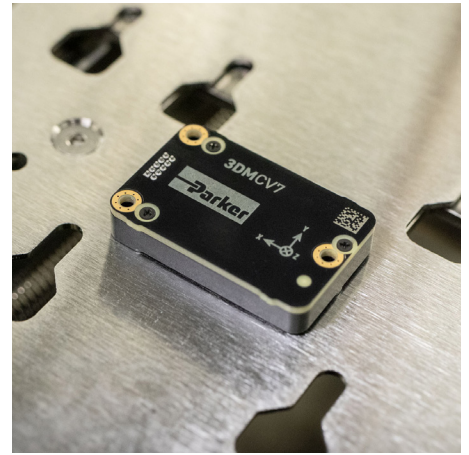# MicroStrain 3DM-CV7

Tactical Grade Embeddable IMU/AHRS and IMU/VRU

Standout Performance in an Embeddable Package:

The 3DM-CV7 offers tactical grade inertial performance in the smallest and lightest OEM package yet. It is available in IMU/AHRS (Attitude and Heading Reference System) and IMU/VRU (Vertical Reference Unit) options. Each 3DM-CV7 is individually calibrated for optimal performance over a wide range of operating conditions.

Cutting-edge orientation algorithms, advanced internal time management, and a flexible event triggering system put the 3DM-CV7 in a league of its own when it comes to price versus performance.

Product Features:

- 1.5°/h Gyro Bias Instability
- Low Latency
- Superior Vibration Rejection
- Adjustable Sampling Rates Up to 1 KHz
- External Clock Synchronization
- Advanced Extended Kalman Filter (EKF)
- Custom Event Trigger System
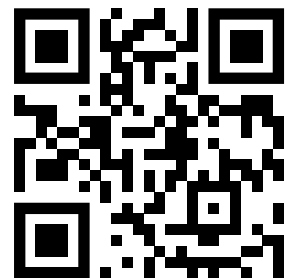
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MicroStrain 3DM-CV7 Specifications

System Performance

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

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 [3]	40 µg	0.004 °/s	-	-
Bias Error Over Temperature	0.75 mg	0.03 °/s	-	-
Scale Factor Error Over Temperature	600 PPM	1000 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	Event triggering, PPS Input/Output

Physical and Electrical

Weight	8.3g
Size	38 mm x 24 mm x 8.6 mm
Power Consumption	230 mW (Typical), 280 mW (Max)
Operating Voltage	3.2 to 5.2 VDC
GPIO Voltage	3V (5V tolerant)
Operating Temperature	-40°C to 85°C
MTBF	2,002,026 hours (Telecordia Method, GM/35C)

Product Variants

| Name	Part Number	Description
3DM-CV7-AHRS	6286-9960	Attitude and Magnetometer-Aided Heading
3DM-CV7-AR	6287-9960	Attitude and Relative Heading
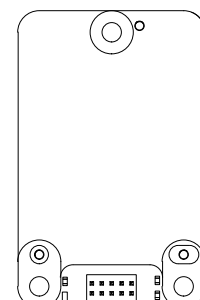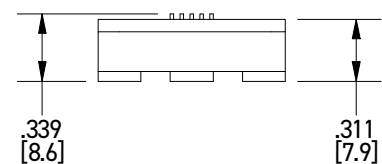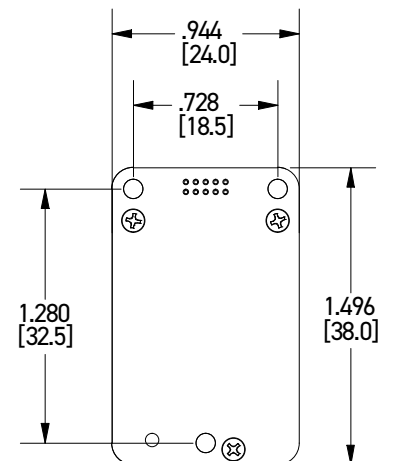
[1] Automotive conditions, vehicle dynamics dependent
[2] Magnetic heading, with valid declination, magnetic environment, and hard/soft iron calibration
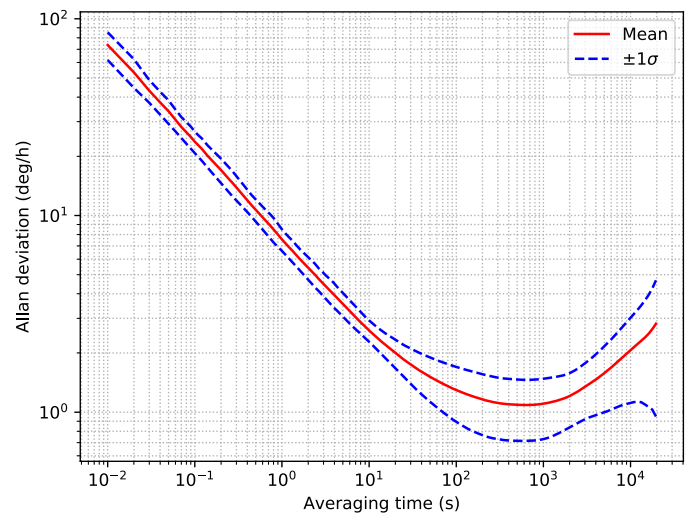[3] Bias repeatability, <24 hours

MicroStrain 3DM-CV7 Allan Variance (AVAR)

Accelerometer AVAR
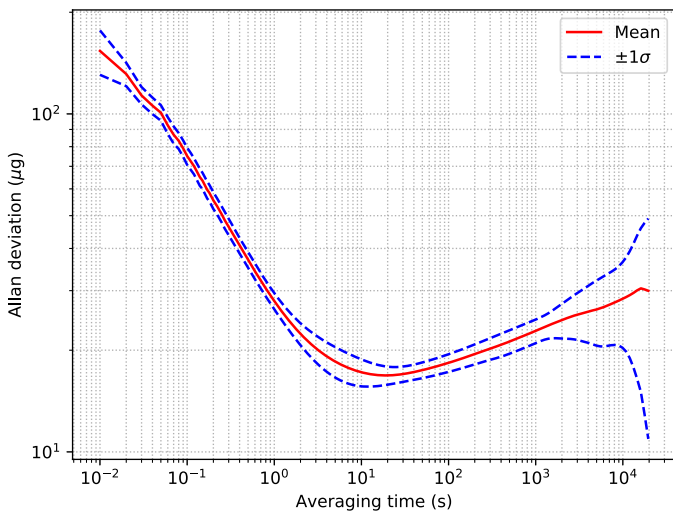
Gyroscope AVAR

MicroStrain 3DM-CV7 Key Features

Precision Timing

- Extensive time synchronization optimization for time alignment with external sensors, such as cameras or LiDAR
- Precision data timestamping and low latency output optimized for time-critical control applications
- 1 KHz output data rate for all channels

Extended Kalman Filter for Orientation Estimation

- Integrated vibration identification and rejection
- IMU bias error tracking improves performance over traditional complementary filters
- Reduces attitude error due to linear acceleration
- Integrated magnetometer allows for absolute heading tracking (AHRS-only)

IMU

- Tactical grade gyro (1.5°/hour bias instability)
- User-adjustable gyro and accel ranges
- Calibrated over full temperature range
- Complete digital calibration report available for each unit
- Continuous Built-In-Test for integrity monitoring

Integration

- Factory supported ROS1 and ROS2 driver
- Multi-language (C++, Python, Matlab, LabVIEW) software communications library simplifies custom software development
- Connectivity kit and USB support allows for rapid prototyping

SWaP-C

- Smaller size, lower power than previous generations
- Optimized for low cost, volume production OEM applications
- Aluminum mounting frame improves performance over solder-down modules by isolating sensitive MEMS components from board stresses
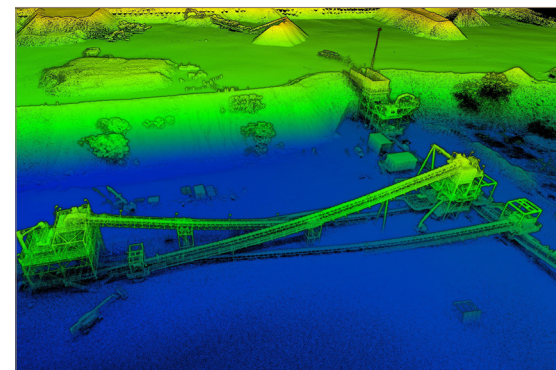
SensorConnect

SensorConnect is PC software for sensor configuration and data collection. Configure inertial parameters, device settings, data channels, and sample rates.

Visualize massive amounts of data instantly using built-in intelligent data collection and graphing algorithms. Create immersive dashboards with rich data visualization.

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 bare-metal 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.

⠿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).

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