

DEFENCE AND SPACE
Spacecraft Equipment

ASTRIX[®] 200

This fibre optic inertial measurement unit is the best performing gyro on the world market



A v i o n i c s



Astrix[®] 200 presents ultimate performances and reliability which have made it selected by various customers all around the world, including European Space Agency (ESA) for Aeolus, Sentinel 2, SoIo and MTG programs.

Astrix[®] 200 offers outstanding inertial performances: its ARW of $2.10e-4^\circ/\sqrt{h}$ coupled with a very stable scale factor ($< 30\text{ppm EOL}$) makes it unrivaled by any other gyro technology.

Astrix[®] 200 two-box concept allows the mounting of the non-thermally dissipative sensor head close or inside the optical instrument, enhancing satellite pointing budget, image localization and post-processing performance, also improved thanks to its intrinsic large detection band width ($> 100\text{Hz}$ sampling frequency possible).

Astrix[®] 200 is fully qualified for long life time and permanently ON missions (up to 15 years in GEO orbit).

The first Astrix[®] 200 unit was successfully launched in December 2011 on Pléiades1A satellite and is in perfect operation since then, maintaining its BOL state of the art performances.

KEY FEATURES

- Best inertial performances: high resolution and stability, very low noise from low to high frequencies
- 4 independent angular rate detection axes in a skewed configuration
- FOG materials compatible with optical payload
- More than 15 years continuous operation (no life limited item)
- High reliability: very simple fault tolerant architecture with no cross-strapping, Ps > 0.995 after 5 years continuous operation
- Auto failure detection for each channel
- 1553B or RS422 digital interface
- Stimulation capability for AOCS ground test

CUSTOMERS / APPLICATION

- Astrix® 200: CNES for Pléiades, ESA for Aeolus, MTG, Sentinel 2

PERFORMANCES

- Noise: $0.0001^{\circ}/\sqrt{h}$ (BOL)
- Bias stability over one hour $0.0005^{\circ}/h$
- Scale Factor stability over one month 30ppm in [-10 ; + 50°C] range

ENVIRONMENT / RELIABILITY

- Thermal: -10 to +50°C (full performance), -20 to +60°C (operation)
- Vibration: 25g sine, GEU 20g rms in plane, ICU 10g rms
- Shock: 1200g over 1200Hz to 10kHz
- Radiation: 15 years GEO, SEP tolerant, latchup immune
- Lifetime: up to 15 years depending on mission profile
- EMI/EMC: MIL-STD-461

BUDGETS

- Mass: 12.7kg (ICU 7.5kg, GEU 4.5kg + harness)
- Volume: ICU ϕ 330 x h 280mm, GEU 295 x 150 x 145mm³
- Power: 5.5W typ. BOL per ON channel, Up to 7.5W EOL per ON

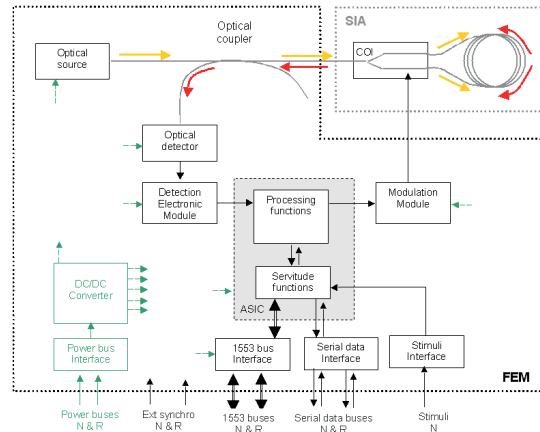
INTERFACES

- Power bus: 22-50V
- Turn-on: < 3s
- Dialog: 1553, RS422
- Synchro hardware link for accurate time-tagging, 1553 broadcast or autonomous mode available
- Testability BIT, RS422 stimulation for AOCS test

HERITAGE

- 28 satellites on orbit flying Astrix: 122 channels cumulating more than 3 million hours ON (as of January 2020)

Astrix® 200 gyroscopic channel architecture



Performances, end of life

General

- Full performance measurement range $\pm 5^{\circ}/s$
- Measurement range $\pm 15^{\circ}/s$
- Scale factor angular resolution 0.001 arcsec/LSB

Scale factor knowledge and stability

- Linearity - Asymmetry 3σ < 10ppm
- Thermal modelling error max < 30ppm
- Over orbital variation max < 15ppm
- Stability over 1 month and 15K range max < 15ppm
- Stability over end of life (all effects included) max σ < 200ppm

Bias stability

- Stability over 1 hour 3σ < $0.0005^{\circ}/h$

ARW

- No other noise contributor (AWN, RF, etc.) 1σ < $0.0001^{\circ}/\sqrt{h}$ (BOL)

Alignment stability (over mechanical and thermal environment)

- Absolute (wrt mechanical reference) < 25 μ rad
- Relative (inter-axes of a same ICU) < 25 μ rad

