

High Accuracy Star Sensor **ASTRO XP**

The Jena-Optronik **ASTRO XP** is an Autonomous Star Sensor for high accuracy star tracking relying on a 45.000 guide stars catalogue.



ASTRO XP has been developed to meet the specific requirements for high accuracy star tracking in science missions and high resolution Earth observation from GEO and LEO.

The catoptric optics is made from a low expansion material only in order to achieve the highest level of stability over the space environment. The optics is free from any color aberration error and therefore suited for all star spectral classes.

The development has been made under contract of the European Space Agency.

ASTRO XP Highlights

- Attitude error in-plane 0.1 arcsec
- Power consumption < 1 W (optical head only)
- Mass \leq 2.6 kg (optical head only)

ASTRO XP Autonomous Star Sensor Performance

Specification	
Field of view	< 3.3 deg circular
Optics	170/2.0 catoptric axial FMA with central obscuration made from a low CTE material
Image sensor	FaintStar2
Bias error	< ± 0.5 arcsec
Thermo-elastic error	< 0.1 arcsec, over life and anywhere on a temperature plateau e.g. $T_{op} \pm 3K$
Attitude random error	< 0.1/3.0 arcsec xy/z 1σ (5 stars, no filtering)
Angular rate	≤ 0.5 deg/sec, 100% acquisition & tracking ≤ 6 deg/sec, 100% acquisition & tracking, supported by ASTRO APS3
Time tag accuracy	< 0.1ms
Lost in space	≤ 500 ms at 8 Hz up to 0.5 deg/sec
Update rates	2, 4, 8 Hz
Power consumption	Optical Head: ≤ 1 W Electronics Unit: ≤ 10 W @ 28 VDC
Mass / Envelope	Optical Head: ≤ 2.6 kg, 172 mm x 172 mm, 100 mm height Baffle, SEA 30deg half-cone: ≤ 1.5 kg, 215 mm x 215 mm, 321 mm height Electronics Unit: ≤ 2.8 kg, 100 mm x 172 mm, 180 mm height
Temperature range	Operational: $-55^{\circ}C \dots +30^{\circ}C$ Non-operational: $-65^{\circ}C \dots +60^{\circ}C$ Start-up: $-60^{\circ}C \dots +55^{\circ}C$
Mechanical interface	Optical Head: 3 x M6 to flat spacecraft interface Baffle, SEA 30deg half-cone: 3 x M6 to flat spacecraft interface Electronics Unit: 4 x M6 to flat spacecraft interface
Operational interface	SpaceWire, MIL1553 (option)
Supply voltage	28 VDC, others (option)
Sun/Earth exclusion	30deg / 26deg half-cone
EEE-parts	≥ 50 krad, SEL ≥ 65 MeVcm ² /mg latch-up free, no SEB
Life time:	18 years, geo-synchronous orbit