

MicroStrain Sensing Product Datasheet

ML5-AR

Low-cost, Compact, Ruggedized CAN bus Attitude Reference and IMU

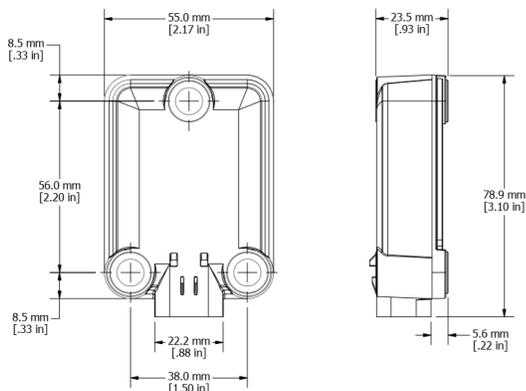


The LORD Sensing ML5-AR gyro-stabilized inclinometer delivers low-cost precision measurements of dynamic inclination, acceleration, and angular rate in challenging environments such as those encountered by heavy-duty construction, off-highway, agriculture, and trucking vehicles.

The ML5-AR utilizes the power of a sophisticated Auto-Adaptive Extended Kalman Filter (EKF) to remove errors associated with vibration, sudden linear motions, and quake, resulting in a true reading of inclination under all conditions.

LORD Sensing's state-of-the-art temperature compensation and calibration assures error-free performance over the full operational temperature range.

The compact size, wide 4.5 to 36 V power range, IP68/IP69K rating, and CAN J1939 or CANopen communications protocol make the ML5-AR a single part solution for a full range of vehicle sizes and applications.



MEASUREMENT PERFORMANCE

- 6 DOF gyro-stabilized inclinometer
- Full accuracy over the entire operational temperature range of -40°C to 85°C
- Auto-Adaptive EKF provides superior dynamic accuracy
- Based on LORD Sensing's proven 5th generation industrial/aerospace solid-state MEMS gyro technology

RUGGEDIZED FOR OFF-HIGHWAY USE

- Compact and rugged reinforced PBT housing is fully sealed for immersion, pressure wash (IP68/IP69K)
- Low-cost, rugged, reliable AMPSEAL 16 connector
- Optional metal guard plate protects sensor and connector permits connector insertion and removal

FLEXIBLE DEPLOYMENT OPTIONS

- CAN J1939 or CANopen communication
- Simple sensor to vehicle alignment, install in any orientation.
- Wide power input range (4.5Vdc-36 Vdc)
- User-settable parameters

APPLICATIONS

- Auto-steer and terrain compensation
- Dynamic incline detection (roll, pitch, rotation)
- Vehicle stability and leveling
- Platform control, alignment and stabilization
- Bucket/Stick/Boom angle
- Impact detection
- Operator feedback
- Precision navigation



Low-cost, Compact, Ruggedized CAN bus Attitude Reference and IMU

Specifications

General		
Integrated Sensors	Triaxial accelerometer, triaxial gyroscope	
Data Outputs	Pitch, Roll, Angular rate, Acceleration	
Inertial Measurement Unit (IMU) Sensor Outputs		
	Accelerometer	Gyroscope
Measurement range	±8 g	±1000° /sec
Output Range	±320 m/s ²	±250 °/sec
Non-linearity	±0.08% fs	±0.06% fs
Resolution *	1.0 mg	<0.003° /sec
Bias instability	±0.08 mg	8° /hr
Initial bias error	±0.008 g	±0.1° /sec
Scale factor stability	±0.08%	±0.05%
Noise density	120 µg/√ Hz	0.0075° /sec/√Hz
Alignment error	±0.1%	±0.05%
Bandwidth	40 Hz	40 Hz
Offset error over temperature	0.2% (typ)	0.1% (typ)
Gain error over temperature	0.1% (typ)	0.1% (typ) 0.4% (max)
Scale factor non-linearity (@ 25°C)	0.1% (typ) 0.2% (max)	0.04% (typ) 0.15% (max)
IMU data output rate	100 Hz default (1-100 Hz selectable)	
Attitude (pitch and roll) Outputs		
Accuracy	±0.5° RMS roll and pitch	
EKF update rate	500Hz	
Pitch	±90 deg	
Roll	±180 deg	
Resolution *	0.05°	
Repeatability	0.5°	
Max Data output rate	100 Hz default (1-100 Hz selectable)	

Physical and Environmental Specifications	
Dimensions	L 78.9 mm x W 55.0 mm x H 23.5 mm
Weight	110.5 grams
Power source	+4.5 V Min, 12/24 V Nominal, +36 V Max
Power consumption	360 mW Nominal
Operating temperature	-40°C to +85°C
Enclosure material	PBT Thermoplastic, Reinforced
Ingress protection	IP68 (Immersion), IP69K (Pressure Wash)
Vibration (random)	MIL-STD-202G, Method 214A, Test Condition 1-B, 24 hrs/axis
Vibration (sweep)	SAE J1455 Appendix A 10-2000Hz, 10 g Peak, 10hr/octave/axis
Thermal shock	SAE J1455 4.1.3.2
Salt spray	MIL-STD-202G, Method 101E Condition A (96 hours)
Hot dunk	5X, 30 mins @ 85C, 30 mins @ ice bath, operating
Mechanical shock drop	SAE J1455 4.11.3.1; 1m onto concrete surface
Mechanical shock operating	MIL STD 202, M213B; 50g, 11ms 1/2sine, 3x each axis; 18 total
MTBF	826,440; Telcordia SR332 (issue 3)
Connectors	AMPSEAL 16 gold plated 4 pin, 4 Position, gold plated pins
Mounting	3 x M8, installation torque 20 Nm ±2 Nm
Regulatory compliance	ROHS, REACH, CE
Communication options	
J1939	Order p/n 6283-4790
CANopen	Order p/n 6283-4792
CAN 250 kb/s, custom baud rates available.	

*NOTE: Communications protocol may impose resolution limits beyond those of the measuring device. Refer to product manual for details.



Parker Hannifin Corporation
MicroStrain Sensing
 459 Hurricane Lane
 Williston, VT 05495 · USA

phone: +1.802.862.6629
 email: sensing_sales@LORD.com
 sensing_support@LORD.com
 www.microstrain.com
 www.parker.com