



## **A-STR AUTONOMOUS STAR TRACKER**

**A-STR is a medium field of view (FOV) star tracker integrated in a single assembly with a radiation hardened design. It is capable to ensure robust and accurate three axis attitude determination with mass and power consumption very low for such class of instrument.**

A-STR is a highly reliable state-of-the-art product in the field of autonomous attitude determination systems that envelopes a broad range of missions. It finds application in the Space commercial market of Telecommunication Geostationary satellites (characterised by severe radiation orbits and long duration) as well as in the Earth Observation LEO satellites, Scientific satellites and interplanetary missions/probes.

Initial attitude acquisition is performed without any apriori information about the S/C orientation (lost in space solution). All operations are executed under microprocessor control by means of SW modules with inflight re-programming capability.

A-STR is a single package sensor including processing electronics and data/command interfaces; power supply ir from spacecraft's main bus.

### **HERITAGE**

A-STR It is a product with outstanding reliability, largely due to its strong heritage to earlier Galileo Avionica flight proven products, but also due to its simple design and the application of modern but low risk electronics, software and packaging technology.

A-STR derives directly from the autonomous star trackers developed for the ESA's Rosetta, Mars Express and Venus Express missions and takes the heritage of the CASSINI Stellar Reference Unit flown by NASA-JPL.

A-STR has been selected for many worldwide programs. Among the others: the Italian COSMO and AGILE, the NASA's MESSENGER (that launched the first two A-STR units in August 2004), STEREO, MRO, SDO and Pluto-KBO spacecraft, the Canadian RADARSAT II satellite, and the ESA's Herschel and Planck space observatories.

## TECHNICAL CHARACTERISTICS

### Operating principle

Embedded star catalogues and algorithms for pattern recognition and attitude estimations

Up to 10 tracked stars

### Operating modes

Autonomous attitude acquisition mode

Tracking mode: automatic after acquisition mode or by AOCS telecommand to resume attitude without passing through acquisition phase

### Characteristics

FOV:	16.4 x 16.4°
Dynamic range:	1.5 ÷ 5.5 Mi
Tracking rate:	0.5 °/sec full accuracy; 2 °/sec reduced accuracy
Lower than 6 sec. acquisition time	
10 Hz update rate	
Accuracy (3σ, EOL, full temperature range)	
bias error about three axis:	<10 arcsec
low frequency error:	<7 arcsec pitch & yaw <25 arcsec roll
random error @ 0.5°/sec tracking rate:	<9 arcsec pitch & yaw; <95 arcsec roll
random error @ 2°/sec tracking rate:	<20 arcsec pitch & yaw; <210 arcsec roll

### Data Interfaces

MIL - STD -1553B; RS 422 optional

Serial interface for EGSE

### Mechanical Interfaces

Size: 195(L) x 175(W) x 288(H) mm

Mass: 3 kg with baffle

### Electrical Interfaces

Main bus: 20 ÷ 50 V

Power consumption: 8.9 W @ 20 °C  
13.5 W @ 60 °C

### Environmental Conditions

Operational temperature: -30 to +60 °C

Storage temperature: -35 to +70 °C

Ambient or space vacuum pressure

Vibrations levels: 23.5 g rms in plane  
26 g rms out of plane

18 years in GEO orbit