

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 accuracy 0.1 arcsec
- Power consumption ≤ 1.5 (optical head only)
- Mass ≤ 2.5 kg (optical head only)

ASTRO XP Autonomous Star Sensor Performance

Layout	
Architecture	Optical Head with a remotely located Electronic Unit for image processing
Field of View (circular)	3.3 deg
Optics	175/2.0 catoptric axial FMA with central obscuration made from a low CTE material
Image Sensor	FaintStar2 system-on-chip - 1024px x1024px
Performance	
Update Rate (Tracking)	2, 4, 8 Hz
Attitude random error	$\leq 0.1 / 3.5$ arcsec (1σ) @ five stars, no filtering (Total Error incl. LSFE & HSFE)
Bias	$\leq \pm 0.5$ arcsec
Thermoelastic Error	≤ 0.005 arcsec/K
Acquisition Time	≤ 1 s
Slew Rate	≤ 0.5 deg/sec; ≤ 6 deg/sec supported by a wide field optical head
Limiting Magnitude	10.2 mi @ 100 ms integration time
Moon in Field of View	Accepted
Reliability	375 FIT (MIL-HDBK-217 @ 30°C baseplate; improved reliability on request)
Environment	
Operating Temperature	-40°C ... +30°C
Storage Temperature	-40°C ... +65°C
Random Vibration / Shock	12.1 grms in a range from 20 ... 2.000 Hz, all axes / 355 g @ 2.000 Hz, all axes
EEE-Parts	≥ 50 krad, SEL ≥ 65 MeVcm ² /mg latch-up free, no SEB
Life Time	Up to 15 years in LEO and >18 years GEO orbit without additional shielding
Physical	
Sun Exclusion Angle (half cone)	30 deg (other on request)
Earth Exclusion Angle (half cone)	26 deg (other on request)
Nominal Envelope (L x W x H)	Optical Head with Baffle: 215 x 215 x 321 mm ³ Electronic Unit: 137 x 146 x 60 mm ³
Mass	Optical Head: ≤ 2.5 kg Electronic Unit: ≤ 1.3 kg Baffle: ≤ 1.5 kg EU
Layout	
Supply Voltage	28 ...100 VDC
Nominal Power Consumption	Optical Head: ≤ 1.5 W Electronic Unit: ≤ 5 W
Output	Attitude quaternion and rate vector, status and health telemetry, full frame image
Operational Interface	SpaceWire, MIL1553