

DEFENCE AND SPACE
Space Products

ASTRIX® 1000 SERIES

A three-axis inertial measurement unit, with the Astrix family signature: reliability, performance and versatility



A v i o n i c s



Astrix® 1000 provides the AOCS with a very reliable three-axis measurement of the satellite's motion. It has been designed to provide continuous operation for up to 15 years on GEO satellite missions and associated worst case environments.

One compact box implements three gyros oriented on the three faces of a corner cube, and their relevant electronics. The use of 2 Astrix® 1000 offers a very simple and reliable redundancy architecture.

Optional accelerometers can be added to provide a full navigation capability for deep space missions.

The EEE, opto-electronics and opto components are fully compliant to HiRel Telecom satellite standard (ECSS-Q-ST-60C class 1 or equivalent).

KEY FEATURES

- High inertial performance: high resolution and stability, very low noise from low to high frequency
- With more than 3 million hours cumulated on orbit and 100% mission success, the Astrix® FOG gyro family is the ideal selection for demanding space applications
- 3-axis inertial detection, redundant by the use of two Astrix® 1000 Series
- Improved reliability thanks to limitation of the number of components and use of HiRel components
- More than 15 years continuous operation (no life-limited item) thanks to FOG technology
- Built-In-Test at equipment level
- Option for a full inertial measurement unit with implementation of 3 accelerometers in the same box
- Support for either 1553B and RS422 digital interfaces
- Stimulation capability for AOCS ground test

MAIN FIELDS OF APPLICATION

- LEO, MEO and GEO satellites
- Deep space probes with unlimited lifetime

ENVIRONMENT / RELIABILITY

- Thermal: -25°C, +60°C (operating)
- Vibration: 25g sine, 20grms random
- Shock: 2000g over 1000Hz to 10kHz
- Radiation: 100krad total dose, SEP tolerant, latch-up immune
- Lifetime: up to 15 years, no wear-out
- EMI/EMC: MIL-STD-461

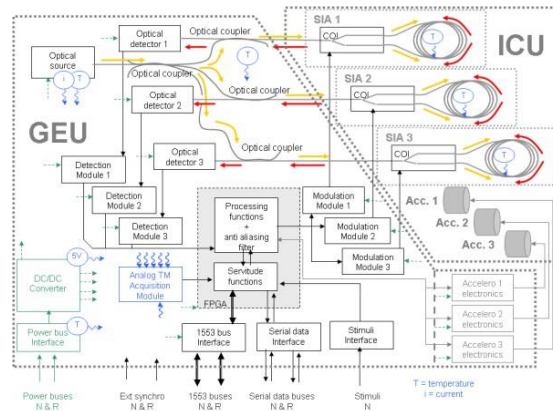
BUDGETS

- Mass: 4.5kg
- Volume: ø 263 x h 192mm footprint
- Power: 13.5W

INTERFACES

- Power bus: 22-50V
- Turn-on: < 3s
- TM/TC: 1553, RS422
- Synchro hardware 1553/RS422 broadcast or autonomous mode
- Testability BIT, RS422 stimulation for AOCS test

Astrix® 1000 architecture



Performances after 15 years continuous operation

General

- | | |
|--------------------------------------|--------------------------|
| - Full performance measurement range | $\pm 20^\circ/\text{s}$ |
| - Start-up time | 3 s |
| - Measurement range | $\pm 140^\circ/\text{s}$ |
| - Scale factor angular resolution | 0.0132 arcsec/LSB |

Scale factor knowledge and stability

- | | |
|--|----------|
| - Linearity - Asymmetry 3σ | < 500ppm |
| - Thermal sensitivity (over 15°C) 3σ | < 400ppm |
| - Repeatability after launch environment 3σ | < 300ppm |
| - Stability end-of-life 3σ (all effects included) | < 500ppm |

Bias knowledge and stability

- | | |
|--|-------------------------|
| - Stability over 1 hour | < $0.01^\circ/\text{h}$ |
| - Thermal sensitivity (over 15°C) | < $0.3^\circ/\text{h}$ |
| - Repeatability after launch environment | < $0.09^\circ/\text{h}$ |
| - Stability end-of-life (all effects included) | < $0.30^\circ/\text{h}$ |

Noise

- | | |
|--|---------------------------------|
| ARW | < $0.005^\circ/\sqrt{\text{h}}$ |
| Velocity Random Noise 1σ | |
| Quantification Noise (at 100 Hz) 1σ | |

Positioning error internally compensated

Alignment stability and repeatability (over mechanical and thermal environment)

- | | |
|---|----------------------|
| - Absolute (wrt mechanical reference) max | < $500\mu\text{rad}$ |
| - Relative (inter-axes) max | < $300\mu\text{rad}$ |

Rotation measurements

Linear motion measurements

- | |
|--|
| $\pm 0.1\text{ g}$ or $\pm 1.1\text{ g}$ |
| 3 s |
| 1.1 g or +20 g |
| 5 $\mu\text{m/s}$ / LSB |

- | |
|---------------|
| 50 or 300 ppm |
| < 200ppm |
| < 200ppm |
| < 1000ppm |

- | |
|--|
| 3 or 20 μg |
| 200 μg (typ. 35 μg) |
| 150 μg |
| < 500 μg |

- | |
|---------------------------------------|
| 5 $10^{-6}\text{ g}/\sqrt{\text{Hz}}$ |
| < 500 μg |