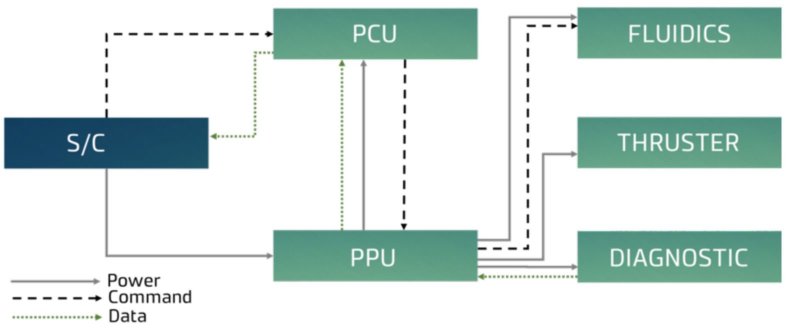
TECHNOLOGY
FOR PROPULSION
AND INNOVATION

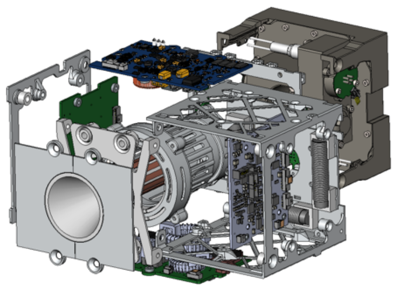
PRODUCT DATASHEET

# REGULUS Electrical Propulsion system for Micro-satellites

## A reliable, complete and cost-effective propulsion system to provide mobility to small objects in space

A unique box including the whole propulsion package specifically designed for Cubesats and Micro platforms mobility (from 6U up to 150 kg)



**Applications**
High DeltaV missions
Orbit Raising
Drag Compensation
Formation Flying
Decommissioning

## Enhanced Plasma Thruster

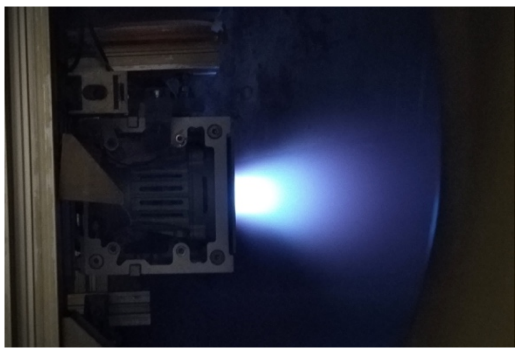
Based on helicon technology, the Magnetically Enhanced RF Plasma Thruster is under development in Padua since 2008, focusing on the needs of small platforms, characterized by low power and budget constraints.

## Benefits

Thanks to its very simple architecture, the thruster allows for cost reduction, making it a valuable solution for small platforms down to multi U. It can be throttleable and easily scalable to match with the customer needs.

## The Technology

Deriving by helicon technology, the thruster is a simple engineering system, featuring a reduced number of components with respect to other systems. It is composed of a discharge chamber, an antenna and a magnetic field generator.
It does not use electrodes, does not require neutralizers and grids, thus allowing cost reductions and long lifetimes.
A proprietary (patented) helicon technology has been developed specifically for micro and nano-satellites.



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A University of Padua Spin-Off

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# REGULUS Electrical Propulsion system for Micro-satellites

| Key Features | Advantages | Benefits |
|---|---|---|
| Ejection of neutral plasmas<br>No grids | No electrodes subjected to deterioration<br>No neutralizer<br>Increased overall system simplicity | Suitable for high Total DeltaV missions, enabling different and new mission scenarios and interplanetary flights<br>Low recurrent production costs<br>Easy system reconfiguration |
| No elements exposed to plasmas | Multi propellant utilization<br>High life time | Innovative mission scenarios<br>Long term missions |
| External sizeable tank | No limit in propellant utilization | Flexibility of the system to adapt to different mission scenarios<br>Flexibility of the system to match customers' particular needs |
| Intense knowledge of plasma production and acceleration physics | Capability to translate customers' specific needs in technical requirements and to scale the system | Low development costs for customization to match customers' particular needs |
| Robust technology experimentally proven | Possibility to work with different gases at different working conditions | High reliability |
| Intense technological assessment and development activity | Intense knowledge of the system behavior | Reduced/limited risks for flight system development |
| Miniaturized overall system | Compact propulsion unit | Flexibility on integration in the satellite platform |
| Standard interfaces with the satellite platform | Ease of integration | Plug & play unit<br>Adaptability to different platforms with reduced customization costs |
| Conceived for Cubesats applications from the beginning | Smart manufacturing (3D printing) and assembly | Suitable for industrial production |

## SPECIFICATIONS

| | |
|---|---|
| Envelope | REGULUS-A 1.5U @ 3000 N•s with possibility of mission extensions (i.e. REGULUS-B 2U @ 11000 N•s) |
| Total weight | 2.5 kg @ 3000 N•s |
| Input power | 20 - 60 W (50 W nominal) |
| Input voltage | 12 V DC (Optional 24 V DC) |
| Thrust | 0.25 – 0.65 mN (0.55 mN @ 50 W) |
| Specific impulse | up to 650 s (550 s @ 50 W) |
| Propellant mass flow | 0.1 mg/s |
| Propellant type | Propellant Iodine ($I_2$) in current configuration (extensive test with Xe, other gases under request) |

| REGULUS-A 3000 N•s SCENARIOS EXAMPLES | REGULUS-B 11000 N•s SCENARIOS EXAMPLES |
|---|---|
| 6U orbital changes* for a total of 500 km in 1.7 month overall | 12U orbital changes* for a total of 950 km in 6.0 months overall |
| 6U decommissioning** from 750 km in 1.6 month | 12U decommissioning** from 1200 km in 6.0 months |
| 6U drag compensation @ 300 km for more than 3 years | 12U drag compensation @ 300 km for more than 6 years |
| 6U 180° phase change in 11 days, 12U 180° phase change in 18 days | 6U 180° phase change in 11 days, 12U 180° phase change in 18 days |

* Departure orbit @ 500 km
** Final orbit @ 300 km

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**Our Project Partners:**