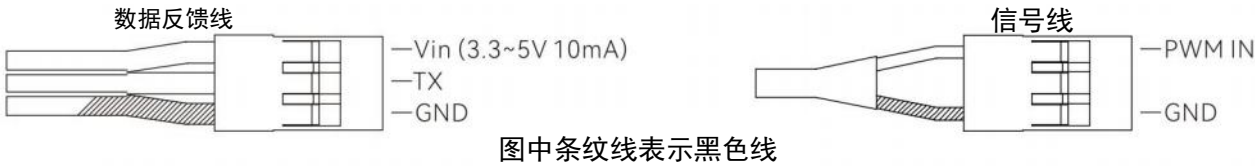


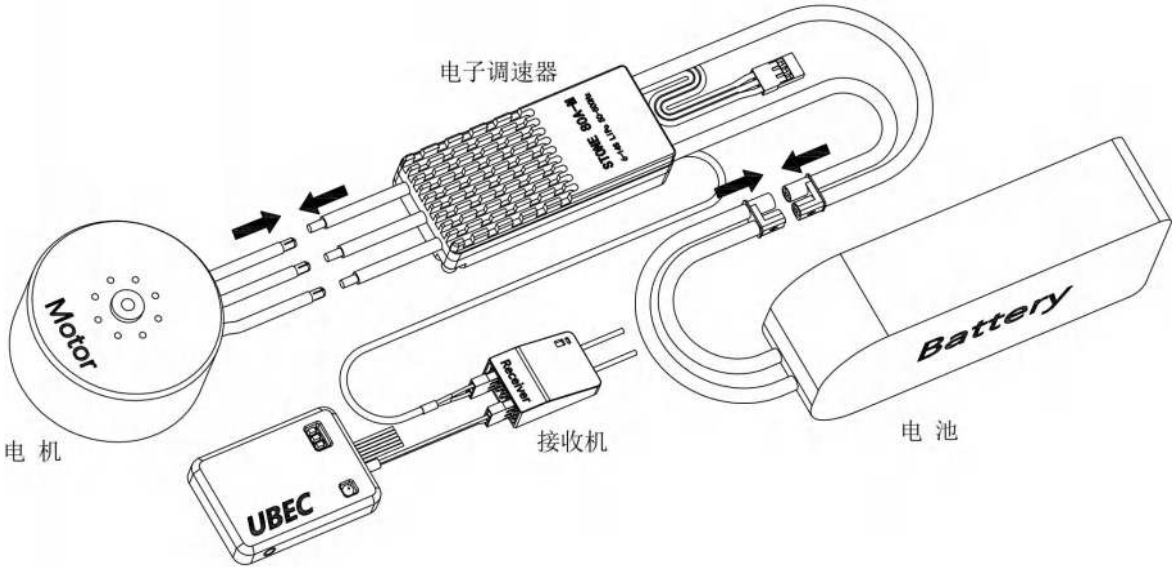
感谢您使用本产品！无刷动力系统功率强大，错误的使用可能造成人身伤害和设备损坏。为此，我们强烈建议您在使用设备前仔细阅读本说明书，我们不承担因使用本产品而引起的任何责任，包括但不限于对附带损失或间接损失的赔偿责任；同时，我们不承担因擅自对产品进行修改和错误使用所引起的任何责任。

我们有权在不经通知的情况下变更产品设计、外观、性能及使用要求。

## 接口定义



## 接线方式



## 油门校正

- 将油门信号调至最大值，接通电源将启动油门校正，电机将发出“♪123-3-3-3”，之后立即将油门信号调至最小值，电机将发出音乐“♪3-3-5-4”，音乐声结束后，油门行程校正完成。
- 首次使用、更换遥控器（油门信号发送设备）前必须校准油门行程，以实现准确控制。

## 数据输出

- 数据输出采用 3 线制 UART-TTL，波特率 38400bps，字符方式。
  - 数据包格式：SPD:XXXX TMOS:XXXX TMOT:XXXX TMCX:XXXXXXXXXXXX CURI:XXXX VOLT:XXXX PWAC:XXXX  
SYS:XXXXXXXXXXXX DBG:XXXXXXXXXXXX
- 其中：
- SPD:XXXX 电机转速（RPM，误差±12RPM，按电机极数 42P 换算得出）
- TMOS:XXXX 电调温度（℃，误差±1℃）
- TMOT:XXXX 电机温度（℃，误差±1℃，保留数据）
- TMCX:XXXXXXXXXXXX （调试数据）
- CURI:XXXX 电机电流（×0.01A，误差±10%，主要用于电调的过流保护）
- VOLT:XXXX 电源电压（×0.01V，误差±0.5V）
- PWAC:XXXX （调试数据）
- SYS:XXXXXXXXXXXX （调试数据）
- DBG:XXXXXXXXXXXX （调试数据）

故障现象

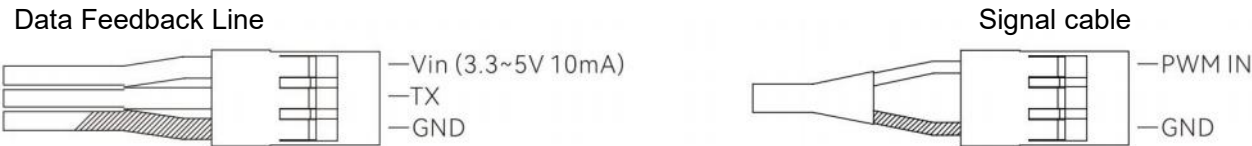
| 故障现象                     | 报警音                       | 可能原因                          | 解决办法                          |
|--------------------------|---------------------------|-------------------------------|-------------------------------|
| 通电后没反应                   | 无                         | 电调未通电<br>内部电源系统故障             | 检查并接通电源<br>返厂检修               |
| 有通电提示音，加油门<br>不启动也无报警音   | ♪123-                     | 油门未归零，等待零油门解锁<br>或高油门进入油门行程校准 | 检查确认信号源的PWM信号<br>数值，或重新校准油门行程 |
| 通电提示音正常，加油<br>门不启动并发出报警音 | ♪123-3<br>♪11111-持续（加油门时） | 检测到电源电压过高<br>而禁止启动            | 检查供电电源电压，<br>或返厂检修            |
| 通电后持续发出报警音               | ♪123-<br>♪1短1长（持续）        | PWM信号持续低电平                    | 检查信号线路                        |
| 通电后持续发出报警音               | ♪123-<br>♪1长1短（持续）        | PWM信号持续高电平                    | 检查信号线路                        |
| 运行过程中减速和停机<br>后持续发出报警音   | ♪1短（间隔1s）                 | 油门信号丢失                        | 检查信号线路                        |
| 油门归零关停后发出<br>报警音         | ♪3-1-3-1（间隔1s）            | 预警，运行过程中油门信号<br>不稳定           | 检查信号线路，或返厂检修                  |

安全告知

- 信号脉冲宽度，频率必须符合要求。不要拉拽和带电插拔控制信号线，确保电调信号线连接可靠无松动，以防产生干扰信号导致控制异常。
- 电源连接可以使用防打火插头，但要确保连接可靠（连接不良会导致插头烧蚀，甚至电源故障）；输出相线不要使用防打火插头，不要带电插拔。确保电源电压稳定（如果是电池供电，注意电池放电倍率要高，低温放电性能要好），否则有可能导致电调损坏。
- 保证电调散热良好，电调长期工作于高温状态会加速元器件的老化，大幅减少电调使用寿命。建议实时监测工作温度，根据实时输出的温度数据，判定当前工况是否安全（温度低于100℃比较安全，高于100℃为散热不良或负载过重，超过115℃不安全）。
- 电调余电未放尽前禁止输出相线短路，可能引起电调损坏。
- 本产品应用于飞行器时，需注意如下事项：
  - ① 请使用合理配置搭配电调，以获得最佳性能（力效，功率，安全性）。若采用不匹配的电机、螺旋桨（甚至不是螺旋桨负载或变化负载）或非正确的电压，可能达不到最优性能，甚至损坏电调。
  - ② 每次飞行前建议检查飞行器各部分结构是否有松动、老化或损坏等情况，机臂和螺旋桨固定螺丝必须锁紧牢固。
  - ③ 务必使用稳定负载，螺旋桨被外部堵转时应尽快关闭油门或断电，防止堵转电流过大而损坏电调。
- 严禁超载使用，否则产品性能和安全将无法得到保证。
- 请勿擅自拆解改装产品，否则无法保证使用性能与安全及保修服务。

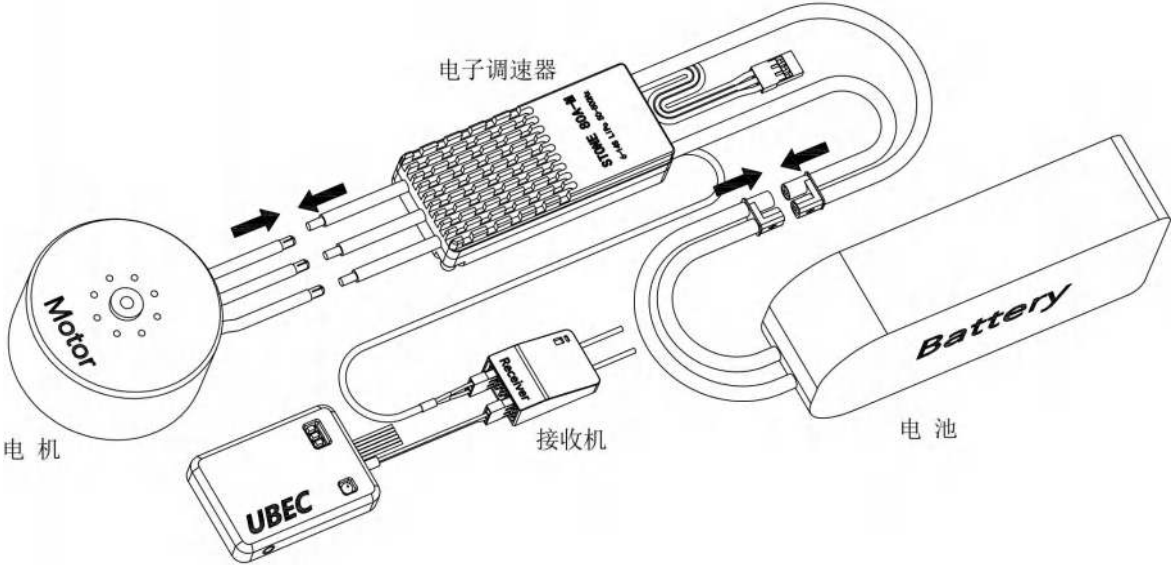
Thank you for using this product! The brushless power system delivers high power output, and improper use may cause personal injury or equipment damage. Therefore, we strongly recommend carefully reading this manual before operating the device. We assume no liability for any damages arising from the use of this product, including but not limited to compensation for incidental or consequential damages. Furthermore, we shall not be held responsible for any issues resulting from unauthorized modifications or incorrect usage of the product. We reserve the right to modify the product's design, appearance, performance, and usage requirements without prior notice.

Interface Definition



The striped lines in the figure represent black lines.

Interface Definition



Throttle Calibration

- Set the throttle signal to maximum value. Powering on will initiate throttle calibration. The motor will emit “♪123-3-3-3”. Immediately thereafter, set the throttle signal to minimum value. The motor will emit the melody “♪3-3-5-4”. Once the melody concludes, throttle travel calibration is complete.
- Throttle travel calibration is mandatory before first use or after replacing the remote control (throttle signal transmitter) to ensure precise control.

Data Output

- Data output employs a 3-wire UART-TTL interface with a baud rate of 38400 bps in character mode.
- Data packet format:SPD:XXXX TMOS:XXXX TMOT:XXXX TMCX:XXXXXXXXXXXXX CURI:XXXX VOLT:XXXX PWAC:XXXX  
SYS:XXXXXXXXXXXXX DBG:XXXXXXXXXXXXX  
Among them:  
SPD:XXXX Motor Speed (RPM, error±12RPM, Converted based on the motor's 42-pole configuration.)  
TMOS:XXXX ESCTemperature (°C, error±1°C)  
TMOT:XXXX Motor Temperature (°C, error±1°C, Retain Data)  
TMCX:XXXXXXXXXXXXX (Debugging Data)  
CURI:XXXX Motor Current (×0.01A, error±10%, Primarily used for overcurrent protection in electronic speed controllers)  
VOLT:XXXX Power supply voltage (×0.01V, error±0.5V)  
PWAC:XXXX (Debugging Data)  
SYS:XXXXXXXXXXXXX (Debugging Data)  
DBG:XXXXXXXXXXXXX (Debugging Data)

Fault Symptoms

| Fault Symptoms   | Alarm sound                                       | Possible causes  | Solution  |
|--|---|--|---|
| No response after powering on  | No  | Electronic control unit not energized Internal power supply system failure   | Check and connect the power supply<br>Return to factory for repair                      |
| Power-on alert tone sounds; accelerate.No alarm sounds if it fails to start. | ♪ 123-  | Throttle position not at zero. Awaiting zero throttle unlock or high throttle input to initiate throttle travel calibration. | Verify the PWM signal value from the signal source, or recalibrate the throttle travel. |
| Power-on alert tone is normal. Throttle does not engage and an alarm sounds. | ♪ 123-3 ♪<br>11111-Continuous (when accelerating) | Detected excessive power supply voltageand prohibited startup  | Check the power supply voltage,or return to the factory for repair.                     |
| Continuous audible alarm upon power-up                                       | ♪ 123- ♪ 1 short, 1 long (continuous)             | PWM signal remains low   | Inspect the signal lines  |
| Continuous alarm sound after power-on  | ♪123-♪1 long 1 short (sustained)                  | PWM signal remains at a high level   | Inspect the signal lines  |
| Continuous alarm sounds during operation,deceleration, and after shutdown.   | ♪1 short (1-second interval)                      | Throttle signal loss   | Inspect the signal lines  |
| After throttle returns to zero and engine shuts down, an alarm sounds.       | ♪3-1-3-1 (1-second interval)                      | Warning: Throttle signal instability during operation  | Inspect the signal lines, or return to the factory for repair.                          |

## Safety Notice

- Signal pulse width and frequency must meet specifications. Do not pull or plug/unplug control signal cables while energized. Ensure ESC signal cables are securely connected without looseness to prevent interference signals causing control abnormalities.
- Power connections may use spark-proof plugs, but ensure connections are secure (poor connections may cause plug erosion or even power supply failure). Do not use spark-proof plugs for output phase wires, and avoid hot-swapping. Ensure stable power supply voltage (for battery-powered systems, ensure batteries have high discharge rates and good low-temperature discharge performance), otherwise ESC damage may occur.
- Ensure adequate ESC cooling. Prolonged operation at high temperatures accelerates component aging and significantly reduces ESC lifespan. We recommend real-time monitoring of operating temperature. Based on the continuously output temperature data, determine whether the current operating condition is safe (temperatures below 100°C are relatively safe; temperatures above 100°C indicate poor cooling or excessive load; temperatures exceeding 115°C are unsafe).
- Do not short-circuit the output phase lines before the ESC has fully discharged its residual power, as this may cause damage to the ESC.
- When using this product in aircraft, the following precautions must be observed:
  - ① Use a properly matched ESC configuration for optimal performance (torque efficiency, power, safety). Using mismatched motors, propellers (including non-propeller loads or variable loads), or incorrect voltage may result in suboptimal performance or damage to the ESC.
  - ② Before each flight, inspect all aircraft components for loose, aged, or damaged parts. Ensure all arm and propeller mounting screws are securely tightened.
  - ③ Always use stable loads. If the propeller stalls due to external obstruction, immediately reduce throttle or cut power to prevent excessive stall current from damaging the ESC.
- Overloading is strictly prohibited, as it compromises product performance and safety.
- Do not disassemble or modify the product without authorization, as this will void performance guarantees, safety assurances, and warranty coverage.