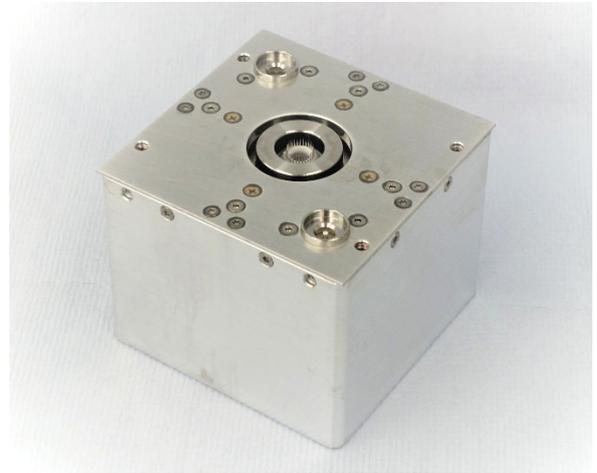


# IFM NANO THRUSTER COTS+

## FIELD EMISSION ELECTRIC PROPULSION (FEEP)

FEEP propulsion technology for precise orbit control of scientific satellites in formation flight was developed at FOTEC with **support from ESA** for more than 15 years. ENPULSION has been founded as a Spin-Out company from FOTEC to meet the market demand for small satellite propulsion by introducing **mass production techniques**. The resulting IFM Nano Thruster was commercialized for low-cost, small satellites aiming at **rapid design and short lifecycles**.



### LOT CONTROL

All EEE components of the IFM Nano Thruster COTS+ are procured in **lot-controlled batches**. Selected sets of these batches are subjected to radiation testing, so that each thruster delivered to a customer can be traced back to a fully representative qualification model using components from the same batch.



### FLIGHT HERITAGE

The IFM Nano Thruster COTS+ is an updated version of the space proven IFM Nano Thruster with **more than 28 units in space\***. It is directly building on its heritage, leveraging the proven design and component selection.

\*as per March 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 for either **panel or side mounting**.



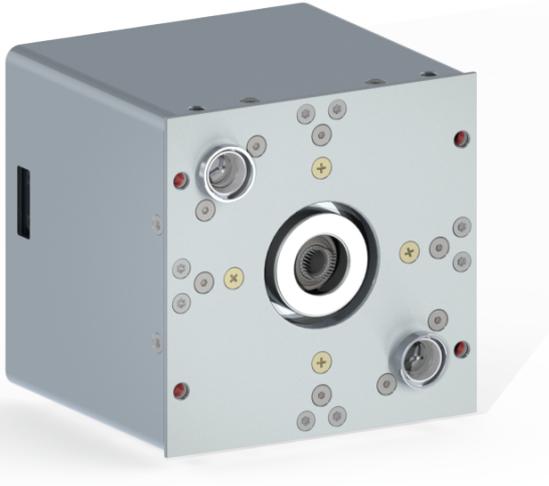
### VERSATILE PERFORMANCE

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 IFM Nano Thruster can provide a higher specific impulse than any other ion propulsion system currently on the market.



### SAFE AND INERT SYSTEM

The IFM Nano Thruster 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.

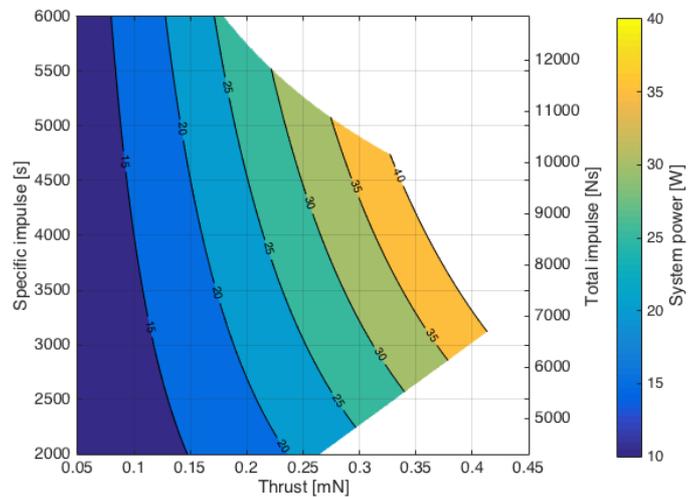


**PROPERTIES AND PERFORMANCE**

While the required power to operate the IFM Nano Thruster COTS+ starts at around 8 W, at higher power levels one can choose between high thrust and high specific impulse operation. The IFM Nano Thruster COTS+ 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 400 $\mu$ N
NOMINAL THRUST	350 $\mu$ N
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 94.5 mm
MASS (DRY / WET)	<1080 / <1300 g
TOTAL SYSTEM POWER	8 - 40 W
HOT STANDBY POWER	3.5 W
COMMAND INTERFACE	RS422 / RS485
TEMPERATURE ENVELOPE (NON-OPERATIONAL)	-40 TO 105°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