

Inertial Electrostatic Confinement Diffusion Thruster

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Thruster Concept

The IEC Diffusion Thruster is based on the IEC device, a fusion reactor concept. IEC design incorporates radial acceleration of ionized particles to a central point where recombination is visible. Neutrons can be measured when operating the reactor with Deuterium. Operating with neutron emission requires restricted access to prevent overexposure. The device also shows visible results by using Argon, however there are no neutrons.

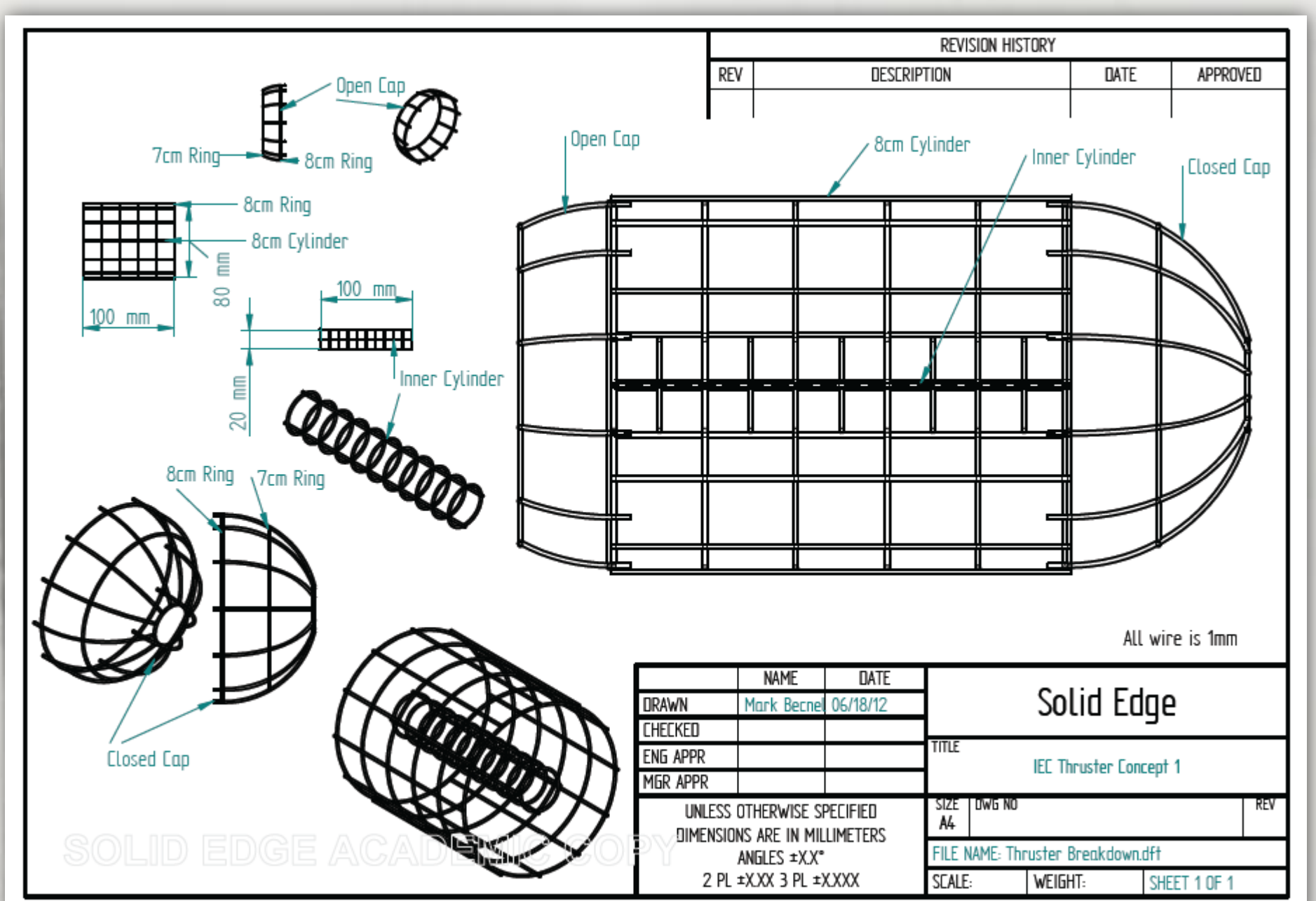


IEC Reactor, Argon, 2kV and 50mA
 Inner electrode through viewport
 MSFC ER-24

Requirements

- The IEC Diffusion Thruster must maintain the following design requirements:
1. Radial symmetry utilized for containment and a high-density core
 2. Electrical insulation of electrodes
 3. Thermal durability during operation
 4. High grid transparency, allowing particles to pass to thruster core

Computer Aided Design



IEC Diffusion Thruster CAD Design
 Designed in Solid Edge

Fabrication



Design Changes and Assembly

The initial designs involved a welded lattice for both the inner and outer electrodes. Welding technologies did not accommodate the inner electrode, and alternative technologies had to be considered. The product was rapid prototyped at the National Center for Advanced Manufacturing, Marshall Space Flight Center, out of titanium, sufficient for the forces applies in testing.

Future work will include integrating with the pendulum thrust stand, power loss mitigation, and orbital flight considerations.



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