

46ESS-62: Ion Thruster

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The ion thrusters belong to the electric propulsion category and are used by modern spacecraft either to maintain their position relative to the Earth or to complete deep space missions. Their main characteristic is the high specific impulse which involves an efficient use of the propellant, a mandatory requirement for space activities where weight is the main restriction. The thrust is generated by the acceleration of ionised gas through a nozzle at very high velocities. The mechanism used to achieve the acceleration distinguishes these propulsive devices in two main categories: electrostatic and electromagnetic. In the first type, a potential difference accelerates the ions through the Coulomb's force. In the second type the interaction of the ionised gas and a magnetic field generates the thrust through the Lorentz's force. This paper focuses on the analysis of the main features and architectures of the electrostatic ion thrusters. In the first part, the reasons why they are used for space applications are explained. Afterwards, the propulsors physic and the working principles are illustrated with considerations on their advantages and limitations. Eventually, an overview of the field of applications and future design innovations is presented.