PRODUCT DATA SHEET

3DM-CX5-AR: Vertical Reference Unit

The MicroStrain 3DM-CX5 family of high performance, industrial-grade, board-level inertial sensors provides a wide range of triaxial inertial measurements, computed attitude, and navigation solutions.

In all models, the Inertial Measurement Unit (IMU) includes direct measurement of acceleration and angular rate, and is fully temperature-compensated and calibrated over the operating temperature. The use of Micro-Electro-Mechanical System (MEMS) technology allows for highly accurate, small, lightweight devices.

SensorConnect software is a user friendly program for device configuration. MIP Monitor (MicroStrain Inertial Protocol) can also be used. Both packages provide for device configuration, live data monitoring, and recording. Alternatively, the MIP Data Communications Protocol is available for development of custom interfaces and easy OEM integration.

The sensor operates independent of computer platform, operating system, or coding language.

PRODUCT HIGHLIGHTS

- Triaxal accelerometer, gyroscope, and temperature sensors achieve the optimal combination of measurement qualities
- Dual on-board processors run a new Auto-Adaptive Extended Kalman Filter (EKF) for outstanding dynamic attitude estimates
- Smallest, lightest, highest performance VRU in its class

BEST IN CLASS PERFORMANCE

- Fully calibrated, temperature-compensated, and mathematically-aligned to an orthogonal coordinate system for highly accurate outputs
- Bias tracking, error estimation, threshold flags, and adaptive noise modeling allow for fine tuning to conditions in each application
- High-performance, low-drift gyros with low noise density and vibrational rectification error
- Accelerometer noise as low as 20 ug/√Hz

EASE OF USE

- SensorConnect enables simple device configuration, live data monitoring, and recording
- Optional hardware communications-development kit available
- The MSCL API allows easy integration with C++, Python, .NET, C#, Visual Basic, LabVIEW and MATLAB environments
- MIP open byte level communication protocol

COST EFFECTIVE

- Out-of-the-box solution reduces development time
- Volume pricing avaiable

APPLICATIONS

- Unmanned vehicles
- Robotics
- Platform stabilization, artificial horizon
- Health and usage monitoring of vehicles

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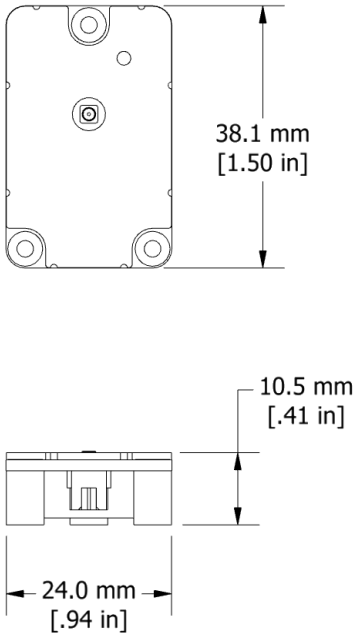
MICROSTRAIN 3DM-CX5-AR SPECIFICATIONS

General	
Integrated Sensors	Triaxial accelerometer, triaxial gyroscope, and temperature sensors
Data Outputs	**Inertial Measurement Unit (IMU) outputs:** acceleration, angular rate, Delta-theta, Delta-velocity
Computed Outputs	
Attitude accuracy	EKF outputs: ±0.25° RMS roll and pitch, (typ) CF outputs: ±0.5° roll and pitch (static, typ) and ±2.0° roll and pitch (dynamic, typ)
Attitude heading range	360° about all axes
Attitude resolution	< 0.01°
Attitude repeatability	0.02° (typ)
Calculation update rate	500 Hz
Computed data output rate	EKF outputs: 1 Hz to 500 Hz CF outputs: 1 Hz to 1000 Hz



Inertial Measurement (IMU) Sensor Outputs		
	Accelerometer	**Gyroscope**
Measurement Range	±8 g (standard) ±2 g, ±4 g, ±20 g, ±40 g (optional)	300°/sec (standard) ±75, ±150, ±900/sec (optional)
Non-linearity	±0.02% fs	±0.02% fs
Bias instability	±0.04 mg	8°/hr
Initial bias error	±0.002 g	±0.04°/sec
Scale factor stability	±0.03%	±0.05%
Noise density	20 µg/√Hz (2 g)	0.005°/sec/√Hz (300°/sec)
Alignment error	±0.05°	±0.05°
Bandwidth	225 Hz (max)	250 Hz (max)
Offset error over temperature	0.06% (typ)	0.04% (typ)
Gain error over temperature	0.03% (typ)	0.03% (typ)
Scale factor non-linearity (@ 25°C)	0.02% (typ) 0.06% (max)	0.02% (typ) 0.06% (max)
Vibration induced noise	--	0.072°/s RMS/g RMS
Vibration rectification error (VE)	0.03%	0.001°/s/g² RMS
Sampling rate	1 kHz	4 kHz
IMU Filtering	Digital sigma-delta wide band anti-aliasing filter to digital averaging filter (user adjustable) scaled into physical units.	
IMU data output rate	1 Hz to 1000 Hz	
Pressure Altimeter		
Altitude Range	-1800 m to 10,000 m	
Resolution	< 0.1 m	
Relative Accuracy	0.01 hPa RMS	
Sampling rate	25 Hz	

MICROSTRAIN 3DM-CX5-AR SPECIFICATIONS

Operating Parameters	
Communication	USB 2.0 (full speed), TTL serial (3.0 V dc, 9,600 bps to 921,600 bps, default 115,200)
Power source	+3.2 to +5.2 V dc
Power consumption	500 mW (typ)
Operating temperature	-40°C to +85°C
Mechanical shock limit	500g/1ms absolute maximum survivability.*
MTBF	400,094 hours (Telcordia method, GM/35C)
Physical Specifications	
Dimensions	38 mm x 24 mm x 9.7 mm
Weight	8 grams
Enclosure material	Aluminum
Regulatory compliance	CE, REACH, RoHS
Intregration	
Connectors	Data/power: Samtec FTSH Series Connectivity kit: Micro-D9
Software	SensorConnect and MIP Monitor software included; Windows XP/Vista/7/8/10 compatible
Data Communications Protocol (DCP)	Protocol compatibility across GX3, GX4, RQ1, GQ4, GX5, CX5 and CV5 product families
Software development kit (SDK)	MicroStrain Communication Library (MSCL) open source license includes full documentation and sample code.
Hardware development kit	Option purchased separately

*Prolonged exposure to >2x full scale range can result in permanent damage. See manual for details

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