNSS/INS with Integrated GNSS-Compass

Highlights

0.05°-0.1°
Dynamic Heading Accuracy (INS)

0.15°
Static Heading Accuracy (GNSS-Compass)

Multi-band GNSS
Integrated L1/L2/E1/E5b GNSS Receiver

MIL-STD VN-310
MIL-STD-810; MIL-STD-461G; DO-160G; IP 68 Rated

0.015°
Dynamic Pitch/Roll Accuracy (INS)

< 1°/hr
Gyro In-Run Bias Stability

RTK/PPK Capable
External RTCM 3 Inputs; Exportable RINEX

Low SWaP VN-310E
31 x 31 x 12 mm; 15 grams; < 1.6 W

Product Overview

The VN-310 is a tactical-grade, high-performance Dual Antenna GNSS-Aided Inertial Navigation System. Incorporating the latest inertial sensor and GNSS technology, the VN-310 combines 3-axis accelerometers, 3-axis gyros, 3-axis magnetometers and two Multi-band L1/L2/E1/E5b GNSS receivers into a compact embedded module or ruggedized packaging option to deliver a high-accuracy position, velocity and attitude solution under both static and dynamic conditions.

The VN-310 is available in two packaging options: a precision milled, anodized aluminum enclosure (VN-310) and a miniature, board-mount option (VN-310E). Certified to MIL-STD and DO-160G standards, the VN-310 is suitable for the most demanding military and aerospace applications. For SWaP-C constrained applications, the ultra compact VN-310E option delivers unprecedented size and weight advantages while still delivering tactical-grade inertial navigation performance.

Features

GNSS-Compass for Static Heading

Two onboard GNSS receivers perform GNSS-Compassing, providing highly accurate heading estimates under static and low dynamic conditions.

Automatic Heading Transition

Automatic and seamless transition between magnetic heading, INS operation in dynamics, and GNSS-Compass in static conditions.

True Inertial Navigation System

No mounting orientation restrictions or configuration modes; Automatic filter initialization and dynamic alignment.

Software Compatibility

The VN-310 and VN-310E share a common communication protocol with the entire VectorNav product line.

Ease of Availibility

ITAR-free and Made in the USA; short lead times.

User Configurable Messages

ASCII and VectorNav Binary messages.

VN-310

VN-310E

VECTORNAV

Each individual VN-310 and VN-310E undergoes a robust calibration and acceptance testing process at VectorNav's AS9100 certified manufacturing facility. Performance specifications are based on comprehensive field testing and results from real-world applications, and are regularly tested to ensure continued conformance to such specifications.

Sensor Summary

- VectorNav proprietary Extended Kalman Filter INS delivers coupled position, velocity, and a continuous attitude solution over the complete 360° range of operation
- GNSS-Compass for static and low dynamic heading accuracy
- Individually calibrated for bias, scale factor, misalignment, and temperature over full operating range (-40°C to +85 °C)
- RTK Capable: Support for External RTCM 3 Inputs
- Raw GNSS Data: Exportable RINEX Data for PPK; Raw Pseudorange, Doppler and Carrier Phase outputs
- Coning and sculling integrals (ΔV's, Δθ's)
- Data output format: ASCII (VectorNav), NMEA-0183, Binary (VectorNav), ARINC 429[1]
- VN-310:
  - IP 68 per IEC 60529
  - Temperature (DO-160G)
  - Electrical (MIL-STD-1275E)
  - Vibration & Shock (MIL-STD-810G)
  - EMI & Radiation (MIL-STD-461G)
- VN-310E: 24-pin 1mm pitch board-to-board interface connector with (2) U.FL for GNSS antenna connection

Performance Specifications

ATTITUDE

Range (Heading/Yaw, Roll) ....± 180°
Range (Pitch) ....± 90°
Heading (Magnetic)[2] ....2.0° RMS
Heading (INS)[3,4] ....0.05° to 0.1°, 1σ
Heading (GNSS-Compass)[5]
    0.5 m Baseline .... 0.3° to 0.6° RMS
    1.0 m Baseline ....0.15° to 0.3° RMS
    2.0 m Baseline .... 0.08° to 0.15° RMS
Pitch/Roll (Static) .... 0.05° RMS
Pitch/Roll (INS)[4] ....0.015°, 1σ
Heading Mounting Misalignment (VN-310)[6] ....< 0.05°, 1σ
Heading Mounting Misalignment (VN-310E)[6] .... 0.15°, 1σ
Pitch/Roll Mounting Misalignment[6] ....< 0.05°, 1σ
Angular Resolution ....0.001°

POSITION/VELOCITY

Horizontal Position Accuracy[5] .... 1.0 m RMS
Vertical Position Accuracy[5] .... 1.5 m RMS
RTK Position Accuracy[7] .... 0.01 m + 1 ppm CEP
Free Inertial Position Drift[8] ....0.5 cm/s²
Velocity Accuracy ....< 0.02 m/s

IMU Specifications

	ACCELEROMETER	GYROSCOPE	MAGNETOMETER
Range[9]	±15 g	±490°/s	±2.5 Gauss
In-Run Bias Stability (Allan Variance)	< 10 µg	< 1°/hr (0.4-0.7°/hr typ.)	-
Noise Density	< 0.04 mg/√Hz	5 °/hr /√Hz	140 µGauss/√Hz
Bandwidth	240 Hz	240 Hz	200 Hz
Cross-Axis Sensitivity	±0.05 °	< 0.05 °	±0.05 °

GNSS Receivers

Receiver Type... 184 Channel, L1C/A, L1OF, E1, B1I, L2C, L2OF, E5b, B2l GNSS
Constellations[10] ....GPS, GLONASS, Galileo,BeiDou, QZSS, SBAS
Time-To-First-Fix (Cold / Hot) .... 24 s / 2s
Altitude Limit ....50,000 m
Velocity Limit...500 m/s

Environmental

Operating Temperature... -40° to +85° C
Storage Temperature... -40° to +85° C
MTBF (VN-310) .... > 25,000 hours
MTBF (VN-310E)... > 45,000 hours

Interfacing

Output Data Rate (IMU)[11]..up to 800 Hz
Output Data Rate (Position, Velocity & Attitude)......................................up to 400 Hz
Primary Interface (VN-310)... RS-422 (Optional RS-232)
Auxiliary Interface (VN-310)..RS-422
Interface (VN-310E) .... (2) Serial TTL
GNSS PPS...30 ns RMS, 60 ns 99%
Input...Sync-in
Output ....Sync-out

Mechanical/Electrical

	SIZE	WEIGHT	INPUT VOLTAGE	CURRENT DRAW[12]	POWER[12]
VN-310	56 x 56 x 31 mm	160 g	12 to 34 V	135 mA @ 24 V	< 3.3 W
VN-310E	31 x 31 x 12 mm	15 g	3.2 to 3.5 V	480 mA @ 3.3 V	< 1.6 W

1. Contact VectorNav for ARINC 429 option.
2. With proper magnetic declination, suitable magnetic environment and valid hard/soft iron calibration.
3. Dependant on a number of factors, contact VectorNav to discuss expected performance in your application.
4. With sufficient motion for dynamic alignment.
5. Dependant on SBAS, clear view of GNSS satellites, good multipath environment, compatible GNSS antenna, and measurement duration period.
6. Constant on a per part basis. Can be calibrated out during system integration using boresighting or other alignment processes.

7. Dependant on atmospheric conditions, baseline length, GNSS antenna, multipath conditions, satellite visibility and geometry.
8. Typical rate of growth in error of position estimates after loss of GNSS signal, provided INS full alignment prior to loss.
9. Contact VectorNav for Extended Range Gyro Option.
10. Only GPS, Galileo and SBAS constellations used in VN-310 default configuration.
11. Contact VectorNav for higher IMU data output rates.
12. Not including active antenna power consumption.