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Star Sensor
Ground Support Equipment

A range of ground support equipment is available to support your star sensor testing needs. In each development phase of your spacecraft AOCS, Jena-Optronik star sensors can thus be complemented by suitable test equipment.

The Jena-Optronik **Optical Sky Stimulator (OSI)** is a smart, universal, and powerful star sensor test equipment. It allows a real end-to-end test of the star sensor functions and performance in closed loop dynamic mode and can be used to test star sensors which are already attached to a satellite.

The Jena-Optronik **Optical Star Pattern Stimulator (OSPS)** is a cost efficient alternative to the OSI allowing open-loop functional testing in static mode of the ASTRO APS star sensor. Different flavors of the equipment allow scaling to your testing needs and help you to streamline your budget.

The Jena-Optronik **Unit Tester (UT)** for ASTRO APS Star Sensors implements a monitoring and control panel allowing to operate the star sensor as a stand-alone unit and to visualize the telemetry generated by the unit.

Optical Sky Stimulator (OSI)

The OSI consists of a lightweight optical head (OH) for the projection, a baffle mount, the connecting harness, and a control computer. The optical head of the OSI mounts directly to the star sensor. The real sky scenery (stars, planets, moon, SEU's, etc.) is imaged in real-time on a high resolution micro-display in front of a special optics providing a collimated beam to the star sensor entrance aperture. It is a universal test system for star sensors plug & play ready for both Jena-Optronik ASTRO 10 and ASTRO APS star sensors, but adaptable as well for third party star sensor.

Flavors and options	
Models	• OSI-Standard (for ambient conditions) • OSI-TV (for use in TVAC)
Usage Methods	• Single Head • Multi Head (optional upon request)
Operational Temperature	• +10°C ...+30°C (OSI-Standard) • -30°C ... +60°C (OSI-TV)
Pressure	• Ambient (OSI-Standard) • 1 x 10^{-6}mbar ... Ambient (OSI-TV)
Performance	
Field of view	> 20°, circular
Optics	Refractive, collimating
Simulated objects	• Stars from star catalogue in range 2.0mi ... 6.5mi +/- 0.3mi • Solar system objects (Moon, Earth, Sun, Jupiter, Mars, Saturn...) • Protons (> 5000 impacts per image, punctual or streak) • Extended objects (via data input or file)
Star diameter	< 0.1° (at 99%)
Single star accuracy	< 0,0075° (3σ)
Star catalogue	• Built-in HIPPARCOS based star catalogue • Easy possibility to load costumer based star catalogues according to simple file format
Motion speed	Up to 3°/s (requires synchronization to STR)
Background	• Dynamical stray light (via image files or simulated by model) • Extended objects (to mask part of the FOV)
Static simulation tools	• Static Attitude (simulation of real star pattern for any viewing direction on the celestial sphere) • Sign Test (verification of reference coordinate system)
Dynamic simulation tools	• Orbit Propagator including maneuver profile editor • File or Data input for customized orbits and profiles
Operating modes	• Stand-alone / Closed loop
Components	
Optical head	Baffle-mounted for ASTRO APS and ASTRO 10
Control computer	Industrial PC in 19 inch rack mount chassis
Harness	• OSI-Standard: 15m • OSI-TV: 25m, 25m, thereof 10m inside TVAC

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Optical Star Pattern Stimulator (OSPS)

The OSPS is a simple, robust, and budget saving optical test system for the Jena-Optronik ASTRO APS star sensor statically simulating a real star pattern. It comes in several flavors: the OSPS-Standard for ambient test conditions, the OSPS-TV for use in TVAC, and the OSPS-PEEK reducing the electromagnetic shielding of the star sensor by the test system. The OSPS is plug and play ready for the Jena Optronik ASTRO APS.

Flavors	
Models	• OSPS-Standard (for ambient conditions) • OSPS-PEEK (for ambient conditions) • OSPS-TV (for use in TVAC)
Operational Temperature	• +10°C ...+30°C (OPSP-Standard and OSPS-PEEK) • -30°C ... +60°C (OSPS-TV)
Pressure	• Ambient (OSPS-Standard and OSPS-PEEK) • 1 x 10^{-6}mbar...Ambient (OSPS-TV)
Performance	
Field of view	> 20°, circular
Optics	Refractive, collimating
Simulated objects	• Stars in range 2.0mi ... 6.5mi +/- 0.3mi, HIPPARCOS based • Right Ascension / Declination: 184° / -60° • (static simulation of a real star pattern of celestial sphere)
Star diameter	< 0.1° (at 99%)
Single star accuracy	< 0,007° (3σ)
Components	
Optical Head	Baffle-mounted for ASTRO APS
Optical head housing material	• AlMg4.5Mn / TiAl6V4 (OSPS-Standard and OSPS-TV) • PEEK 1000 (OSPS-PEEK)
Power Supply	Optional upon request
Harness	• 17m (OSPS-Standard and OSPS-PEEK) • 17m, thereof 15m compatible for TVAC (OSPS-TV)

Unit Tester (UT)

The ASTRO APS Tester (UT) takes over the role of the spacecraft AOCS in case of stand-alone testing for Star Sensors. It powers the ASTRO APS, controls and communicates with it and receives data from it.

Performance	
	• Closed-loop testing with OSI • Sending telecommands (TC) to the STR • Receiving telemetry and housekeeping data from the STR • Monitoring the health status of the STR • Visualization of the received telemetry data • Control the power supply and sync pulse • Record and replay of the STR data stream • Controlling and modification of all sensor specific parameters
Components Unit Tester Power Box	
Features	• PPS signal conversation and distribution • Voltage and current control, measurement and visualization • ON/OFF pulse generation for powering the STR
Current	max. 6 A (sensor / project specific)
Voltage	max. 100 V (sensor / project specific)
Components Unit Tester IPC (UT PC)	
Type	High performance Industrial PC (at least 4 CPU cores, 2 GB RAM, reliable components)
Control Interface	User friendly GUI
Timing Interface	1 PPS timing link
Data Interface	RS-422, MIL-1553 (sensor/project specific)
UT Software Application (UT GUI)	
Features	• Command control of STR • Telemetry display and analysis • Full memory and parameter control of STR • Photo mode with analysis tool • Recording and replay mode • UT power box control • PPS signal generation and control

EN 9100 certified AIRCERT Certification of Management Systems

Jena-Optronik GmbH · Otto-Eppenstein-Straße 3 · 07745 Jena · Germany
Phone +49 3641 200-110 · **Fax** +49 3641 200-222
Email sales@jena-optronik.de · **Web** www.jena-optronik.com