

无刷电子调速器说明书

感谢您购买中特威天鹰系列无刷电子调速器。为了安全起见，我们强烈建议您在使用之前仔细阅读本产品使用手册。我们不承担因使用本产品或擅自对产品进行改造所引起的任何责任，包括但不限于对附带损失或间接损失的赔偿责任。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。

注意事项

- 使用此产品的时候，时刻牢记安全第一。
- 马达连接好电池和电调的情况下，有可能意外启动而造成伤害，请谨慎连接。
- 连接电池前，如果需要对飞机或者直升机进行近距离操作，请先不安装螺旋桨或者断开小齿轮。
- 请遵守当地所有关于遥控飞行器的法律法规。
- 请勿在人群上面或者附近飞行。

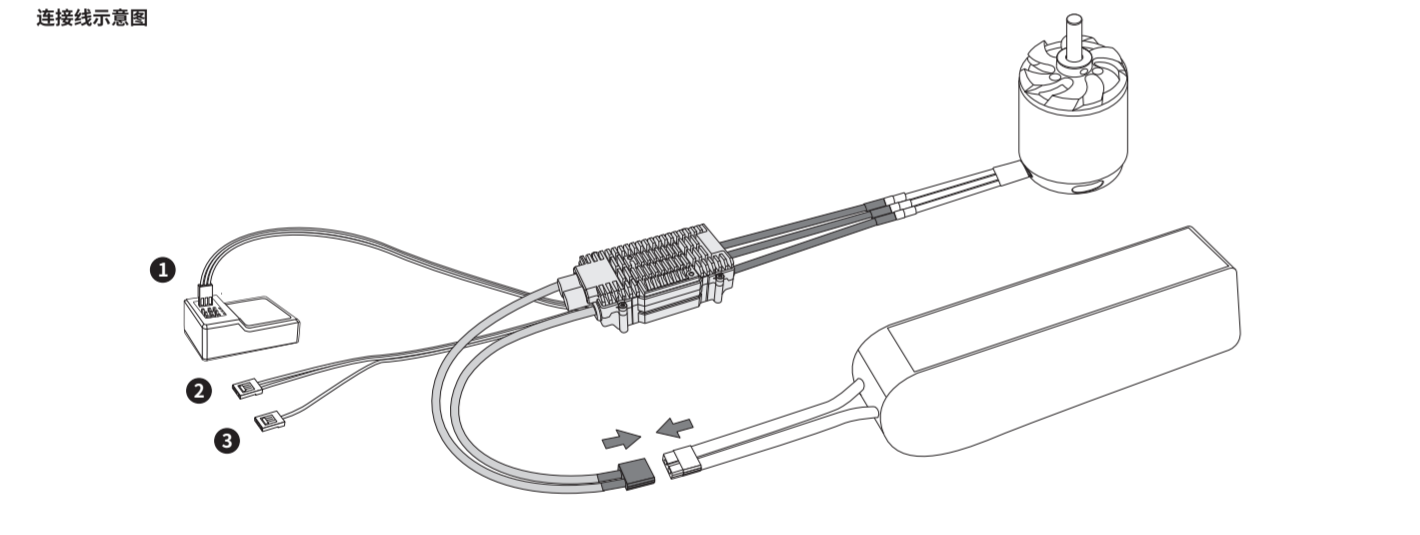
主要特性

- 采用高性能32位处理器，运行频率高达170MHz，运算能力极强，运行速度更快。
- 采用新一代制作工艺的功率输出元器件(MOSFET)，低发热，瞬间承受电流大，可靠性高。
- 自检功能:电调上电后会对电源短路，电机是否缺相，油门归零问题，电压范围进行自检。
- 单侧面开孔以及独特的吸风流道设计，极大地增强了电调散热性能。
- 具有两种飞行模式：固定翼模式和直升机模式。
- 具有直升机定速功能，定速感度可调，易于操作。
- 具有熄火降落反悔时间选择功能，在设定的时间内可人工中断熄火降落过程并快速重启电机，避免因操控失误而坠机。
- 电调有独立的编程接口，可用LCD编程卡或蓝牙模块为电调进行参数设定。
- 具有数据回传功能，可实时发送数据：电流、电压、温度、转速、油门、电调状态，手机App或LCD编程卡上可实时查看以上数据。
- 支持蓝牙无线调参，通过手机(苹果&安卓)APP可进行参数设置，升级电调软件，查看数据记录等操作。
- 多重保护：上电电压异常保护，启动保护，温度保护，油门信号丢失保护，过负荷保护，低压保护，过流保护。

产品规格

型号	编号	持续电流 峰值电流 (A)	电池节数	重量(g)	BEC输出	尺寸 (mm) (长*宽*高)	编程方式
Skyhawk 65A SBEC	4065211	65A /80A	3-6S Lipo	55	6V,7.4V,8.4V adjustable /10A	60*34*22	LCD编程卡G2/安卓&苹果APP
Skyhawk 125A SBEC	4125211	125A / 140A	3-8S Lipo	171	6V,7.4V,8.4V adjustable /10A	87*40*32	LCD编程卡G2/安卓&苹果APP
Skyhawk 155A SBEC	4155211	155A / 170A	3-8S Lipo	171	6V,7.4V,8.4V adjustable /10A	87*40*32	LCD编程卡G2/安卓&苹果APP
Skyhawk 130A HV SBEC	4130311	130A / 150A	6-14S Lipo	236	6V,7.4V,8.4V adjustable /10A	95*50*36	LCD编程卡G2/安卓&苹果APP
Skyhawk 160A HV SBEC	4160311	160A / 180A	6-14S Lipo	236	6V,7.4V,8.4V adjustable /10A	95*50*36	LCD编程卡G2/安卓&苹果APP
Skyhawk 300A HV OPTO	4300411	300A / 320A	6-14S Lipo	461	None	118*59*47	LCD编程卡G2/安卓&苹果APP

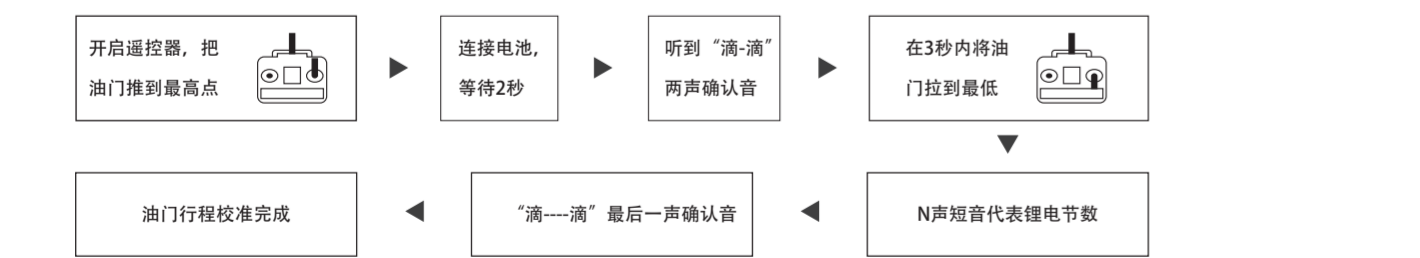
Ⓛ注:电调的重量和尺寸含风扇在内



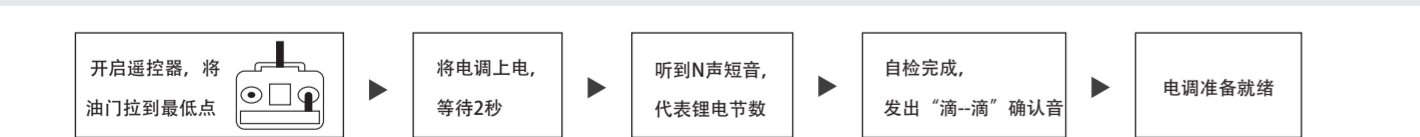
- Ⓛ** 油门信号线（黑、红、白）：插入接收电机油门通道，其中白线用于传递油门信号，而红线和黑线为电压输出线和地线。
- Ⓐ** BEC输出线（黑、红）：插入接收机电池专用通道或其它任意空闲通道。
- Ⓢ** RPM信号线（黄）：插入无副翼系统转速输入通道。

首次使用电调并设置油门行程

温馨提示：在首次使用本电调或更换其他遥控器使用时，请务必先重新设定油门行程。



电调的正常启动程序

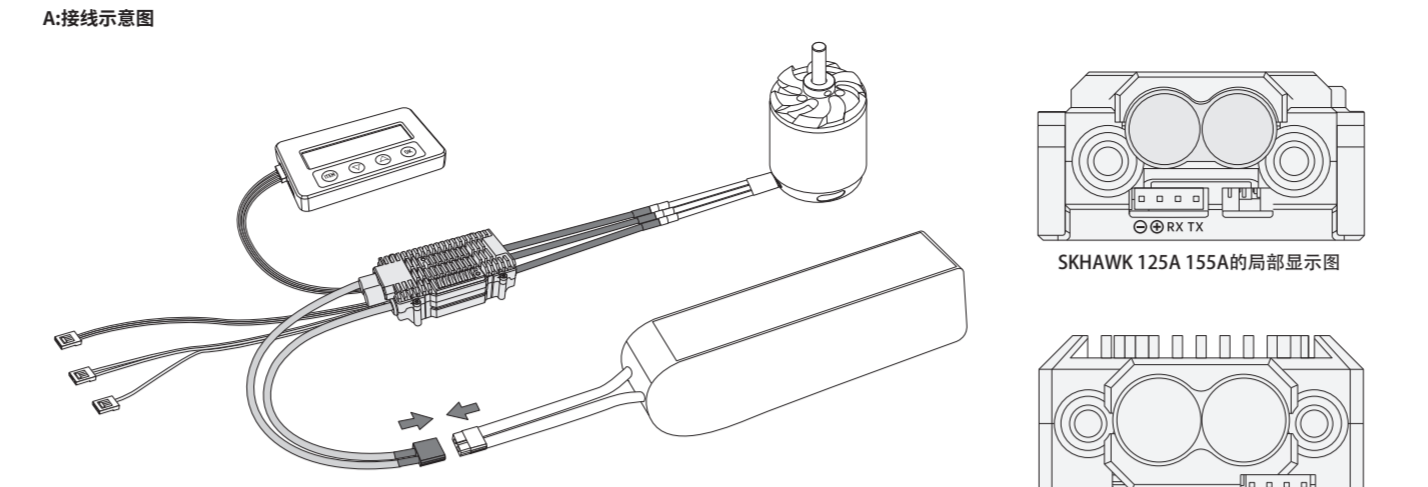


参数设定与电调运行数据查看方法

本电调可进行参数设定，以满足不同的飞行需求。

本电调可通过LCD编程卡和手机APP查看电调的实时数据：包括电流，电压，电调温度，油门，电调状态码等。

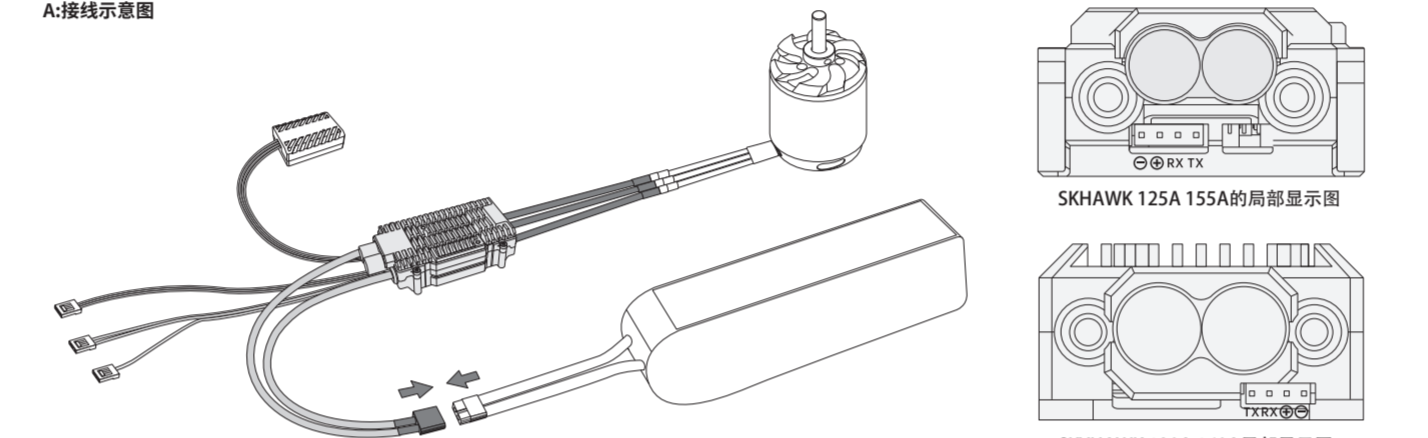
1. 使用LCD编程卡调参及查看实时数据(LCD编程卡需另购)



B:操作步骤

- 根据上面接线示意图将电调与LCD编程卡和电池正确连接。（用编程卡连接线连接编程卡与电调时可根据刻字区分正负极位置，红线对应正极，黑线对应负极进行连接。）
- 正确连接好后，LCD编程卡首先会自动进入实时数据界面，此时可查看电调实时数据。（显示实时数据信息有电压/电流/油门/转速/温度等）
- 再按“ITEM”或“OK”键，即可进入参数设置界面。（按“ITEM”代表循环切换编程项，按“▽”代表向下切换某编程项的参数值，按“△”代表向上切换某编程项的参数值，按“OK”键代表保存并发送当前所选的参数值到电调。）
- 每次更改完参数后，需要重新上电，新更改的参数才会生效。

2. 使用手机APP调参及查看实时数据(蓝牙模块需另购)



B:操作步骤

- 根据上面接线示意图连接电调与蓝牙模块，并将电调连接电池。（蓝牙模块的红线对应正极，黑线对应负极进行连接。）
- 下载并安装好中特威航模手机APP，打开APP并且连接到蓝牙，然后即可进行参数设置及实时数据的查看。
- 每次更改完参数后，需要重新上电，新更改的参数才会生效。

可编程参数项及说明

1. 可编程参数项及对应可编程设定值	
1 刹车类型	*普通刹车，反推刹车
2 刹车力度	*0, 0-100%
3 进角	*15° 0-30°
4 正反转	*CW, CCW
5 SR功能	ON, *OFF
6 电池节数	*自动 / 3S, 4S, 6S / 3S, 4S, 6S, 8S / 6S , 8S, 10S, 12S, 14S
7 低电压保护点	关闭, 2.5V, *3.0V, 3.2V, 3.4V, 3.6V, 3.8V
8 低电压保护方式	*降低功率，立即关断
9 BEC	6.0V, *7.4V, 8.4V
10 加速度	1, *2, 3, 4
11 启动力度	低, *中, 高
12 飞行模式	*固定翼, 直升机
13 定速参数P	*4 1-10
14 定速参数I	*3 1-10
15 遥控回传	*1 实时数据, 2 SBUS
Ⓛ 带*的为出厂默认设置	

2. 可编程项目说明

- 刹车类型**
 - 普通刹车：设置该功能时，油门遥感归零后，电调将按照设置的刹车力度使电机反转，**默认设置为普通刹车。**
 - 反转刹车：通过切换电机正反向，快速停止。将3Pin信号线接入油门通道，将1Pin信号线接入接收机任意的2段开关通道，打开遥控器2段开关，此时反转功能开启，拨动遥控器2段开关即可调整电机正反向。
- 刹车力度**

设定普通刹车功能下油门归零以后，电机反转的速度，数值越大，电机刹停的力度就越强，电机从旋转到停止的时间也越短。0%-100%可调（步长为：1%），**默认设置为0%**（该功能仅在普通刹车模式下有效）
- 进角**

调节电调驱动电机的进角，0° - 30° 可调，**默认设置为15°。**
- 正反转**

设置电机转向，连接好电机与电调以后，默认电机为正转，则设置为反转后电机将反转，若默认电机为反转，则设置为反转后电机将正转，**默认设置为正转。**
- SR功能**

可使电调工作效率更高，更节能，续航时间更长，**默认设置为关闭。**
- 锂电节数**

可自动计算，也可手动设置电池节数，选择自动计算，将按单节3.8V计算电池节数。使用Life或者LiHv电池若出现电调自检过程鸣叫电池错误，可调节此项纠正检测，**默认设置为自动。**
- 低电压保护点**

支持2.5V/3.0V/3.2V/3.4V/3.6V/3.8V 6档可调。该值为单节电池的电压值，若您使用的是6节锂电池，那最终的保护电压即为设置的值X6，**默认设置为3.0V。**
- 低电压保护方式**

降低功率:当达到预设的低电压保护阈值时，电调减少输出功率至70%，**默认设置为降低功率。**
立即关断:当达到预设的低电压保护阈值时，电调立即关断输出功率。

- BEC**

设置电调内置BEC电压，6.0V/7.4V /8.4V三档可调，**默认设置为7.4V。**

- 10 加速度**

1, 2, 3, 4四档可调，数值越大加速度越柔和，**默认设置为2。**

- 11 启动力度**

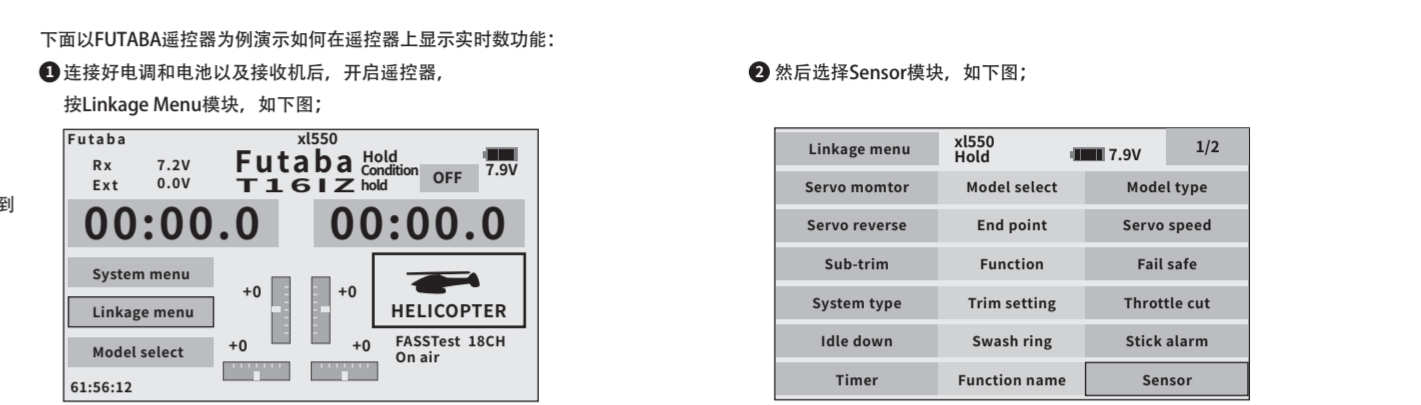
调整电机启动启动时的启动力度，设置越高档启动力度越大，低/中/高档三档可调，**默认设置为中档。**
- 12 飞行模式**

固定翼模式：适用于固定翼飞行器及多旋翼飞行器，该模式下油门高于5%（包含5%）才启动电机，电机响应迅速。
直升机模式：适用于使用本电调进行定速飞行的直升机飞行器，该模式下油门高于40%(包含40%)才启动电机，电机以超柔和方式启动，完成缓启动后转速稳定进入定速运行状态。每次从其它模式调整至该模式时需要做一次转速标定，才可以正常运行定速功能，以后保持在该模式下就不需要反复做转速标定了，**默认设置为固定翼模式。**
- 13 定速参数P**

控制电调在维持定速过程中补转的程度，数值越大，出现转速不足或转速过高时回归目标转速的程度就越大，该功能需要配合定速感度I设置，1到10档可调，**默认设置为4档。**
- 14 定速参数I**

当转速低于或超过设置的过预期值时，电调会进行转速补偿。该参数用于调整补转的程度大小。参数过大将造成补转过度，参数过小将引起补转不足，1到10档可调，**默认设置为3档。**
- 15 遥控回传**

Real Time Data ,SBUS2.**默认设置为Real Time Data.**
设置Real Time Data可在LCD编程卡和手机APP显示电调实时数据。
设置SBUS2则可在遥控器显示电调实时数据（遥控器需要支持SBUS2协议）。



- 进入Sensor 模块后按顺序选择各数据项目，如下图；

Sensor	x1550 Hold	7.9V	1/3
Sensor type	ID	Sensor type	ID
1	Curr-F1678	0	7 Voltage
2	Curr-F1678	8	---
3	Curr-F1678	9	---
4	rpm sensor	0	10 ---
5	Temp-F1713	0	11 ---
6	Voltage	0	12 ---

定速功能说明及设置

- 电调定速说明**

通过转速标定，建立电机转速-油门值对应曲线，然后在遥控器上将油门值设置为某一个固定值，即输出该油门值对应转速，并在电机负载变化时维持该转速不变。
注：电调出厂默认为固定翼模式，若设置为直升机模式，首次使用需要标定转速，标定转速后以后电调断电再重新上电就不需要再次执行转速标定，电调会储存上次标定的转速。若从直升机模式调整到固定翼模式并保存，再回到直升机模式，电调存储的电机转速就会被清除，因此需要再一次执行转速标定。

 - 使用陀螺仪定速时，需要设置为固定翼模式，并且加速度调至4.
- 转速标定过程**
 - 转速标定前先用油门行程校准（若该电调已做过油门校准无需重复操作）。
 - 主旋翼螺距设为0度。
 - 遥控器油门在最低值，等待电调自检完成。
 - 随后将油门推至50%，主旋翼会开始缓慢加速旋转（因主旋翼螺距为0度，直升机不会升空），主旋翼转速稳定后，将油门摇杆推至最低，直升机主旋翼开始减速停转，转速标定完成。
- 如何计算主旋翼100%油门转速**
 - 首先通过LCD编程卡查看标定的最高转速，如下图（该值为电机在100%油门下所能达到的最大电气转速）：
 - 主旋翼100%油门转速=MAX RPM ÷（电机级数÷2）÷齿比
假如电机为10级，电机为10级，电机齿为13T，主齿为120T，即齿比为9.23，根据如下公式可得主旋翼100%油门下的转速。
公式：主旋翼100%油门转速=MAX RPM ÷（电机级数÷2）÷齿比
图中主旋翼100%油门转速即为145000÷（10÷2）÷（120÷13）约为3140转，如果3D飞行时的主旋翼需要保持2500转，则需要设定的定速油门为2500÷3140约得0.8，需要设定油门值为80%。
 - 您也可以直接在LCD编程卡设置电机机对数和齿比得出主旋翼100%油门转速。
(1)转速标定完成后，连接编程卡并选择如左图编程卡界面。
(2).按OK键后即可通过对比对马达级数进行选择，再按OK键后可对马达齿比进行选择，再按OK键显示出的转速即为主旋翼100%油门转速。”

保护功能说明

- 上电电压异常保护

电调连接电池或电源时，会检测输入的电压，若输入电压不在电调的工作电压范围，则判断上电电压异常，进入保护状态，并闪烁鸣叫提示。
- 启动保护

当推油门启动后，如在两秒内未能正常启动电机，电调将会关闭电机，油门需要重新设置，才可以重新启动。可能原因：电调与电机接线断开或接触不良、螺旋桨被其他物体阻挡、减速齿卡死等。
- 温度保护

当电子调速器工作温度超过110度时，电调将自动降低输出功率进行保护，但不会将输出功率全部关闭，最多降到全功率的70%，以保证电机留有一定动力，避免炸机。
- 油门信号丢失保护

当电调检测到油门信号丢失1秒后，将自动减少对马达的输出功率，然后油门信号丢失超过2秒，电调将自动关断马达。如果在降功率过程中油门信号恢复，电调可以立即恢复油门控制。这样在瞬间信号丢失情况下（2秒以下），电调并不会进行油门保护；只有当遥控信号确实长时间丢失，才进行保护，但电调不是立即关闭输出，而是有一个逐步降低输出功率的过程，给玩家留有一定的救机时间，兼顾安全性和实用性。
- 过负荷保护

当负载突然变得很大时，电调会切断动力，或自动重启，出现负载急剧增加的原因通常是马达堵转。
- 低压保护

当电调工作电压低于设定的保护电压时，电调会逐渐降低输出功率进行保护，但不会将输出功率全部关闭，最多只降到全功率的50%，保证仍有动力可以降落，更换新电池重新上电后恢复正常。
- 过流保护

使用过程中，若电流超过规定值以后，电调会立即切断输出，然后快速恢复动力，再次超过规定值将彻底切断动力不再恢复，断电重连后恢复正常。有可能是因为过载，马达烧了等原因造成的。
- 断线保护

电机和电调没连接好，需要检查电调和电机的接头是否连接好或者焊接是否焊好。

问题	报警声:
1.油门信号丢失	"哔-哔-" (每隔2s)
2.温度保护	"哔哔-哔哔-" (每隔2s)
3.电压保护	"哔哔哔-哔哔哔-" (每隔2s)
4.上油门不归零	"哔-哔-" (每隔200ms)
5.电压不在支持范围	"123-123-" (每隔200ms)

地址:深圳市宝安区西乡街道九围新村冠锋工业园一栋二楼
电话:+86 755 29120026, 29120036, 29120056 传真:+86 755 29120016
网址: www.ztwoem.com 邮箱: support@ztwoem.com

Thank you for purchasing ZTW Skyhawk Brushless Electronic Speed Controller (ESC). We strongly recommend reading this manual carefully before using this product for the sake of safety. ZTW have no control over the use, installation, or maintenance of this product, no liability may be assumed for any damages or losses resulting from the use of the product. We do not assume responsibility for any losses caused by unauthorized modifications to our product. Besides, we have the right to modify our product design, appearance, features and usage requirements without notification.

Important Warnings

- Always place safety as priority when you use the product.
- An electric motor that is connection with battery pack and ESC may start unexpectedly and cause serious danger. Always treat a powered system with respect.
- Always remove the propeller or disengage the pinion gear before the battery connected if you need to working on a plane or helicopter at short range.
- Please observe all local laws regarding the flying of remote control aircraft.
- Never fly over or near crowds.

Key Features

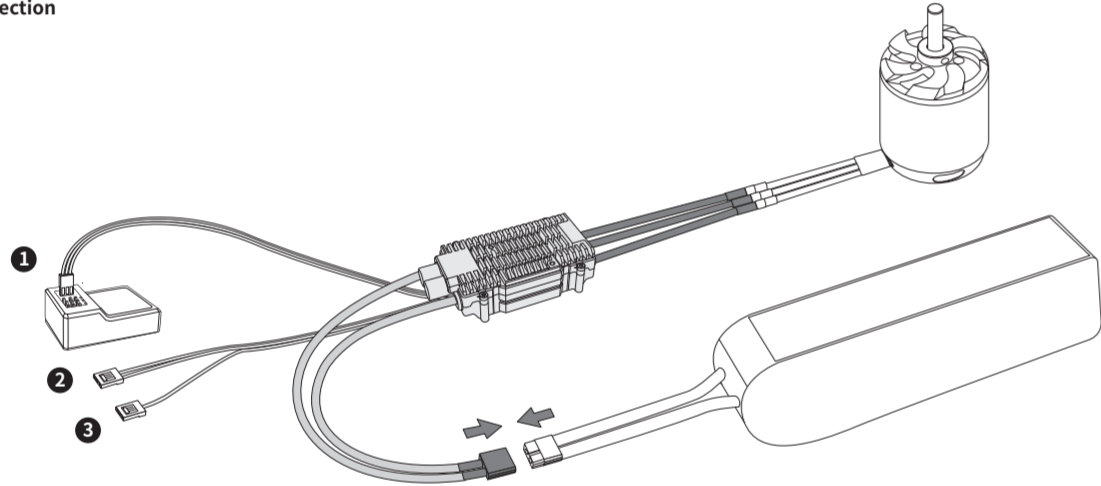
- Adopting high performance 32 bit microprocessor with a running frequency of 170MHz, supported much stronger computing ability and faster running speed.
- Adopting new generation craft on the MOSFET, low heat generation, large instantly withstand current, and high reliability.
- Self-check function: after the ESC powered on, it will automatically check if have the power short circuit, motor lose phase, throttle is not at zero position problem, and voltage range.
- The special ESC case design and the unique fan guard structure greatly enhance the ESC heat dissipation performance.
- There are two flight modes: fixed-wing mode and helicopter mode.
- Equipped with the helicopter speed-control function, the speed sensitivity is adjustable and easy to operate.
- Equipped with the time selection function for stall landing, it can be manually adjustable within the time set to avoid a crash due to handling errors.
- The ESC has a separate programming interface to connect with LCD programming card or Bluetooth module for programming.
- Supporting data returning function: current, voltage, temperature, RPM, throttle and ESC status code.
- Bluetooth module supported, change the parameter settings, software upgrading, data recording and the operation can be completed via the mobile phone (Apple and Android) APP.
- Multiple protections: abnormal power-on voltage protection, start up protection, temperature protection, throttle signal loss protection, over load protection, low voltage protection, over current protection

Product Specifications

Type	PN# Model	Cont. Current Burst Current	Input Voltage	Weight (g)	BEC Output	Size (mm)	Programming Way
Skyhawk 65A SBEC	4065211	65A/80A	3-6S LiPo	55	6V,7.4V,8.4V adjustable /10A	60*34*22	LCD Program Card G2/ Android&iOS APP
Skyhawk 125A SBEC	4125211	125A/140A	3-8S LiPo	171	6V,7.4V,8.4V adjustable /10A	87*40*32	LCD Program Card G2/ Android&iOS APP
Skyhawk 155A SBEC	4155211	155A/170A	3-8S LiPo	171	6V,7.4V,8.4V adjustable /10A	87*40*32	LCD Program Card G2/ Android&iOS APP
Skyhawk 130A HV SBEC	4130311	130A/150A	6-14S LiPo	236	6V,7.4V,8.4V adjustable /10A	95*50*36	LCD Program Card G2/ Android&iOS APP
Skyhawk 160A HV SBEC	4160311	160A/180A	6-14S LiPo	236	6V,7.4V,8.4V adjustable /10A	95*50*36	LCD Program Card G2/ Android&iOS APP
Skyhawk 300A HV OPTO	4300411	300A/320A	6-14S LiPo	461	None	118*59*47	LCD Program Card G2/ Android&iOS APP

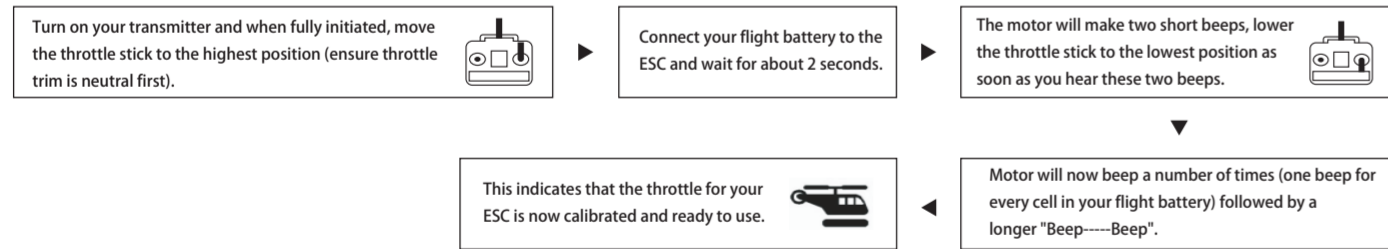
Remark: The ESC weight and size spec. include fan.

Wires Connection



- Throttle signal wire (Black,Red,White): Plug into the receiver throttle channel, the white wire is transmitter the throttle signal, the red wire and black wire is the BEC voltage output wire and ground wire.
- BEC output wire(Black,Red): Plug into the receiver battery dedicated channel or any available channel.
- RPM signal wire (Yellow): Plug into the speed input channel.

Throttle Calibration



Normal Startup Procedure

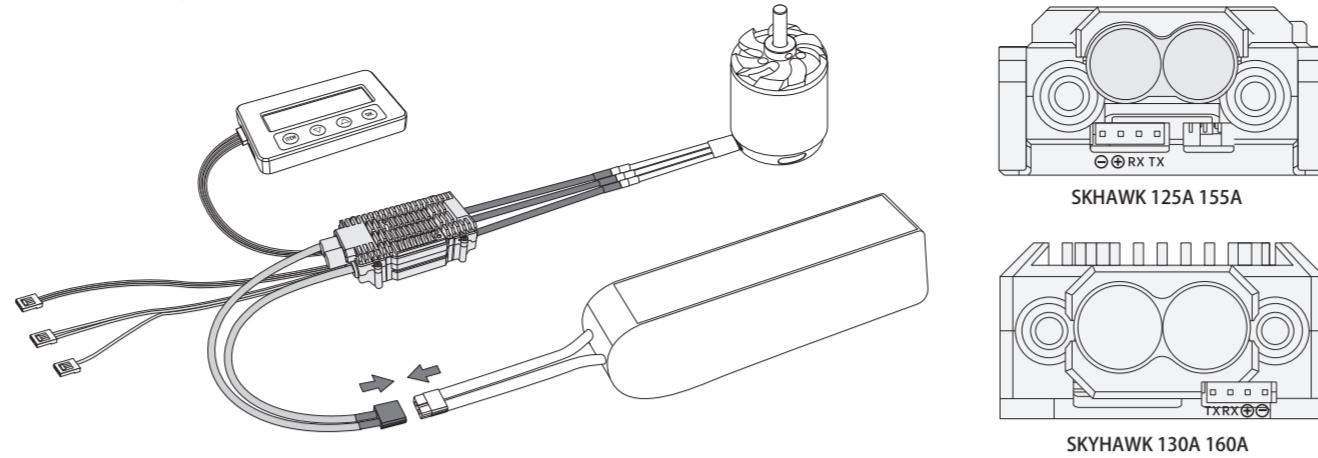


Parameter setting and the way to check the ESC real time data

The ESC parameters can be programmed to meet different flight needs. The ESC real time data like current, voltage, ESC temperature, throttle, and ESC status code can be checked by LCD program card or Mobile phone APP.

1. Using LCD program card to set the ESC parameters (need to purchase LCD program card separately)

A. Wire connection diagram

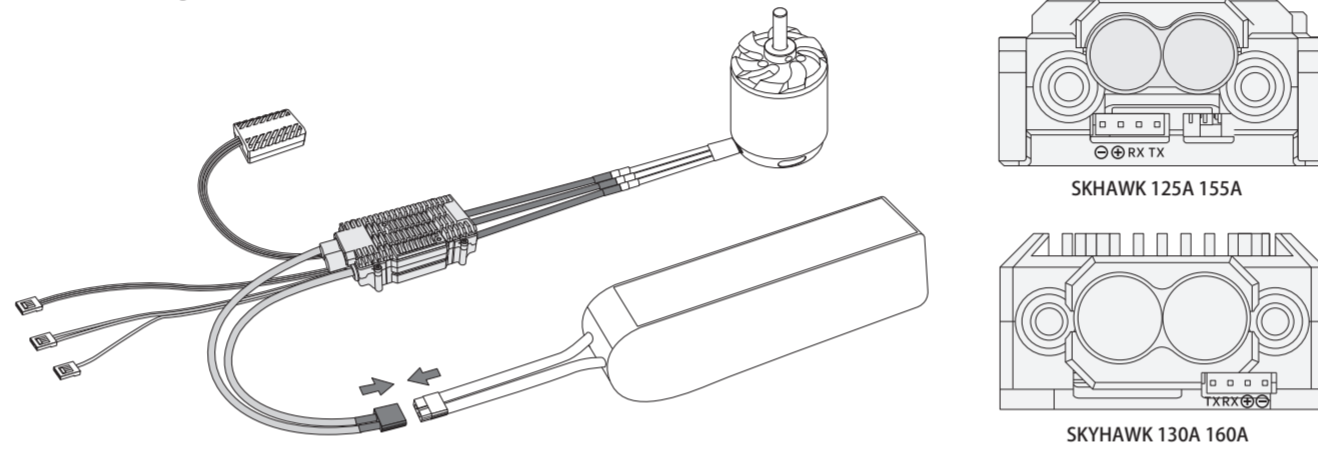


B: Operating steps

- Connect the ESC to LCD program card and battery correctly base on above wire connection diagram. (The LCD program card connecting wire: Red wire corresponds to the "+" and Black wire correspond to the "-" position, pay attention to the "+" "-" lettering on the LCD and ESC)
- After connected well, LCD program card turns on and will go to the real time data interface first. (Real time data includes: voltage/current/throttle/RPM/temperature and so on)
- Then press **ITEM** or **OK** button, it goes to the parameters setting interface. (In parameters setting interface, press **ITEM** to change the programmable items, press **Δ** or **▽** button to choose the item parameters, and press **OK** to save settings.)
- After set the new ESC parameters, need to re-power the ESC again, then the new set parameters will take effect.

2. Using Mobile phone APP to set the ESC parameters and view real time data (need to purchase the Bluetooth module separately)

A. Wire connection diagram



B: Operating steps

- Connect the ESC to the Bluetooth module and battery correctly base on above wire connection diagram. (Blue tooth module Red wire corresponds to "+" and Black wire corresponds to "-", pay attention to the "+" and "-" lettering on the ESC)
- Download and install ZTW APP well, open APP and connect it with Bluetooth, then you can start to set the ESC parameters and check the real time data by APP.
- After set the new ESC parameters, need to re-power the ESC, then the new set parameters will take effect.

Programmable parameters items and instructions

1. Programmable parameter items and corresponds programmable set values

1 Brake Type	*Normal, Reverse
2 Brake Force	*0% 0-100%
3 Timing	*15° 0-30°
4 Motor Rotation	*CW, CCW
5 SR Function	ON, *OFF
6 Battery Cells	*Auto /3S, 4S, 6S /3S, 4S, 6S, 8S /6S, 8S, 10S, 12S, 14S
7 Low Voltage Cutoff Threshold	OFF, 2.5V, *3.0V, 3.2V, 3.4V, 3.6V, 3.8V
8 Low Voltage Cutoff Type	*Reduce Power, Cutoff Power
9 BEC	6.0V, 7.4V, 8.4V
10 Acceleration	1, *2, 3, 4
11 Start-up Power	Low, *Middle, High
12 Flight Mode	*Fixed Wing, Helicopter
13 Governor Parameter P	*4 1-10
14 Governor Parameter I	*3 1-10
15 Telemetry	*1 Real Time Data , 2 SBus

The options marked with "*" are the factory default setting.

Remark: When using gyro for the speed calibration, the Flight Mode need to choose Fixed Wing, and the Acceleration need to choose 4.

2. Programmable parameter project description

- Brake Type**
 - Normal Brake: When "Normal Brake" is turned on, after the throttle trigger return to zero position, it will make the motor stop running according to the parameter of brake force set, default setting is Normal brake.
 - Reverse Brake: Plug the 3Pin signal wire into the throttle channel, and plug the 1Pin signal wire into any 2-stage switch channel of the receiver, then turn on the transmitter 2-stage switch. The Reverse Brake function is turned on now, you can change the forward and reverse directions of the motor by flipping the 2-stage switch of the transmitter.

Warning: This function can only be effective when the throttle is below 50%, and it is only allowed to be used.
- Brake Force**
After throttle trigger is pulled to zero position, the higher value means the stronger brake force, and it will take shorter time to make the motor from running to standstill. 0%-100% adjustable, 1% as 1 step, default setting is 0%. (This function only valid under normal brake mode.)
- Timing**
Adjust the angle of the motor electrically, 0° -30° adjustable, default setting is 15°.
- Motor Rotation**
Clockwise and counter-clockwise direction is adjustable from the ESC, default setting is CW.
- SR Function**
The synchronous rectification function makes the ESC with higher driving efficiency and more energy-saving, and support longer flight time, default setting is off.
- Battery Cells**
The number of battery cells can be set by calculated automatically and set manually. If select Auto-calculation (calculated base on 3.8V each cell), if battery cells errors occurs with motor beeps, like used LiFe or LiHV batteries, then you can set manually, default setting is auto.
- Low Voltage Cutoff Threshold**
2.5V/3.0V/3.2V/3.4V/3.6V/3.8V adjustable, the voltage means each cell voltage. For example if you used 6 cells Lipo battery, then the low voltage threshold value is 6x set voltage value, default setting is 3.0V.
- Low Voltage Cutoff Type**
Reduce Power: When the voltage drops to the set low-voltage protection threshold, the ESC will reduce power to 70%.
Cutoff Power: When the voltage drops to the set low-voltage protection threshold, the ESC will cut off the power immediately. default setting is reduce power.
- BEC**
The ESC is built in BEC with 6.0V/7.4V/8.4V adjustable, default setting is 7.4V.
- Acceleration**
1,2,3,4 adjustable, the higher value means more soft acceleration, default setting is 2.
- Start Up Power**
Low/Middle/High adjustable, set high means stronger start up force, default setting is Middle

12 Flight Mode

Fixed-wing mode: suitable for fixed-wing and multi-rotary aircraft, in this mode, the throttle has to be more than 5% (include 5%) to start the motor and the throttle responds is rapid. Helicopter mode: suitable for fixed speed flight helicopter aircraft, the throttle in this mode has to be more than 40% (include 40%) before starting the motor, the motor starts in a ultra smooth manner, after the completion of slow start speed into the fixed speed operating state, default setting is Fixed-wing mode.

13 Governor Parameter P

Control the degree of rotation while maintaining at fixed speed. The higher the value, the greater the degree of regression target speed when the speed is insufficient. Whereas, when the speed is too high, the function needs to be combined with the fixed speed sensitivity setting. 1 to 10 adjustable, default setting is 4.

14 Governor Parameter I

When the speed falls below, or exceeds the value set, the speed is compensated by the ESC. This parameter is used to resize the degree of rotation. Too large parameters will cause excessive make-up, too small parameters will cause insufficient replacement. 1 to 10 adjustable, default setting is 3.

15 Impetry

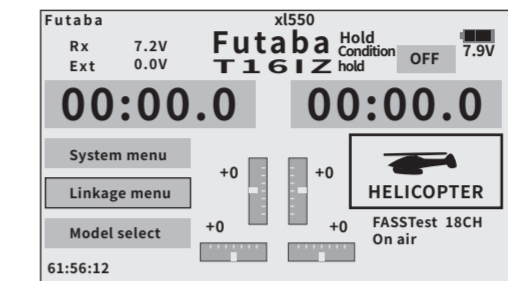
Real Time Data, SBus2, default setting is Real Time Data.

If set Real Time Data means you can have the real time data on the LCD program card and mobile phone app.

If set SBus2 means you can have the real time data on the transmitter.

Let's take FUTABA remote control (SBus2 protocol) as an example, to show you how to set the (Telemetry) real time data return function.

- Connected the ESC with battery and receiver well, then turn on the transmitter, press the "Linkage" Menu like the following picture;



- Select and press "Sensor" like the following picture;

Linkage menu	x1550 Hold	7.9V	1/2
Servo motor	Model select	Model type	
Servo reverse	End point	Servo speed	
Sub-trim	Function	Fail safe	
System type	Trim setting	Throttle cut	
Idle down	Swash ring	Stick alarm	
Timer	Function name	Sensor	

- After entered the sensor interface, select each data item in sequence like the following picture

Sensor	x1550 Hold	7.9V	1/3
Sensor type	ID	Sensor type	ID
1 Curr:F1678	0	7	---
2 Curr:F1678	8	---	---
3 Curr:F1678	9	---	---
4 rpm sensor	0	10	---
5 Temp-F1713	0	11	---
6 Voltage	0	12	---

- After exiting from the sensor interface then enter the Telemetry interface, add the selected data item like the following picture, then you can have the real time data on the transmitter.

Telemetry	x1550 Hold	7.9V	1/3
1 Cruu:F1678			
Current		0.0A	
5 Temp-F1713		43°C	
Temperature			
Voltage		22.5V	
Battery			
4 rpm sensor		0rpm	
Rotation			

The Fixed Speed Function Settings

1. Fixed speed description

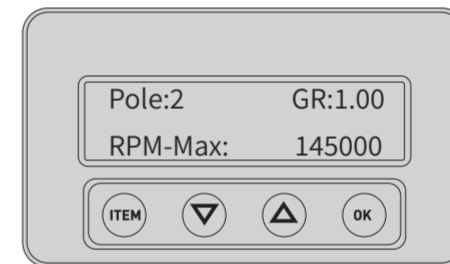
By speed calibration, the motor speed-throttle value corresponding curve is established. The throttle value is set to a fixed value on the remote control, the output of the throttle value corresponds to the speed, and the motor load changes to maintain the same speed.

Note: The manufacture default setting is Fixed-wing mode, if set to the helicopter mode, then you need to do the speed calibration for the first time, and the ESC will stores the motor speed-throttle value corresponding curve after the speed calibration.

- When using gyro for the speed calibration, the Flight Mode need to choose Fixed Wing, and the Acceleration need to choose 4.

2. Speed calibration process

- Need to do the throttle calibration first before the speed calibration (if already done, just skip this step).
 - Make sure the main rotor pitch is at 0 degrees.
 - Pull the throttle stick to the minimum position, waiting for the esc self-check process.
 - Push the throttle to 50%, the rotor of the helicopter will start to slowly accelerate (the main rotor pitch is zero degrees, the helicopter will not lift off), and wait for the acceleration to complete. When the rotor speed is stable, push the throttle stick to the minimal position.
 - Speed calibration is finished.
3. How to calculate the main rotor RPM at 100% throttle
- Connect the LCD program card or Bluetooth after the speed calibration is completed to find the records as shown:



The values in the figure is just a example, depending on the actual display values. This value is the maximum electrical speed that the motor can achieve at 100% throttle.

Protection Function

- Abnormal power-on voltage protection:** The ESC enters a protective state once the input voltage detected is not in the operating voltage, Prompting LED light to flash.
- Start-up protection:** If the motor fails to start normally within 2 seconds after pushing the throttle to start, the ESC will cut off the output power, and you need to make the throttle calibration again, then ESC can be restarted. Possible reasons: disconnection or poor connection between ESC and motor, the propeller or motor is blocked by other objects, the gearbox is damaged, etc.
- Over-heat protection:** When the temperature of the ESC is over about 110°C, the ESC will automatically reduce the output power for protection, but will not fully shut down the power, reduce it to 70% of the full power at most to ensure the motor has enough power to avoid crashes.
- Throttle signal loss protection:** The ESC will reduce the output power if throttle signal is lost for 1 second, will cut off output to the motor if the throttle signal is lost over 2 seconds. If the throttle signal restored during power down, the ESC will immediately restored throttle control. In this way, the ESC will not protect when the signal loss less than 2 seconds, only when the signal loss is over 2 seconds or longer time. And the ESC will reduce the output power gradually instead of cutting off it immediately, so the player has enough of time to save the plane, taking into account safety and practicality.
- Over load protection:** The ESC will cut off power or restart automatically when the load increased a lot suddenly, possible reason is the motor blocked.
- Low voltage protection:** When the operating voltage of the ESC have exceeded the protection voltage set, power will be gradually reduced for safety, but will not be turned off. These will be up to 50% of power, to ensure that the motor has the power to land.
- Over-current protection:** When the peak current exceeds the specified value, the ESC will immediately cut off the output power, and then restart to restore the power. If the current exceeds the specified value again, the output power will be completely cut off. Possible reason is overload, burnt motor and so on.
- Break Protection:** If there is a break in the connection between the motor and ESC. Check the motor is fully connected, check connectors or solder joints are as they should be.

Explanations for Warning Tones

Troubles:	Warning Tones:
1. Throttle signal loss	"Beep-Beep-" (every two seconds)
2. Temperature protection	"Beep Beep-Beep Beep-" (every two seconds)
3. Low voltage protection	"Beep Beep Beep-Beep Beep Beep-" (every two seconds)
4. The throttle value is not at 0% throttle	"Beep-Beep-" (every 200 milliseconds)
5. The voltage is not within the range	"DoRaMi-DoRaMi-" (every 200 milliseconds)