

Space Equipment Avionics



ASTRIX® 200

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

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, SoI/O 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 ($< 30ppm$ 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 bandwidth ($> 100Hz$ 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 Pleiades1A 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, $P_s > 0.995$ 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 $[-10\ 50^\circ C]$ range

BUDGETS

- Mass: 12,7kg (ICU 7.5kg, GEU 4.5kg + harness)
- Volume: ICU \varnothing 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 channel

ENVIRONMENTS / RELIABILITY

- Thermal: -10 to $+50^\circ C$ (full performance), -20 to $+60^\circ C$ (operation)
- Vibrations: 25g sine, GEU 20grms in plane, ICU 10grms
- Shocks: 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

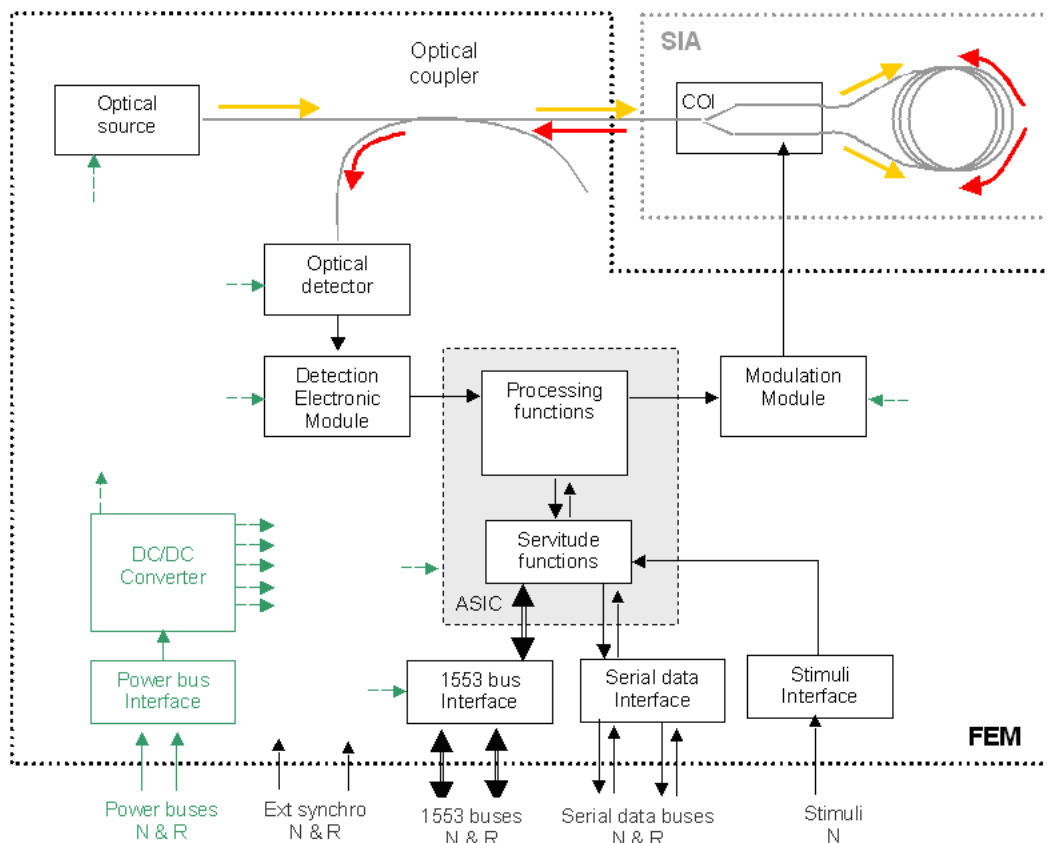
INTERFACES

- 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

- The Astrix® 200 is flying on Pléiades satellites
- 13 satellites flying Astrix: 48 channels cumulating 79 years in flight / 700 000 hours ON (time ref.: 01/12/2014)

Astrix® 200 gyroscopic channel architecture



Performances, end of Life

Full performance measurement range

- Measurement range $\pm 5^\circ/s$
- Scale factor value $\pm 15^\circ/s$
- Scale factor value 0.001 arcsec/LSB

Scale factor knowledge and stability

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

Bias stability

- Stability over 1 hour $3 \sigma < 0.0005^\circ/h$

ARW

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

Alignment stability (over mechanical and Thermal environment)

- Absolute (wrt mechanical reference) max $< 25\mu\text{rad}$
- Relative (inter axes of a same ICU) max $< 25\mu\text{rad}$

