

OVER-DEFINED VERTICAL PROFILING FLOAT INSPECTION SHEET

Name: Submerger

Diameter: 17.4cm **Height:** 62.6cm

Weight: 8.57 kg

Power Supply: Powered from 8*1.5V

AA NiMH batteries connected in series

Safety Features:

- 2A Fuse
- No sharp edges
- Electronics are appropriately labelled and sealed

Design rationale:

Our float, Submerger, has a syringe with a plunger inside controlled by the encoder motor. The encoder motor moves based on the depth detected by the pressure sensor to maintain a suitable buoyancy and hence position. We use an nRF24 module for data transmission.

Operation:

The previous version of our float used Bang-Bang control to adjust the plunger position. This system was unstable and had high delays, which led to several operational issues. Therefore, this year, we used two PID controlling systems to control the plunger, allowing the float to reach its target position efficiently.

After the vertical profiles, the submerger uses the nRF24 module to wirelessly transmit the data packets to the control station. Then, our program at the station would filter out the invalid data and choose the accurate data to plot a depth-time graph.

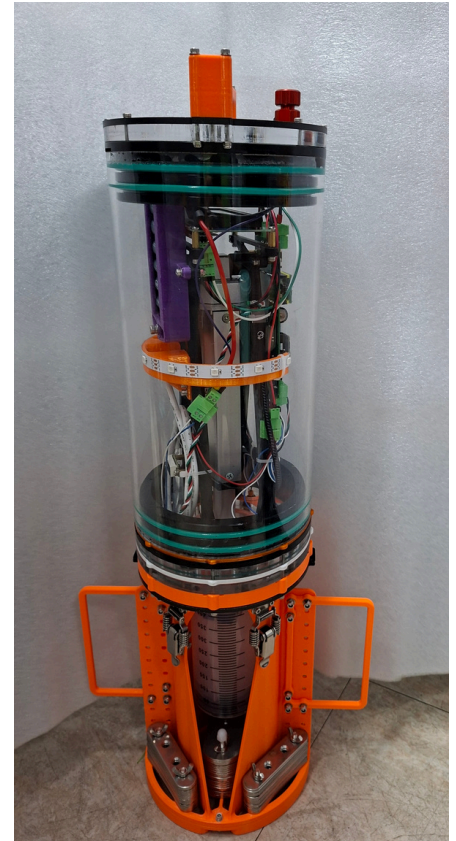


Figure 1: Submerger (Float)



Figure 2: AA NiMH batteries



Figure 3: 2A Fuse

Battery Pack Design

The VPF uses Ni-MH batteries with a maximum discharge rate of 3C, where each 1C equals 2450mAh. This gives a maximum current supply of 7.35A, which safely covers the VPF's full load current of 1.8A. The battery pack design ensures that the system operates reliably within these parameters, providing sufficient power for all onboard components.

Additional Features for Testing and Monitoring

For replacing traditional physical calibration, we have designed “Editor mode”, allowing us to change parameters wirelessly, increasing testing efficiency.

Moreover, an LCD and an LED strip are installed to indicate the submerger's different states when the float is deployed.

Furthermore, the waterproof compartment is connected to the stand by 4 latches, allowing quicker assembly and disassembly. The buoyancy can also be adjusted by adding or removing metal pieces, and we use butterfly screws for easier adjustments.

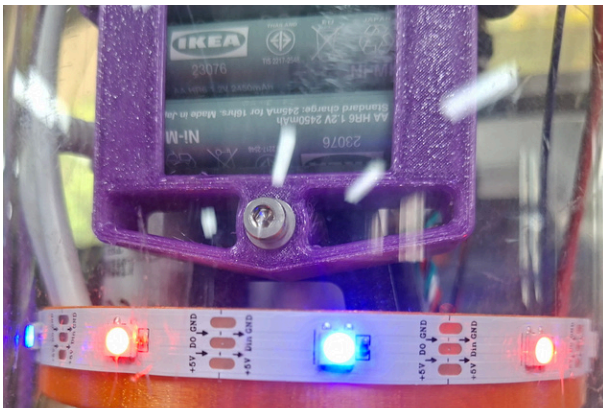


Figure 4: LED light strip

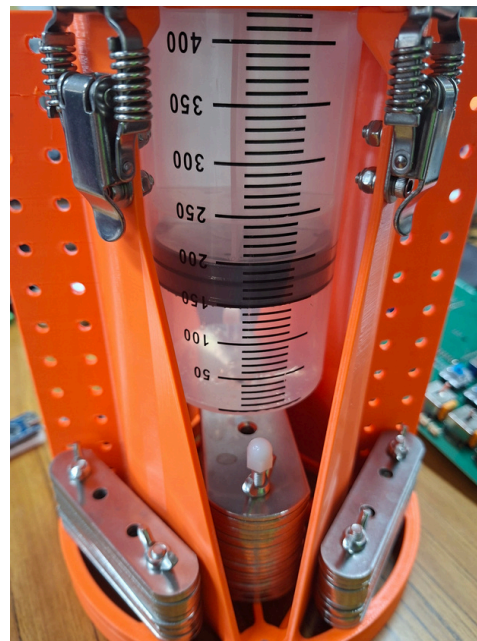
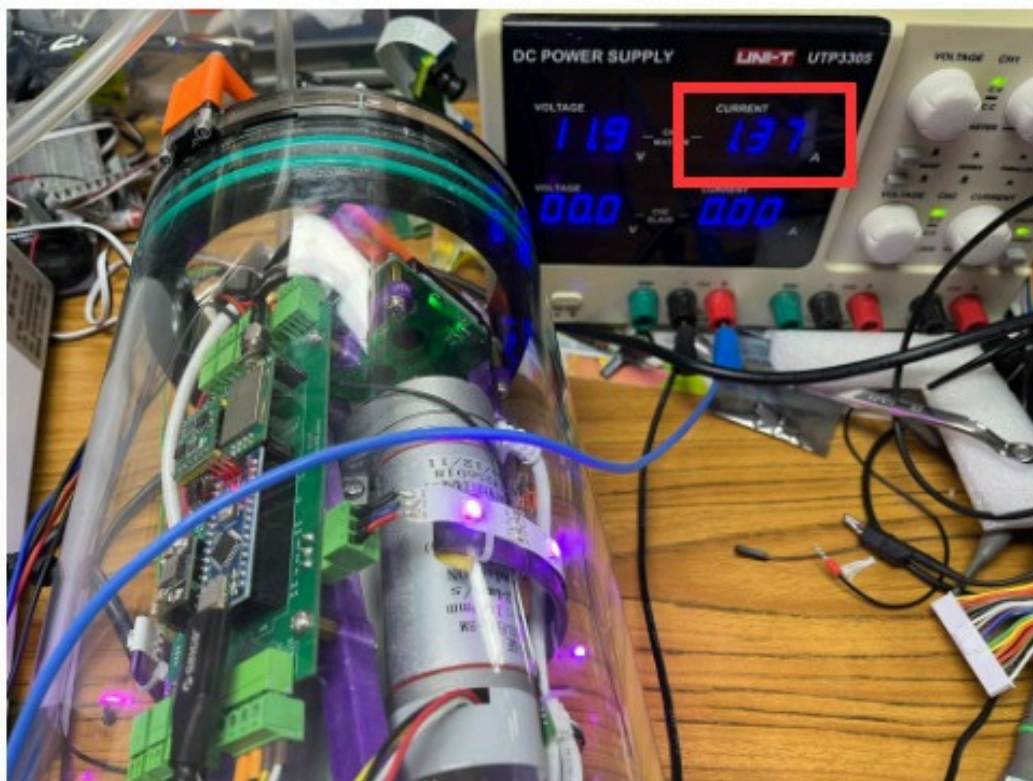
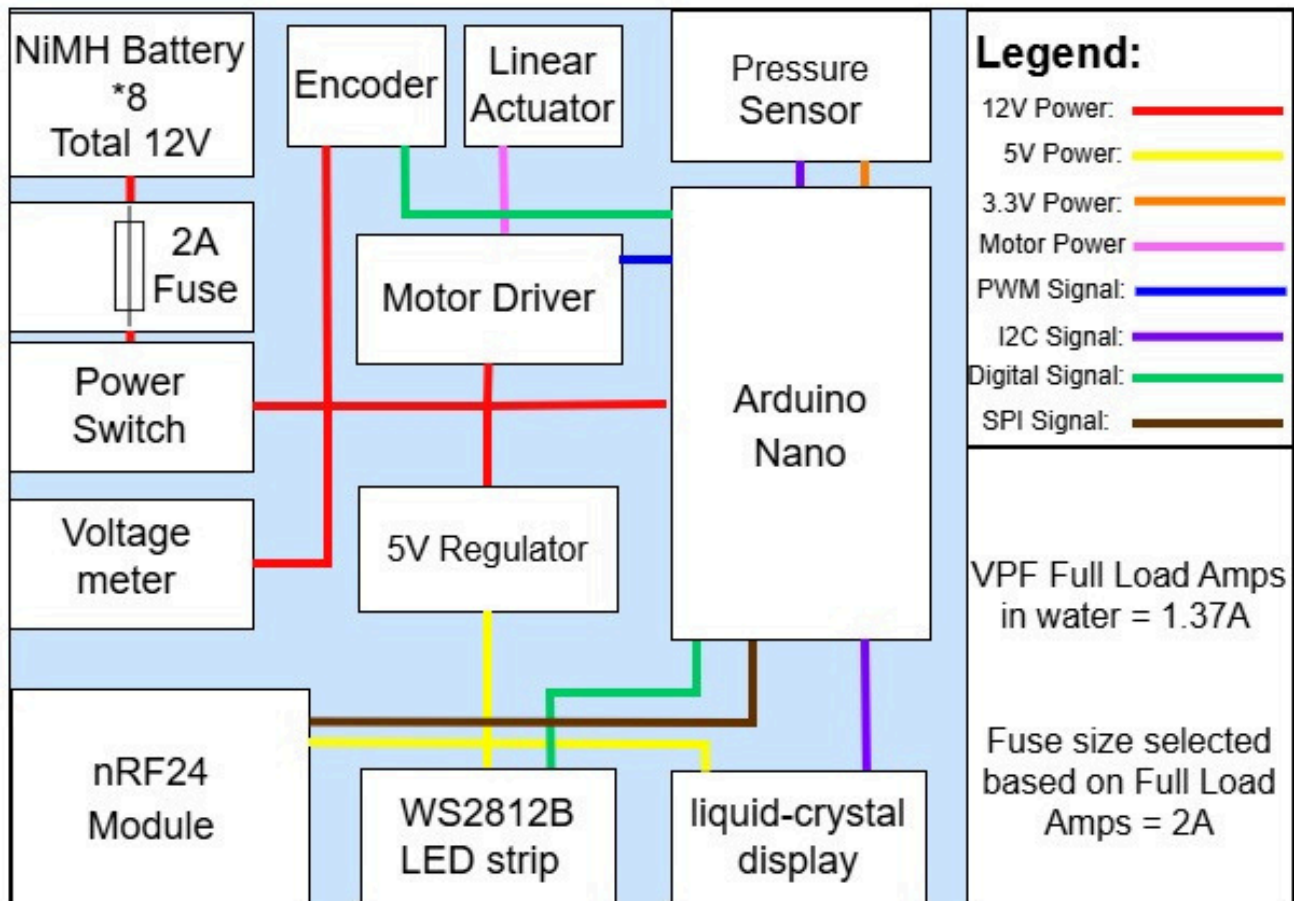


Figure 5: latches and metal pieces

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The above figure shows the full load amps in a simulated environment. A vacuum pump is used to simulate the water pressure at a depth of 9 m.