ENPULSION

NANO R³

FIELD EMISSION ELECTRIC PROPULSION (FEEP)

The *ENPULSION NANO R³* is the next-generation FEEP system based on the flight-proven success story that is the *ENPULSION NANO* (formerly: IFM Nano Thruster). Incorporation of lessons learned from a large number of acceptance test campaigns and in-orbit performance verifications led into an updated electronics design, thermostructural concept, and software functionality. The resulting product – the *ENPULSION NANO R³* – features increased reliability, radiation tolerance, and environmental resilience.

RAD-TOLERANT ELECTRONICS

All EEE components of the *ENPULSION NANO R³* are procured in **lot-controlled batches**. Selected sets of these batches are subjected to radiation testing, so that each thruster can be traced back to a fully representative qualification model. EEE components were selected and integrated to be more tolerant to TID and SEE.

FLIGHT HERITAGE

The *ENPULSION NANO R³* is an updated version of the space proven *ENPULSION NANO* with **more than 37 units in space***. It is directly building on its heritage, leveraging the proven design and component selection.

*as per September 2020

PROTECTIVE CASING

The thruster is assembled into a protective casing that **shields the electronics** from the hazardous space radiation environment, **facilitates handling** during integration, and allows **side mounting**.

VERSATILE PERFORMANCE

Thrust can be controlled through the electrode voltages, providing **excellent controllability** over the full thrust range and a low thrust noise. Due to the efficient ionization process, the *ENPULSION NANO R³* can provide a higher specific impulse than any other ion propulsion system currently on the market.

SAFE AND INERT SYSTEM

The *ENPULSION NANO R³* contains **no moving parts** and the indium propellant is in its solid state at room temperature. Avoiding any liquid and reactive propellants as well as pressurized tanks significantly simplifies handling, integration, and launch procedures.

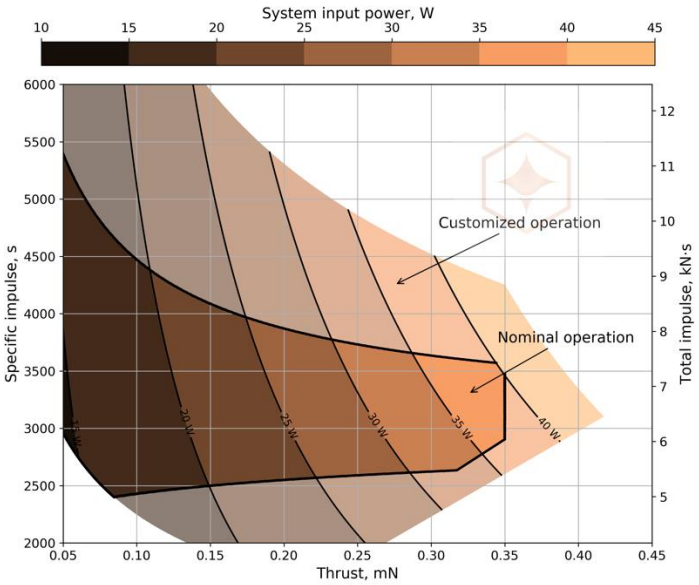
ENPULSION
NANO R³

PROPERTIES AND PERFORMANCE

While the required power to operate the *ENPULSION NANO R³* starts at around 8 W, at higher power levels one can choose between high thrust and high specific impulse operation. The *ENPULSION NANO R³* can operate at an I_{sp} range of 2,000 to 6,000 s.

At any given thrust point, higher I_{sp} operation will increase the total impulse, while also increasing the power demand. The thruster can be operated along the full dynamic range throughout the mission. This means that high I_{sp} and low I_{sp} manoeuvres can be included in a mission planning as well as high thrust orbit manoeuvres and low thrust precision control manoeuvres.

DYNAMIC THRUST RANGE	10 TO 350 µN
NOMINAL THRUST	350 µN
SPECIFIC IMPULSE	2,000 TO 6,000 s
PROPELLANT MASS	220 g
TOTAL IMPULSE	MORE THAN 5,000 Ns
POWER AT NOMINAL THRUST	40 W INCL. NEUTRALIZER
OUTSIDE DIMENSIONS	98.0 x 99.0 x 95.3 mm
MASS (DRY / WET)	<1200 / <1420 g
TOTAL SYSTEM POWER	8 – 40 W
HOT STANDBY POWER	3.5 W
COMMAND INTERFACE	RS422 / RS485
TEMPERATURE ENVELOPE (NON-OPERATIONAL)	-40 TO 95°C
TEMPERATURE ENVELOPE (OPERATIONAL)	-20 TO 40 °C
SUPPLY VOLTAGE	12 V, 28 V, OTHER VOLTAGES UPON REQUEST



Depending on available power, the user can choose from any operational point - data shown corresponds to 12 V configuration. Performance model is based on heritage *ENPULSION NANO*.