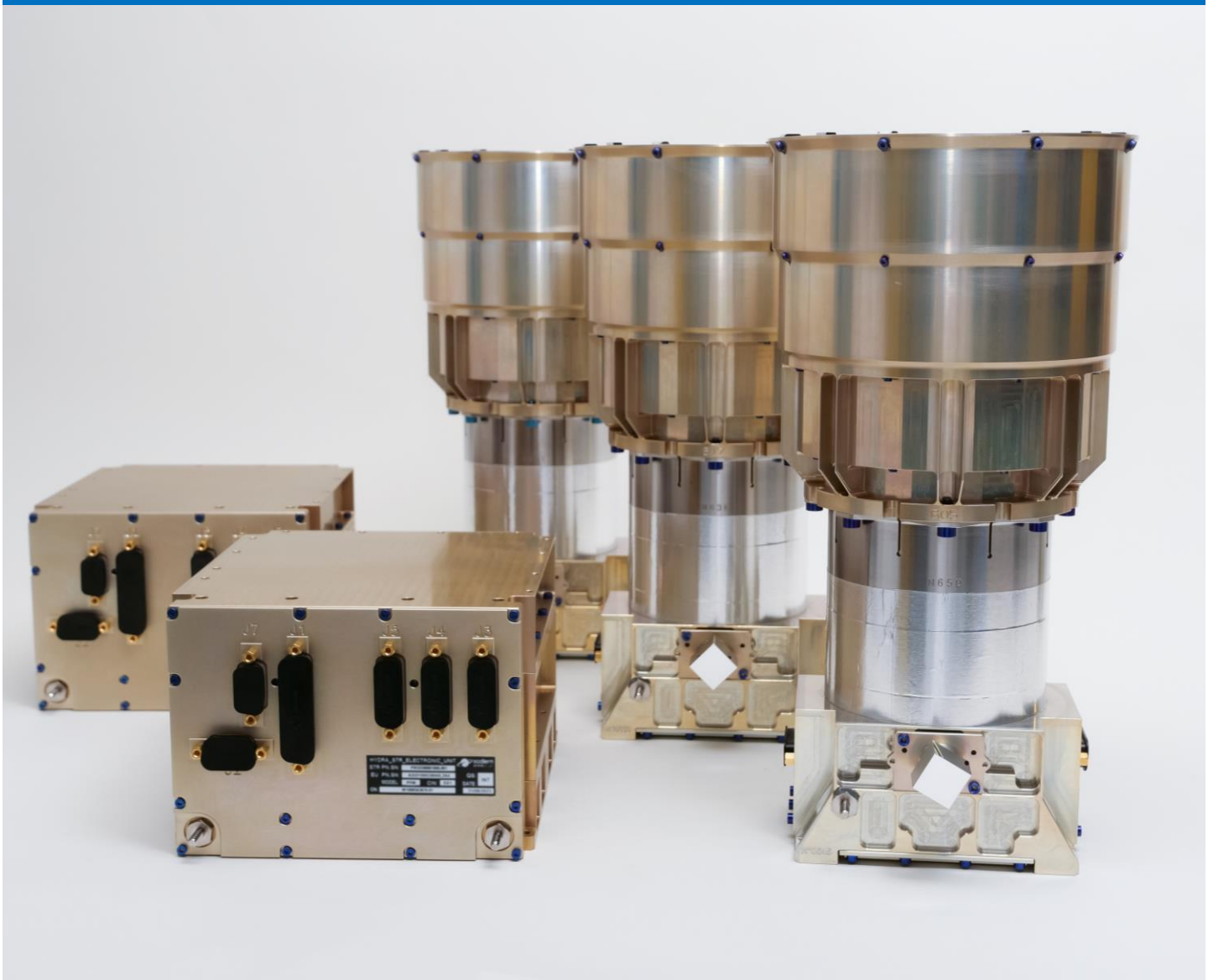
Hydra Baseline



The most versatile high-end Hydra star tracker

- Best-in-class performance, Accuracy and Robustness
- Highly modular solution: 1 to 4 Optical Heads connected to 1 or 2 Electronics Units
- Flight-proven (TRL9) since 2012
- Inherited from 50+ years experience in star trackers

HYDRA BASELINE

THE MOST VERSATILE HIGH-END HYDRA STAR TRACKER

KEY FEATURES

- Up to 4 Optical Heads (OH) connected to 1 or 2 Electronics Units (EU) through SpaceWire interface (MIL 1355) with up to 8m-long cables
- HAS-2 CMOS sensor with Thermo-Electric Cooler (TEC)
- Electronics unit embedded software processes multiple OH data and delivers a fused quaterniion
- Optics made of rad-hard material
- EU available in option with additional shielding for GEO missions
- Export control EU Dual Use 7A004

ACCURACY & PERFORMANCE (EOL)

Bias	<11 arcsec
Thermo-elastic error	<0.055 arcsec/°C
Low Frequency Spatial Error (LFSE) @ 3σ	0.6 arcsec (XY) | 4.6 arcsec (Z)
High Frequency Spatial Error (HFSE) @ 3σ	3.4 arcsec (XY) | 27 arcsec (Z)
Temporal noise @ 3σ	2.3 arcsec (XY) | 18 arcsec (Z)
Slew rate	≤5 deg/s in Acquisition | ≤8 deg/s in Tracking
Acceleration	≤2 deg/s² in Acquisition | ≤10 deg/s² in Tracking (30Hz)
Time from lost-in-space	2.2s typ
Sun/Earth Exclusion Angle (SEA/EEA)	26 deg / 18.5 deg

No performance degradation with full moon in the field of view

RELIABILITY & LIFETIME

EEE parts class	Level 1 & Level 2
Reliability (MIL-HDBK-217F @ 30°C)	Level 1: 110FIT (OH) | 585FIT (EU) Level 2: 190FIT (OH) | 866FIT (EU)
Lifetime	10 years LEO | 18 years GEO

Robust to solar flare in acquisition and tracking

MASS & VOLUME

Footprint	OH (incl. Baffle): Ø147mm x 283mm | EU: 170mm x 146mm x 103mm
Mass	OH (incl. Baffle): 1.4 kg | EU: 1.8 kg

INTERFACES

Power supply	21V to 52V
Power consumption @30°C, 28V, 30Hz	7.7W typ. (2 OH ON, TEC OFF)
Output data	MIL1553B or RS422 (AS/CS16)
Output rate	8Hz, 10Hz, 12Hz, 16Hz, 20Hz, 30Hz

ENVIRONMENTS

Temperature Range	-30°C / +60°C (Operation) | -40°C / +70°C (Storage)
Random vibrations	OH: 30g RMS | EU: 28g RMS
Shocks	OH: 2000g SRS | EU: 2000g SRS

EXCEPTIONNAL ROBUSTNESS
Hydra can survive high mechanical loads and performs under very harsh conditions :
High slew rates, temperature, protons, stray-light…

EMBEDDED FDIR FUNCTIONS
Hydra Star Tracker delivers accurate attitude in any situations thanks to multiple-head autonomous management

Product specifications are subject to change without notice or obligation

More information on www.sodern.com

Contact: sales-department@sodern.fr

Hydra Access

High-end Hydra star tracker available off-the-shelf

- Best-in-class performance, Accuracy and Robustness
- Standardized Hydra definition, shortened lead-time and optimized cost
- Centralized Processing (CP) version enabling extra mass & cost optimization at system level
- Flight-proven (TRL9) since 2014
- Inherited from 50+ years experience in star trackers

HYDRA ACCESS

HIGH-END HYDRA STAR TRACKER AVAILABLE OFF-THE-SHELF

KEY FEATURES

- Up to 4 Optical Heads (OH) connected to spacecraft's on-board computer through SpaceWire interface (MIL 1355) with up to 8m-long cables
- HAS-2 CMOS sensor with Thermo-Electric Cooler (TEC)
- Software integrated in the spacecraft processor processes multiple OH data and can be made available for any processor
- Optics made of rad-hard materials
- Export control EU Dual Use 7A004

ACCURACY & PERFORMANCE (EOL)

Bias	<11 arcsec
Thermo-elastic error	<0.055 arcsec/°C
Low Frequency Spatial Error (LFSE) @ 3σ	0.6 arcsec (XY) | 4.6 arcsec (Z)
High Frequency Spatial Error (HFSE) @ 3σ	3.4 arcsec (XY) | 27 arcsec (Z)
Temporal noise @ 3σ	2.3 arcsec (XY) | 18 arcsec (Z)
Slew rate	≤5 deg/s in Acquisition | ≤8 deg/s in Tracking
Acceleration	≤2 deg/s² in Acquisition | ≤3 deg/s² in Tracking
Time from lost-in-space	2.2s typ
Sun/Earth Exclusion Angle (SEA/EEA)	26 deg / 18.5 deg

No performance degradation with full moon in the field of view

RELIABILITY & LIFETIME

EEE parts class	Level 2
Reliability (MIL-HDBK-217F @ 30°C)	190FIT (OH)
Lifetime	10 years LEO | 18 years GEO

Robust to solar flare in acquisition and tracking

MASS & VOLUME

Footprint	OH (incl. Baffle): Ø147mm x 283mm
Mass	OH (incl. Baffle): 1.4 kg

INTERFACES

Power supply	5V±10%
Power consumption	OH: 0.7W typ (TEC OFF)
Output data	SpaceWire (MIL 1355)
Output rate	8Hz

ENVIRONMENTS

Temperature Range	-30°C / +60°C (Operation) | -40°C / +70°C (Storage)
Random vibrations	OH: 30g RMS
Shocks	OH: 2000g SRS

EXCEPTIONNAL ROBUSTNESS
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EMBEDDED FDIR FUNCTIONS
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HYDRA TC

HIGH-END HYDRA STAR TRACKER OPTIMIZED FOR GEO MISSIONS

- BEST-IN-CLASS PERFORMANCE, ACCURACY AND ROBUSTNESS
- TWO OPTICAL HEADS CONNECTED TO ONE REDUNDANT ELECTRONICS UNIT
- FLIGHT-PROVEN (TRL9) SINCE 2015
- INHERITED FROM 50+ YEARS EXPERIENCE IN STAR TRACKERS

HYDRA TC

HIGH-END HYDRA STAR TRACKER OPTIMIZED FOR GEO MISSIONS

KEY FEATURES

- 2 Optical Heads (OH) connected to 1 fully redundant Electronics Unit (EU) through SpaceWire interface (MIL 1355) with up to 8m-long cables
- HAS-2 CMOS sensor with Thermo-Electric Cooler (TEC)
- Electronics unit embedded software processes multiple OH data and delivers a fused quaterniion
- Optics made of rad-hard material
- Export control EU Dual Use 7A004

ACCURACY & PERFORMANCE (EOL)

Bias	<11 arcsec
Thermo-elastic error	<0.055 arcsec/°C
Low Frequency Spatial Error (LFSE) @ 3σ	0.6 arcsec (XY) | 4.6 arcsec (Z)
High Frequency Spatial Error (HFSE) @ 3σ	3.4 arcsec (XY) | 27 arcsec (Z)
Temporal noise @ 3σ	2.3 arcsec (XY) | 18 arcsec (Z)
Slew rate	≤5 deg/s in Acquisition | ≤8 deg/s in Tracking
Acceleration	≤2 deg/s² in Acquisition | ≤10 deg/s² in Tracking (30Hz)
Time from lost-in-space	2.2s typ
Sun/Earth Exclusion Angle (SEA/EEA)	26 deg / 18.5 deg

No performance degradation with full moon in the field of view

RELIABILITY & LIFETIME

EEE parts class	Level 1 & Level 2
Reliability (MIL-HDBK-217F @ 30°C)	Level 1: 110FIT (OH) | 465FIT (EU) Level 2: 190FIT (OH) | 606FIT (EU)
Lifetime	10 years LEO | 18 years GEO

Robust to solar flare in acquisition and tracking

MASS & VOLUME

Footprint	OH (incl. Baffle): Ø147mm x 283mm | EU: 194mm x 166mm x 159mm
Mass	OH (incl. Baffle): 1.4 kg | EU: 3.9 kg

INTERFACES

Power supply	23V to 55V
Power consumption @ 30°C, 28V, 30Hz	9.3W typ. (2 OH ON, TEC OFF)
Output data	MIL1553B (RS422 AS/CS16 option available)
Output rate	8Hz, 10Hz, 12Hz, 16Hz, 20Hz, 30Hz

ENVIRONMENTS

Temperature Range	-30°C / +60°C (Operation) | -40°C / +70°C (Storage)
Random vibrations	OH: 30g RMS | EU: 18g RMS (XY) / 28g RMS (Z)
Shocks	OH: 2000g SRS | EU: 1600g SRS

EXCEPTIONNAL ROBUSTNESS
Hydra can survive high mechanical loads and performs under very harsh conditions :
High slew rates, temperature, protons, stray-light…

EMBEDDED FDIR FUNCTIONS
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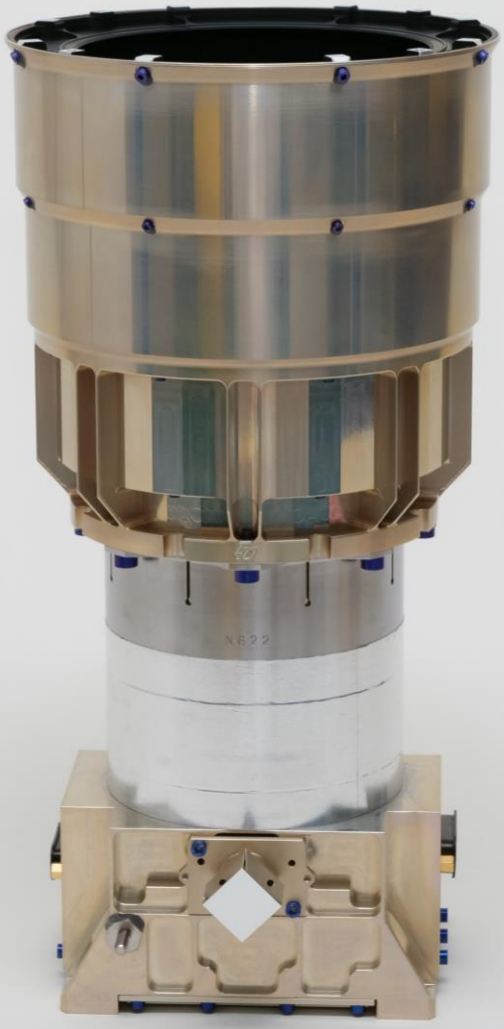
Hydra CP



High-end Hydra star tracker in centralized processing (CP)

- Best-in-class performance, Accuracy and Robustness
- Hydra optical head along with dedicated software hosted in spacecraft's on-board computer
- extra mass & cost optimization at system level
- Flight-proven (TRL9) since 2014
- Inherited from 50+ years experience in star trackers

HYDRA CP

HIGH-END HYDRA STAR TRACKER IN CENTRALIZED PROCESSING (CP)

KEY FEATURES

- Up to 4 Optical Heads (OH) connected to spacecraft's on-board computer through SpaceWire interface (MIL 1355) with up to 8m-long cables
- HAS-2 CMOS sensor with Thermo-Electric Cooler (TEC)
- Software integrated in the spacecraft processor processes multiple OH data and can be made available for any processor
- Optics made of rad-hard materials
- Export control EU Dual Use 7A004

ACCURACY & PERFORMANCE (EOL)

Bias	<11 arcsec
Thermo-elastic error	<0.055 arcsec/°C
Low Frequency Spatial Error (LFSE) @ 3σ	0.6 arcsec (XY) | 4.6 arcsec (Z)
High Frequency Spatial Error (HFSE) @ 3σ	3.4 arcsec (XY) | 27 arcsec (Z)
Temporal noise @ 3σ	2.3 arcsec (XY) | 18 arcsec (Z)
Slew rate	≤5 deg/s in Acquisition | ≤8 deg/s in Tracking
Acceleration	≤2 deg/s² in Acquisition | ≤3 deg/s² in Tracking (10Hz)
Time from lost-in-space	2.2s typ
Sun/Earth Exclusion Angle (SEA/EEA)	26 deg / 18.5 deg

No performance degradation with full moon in the field of view

RELIABILITY & LIFETIME

EEE parts class	Level 1 & Level 2
Reliability (MIL-HDBK-217F @ 30°C)	Level 1: 110FIT (OH) Level 2: 190FIT (OH)
Lifetime	10 years LEO | 18 years GEO

Robust to solar flare in acquisition and tracking

MASS & VOLUME

Footprint	OH (incl. Baffle): Ø147mm x 283mm
Mass	OH (incl. Baffle): 1.4 kg

INTERFACES

Power supply	5V±10%
Power consumption @ 30°C, 5V	OH: 0.7W typ (TEC OFF)
Output data	SpaceWire (MIL 1355)
Output rate	8Hz (10Hz option available)

ENVIRONMENTS

Temperature Range	-30°C / +60°C (Operation) | -40°C / +70°C (Storage)
Random vibrations	OH: 30g RMS
Shocks	OH: 2000g SRS

EXCEPTIONNAL ROBUSTNESS
Hydra can survive high mechanical loads and performs under very harsh conditions :
High slew rates, temperature, protons, stray-light…

EMBEDDED FDIR FUNCTIONS
Hydra Star Tracker delivers accurate attitude in any situations thanks to multiple-head autonomous management

Product specifications are subject to change without notice or obligation

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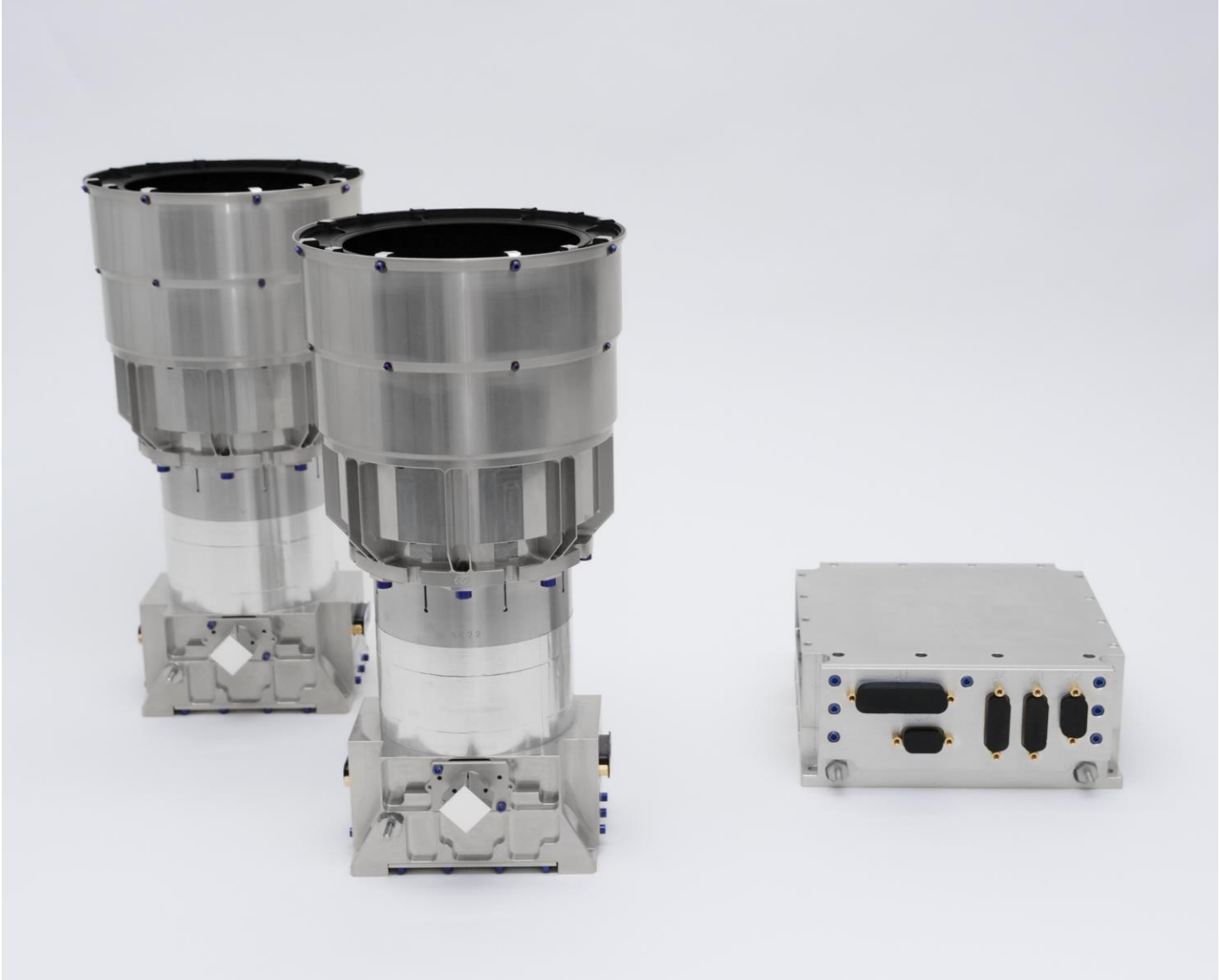
Hydra M



High-end Hydra star tracker optimized for mass and power

- Best-in-class performance, Accuracy and Robustness
- Low power dissipation, low mass & optimized cost
- Flight-proven (TRL9) since 2019
- Inherited from 50+ years experience in star trackers

HYDRA M

HIGH-END HYDRA STAR TRACKER OPTIMIZED FOR MASS AND POWER

KEY FEATURES

- Up to 2 Optical Heads (OH) connected to 1 Electronics Unit (EU) through SpaceWire interface (MIL 1355) with up to 8m-long cables
- HAS-2 CMOS sensor without Thermo-Electric Cooler (TEC)
- Electronics unit embedded software processes multiple OH data and delivers a fused quaterniion
- Optics made of rad-hard material
- Export control EU Dual Use 7A004

ACCURACY & PERFORMANCE (EOL)

Bias	<11 arcsec
Thermo-elastic error	<0.055 arcsec/°C
Low Frequency Spatial Error (LFSE) @ 3σ	0.6 arcsec (XY) | 4.6 arcsec (Z)
High Frequency Spatial Error (HFSE) @ 3σ	3.4 arcsec (XY) | 27 arcsec (Z)
Temporal noise @ 3σ	2.3 arcsec (XY) | 18 arcsec (Z)
Slew rate	≤5 deg/s in Acquisition | ≤8 deg/s in Tracking
Acceleration	≤2 deg/s² in Acquisition | ≤10 deg/s² in Tracking (30Hz)
Time from lost-in-space	2.2s typ
Sun/Earth Exclusion Angle (SEA/EEA)	26 deg / 18.5 deg

No performance degradation with full moon in the field of view

RELIABILITY & LIFETIME

EEE parts class	Level 1 & Level 2
Reliability (MIL-HDBK-217F @ 30°C)	Level 1: 45FIT (OH) | 513FIT (EU) Level 2: 125FIT (OH) | 707FIT (EU)
Lifetime	10 years LEO | 5 years GEO

Robust to solar flare in acquisition and tracking

MASS & VOLUME

Footprint	OH (incl. Baffle): Ø147mmx 283mm | EU: 171mm x 156mm x 65mm
Mass	OH (incl. Baffle): 1.4 kg | EU: 1.4 kg

INTERFACES

Power supply	21V to 52V
Power consumption @ 30°C, 28V, 30Hz	6.5W typ. (2 OH ON)
Output data	MIL1553B (RS422 AS/CS16 option available)
Output rate	8Hz, 10Hz, 12Hz, 16Hz, 20Hz, 30Hz

ENVIRONMENTS

Temperature Range	-30°C / +50°C (Operation) | -40°C / +70°C (Storage)
Random vibrations	OH: 30g RMS | EU: 28g RMS
Shocks	OH: 2000g SRS | EU: 2000g SRS

EXCEPTIONNAL ROBUSTNESS
Hydra can survive high mechanical loads and performs under very harsh conditions :
High slew rates, temperature, protons, stray-light…

EMBEDDED FDIR FUNCTIONS
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