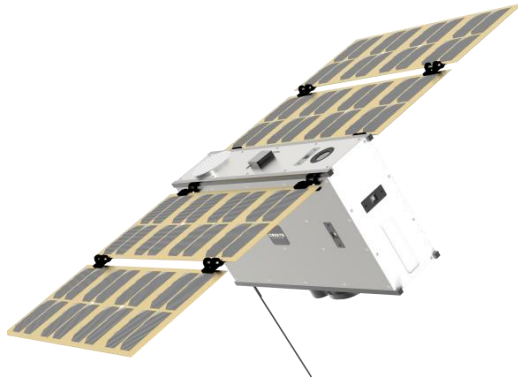




COSATS
keep Your Pace with Space

星众空间

Products Selection Guide



COSATS PROFILE

COSATS Co., Ltd. is a commercial aerospace company mainly engaging in Micro/nanosatellite bus, subsystems and launch services. The research team has rich experience in space system development. COSATS could provide customers with one-stop solutions such as quick delivery, powerful satellite subsystems, reliable satellite bus, high performance and competitive launch services.

COSATS BELIEFS

RELIABLE

EXCELLENT

ECONOMICAL

*Most Products lead time only takes **6-8** weeks.*

Selection Guide Version: V 2.1
Applicable Products: All COSATS products.

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COSTR CubeSat Structure

1 Brief Introduction

COSTR is a standard CubeSat structure based on modular concept design. A standard U is used as CubeSat structure unit ranging from 1U to 16U. 1U is 10cm×10cm×10cm. The COSTR is compatible with *CubeSat Design Specification* published by Cal Poly SLO. It could hold various types of CubeSat subsystems and has strong adaptability to the satellite bus.

The COSTR could provide several built-in separation switches to ensure that the CubeSat is powered off before launch and can be configured with side panels according to the customer's requirements.



Fig. 1 COSTR CubeSat Structure

2 Specifications

The COSTR is made of 7075 high-strength aluminum alloy or magnesium-lithium alloy and the surface treatment process is hard anodizing. The specifications are shown in Table 1:

Table 1 Specifications of COSTR CubeSat Structure

	Size/mm	Mass/kg	Side Panel
1U	100.0×100.0×113.5	0.15	o
1.5U	100.0×100.0×170.2	0.17	o
2U	100.0×100.0×227.0	0.28	o
3U	100.0×100.0×340.5	0.43/0.30 ¹	o
6U	100.0×226.3×366.0	0.87/0.61 ¹	o
8U	226.3×226.3×227.0	1.21/0.85 ¹	o
12U	226.3×226.3×366.0	1.78/1.25 ¹	o
16U	226.3×226.3×454.0	2.41/1.69 ¹	o

¹. High-strength magnesium-lithium alloy is used.

o Optional Configuration: The side panel could use different thickness aluminum board according to the customers' requirements.

3 Features

- The structure uses 7075 high-strength aluminum alloy or high-strength and ultralight magnesium-lithium alloy.
- All screws are titanium alloy featured with non-magnetic, high-strength and corrosion-resistant.
- Hard anodizing is used on structure surface.
- The subsystems that meet the standard of CubeSat could be directly mounted in COSTR CubeSat Structure.
- The internal space can be flexibly adjusted to meet the subsystem installation.
- CubeSat subsystem and payload could be configured and installed horizontally and vertically.
- All the structural parts are tested by crack detection without cracks, shrinkage cavity, etc.

4 Flight Heritage

COSTR has been applied in many CubeSat missions since 2016.

Annex: COSTR CubeSat Structure Specifications

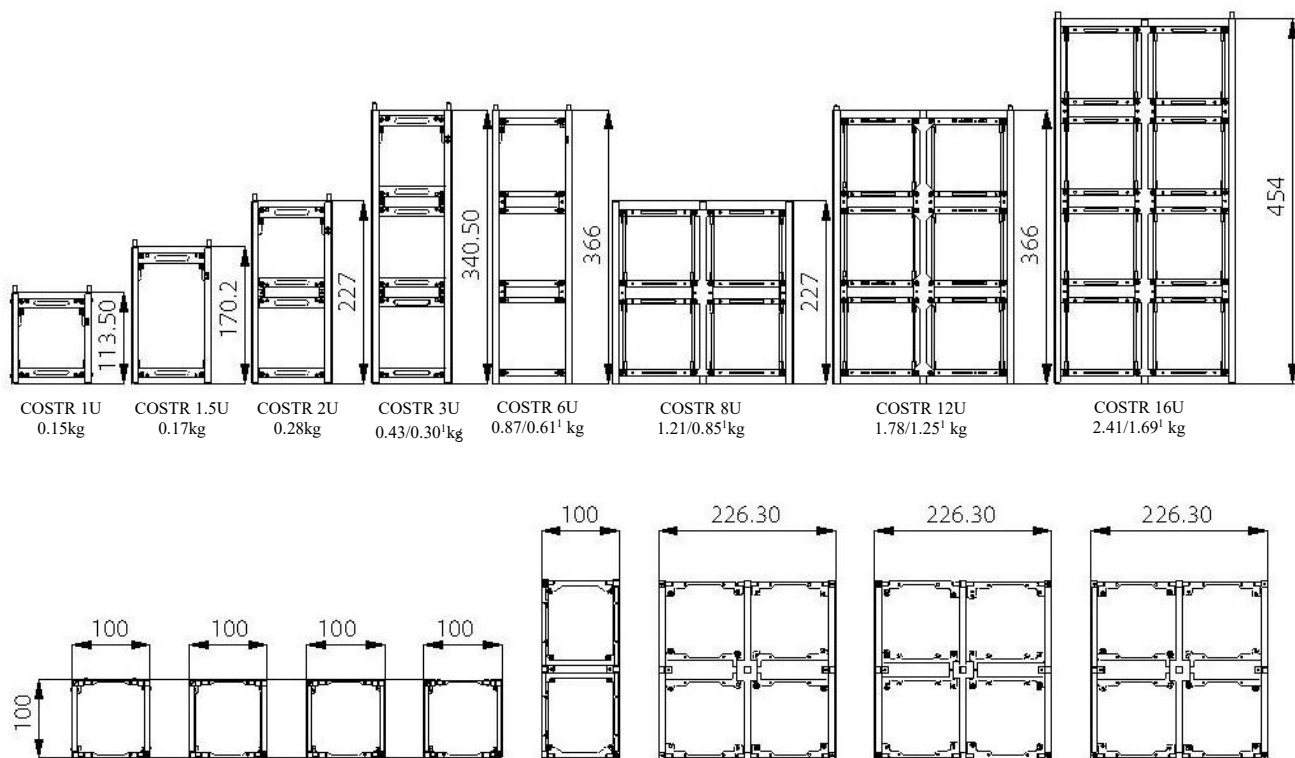


Fig. 2 COSTR CubeSat Structure Specifications

¹. The structure is made of magnesium-lithium alloy.

Multilayer Heat Insulation Assembly

1 Brief Introduction

The Multilayer Thermal Insulation (MLI) is composed of low emissivity (i.e., high reflectivity) reflective screens and low thermal conductivity spacers alternately laminated. This assembly utilizes the layers reflection of the screen to form a high thermal resistance against the radiant heat flow and then isolates the heat conduction by spacers so as to generate the excellent heat insulation performance under vacuum conditions.



Fig. 3 Satellite MLI

2 Specifications

The specifications are shown in Table 2:

Table 2 MLI Specifications

Hemispherical Emissivity	Ultraviolet Radiation (800ESH)	Electron Irradiation	Proton Irradiation
0.85, 0.88 or 0.90	<0.5°	<0.03	<0.02

3 Features

- Thermal Cycle: -196°C ~ 100°C 100 times.
- Humidity Resistance: Relative humidity 95%+5%, temperature 50°C+2°C, 24 hours.
Relative humidity 95%+5%, temperature 30°C+2°C, 48 hours.

4 Flight Heritage

The MLI has been widely used in many satellites since 2015.

COSMAG High-performance Magnetometer

1 Brief Introduction

The COSMAG high-performance magnetometer with triaxial vector sensors is intended to measure the size and direction of the magnetic field. It is featured with high resolution, low power consumption, strong anti-interference, wide dynamic range, etc., and is widely applied in aerospace, industry, agriculture, marine and meteorological sector, etc.



Fig. 4 COSMAG High-performance Magnetometer

2 Specifications

The main specifications are shown in Table 3.

Table 3 Specifications of COSMAG High-performance Magnetometer

Range/ μT	Sensibility/nT	Repeatability/%	Linearity/%
-100 ~ +100	25	0.5	5

Other Specifications:

- Operation Voltage: $5\text{V} \pm 5\%$.
- Power Consumption: $\leq 0.3\text{W}$.
- Size: $34\text{mm} \times 34\text{mm} \times 10.3\text{mm}$.
- Mass: $< 30\text{g}$ (Single CAN interface).
- Data Interface: CAN (500kbps).
- Operation Temperature: $-10^\circ\text{C} \sim 50^\circ\text{C}$.

3 Features

- The application of OpenHarmony InSpace Real-time Operating System improves system's reliability and performance.
- The system is based on a non-magnetic design to reduce the data measurement negative effect from the magnetic field that is generated by the system itself.
- The redundant dual CAN interface configuration is also available.
- All the components have undergone screen.
- Anti-radiation treatment is used.

4 Flight Heritage

At present, many flight missions have used the COSMAG.

COSAMU Attitude Measurement Unit

1 Brief Introduction

The Attitude Measurement Unit (AMU) integrates sun sensor, triaxial gyroscope, triaxial magnetometer, temperature sensor and high-performance processor. It's capable of measuring the triaxial attitude information of the spacecraft in real time and providing high-performance and high-reliability attitude information.



Fig. 5 COSAMU Attitude Measurement Unit

2 Specifications

The specifications are shown in Table 4.

Table 4 Specifications of COSAMU Attitude Measurement Unit

Sun Sensor FOV/°	Accuracy/°	Angular Velocity Range/°/s	Angular Velocity Resolution/°/s/LSB	Magnet Field Range/μT	Magnet Field Resolution/nT
120	0.5	-2000~2000	0.030517	100	25

Other Specifications:

- Operation Voltage: 5.0V.
- Power Consumption: 400mW@5.0V.
- Size: 45.6mm×45mm×11.7mm.
- Mass: ≤55g.
- Data Interface: CAN(500kbps).
- Operation Temperature: -20°C ~ +60°C.

3 Features

- It integrates a sun sensor, triaxial gyroscope and triaxial magnetometer.
- It supports double CAN bus which is a high reliability design.
- The system uses OpenHarmony Real-Time Operating System to improve reliability and performance.
- Small size and light mass.
- The system is based on a delicate non-magnetic design to reduce the negative effect of the magnetic field generated by the system itself on the measured data.
- Anti-irradiation treatment is used.
- All the components have undergone screen.

4 Flight Heritage

At present, many flight missions have used this series of products.

COSSD Sun Sensor

1 Brief Introduction

COSSD sun sensor could measure the attitude information of the satellite relative to the sun. It could determine the orientation of the sun vector in the satellite coordinate system to obtain the spacecraft's attitude relative to the sun. It is small and high precision with low power consumption.



Fig. 6 COSSD Sun Sensor

2 Specifications

The specifications are shown in Table 5.

Table 5 Specifications of COSSD Sun Sensor

Field of View/°	Accuracy/°
120	0.5

Other Specifications:

- Operating Voltage: 5.0V.
- Power Consumption: 200mW@5.0V.
- Mass: 21±1g.
- Size: 47.6mm×19.6mm×9.3mm.
- Data Interface: CAN (500kbps).
- Operating Temperature: -20°C ~ +60°C.

3 Features

- High reliable digital output interface.
- OpenHarmony Real-Time Operating System is applied to improve the reliability and performance.
- Reduce the influence of the Earth albedo.
- Anti-irradiation treatment is used.
- An optional mounting bracket is prepared for adjusting the sun sensor's installation angle.
- All the components have undergone screen.

4 Flight Heritage

At present, many flight missions have selected the product.

COSSA Sun Sensor

1 Brief Introduction

COSSA sun sensor could measure the attitude information of the satellite relative to the sun. It could determine the orientation of the sun vector in the satellite coordinate system to obtain the spacecraft's attitude relative to the sun. It is small and high precision with low power consumption.

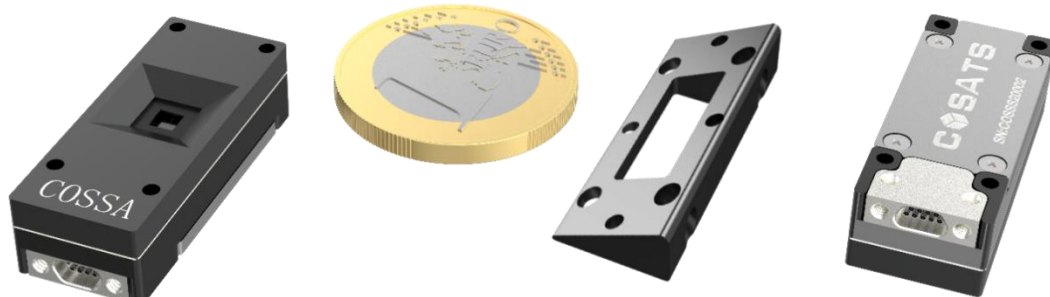


Fig. 7 COSSA Sun Sensor and Mounting Bracket (Mounting Bracket is optional.)

2 Specifications

The specifications are shown in Table 6.

Table 6 Specifications of COSSA Sun Sensor

Field of View/°	Accuracy/°
120	0.5

Other Specifications

- Operating Voltage: 3.3V.
- Power Consumption: 50mW@3.3V.
- Size: 32.3mm×15.5mm×8.9mm.
- Mass: 11±2g.
- Interface: Analog outputs.
- Operating Temperature: -20°C ~ +60°C.

3 Features

- High reliable analog interface.
- Small and light.
- Anti-irradiation treatment is used.
- An optional mounting bracket is prepared for adjusting the sun sensor's installation angle.
- All the components have undergone screen.

4 Flight Heritage

At present, many flight missions have used this series of products.

Star Tracker

1 Brief Introduction

The TYST series star tracker could measure the attitude information of the satellite relative to the fixed star and output the quaternion attitude information. It is compact and reliable with low power consumption. We could provide different star trackers ranging from Micro/Nanosatellite to large satellite. Also, it has been successfully launched into space with perfect performance in more than 100 satellites, such as Jilin-1, NS-1, NS-2 and Zhuhai-1, Lunar Exploration Program and The key Project of High-resolution Earth Observation.



Fig. 8 TYST Star Tracker

2 Specifications

The detailed specifications are shown in Table 7:

Table 7 Specifications of TYST Star Tracker

	Size/mm	Mass/g	Accuracy/''	Slew Rate/°/s	Data Availability
PST3S-K4	Φ40×35 (Baffle Folded)	60±10 (Baffle Included)	≤5''[3σ] Pointing ≤50''[3σ] Rolling	≤2	≥98%(≤0.5°/s) ≥96%(0.5°/s ~1.5°/s)
NST20-G3	120×140×246 (Fixed Baffle)	1200±50 (Baffle Included)	≤1''[3σ] Pointing ≤6''[3σ] Rolling	≤5	≥98%(≤0.5°/s) ≥96%(0.5°/s ~1.5°/s)

Other Specifications:

- Operation Voltage: 5V.
- Operating Temperature: -30°C ~ 40°C.
- PST3S-K4 is smaller by using an innovative deployable baffle.
- Angle of stray light suppression: PST3S-K4<35° (Sun), <30° (Earth Atmosphere).
NST20-G3<25° (Sun), <20° (Earth Atmosphere).
- Data Updating Rate: 10Hz (20Hz is optional).
- Power Consumption: PST3S-K4<0.9W, NST20-G3<3W.
- Data Interface: RS422/CAN.
- Lifetime: >3 years.
- TID: <10k rad (si).

3 Flight Heritage

At present, more than 100 missions have used this series of products.

COSMTQ Three-axis Magnetorquer

1 Brief Introduction

COSMTQ Three-axis Magnetorquer is used to control the satellite attitude and desaturation of the reaction wheel. It consists of two magnetorquer rods with metal cores and an air-core torquer, adopts pulse width modulation (PWM) signals drive the magnetorquer rods/magnetorquer coil independently. Besides, the temperature sensor, current sensor and magnetometer is embedded to monitor three-axis magnetorquer running status.



Fig. 9 COSMTQ Three-axis Magnetorquer

2 Specifications

The specifications are shown in Table 8:

Table 8 Specifications of Three-axis Magnetorquers

Rated Magnetic Moment/Am ²	Remnant Magnetic Moment/Am ²
0.30 (metal core)	<0.008
0.22 (air core)	

Other Specifications:

- Operating Voltage: Control circuit power supply 3.3V; magnetic rod drive power supply 5V.
- Operating Temperature: -10°C ~ +50°C.
- Size: 96mm×92mm×18mm (without shell)/100mm×94mm×25mm (with shell).
- Mass: <230g (without shell); <340g (with shell).
- Power Consumption: ≤500mW (single axis).
- Data Interface: CAN/I2C.

3 Features

- The closed-loop control method is used to improve the magnetic moment accuracy.
- High Reliability.
- All the components have undergone screen.

4 Flight Heritage

Since 2016, several satellites have used the COSMTQ in their mission.

COSRW15 15mNms Reaction Wheel

1 Brief Introduction

COSRW15 15mNms reaction wheel consists of digital control circuit, drive motor, cable, etc. It is not only light and small, but also characterized with high output torque and control precision. As the actuator of micro/nanosatellite attitude maneuver control and attitude stability control, this reaction wheel has been used on many satellites missions.



Fig. 10 COSRW15 15mNms Reaction Wheel

2 Specifications

- Angular Momentum: 15mNms @6000rpm.
- Output Torque: $\geq 2\text{mNm}$.
- Rotate Speed Control Accuracy: $\leq 2\text{rpm}$ (2σ).
- Mass: $\leq 120\text{g}$ (including control board).
- Steady-state Power Consumption: $\leq 2.4\text{W}$ @ $\pm 6000\text{rpm}$.
- Peak Power Consumption: $\leq 9\text{W}$ @ 2mNm .
- Size: $\Phi 51\text{mm} \times 20\text{mm}$.
- Control Board Size: $55\text{mm} \times 40\text{mm} \times 10\text{mm}$.
- Power Supply Voltage: $10\text{V} \sim 14\text{V}$.
- Data Interface: CAN/RS422.
- Operating Temperature: $-15^{\circ}\text{C} \sim +45^{\circ}\text{C}$.

3 Features

- Small and Light.
- Automatic recovery after SEU.
- Total Ionizing Dose (TID) $> 20\text{krad (Si)}$.
- Lifetime ≥ 3 years.

4 Flight Heritage

The COSRW15 15mNms reaction wheel has been used in many micro/nanosatellite missions since 2017.

COSRW300 300mNms Reaction Wheel

1 Brief Introduction

COSRW300 300mNms Reaction wheel adopts an electromechanical integration design, including digital control circuit, drive motor, connector, cable, etc. It is featured with high output torque and control precision and can be used as the attitude control or stability control actuator.



Fig. 11 COSRW300 300mNms Reaction Wheel

2 Specifications

- Max. Angular Momentum: 300mNms@5000rpm.
- Max. Output Torque: $\geq 20\text{mNm}$.
- Rotate Speed Control Accuracy: $\leq 2\text{rpm}(2\sigma)$.
- Mass: $950 \pm 100\text{g}$.
- Control Mode: Speed control mode or torque control mode.
- Power Supply Voltage: 24 ~ 30V.
- Data Interface: RS422 or CAN2.0A.
- Steady-state Power Consumption: $\leq 3\text{W}@ \pm 3000\text{rpm}$.
- Peak Power Consumption: $\leq 30\text{W}@20\text{mNm}$.
- Size: 105mm×105mm×87mm.
- Operating Temperature: $-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$.

3 Features

- High output torque and control accuracy.
- Automatic recovery after SEU.
- Total Ionizing Dose (TID) $> 20\text{krad (Si)}$.
- Service life ≥ 3 years.

4 Flight Heritage

The COSRW300 300mNms reaction wheel has been used in many micro/nanosatellite missions since 2017.

COSRW600 600mNms Reaction Wheel

1 Brief Introduction

COSRW600 600mNms reaction wheel adopts an electromechanical integration design, including digital control circuit, drive motor, connector, cable, etc. It is featured with high output torque and control precision and can be used as the attitude control or stability control actuator.

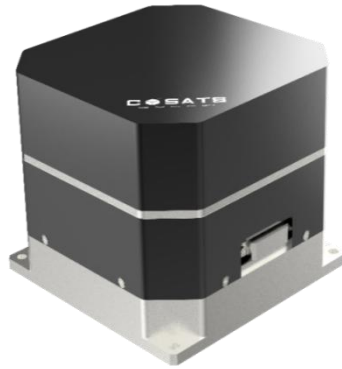


Fig. 12 COSRW600 600mNms Reaction Wheel

2 Specifications

- Max. Angular Momentum: 600mNms@6000rpm.
- Max. Output Torque: $\geq 40\text{mNm}$.
- Rotate Speed Control Accuracy: $\leq 2\text{rpm}(2\sigma)$.
- Mass: $1400\pm 100\text{g}$.
- Control Mode: Speed control mode.
- Power Supply Voltage: 24 ~ 30V.
- Data Interface: RS422/CAN.
- Steady-state Power Consumption: $\leq 3\text{W}@ \pm 3000\text{rpm}$.
- Peak Power Consumption: $\leq 30\text{W}@ 40\text{mNm}$.
- Size: 115mm×115mm×87mm.
- Operating Temperature: $-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$.

3 Features

- High output torque and control accuracy.
- Automatic recovery after SEU.
- Total Ionizing Dose (TID) $>20\text{krad}(\text{Si})$.
- Service life ≥ 3 years.

4 Flight Heritage

The COSRW600 600mNms reaction wheel has more than 80 missions.

COSGNSS Receiver

1 Brief Introduction

COSGNSS receiver is a high dynamic and low power consumption Global Navigation Satellite Systems (GNSS) receiver for micro/nanosatellites. It adopts a high-dynamic engine with BDS+GPS dual systems and dual-band for accurate positioning calculation, which could provide excellent dynamic performance in the harsh space environment. Currently, dozens of satellite missions have used the COSGNSS receivers.



Fig. 13 COSGNSS Receiver

2 Specifications

- Time Accuracy: 30ns.
- Standard Single Point Positioning Accuracy: Single-frequency: $H \leq 3\text{m}$, $V \leq 5\text{m}$ (1σ , $\text{PDOP} \leq 4$).
Dual-frequency: $H \leq 1.5\text{m}$, $V \leq 3\text{m}$ (1σ , $\text{PDOP} \leq 4$).
- High-speed Single Point Positioning (speed $\leq 8000\text{m/s}$): Dual-frequency: $H \leq 5\text{m}$, $V \leq 10\text{m}$ (1σ , $\text{PDOP} \leq 4$).
- Speed Accuracy: $< 0.2\text{m/s}$.
- Operating Voltage: $5\text{V} \pm 5\%$ (UART); $12\text{V} \pm 5\%$ (CAN).
- Size: $56\text{mm} \times 54\text{mm} \times 11.4\text{mm}$ (with shell, UART); $52\text{mm} \times 40\text{mm} \times 8.2\text{mm}$ (without shell, UART).
 $112\text{mm} \times 100\text{mm} \times 24\text{mm}$ (with shell, CAN); $94\text{mm} \times 94\text{mm} \times 14.7\text{mm}$ (without shell, CAN).
- Mass: $< 70\text{g}$ (with shell, UART); $< 40\text{g}$ (without shell, UART).
 $< 200\text{g}$ (with shell, CAN); $< 100\text{g}$ (without shell, CAN).
- Power Consumption: $< 3\text{W}$.
- Data Interface: UART/CAN.
- Operating Temperature: $-40^\circ\text{C} \sim +75^\circ\text{C}$.

3 Features

- Support BDS B1/B2, GPS L1/L2.
- Support BDS/GPS single system independent positioning or BDS+GPS multi-system combined positioning.

4 Flight Heritage

Since its first flight in 2016, dozens of satellite missions have used COSGNSS receivers.

COSATS CubeSat Education Kit

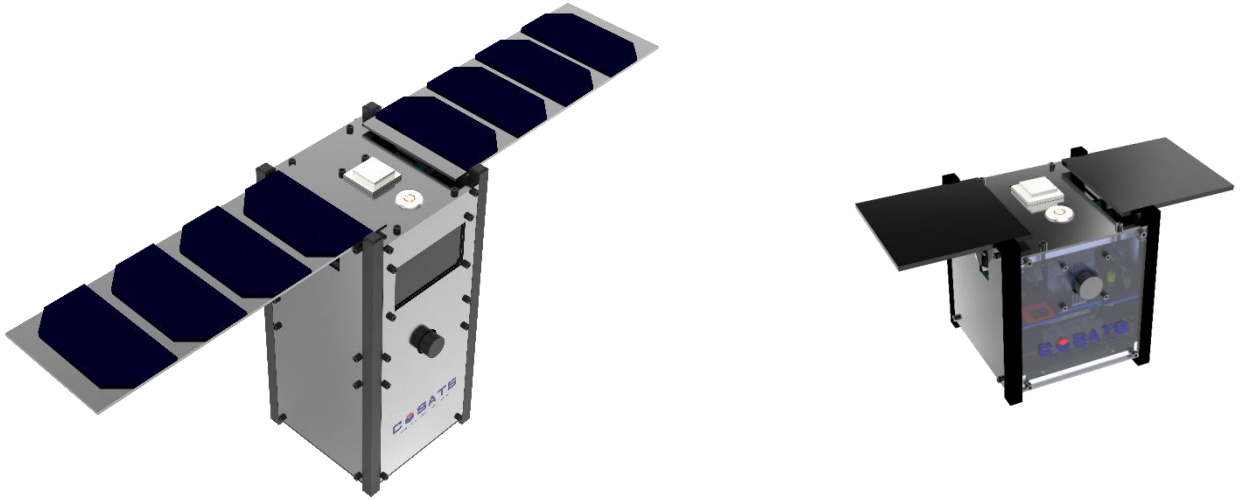


Fig. 14 COSATS CubeSat Education Kit

1 Brief Introduction

COSATS CubeSat education kit is used for space science research and education. It consists of hardware, interactive control platform and courseware. Its subsystems consist of camera, power, communication, on-board computer, frame, solar panels, etc.

2 Introduction on CubeSat Education Kit Function and Options

The specifications are shown in Table 9:

Table 9 Functions of Education Kit

Function Introduction		1U	2U	3U	6U
Camera	Interactive control platform controls camera taking photos to simulate CubeSat remote sensing photography.	√	√	√	√
Communication	Interactive control platform communicates with CubeSat via WLAN to simulate the telemetry and command function.	√	√	√	√
Deployable Solar Panel	Interactive control platform controls the solar panels folding and unfolding to simulate the solar panel folding and unfolding in orbit.	√	√	√	√
Temperature Control	Interactive control platform opens or closes temperature control function to simulate thermal control of CubeSat.	√	√	√	√
Real-time Clock	CubeSat education kit applies real-time clock to simulate the automatic time determination of the CubeSat.	√	√	√	√
Positioning	CubeSat education kit has GNSS receiver to simulate CubeSat in-orbit positioning.	√	√	√	√
Sun Pointing	The solar panels could automatically adjust the deployment angle to realize the highest photoelectric conversion rate.	√	√	√	√
LED Indicator	For teaching and ground demonstration, the CubeSat education kit is equipped with LED temperature control indicator to observe the thermal control status.	√	√	√	√

OLCD Display	For teaching and ground demonstration, the CubeSat Education kit has the OLCD display function to show its main parameters.	0.96 inch	2.42 inch	2.42 inch	2.42 inch
Lithium Battery Pack	Provide the power to the CubeSat education kit.	2800mAh	2800mAh	5600mAh	5600mAh
1U Structure		√			
2U Structure			√		
3U Structure				√	
6U Structure					√

3 Introduction on Interactive Control Platform

- 3D Display: It displays the virtual running state of the CubeSat via 3D interface.
- Control Functions: It realizes the functions of taking pictures, thermal control, solar panel folding and unfolding.
- Parameter Display: It displays CubeSat battery level, voltage and temperature parameters with a histogram or graph.
- Data Storage: Save and backup all the received CubeSat data.

4 Education Curricula

- CubeSat Orbit: It introduces various orbits, orbital change theory, orbital maneuver, etc.
- CubeSat Design: It indicates how to design a CubeSat.
- CubeSat Composition: It introduces CubeSat knowledge about payload, structure, control system, thruster, power supply system, thermal control system, etc.
- CubeSat Ground Experiments: It introduces the ground mechanics experiment, thermal environment experiment, etc.
- CubeSat Applications: It introduces the applications of CubeSat in science, communication, geography, environment, meteorology, etc.

COSEPS Power System

1 Brief Introduction

COSEPS power system is designed to gather, convert, store and distribute the electric energy generated from solar panels. It is composed of a lithium battery pack, MCU, Maximum Power Point Tracking (MPPT) charging and discharging management unit, DC/DC conversion unit, active heating unit, etc. It is light and small with high power density.



Fig. 15 COSEPS Power System

2 Specifications

The main specifications are shown in Table 10:

Table 10 Specifications of COSEPS Power System

	Size/mm	Mass/g	Lithium Battery Bus Voltage	Output Voltage
Without battery	90×96×15 (Without Shell) 100×94×30 (With Shell)	<75g (Without Shell) <175g (With Shell)	Without Voltage	3.3V, 5V and Battery Voltage
With two batteries	90×96×26 (Without shell) 100×94×30 (With shell)	<185g (Without Shell) <285g (With Shell)	8.4V	3.3V, 5V and Battery Voltage

Other Specifications:

- Nine-way Voltage Output: Battery voltage, 3.3V, 5V, three-way 3.3V controllable, with overcurrent protection.
- Peak Power Consumption: $\leq 300\text{mW}$; Conversion efficiency: $\geq 85\%$.
- Charging/Discharging Current: Rated 1A/2A, Max. 2.5A/4A.
- The system contains two lithium batteries (Expandable) with over-discharge, over-charge and short circuit protection.
- Operating Temperature: $-20^{\circ}\text{C} \sim 60^{\circ}\text{C}$.

3 Features

- 3-way independent solar panel inputs and independent maximum power point tracking capability.
- Monitoring on voltage, current, temperature, etc.
- Self-locking power switch function after separation.
- Standard 12C bus interface.

4 Flight Heritage

The COSEPS has been successfully used in several flight missions.

Microsatellite Power System

1 Brief Introduction

Microsatellite power system comprises a shunt regulating unit, filtered power supply unit, autonomous charging circuit, etc. By charging and discharging solar panels and accumulator packs, the power system transformation is completed for once to meet power supply demand of satellite payloads and subsystems. Also, it could transform and control the power system's main parameters telemetry. Microsatellite power system is light and small with high power density.



Fig. 16 Micro Satellite Power System

2 Specifications

The main specifications are shown in Table 11 :

Table 11 Specifications of Microsatellite Power System

Size/mm	Mass/kg	Power/W	Bus Voltage/V	Temperature/°C
Customized	Customized	<1500	12V, 28V, 42V	-20°C ~ 60°C

Other Specifications:

- Power: 100W~1500W.
- It is equipped with shunt regulating unit, filtered power supply unit, telemetry and telecommand unit, etc.
- Operating Temperature: -20°C~60°C.
- Structure: Aluminum, black anodized.
- Suitable for microsatellite missions.

3 Flight Heritage

Since the first flight in 2018, dozens of missions have used the microsatellite electrical power system.

Satellite Solar Panels

1 Brief Introduction

The satellite solar panels could convert solar energy into electricity and supply power for satellites. The panel with 30% efficiency triple-junction GaAs solar cell could be pasted on PCB, aluminium plate or honeycomb carbon fiber aluminium plate to output power signal by electric coupler and could be designed as a body-mounted or deployable and integrate with an embedded temperature sensor. Up to now, more than 100 satellite missions have used this products.



Fig. 17 Satellite Solar Panels

2 Specifications

The main specifications are shown in Table 12:

Table 12 Specification of Micro/Nano-Satellite Solar Panels

Size/mm	Mass/kg	Efficiency	Power Density/W/m ²	Temperature/°C
Customized	Customized	>30%	250	-100°C ~ +100°C

3 Features

- 30% efficiency triple-junction GaAs solar cells with separated bypass protection diode and radiation-resistant cover glass.
- Aluminum substrate, black anodized, surface covered with PI film.
- Mechanical and electrical interfaces could be customized according to customer's requirements.
- Power: Tens to hundreds of watts.
- Operating Temperature: -100°C ~ +100°C.
- Integratable temperature sensors.
- Support for body-mounted, multi-folded deployable solar panels.

4 Flight Heritage

Since the first flight in 2016, lots of satellites have used this series of Micro/Nano Satellite Solar Panels.

COSPOD CubeSat Deployer

1 Brief Introduction

COSPOD CubeSat deployer is used for releasing CubeSat in orbit. We develop two kinds of deployers named COSPOD-M using a frame with high strength 7075 aluminum alloy and COSPOD-3D using 3D printing frame with high strength aluminum alloy. There is a pushing plate in the back of COSPOD and four sliding rails inside it. The memory alloy unlocking device controls the opening and closing of the front door.

COSPOD could be equipped with an optional multi-satellite deployment controller with built-in power system so the rocket only needs to provide a low-power separation level signal to realize the sequential deployment of one or more satellites, which simplifies the interface between the launcher and the deployer.



Fig. 18 COSPOD CubeSat Deployer

2 Specifications

The detailed specifications are shown in Table 13:

Table 13 Specifications of COSPOD

	Size/mm	Mass/kg	Separation Controller	Separation Indicator
1U	190.0×197.0×188.0	1.5	o	o
2U	190.0×197.0×304.0	1.8	o	o
3U	190.0×197.0×424.0	2.00/1.51 ¹	o	o
6U	196.0×327.0×436.0	4.5	o	o
12U	321.0×347.0×436.0	5.5	o	o

¹ The mass of 3U COSPOD-3D that uses 3D printing technology.

o Optional Configuration.

(1) The deployment controller is optional. The launcher only needs to provide the level signal to realize the multi-satellite sequential deployment.

(2) The separation indicator is optional. When the CubeSat is ejected from the deployer, the separation signal could be output to confirm the separation time and status.

(3) Shock absorber could isolate high-frequency vibration and lower the low frequency resonance greatly, which can effectively avoid the resonance of satellite structure and reduce the total root mean square (TRMS) of satellite random vibration response.

3 Features

- The design is based on the international standard of CubeSat.
- COSPOD-M uses high-performance 7075 aluminum.
- COSPOD-3D uses 3D printing with aluminum alloy to reduce 25% mass with over 500MPa tensile strength.
- The COSPOD can be used for the release of standard CubeSats and can provide customized versions based on client requirements for CubeSats applications like large deployable solar panels or large antennas.
- The door opening experiment could be repeated by using the memory alloy unlocking system.
- Adjustable Separation Speed: 0.3-3 m/s.
- Operating Temperature: -40°C ~ 58°C.

4 Flight Heritage

In 2016, CubeSat deployers successfully released the world's first 12U CubeSat. On May 5th, 2020, the world's first 3D printing COSPOD-3D deployer completed the in-orbit test carried by China's experiment ship of China's new-generation manned spacecraft. Up to now, there have been many spaceships/launchers selected COSPOD family, such as the experiment ship of China's new-generation manned spacecraft, Tianzhou Cargoship, Long March 2C, Long March 2D, Long March 7, Kuaizhou-1, LiJian-1, etc.



MultiSats Deployment Controller

COSIST Integration Turntable

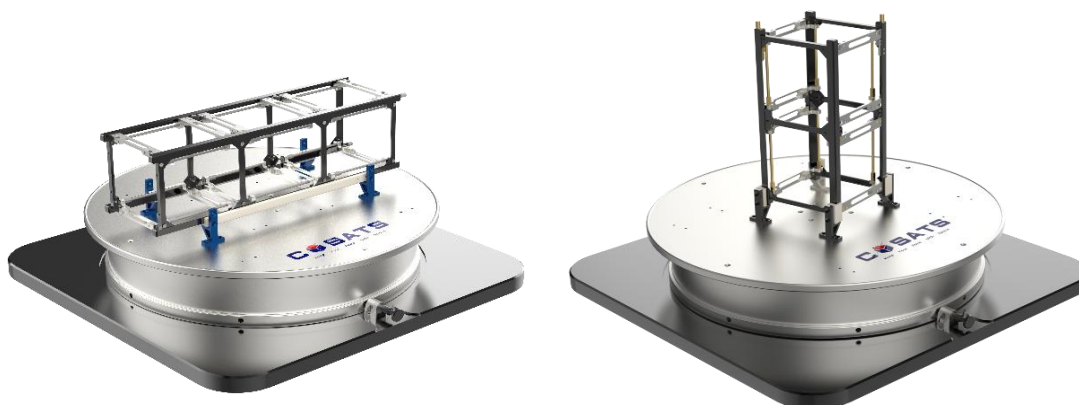


Fig. 19 COSIST Integration Turntable

1 Brief Introduction

COSIST Integration Turntable made by high strength aviation aluminum alloy is used for CubeSat ground assembly and integration, supporting 1~12U CubeSats, equipped with a 360° rotating bearing and an index plunger for positioning.

2 Specifications

The detailed specifications are shown in Table 14:

Table 14 COSIST Integration Turntable Specifications

	Size/mm	Mass/kg	Qty./Set	Remarks
COSIST Turntable A	185×185×31	< 2	1	For 1-3U CubeSat
COSIST Turntable B	450×450×101	< 7	1	For 1-12U CubeSat

3 Features

- COSIST is suitable for 1~12U standard CubeSat.
- COSIST is easy for rotating and positioning.

COSMS CubeSat Mass Simulator

1 Brief Introduction

COSMS CubeSat mass simulator is able to accurately simulate a real CubeSat's size, mass and centroid. It could be used in the ground test, assembly and flight counterweight of the launch mission. The mass simulator from 1U to 12U CubeSat is available.



Fig. 20 COSMS CubeSat Mass Simulator

2 Specifications

The detailed specifications are shown in Table 15:

Table 15 Specifications of COSMS CubeSat Mass Simulator

	Size/mm	Centroid Adjustment Range/x/y/z/mm	Mass Range/kg
1U CubeSat Mass Simulator	100.0×100.0×113.5	±7/±7/±7	1.1~2
2U CubeSat Mass Simulator	100.0×100.0×227	±3.5/±3.5/±3.5	1.2~5
3U CubeSat Mass Simulator	100.0×100.0×340.5	±3.5/±3.5/±50	4.1~6

3 Features

- COSMS is designed based on the international standard of CubeSat.
- Simple operation and easy installation.
- It can be customized.

COSATS Three-Axis Air Bearing Table

1 Brief Introduction

COSATS air bearing table is used to simulate the space environment for ground testing. Currently, we have three-axis and uniaxial air bearing table. Using the air bearing, the table could simulate the attitude control process and verify the actual control laws. It is a necessary and reliable experimental device for satellite attitude control in ground simulation.



Fig. 21 COSATS Air Bearing Table

2 Specifications

The main specifications are shown in Table 16 :

Table 16 Specifications of COSATS Three-Axis Air Bearing Table			
Size/mm	Table Diameter/mm	Load Capacity/kg	Air Supply Pressure/Mpa
180×180×115	125	>100	0.3-0.55
140×140×100	85	>60	0.3-0.55

Other Specifications:

- The machining accuracy of the table: <1μm.
- The machining accuracy of the table base: <1μm.
- Air supply pressure: 0.3-0.55Mpa.

3 Features

- Low friction loss.
- Multiple degree of freedom.
- High stability.
- Large load-bearing capacity.
- The diameter of the air-floating table can be customized according to the customer requirements.

COSCOM -X/S Communication System

1 Brief Introduction

The COSCOM communication system is compatible with CubeSat standard for receiving telecommand data from ground and transmitting satellite-to-ground telemetry data and satellite payload data. It is functioned as telecommand, telemetry, data transmission integrated system, among which the slave computer can respond to OBC to complete its telemetry collecting and sending, to receive instructions from satellite missions. Now, the downlink rate of X-band is as high as 1.2Gbps.



Fig. 22 COSCOM High-Speed Communication System

2 Specifications of COSCOM-X Integrated X-band¹ Communication System

The main specifications are shown in Table 17.

Table 17 X-band Integrated Communication System Specifications and Options

	COSCOM-X40A	COSCOM-X100A	COSCOM-X300A	COSCOM-X1200A
Data Transmission Rate	QPSK 1Mbps~40Mbps	QPSK 1Mbp ~100Mbps	QPSK 50Mbps~300Mbps	QPSK: 300~600Mbps 8PSK: 900Mbps 16APSK: 1200Mbps
Work Frequency Bands	Uplink: 7235-7250MHz; Downlink: 8025-8400MHz			
Uplink Telecommand Code Rate	1024bps~16384bps			
Downlink Telemetry Rate	4096bps~16384bps			
Modulation Method	Data Transmission: QPSK; Telemetry and Command: PCM-BPSK-CDMA; Uplink Transmission: BPSK, RS+Convolution			Data Transmission: QPSK, 8PSK, 16APSK; Telemetry and Command: PCM-BPSK-CDMA; Uplink Transmission: BPSK, RS+Convolution
Data Interface	1-way 100Mbps Network and 6-way LVDS Data Interface		1-way 1000Mbps Network and 6-way LVDS Data Interface	3-way 1000Mbps Network and 8-way LVDS Data Interface
Memory Capacity	≤128Gbit	≤256Gbit	≤1Tbit	≤2Tbit
Encoding Method	LDPC, Encoding Rate 7/8			
Output Power	Data Transmission: 33dBm; Telemetry: 25dBm			
Error Vector Magnitude (EVM)	8%			
TT&C System	Non-coherent Spread Frequency			
Receiver Dynamic Range	≥60dB			
Anti-Doppler Shift	≥±300kHz			

	COSCOM-X40A	COSCOM-X100A	COSCOM-X300A	COSCOM-X1200A
Doppler Frequency Tracking Rate	$\geq \pm 10\text{kHz/s}$			
Telecommand Sensitivity	Better than $-110\text{dBm}@16384\text{bps}$			
Uplink Transmission Sensitivity	Better than $-101\text{dBm}@1\text{Mbps}$			
Capture Time	$\leq 2\text{s}$ (Capture Ratio 90%, in flight)			
Size	94.3mm×90.3mm×45mm			180mm×130mm×40mm
Mass	$\leq 0.55\text{kg}$			$\leq 1.2\text{kg}$
Power Consumption	Telecommand: 5W; Telemetry: 11W; Data Transmission: 15W@40Mbps	Telecommand: 6.5W; Telemetry: 11W; Data Transmission: 15W@100Mbps	Telecommand: 8.5W; Telemetry: 13W; Data Transmission: 17W@300Mbps	Telecommand: 15W; Telemetry: 23W; Data Transmission: 28W@1.2Gbps

3 Specifications of COSCOM-S Transponder

- Work Frequency Bands: Uplink: 2000-2100MHz.
Downlink: 2200-2300MHz.
- Modulation Scheme: Telemetry and Command: PCM-BPSK-CDMA.
Uplink transmission: BPSK, RS+Convolution.
- Data Interface: 1-way 1000Mbps Network and 2-way 422 Data Interface.
- Telemetry and Command Rate: 4096bps, 8192bps, 16384bps.
- Uplink Transmission Rate: BPSK: 2Mbps.
- Output Power: Telemetry: 25dBm.
- EVM (Error Vector Magnitude): 8%.
- Memory Capacity: $\leq 256\text{Mbit}$.
- Telemetry and Command System: Non-coherent Spread Frequency.
- Receiver Dynamic Range: $\geq 70\text{dB}$.
- Anti-Doppler Shift: $\geq \pm 100\text{kHz}$.
- Doppler Frequency Tracking Rate: $\geq \pm 10\text{kHz/s}$.
- Telecommand Sensitivity: Better than $-110\text{dBm}@16384\text{bps}$.
- Uplink Transmission Sensitivity: Better than $-98\text{dBm}@1\text{Mbps}$.
- Capture Time: $\leq 1\text{s}$ (90% capture ratio, in flight).
- Size: 160mm×140mm×42mm (redundancy configuration).
- Mass: $\leq 1.2\text{kg}$ (redundancy configuration).
- Power Consumption: Telecommand: 5W (single equipment).
Telemetry and command: 15W (single equipment).

4 Functions

- Realize satellite spread frequency telemetry and command: Receive the uplink instructions and transmit the telemetry information from the satellite.
- Realize uplink transmission with high code rate: Receive and store the uplink data to complete on-orbit reconstruction.
- Realize the on-orbit refresh of the satellite: Anti-fuse FPGA is used to refresh the on-orbit important data, with the strong ability to resist the influence of the space environment.

5 Features

- Software radio architecture.
- Stable EVM specification.
- A variety of telemetry and command rate.
- Functions of on-orbit reconstruction, error correction and timing refresh.
- CAN Bus.
- Small and light with lower consumption.
- Stable temperature.

6 Flight Heritage

The COSCOM have been used for over 30 missions since October 2018.

¹. The S-band communication system is also available.

COSANT 8×8 Data Transmitting Patch Array

1 Brief Introduction

COSANT data transmitting antenna is a high-gain patch array for satellite missions. The antenna is designed to work in different frequency based on the requirement of the mission.

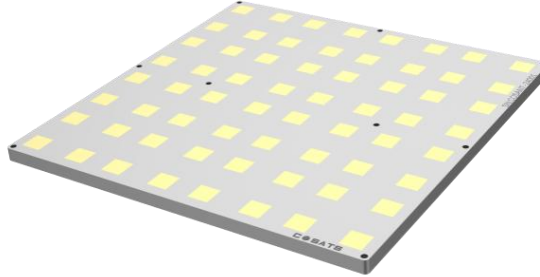


Fig. 23 COSANT 8×8 Data Transmitting Patch Array

2 Specifications of Antenna System

(1) X-Band Data Transmitting Antenna

- Frequency/Bandwidth: 8.025~8.4GHz¹.
- Polarization: RCP.
- Antenna Gain: $\geq 15\text{dBi}$ (16 Cell Array).
 $\geq 21\text{dBi}$ (64 Cell Array).
- $\theta_{3\text{dB}}$: $\leq \pm 4^\circ @ 21\text{dBi}$.
 $\leq \pm 10^\circ @ 15\text{dBi}$.
- VSWR (Voltage standing wave ratio): ≤ 2 .
- Power Capability: $\geq 10\text{W}$.
- Dimensions: $< 200\text{mm} \times 200\text{mm} \times 10\text{mm} @ 21\text{dBi}$; $< 82\text{mm} \times 83\text{mm} \times 10\text{mm} @ 15\text{dBi}$.
- Mass: $< 500\text{g} @ 21\text{dBi}$.
 $< 100\text{g} @ 15\text{dBi}$.
- Connector: SMP-J@15dBi.
SMA-F@21dBi.
- Working Temperature: $-90^\circ\text{C} \sim +90^\circ\text{C}$.

(2) X-Band Telecommand Antenna

- Frequency/Bandwidth: 7.235-7.250GHz.
- Polarization: LCP.
- Gain: $\geq 0\text{dBi}$ ($\pm 60^\circ$).
 $\geq -4\text{dBi}$ ($\pm 75^\circ$).
- VSWR: ≤ 2 .
- Antenna Size: $< 40\text{mm} \times 40\text{mm} \times 10\text{mm}$.
- Mass: $< 100\text{g}$.
- Tolerance Power: 10W.
- Working Temperature: $-90^\circ\text{C} \sim +90^\circ\text{C}$.

(3) X-Band Telemetry Antenna

- Frequency/Bandwidth: 8.025~8.4GHz.
- Polarization Mode: RCP.
- Gain: $\geq 0\text{dBi}$ ($\pm 60^\circ$).
 $\geq -4\text{dBi}$ ($\pm 75^\circ$).
- VSWR: ≤ 2 .
- Antenna Size: $< 40\text{mm} \times 40\text{mm} \times 10\text{mm}$.
- Mass: $< 100\text{g}$.
- Working Temperature: $-90^\circ\text{C} \sim +90^\circ\text{C}$.

3 Flight Heritage

The product has been used for over 30 missions since October 2018.

¹. S-band, Ka or Ku-band antenna is also available.

COSHGT High-performance Green Thruster

1 Brief Introduction

COSHGT high-performance green thruster uses non-toxic, high-energy Hydroxylammonium nitrate (HAN) as propellant instead of very toxic Hydrazine. In 2023, Dalian University of Technology launched a 12U CubeSat named Dalian-1 Lianli, COSATS provided the HAN propulsion system, which successfully tested for the first time the green propellant HAN module as the possible future answer for the manoeuvring capabilities of satellites. The thruster includes a propellant tank, front-end solenoid valve, thruster assembly (With starting solenoid valve), pressure sensor, helium inlet and outlet valve, liquid adding and draining valve and other modules with the blowdown design. The rated output thrust of the thruster is 0.5N. The total impulse can be up to 500N.s (The type of 1100N.s could be provided.), which could be used for the attitude and orbit control in steady-state and pulse mode. The thruster system is prepackaged and does not need on-site refueling.

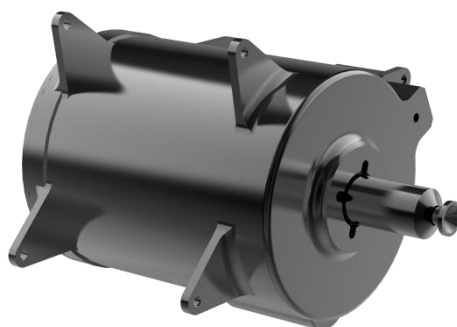


Fig. 24 COSHGT Green Thruster

2 Specifications

The detailed specifications are shown in Table 18:

Table 18 Specifications of COSHGT High-Performance Green Thruster

Rated Thrust/N	Rated Thrust Deviation/N	Rated Vacuum-specific Impulse/s	Total Impulse/Ns
0.5	$\leq \pm 0.05$	≥ 200	≥ 500

Other Specifications

- Full Angle of Plume: 30°.
- Cumulative Number of Pulses: >10000.
- Size: 96mm×91.19mm×149.18mm.
- Mass: ≤ 1300 g.
- Power Supply Voltage: 12V.
- Power Consumption: 8.5W (Standby mode).
11.74W (Work mode).

3 Features

- High-energy green propellant.
- Easy to use, prepackaged, no need on-site refueling.
- Small and light.
- High reliability.

4 Flight Heritage

Since 2023, HAN green thruster has been successfully applied and verified through Dalian 1- Lianli satellite with perfect performance for orbit rising in many times.

COSCMG-1 Control Moment Gyroscope

1 Brief Introduction

COSCMG-1 is an 1Nms Control Moment Gyroscope (CMG) with the electromechanical split design, including the control circuit box, CMG body, cable, etc. The product has the characteristics of large output torque and high control accuracy. It can be used as the attitude maneuver control actuator and also as the attitude stability control actuator for the agile small satellite.



Fig. 25 COSATS 1Nms CMG

2 Specifications

- Angular Momentum: 0-1Nms (Adjustable).
- Max. Output Torque: $\geq 1\text{Nm}$.
- Speed Control Accuracy of Inner Rotor: Better than 2rpm.
- Max. Speed of the Inner Rotor: 6000rpm.
- Control Accuracy of Outer Rotor: The outer frame motor speed $\leq 2.8^\circ/\text{s}$, better than $0.02^\circ/\text{s}(3\sigma)$.
The outer frame motor speed $> 2.8^\circ/\text{s}$, better than 1%.
- Max. Speed of Outer Rotor: $\geq 60^\circ/\text{s}$.
- Output Torque Control Accuracy: $\leq 0.1\text{mNm}$.
- Mass: $1800 \pm 200\text{g}$.
- Power Supply Voltage: 24 ~ 30V.
- Steady-state Power Consumption: $\leq 9\text{W}$.
- Peak Power Consumption: $\leq 32\text{W}$.
- Communication Interface: RS422 or CAN2.0A.
- Size: $120\text{mm} \times 120\text{mm} \times 160\text{mm}$.
- Working Temperature: $-20^\circ\text{C} \sim +50^\circ\text{C}$.

3 Features

- Large output torque and high control accuracy.
- Automatic recovery when SEU.
- Total Ionizing Dose (TID) $> 20\text{krad}(\text{Si})$.
- Lifetime ≥ 5 years.

4 Customized Options

- The acceptance test can be carried out in line with user's requirements and the test report is issued by an authoritative third party.
- CMG group combination configuration and CMG group mounting bracket could be designed according to user's requirements. For example, the regular quadrangular pyramid configuration.
- CMG group integrated control rate module could be designed according to the requirements of the customer.

COSOBC On-board Computer

1 Brief Introduction

COSOBC is a powerful and reliable On-board Computer (OBC) for micro/nanosatellite. The system has a dual-core ARM processor with a floating point processing unit (FPU), memory protection unit (MPU), real-time clock (RTC), large-capacity memory, integrated three-axis gyroscope and three-axis magnetometer, high-precision temperature measurement system, etc.



Fig. 26 COSOBC On-board Computer

2 Specifications

- ARM Processor Frequency: 240Mhz, Max. 480Mhz.
- FLASH Memory Capacity: 2MB + 16MB FLASH.
- RAM: 1MB SRAM (With ECC).
- Data Storage: 512kB FRAM and 4G SD card ×2.
- Data Interface: 16bit ×8 ADC, Two CAN, Two RS422, Two UART, One Differential PPS, Two Isolated I2C.
- Attitude Sensor: Gyroscope Range ± 250 dps, Resolution 8mdps; Magnetometer $\pm 100\mu$ T, Resolution 13nT.
- Working Temperature: $-20^{\circ}\text{C} \sim 50^{\circ}\text{C}$.
- Mass: $\leq 100\text{g}$ (without shell)/ $< 200\text{g}$ (with Shell).
- Size: $96\text{mm} \times 92\text{mm} \times 25\text{mm}$ (without shell)/ $100\text{mm} \times 94\text{mm} \times 25\text{mm}$ (with shell).
- Power Consumption: $\leq 500\text{mW}$.

3 Features

COSOBC could run OpenHarmony InSpace Real-time Operating System and improve the reliability by using software triple modular redundancy and ECC.

4 Flight Plan

The COSOBC on-board computer will be used in several flight missions in 2024.

High-resolution Remote Sensing Nanosatellite

1 Brief Introduction

COSHRs is a high-resolution multispectral and infrared remote sensing 8U CubeSat bus. An innovative compact multispectral camera and an infrared camera are integrated. The high-performance attitude determination and control system utilizes a self-developed highly-integrated control unit COSACS, which integrates a star tracker, sun sensors, triaxial magnetorquers, triaxial gyroscopes, triaxial magnetometers, four reaction wheels, attitude control computers, BDS/GPS and other systems. With the use of green and non-toxic Hydroxylammonium nitrate (HAN) propulsion system, the satellite is able to maneuver its orbital altitude to 100km within 24 hours.

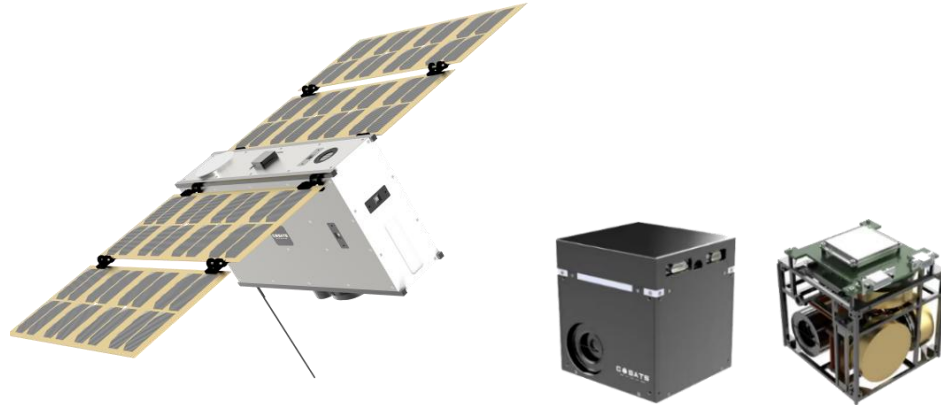


Fig. 27 High-resolution Multispectral and Infrared Remote Sensing Nanosatellite Platform and COSACS

2 Specifications

- Size: 100mm×226.3mm×466mm (before launch).
- Mass: <15kg (depends on the final configuration).

Infrared Camera

- Imaging Spectral Bands and Sensitivity:
3.0-5.0 μm : $\leq 0.5\text{k}@400\text{k}$; 8.0-14.0 μm : $\leq 0.1\text{k}@300\text{k}$
10.5-11.5 μm : $\leq 0.2\text{k}@300\text{k}$; 11.5-12.5 μm : $\leq 0.2\text{k}@300\text{k}$.
- Imaging Resolution: 120m@500km.
- Infrared Camera Imaging Width: 110 $\pm$ 10km@500km.

Multispectral Camera

- Imaging Resolution: <4m@500km (PAN).
- Imaging Width: <20km@500km.
- Imaging Spectral Bands:
PAN (Panchromatic): 0.45 μm -0.75 μm .
Blue Band: 0.45 μm -0.52 μm .
Green Band: 0.52 μm -0.60 μm .
Red Band: 0.63 μm -0.69 μm .
NIR (Near-Infrared): 0.77 μm -0.89 μm .
- Orbit Determination: Location <10m (3 σ); Velocity <0.1m/s (3 σ).
- Attitude Pointing: <0.2 $^\circ$.
- Attitude Stabilization: <0.01 $^\circ$ /s.
- Peak Power: >50W.
- TT&C: X-band.
- Data Storage Capacity: >256GB.
- Data Transmission Rate: >200Mbps.
- Propulsion Total Impulse: > 800Ns.



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