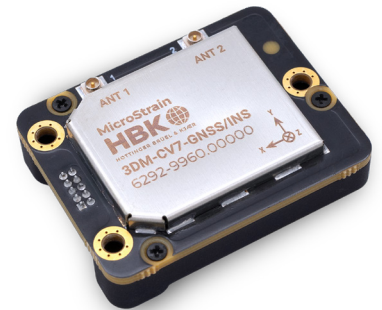


PRODUCT DATA

# MicroStrain 3DM-CV7-GNSS/INS

Tactical grade embeddable  
GNSS-Aided Inertial Navigation System



## MICROSTRAIN 3DM-CV7-GNSS/INS OVERVIEW

The 3DM-CV7-GNSS/INS is the next evolution in inertial navigation technology, delivering tactical-grade performance within an exceptionally compact and lightweight OEM form factor. This sensor has been designed specifically for navigation and localization applications where size, weight, and cost are primary considerations.

Each unit undergoes a comprehensive multi-point calibration over a full industrial temperature range and leverages our tried-and-tested Adaptive Extended Kalman Filter, ensuring optimal accuracy and stability across diverse operational environments.

Beyond its core inertial capabilities, the 3DM-CV7-GNSS/INS integrates onboard GNSS receivers for GNSS-aiding, as well as sophisticated orientation algorithms, precise internal time management, and a highly adaptable event triggering system, enabling complex navigation applications with ease.



**NDAA  
Compliant**



**ITAR Free**



**L1/L5  
Support**



**Dual Antenna  
Heading**



**RTK/PPP/  
SBAS**

### Performance

- 0.05° roll and pitch
- 0.25° heading accuracy
- 1.5°/h gyro bias instability
- Adjustable sampling rates up to 1000 Hz

### Features

- RTK capable
- Dual-frequency GNSS receiver (L1/L5)
- SPARTN 2 and RTCM 3.3 support
- Highly configurable extended Kalman filter
- 4 GPIO pins for flexible aiding and time synchronization
- 4 configurable aiding frames simplify external sensor input

### SWaP

- Lightweight at only 15.6 g
- Optimized for cost-sensitive applications
- Mounting footprint only 38mm x 30mm
- OEM form factor for flexible system integration

## FEATURES CAREFULLY ENGINEERED FOR PRECISION, FLEXIBILITY, AND EASE OF INTEGRATION

The advanced features of the 3DM-CV7-GNSS/INS are designed to enhance navigation accuracy, simplify system integration, and adapt to demanding environments. From external time synchronization for better sensor fusion to configurable filters and full temperature calibration, each capability has been optimized to deliver optimal inertial navigation performance in real-world applications.

### External Clock Synchronization

- Tighter synchronization with external aiding sensors like LiDAR or cameras to improve reliability when GNSS is degraded or denied

### Tactical Grade Gyroscope

- Improved position accuracy during dead reckoning

### Custom Event Trigger System

- Simplifies configuration and synchronization of context-based events

### Onboard Multi-band GNSS Receivers

- Tightly coupled integration delivers better navigation performance and reliability

### Low Latency

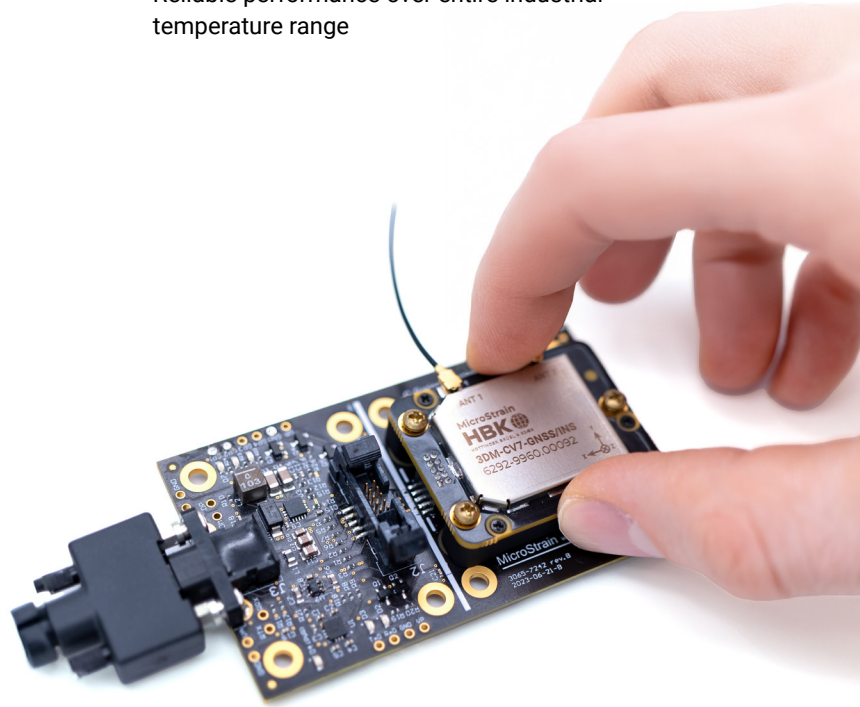
- Reduces navigation errors from clock drift when combining with external aiding sensors

### Highly Configurable Extended Kalman Filter

- Wide range of external aiding inputs for improved performance in dynamic environments

### Calibrated Over Full Temperature Range

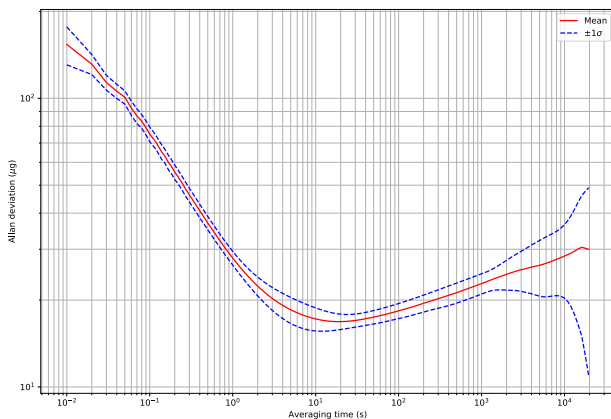
- Reliable performance over entire industrial temperature range



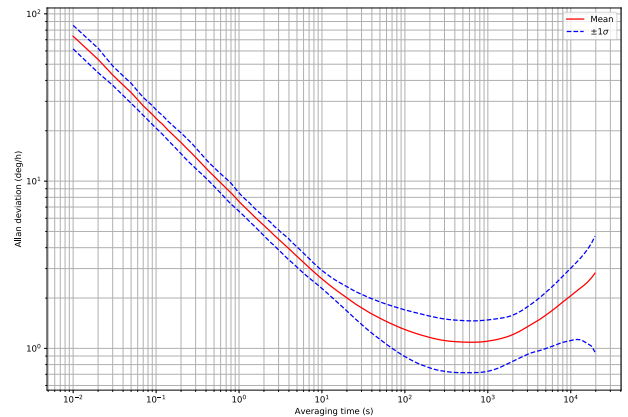
## 3DM-CV7-GNSS/INS ALLAN VARIANCE

There's no better way to visualize an inertial sensor's long-term noise performance than the Allan Variance plot. It reveals key characteristics like bias instability and random walk—essential for evaluating sensor suitability in precision navigation and motion sensing applications.

Accelerometer AVAR



Gyroscope AVAR



# MICROSTRAIN 3DM-CV7-GNSS/INS SPECIFICATIONS

## Performance Specifications

| 3DM-CV7-GNSS/INS                     |   |
|--------------------------------------|---|
| Roll, Pitch <sup>[1]</sup>           | 0.05°   |
| Heading <sup>[1,2]</sup>             | 0.25°   |
| Position (Horizontal) <sup>[3]</sup> | Single Point: 1.5 m, SBAS: 1.0 m, RTK: 1 cm + 1 ppm |
| Velocity <sup>[1]</sup>              | 0.05 m/s  |

[1] Automotive conditions, vehicle dynamics-dependent

[2] With dual antenna heading

[3] 24 hour static, RMS

## IMU

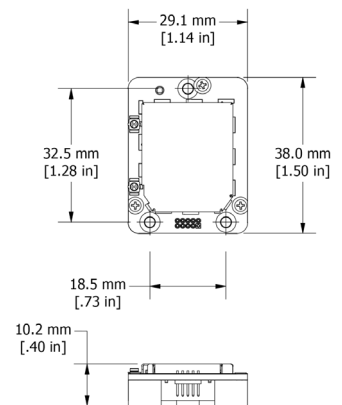
|                             | Accelerometer | Gyroscope                 | Magnetometer | Barometer        |
|-----------------------------|---------------|---------------------------|--------------|------------------|
| Range                       | ± 4g, 8g, 16g | ± 250°/s, 500°/s, 1000°/s | ±8 Gauss     | 260 to 1260 mbar |
| Random Walk                 | 30 µg/√Hz     | 0.14 °/√h                 | -            | -                |
| Bias Instability            | 18 µg         | 1.5 °/h                   | -            | -                |
| Noise Density               | 30 µg/√Hz     | 8.5 °/h/√Hz               | -            | -                |
| Turn-on to turn-on bias     | 60 µg         | 0.004 °/s                 | -            | -                |
| Bias Error Over Temperature | 0.75 mg       | 0.03 °/s                  | -            | -                |
| Scale factor stability      | 600 PPM       | 1000 PPM                  | -            | -                |

## Interface

| 3DM-CV7-GNSS/INS               |  |
|--------------------------------|--|
| Connector                      | Samtec FTS-105 (2x5)   |
| Communications Interface       | UART (TTL), USB  |
| Output Data Rate (IMU and EKF) | 1 to 1000 Hz   |
| I/O                            | 4x GPIO  |
| GPIO Functions                 | Event triggering, PPS Input/Output   |
| Protocols                      | MIP, NMEA  |
| External Aiding Inputs         | Global Position + Velocity, Heading, Magnetometer, Barometer, Body-Frame Velocity, Wheel Speed |

## Physical and Electrical

| 3DM-CV7-GNSS/INS      |  |
|-----------------------|--|
| Weight                | 15.7 g                                     |
| Size                  | 38 mm x 30 mm x 10.2 mm                    |
| Power Consumption     | 896 mW (Typical), 1.2 W (Max)              |
| Operating Voltage     | 3.2 to 5.2 VDC                             |
| GPIO Voltage          | 3V (5V tolerant)                           |
| Operating Temperature | -40°C to 85°C                              |
| MTBF                  | 1,327,311 hours (Telcordia method, GM/35C) |



## GNSS

| 3DM-CV7-GNSS/INS        |  |
|-------------------------|--|
| Number of Receivers     | 2  |
| Channel Count           | 184  |
| Constellations          | GPS, QZSS, GLONASS, Galileo, SBAS, BeiDou  |
| Frequencies             | GPS L1C/A L5, GLO L10F, GAL E1B/C E5a, BDS B1I B2a, QZSS L1C/A L1S L5, SBAS L1C/A NavIC L5 |
| Operational Limits      | Altitude 50,000 meters, Velocity 500 m/s   |
| Corrections Protocols   | SPARTN 2, RTCM v3.3  |
| GNSS Antenna Connectors | 2x U.FL  |

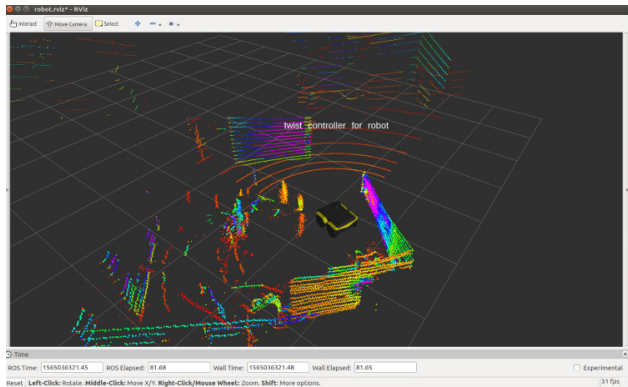
### PX4 Autopilot™

PX4 is an open-source flight control software used widely in drones and autonomous vehicles. MicroStrain by HBK inertial sensors are supported in PX4 through dedicated drivers, allowing straightforward integration of high-quality inertial data. This enables access to features like sensor fusion, real-time data streaming, and extended Kalman filtering—key elements for precise navigation and control.

### ROS™

MicroStrain offers an open source, license-free (MIT License) series of actively supported drivers specifically designed and tested for Robot Operating System (ROS).

Use ROS for building and simulating robotics applications, unmanned ground vehicles (UGVs) and simultaneous localization and mapping (SLAM).



### MSCL™ API and MIP SDK

The MicroStrain Communication Library (MSCL) is our open-sourced API that simplifies writing code to interact with our sensors. MIP SDK is a lightweight C/C++ library for interacting with MicroStrain G and C-series products via baremetal and resource constrained microcontrollers.

Both APIs are readily available and fully-documented on GitHub, featuring valuable tools such as full documentation, example code, and a quick start guide.



### InertialConnect™

InertialConnect is the latest software GUI for MicroStrain inertial sensors, designed to seamlessly guide you through every phase of your project – from configuration and testing to analysis and simulation.

InertialConnect lets you easily configure your sensors, adjust parameters, upgrade firmware, and deploy preconfigured parameter files. You can also verify sensor outputs with intuitive visualizations, including timeseries data, position data, and statuses.

InertialConnect is compatible with both Windows and Linux operating systems, making it your go-to solution for precision and efficiency in inertial sensor management.



### SensorCloud RTK

Our cloud-based RTK corrections service has been completely revamped to offer a premium user experience at a fraction of the price of traditional corrections services. Plug and play functionality with our 3DM-RTK modem allows for fast, easy deployment across the globe. Get started easily with our commitment-free subscription service, available immediately after registration.

