

IFM MICRO THRUSTER COTS+

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 models for flight demonstration missions will be delivered in Q2 of 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 24,000 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

Thrust can be controlled through the electrode voltage, which provides excellent controllability, down to a precision of 25 μ N with low thrust noise.



DEBRIS SAFETY

Even during active operation, no part of the thruster is pressurized, and no chemical energy is stored. This means that in case of a collision or impact, there will not be an explosive reaction which could harm the spacecraft and create debris.



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} all over the range from 1,000 s to 6,000 s.



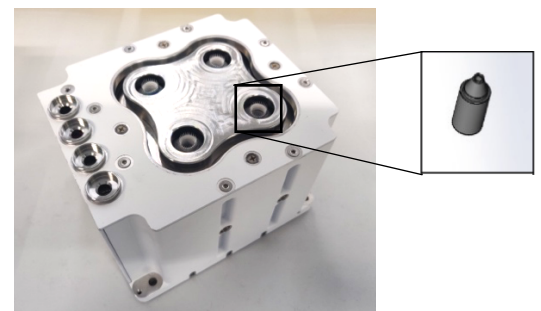
HERITAGE ELECTRONICS

The available COTS+ Power Processing Unit is based on the heritage electronics used in the IFM Nano Thruster, leveraging exhaustive on-orbit and testing heritage, as well as introducing component lot control and heritage in EEE part selection. The PPU can be either stacked or integrated separately from the thruster



SAFE AND INERT SYSTEM COMPLIANT DURING LAUNCH

IFM Micro technology contains no moving parts and uses non-toxic indium as propellant. There are neither liquids or reactive propellants nor pressurized vessels. Stored as a solid and filled at our factory it requires no special handling, integration, or launch procedures.



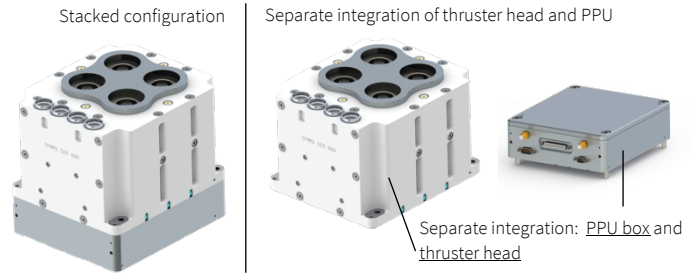
4 Emitters, reservoir for 1.3 kg of indium in a 14x12x10 cm envelope

Each emitter is identical to used in the ongoing lifetime test (>24,000 h)



PROPERTIES AND PERFORMANCE

The IFM Micro Thruster can be integrated in a stacked configuration, with the PPU situated directly underneath the thruster head, with same footprint. Alternatively, the PPU box can be integrated separately from the thruster head.

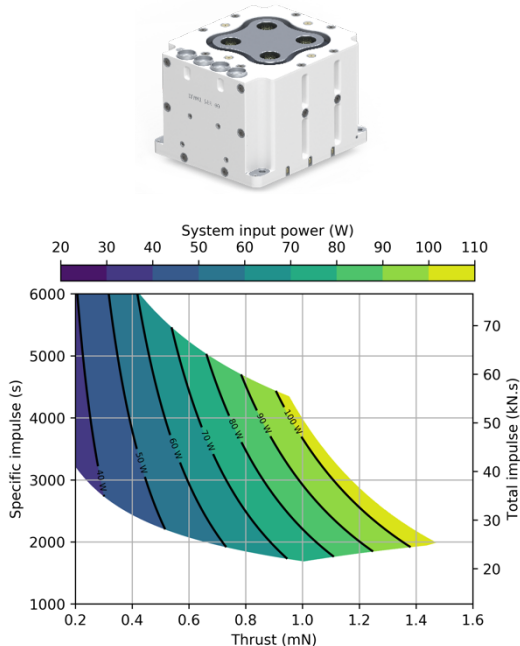


	MICRO 100	MICRO 200	MICRO 400	MICRO 600
	COTS+	COTS+	COTS+	COTS+
DYNAMIC THRUST RANGE	75 μ N - 1.45 mN	75 μ N - 2.9 mN	75 μ N - 5.8 mN	75 μ N - 8.7 mN
NOMINAL THRUST	1 mN	2 mN	4 mN	6 mN
SPECIFIC IMPULSE	1,500 - 6,000 s	1,500 - 6,000 s	1,500 - 6,000 s	1,500 - 6,000 s
PROPELLANT MASS	1.3 kg	2.6 kg	5.2 kg	7.8 kg
TOTAL IMPULSE	> 50 kNs	> 100 kNs	> 200 kNs	> 300 kNs
TOTAL SYSTEM POWER	20 - 110 W	20 - 220 W	20 - 440 W	20 - 660 W
POWER AT NOMINAL THRUST *	80 - 90 W	160 - 180 W	320 - 360 W	500 - 540 W
OUTSIDE DIMENSIONS				
Thruster head	140 x 120 x 98.6 mm	140 x 240 x 98.6 mm	280 x 240 x 98.6 mm	280 x 360 x 98.6 mm
PPU box	140 x 120 x 34.0 mm	140 x 240 x 34.0 mm**	280 x 240 x 34.0 mm**	280 x 360 x 34.0 mm**
MASS (DRY / WET) including PPU	2.6 kg / 3.9 kg	5.2 kg / 7.8 kg	10.4 kg / 15.6 kg	15.6 kg / 23.4 kg
HOT STANDBY POWER	5 - 10 W	10 - 20 W	20 - 40 W	30 - 60 W
COMMAND INTERFACE	RS485, other possible			

Annotation: *) dependent on specific impulse commanded
**) alternative arrangement of the individual PPU boxes 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 as shown below.

IFM MICRO 100 THRUSTER



IFM MICRO 400 THRUSTER

