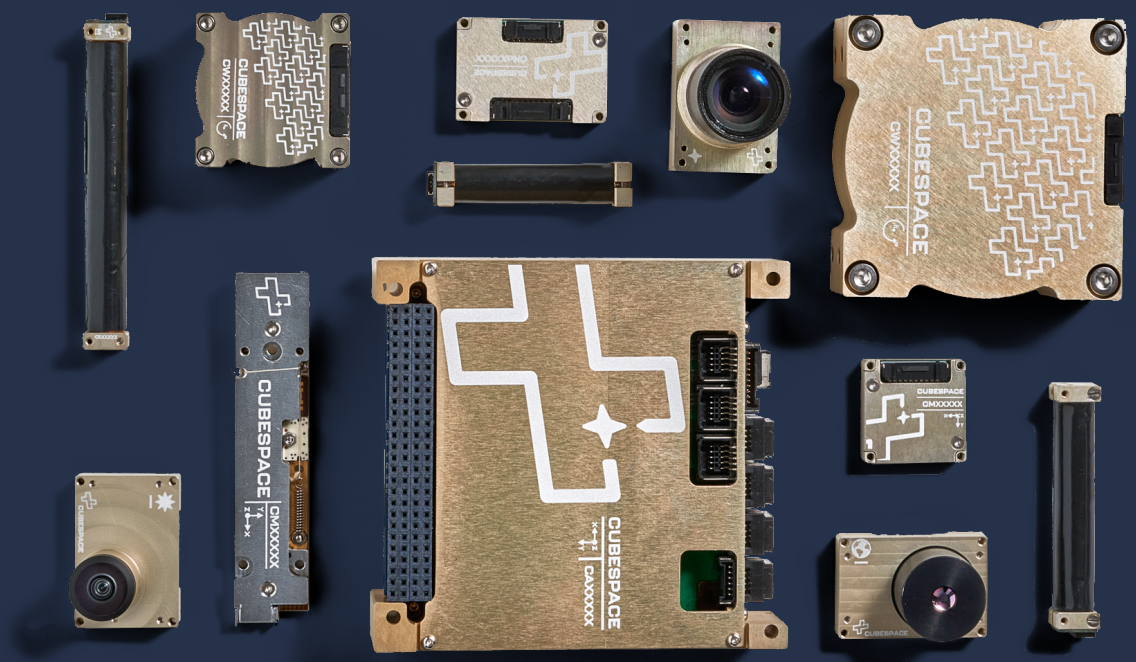
GEN2

CLOSED-LOOP ADCS SYSTEMS



With over 200 systems delivered and counting, our CubeADCS system just got even better. We have applied the lessons that we learned over the last 8 years, and the trends that we have seen in the industry, to make what we believe is the perfect turn-key ADCS solution. We made it flexible so that it can adapt to your satellite mechanics and electronics, robust so that it can easily survive any launch and operate seamlessly in orbit, and scalable both in performance and in size so that all missions are covered. Our system and our company are fully geared for large scale production, while maintaining an uncompromised focus on delivering customized solutions to each individual satellite. We do this through user-friendly products, great documentation, and unconditional support and we are ready to help drive the satellite industry to the next phase of growth.

www.cubespace.co.za

WHAT IS A TURN-KEY ADCS?

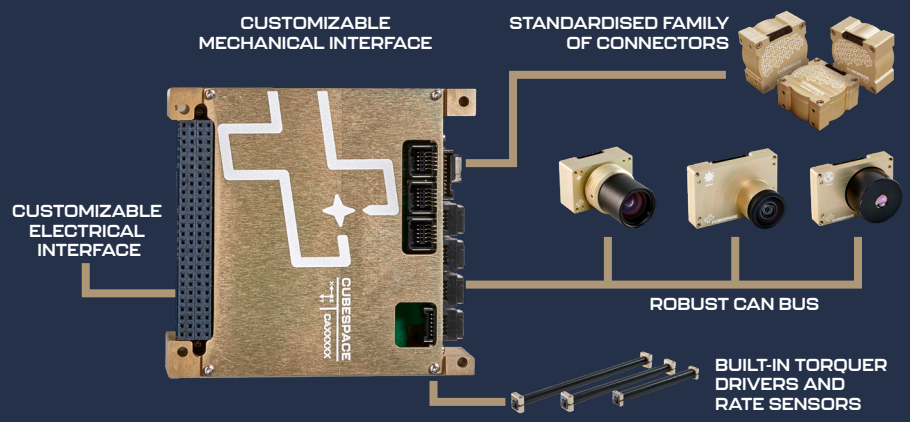
The ADCS of a satellite is a system on its own. It involves complex timing and mathematics, extensive data handling and processing, and requires the precise management of a collection of sensors and actuators. We have refined our system to execute these tasks flawlessly and have packaged it in a simple to use, flexible and modular ADCS product.

At the heart of CubeADCS is our radiation tolerant flight computer which provides a simple to use interface to the main satellite OBC, runs our proprietary ADCS management software, and controls the whole ADCS.

CubeADCS makes the task of doing any ADCS pointing, for example target tracking, as simple as setting the right modes, and commanding the target.

ADCS COMPUTER

- Simple API for interface to main OBC
- Bootloader with in-orbit re-programmability 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,



HOW TO ORDER AN ADCS

We sign an NDA if you need one
We are aware of the sensitivities of your mission, and we respect your privacy.

You share your mission details with us
You fill in our easy-to-use Mission Overview document which guides you through the important considerations for your satellite ADCS.

We provide you with an ADCS analysis
We advise on the selection of sensors, and size of actuators required.
We identify 3rd party components if required.

We provide you with a simulation report
We use your satellite specs, together with the selection of components, to estimate the performance of your satellite in orbit.

We ensure compatibility of electrical and mechanical interfaces
CubeADCS Gen 2 has the option of customization of mechanical and electrical interfaces.

We are on high-priority standby to support in-orbit commissioning
Our team of experts have over 100 years of collective ADCS experience, and are available to support you in orbit.

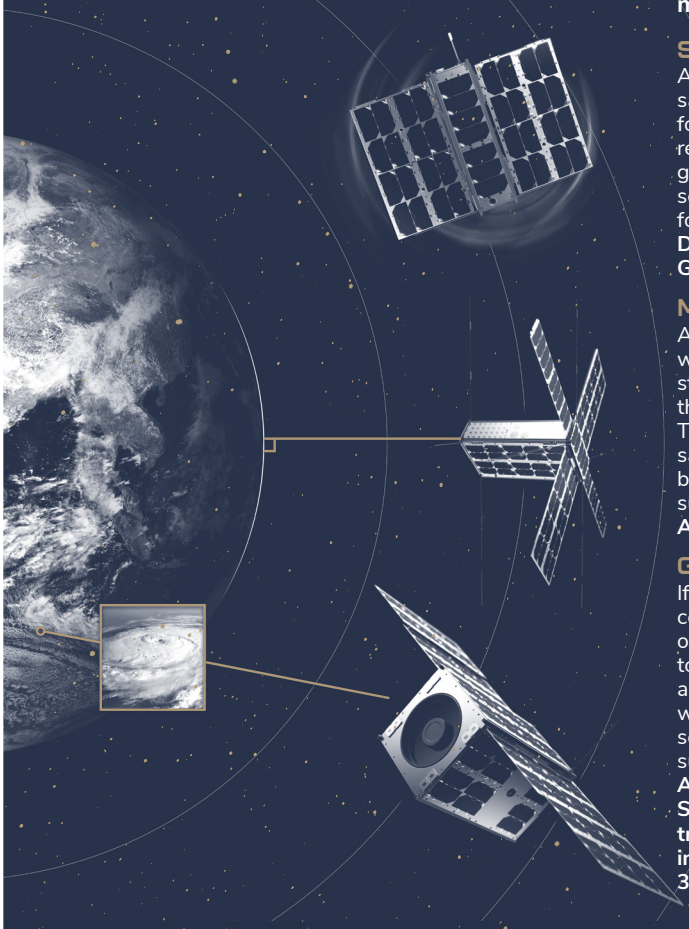
We can assist with integration support if required
We provide remote assistance with integration.
If required, we can assist with on-site integration.

When the system is complete, we deliver it to your facility
You receive the system packaged in a robust case.
Ground support equipment and PC testing software included.

You place an order

We provide you with a quotation based on our publicly available pricing
Our pricing is public, and standardised.
We provide discount for bulk orders.
Shipping to your door is included in all orders.

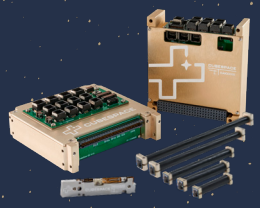
CONTROL MODES



ADCS pointing control requirements can typically be split into three main categories. They are listed below together with the various control modes that our system offers by default.

Spin pointing satellite

A spin-stabilized satellite uses torquer rods to control the satellite into an inertially fixed spin. This control mode can for example be used to keep the satellite in a fixed spin relative to the orbit to optimize both comms and power generation, or to spin inertially fixed to the sun, keeping solar panels illuminated. Default supported control modes for this type of control include: **YBDot, 3-Axis BDot, Fast Detumbling, YSpin, SunYSpin, ZSpin, ZSunSpin, Gravity Gradient (GG) Boom control, GG Sun**



Momentum stabilized earth pointing

A momentum stabilized satellite uses a single reaction wheel in the orbit normal direction to provide gyroscopic stiffness to the satellite, and magnetorquer rods to keep the satellite pointing in a fixed direction, usually Nadir. This is a very low power and volume way of keeping a satellite Nadir pointing. The Y-Wheel's speed can also be altered to change the pitch of the satellite. Default supported control modes for this type of control include: **All controllers included above, +Y Wheel control**

Ground or orbit target tracking

If your satellite has to point a payload in any direction, a 3-axis controlled satellite is required. 3 Reaction wheels are used in an orthogonal configuration, or 4 wheels in a pyramid configuration, to control the orientation of the satellite, while magnetorquers are used to continuously dump momentum build-up on the wheels. A 4-wheel configuration gives you more agility and some redundancy, but takes more volume and power. Default supported control modes for this type of control include: **All controllers included above, plus 3-Axis inertial pointing, Sun tracking, Moon tracking, Satellite tracking, Earth Target tracking, Target tracking with external sensor steering (for instance laser terminals), 3-Axis with Sun Yaw optimization, 3-Axis with Sun Roll optimization, and others.**

DEPENDING ON THE REQUIRED ACCURACY AND DESIRED ADCS MODES, A SET OF SENSORS ARE SELECTED.

CubeMag

Backup magnetometer in case of unexpected magnetic disturbance on satellite, or failure of main magnetometer.

CubeSense Sun

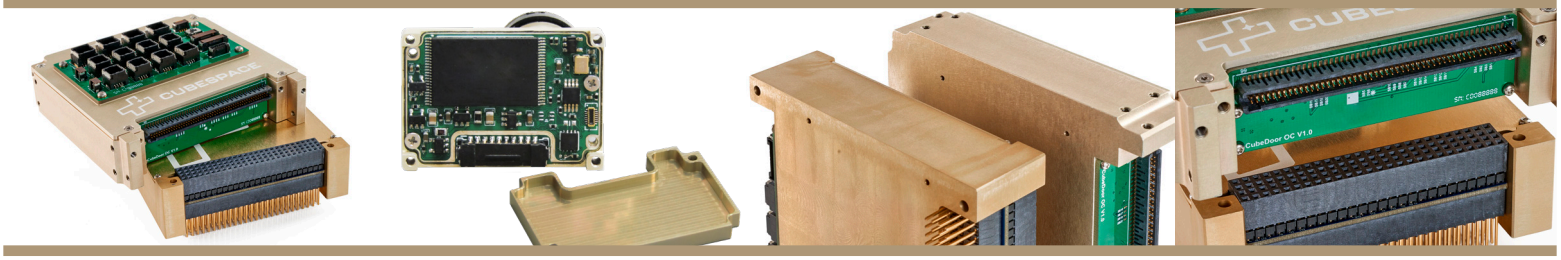
For sun tracking, or for 3-axis pointing during sunlit part of orbit.

CubeSense Earth

For coarse 3-axis pointing during whole orbit (usually used together with CubeSense Sun)

CubeStar

For fine 3-axis pointing during whole orbit (Usually used together with CubeSense)



WHY CUBEADCS

WE ADAPT TO YOUR SATELLITE

DISTRIBUTED OR INTEGRATED SENSORS/ACTUATORS | CUSTOMIZABLE MECHANICAL AND ELECTRICAL INTERFACE

Game changing functionality
In-orbit re-programmability of all components
PC Simulation software with HIL and SIL functionality
Event logging and monitoring
Orthogonal or tetrahedral reaction wheels

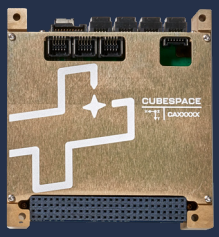
Highest quality and reliability
Software developed to MISRA-C standards
14g RMS, 24kRad, and -20°C to 80°C qualification
Built in fault detection, isolation and recovery
EMI shielding and filtering

We've got all missions covered
Actuators for 2U - 27U
Sensors for all mission types
3rd party sensor and actuator support

WE HAVE SERVICED OVER 200 SATELLITES

Our production is refined and automated, and we can produce large volumes, on short lead times.

CONFIGURATIONS



CORE MODULE

The CubeADCS Core contains our radiation tolerant computer, all ADCS software, rate sensors, magnetorquer drivers, electrical interface, mechanical interface, and GSE and PC software.

ACTUATORS

CUBEWHEELS

MOMENTUM STORAGE

CW0017	1.77 mNms
CW0057	5.7 mNms
CW0162	16.2 mNms
CW0500	50 mNms
CW1200	120 mNms
CW2500	250 mNms
CW5000	500 mNms

TORQUERS

MAGNETIC MOMENT

CR0002	0.20 Am²
CR0003	0.30 Am²
CR0004	0.40 Am²
CR0006	0.60 Am²
CR0008	0.80 Am²
CR0010	1.00 Am²
CR0012	1.20 Am²
CR0020	2.00 Am²

SENSORS

CubeMag Compact
Temperature Calibrated Magnetometer

CubeMag Deployable
Deployable Temperature Calibrated Magnetometer

CubeSense Sun
Fine Sun Sensor

CubeSense Earth
IR Earth Horizon Sensor

CubeStar
Miniature Star Tracker

NEED TO INTEGRATE A 3RD PARTY SENSOR/ACTUATOR?

If you need to integrate a 3rd party component, we've got you covered. Our CubeNode product provides a variety of comms interfaces to outside components, and translates that to comms on our CAN bus and protocol. We already have a number of 3rd party sensors and actuators that are supported, but we can also integrate new components on request.
Please contact us for pricing about your particular needs.

Free shipping and insurance included in all orders.

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 2400 ADCS components to 150 clients for approximately 250 satellites.

CubeSpace, The LaunchLab
Hammanshand Road,
Stellenbosch, 7600
South Africa

Telephone	+27 (79) 945 9957
General Enquiries	info@cubespace.co.za
Sales Enquiries	sales@cubespace.co.za
Office Hours	06:00 - 15:00 GMT

For more information, please visit our website at www.cubespace.co.za