

ML5-AR

Low-cost, Compact, Ruggedized Attitude Reference and IMU



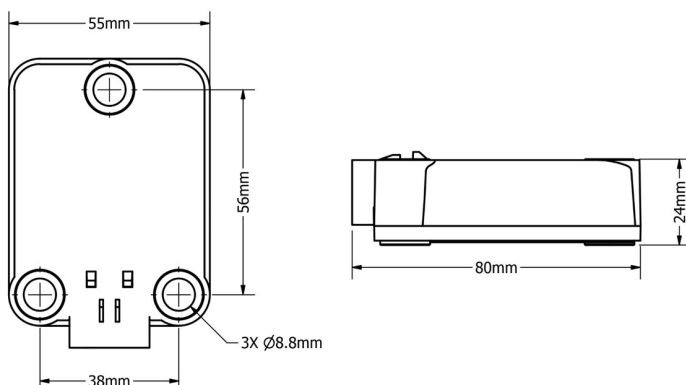
ML5-AR – Low-cost gyro Stabilized Inclinometer and 6-DOF IMU in a compact, ruggedized reinforced PBT housing

The LORD Sensing ML5-AR 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 industries.

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 communications interface 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

- Tare
- Sensor to vehicle rotations
- Wide power input range
- User-settable parameters
- CAN J1939 or CANopen communication options*

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



ML5-AR Ruggedized Gyro Stabilized Inclinometer and IMU

Specifications

General		
Integrated Sensors	Triaxial accelerometer, triaxial gyroscope, temperature sensors	
Data Outputs	J1939 or CANopen*	
Inertial Measurement Unit (IMU) Sensor Outputs		
	Accelerometer	Gyroscope
Measurement range	±8 g	±1000° /sec
Output Range	±200 m/s²	±250 °/sec
Non-linearity	±0.08% fs	±0.06% fs
Resolution	0.05 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 Hz to 500 Hz selectable)	
Operating Parameters		
Communication	CAN 250 kb/s, J1939, or CANopen	
Power source	+4.5 V Min, +36 V Max	
Power consumption	250 mW Nominal	
Operating temperature	-40°C to +85°C	
Mechanical shock limit	50g, 11 ms half-sine pulse, 3 each axis	

Inclinometer Outputs	
Attitude accuracy	±0.5° RMS roll and pitch
Attitude heading range	360° about all axes
Calculation update rate	
Slope Output range	-85° (min) +85° (max)
Measurement range (3 axis)	-180° (min) +180° (max)
Attitude resolution	0.05°
Static Inclination Error (-40°C to 85°C)	
Translational acceleration error	
Settling time	5 mSec (typ), 200 mSec (max)
Attitude repeatability	0.5°
Data output rate	100 Hz default (1 Hz to 100 Hz selectable)
Physical Specifications	
Dimensions	L 80 mm x W 55 mm x H 24 mm
Weight	120 grams
Enclosure material	PBT Thermoplastic, Reinforced
Ingress protection	IP68, IP69K
Mounting	3 x M8, installation torque 20 Nm ±2 Nm
Regulatory compliance	ROHS, REACH, CE
Integration	
Connectors	AMPSEAL 16 gold plated 4 pin, 4 Position, gold plated pins

* Part number differential here



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