

# HYDRA-M



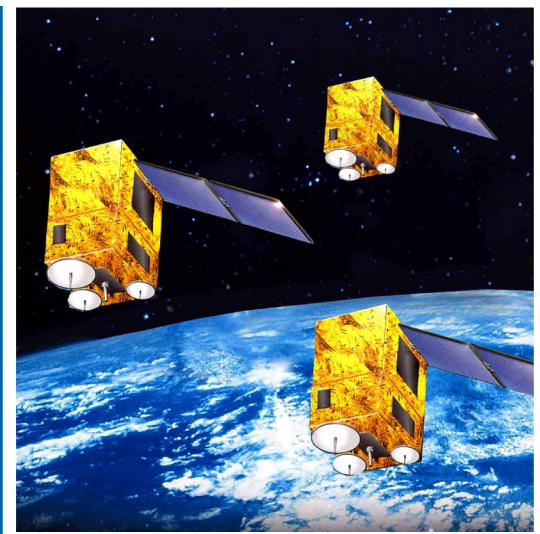
HYDRA-M is a low cost, low power, low mass multiple head autonomous star tracker providing 3-axis satellite attitudes derived from observations of the celestial vault.

Maximum performance is independent of the FOV configuration and orientation of the satellite and is achieved for a wide range of angular rates.

The HYDRA-M design is a small deviation from Sodern's flight proven HYDRA Baseline Active Pixel Sensor (CMOS) Star Tracker. The number of optical heads is limited to two without Thermo-Electric Cooler regulation.

The HYDRA-M Electronic Unit is smaller and lighter than HYDRA Baseline and can be used alone or with a redundant unit. Cross-coupling to the Optical Heads is included.

The HYDRA-M Optical Head is intended for use on a temperature regulated base plate. Full performance is obtained for a maximum base plate temperature of 40°C for missions lasting up to seven years.



Moderate Cost  
MicroSat Compatible  
Modular Design



OPTRONIC  
SPACE EQUIPMENT

## TECHNICAL SPECIFICATIONS

Up to 2 Optical Heads may be connected to 1 or 2 Electronic Units with 8m cable length

### Optical Head (OH)

- Baffle protecting the lens from direct Sun and Earth illumination
- Lens made of Rad-Hard glasses
- HAS-2 APS (CMOS) detector
- 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 2 head blended solution:

- Bias < 11 arcsec
- Thermo-elastic error < 0.055 arcsec / °C
- FOV spatial error < 0.7 arcsec @  $3\sigma$  three axes
- Pixel spatial error < 3.4 arcsec @  $3\sigma$  three axes
- Temporal NEA < 0.8 arcsec / vHz @  $3\sigma$  three axes

### Additional Performance Features

Autonomous Attitude Acquisition in less than 2.5 seconds

Attitude tracking up to 2 heads simultaneously:

- 15 Stars per OH
- Update rate up to 16Hz

### Robustness:

- Angular rate determination up to 10 deg/s
- Acquisition up to 8 deg/s from lost in space
- Tracking up to 8 deg/s and 7 deg/s<sup>2</sup> @ 16Hz
- 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 one heads with two heads operating
- 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 +40°C
- Operating range -30°C to +50°C
- Storage -40°C to +70°C

Mechanical loads: Random 28 gRMS, Shocks 2000 gSRS

### Mechanical Interfaces (LEO with 26 Deg SEA)

1 OH: Mass 1.4 kg, Dimensions Ø146.5mm x H283mm  
1 EU: Mass 1.35 kg, Dimensions 171 x 156 x 65 mm<sup>3</sup>

### Electrical Interfaces

Typical power consumption @ 20°C for 1EU and 2OH: 7 W

Electrical Consumption @ 20°C per OH < 1 W

Power supply: 21 to 52 Volts

Output data: MIL1553B

### Reliability and Lifetime

1 OH: Level 1: 166 FIT, Level 2: 205 FIT

1 EU: Level 1: 540 FIT, Level 2: 657 FIT

LEO 10 years

### Product developed with CNES funding



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