



HYDRA is a multiple head Star Tracker with separate Optical Heads and Electronic Units.

Its extensive autonomy offers a large potential for AOCs simplification. This new sensor paves the way for gyroless satellite attitude control.

HYDRA Optical Head employs Active Pixel Sensors (CMOS), offering improved performances, flexibility, low mass and low power dissipation for an easy accommodation.

Its exceptional robustness is a quantum leap ahead of other products: HYDRA can survive high mechanical loads and performs under very harsh conditions (dynamic, protons, stray-light...).

Embedded FDIR functions can autonomously manage any situation and the sensor will always deliver accurate attitude data in operating domains with selectable update rates up to 30Hz.

Its versatility and modularity allows an easy and cost effective adaptation to a wide range of missions.

HYDRA has reached TRL-9 in September 2012 on-board SPOT-6 spacecraft.



**Versatile
Robust
Accurate
Flight Proven**



TECHNICAL SPECIFICATIONS

Up to 4 Optical Heads may be connected to 2 Electronic Units with up to 8m length cable

Optical Head (OH)

- Baffle protecting the lens from direct Sun and Earth illumination
- Lens made of Rad-Hard glasses
- HAS-2 APS (CMOS) detector and its Thermo-Electric Cooler
- Spacewire interface (MIL 1355) with Electronic Unit

Electronic Unit (EU)

- Power Converter supplying the OH and the Processing Unit
- Embedded software processing OH's data and computing the attitude
- Embedded Star Catalog

Typical Attitude accuracy in 3-head configuration

- Bias < 11 arcsec
- Thermo-elastic error < 0.055 arcsec / °C
- FOV spatial error < 0.6 arcsec @ 3σ three axes
- Pixel spatial error < 2.1 arcsec @ 3σ three axes
- Temporal NEA < 0.55 arcsec/vHz @ 3σ three axes

Additional Performance Features

Autonomous Attitude Acquisition in less than 1.5 seconds

Attitude tracking up to 3 heads simultaneously:

- 15 Stars per OH
- Update rate up to 30Hz

Robustness:

- Angular rate determination up to 10 deg/s
- Acquisition up to 8 deg/s from lost in space
- Tracking up to 10 deg/s and 10 deg/s² @30Hz
- Sun Exclusion Angle: 26 deg, Earth limb Exclusion Angle: 18.5 deg
- No performance degradation with full Moon in FOV
- Robust to Sun and Earth blooming on two heads out of three
- Robust to peak Solar Flare in acquisition and tracking

Single FOV and blended solution attitude data both available

Environmental Characteristics

Temperatures:

- Full performance -20°C to +50°C
- Operating range -30°C to +60°C
- Storage -40°C to +70°C

Mechanical loads: Random 28 gRMS, Shocks 2000 gSRS

Mechanical Interfaces (LEO with 26 Deg SEA)

OH: Mass 1.4 kg, Dimensions Ø146.5mm x H283mm
EU (for 3 OH configuration):
Mass 1.8 kg, Dimensions 170 x 146 x 103 mm³

Electrical Interfaces

Typical power consumption @ 20°C for 1EU and 3OH: 9.5 W

Electrical Consumption @ 20°C per OH < 1 W

Head dissipation @20°C (no Sun): 0.9W (dissipation through baffle)

Power supply: 21 to 52 Volts

Output data: MIL1553B or RS422

Reliability and Lifetime

1 OH: Level 1: 190 FIT, Level 2: 241 FIT

1 EU: Level 1: 585 FIT, Level 2: 866 FIT

LEO 10 years - GEO 18 years

Qualified Options

Enhanced shielding for GEO mission

Baffle with 35 deg Sun Exclusion Angle

HYDRA-TC: fully redundant EU version for 2 OH, GEO shielding

HYDRA-M: light LEO version for 1 or 2 OH without Thermo-Electric Cooler

HYDRA-CP: software hosted into On-Board Computer

Product developed with CNES funding



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