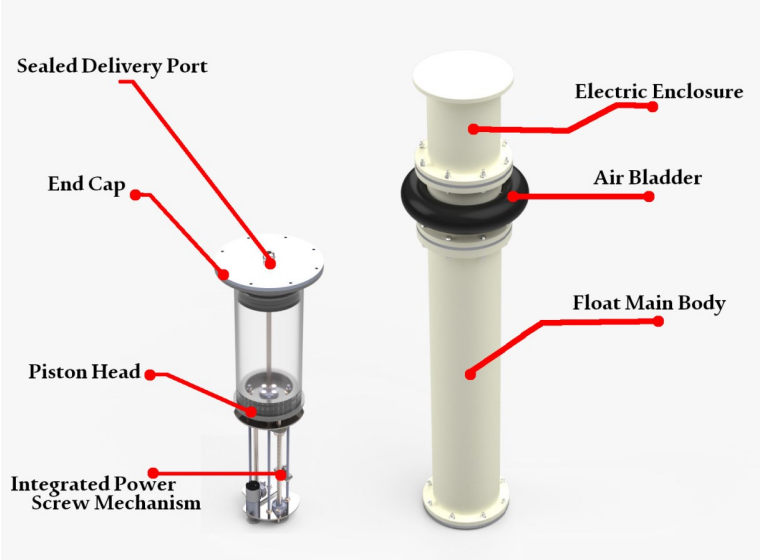
Controlling System

In order to achieve a projected medium cost, quick response time, and the easiest to manufacture, Multiple designs were introduced, tested, and assessed until it was decided to implement the idea of the reciprocating positive-displacement pump system as the best candidate with a change of making the process almost isobaric. The principle of the system is a motor transmits power to a lead screw - through a pulley system- that moves a carriage where the lead screw nut and the piston head's rod are fixed. supporting rods are put to support the movement of the carriage when it moves upwards. To adjust the water displacement volume by pushing in or pulling out a piston, modifying the vehicle's density and so the buoyancy, that will propel the vehicle through the water column.



Figure(2). Anubis || Float Device

System Design

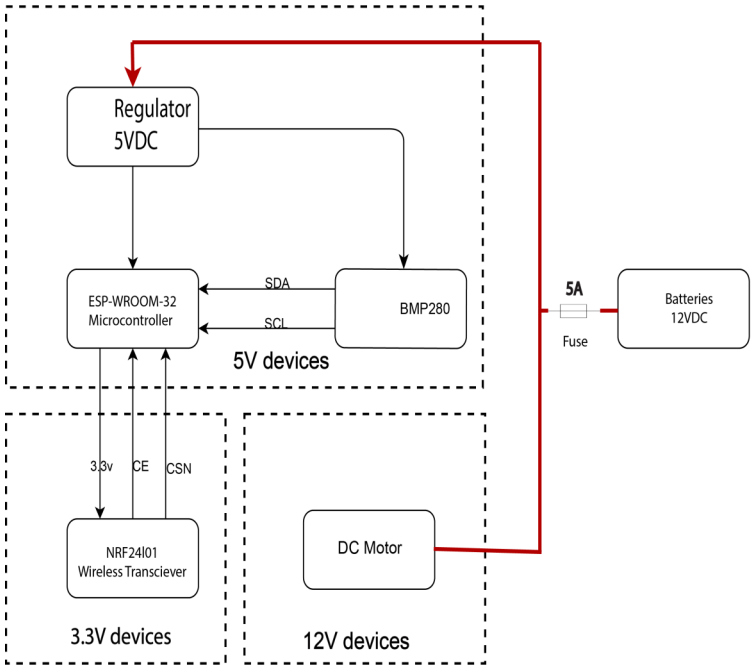
The determining operational requirements are a lead screw and its tools and designed housing for mechanical and electrical components. The seal around the system is important to maintain the pumping action and to avoid leaks to electrical components. So, the electrical enclosure consists of two parts. One is fixed to the mechanism's casing using fasteners with O-rings used for sealing. The other part is fixed using O-rings only so that if the pressure increases inside this part will be ejected outside the float's body. the upper flange is fixed to an aluminum cap by fasteners and sealed with O-rings to prevent leakage.

Stability

For a vertically translating variable buoyancy vehicle, it's clear that the center of buoyancy must be above the center of gravity for a stable dive path. To meet this condition, a max surf program was used. The simulation studies showed that the system with some orientation in roll and pitch because of any external disturbance will re-orient itself back because of the righting moment created due to CG and CB positions.

Electrical System

Anubis II utilizes a piston mechanism for controlling the movement by pumping air into and out of a enclosure. It is operated by an ESP32 microcontroller along with a BMP-280 pressure sensor, powered by 12V Alkaline batteries. The pressure sensor determines the device's height based on sampled pressure readings, deciding whether to ascend or descend. Movement is achieved by a DC motor -driven piston, which stops at the end of its travel path signaled by motor driver. A real-time clock chip ensures accurate time readings, transmitted wirelessly to the control station via a wireless module and HTTP web server. Anubis know it's depth by pressure displacement, from pressure sensor.



Figure(2). Anubis || Electrical SID