

## OVER-DEFINED VERTICAL PROFILING FLOAT INSPECTION SHEET

**Name:** Submerger

**Diameter:** 17cm **Height:** 64cm

**Weight:** 8.4kg

**Power Supply:** Powered from 8\*1.5V

AA NiMH batteries connected in series

**Safety Features:**

- 3A Fuse
- No sharp edges
- Electronics are appropriately labelled and sealed

**Design rationale:**

The VPF is equipped with a pressure sensor and a linear actuator with an encoder. The pressure sensor calculates its speed and position in the water, while the encoder detects the plunger's position. Using this information, the linear actuator adjusts the plunger, controlling the amount of water inside the system. This mechanism regulates buoyancy, ensuring the VPF moves steadily within the target region.

Once the VPF is deployed in the pool, it initially sinks and detects whether its motion is sinking or floating. If it floats above the target region, it pumps in water to remain within the desired range. Conversely, if it sinks below the target region, it expels water to maintain its position.

**Operation:**

The VPF records pressure data every five seconds. After collecting ten readings within the target range, it surfaces and generates a data packet. The data packet is then wirelessly transmitted to the land station using the RF24 module.

If necessary, commands can be sent to the VPF after deployment to adjust its functionality or retrieve specific data. These communications are also facilitated via the RF24 module.



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### **Battery Pack Designed**

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**

To make testing results clearer and easier to visualize, the VPF is equipped with an LCD display that shows the current pressure, speed, and other relevant data in real time.

Additionally, LED lights are installed to indicate the VPF's state of motion. These lights change color based on whether the VPF is sinking, floating, or stationary, providing visual feedback for easier monitoring during testing and operation.

