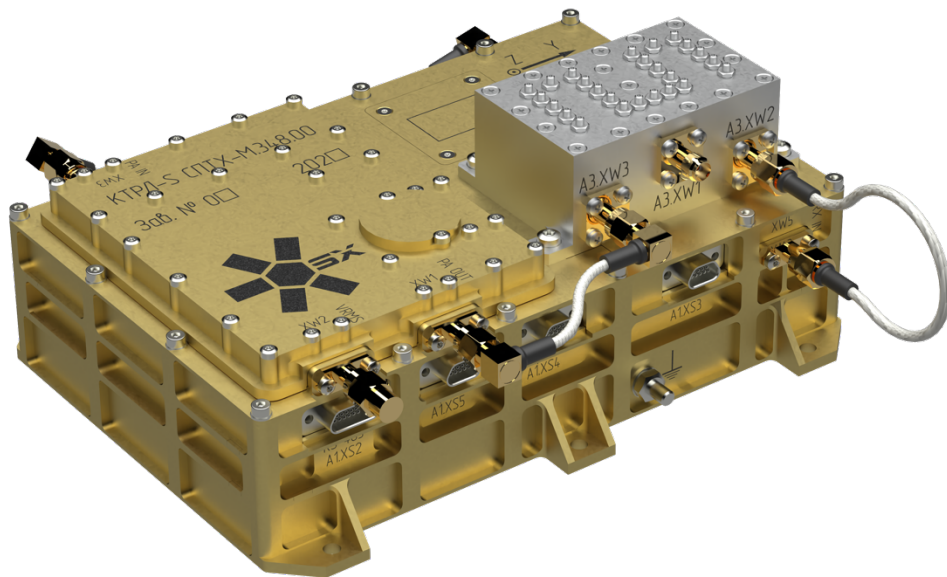




Line of microsatellite devices

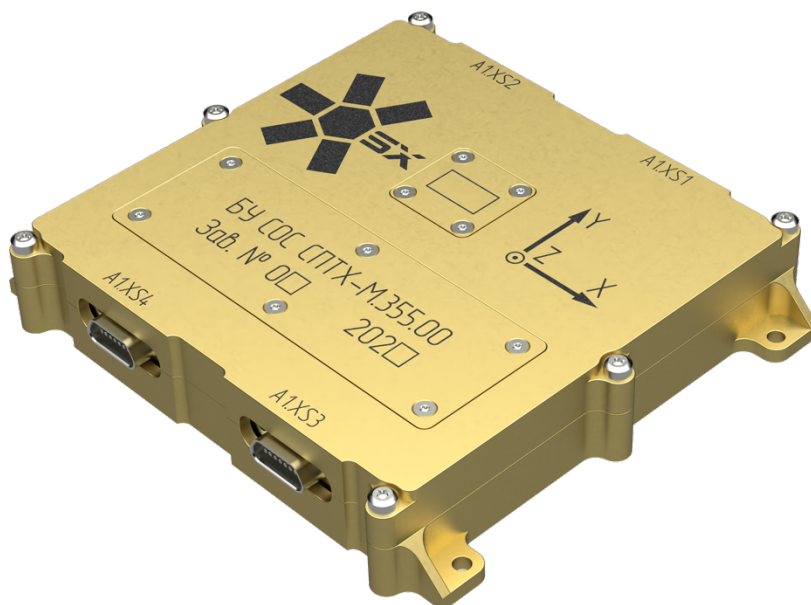
ADCS Actuators

SX-SBOX



ADCS control unit

SX-SBOX-ADCU-01



Parameters	Value
Dimensions	101 x 100 x 20 mm (without fasteners)
Mass	220 g
Power voltage	6 — 36 V, (without galvanic isolation)
Power consumption	No more 5 W, (the average 2)
Duplicated interfaces	CAN2B, RS422/485
Reservation	Hot redundancy
Processor	160 MHz, ARM Cortex-M4
Storage	32 Mb ROM (Flash), 4 Mb ROM (MRAM), 16 Mb RAM
Operating system	RTOS

The attitude control and stabilization system control unit (OSSCU) carries out:

- collection and processing of information from on-board devices and payload
- implementation of orientation and stabilization algorithms
- formation of telemetry

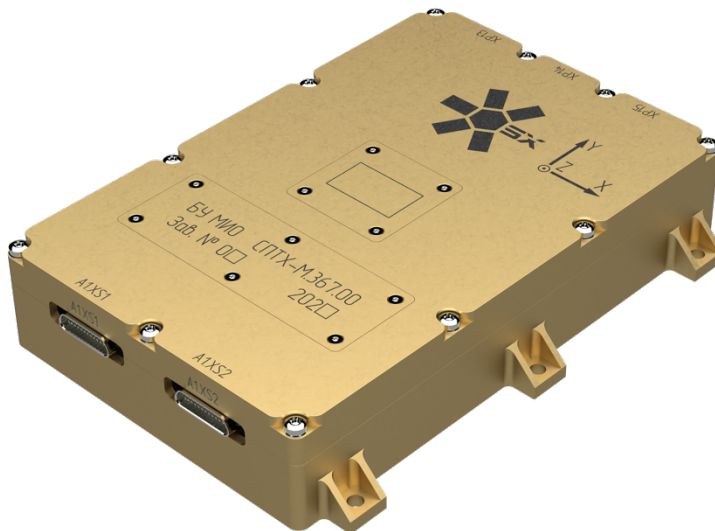
SPUTNIX LLC is a Russian private company manufacturing high-tech satellite components and platforms, as well as ground equipment for sat testing, ground-based satellite stations, and equipment for aerospace education.

OSSCU consists of two semi-sets, each of which is controlled by a separate microcontroller, the purpose of which can be redefined during the operation of the system. The hardware of the two semi-sets is identical. OSSCU can use a SPUTNIX-developed on-board software that has flight qualifications in various missions.

OSSCU is made in the framework of the ideology of the unity of hardware and software solutions of the company's product line. As a result, it makes it possible to effectively use it both with onboard systems of third-party manufacturers and to ensure the fastest possible hardware and software integration into the spacecraft onboard with other onboard systems of SPUTNIX.

Magnetic torquers control unit

SX-SBOX-MTQU-0



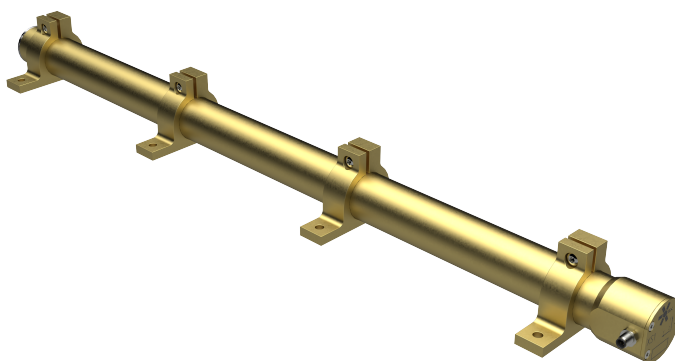
Parameters	Value
Power consumption	0,8 W
Power voltage	6 — 36 V, without galvanic isolation
Dimensions	54x48x20 mm (without fasteners)
Mass	85 g
Duplicated interfaces	CAN2B
Control channels of MT	3
Method of managing channels of MT	PDM
Maximum power for each control channel of the MT	Up to 2 W

Magnetic torquers control unit (MTCU) is used in the ADCS circuit to unload the flywheels, realizing the law of damping of the angular velocity using measurements of a magnetometer or an inertial measuring module.

Own development of the company according to company standards, compatible with ECSS recommendations, relatively low cost, light weight and energy consumption; adaptation to customer requirements; use of unified electrical, information and mechanical interfaces. Separately, it should be noted that the device can independently implement the algorithms of the stabilization system, it allows connecting up to three magnetic actuators from the SX-MT line to it. All MA channels are independently controlled.

Magnetic torquers

SX-SBOX-MTQ



Magnetic torquers (MT) are used in conjunction with a magnetic torquers control unit (MTCU) to provide satellite orientation and stabilization modes that do not require high accuracy and speed. As a rule, these are modes that provide damping of the angular velocity of rotation of the spacecraft and unloading of the control flywheel motors. The minimum number of MT for installation in a spacecraft is 3 pcs.

Code	Maximum moment, A·m ²	Consumption, Wt	Mass, g	Diameter, mm	Dimensions, mm
SX-MT-1	1	0,4	200	16	140x30x30
SX-MT-5	5	0,6	350	20	220x50x35
SX-MT-10	10	0,7	550	20	320x50x35
SX-MT-15	15	0,8	650	20	400x50x35
SX-MT-20	20	1,0	800	20	470x50x35
SX-MT-25	25	1,2	1000	22	470x50x35
SX-MT-30	30	1,8	1200	25	440x50x40

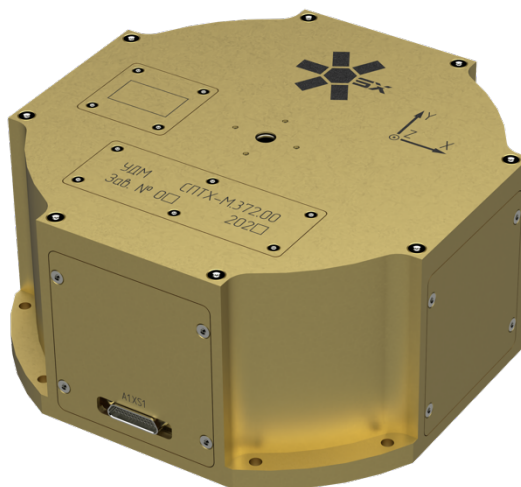
Dimensions without fasteners.

Each device developed by SPUTNIX uses proprietary magnetic actuators. These are the most reliable attitude control devices due to their simple design and low energy consumption.

It is also important that in the manufacture of devices, they are subject to careful control during winding and assembly of the device as a whole. The production uses its own specialized equipment and proven materials, as well as proven technological processes.

Reaction wheel

SX-SBOX-RWH-50-2.0-01



Parameters	Value
Power consumption	43 W (without galvanic isolation)
Peak power consumption	10 W
Power voltage	22-34 V
Mass	3200 g
Dimensions	160x160x80 m m (without fasteners)
Duplicated interfaces	CAN2B
Maximum control torque, Nmax	0,05 Nm
Maximum kinetic moment, hmax	2 Nms

The control flywheel motor (CFM) is designed to create a control mechanical torque due to acceleration and deceleration of the rotor speed.

Own development of the company according to company standards, compatible with ECSS recommendations, relatively low cost, light weight and energy consumption; adaptation to customer requirements; use of unified electrical, information and mechanical interfaces; the GEM cycle has been successfully completed.

Options of devices delivery

- EM – engineering model
- FM – flight model

The differences between the EM and FM options are in the scope of the tests. Options are shown in the table.

№	Test	Model		Comment
		EM	FM	
1	Preliminary tests: - Checking power supply circuits; - Verification of information exchange (with the device and device nodes); - Calibration (if necessary)	+	+	Carried out in the laboratory of SPUTNIX LLC under normal climatic conditions.
2	Functional Acceptance Tests (FAT)	-*	+*	Checks for compliance of the device with the functional characteristics specified in the Operational Manual and compliance with the MS
3	Vibrodynamic Acceptance Tests	-	+*	Tests for resistance to mechanical external influences specified in Technical conditions (or Operational Manual)
4	Thermovacuum Acceptance Tests	-	+*	Checks for resistance to thermal and climatic external influences

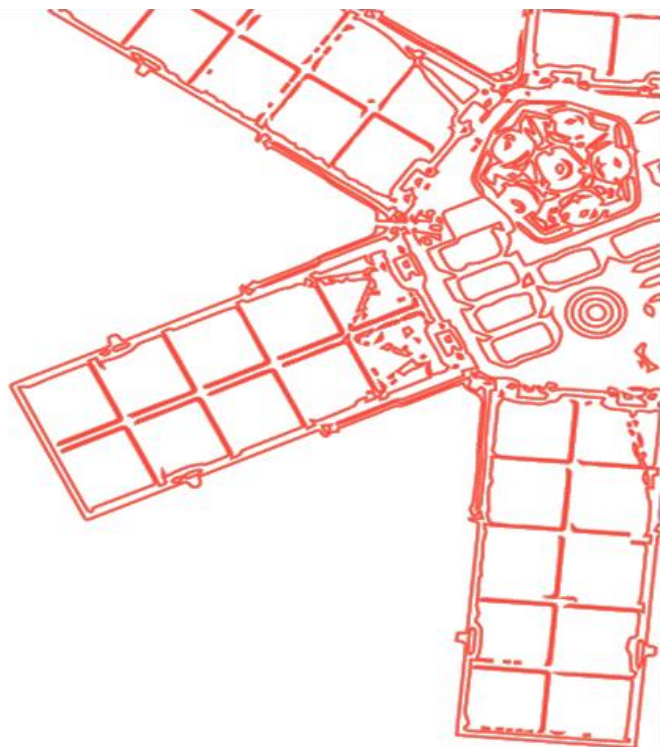
				specified in Technical conditions (or Operational Manual)
5	Electromagnetic Acceptance Tests	-	+	Tests for resistance to electrical external influences specified in Technical conditions (or Operational Manual)
Notes: *Inspection can be carried out, carried out partially or excluded as agreed with the Customer				

If the requested device intended for laboratory testing will not be installed in a real satellite, EM with test type 1 (minimum test scope) should be used.

If the requested device is intended for use as part of a specialized functional stand, EM should be used with preliminary and functional acceptance tests (1 and 2).

If the requested device is intended for installation on a satellite, or for use as part of a stand for ground experimental testing of a flight product, it is required to use a FM with a full scope of tests (1, 2, 3, 4, 5).

If the requested device is intended for installation on a satellite (flight model), but for some reason it is not possible to conduct a full scope of tests, it is allowed to exclude certain types of tests for external influences (3,4,5) in a combination and sequence discussed with the Supplier. In this case, the responsibility for carrying out the missing tests lies with the Customer.



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