3DM®-CX5-25

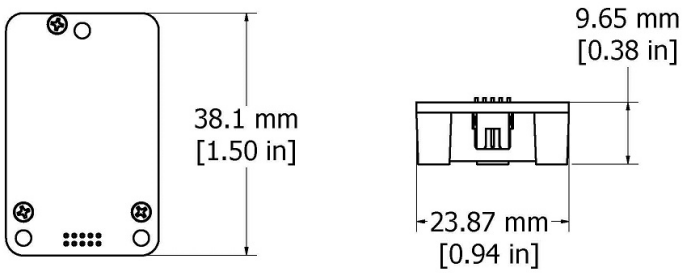
Attitude and Heading Reference System (AHRS)

3DM-CX5-25 *– high-performance, industrial-grade attitude and heading reference system (AHRS) with integrated magnetometers, high noise immunity, and exceptional performance*

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

The 3DM-CX5-25 is the smallest and lightest industrial AHRS with an Adaptive Kalman Filter available. It features a triaxial accelerometer, gyroscope, magnetometer, and temperature sensors to achieve the optimum combination of measurement qualities. The dual on-board processors run a new Auto-Adaptive Extended Kalman Filter (EKF) for outstanding dynamic attitude estimates, making it ideal for a wide range of applications, including platform stabilization and vehicle health and usage monitoring.

The LORD Sensing **MIP Monitor** software can be used 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.



PRODUCT HIGHLIGHTS

- Triaxial accelerometer, gyroscope, 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 pitch and roll

FEATURES AND BENEFITS

BEST IN CLASS PERFORMANCE

- Bias tracking, error estimation, threshold flags, and adaptive noise modeling allow for fine tuning to conditions in each application
- Accelerometer noise as low as 25 ug/√Hz
- Smallest and lightest industrial AHRS with Adaptive Kalman Filter available

EASE OF USE

- Automatic magnetometer calibration and anomaly rejection eliminates the need for field calibration
- Automatically compensates for vehicle noise and vibration
- Easy integration via comprehensive and fully backwards-compatible communication protocol
- Common protocol between 3DM-GX3, GX4, RQ1, GQ4, and GX5 inertial sensor families for easy migration

COST EFFECTIVE

- Out-of-the box solution reduces development time
- Volume discounts

APPLICATIONS

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

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Specifications

General			
Integrated sensors	Triaxial accelerometer, triaxial gyroscope, 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.		
Inertial Measurement Unit (IMU) Sensor Outputs			
	Accelerometer	**Gyroscope**	**Magnetometer**
Measurement range	±8 g (standard) ±2 g, ±4 g, ±20 g, ±40 g (optional)	300°/sec (standard) ±75, ±150, ±900 (optional)	±8 Gauss
Non-linearity	±0.02% fs	±0.02% fs	±0.3% fs
Resolution	<0.1 mg	<0.003°/sec	--
Bias instability	±0.04 mg	8°/hr	--
Initial bias error	±0.002 g	±0.04°/sec	±0.003 Gauss
Scale factor stability	±0.03%	±0.05%	±0.1%
Noise density	25 µg/√Hz (2 g)	0.005°/sec/√Hz (300°/sec)	400 µGauss/√Hz
Alignment error	±0.05°	±0.05°	±0.05°
Adjustable 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)	±0.0015 Gauss
Vibration induced noise	--	0.072°/s RMS/g RMS	--
Vibration rectification error (VRE)	0.03%	0.001°/s/g2 RMS	--
IMU filtering	Digital sigma-delta wide band anti-aliasing filter to digital averaging filter (user adjustable) scaled into physical units.		
Sampling rate	1 kHz	4 kHz	100 Hz
IMU data output rate	1 Hz to 1 kHz		

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: ±0.25° RMS roll and pitch, ±0.8° RMS heading (typ) CF outputs: ±0.5° RMS roll and pitch, ±1.5° RMS heading (typ)
Attitude heading range	360° about all axes
Attitude resolution	< 0.01°
Attitude repeatability	0.2° (typ)
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	+4 to + 36 V dc
Power consumption	500 mW (typ)
Operating temperature	-40°C to +85°C
Mechanical shock limit	500 g (calibration unaffected) 1000 g (bias may change), 5000 g (survivability)
Physical Specifications	
Dimensions	38 mm x 24 mm x 9.7 mm
Weight	8 grams
Enclosure material	Aluminum
Regulatory compliance	ROHS, CE
Integration	
Connectors	Data/power output: micro-DB9Samtec FTSH Series
Software	MIP Monitor, Windows XP/Vista/7/8/10 compatible
Compatibility	Protocol compatibility across 3DM®-GX3, GX4, RQ1, GQ4, GX5 and CV5 product families
Software development kit (SDK)	MIP data communications protocol with sample code available (OS and platform independent)

LORD Sensing MicroStrain
459 Hurricane Lane Suite 102
Williston, VT 05495 • USA
www.microstrain.com

Customer Support Center (in United States & Canada)
Tel: +1.802.862.6629
Email: sensing_sales@LORD.com | sensing_support@LORD.com
For a listing of our worldwide locations, visit LORD.com

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