MicroStrain Sensing Product Datasheet

3DM-CV5-VRU

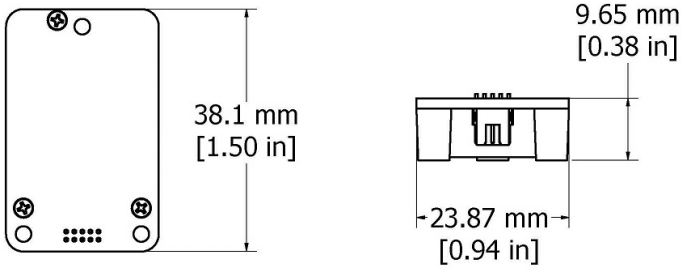
Vertical Reference Unit

The LORD Sensing 3DM-CV5 family of industrial-grade, board-level inertial sensors provides a wide range of triaxial inertial measurements, computed attitude, and navigation solutions.

The Inertial Measurement Unit (IMU) includes direct measurement of acceleration, angular rate, Delta-theta, and Delta-velocity. Compensation options include automatic compensation for magnetic anomalies, gyro and accelerometer noise, and noise effects. In models that include computed outputs, sensor measurements are processed through and auto-adaptive estimation filter algorithm to produce high accuracy computed outputs under dynamic conditions. The computed outputs vary between models and can include roll, pitch, and yaw. All sensors are fully temperature-compensated and calibrated over the operating temperature. Micro-Electro-Mechanical Systems (MEMS) technology allows for highly accurate, small, light-weight devices.

SensorConnect software is a user friendly program for device configuration. MIP Monitor (MicroStrain Internet 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

- Triaxial 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 roll, pitch, and yaw performance
- Smallest, lightest, highest performance VR in its class

FEATURES AND BENEFITS

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-cost solution
- Direct PCB mount or chassis mount with ribbon cable
- Precision mounting alignment features

EASE OF USE

- SensorConnect enables simple device configuration, live data monitoring, and recording
- Hardware 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 discounts

APPLICATIONS

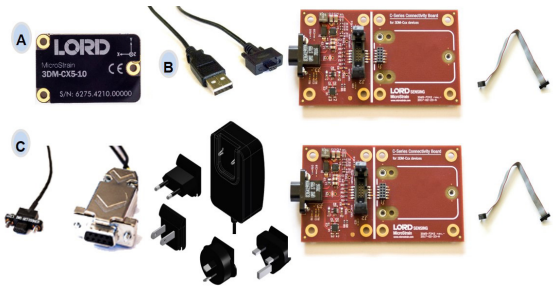
- Unmanned Vehicles
- Robotics
- Platform stabilization, artificial horizon
- Health and usage monitoring of vehicles

ENGINEERING YOUR SUCCESS.

Vertical Reference Unit (VRU)

Specifications

General		
Integrated sensors	Triaxial accelerometer, triaxial gyroscope, pressure altimeter, and temperature sensors	
Data outputs	**Inertial Measurement Unit (IMU) outputs:** acceleration, angular rate, magnetic field, ambient pressure, Delta-theta, Delta-velocity **Computed outputs** **Extended Kalman Filter (EKF):** filter status, timestamp, attitude estimates (in Euler angles, quaternion, orientation matrix), linear and compensated acceleration, bias compensated angular rate, pressure altitude, gravity-free linear acceleration, gyroscope and accelerometer bias, scale factors and uncertainties, gravity and magnetic models, and more. **Complementary Filter (CF):** attitude estimates (in Euler angles, quaternion, orientation matrix) stabilized, north and up vectors, GNSS correlation timestamp	
Inertial Measurement Unit (IMU) Sensor Outputs		
	Accelerometer	**Gyroscope**
Measurement range	±8 g (standard) ±2 g, ±4 g, (optional) ±20 g, ±40 g (optional)	±500°/sec (standard) ±250°, ±1000°/sec (optional)
Non-linearity	±0.04% fs	±0.06% fs
Resolution	0.05 mg (+/- 8 g)	<0.003°/sec (500 dps)
Bias instability	±0.08 mg	8°/hr
Initial bias error	±0.004 g	±0.01°/sec
Scale factor stability	±0.05%	±0.05%
Noise density	100 µg/√Hz	0.0075°/sec/√Hz (500°/sec)
Alignment error	±0.05°	±0.08°
Adjustable bandwidth	225 Hz (max)	500 Hz (max)
Offset error over temperature	0.02% (typ)	0.01% (typ)
Gain error over temperature	0.05% (typ) ±0.2% (max)	0.1% (typ) ±0.4% (max)
IMU filtering	First stage sigma delta Analog to Digital Converter sampled at 1 kHz. Second stage user adjustable digital low pass filter.	
Sampling rate	1 kHz	1 kHz
IMU data output rate	1 Hz to 1 kHz (sensor direct mode)	



Pressure Altimeter	
Range	-1800 m to 10,000 m
Resolution	< 0.1 m
Noise density	0.01 hPa RMS
Sampling rate	25 Hz
Computed Outputs	
Attitude accuracy	EKF outputs: ±0.5° RMS roll and pitch(typ) CF outputs: ±0.8° RMS roll and pitch (typ)
Attitude heading range	360° about all axes
Attitude resolution	0.05°
Attitude repeatability	0.5°
Calculation update rate	500 Hz
Computed data output rate	EKF outputs: 1 Hz to 500 Hz CF outputs: 1 Hz to 1000 Hz
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	360 mW (typ), 500 mW (max)
Operating temperature	-40°C to +85°C
Mechanical shock limit	500*g*/1ms absolute maximum survivability*
Physical Specifications	
Dimensions	38 mm x 24 mm x 9.7 mm
Weight	11 grams
Enclosure material	Aluminum
MTBF	1,035,471 hours (Telcordia method gm/35C)
Regulatory compliance	ROHS, CE
Integration	
Connectors	Data/power output: Micro-D9 Samtec FTSH Series
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	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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