



T1 & T2 Star Trackers

Miniaturized Optical Heads and Electronic Unit

STAR-TRACKER-ON-A-CHIP TECHNOLOGY

T1 and T2 are Optical Heads based on the sensor chips Faintstar and its predecessor LCMS, both developed under ESA contracts. LCMS and Faintstar are CMOS Active Pixel Sensors with a suite of integrated on-chip functionality supporting a complete new class of miniaturized high performance star trackers.

Terma has taken the miniaturization challenge as far as possible, without compromising the accuracy required from a state-of-the-art star tracker.

The new Optical Heads have been designed with very few components, for high reliability and low recurrent cost. The Optical Heads are offered with SpaceWire interface, enabling an optimal solution for mass, power and cost savings, by connecting the Optical Head directly to the S/C on board computer, without the need for the dedicated Electronic Unit.

Interested parties are invited to contact the lead engineer, Peter Davidsen, pd@terma.com or the commercial contact, Hans Henrik Bonde, hbb@terma.com

FEATURES

- Rad-hard aspherical large aperture optics with outstanding straylight attenuation
- Completely separated baffle and camera for best thermal stability
- Kinematic mounting legs, compatibility to any S/C panel CTE

SALES OPTIONS

- Optical Head stand alone
- Optical Head + SW library
- Optical Head + Electronic Unit (fully autonomous)

QUALIFICATION STATUS

- The T2 has flight heritage
- The T1, using the same optics and mechanics, has gone through ground qualification
- Electronic Unit will reach TRL 8 in Q1 2019



Miniaturized Optical Heads and Electronic Unit

Optical Head	T1	T2
Accuracy (EOL @ +30 °C, 1 σ)	1.5 arcsec Cross-boresight 9 arcsec Roll-boresight	3.5 arcsec Cross-boresight 21 arcsec Roll-boresight
Power Consumption	0.75 W	0.5 W
Interface CMD/Data	SpaceWire, 80 MHz	SpaceWire, 20 MHz
Maximum Update Rate	10 Hz	5 Hz
APS Resolution	1024 x 1024	512 x 512
Camera Head Mass	310 g	
Optical Head Dimension	Footprint Ø92 mm Height 68 mm	
Straylight Baffle Options (SEA, Dimension, Mass)	45 deg, Ø99 mm, total OH height 104 mm, 163 g 30 deg, Ø125 mm, total OH height 165 mm, 230 g 26 deg, Ø155 mm, total OH height 213 mm, 315 g	
Supply Voltage	5.0 V	
Operating Temperature (full performance)	-40 °C to +30 °C	
Survival Temperature	-45 °C to +70 °C	
Lifetime	12 years in LEO @ 1000km 15 years in GEO	
Lenses	Aspherical, radiation hard glasses	
Field of View	20 deg circular, full moon accepted in FOV	

Electronic Unit

Architecture	LEON3-FT
Dimensions	100 x 100 x 40 mm ³
Mass	450 g
Power	2.5 W
Supply Voltage	Redundant +28 V (20 V to 36 V)
Spacecraft Interface (TC/TM)	Redundant SpaceWire or RS422
Camera Head Interfaces	SpaceWire (maximum 2 OHs)
SEU Tolerance worst case GEO flux (25k protons/cm ² /s)	Acquisition & tracking full performance
SAA Tolerance	Acquisition & tracking full performance
Slew Rate	< 0.5 deg/sec full performance < 3.0 deg/sec reduced performance
Acquisition time	< 10 s