HYDRAZINE/ION THRUSTER CONCEPT

Product Type:
Compact High-Precision Ion/Hydrazine Thruster Unit

Intended Use:
Micro- to small-scale spacecraft propulsion for orbital maneuvering, attitude control, and station keeping.

DIMENSIONAL CHARACTERISTICS

– Total Thruster Height: 101.6 mm (4 inches)
– Thruster Diameter: 50.8 mm (2 inches)
– Chamber Height: 25.4 mm (1 inch)
– Base and Top Chamfers: 4 × 4.76 mm (3/16 inch)
– Axle Bore Diameter: 12.7 mm (1/2 inch + tolerance)
– Lower & Upper Grip Height: 17.46 mm (approx.)
– Hexagonal Injector Pocket (Big): ~36.5 mm flat-to-flat
– Hexagonal Injector Pocket (Small): ~25.9 mm flat-to-flat

MECHANICAL FEATURES

– Hexagonal bolt and injector socket machined into both ends
– Chamfered edges for weight optimization and aerodynamic blending
– Central bored channel for anchoring rod or nozzle attachment
– Cylindrical body generated via rotational extrusion in OpenSCAD
– Modular top and bottom injector accommodation with standardized endmill cutter profiles
– Integrated mechanical pockets for injector flow plates or fluid inlets

PROPULSION-SPECIFIC FEATURES

– Dual compatibility with ionized gas injection or monopropellant (hydrazine) pulse feeds
– Propellant Compatibility: N_2H_4 (hydrazine), xenon plasma, or similar
– Injector Array Support: 3–6 modular nozzles in equidistant hex pattern
– Central axial plasma or fuel conduit
– Back-vented ionization grid chamber for ion thruster configuration
– Nozzle cone geometry optimized for low-volume thrust pulses and focused vectoring
– Expandable with external ionization or RF coil modules
– Materials compatible with pressurized and corrosive fluid environments (e.g., titanium alloy or Inconel recommended in physical models)

THERMAL AND STRUCTURAL CONSIDERATIONS

– Chamfer design improves thermal dissipation
– Symmetric cylindrical mass distribution to ensure rotational stability
– Can be integrated into clustered propulsion systems (e.g., quad-layout or ring assembly)
– Reinforced base and top ring for increased torque during mounting or orbital ignition cycles

MANUFACTURING & ASSEMBLY NOTES

– All parts modeled parametrically in OpenSCAD for easy scaling
– Machinable via CNC or additive manufacturing (metal 3D printing)
– Injector and nozzle slots compatible with standard aerospace microvalves
– Hexagonal features designed to interface with torque wrenches or robotic assembly arms

POTENTIAL APPLICATIONS

– Small satellite propulsion (CubeSats, microsatellites)
– Deep space ion maneuvering units
– Attitude control systems for experimental platforms
– Low-thrust high-precision navigation