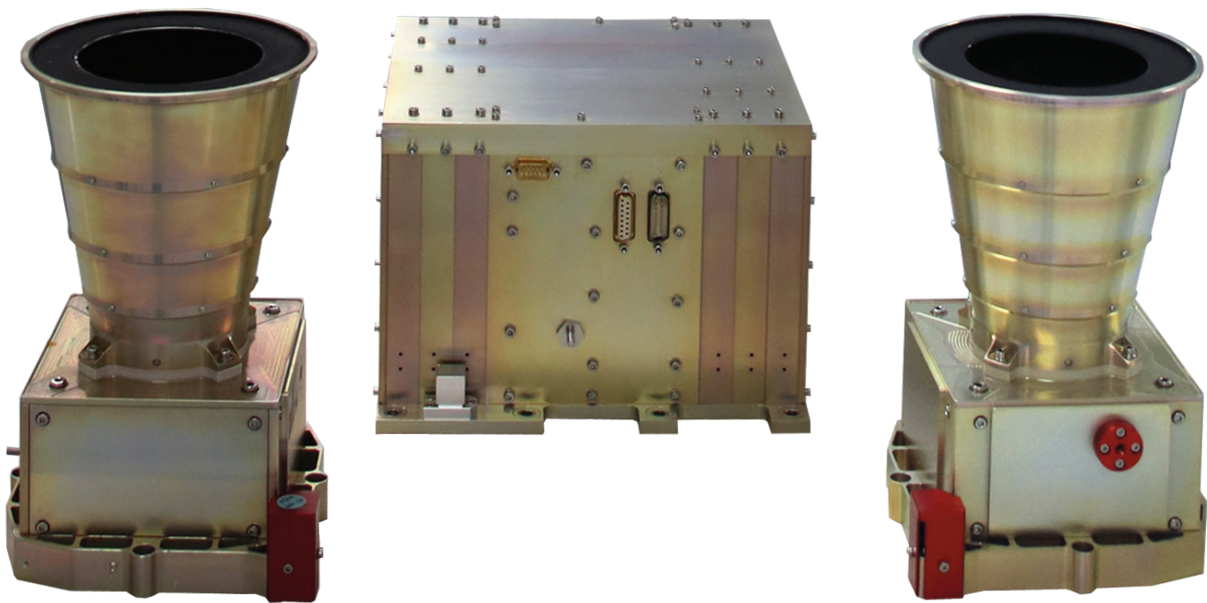


ASTROgyro™

The Jena-Optronik **ASTROgyro** unfolds the synergies of star trackers and gyroscopes.



Unfolding the synergies of star trackers and gyroscopes, **ASTROgyro™** establishes a reliable and performant attitude determination system by combining Jena-Optronik's successful **ASTRO** star tracker series, as source of absolute and drift-free attitude information based on star pattern recognition, with the broad dynamic range and low noise rate spectrum of inertial sensing technology.

ASTROgyro Performance [as per June 2020]

	ASTROgyro Star Sensor (AGS) ASTRO APS	ASTROgyro IRU (AGI) Inertial Reference Unit
System Design & Performance (typical)		
Technology	APS CMOS detector chip, radiation hard	Coriolis Vibratory Gyroscope (CVG)
System Concept		2 x AGS 1 x AGI (2 x 3-Axis Gyro Units) AGS and AGI cross-strapped
Output	Rate and attitude quaternions from merged AGS and AGI data (raw data available)	
Random Attitude Error, typical	~ 1 arcsec (1 σ), all axes	
Random Rate Error, typical	~ 4 arcsec/sec (1 σ), all axes	
Gyro-Assisted Attitude Bridging (Star Tracker AGS denied, Earth Rate)	Typical 0.1 deg accuracy over a time period of 1000 sec	
Interfaces & Operations		
Update Rate	30 Hz (drift-free IRU data aided by 10 Hz STR updates)	
Reliability	~ 0.981 (Probability of Success, 45°C, 15 years)	
Data Interfaces	MIL-STD-1553B (other data interfaces on request)	
Power Interface	28V nominal (customized versions on request)	
Power Consumption	< 6 W (Peltier Cooler OFF) < 12 W (Peltier Cooler ON)	< 15 W (cold-redundant) < 30 W (hot-redundant) < 21 W (nominal min., system 1 x AGS & 1 x AGI cold-redundant) < 54 W (nominal max., system 2 x AGS & 1 x AGI hot-redundant)
Size & Mass		
Dimensions	154 mm x 154 mm x 237 mm (single unit)	~ 230 mm x 230 mm x 170 mm
Mass	approx. 2 kg (single unit)	approx. 7.8 kg
Temperature Range		
Operational	-30 °C ... +60 °C	-30 °C ... +65 °C (full performance)
Non-operational	-40 °C ... +70 °C	-55 °C ... +85 °C
Gyro Performance Characteristics (typical)		
Full Scale Range	+/- 20 deg/sec (coarse), +/- 1 deg/sec (fine)	
Angle Random Walk	< 0.005 deg/ $\sqrt{\text{hr}}$, per axis	
Noise Equivalent Angle	< 0.2 arcsec (1 σ), per axis	
Noise Equivalent Rate	< 2 deg/hr r.m.s (0.1 Hz ... 15 Hz), per axis	
Bias Instability	< 0.05 deg/hr (1 σ), per axis (Allan deviation)	
Scale Factor Error	< 3500 ppm (1 σ), per axis	
Star Sensor Performance Characteristics (typical)		
Bias Error	< 5 arcsecs (full temperature range)	
Noise Equivalent Angle	< 1 arc-sec (1 σ , xy-axis) , < 8 arc-sec (1 σ , z-axis)	
Acquisition Time	< 10 sec (switch-on) < 5 sec (re-acquisition, lost-in-space)	
Stray Light	Sun: 26 deg Sun Exclusion Angle Earth: 20 deg Earth Exclusion Angle Moon: accepted in FoV	