

IFM MICRO THRUSTER

Building on the heritage of the IFM Nano Thruster, ENPULSION is developing a scaled version of the technology to target **small and medium size spacecrafts**. The IFM Micro 100 Thruster is engineered in a modular approach, with units clustering easily together to form building blocks that can be arranged for various mission profiles. Radiation tolerant options for the power processing unit are available for different mission applications and reliability levels. **First prototypes for flight demonstration missions will be available mid of 2019. A qualified product will be on the market in Q1 2020.**



MATURE TECHNOLOGY

The IFM Micro 100 Thruster is a scaled technology of the IFM Nano Thruster which has a developmental history of over 15 years. During this time, there have been hundreds of emitters tested with an ongoing lifetime test that has surpassed 23,000 hours of firing. This endurance test continues without degradations.



MODULAR PACKAGE WITH HIGH TOTAL IMPULSE

One module and its tank only take up a volume of 1.6 L and can provide more than 50,000 Ns at 4,000 s I_{sp} . The module is simply bolted to the outside of the spacecraft and can be used as a standalone unit or can easily be clustered to form the IFM Micro 200 Thruster or the IFM Micro 400 Thruster.



DYNAMIC PRECISE THRUST CONTROL

The thrust can be controlled through the electrode voltage, which is providing excellent controllability, down to a precision of 25 μ N as well as low thrust noise.



THRUST VECTORING

In the IFM Micro 400 Thruster, the four segments of the thruster can be controlled individually and provide a significant capability to vary the effective thrust footprint.



CONTROLLABLE SPECIFIC IMPULSE UP TO 6,000 S

With its efficient ionization process the IFM Micro 100 Thruster can deliver higher specific impulse than any other ion propulsion system currently on the market. The thruster is capable of accurately controlling the I_{sp} anywhere from 1,000 s to 6,000 s.



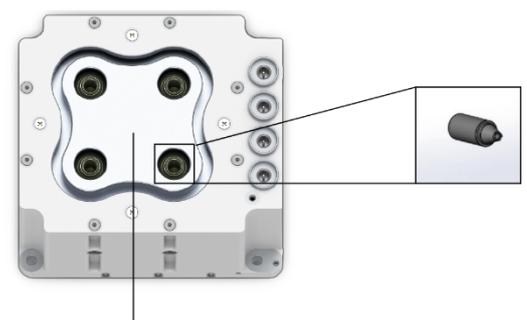
DEBRIS SAFETY

Even during active operation, no part of the thruster is pressurized, and no chemical energy is stored. In case of a collision or impact, no explosive reaction can be triggered, which could harm the spacecraft system and create additional debris.



SAFE AND INERT SYSTEM COMPLIANT DURING LAUNCH

IFM Micro technology contains no moving parts and uses non-toxic indium as the propellant. There are no liquids or reactive propellants as well as no pressurized vessels. Stored as a solid and filled at our factory it requires no special handling, integration or launch procedures.



4 Emitters, reservoir for 1.3 kg of indium in a 14x12x10 cm envelope

Each emitter is identical to the one used in the ongoing lifetime test (>23,000 h)

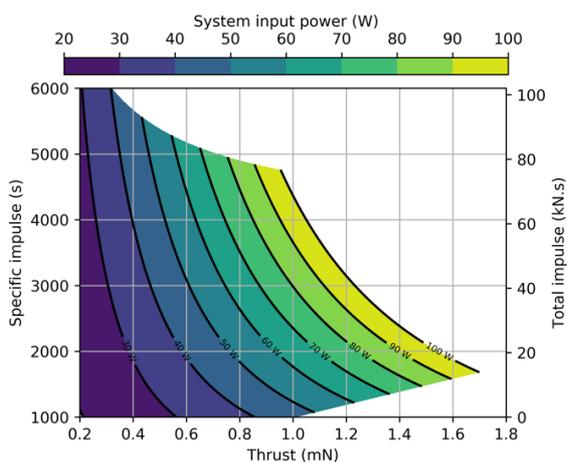
PROPERTIES AND PERFORMANCE

The following figures are based on testing of the IFM Micro 400 Thruster Engineering Model including direct thrust measurements, as well as heritage from the IFM Nano Thruster.

	MICRO 100	MICRO 200	MICRO 400	MICRO 600
DYNAMIC THRUST RANGE	75 μ N - 1.5 mN	75 μ N - 3 mN	75 μ N - 6 mN	75 μ N - 9 mN
NOMINAL THRUST	1 mN	2 mN	4 mN	6 mN
SPECIFIC IMPULSE	1,500 - 6,000 s	1,500 - 6,000 s	1,500 - 6,000 s	1,500 - 6,000 s
PROPELLANT MASS	1.3 kg	2.6 kg	5.2 kg	7.8 kg
TOTAL IMPULSE	> 50 kNs	> 100 kNs	> 200 kNs	> 300 kNs
POWER AT NOMINAL THRUST	100 W	200 W	400 W	600 W
OUTSIDE DIMENSIONS	< 140 x 120 x 100 mm	< 140 x 240 x 100 mm	< 280 x 240 x 100 mm	< 280 x 360 x 100 mm
MASS (DRY / WET)	1.7 kg / 3.2 kg	3.4 kg / 6.4 kg	6.8 kg / 12.8 kg	10.2 kg / 19.2 kg
TOTAL SYSTEM POWER	20 - 100 W	20 - 200 W	20 - 400 W	20 - 600 W
HOT STANDBY POWER	5 - 10 W	10 - 20 W	20 - 40 W	30 - 60 W
COMMAND INTERFACE	RS485, other possible			

The IFM Micro Thruster can be operated at a wide range of thrust and specific impulse, depending on the power level available. The operational envelope is based on total system power including heater and neutralizers are shown below.

IFM MICRO 100 THRUSTER



IFM MICRO 400 THRUSTER

