

PRODUCT DATA

MicroStrain 3DM-CX7-INS



MicroStrain 3DM-CX7-INS overview

The 3DM-CX7-INS delivers precision inertial performance in the same compact, embeddable OEM form factor trusted across the C-Series product line, redesigned for demanding high-vibration platforms. Built on 80+ years of HBK sensing heritage, every unit is individually calibrated across its full temperature range and features the industry-proven MicroStrain auto-adaptive Extended Kalman Filter for real-time error rejection.

Accepting external GNSS, body-frame velocity, and heading aiding inputs, the 3DM-CX7-INS fuses inertial data with your navigation stack to maintain a robust position, velocity, and attitude solution even when

satellite signals are degraded or unavailable. The 3DM-CX7-INS builds on decades of inertial expertise and is uniquely suited for autonomous platforms that experience high levels of shock and vibration, like UAVs and unmanned ground vehicles. Wherever the mission takes your platform, the 3DM-CX7-INS keeps it on course.



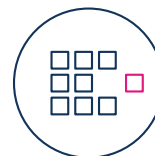
**Up to 100x Better
Shock and Vibration
Robustness***



**NDA
Compliant**



**ITAR
Free**



**Redundant
Multi-IMU
Architecture**



**Wide
Accelerometer and
Gyroscope Ranges**

Performance

- 2.1°/h gyro bias instability for reliable navigation continuity during GNSS interruptions
- Extended ± 32 g accelerometer range
- Extended $\pm 4,000^\circ/\text{s}$ gyroscope range
- RTK-compatible with external GNSS receivers for centimeter-level positioning
- Accepts external position, velocity, and heading aiding inputs

Features

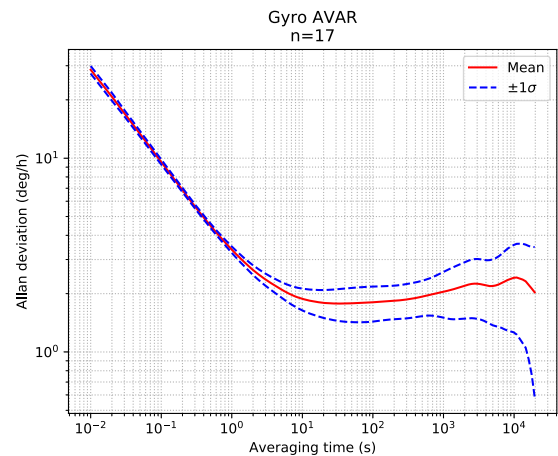
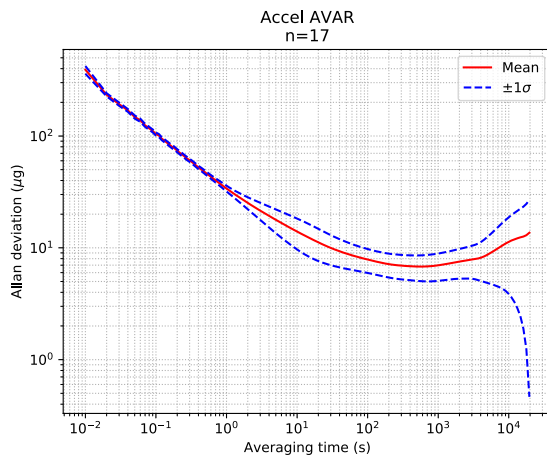
- Flexible aiding framework supports GNSS, radar, LiDAR, wheel encoders, and optical flow
- Highly configurable Extended Kalman Filter with real-time error model adaptation
- Defense-ready encrypted GNSS receiver support (SAASM and M-Code compatible)
- Redundant multi-IMU architecture with real-time cross-checking and outlier rejection

SWaP

- 8.3 grams
- Mounting footprint of only 38 mm x 24 mm
- OEM form factor for flexible system integration
- Optimized for cost-sensitive applications

* Compared to 3DM-CV7-AHRS

MicroStrain 3DM-CX7 Series Allan Variance (AVAR)



MicroStrain 3DM-CX7 Series Key Features

Up to 100x Better Vibration & Shock Robustness

- Maintains attitude solution where others fail completely

External Clock Synchronization

- Tighter synchronization with external sensors like LiDAR or cameras to improve state estimation

Tactical Grade Gyro

- Improved position accuracy during dead reckoning



Custom Event Trigger System

- Simplifies configuration of context-based events and frees up CPU on vehicle main board

Redundant Multi-IMU Architecture

- Intelligent outlier rejection for reliable estimation in high-dynamic environments

Adjustable Sampling Rates

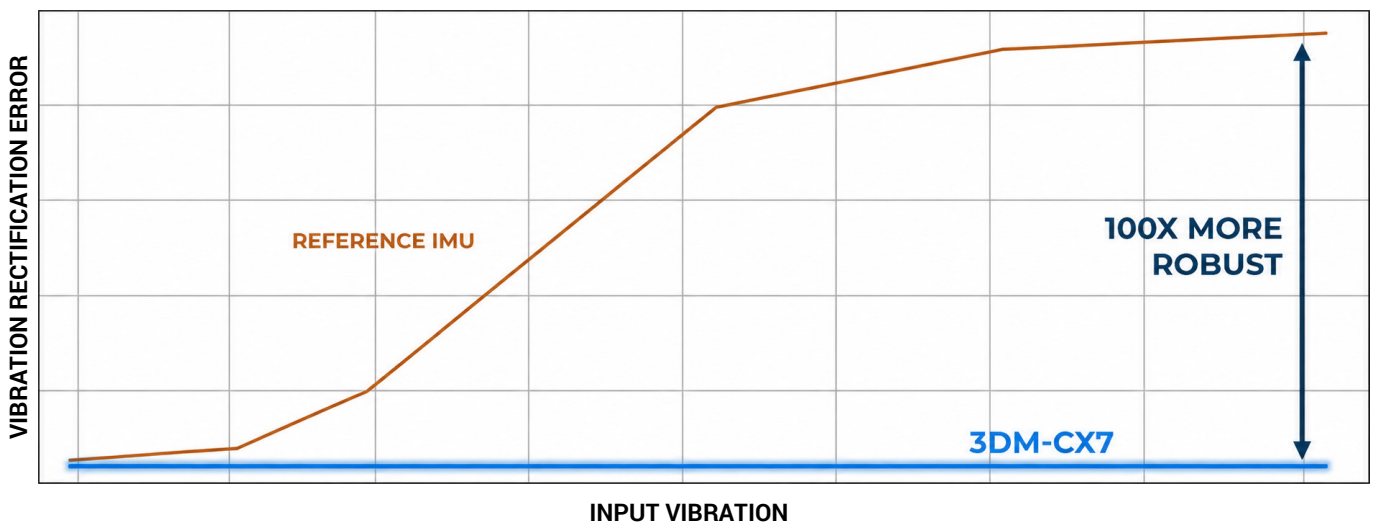
- Faster response to vehicle dynamics

Calibrated Over Full Temperature Range

- Consistent and reliable performance over entire temperature range

Expanded accelerometer and gyroscope ranges

- Accelerometer supports up to ± 32 g; gyroscope supports up to $\pm 4,000^\circ/\text{s}$



Breakthrough MEMS technology enables reliable attitude accuracy in previously impossible applications.

MicroStrain 3DM-CX7-INS Specifications

System Performance

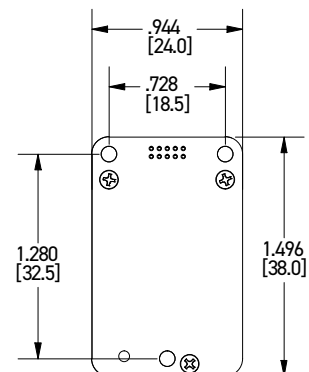
Attitude and Heading	
Roll, Pitch (static)	0.25°
Roll, Pitch(dynamic) ^[1]	0.5°
Heading (static) ^[2]	0.5°
Heading (dynamic) ^[1,2]	2°

IMU Performance

	Accelerometer	Gyroscope	Magnetometer	Barometer
Range	±32g	±4000°/s	±8 Gauss	260 to 1260 mbar
Random Walk	36 µg/√Hz	0.058 °/√h	–	–
Bias instability	8.5 µg	2.1 °/h	–	–
Noise Density	36 µg/√Hz	3.5 °/h/√Hz	–	–
Turn-on to Turn-on Bias ^[3]	60 µg	0.0022 °/s	–	–
Bias Error Over Temperature	0.70 mg	0.028 °/s	–	–
Scale Factor Error Over Temperature	440 PPM	270 PPM	–	–

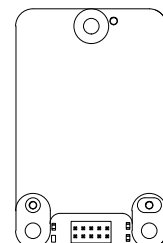
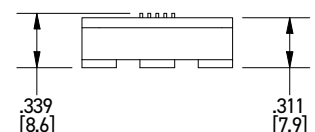
Interface

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	General Purpose I/O, PPS, Events, UART
Protocols	MIP, NMEA



Physical and Electrical

Weight	8.3g
Size	38 mm x 24 mm x 8.6 mm
Power Consumption	324 mW (Typical), 404 mW (Max)
Operating Voltage	3.2 to 5.2 VDC
GPIO Voltage	3V (5V tolerant)
Operating Temperature	-40°C to 85°C
MTBF	1,953,356 hours (Telecordia Method, GM/35C)



Product Variants

Name	Part Number	Description
3DM-CX7-INS	6702-9960	Inertial Navigation System

- [1] Automotive conditions, vehicle dynamics dependent
 [2] Magnetic heading, with valid declination, magnetic environment, and hard/soft iron calibration
 [3] Bias repeatability, <24 hours

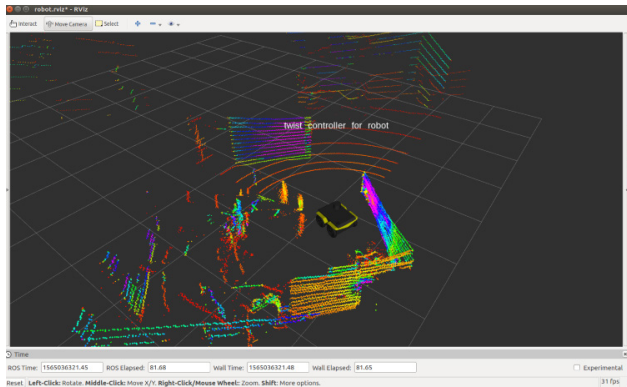
PX4 Autopilot™

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.

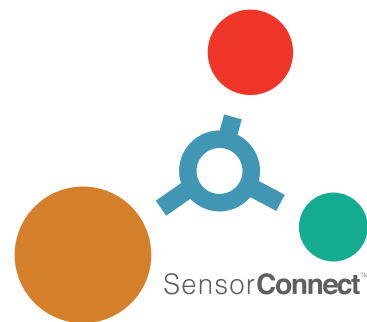
Both APIs are readily available and fully-documented on GitHub, featuring valuable tools such as full documentation, example code, and a quick start guide.



SensorConnect

SensorConnect is MicroStrain's desktop software for sensor configuration, data collection, and real-time visualization. An intuitive interface makes it easy to configure inertial parameters, select data channels, and set sample rates without writing a line of code — getting engineers from unboxing to acquiring data in minutes.

Built-in graphing algorithms handle large data volumes instantly, and customizable dashboards make it easy to visualize and inspect results.



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 a flexible solution for inertial sensor management.

