T3 STAR TRACKER

Miniaturized Optical Head with Built-In Processing Unit

STAR-TRACKER-ON-A-CHIP TECHNOLOGY
The compact T3 Star Tracker is ideally suited for nano- and microsatellite missions with lifetime in excess of 5 years. The star tracker is based on a scaled-down version of the Terma T1 Star Tracker with a smaller optical system and computer processing unit based on high reliable COTS components.

The Optical Head (OH) is based on the sensor chip FaintStar-2 developed under ESA contracts. The FaintStar-2 is a CMOS Active Pixel Sensor with a suite of integrated on-chip functionality supporting a completely 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 processing unit accommodates the star catalogue and software algorithms for autonomous attitude acquisition and tracking.

FEATURES

- High accuracy
- Very compact with build in processing unit
- Rad-hard aspherical optics.
- Integrated baffle with outstanding straylight attenuation.
- Excellent thermal stability.
- Extremely low recurrent cost at larger quantities.
- 5 as reference cube for alignment.

QUALIFICATION STATUS

- T3 STR is at TRL 9.

Interested parties are invited to write our team, terma.space@terma.com.



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T3	
Accuracy	See next page
Maximum Update Rate	5 Hz
Slew Rate	< 0.3 deg/s full performance < 1.5 deg/s reduced performance
Acquisition time (typical)	< 10 s
Sun exclusion angle (shown example, other options on request)	37.5 deg
SAA & SEU Tolerance worst case GEO flux (25k protons/cm2/s)	Acquisition & tracking full performance
Field of View	20 deg circular, full moon accepted in FOV
APS Resolution	1024 x 1024 pixels
Lifetime	> 5 years
Lenses	Aspherical, radiation hard glasses
Power consumption	2 W
Supply Voltage	4.5 - 5.5 V 7 – 33 V (variant)
Spacecraft Interface (TC/TM)	RS422 CAN (variant)
Interface Connector	Harwin M80
Computer Architecture	Zynq Ultrascale
Mass	350 g
Dimensions	60 x 60 x 100 mm^3
Operating Temperature (qualification limits)	-35 °C to +65 °C (reduced performance above +30 °C on sensor)
Survival Temperature (qualification limits)	-35 °C to +70 °C

T3 PERFORMANCE

Performance		BOL (EOL)	
Bias	[as] max	10	
Thermal Stability	[as/K] max	0.1	
Spatial Error (FOV)	[as] 3σ	2.1 - 2.4	
Spatial Error (Pixel)	[as] 3σ	1.3 (1.7)	
		+30°C	**+50°C**
Temporal Noise (rate < 0.3 deg/s)	[as] 3σ	2.0 (2.6)	8.0 (10)
Temporal Noise (rate < 0.8 deg/s)	[as] 3σ	6.0 (8)	24 (31)
Temporal Noise (rate < 1.5 deg/s)	[as] 3σ	22 (29)	89 (114)

General remark: All parameters are quoted for normal to cross-boresight directions. Around boresight, values are a factor of 7 higher, except for the Bias and Thermal Stability parameters.

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ORDERING INFORMATION

The T3 Star Tracker components can be ordered according to the table below.

Legend:

- A component is identified by a part number and dash variant according to xxxxxxx-yyy.
- A component can be ordered as an engineering model (EM) or flight model (FM).
- EEE screening level is per default grade 2 (QML-Q) for sensor and proximity electronics. Computer EEE components are high reliable COTS.

Component	P/N [xxxxxxx]	EM [-yyy]	FM [-yyy]
T3 with RS422 TCTM interface and 37.5 Sun exclusion angle baffle (fully qualified)	1445040	-218	-001
T3 with CAN bus TCTM interface and 37.5 Sun exclusion angle baffle (under development)	TBD	TBD	TBD
Dynamic OGSE, 37.5 deg SEA Baffle interface	1665815-037		
Static OGSE, 37.5 deg SEA Baffle interface	903964-037		