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ApisQueen 45A Bi-Directional ESC

ApisQueen 2-6S 45A Bi-Directional Electronic Speed Controller (ESC) User Manual

Model: 45A Bi-Directional ESC

1. Introduction

Thank you for choosing the ApisQueen 2-6S 45A Bi-Directional Electronic Speed Controller (ESC). This ESC is designed for use with underwater thrusters and motors in the continuous power range of 100-500W, offering reliable bi-directional control. Please read this manual thoroughly before installation and operation to ensure proper use and longevity of your device.

2. Safety Information

WARNING: This device is only splash-proof or suitable for short periods of water immersion. It is not designed for continuous submersion or deep-water operation. Ensure all connections are properly insulated to prevent short circuits.

- Always disconnect the battery before making or changing any connections.
- Ensure correct polarity when connecting the battery to avoid damage to the ESC and battery.
- Operate the ESC within its specified voltage and current limits.
- Keep the ESC away from heat sources and direct sunlight.

3. Product Overview

3.1 Key Features

- Bi-directional control for forward and reverse thruster/motor operation.
- Waterproof rating IPX6: splash-proof or suitable for short periods of water immersion.
- Support for OneShot 125 protocol.
- Utilizes a powerful, high-performance MCU for efficient operation.
- Compact size and lightweight design.
- Firmware optimized specifically for underwater thrusters, ensuring excellent compatibility and stability.
- Highly adaptive and user-friendly firmware that balances system stability and battery life.
- Supports throttle signals with refresh rates up to 500Hz (note: throttle signals ≥500Hz are non-standard).

3.2 What's in the Box

- ApisQueen 45A ESC x 1

3.3 Physical Description



Image 1: Front View of the ApisQueen 45A ESC. This image shows the main body of the ESC with the ApisQueen logo and '45A' rating clearly visible. The input power wires (red and black) with an XT60 connector are on one end, and the three motor phase wires (black) are on the other. A small signal wire (white, black) extends from the ESC.



Image 2: ApisQueen 45A ESC with XT60 Connector. This view highlights the XT60 battery connector and the signal wire. Text on the image indicates '4.0' (likely wire gauge) and 'XT60'. A crucial note states: 'This ESC does not have a BEC 5V output and cannot power the receiver, and requires additional power supply.'

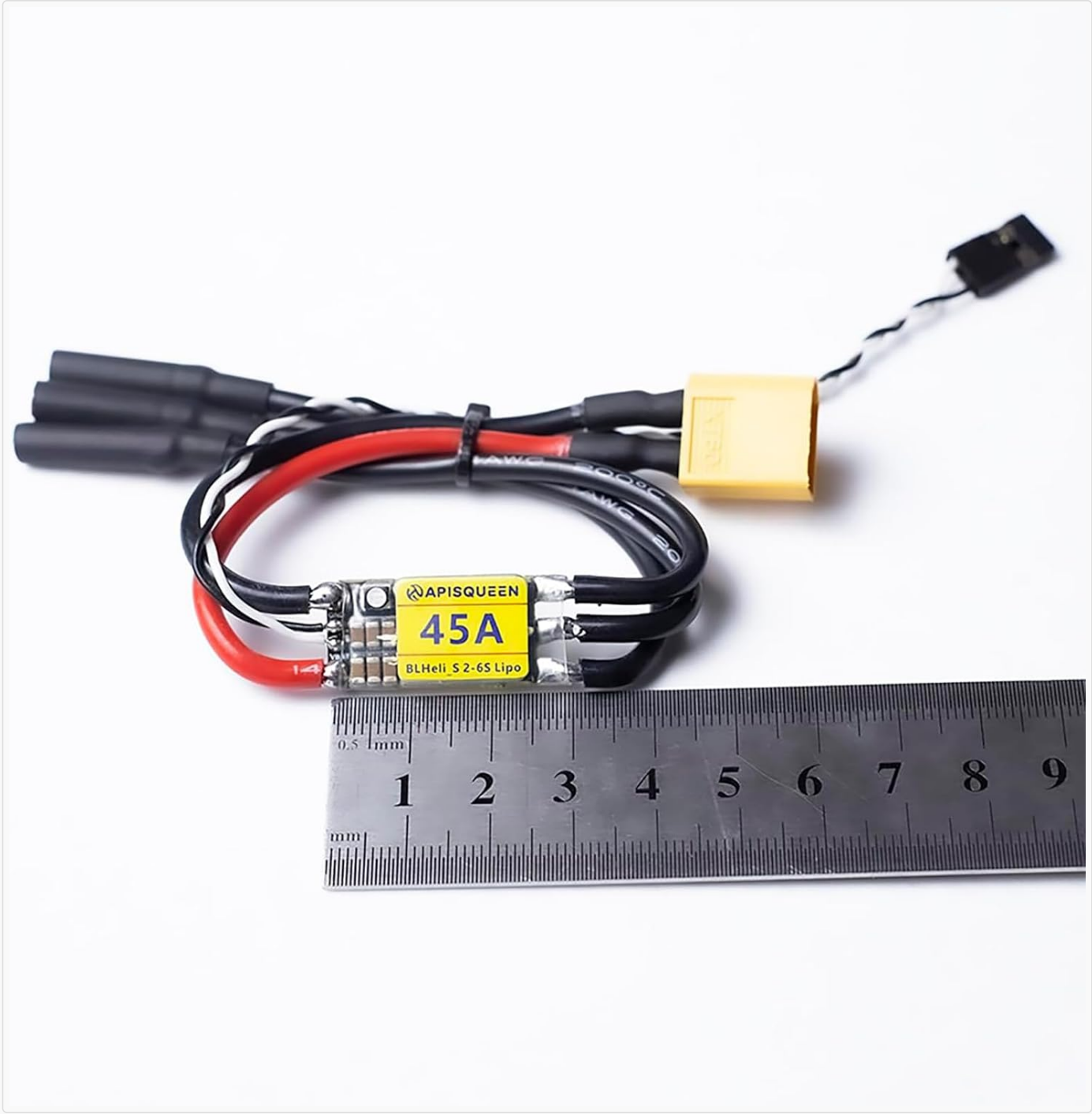


Image 3: ApisQueen 45A ESC with Ruler. The ESC is shown alongside a metric ruler, indicating its compact size. The main body of the ESC is approximately 30mm long.

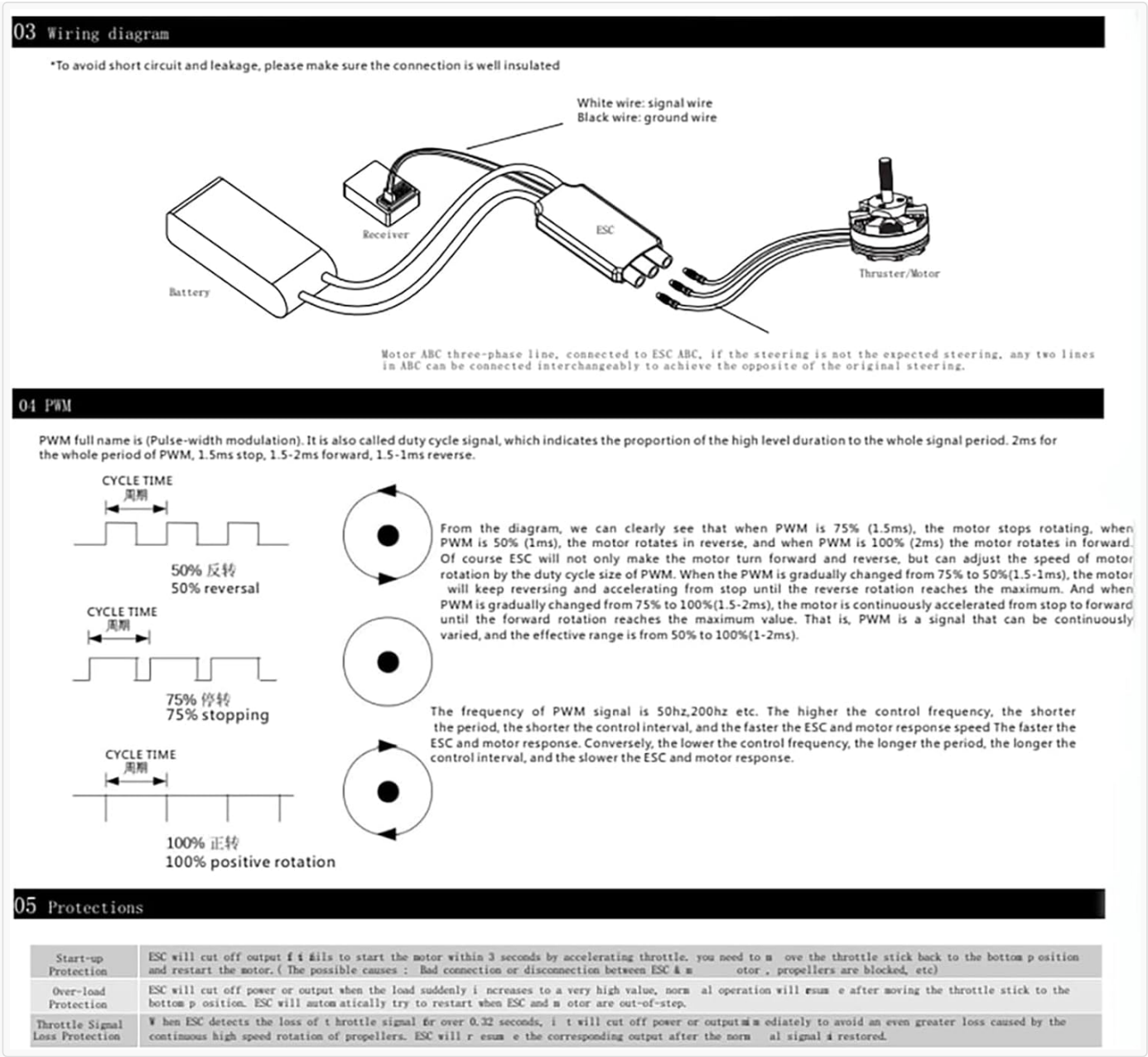


Image 4: ApisQueen 45A ESC Waterproof Rating. This image emphasizes the 'WATERPROOF: IPX6' rating, indicating its resistance to strong jets of water or temporary immersion.

4. Specifications

Feature	Specification
Input Voltage	2-6S LiPo (7.4V - 25.2V)
Continuous Current	45A
Control Type	Bi-directional
Waterproof Rating	IPX6
BEC Output	None (requires external 5V supply for receiver)
Throttle Signal Refresh Rate	Up to 500Hz
Dimensions	1.25 x 0.53 x 0.2 inches (approx. 31.75 x 13.46 x 5.08 mm)

Feature	Specification
Item Weight	1.12 ounces (approx. 31.75 grams)

5. Setup and Wiring

Proper wiring is crucial for the safe and correct operation of your ESC. Refer to the diagram below for connection details. Ensure all connections are secure and properly insulated to prevent short circuits.

Image 5: Wiring Diagram, PWM Explanation, and Protections. This comprehensive diagram illustrates the connections between the battery, receiver, ESC, and thruster/motor. It also details PWM signal characteristics and lists various protection mechanisms.

5.1 Connection Steps

1. **Battery Connection:** Connect your 2-6S LiPo battery to the XT60 connector of the ESC. Ensure correct polarity (red to positive, black to negative).
2. **Motor/Thruster Connection:** Connect the three phase wires from the ESC to your thruster/motor. The motor ABC three-phase line connects to ESC ABC. If the steering is not the expected steering, any two lines in ABC can be connected interchangeably to achieve the opposite of the original steering.
3. **Receiver Connection:** Connect the signal wire (white: signal, black: ground) from the ESC to the throttle channel of your receiver. **Important:** This ESC does not have a built-in BEC (Battery Eliminator Circuit). You must provide a separate 5V power supply to your receiver.

6. Operation

6.1 Bi-directional Control

This ESC provides bi-directional control, allowing your thruster/motor to operate in both forward and reverse directions. The direction and speed are controlled by the PWM (Pulse-Width Modulation) signal from your receiver.

6.2 PWM Signal Interpretation

PWM is a digital signal where the duration of the high level (pulse width) within a fixed period determines the control output. The ESC interprets this signal as follows:

- **50% PWM (1.5ms pulse width):** Motor stops rotating. This is the neutral point.
- **PWM < 50% (e.g., 25%):** Motor rotates in reverse. As PWM decreases from 50% to 0%, reverse speed increases.
- **PWM > 50% (e.g., 75%):** Motor rotates in forward. As PWM increases from 50% to 100%, forward speed increases.

The frequency of the PWM signal is 50Hz (20ms period). Higher control frequencies generally lead to faster ESC and motor response.

7. Maintenance

- **Cleaning:** After use, especially in saltwater environments, rinse the ESC with fresh water and allow it to dry completely before storage.
- **Inspection:** Regularly inspect all wires and connectors for signs of wear, corrosion, or damage. Replace any damaged components immediately.
- **Storage:** Store the ESC in a dry, cool place away from direct sunlight and extreme temperatures.

- **Water Exposure:** While IPX6 rated, avoid prolonged submersion. If the ESC is submerged for an extended period, allow it to dry thoroughly before attempting to use it again.

8. Troubleshooting and Protections

The ESC is equipped with several protection features to ensure safe operation. Understanding these can help in diagnosing issues.

Protection/Issue	Description/Solution
Start-up Protection	If the motor fails to start within 3 seconds by accelerating throttle, the ESC will cut off output. Possible causes include bad connection or disconnection between ESC & motor, or propellers being blocked. To restart, move the throttle stick back to the bottom position and restart the motor.
Over-load Protection	If the ESC detects the output power or current is too high (e.g., due to a heavy load), it will cut off power or operate at a reduced level to avoid damage. Check for obstructions or excessive load on the motor.
Throttle Signal Loss Protection	If the ESC detects the loss of the throttle signal for over 0.32 seconds, it will cut off power output to avoid an even greater loss caused by continuous high-speed rotation of propellers. The ESC will resume normal operation once a valid throttle signal is restored.

9. Warranty and Support

For warranty information and technical support, please refer to the product's purchase platform or contact ApisQueen customer service directly. Keep your purchase receipt as proof of purchase.

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