DUXING POSEIDON

XI'AN JIAOTONG UNIVERSITY IN XIAN,CHINA

company information

The CEO-Qingzhe Xiong

The CTO--Haitong Xu

The CFO--Chao Wang

The CMO --Shunheng Xin

The CSO-Yurui Wang

The COO--Yudong Fan

Production Engineer -Zuyu Cheng

Sales Manager -Haolin Zhang

Administrative Manager --Hongrui Yuan

Industrial Engineer--Jinxin Shi

Manager of the Manufacturing Division--Shiqing Liu

Management and governance of the engineering and technology department --Jingshun Sun

Non-ROV device design document

THEME

Buoy Report

Brief description of principle

1. Function: The profile buoy can move vertically (i.e. from the surface of the water to the bottom and back to the surface). When the buoy reaches the surface, it sends its team number, time, depth and pressure data to the mission signal station

2. Principle: Buoyancy drive device is used to transport fluid from the inside. The reservoir uses a needle to store or drain seawater to change the density of the buoy, allowing it to float up and down. ESP32 is used for the motion control and transmission of the relevant data, which is fast and easy to operate

3. Working process:

(1) Initialization: The ROV arranges the buoy to the specified position on the water surface. The electronic control system performs self-checking, obtains the position of the thrusters through micro switches on the upper limit, and positions the two needle thrusters at the top, filled with air to keep the buoy above the water surface. The Bluetooth receiver is activated and connected to the upper computer for communication, waiting for the diving command, while the motion control system is turned off.

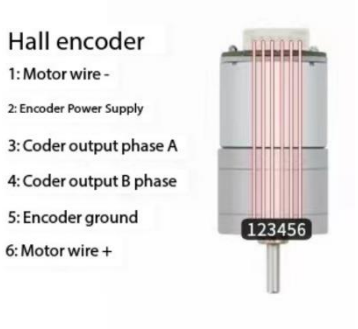

figure1 ESP32 communication board **figure2 motor with Hall Coder**

(2) Diving: After receiving the diving command from the upper computer via Bluetooth, the ESP32 rotates the motor to drive the lead screw to rotate, thereby realizing the pushing and pulling operation of the push-pull handle. When reaching the lower limit, the motor locks the position. After suctioning the needle, the liquid flows from the rubber water pipe to the needle cylinder, increasing the average density of the buoy body. When its density is greater than that of seawater, the buoy automatically sinks. During the diving process, the ESP32 obtains depth data in real-time through the depth gauge located at the bottom of the buoy, storing the data every 5 seconds. When the depth data remains unchanged within a certain error range for 10 consecutive seconds, it is detected that the buoy has reached the bottom and is ready to ascend.

(3) Floating: After detecting that the buoy has reached the bottom, it gradually releases the liquid in the needle cylinder by pulling the push-pull handle (still discharged from the rubber pipe). When reaching the upper limit, the motor locks the position to reduce the average density of the buoy body. When its density is less than that of seawater, the buoy automatically ascends. During the ascent, depth data continues to be monitored and recorded every 5 seconds. When the depth data

remains unchanged within a certain error range for 10 consecutive seconds, it is considered that the buoy has reached the water surface, depth detection is turned off, Bluetooth is reactivated, and scanning continues until connection with the upper computer is established to initiate communication.

(4) Communication: After connecting to the upper computer, the ESP32 sends the depth data of diving and floating via Bluetooth communication mode to the upper computer for processing. Upon receiving the data, the upper computer automatically processes the data and draws real-time graphs, while also backing up each set of data information locally for later retrieval. After the data transmission is completed, the buoy enters a low-power standby mode, waiting for the upper computer to send the next diving command.

Introduction to mechanical structure

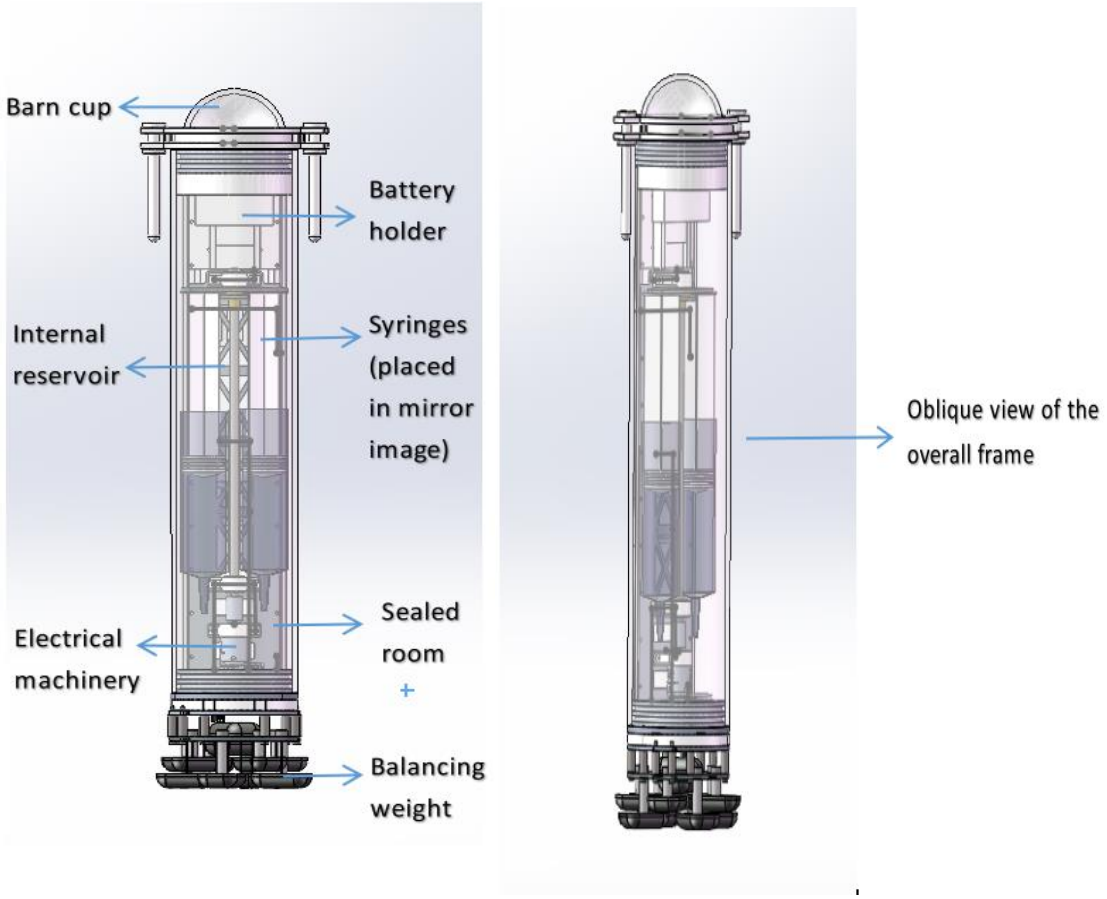

figure3 floats mechanical structure

Our buoy modeling is shown in the figures. It is mainly composed of a pillar-shaped sealed room, an electrical machinery, two syringes placed in mirror image, an internal reservoir and balancing weight. A 5V battery and a 24V battery are installed in the internal reservoir to supply power to the electrical machinery for driving the screw.STM32 controls the direction of the screw's rotation. ESP32 is responsible for completing the communication to the target receiving station. The two batteries are equipped for powering the two boards. The two syringes are connected with the rubber tubes, which are designed for water absorption and drawing off the water. The overall height of the buoy is about 640mm and the diameter is about 80mm.

Selection of propeller

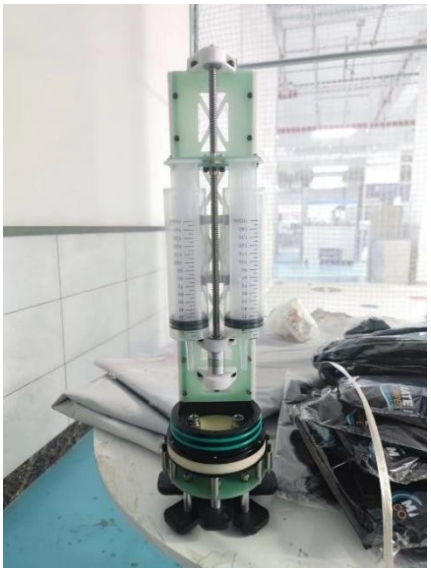

figure4 Structure of the floats compartment

The snapshot above shows the inner appearance of the float we built. You can see these two syringes. Its size, shape and function meet our requirements.

Flow chart of the electronic control system

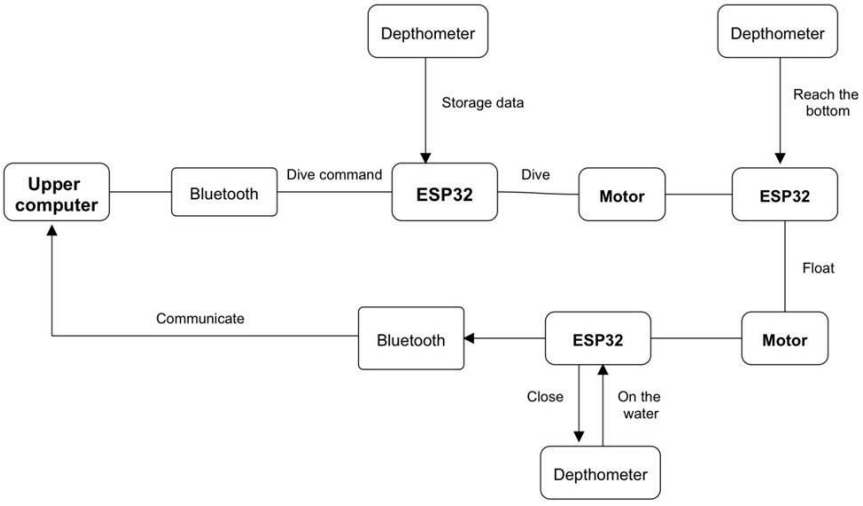

figure5 control system

figure6 Alkaline battery model