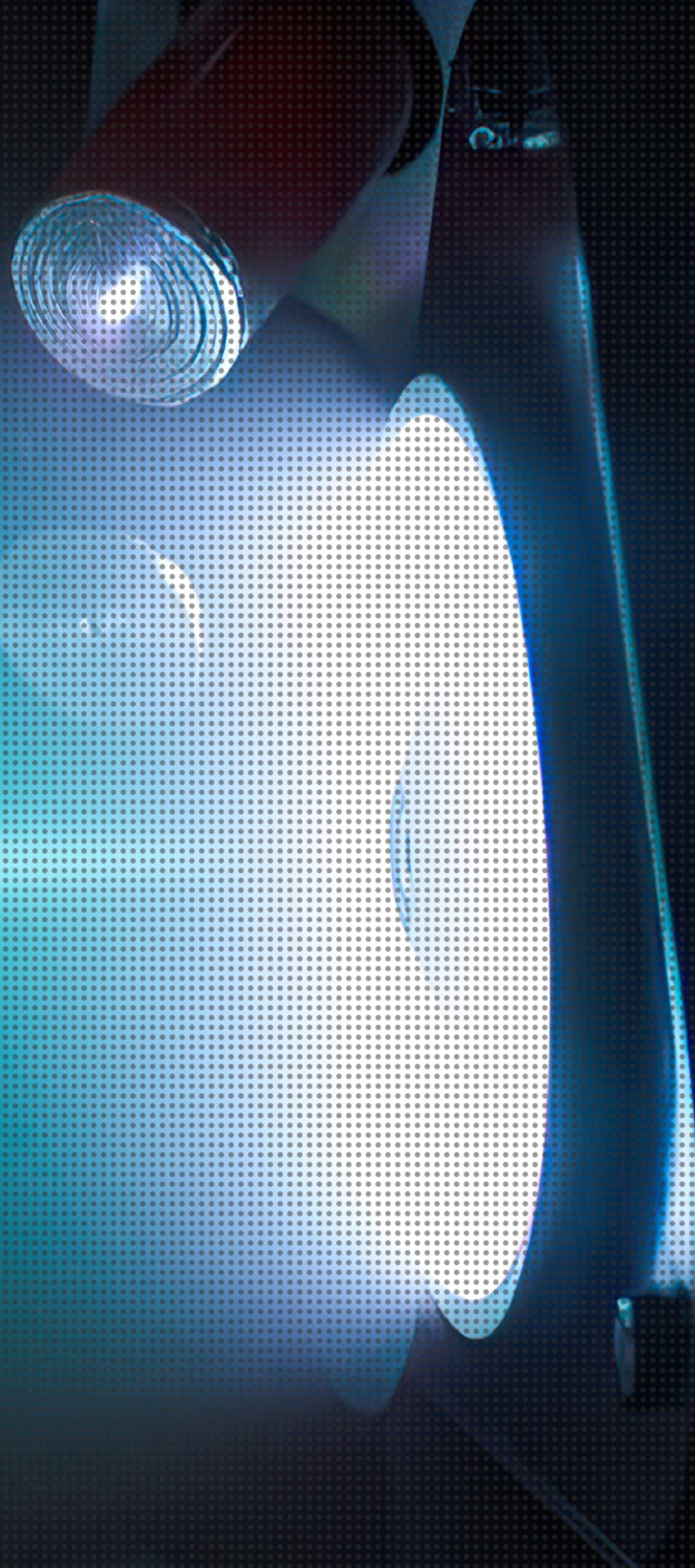




SETS
SPACE ELECTRIC THRUSTER SYSTEMS

Space Electric Thruster Systems (SETS)

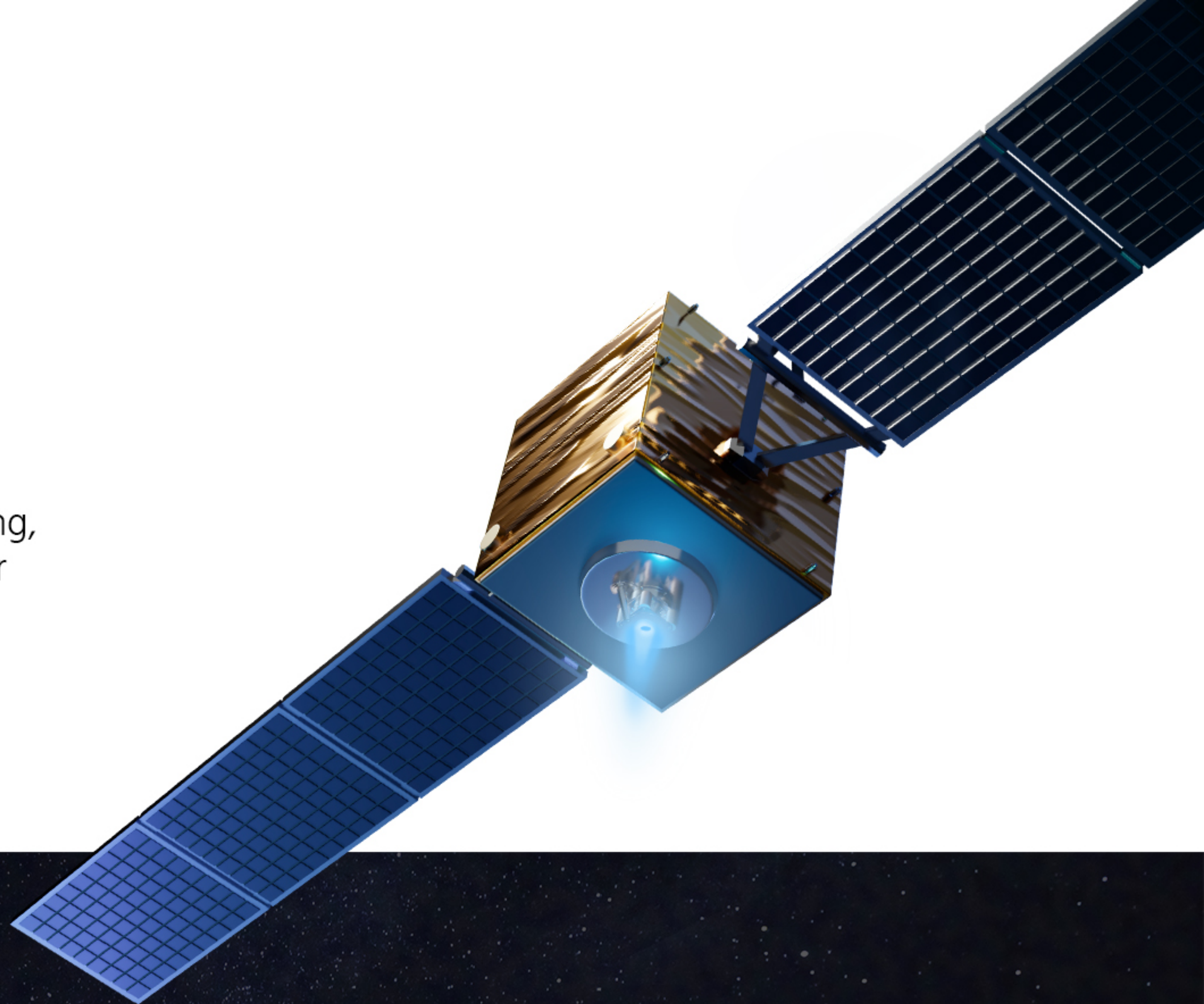
provides electric propulsion systems for satellites
offering competitive price/quality/terms ratio.





SETS overview

We have a full cycle of design, manufacturing, testing, and delivery of electric propulsion systems and their subsystems (Hall thrusters, xenon storage and feed system, and power processing unit).



Our benefits



Satellites weight decreasing



Reducing of space debris amount



Extending of satellites lifetime and increasing their functionality



Satellites launch cost reduction



Using nontoxic green propellant



Company milestones



Company foundation

03/2016

Development strategy establishing. Business planning. Market analysis. Laboratory formation.



Creating a laboratory

07/2016

Forming the core team. The vacuum test stands purchase. Selecting of measuring equipment. Defining of electric propulsion design parameters for various missions. Propulsion system main elements calculating.



Laboratory prototypes

09/2018

Development of electric propulsion systems components (anode block, hollow cathode, XFS, PPU, and others). Team growth. Manufacturing of laboratory prototypes of the electric propulsion systems components. Organization of test facilities.



Qualification models

2019-2021

Designed qualification models:

- Propulsion systems: SPS-25, SPS-40
- Hall-Effect thrusters: ST-40, ST-25
- Power Processing Units
- Xenon storage and feed systems: XFS-1, XFS 1M



Flight models

2021-2022

Designed, tested and shipped three flight models of electric propulsion systems to private customers.



Flight heritage

05/2023-now

Successful electric propulsion system operation in orbit.



About Us

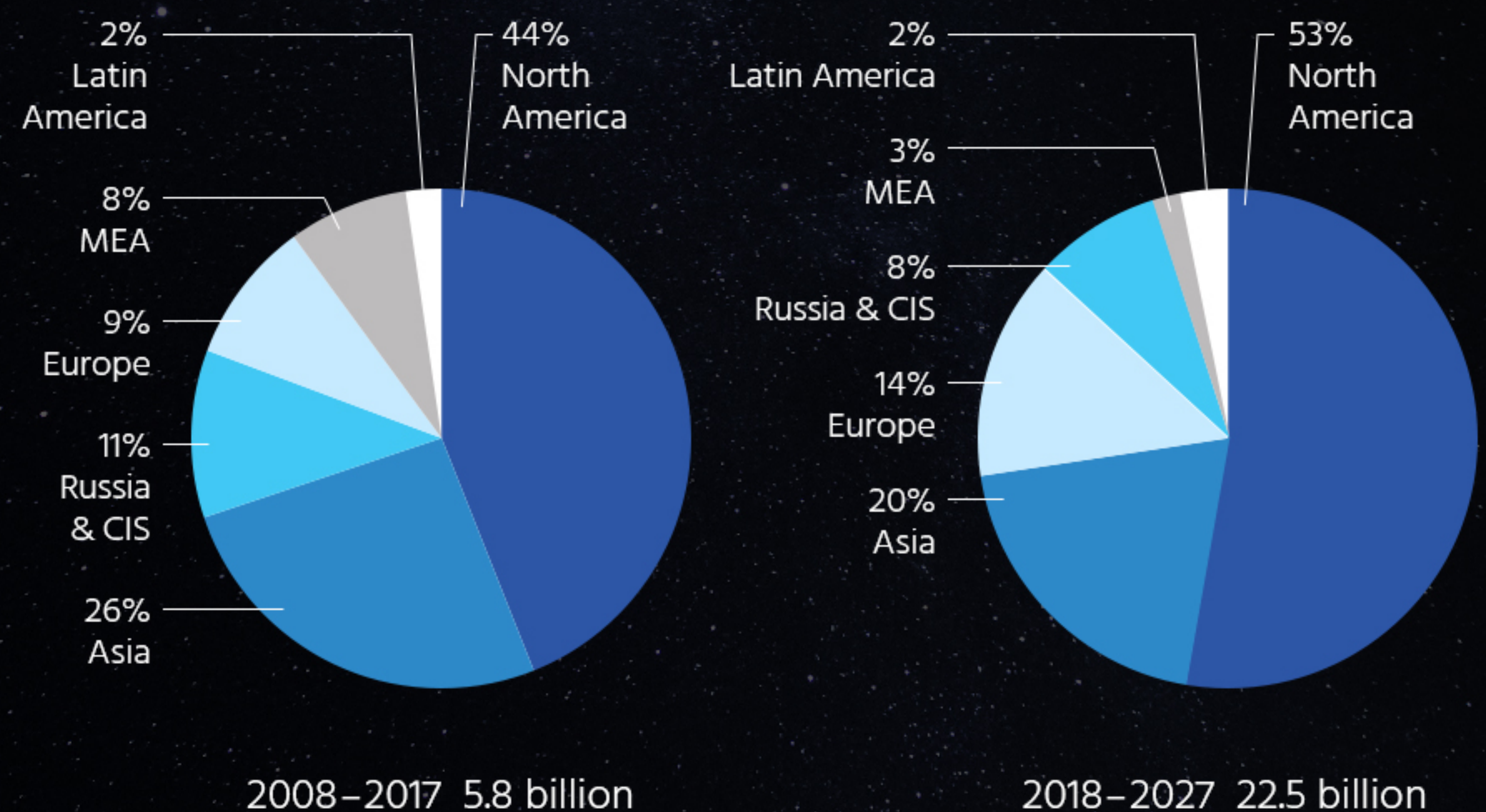
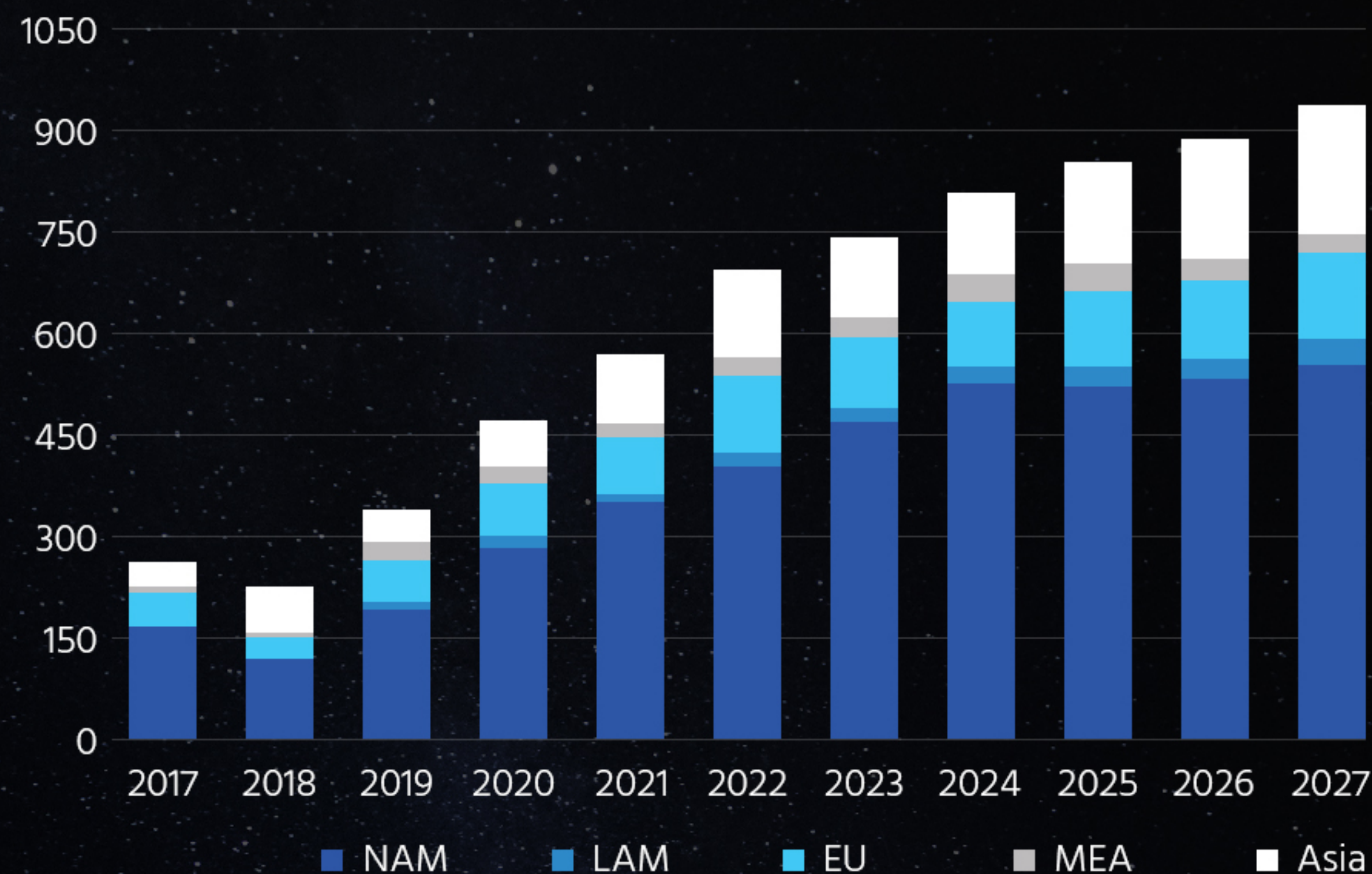
On the basis of SETS, there has been organized a small-scale production of main structural elements of propulsion systems. Vacuum chambers and furnace, clean room, manufacturing area enable fast production and product quality control. Along with this, our 30 members team headed by four Ph.D. are able to provide customers fast ready-made solutions.



The rise of small satellites

The present technologies of satellite miniaturization and usage of different propulsion systems allow smallsats to provide services the same as large sats have been doing during the last years.

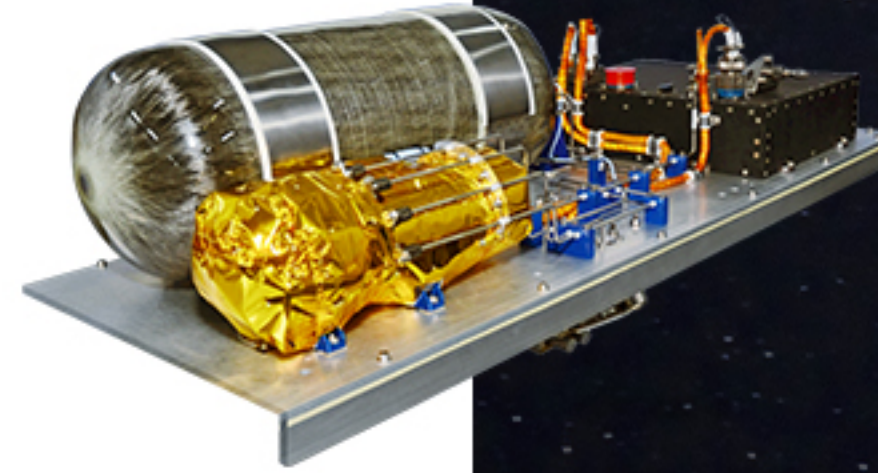
Thus NSR's Small Satellite Market Report shows the market to generate \$37 billion in revenues from 6,500 smallsat manufacturing and launch by 2027.



Source: NSR

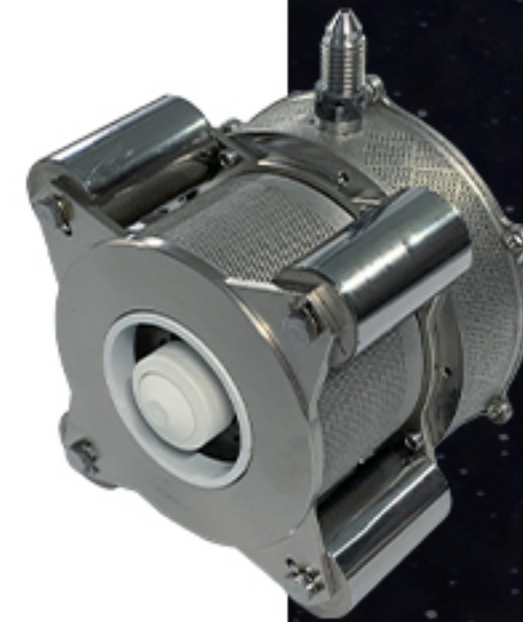


Main areas of work



SPS-25 & SPS-40 Propulsion Systems

We provide state-of-the-art Electric Propulsion Systems for a wide range of space missions



Hall Thrusters and Cathodes

We develop various Hall effect thrusters with power consumption from 100 W to 1.5 kW



Power Processing Unit

The PPU includes all the elements for controlling and supplying the propulsion system



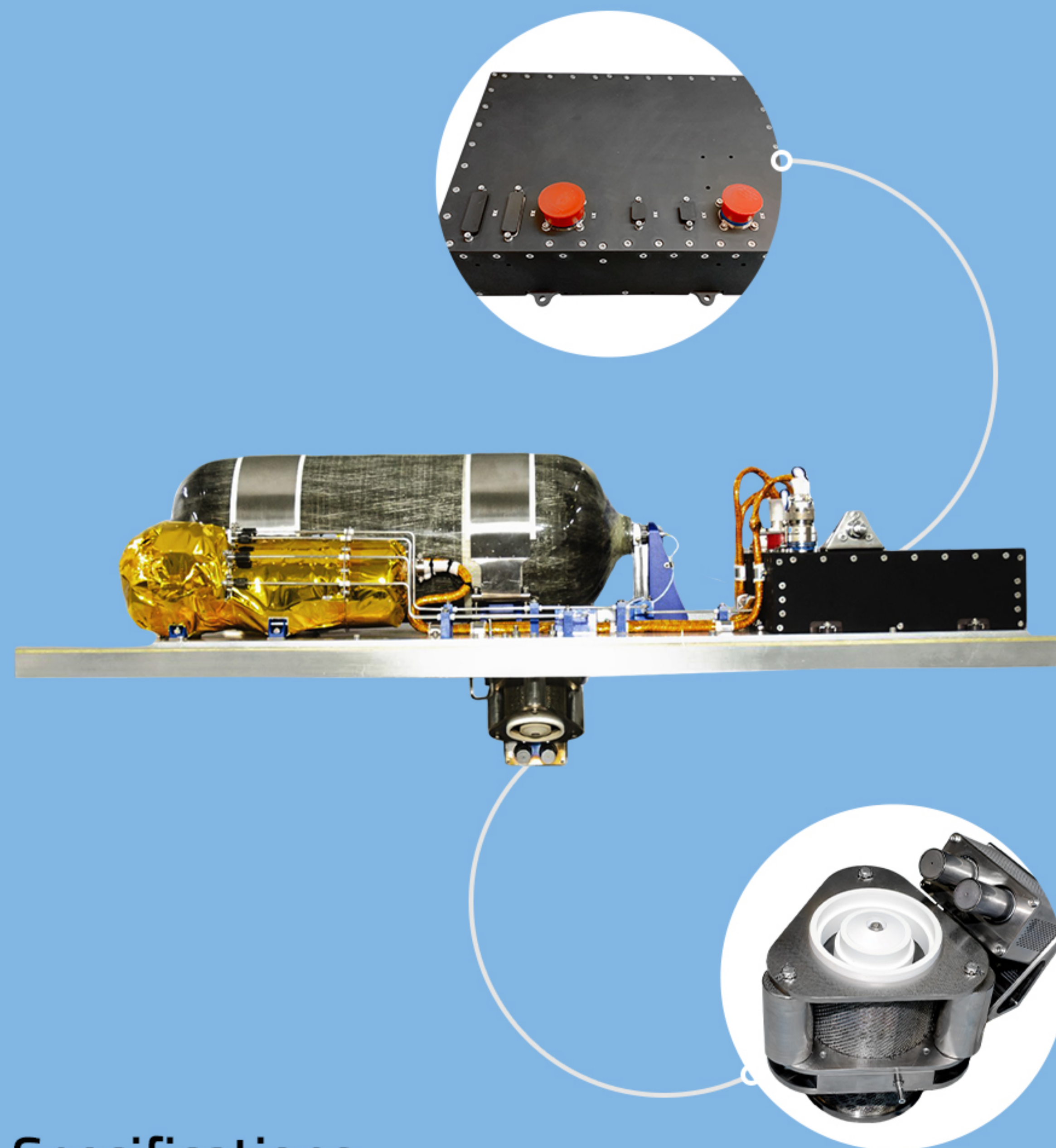
Xenon Feed System

XFS fulfills two main tasks: decreasing the high pressure to the working pressure and feeding the required values of the mass flow rates into electrical propulsion thrusters

SPS-40

Propulsion System

The SPS-40 Propulsion System was designed for medium and large satellites. It is able to adjust the orbit parameters and ensure the maneuverability of satellites in space. The propulsion system is designed for advanced satellite constellations in order to correct position relative to each other.



Specifications



Consumption Power, W
300–500



Thrust, mN
15–29



EPS dry mass
(without tank), kg
9.2

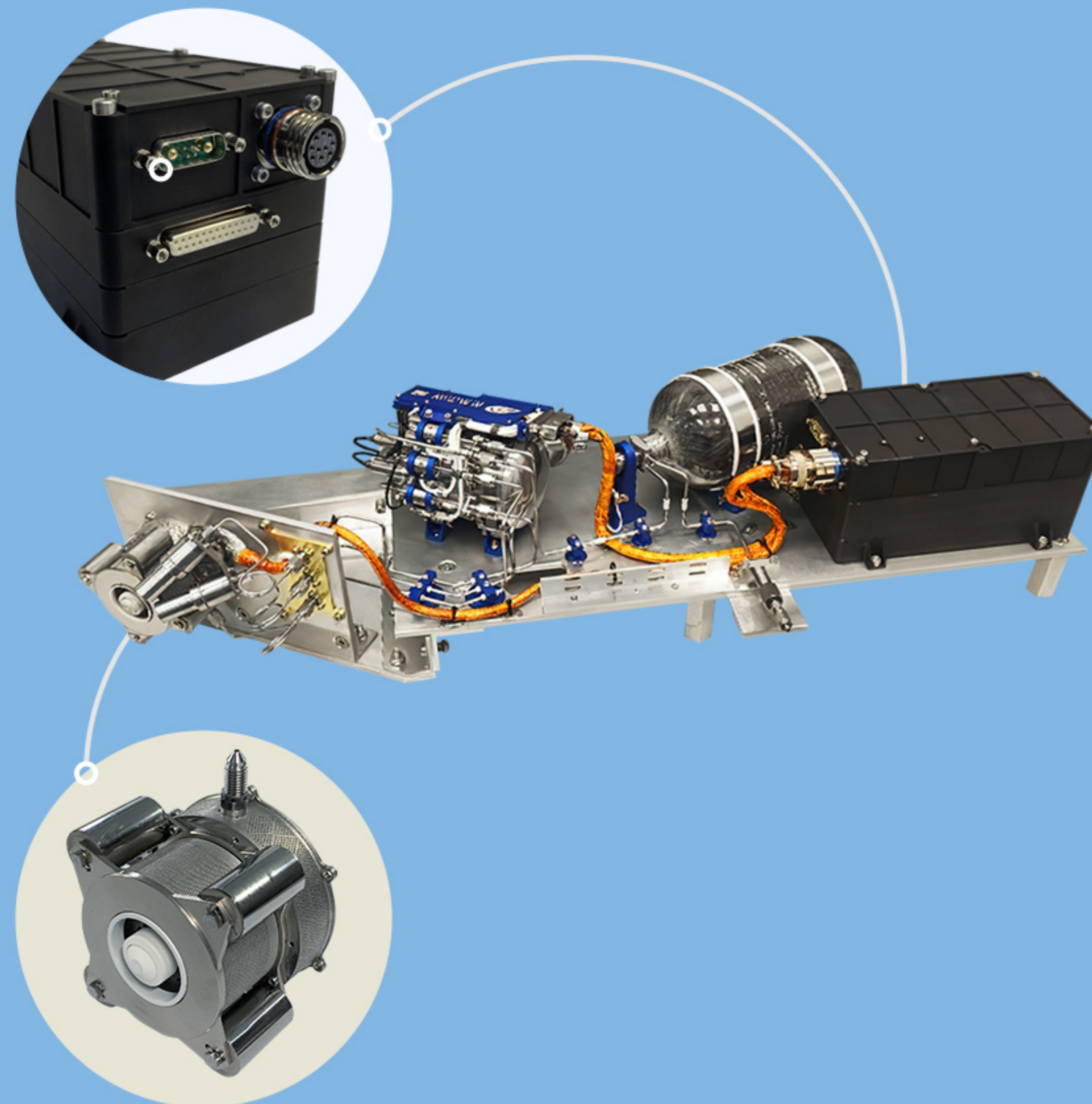


Total impulse, kNs
350

SPS-25

propulsion system

The SPS-25 Propulsion System is designed for small satellites up to 500 kg. The propulsion system is used to adjust the positions of satellites and deorbit them after their operational lifespan. A vital advantage of this propulsion system is the significantly smaller power consumption. SPS-25 is based on the ST-25 Hall Thruster.



Specifications



Consumption Power, W
120–200



Thrust, mN
5–11



Dry Mass
(without tank), kg
5



Total impulse, kNs
(depends on mission)
115



ST-100

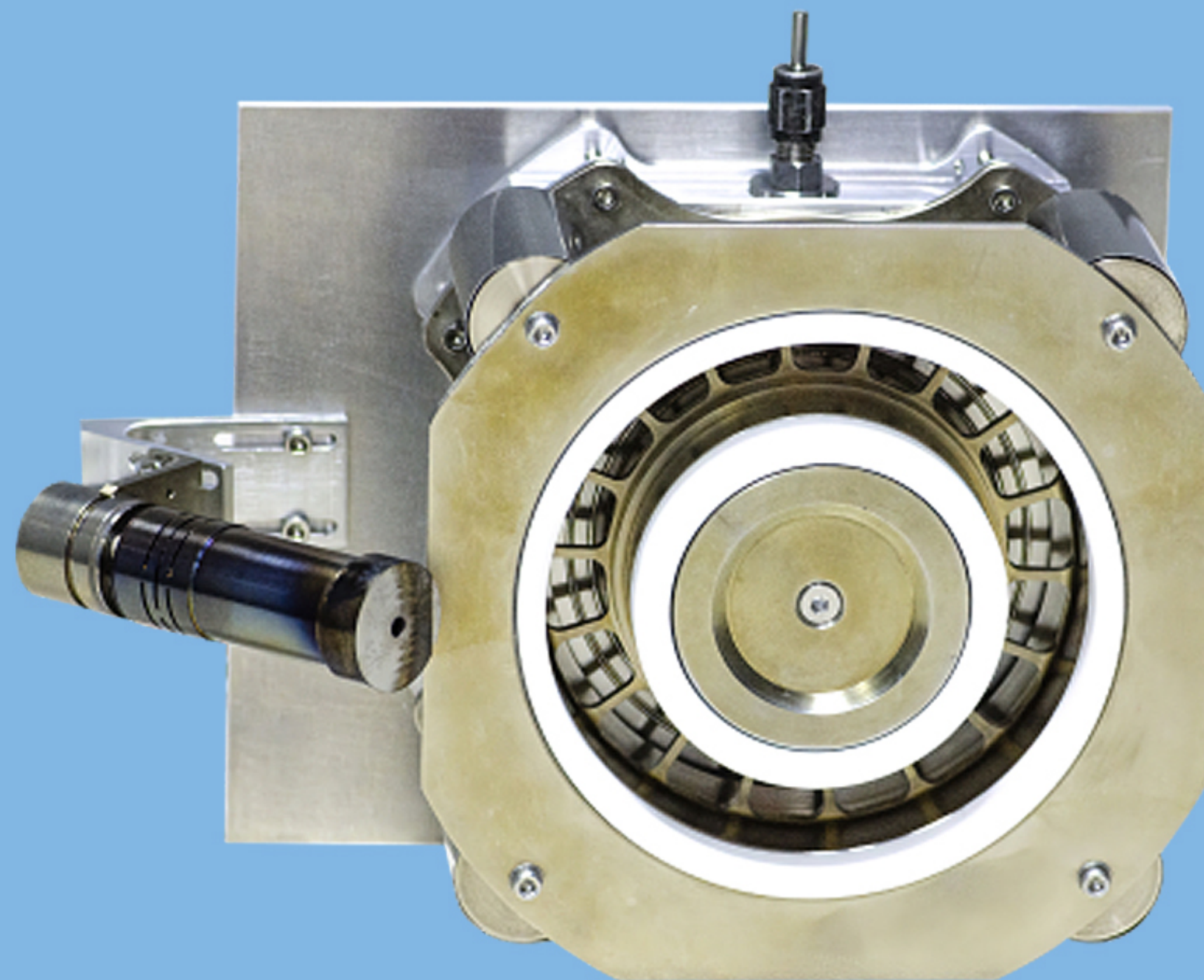
Hall Thruster

The ST-100 is a 1.5 kW Hall-Effect Thruster developed by SETS.

Dedicated to a wide range of spacecraft applications and providing the following capabilities: maintaining the spacecraft's orbit parameters, performing orbital maneuvers, and deep space missions.

Thruster's parts are produced using additive technologies, which have significantly increased the accuracy of parts manufacturing and ensured the automated production process.

The advantages of the ST-100 Hall Effect Thruster are high parameters, reliability, and long lifetime.



Specifications



Consumption Power, W
800-1500



Thrust, mN
50-107



Efficiency, %
Up to 50



Specific Impulse, s
Up to 1700

ST-40

Hall Thruster

The ST-40 Hall-Effect Thruster is designed for use as part of the propulsion system for LEO - GEO satellites. The thruster provides a thrust of up to 34 mN at a maximum electric power consumption of 600 W. The propulsion system that contains ST-40 can be used on satellites for various purposes.



Specifications



Consumption Power, W
250–600



Thrust, mN
15–34



Efficiency, %
50

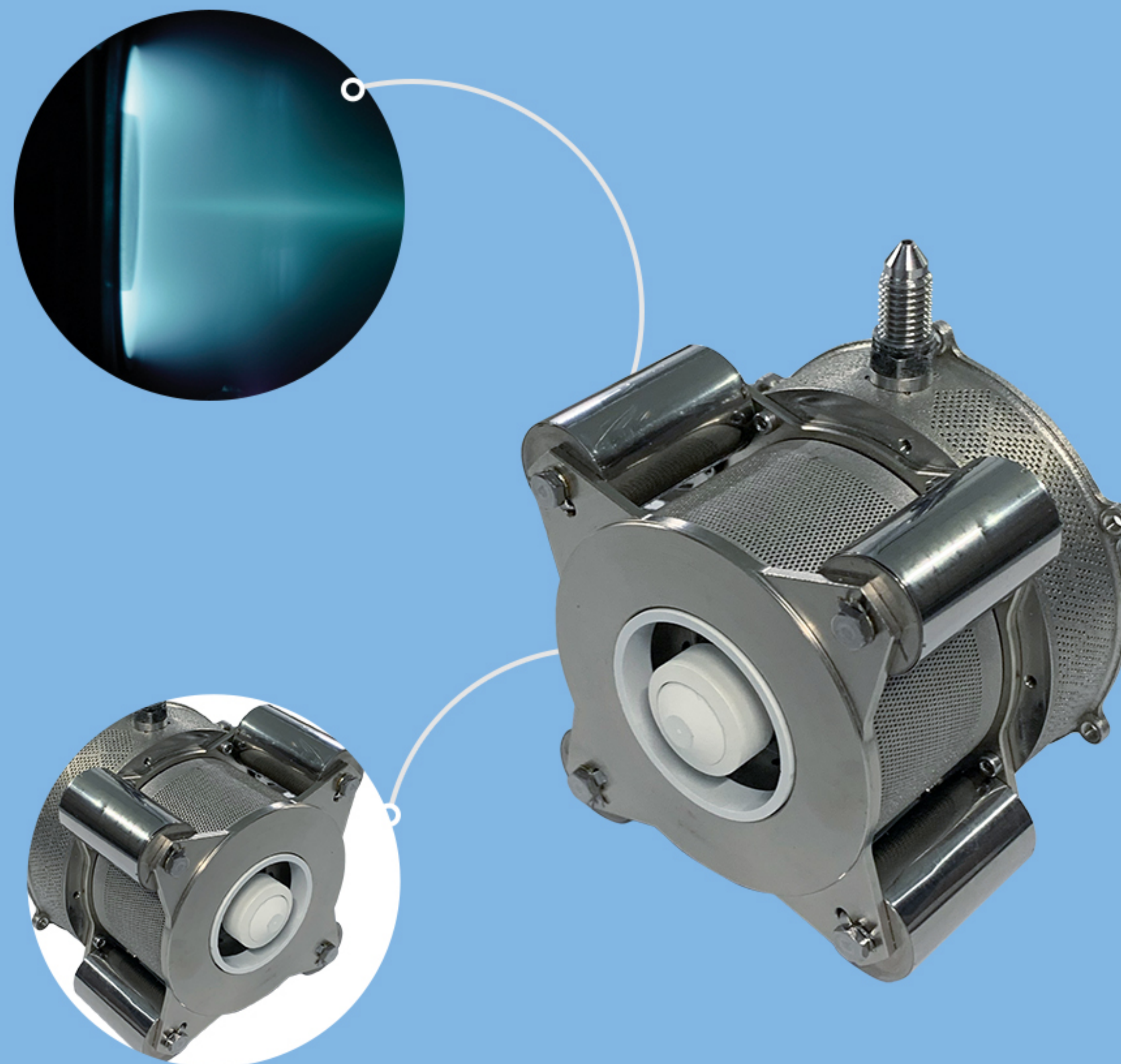


Specific Impulse, s
1300-1750

ST-25

Hall Thruster

ST-25 is a compact Hall Thruster, based on the permanent magnet in the central core. It is designed with the latest modern manufacturing principles that make our thruster a perfect solution for satellite constellations. The high standards of manufacturing and technology allowed the ST-25 thruster to operate on board the spacecraft and show excellent performance which is confirmed by successful flight heritage.



Specifications



Consumption Power, W
120–250



Thrust, mN
5–14



Efficiency, %
38



Specific Impulse, s
1000–1500

PPU-200

The Power Processing Unit (PPU) is a power management equipment intended for LEO satellite applications and designed according to space standards. It transforms onboard voltage to power a Hall Thruster from 80W to 180 W and controls Xenon Feed System.

PPU-200 is designed with a focus on mass manufacturing and optimized for using, developing, and production for the satellite constellations.



Specifications



Anode Power, W
up to 180



Input Voltage, V
22 to 36



Operating
Temperature, °C
-35/+80



Efficiency, %
up to 91



SETS
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PPU-500

The Power Processing Unit (PPU) is a power management equipment intended for LEO satellite applications and designed according to space standards. It transforms onboard voltage to power a Hall Thruster from 200 W to 500 W and controls Xenon Feed System. It is based on a modular design that allows customers to choose only the mission-specific functionality and redundancy level required, thereby optimizing mass, power, and volume.



Specifications



Anode Power, W
up to 500



Input Voltage, V
22 to 36



Operating
Temperature, °C
-40/+80



Efficiency, %
up to 94

XFS

SETS is developing a modular Xenon Feed System (XFS) with significant reductions in mass and cost while increasing system reliability. The feed system can be adapted to any thrusters with different power level and mass flow rate requirements.



Specifications



Inlet Pressure, bar
Up to 180



Nominal Flow Rate, mg/s
Anode: up to 3
Cathode: up to 0,5



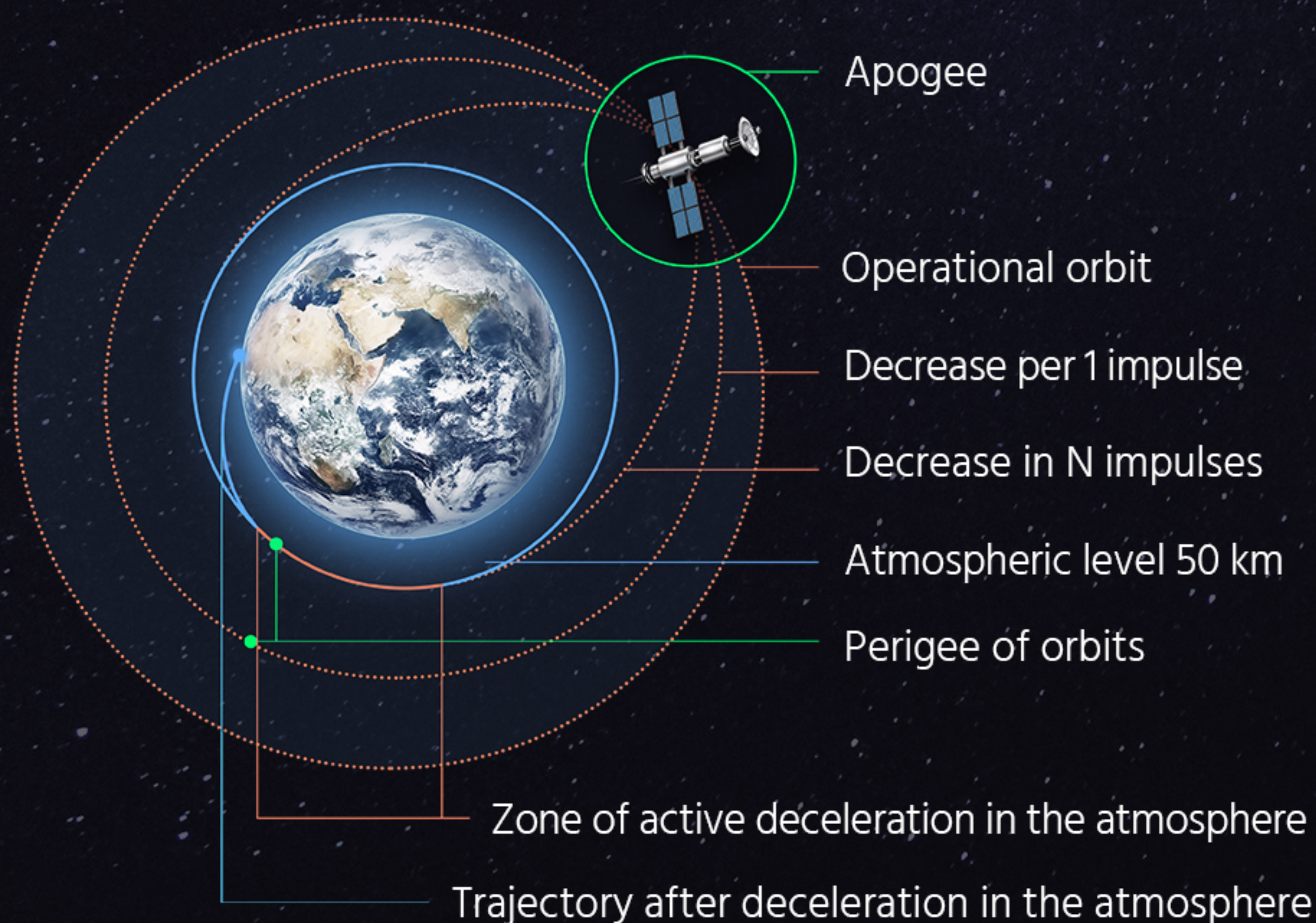
Dimensions, mm
145*127*118



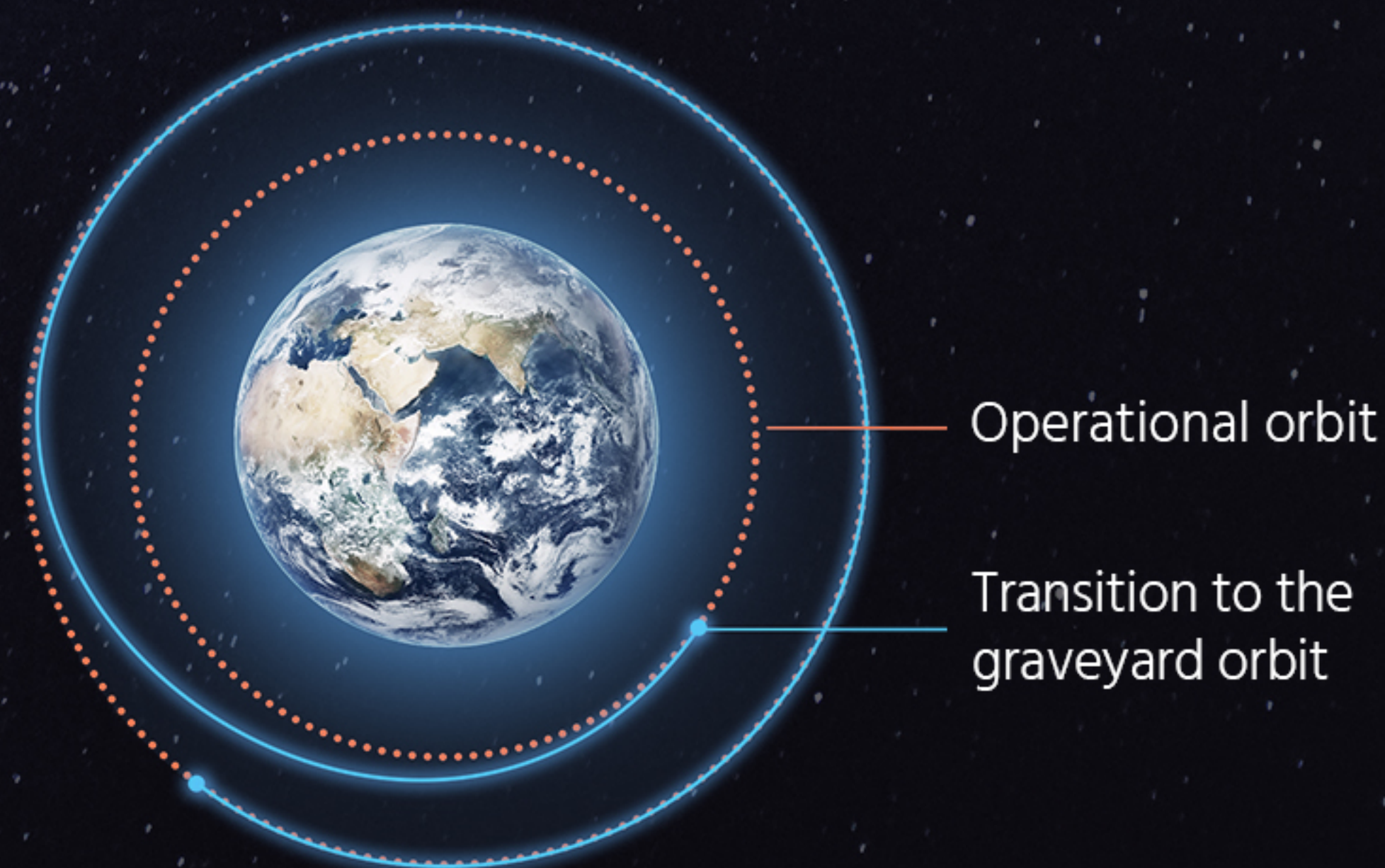
Working Substance
Xenon, Krypton

Capabilities of SETS thruster systems

Deorbit into the atmosphere



Transfer to the graveyard orbit





Thanks for your attention

www.sets.space

