

## Integrated Propulsion System

**X18069000-1**

VACCO's Integrated Propulsion System (IPS) provides a highly reliable, intelligent, attitude control and delta-V solution capable of delivering 12,000 N-sec total impulse to any SmallSat. IPS is a complete, bolt-on propulsion module including propellant storage, feed system, thrusters and controller. Components and manufacturing methods used are the product of 57 years of space experience including propulsion systems that powered both highly successful Mars Cube One (MarCO) CubeSats.

The IPS features four, flight-proven, 1N LMP-103S green monopropellant thrusters double-canted for a net axial thrust of 3.97N. First launched in 2010, fifty six of these 1N thrusters have been successfully flown. During delta-V operations individual thrusters can be off-pulsed to achieve thrust vector control, roll control or reaction wheel desaturation. Given high thruster throughput capability, propellant and pressurant capacity can be expanded to increase total impulse with minimal impact to the overall design.

**Performance Density:  
1,079 N-sec/L**



**SPACE**

**Flight systems currently in production.**

### Features:

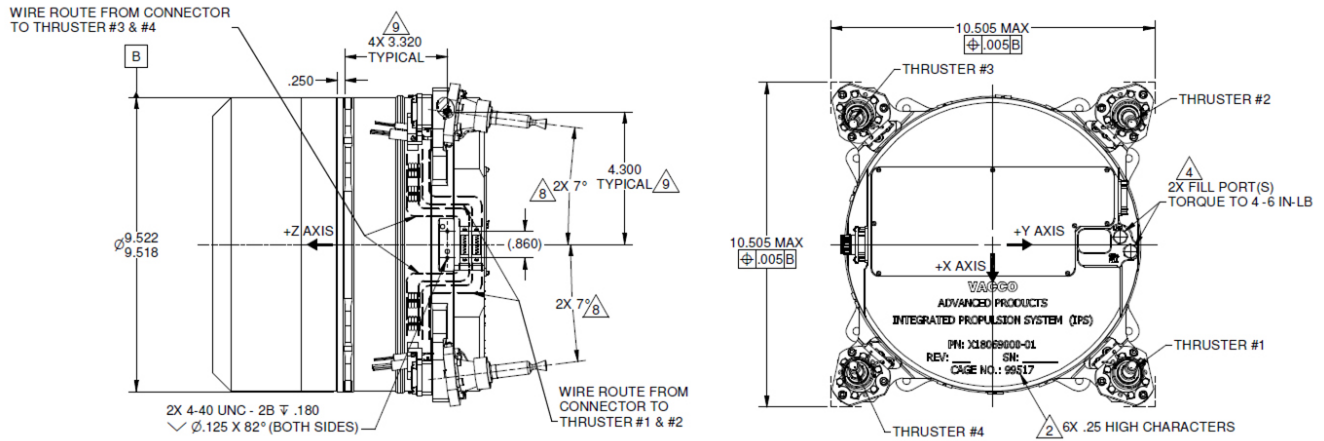
- Range Safety Friendly
- Three interrupts against propellant leakage
- Leak before burst pressure boundary
- Separate power inputs for "Safe" and "Arm"
- Integral Microcontroller with RS422 digital interface
- Radiation resistant components with integral shielding
- Robust, sophisticated flight-proven software
- Redundant electronic pressure regulators
- <1W required for communication and health monitoring
- 50W peak power
- Frictionless high reliability micro valves
- All-welded, high strength titanium alloy structure
- Fully manifolded components (no tubing)
- Performance density 1,079 N-sec/L

### Operating Parameters:

|                       |                                  |                                |                                  |
|-----------------------|----------------------------------|--------------------------------|----------------------------------|
| Propellant.....       | LMP-103S                         | External Leakage.....          | <1.0 x 10 <sup>-6</sup> sccs GHe |
| Net Axial Thrust..... | Throttlable from 1 to 3.97 N     | Operating Temperature.....     | +10°C to +40°C                   |
| Total Impulse.....    | 12,000 N-sec                     | Non-Operating Temperature..... | -34°C to +40°C                   |
| MEOP.....             | 22 bar (320 psia)                | Dry Mass.....                  | 9.0 kg (19.8 lbm)                |
| MDP.....              | 63.4 bar (920 psia)              | Wet Mass.....                  | 14.7 kg (39 lbm)                 |
| Proof Pressure.....   | 95.1 bar (1380 psia)             | Safe Power Input.....          | 12 ±0.3V, 24W max.               |
| Burst Pressure.....   | 126.8 bar (1840 psia)            | Arm Input Power.....           | 28 ±4V, 50W max.                 |
| Internal Leakage..... | -1.0 x 10 <sup>-4</sup> sccs GHe | Data Interface.....            | RS-422                           |

*Performance characteristics are based on customer requirements. As such, they are not representative of component capabilities or limitations.*

## Envelope Drawing:



## Flow Schematic:

