CNS-5000 INS

KVH's GPS/IMU Continuous Navigation Sustem

Key Features

- FOG-based IMU with GNSS for high reliability and stable performance
- GPS-aided Continuous Navigation System with integrated GPS/IMU in a single enclosure
- Deeply coupled key technology: DSP-3000 FOG-based inertial measurement technology and the NovAtel OEM628 GNSS receiver
- Full 100 Hz position, velocity, and attitude sensing
- IMU data enables 5X faster GPS signal reacquisition
- RTK, L-band, and SBAS positioning modes
- Optional dual antenna for precise heading
- Rugged COTS design for demanding environments
- Provides continuous, precision positioning and orientation, even when GPS signals are blocked or unavailable
- Wheel sensor input for ground applications

Applications

- The CNS-5000 is the ideal solution for a wide range of motion-control and GNSS-integrated navigation applications

  - Aerial and Land Surveying/Mapping

  -Autonomous Vehicles: Robotics, Precision Agriculture, UAVs

  -Guidance

CNS-5000 – The Complete Position, Velocity, and Attitude Solution for Challenging Environments

The versatile KVH CNS-5000 combines two technologies – a highly accurate GPS receiver and a fiber optic gyro (FOG)-based inertial measurement unit (IMU) – within a single enclosure. Through its seamless integration of these two navigation systems, the CNS-5000 provides a low-cost, small form factor solution for 3-D positioning, velocity, and attitude measurement.

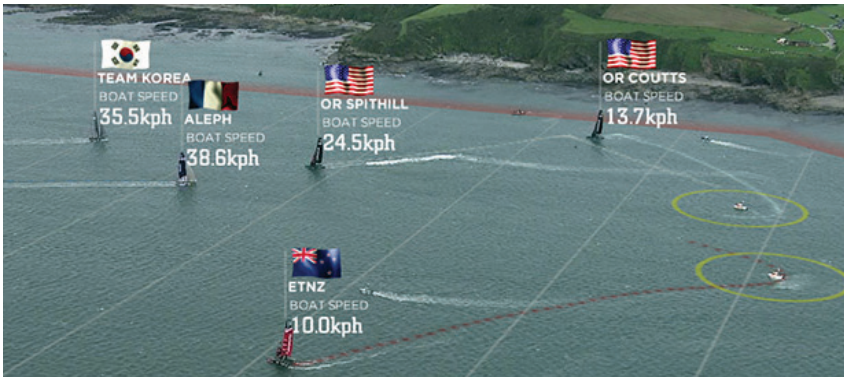
Precise Navigation when GPS is Blocked

The CNS-5000 deep coupling technology provides uninterrupted navigation information when GPS reception is obstructed, jammed, or unavailable. With GPS-only positioning, navigation becomes unreliable when satellite signals are blocked by obstructions; inertial measurement units (IMUs) will drift over time without an external reference. The CNS-5000 overcomes these limitations by combining the two navigation technologies so they enhance each other, creating a powerful precision navigation/positioning system. The absolute position and velocity accuracy of the GPS is used to compensate for IMU drift, while the stable relative position of the highly reliable FOG-based IMU provides superior bridging capability between the two technologies.

Faster GPS Signal Reacquisition

The deeply coupled technologies in the CNS-5000 deliver dramatically faster GPS signal reacquisition while maintaining precise inertial navigation. Unlike most GPS/IMU systems that use GPS data to control errors in data from the IMU, KVH's CNS-5000 relies on the inertial data to support the GPS by aiding in satellite reacquisition. The CNS-5000 delivers L1/L2 band signal lock in less than 2 seconds; other GPS/IMU systems typically take 10 seconds or more to deliver L1 band-only signal lock. The CNS-5000 is also ideal for highly dynamic applications with its high rate output of position, velocity, and attitude data.

A rugged commercial off-the-shelf (COTS) product, the reliable and affordable KVH CNS-5000 blends two powerful navigation technologies to deliver superior GPS tracking and performance.



The CNS-5000 precisely determines the exact position, orientation, and movement of the America's Cup catamarans. It overlays that data along with computed distances and laylines to the marks on the race course onto video being shot from helicopters also equipped with the CNS-5000. This is all accomplished in real time for live television coverage.

KVH CNS-5000 Integrated GPS/IMU

IMU Specifications

Gyro Technology	FOG
Input Rate	±375°/sec
Bias Instability *(25°C)*	≤1°/hr, 1σ
Bias vs. Temperature *(≤1°C/min)*	≤6°/hr, 1σ
Bias Offset *(25°C)*	±20°/hr
Scale Factor Non-linearity *(max rate, 25°C)*	≤1000 ppm, 1σ
Scale Factor vs. Temperature *(≤1°C/min)*	≤300 ppm, 1σ
Angle Random Walk *(25°C)*	≤0.067°/√hr (≤4°/hr/√Hz)
Bandwidth *(-3 dB)*	≥150 Hz
Initialization Time *(valid data)*	≤5 secs
Data Interface	Asynchronous RS-422 or RS-232
Baud Rate	115.2 Kbps
Data Rate	100 Hz

Accelerometer Specifications

Accelerometer Technology	MEMS Silicon
Input Limit *(max)*	±10 g
Bias Instability *(constant temp)*	25 mg, 1σ
Bias Offset *(constant temp)*	±5 mg
Scale Factor Temperature Sensitivity	250 ppm/°C, 1σ (max), ≤100 ppm/°C, 1σ (typical)
Velocity Random Walk *(25°C)*	≤0.12mg/√Hz (0.23 ft/sec/√hr)
Bandwidth *(-3 dB)*	≥50 Hz

Connectors

Power and I/O	MIL-DTL-38999 Series 3
Antenna Input	TNC Female

Horizontal Position Accuracy (RMS)

Single Point L1/L2	1.2 m
SBAS	0.6 m
DGPS	0.4 m
L-band	
VBS	0.6 m
XP	0.15 m
HP	0.1 m
RT-2™	1 cm + 1 ppm

Communication Ports

RS-232 UART COM	2
USB Device	1
CAN	1
Event Input Trigger	1
Configurable PPS	1

GNSS System Performance[1]

Signal Tracking	
GPS	L1, L2
GLONASS	L1, L2
SBAS	
L-band	

Physical/Electrical/Environmental

Dimensions *(max)*	169.4 mm L x 152.4 mm W x 88.9 mm H (6.67" x 6" x 3.5")
Weight *(max)*	2.4 kg (5.3 lbs)
Power Consumption	13.5 W (typical)
Input Voltage	+9 to +18 VDC
Temperature *(operating)*	-40°C to +65°C (-40°F to +149°F)
Shock	7 g, 6-11 msec, half-sine
Vibration	6 g rms, 20-2000 Hz random
Humidity	95% non-condensing

Data Rates

GPS Measurement	20 Hz
GPS Position	20 Hz
IMU Measurement	100 Hz
INS Solution	Up to 100 Hz
Time Accuracy[2]	20 ns RMS
Maximum Velocity	515 m/s

Optional Dual Antenna[3]

Baseline	Heading Accuracy
0.5 m	0.4°
1.0 m	0.2°
2.0 m	0.1°

[1] *Typical values. Performance specifications subject to GPS characteristics, US DOD operational degradation, ionospheric and tropospheric conditions, satellite geometry, baseline length, multipath effects and the presence of intentional or unintentional interference.*

[2] *Time accuracy does not include biases due to RF or antenna delay.*

[3] *Dual antenna requires a second receiver to be paired with the CNS-5000.*

[4] *Post-processing accuracy using Inertial Explorer processing software.*

KVH CNS-5000 Performance During GNSS Outage[1]

Outage Duration	Positioning Mode	Position Accuracy (m) RMS		Velocity Accuracy (m/s) RMS		Attitude Accuracy (degrees) RMS		
		Horizontal	Vertical	Horizontal	Vertical	Roll	Pitch	Heading
0 s	RTK	0.020	0.050	0.020	0.010	0.015	0.015	0.050
	HP	0.100	0.080	0.020	0.010	0.015	0.015	0.050
	SP	1.200	0.600	0.020	0.010	0.015	0.015	0.060
	PP[4]	0.010	0.020	0.020	0.010	0.015	0.015	0.030
10 s	RTK	0.230	0.120	0.062	0.016	0.020	0.020	0.060
	HP	0.770	0.410	0.063	0.017	0.020	0.020	0.060
	SP	1.550	0.720	0.064	0.017	0.020	0.020	0.065
	PP[4]	0.020	0.020	0.020	0.020	0.015	0.015	0.030
60 s	RTK	5.710	1.600	0.212	0.059	0.028	0.028	0.090
	HP	6.470	1.690	0.240	0.071	0.028	0.028	0.095
	SP	7.120	1.890	0.260	0.075	0.028	0.028	0.100
	PP[4]	0.230	0.070	0.030	0.030	0.016	0.016	0.032

For detailed interface control drawings (ICD) and technical manuals on this product, please visit ***www.kvh.com/CNS5000docs***

QUALITY CERTIFIED SYSTEM ISO 9001

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