



## **SiREUS THE SILICON RATE SENSOR**

**SiREUS meets the Space market need for a Coarse Rate Sensor as a key part of Attitude and Orbital Control Systems.**

It is robust and radiation hardened to provide a three axis MEMS based gyro solution for use in Geostationary satellites as well as applications in LEO Earth Observation, Scientific and Exploratory space missions.

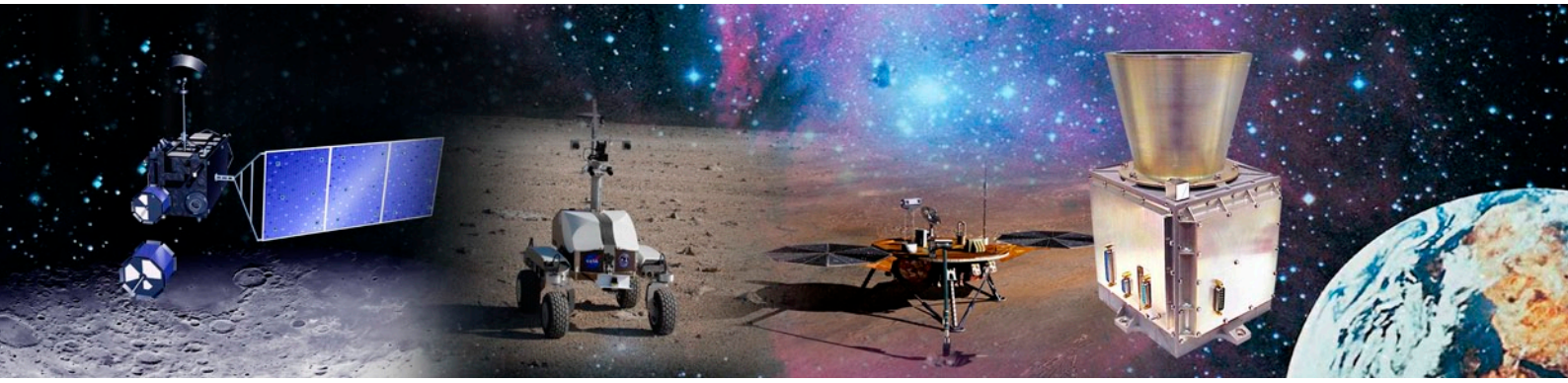
The single box unit contains all the control, processing, power and interface requirements necessary for operation and is usually provided as a flight set of two units.

SiREUS has been designed to be an inherently reliable product with no wear out mechanisms and a relatively simple electronic configuration and packaging concept. Parts are high reliability and space grade for the harshest radiation environments to meet the broadest demands of the World Space market, including telecommunications applications. The heritage of the unit builds on over 30 years of success in delivering over 100 mechanical Gyros for a range of satellite primes, plus the complementary benefits of being part of SELEX Galileo.

SiREUS makes full use of and developed for Space the terrestrial MEMS gyro technology which was designed for the automotive and military domains by Atlantic Inertial Systems Limited in Plymouth. Combining Space standard electronics from Systems Engineering & Assessment Limited in Bristol, and a concept, mechanical and thermal design from SELEX S&AS in Edinburgh, SiREUS provides a small size, low mass, low power and low recurring cost Coarse Rate Sensor solution for most missions and applications.

### **KEY FEATURES**

- A compact low power, low mass, 3 axis orthogonal Coarse Rate Sensor system
- Meets the key technical requirements from LEO Scientific to GEO Telecom programmes.
- System developed following ESA Gyro Harmonisation Study identifying Coarse Rate Sensor requirements.
- Development funded and reviewed by ESA, compliant with their management and development processes.
- System delivered and integrated already as a Flight Experiment on Cryosat 2.



SiREUS is suitable for a wide range of spacecraft applications such as FDIR, complement to star sensors, smallsats /  $\mu$ sats, planetary landers and rovers.

- Low cost 3-axis rate sensor:
- < 10 deg/hour Rate Bias Drift
- < 0.2 deg/ $\sqrt{\text{hr}}$  Angular Random Walk
- Low mass/volume/power compared to other rate sensors
- Digital and Analogue Rate Outputs
- User controlled output bandwidth (1-10Hz)

The SiREUS unit is designed for a mission lifetime of:

- 5 years on ground storage, 3 months launch phase, 18 years in GEO
- Unit simplex reliability is predicted as > 0.98 for an 18 year mission with a typical (37°C) unit baseplate temperature. Further system level reliability improvement can be achieved through provision of unit level redundancy and/or reduction of baseplate temperature.

## TECHNICAL CHARACTERISTICS

### Sensor Characteristics

Sensor Type	3 axis MEMS rate sensor
Rate Measurement Bandwidth	10 Hz (max)
Measurement Output Rate	2-20 Hz (settable)
Switch-on to Switch-on Change (SSC)	<10 deg/hr (with off time constraints)
Angular Rate Bias (ARB)	10-20 deg/hr
Rate Bias Drift (RBD)	5-10 deg/hr over 24 hours with $\pm 10^\circ\text{C}$ temperature change
Scale Factor Linearity	<2000 ppm
Angular Random Walk (ARW)	0.1-0.2 deg/ $\sqrt{\text{hr}}$
Noise Equivalent Rate (NER)	< 1 deg/hr

### Electrical Interfaces

Command Interface	RS422 input, asynchronous serial channel RS422 input, 1 PPS (SiREUS clock synchronisation)
Telemetry Interface	RS422 output, asynchronous serial channel 3 axis rate data output at programmable rate of 2-20 Hz SiREUS housekeeping telemetry output included in rate message
Analogue Rate Outputs	3 off single-ended analogue channels providing X-axis, Y-axis, Z-axis rates 1 off analogue status channel
Power Interface	28Vdc unregulated <6W Watts

### Environmental Characteristics

Operating Temperature /	-40°C to +70°C
Radiation Tolerance (TID)	100 krads

### Physical characteristics

Unit Dimensions	110 mm x 136 mm x 70mm (LWH)
Mass	~ 0.75 Kg