ADCS SENSORS

CubeSpace offers a range of attitude determination sensors and control actuators to cover all sizes of CubeSat missions, from 2U to 16U. We pride ourselves on building robust, low-power and class-leading products that are available either as standalone components or as part of our integrated CubeADCS units.

CubeSense Sun

Fine Sun Sensor

A CMOS-based fine sun sensor with a wide field of view, low power consumption, high accuracy, immunity against albedo effects and fully calibrated in our state-of-the-art dark calibration room.

CubeSense Earth

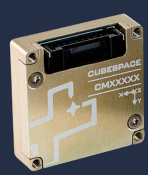
IR Earth Horizon Sensor

An infrared horizon sensor that provides high-accuracy pitch and roll determination throughout the entire orbit. It is the perfect sensor for satellites requiring nadir pointing or station tracking throughout the orbit.

CubeStar

Miniature Star Tracker

A medium to high accuracy star tracker designed for low power consumption, in a small form factor. The tracker outputs quaternions directly and has both “lost in space” and tracking modes. A variety of baffles can be screwed directly onto the baffle thread, making it easily customizable for any mission.



CubeMag

Temperature Calibrated Magnetometer

A 3-axis magnetometer built for robustness and including a backup sensor. The sensor comes in a compact or deployable version for satellites with larger magnetic disturbances.

www.cubespace.co.za

PRODUCT INFORMATION

	CubeSense Sun	CubeSense Earth	CubeStar
PERFORMANCE			
Accuracy (Dependant on slew)	0.2° (roll and elevation) 2-sigma	1° (roll and elevation) 3-sigma"	0.02° (cross-axis) 0.06° (roll) 3-sigma
Max slew rate [°/s]	70	14	0.3
PHYSICAL			
Mass [g]	15	18	47
Dimensions [WxHxL] [mm]	35x22x24	35x24x20	35x49x24
Detection field of view [°] (Horizontal/vertical)	166	90/80	42
Detection field of view [°] (Diagonal)	176	90	59.4
POWER & DATA			
Data bus**		CAN/UART/RS-485 **I2C available for custom solutions	
Connector		Molex Micro-Lock Plus	
Update rate [Hz]	Up to 2	Up to 2	Up to 1
Supply voltage [V]	3.3	3.3	3.3
Peak power [mW]	174	280	271
Average power [mW]	100	200	165
QUALIFICATION			
Radiation		24 kRad	
Random vibration		14.16 g RMS (NASA GEVS)	
Thermal vacuum [°C]		-20 to 80	
Thermal cold and hot start [°C]		-35 to 70	

	CubeMag Deployable	CubeMag Compact
PERFORMANCE		
Noise per channel [3-sigma] [nT]	50	120
Linearity [full scale]	0.6%	0.6%
PHYSICAL		
Mass [g]	16	6
Dimensions [WxHxL] [mm] *height with protrusion is 9.5	17x6.5*x82	24x7.8x24
POWER AND DATA		
Data bus**	CAN/UART/RS-485 **I2C available for custom solutions	
Connector	Molex Micro-Lock Plus	
Update rate [Hz]	5	
Supply votage [V]	3.3	
Peak power [mW]	230	
Average power [mW]	50	50
Deployment power [mW]	2350	N/A
QUALIFICATION LEVELS		
Radiation	24 k Rad	
Random Vibration	14.16g RMS (NASA GEVS)	
Thermal vacuum [°C]	-20 to 80	
Thermal cold and hot start [°C]	-35 to 70	

TRADE-OFF TABLE

	CubeStar	CubeSense Earth	CubeSense Sun
PERFORMANCE			
Eclipse Performance	Very High	Medium	N/A
Eclipse Availability	High	Very High	N/A
Sunlight Performance	Very High	Medium	Very High
Sunlight Availability	Sensitive to sun in FOV	Very High	Very High
Price	$ 17,600	$ 8,500	$ 3,580
Leadtime	12 weeks	12 weeks	12 weeks
Application	High-performance EO	Communications/ Mid-performance EO	Communications/Mid-performance EO (Sunlight only)

EXAMPLE MISSIONS

3U COMMS MISSION

A satellite that requires medium accuracy in both sunlight and eclipse.

The satellite will be mainly nadir pointing so an earth horizon sensor is ideal.

Recommended sensors: CubeMag deployable, CubeSense Earth and CubeSense Sun.

6U SNAPSHOT EO MISSION

A satellite that requires high accuracy in sunlight.

A Sun and Earth sensor can be used, but a star tracker can be added for higher accuracy missions.

Recommended sensors: CubeMag deployable, CubeSense Earth, CubeSense Sun, Optional: CubeStar

12U LINESCAN EO MISSION

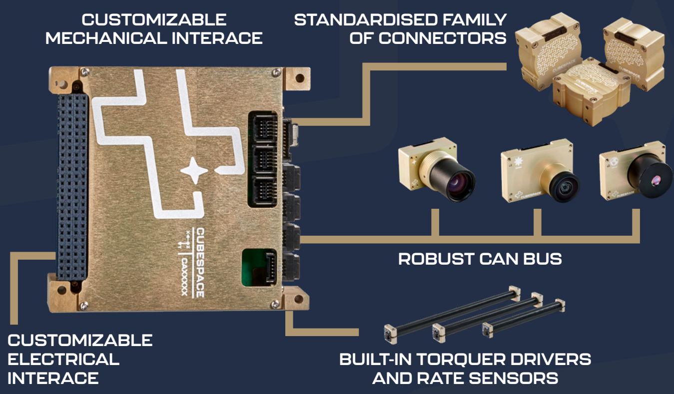
A satellite that requires the highest accuracy in both sunlight and eclipse.

Depending on requirements either our own star tracker or third-party star trackers can be used

Recommended sensors: CubeMag deployable, CubeSense Earth, CubeSense Sun, CubeStar, Optional: 3rd party star tracker

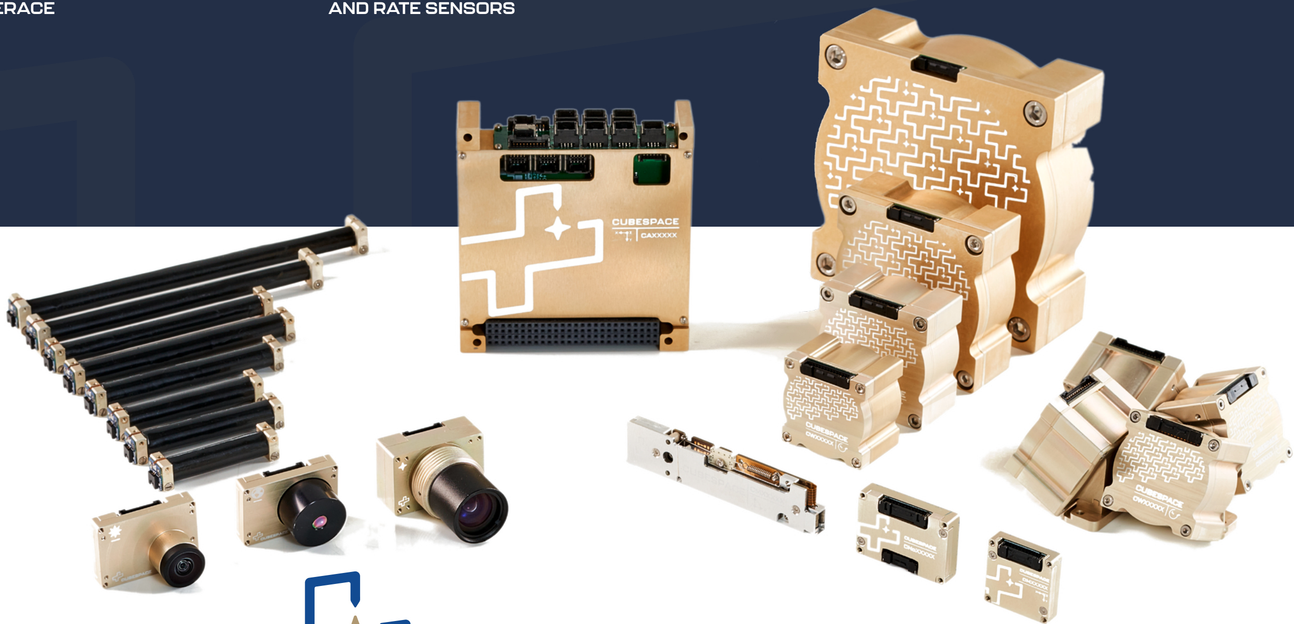
UPGRADE TO A TURN-KEY ADCS

Our integrated ADCS solutions combine our radiation tolerant computer, our flight-proven control system algorithms, our robust fault-detection and correction software, our comprehensive data and event logging mechanisms, with any selection of our sensors and actuators, with the option of also integrating third party components. We also assist with mission analysis and commissioning, effectively being your outsourced ADCS team.



ADCS COMPUTER

- Simple API for interface to main OBC
- Bootloader with in-orbit reprogramability for all parts of the ADCS
- Non-volatile memory for permanent storage
- Firmware images for each component
- TLM and event logging and monitoring
- Sensor mounting configuration and calibration
- Range of estimators and controllers
- Synchronization of ADCS components (including PPS input)
- Power monitoring, regulation, and switching
- Fault detection, isolation and recovery (FDIR) mechanisms



CUBESPACE

CubeSpace is an aerospace company that specializes in small satellite Attitude Determination and Control Systems (ADCS). We offer modular, low-power ADCS components with class-leading performance. Our components are designed to be compatible with almost all commercially available CubeSat suppliers.

We support each customer to evaluate their ADCS needs, choose the correct hardware solution, and tailor this solution to correctly integrate into their satellite.

Our service is personalized, and we strive to help customers find the balance between powerful ADCS performance and reliable operations.

Our 480m² facility is equipped with state-of-the-art equipment such as 160m² clean room space with an 8-meter-long dark optics calibration room, humidity controlled thermal chamber, Helmholtz coil, a 75m² test facilities with a 900 mm x 1300mm thermal vacuum chamber, 8kN vibration shaker, auto-winding machine, wheel balancing machine, and high accuracy 3-axis rotation stages.

The CubeSpace team consists of highly qualified aerospace technicians with IPC class 3 training, and engineers specializing in control system research and development. Our company has delivered more than 2000 ADCS components to 130 clients for approximately 180 satellites.

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