



LR-500 Quad Mass Gyro (QMG) Inertial Measurement Unit

Superior Performance for the right Size, Weight, Power, and Cost (SWaP-C)

Featuring an advanced gyro design for enhanced capabilities, coupled with groundbreaking micro-electromechanical systems (MEMS) technology that stands out among tactical-grade inertial measurement units (IMUs), Northrop Grumman's LR-500 quad mass gyro (QMG) IMU provides defense, industrial, and commercial customers with an unparalleled low-cost, environmentally sealed, small IMU — created through our advanced fabrication process.

LR-500 innovations include <1 deg/hr class technology that reduces the required size of tactical-grade IMUs to a compact six cubic inches, compared to much larger-sized similar devices.

DESCRIPTION

The LR-500 is a lightweight, low-power consumption, MEMS-based and vibration-isolated IMU that stands in a class by

itself. It features Northrop Grumman's proven solid-state silicon MEMS accelerometers and our MEMS QMG in a common IMU package. It delivers the durability and performance required for platform stabilization, guidance, and control in GPS-challenged applications — even operating in severe environmental conditions. Consistent with Northrop Grumman's standard-setting LN-200 Fiber-optic Gyro (FOG) IMU, the LR-500 provides inertial, sensor-based incremental velocity and incremental angle output data over a digital serial data bus for a wide variety of applications.

Integral to the LR-500, the QMG combines the best features of tuning forks and ring gyroscopes to maximize positioning, navigation and timing (PNT) capabilities. Northrop Grumman's QMG silicon accelerometer (SiAc) sensors deliver performance levels similar to FOG- and Ring Laser Gyro-based (RLG) systems,

while maintaining traditional benefits of MEMS sensors with regard to SWaP-C and reliability.

APPLICATIONS

The LR-500’s premier capabilities make it the clear IMU of choice for a wide range of tactical to near-navigation grade applications, including:

- Electro-Optical (EO)/Forward-looking infrared (FLIR)/ camera – radar stabilization
- Missile guidance
- Flight control
- Oil and gas pipeline inspection
- Mining



LR-500 PERFORMANCE DATA

Parameter (1-σ)	Value	Units
SWaP		
Volume	6.4	cu-inch
Weight	0.35	lbs
Power	2.5	W
Accelerometer		
Range	±60	g
Accelerometer White Noise	20	μg/√Hz
Bias, in-run	5	μg
Bias, total	300	μg
SF	100	ppm
Misalignment	0.5	mrad
Vibration Rectification	10	μg/g ² rms
Gyro		
Range	±1,200	°/s
Angle Random Walk	0.05	°/hr
Bias, in-run	0.1	°/hr
Bias, total	1	°/hr
Misalignment	0.5	mrad
SF	300	ppm
Vibration Rectification	0.04	°/hr/g ² _{rms}
Environments		
Vibration 20 – 2,000 Hz	15	g _{rms}
Shock Survivability	320	g, 5 ms half sine
Mean Time Between Failures (MTBF)	>20,000	hours
Latency	<1	ms

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 CS-20525
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