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DEVELOPMENT AND QUALIFICATION OF THE IFM MICRO THRUSTER

Abstract

The development of smaller satellite constellations has prompted a real need for propulsion systems optimized for satellites in the hundreds of kilograms mass range. Building upon the heritage of FOTEC's liquid metal ion sources and the flight experience acquired by ENPULSION with the IFM Nano Thruster, ENPULSION is developing a new FEEP thruster head assembly while FOTEC is developing a new generation of COTS based power and control electronics. In addition, higher reliability Power Processing Units are developed by heritage space electronics suppliers. The IFM Micro Thruster is a modular and extremely compact propulsion system built around the indium FEEP technology. At its core it uses the same porous crown emitter developed by FOTEC. This emitter has been tested for more than 20,000 hours on the ground and is already in orbit on board a dozen IFM Nano Thrusters. By clustering 16 emitters unprecedented levels of thrust can be achieved by a FEEP while also increasing reliability and efficiency.

The IFM Micro Thruster is a 400 W thruster that offers up to 6 mN of thrust and a continuously adjustable specific impulse between 1500 and 6000 s. The integrated thruster head and propellant storage design means that 200 kN.s of total impulse can be stored in a 28x24x20 cm (6.7 L) module, which makes it one of the most compact thruster system on the market. With its wide operating envelope and precise thrust control capabilities the IFM Micro Thruster is uniquely suited for drag compensation, constellation phasing, stationkeeping and end-of-life deorbiting. The total impulse also allows for significant orbit raising and plane change capabilities.

The IFM Micro Thruster uses non-toxic solid indium propellant which makes it safe and simple to handle and integrate. No pressurized tanks, complex filling procedures or fluid management systems are required. This removes the need for any specific waiver from launch providers.

The IFM Micro Thruster is undergoing performance testing and qualification with an expected commercial availability by the end of 2019.