

THE VALUE OF PERFORMANCE.

NORTHROP GRUMMAN

Scalable SIRU™



The Scalable SIRU™ combines innovation and high reliability—with 100 percent mission success in more than 22 million on-orbit hours and 147 billion miles traveled—for precision performance on space missions.

Description

The Hemispherical Resonator Gyro (HRG) sensor on the Scalable SIRU™ is composed of three simple machined quartz parts—an outer shell, a high-Q vibrating hemispherical resonator and an inner shell. The quartz construction of the HRG is inherently stable, impervious to aging effects, and naturally radiation hardened. Operating in a completely evacuated hermetically sealed case, the HRG sensor is the ideal gyro for space applications.

Applications

The Scalable SIRU™ is the spacecraft manufacturer's choice for sensor pointing/stabilization

and spacecraft attitude control on demanding long-term space missions, including:

- Earth orbits at all altitudes/angles
- Interplanetary missions
- Deep space missions

Advantages

The HRG-based Scalable SIRU™ incorporates unmatched features:

- Proven high reliability and long life, due to the simple HRG sensor design
- Ultra-low angle random walk and inherent freedom from dead band
- Fault-tolerant, redundant system architecture with cross-strapped HRGs and electronics, helping to ensure the success of missions lasting 15 or more years
- Demonstrated gyro capability, providing an inertially stable, low noise, wide bandwidth reference

- Radiation hardened sensors and electronics that operate reliably when subjected to long-term radiation exposure in space

Performance

The Scalable SIRU™ features precision inertial rate measurements, characterized by extremely stable gyro bias, low noise and precise scale factor.

Additionally, the efficient and redundant architecture of the Scalable SIRU™ helps ensure high performance and minimizes subassembly count. It contains:

- Four HRGs and four (optional) accelerometers, with independent associated loop control/readout/thermal control electronics, and sensing along the octahedral-tetrad axes
- Two power supplies and two sets of sensor processors with input/output electronics

Each of the four inertial sensor channels can be operated independently by either of the two power supply/processors, providing a probability of mission success of 0.997 for a 15-year mission.

In a compact 15.7 lb standard package, the internally redundant Scalable SIRU™ provides a significant size, weight and power savings over competitive systems.

Radiation Hardness

Radiation hardness can be scaled by selecting specific EEE parts and variable thickness bolt-on shielding for low total dose, high total dose, high dose rate [2E8 rad (Si/s)] and SEU/SEL tolerance.

Heritage

The space-qualified Scalable SIRU™ evolved from the heritage Core SIRU™. Together, these systems have operated in space since 1996

for over 22 million hours with 100 percent mission success. Our heritage systems have been launched more than 132 times and have traveled over 147 billion miles while used for NASA, Department of Defense, commercial and international space applications, including: Deep Impact, MESSENGER, Cassini, NEAR, GLAST, EOS, Geolite, Aura, Aqua, KOMPSAT 1, GOES, 601-HP, 702 bus, TDRS, GPM, WGS, EchoStar, IKONOS, AEHF, A2100 bus, 1300 bus, STAR bus, MUOS, SBSS, Worldview, Herschel, GeoEye, TerreStar and Landsat.

Performance	
Ps (15 years continuous operation)	>0.997
Gyro Bias Stability	<0.0015°/hr, 1σ at constant temperature over 12 hours
Gyro Noise	
– Noise Equivalent Angle	<3 arc sec pk-pk
– Angle Random Walk	<0.00015°/√hr
– Angle White Noise	<0.003 arc sec/√Hz
Scale Factor short term stability	
Scale Factor Non-Linearity	<5 ppm, 1σ at constant temperature over 12 hours
High Accuracy Mode Rate Range	<20 ppm, (1σ), -7 to +7°/sec at gyro input axis <0.1°/hr, -1 to +1°/sec
Continuous hours on orbit (MTBF)	>22,000,000 hours

Characteristics	
Power	28 or 70 Vdc, 43 W max
Size	Length: 11.4* in. (28.9 cm) Width: 7.1 in. (18 cm) Height: 5.9 in. (14.9 cm) * Without Optical Cube
Weight	15.7 lb (7.1 kg)
Temperature	-55°C (-67°F) to +85°C (185°F) (non-operational) -10°C to +60°C (full performance)
Altitude	Sea level to space
Shock (Pyrotechnic)	3000g peak
Cooling	Base-plate conduction
Interface	1553B and/or RS-422
Random Vibration	18.56g rms
Sine Vibration	20g pk
Radiation Hardness	Scalable up to >15 year GEO missions

Features
Lightweight, small size, low power
Four solid-state HRGs and cross-strapped electronics in a redundant architecture
Optional accelerometers
Optional one and two optical cube configurations

For more information, please contact:

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