

ASTRO APS3

Jena-Optronik's **ASTRO APS3** is the latest development of an autonomous high-reliable Star Sensor. ASTRO APS3 follows the very successful ASTRO APS and continues all well-known features while it comes with an improved performance within a smaller footprint and reduced mass.



Highly modular design is used to serve wide variety of customer specific interfaces to support all applications, missions and orbits from LEO, MEO, GEO, lunar orbits and beyond for deep-space missions.

Based on the heritage of the very successful ASTRO APS with more than 450 units contracted, ASTRO APS3 extends existing functionalities and performance while being more compact and lightweight at favourable price.

Features

- Lifetime on orbit >18 years
- 26° sun exclusion and full performance with moon in the field of view
- Internal data processing with powerful CPU, output of attitude quaternion
- Almost drop-in replacement for ASTRO APS

ASTRO APS3 highlights

- Super-fast (0.5 sec) initial acquisition under all conditions without a-priori knowledge
- Improved optical budget with lowered limiting magnitude of 7.0mi
- Background adaptation including DSNU, dark current, white spots and SEU rejection ensures super-fast acquisition and tracking even under maximum heavy solar flare conditions
- True real-time snap shot images and image series, e.g. for relative optical navigation

ASTRO APS3 Performance

Size & Mass		
Dimensions	137 mm x 137 mm x 213 mm	Complete unit including baffle
Mass	<1.8 kg	Complete unit including baffle
Imaging System Design		
Optics	refractive, f/1.0	rad-hard glass material
Detector Resolution	1024 x 1024 pixels	
Field of View	20 deg	circular
Detector Options	FaintStar2	APS CMOS radiation hard & latch-up free
Temperature Range		
Operational	-30 °C ... +60 °C	typical cooler controller set point +30°C at detector
Non-operational	-40 °C ... +70 °C	
Attitude Performance		
Random Error	< 2.4 arcsec [3σ], across boresight < 20 arcsec [3σ], boresight	Rates < 0.1 deg/s, includes LSFE, HSFE, TE
Bias Error	< 6 arcsec, all axes	over full operational temperature range
Acquisition Time	0.5 sec, acquisition "lost in space"	
Slew Rate & Acceleration	≤ 6.0 deg/sec, ≤ 7.0 deg/sec ²	reduced performance
Sensitivity	7.0mi G0-reference star	end of life performance
Sampling Rate	8, 10, 16 Hz	Options available
Stray Light	Sun: 26 deg exclusion angle Earth: < 20 deg Moon: accepted in field of view	half cone depending on orbit height and earth illumination conditions
Interfaces		
Data	SpaceWire MIL-STD-1553B RS422	optional selectable, others on demand optional selectable, others on demand optional selectable, others on demand
Power	5V regulated 28V nominal 50V nominal 100V nominal	optional selectable for either regulated or unregulated primary power s/c bus architectures other voltages on demand
Power Consumption		
	< 6 W, peltier cooler OFF < 8 W, peltier cooler ON _{MAX}	depends on operational interface
Operations		
Reliability	330 / 375 FIT, $T_{1/F}=30^{\circ}\text{C}$	with Class 1 EEE parts; MIL-1553 / SpaceWire
Operational Modes	Standby-Mode Autonomous Attitude Determination (AAD) Nominal Attitude Tracking (NAT) Photo, Upload/Download, Self-Test	fully autonomous mode switching from Power-ON to NAT depending on software parameters additional processing capacity, for e.g. relative optical navigation and other applications