

## Star sensors

### The eye of a spacecraft: Sensors for attitude & orbit control in space

Jena-Optronik is world leading in the development, manufacturing and test of star sensors (star trackers), which are necessary to keep satellites and other spacecraft stable and on track. They accomplish this task by taking pictures of the starry sky and comparing the star pattern with an integrated star catalogue in order to allow a correct orientation of satellites, probes and spaceships.

The wide range of star sensor products allows to support various kinds of missions, starting from small satellite projects and constellations up to high-end science missions. With our portfolio we can support almost every program with the fitting star sensor:

- ASTRO APS and ASTRO APS3 for all mission scenarios in LEO, MEO, HEO and GEO orbit as well as deep-space, exploration and human spaceflight programs
- ASTRO CL the latest and smallest of the ASTRO product family for small satellite and constellation missions
- ASTRO XP for the next generation of Earth observation and science mission which require a very high pointing accuracy of the spacecraft
- ASTROgyro as integrated and cost-efficient attitude and orbit control sensor

### On our way to the Moon, Mars and beyond

The current generation of star sensors, which includes the ASTRO APS, is based on CMOS detector technology. The sensor has been sold more than 470 times up to now and more than 200 are already flying successfully in orbit. The ASTRO APS is a very versatile star sensor (star tracker), which is not only used for LEO, MEO and GEO applications, but also on missions to the Moon (Orion in the frame of the Artemis program) and to Mars (Mars Sample Return Earth Return Orbiter).

The ASTROgyro, an innovative combination of star sensors and gyroscopes, which

provides a significantly increases performance compared to a standalone star sensor, relies on the reliable ASTRO APS and its technology as well.

As successor of the ASTRO APS, the high-performance ASTRO APS3 is already waiting in the starting blocks – this new star sensor will have its first mission and corresponding maiden flight already this year (2024). This category of star sensors will be used, like its predecessor, in the frame of complex long-term missions where high accuracy and dynamic requirements play a crucial role. Thanks to their robust architecture from a mechanical and electrical point-of-view, the ASTRO APS and ASTRO APS3 can be used in all orbits.

For small satellites and constellations, Jena-Optronik's ASTRO CL is one of the best star sensors in this category. The smallest family member of the ASTRO family has been sold more than 1000 times since its market introduction in 2020. With a current manufacturing capacity of twelve sensors per week, the ASTRO CL is the ideal product for constellations as it meets the commercial demands of the “new space” market. In addition, it can be used in all other kinds of small satellite applications. The ASTRO CL consists of full radiation hard parts only and is therefore, thanks to its performance and robustness, not limited to short-term missions in LEO orbit.

For missions with very high demands and requirements, Jena-Optronik currently develops the ASTRO XP star sensor. Especially with its 10-times higher accuracy compared to the ASTRO APS and ASTRO APS3 star sensors, the ASTRO XP and its award-winning optics are designed for science and Earth observation missions in order to achieve the needed very high pointing accuracy of the satellites and spacecraft in this segment.

## **A “throwback” in our history**

Since 1980 our specialists in Jena design and build opto-electronic sensors for all different kinds of spacecraft – satellites, probes and spaceships – in order to keep them on track.

The first star sensor ASTRO 1 proved its space competence already in the mid-1980s and was succeeded by many other successful products. This includes the ASTRO 10, which has been used (amongst others) in the Earth observation programs TerraSAR-X, Tandem-X and SARLupe, and the ASTRO 15. The ASTRO 15 with its high pointing accuracy had been developed specifically for long-term missions and has been used for example on DirecTV's Spaceway satellites.

Source: <http://www.jena-optronik.com>

