

# 无刷电子调速器说明书

感谢您购买无刷电子调速器。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

- 1. 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。
- 2. 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。
- 3. 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。

4. 双侧面开孔以及独特的散热风道设计,极大地增强了电调散热性能。

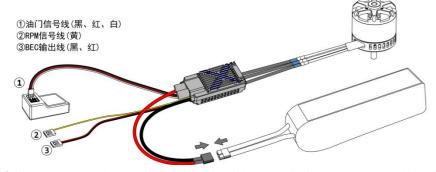
- 5. 具有固定翼、直升机两种模式选择。
- 6. 具有直升机定速功能,定速强度可调,易于操作。
- 7. 电调有独立的编程接口,可用 LCD 编程卡或蓝牙模块为电调进行参数设定。
- 8. 具有数据回传功能,可实时发送数据:电流、电压、温度、转速、油门、电调状态, 手机 App或LCD 编程卡上可实时查看以上数据。
- 9. 支持蓝牙无线调参,通过手机(苹果&安卓)App 可进行参数设置,升级电调软件,查看数据记录等操作。
- 10. 多重保护: 上电电压异常保护, 启动保护, 温度保护, 油门信号丢失保护, 过负荷保护, 低压保护, 过流保护。

## 产品规格

型号	持续电流 峰值电流 (A)	电池节数	重量约 (g)	BEC 輸出	尺寸 (mm)	编程方式
X45A LW	45A/60A	3-6S Lipo	45	6V, 7.4V, 8.4V adjustable/7A	38*25*15.4	LCD 编程卡 G2/安卓&苹果 App
X65A LW	65A/85A	3-6S Lipo	53	6V, 7.4V, 8.4V adjustable/8A	34*27*17.7	LCD 编程卡 G2/安卓&苹果 App
X85A LW	85A/105A	3-6S Lipo	69	6V, 7.4V, 8.4V adjustable/8A	42*32*20.4	LCD 编程卡 G2/安卓&苹果 App
X65A PRO SBEC	65A/85A	3-6S Lipo	68	6V, 7.4V, 8.4V adjustable/8A	51*35*18.6	LCD 编程卡 G2/安卓&苹果 App
X85A PRO SBEC	85A/105A	3-6S Lipo	82	6V, 7.4V, 8.4V adjustable/8A	60. 5*36*22	LCD 编程卡 G2/安卓&苹果 App

## 注:电调尺寸、重量含散热风扇。X45A LW、X65A LW、X85A LW, 不含。

## 连接线示意图



①油门信号线(黑、红、白):插入接电机油门通道,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。 ②RPM 信号线(苗), 插入无副翼系统转束输入诵道。 ③BEC 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。

# 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。



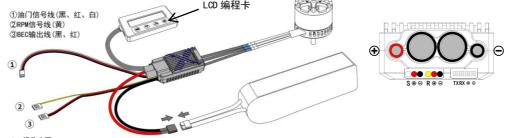


## 参数设定与电调运行数据查看方法

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

A: 接线示意图

1. 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)

2. 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)

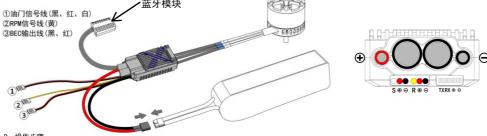
3. 再按"ITEM"或"OK"键,即可进入参数设置界面。

(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,代表保存并发生 当期所选的参数值到电调。)

4. 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 APP 调参及查看实时数据(蓝牙模块需另购)

A: 接线示意图



### B: 操作步骤

1. 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。)

2. 下载并安装好朗宇航模手机 APP,打卡 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。

3. 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

参数项										
1. 定速模式	*内部定速	外部定速								
2. 低压保护值	关闭	2. 7V	*3. 0V	3. 2V	3. 4V	3. 6V	3. 8V			
3. 进角	*自动	低	中	高						
4. BEC	6V	7. 4V	*8. 4V							
5. 正反转	*正向(CW)	反向(CCW)								
6. 定速参数 P	1	2	3	*4	5	6	7	8	9	10
7. 定速参数	1	2	*3	4	5	6	7	8	9	10
8. 加速度	快	普通	*慢	非常慢						
9. 自动重启时间	*关闭	90s (打开)								
10. 直升机类型	Other	OMP-M4	*OMP-M4MAX							
11. 恢复出厂默认	友复出厂默认 复位									

# 注:以上表格内容、带\*为直升机出厂默认洗项参数。

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	*0FF						
6. 电池节数	*自动		38,	4S, 6S / 3S, 4	S, 6S, 8S / 6S,	8S, 10S, 12S,	14\$	
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	快	*普通	慢	非常慢				
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. 电机极对数	*1	1~30						

## 1、 刹车类型

①善通到车,设置该功能时、油门提杆归零后、由调将按照设置的到车力度使由机停转、默认设置为普通到车。 ②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。 ▲ 警告:此功能只能在50%油门以下才有效,且只允许在飞机降落至地面使用,否则有可能引起电调烧毁! 2、 刹车力度

设定普通刹车功能下油门归零以后,电机停转的速度,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)。

调节电调驱动电机的进角。0°~30°可调,默认设置为15°。

# 4、 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。 5、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,

6、 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。 7、 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 a

### 8、 低电压保护方式

降低功率: 当达到预设的低压保护阈值时, 电调减少输出功率至 70%, 默认设置为降低功率。

立即关断: 当达到预设的低压保护阈值时, 电调立即关断输出功率

## 9, 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/8.4V

### 10、加速度 快, 普诵, 慢, 非常慢四挡可调, 数值越大加速度越柔和, 默认设置为普诵,

11、启动力度

调整电机启动时的启动力度,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。

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,油门响应迅速。

# 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 30%(包含 30%) 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  ${f I}$  设置,1 到 10 档可 14、定速参数 I

当转速低于或超过设置的预期值时, 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、电机极对数 1~30, 默认设置为 1, 例如: 电机 5 对极=10 极。

# 定速功能说明及设置

# 1. 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

# 2. 转速标定过程

①转速标定前先做油门行程校准(若该申调已做讨油门校准无需重复操作)。 ②主旋翼螺距设为0度。

# ③遥控器油门在最低值,等待电调自检完成。

④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,将油门巡杆推至最低,直升机主旋翼开 始减速停转,转速标定完成。

⑤如果是 M4/M4MAX 不用标定,可直接选择直升机类型。其它直升机要先选择 Other,再进行标定。

# 3. 如何计算主旋翼 100%油门转速

①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)

> GR:1.00 Pole:2 RPM-Max: 145000  $(\Delta)$

②主旋翼 100%油门转速=MAX RPM÷(电机极数÷2)÷齿比

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÷(电机极数÷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

假如电机为 10 极, 电机为 10 级, 电机齿为 13T, 主齿为 120T。即齿比为 9, 23。

约得 0.8. 需要设定油门值为 80%。 ③您也可以直接在 LCD 编程卡设置电机极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作图编程卡界面。

(2) 按 OK 键后即可通过按对马达极数进行选择,再按 OK 键后可对马达齿比进行选择, 再按 0K 键显示出的转速即为主旋翼 100%油门转速。

# 保护功能说明

# 1. 上电电压异常保护

申调连接申沛或申源时,会检测输入的申压,若输入申压不在申调的工作申压范围,则判断上申申压异常,进入保护状态,并闪灯鸣叫提示。 2. 启动保护

当推油门启动后,如在两秒内未能正常启动申机,申调将会关闭申机,油门需要重新设置,才可以重新启动。可能原因;申调与申机接线断开或接触不良、 螺旋桨被其它物体阻挡、减速齿卡死等。 3. 温度保护

### 动力, 避免摔机, 4. 油门信号丢失保护

当申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,申调将自动关断马达。如果在降功率过程中油门信号恢 复,申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),申调并不会进行油门保护;只有当谣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。

当电子调速器工作温度超过 110 度时,电调将会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

# 5. 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。 6. 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。

# 7. 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

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。

# 鸣叫报警音说明

能是因为过载,马达烧了等原因造成的。

问题	报警音
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. 低压保护	"哔哔哔-哔哔哔-" (每隔 2s)
4. 上电油门不归零	"哔-哔-" (每隔 200ms)
5. 电压不在支持范围	"123-123" (毎隔 200ms)



# Brushless ESC User Manual

Thank you for purchasing the brushless electronic speed controller. We strongly recommend carefully reading this user manual before use for safety reasons. We do not assume any liability for any damages caused by the use of this product or unauthorized modifications to the product, including but not limited to compensation for any consequential or indirect losses. We reserve the right to change product design, appearance, performance, and usage

## **Safety Precautions**

·Always prioritize safety when using this product;

·Be cautious when connecting the motor to the battery and speed controller, as accidental startup can cause injury;

·Before connecting the battery, if you need to perform close-range operations on fixed-wing aircraft or helicopters, do not install the propeller or disconnect the pinion gear:

·Please comply with all local laws and regulations regarding remote-controlled aircraft;

·Do not fly over crowds or in restricted areas:

### Main features

- 1.Utilizes a high-performance 32-bit processor with a running frequency of up to 170MHz, providing powerful computational capabilities and faster
- 2.Incorporates power output components (MOSFET) manufactured using the latest technology, resulting in low heat generation, high instantaneous current tolerance, and enhanced reliability.
- 3. Self-check function: The speed controller performs self-checking upon power-up, including power supply short circuit detection, motor phase detection, throttle zeroing, and voltage range verification
- 4. Features dual side vents and a unique heat dissipation channel design, greatly enhancing the heat dissipation performance of the speed controller. 5.Offers selection between fixed-wing and helicopter modes.
- 6. Equipped with a helicopter governor function, allowing adjustable governor strength for easy operation.
- 7.The speed controller has an independent programming interface, which can be used with an LCD programming card or Bluetooth module for parameter configuration.
- 8. Supports data telemetry, providing real-time transmission of data such as current, voltage, temperature, RPM, throttle, and speed controller status. This data can be viewed in real time on a mobile app or LCD programming card.
- 9. Supports wireless Bluetooth parameter adjustment, allowing parameter settings, firmware upgrades, and data logging operations via a mobile app (compatible with both iOS and Android).
- 10. Multiple protections are included: abnormal power voltage protection, startup protection, temperature protection, throttle signal loss protection, overload protection, low voltage protection, and over-current protection.

# Product specifications

Model	Continuous Current (A)	Peak Current (A)	Battery Cells	Weight (approx.) (g)	BEC Output	Dimensions (mm)	Programming Method
X45A LW	45A/60A	60A	3-6S Lipo	45	6V,7.4V,8.4V adjustable/7A	38*25*15.4	LCD Programming Carg G2 Android&ios App
X65A LW	65A/85A	85A	3-6S Lipo	53	6V,7.4V,8.4V adjustable/8A	34*27*17.7	LCD Programming Carg G2 Android&ios App
X85A LW	85A/105A	105A	3-6S Lipo	69	6V,7.4V,8.4V adjustable/8A	42*32*20.4	LCD Programming Carg G2 Android&ios App
X65A PRO SBEC	65A/85A	85A	3-6S Lipo	68	6V,7.4V,8.4V adjustable/8A	51*35*18.6	LCD Programming Carg G2 Android&ios App
X85A PRO SBEC	85A/105A	105A	3-6S Lipo	82	6V,7.4V,8.4V adjustable/8A	60.5*36*22	LCD Programming Carg G2 Android&ios App

### Note: The dimensions of the speed controller include the approximate size of the heat dissipation fan. X45A, X65A,And X85A do not include a heat dissipation fan.

### Connection Diagram:

Turn on the remote

controller, push the

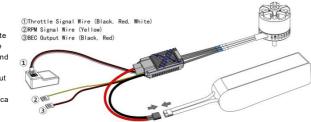
hrottle stick to the

①Throttle Signal Wire (Black, Red, White):

Insert into the motor throttle channel, where the white wire is used to transmit the throttle signal, while the red and black wires are for voltage output and ground respectively.

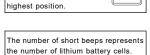
@RPM Signal Wire (Yellow): Insert into the RPM input channel of the aileronless system.

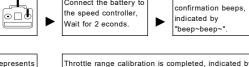
③BEC Output Wire (Black, Red): Insert into the dedica ted channel for the receiver battery or any other

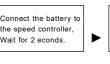


## First-time Use of the Speed Controller and Throttle Range Setting

Important Note: When using the speed controller for the first time or when switching to a different remote controller, it is essential to reconfigure the throttle range

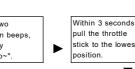






a final "beep~~~beep"





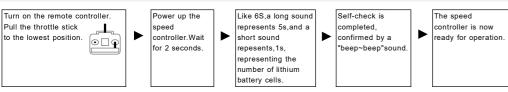


stick to the lowest

Listen for N short beeps indicating the number of lithiur

Please follow these steps carefully to ensure proper throttle range calibration.

# Normal Startup Procedure for the Speed Controller



Please ensure that you follow this startup procedure to ensure the proper functioning of the speed controller

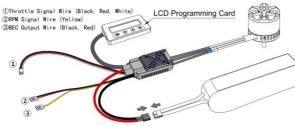
# Parameter Setting and Speed Controller Data Viewing Method

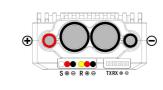
This speed controller allows for parameter settings to meet different flight requirements

You can use an LCD programming card or a mobile app to view real-time data from the speed controller, including current, voltage, speed controller temperature, throttle, and status codes

1. Using the LCD Programming Card for Parameter Setting and Real-time Data Viewing(LCD Programming Card needs to be purchased separately)

## A: Wiring Diagram





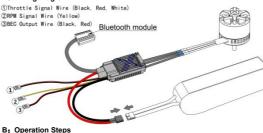
## B: Operation Steps

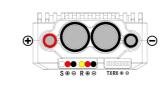
1.Refer to the diagram to correctly connect the speed controller, LCD programming card, and battery. (When connecting the programming card to the  $speed\ controller\ using\ the\ programming\ card\ connection\ cable,\ you\ can\ differentiate\ and\ negative\ positions\ based\ on\ the\ markings.\ The\ red\ wire$ corresponds to the positive terminal, and the black wire corresponds to the negative terminal.)

- 2. Once properly connected, the LCD programming card will automatically enter the real-time data interface, where you can view the real-time data from the speed controller. (The displayed real-time data includes voltage, current, throttle, RPM, temperature, etc.)
- 3. Press the "ITEM" or "OK" button to enter the parameter setting (Pressing "ITEM" cycles through the programming items, pressing "▽" moves down to change the parameter value of a specific programming item, pressing "\times" moves up to change the parameter value of a specific programming item, and pressing the "OK" button saves and applies the selected parameter value to the speed controller.)
- 4.After each parameter change, it is necessary to re-power the speed controller for the new settings to take effect

# 2.Using the App for Parameter Setting and Real-time Data Viewing (Bluetooth module needs to be purchased sepa

# A: Wiring Diagram





- 1. Refer to the diagram to connect the speed controller to the Bluetooth module, and then connect the speed controller to the battery. (The red wire of the Bluetooth module corresponds to the positive terminal, and the black wire corresponds to the negative terminal.)
- 2.Download and install the corresponding mobile app (e.g., SUNNYSKY Mobile App) on your smartphone. Open the app and connect to the Bluetooth module. Once connected, you can proceed with parameter setting and real-time data viewing.
- 3.After each parameter change, it is necessary to re-power the speed controller for the new settings to take effect

## **Programmable Parameter Items and Descriptions**

1.Helicopter Programmable P	r Programmable Parameter Items and Corresponding Setting Values Table									
Parameter Item										
1.Governor Mode	*Internal Governor	External Governor								
2.Low Voltage Protection	Disabled	2.7V	*3.0V	3.2V	3.4V	3.6V	3.8V			
3.Timing	*Auto	*Auto Low		High						
4.BEC Voltage	6V	6V 7.4V								
5.Motor Rotation	*Clockwise (CW)	Counter-clockwise (CCW)								
6.Governor Parameter P	arameter P 1 2		3	*4	5	6	7	8	9	10
7.Governor Parameter I	1	1 2		4	5	6	7	8	9	10
8.Acceleration	Fast	Fast Normal		Very Slow						
9.Auto Restart Time	*Disabled	*Disabled 90s(Enabled)								
10.Helicopter Type	Other	OMP-M4	*OMP-M4MAX							
11.Factory Reset	Reset									

# Note: The values marked with \* represent the default factory settings for helicopters

1. Brake Type	*Normal Brake	Reverse Brake					1		
2. Brake Strength	*0	0~100							
3. Timing	*15°	0~30°							
4. Motor Rotation	*CW(Clockwise)	CCW(Counter-clockwise)							
5. SR Function	ON	*OFF							
6. Battery Cell Count *Auto		3S, 4S, 6S/3S, 4S, 6S, 8S/6S, 8S, 10S, 12S, 14S							
7. Low Voltage Protection Threshold	Disabled	2.5V	*3.0V	3.2V	3.4V	3.6V	3.8V		
8. Low Voltage Protection Mode	*Reduce Power	Immediate Shutdown							
9. BEC Voltage	6.0V	*7.4V	8.4V						
10.Acceleration	Fast	*Normal	Slow	Very Slow					
11.Startup Power	Low	*Medium	High						
12.Flight Mode	*Fixed-wing	Helicopter							
13.Governor Parameter P	*4	1~10							
14.Governor Parameter I	*3	1~10							
15.Motor Pole Count	*1	1~30							

Note: The values marked with \* represent the default factory settings for fixed-wing aircraft.

## 3.Explanation of Programmable Items for Fixed-wing Aircraft

## 1, Brake Type

(i)Normal Brake: When this function is enabled, the speed controller will apply the set brake strength to stop the motor after the throttle stick is returned to zero . This is the default setting for brake type.

② Reverse Brake: By switching the motor's direction, the motor can be rapidly stopped. To activate this function, connect the 3-pin signal wire to the throttle channel and connect the 1-pin signal wire to any 2-position switch channel on the receiver. Turn on the 2-position switch on the remote controller to enable the reverse function. Toggle the 2-position switch on the remote controller to adjust the motor's direction.

Warning: This function is only effective below 50% throttle and should only be used when the aircraft is landing on the ground. Otherwise, it may cause damage to the speed controller!

## 2, Brake Strength

This parameter sets the speed at which the motor stops when the throttle is returned to zero in normal brake mode. A higher value indicates a stronger braking force and a shorter time for the motor to stop. The range is 0% to 100% adjustable (in steps of 1%). The default setting is 0%. (This function is

3, Timing This parameter adjusts the advance timing of the speed controller driving the motor. The range is 0° to 30° adjustable, with a default setting of 15°

## 4, Motor Rotation

This parameter sets the direction of the motor rotation. By default, the motor rotates in the forward direction (CW). If set to reverse (CCW), the motor will rotate in the opposite direction

## 5. SR Function

This function improves the efficiency and energy-saving capabilities of the speed controller, resulting in longer flight times. The default setting is OFF.

### 6. Battery Cell Count This parameter can be set to automatically calculate the number of battery cells or manually set the cell count. When set to auto, the cell count is calculated based on a single cell voltage of 3.8V. If using LiFe or LiHV batteries and encountering a battery error during the speed controller self-check

process, this parameter can be adjusted to correct the detection. The default setting is auto. 7. Low Voltage Protection Threshold

This parameter supports 2.5V/3.0V/3.2V/3.4V/3.6V/3.8V in 6 adjustable levels. The value represents the voltage per cell. For example, if using a 6-cell LiPo battery, the final protection voltage will be the set value multiplied by 6. The default setting is 3.0V.

### 8, Low Voltage Protection Mode

Reduce Power: When the preset low voltage protection threshold is reached, the speed controller reduces the output power to 70%. This is the default setting.

### Immediate Shutdown: When the preset low voltage protection threshold is reached, the speed controller immediately shuts down the output power. 9, BEC Voltage

# This parameter sets the voltage output of the built-in BEC (Battery Eliminator Circuit). The options are 6.0V, 7.4V, and 8.4V, with a default setting of 7.4V.

10. Acceleration This parameter adjusts the acceleration of the motor. The options are Fast, Normal, Slow, and Very Slow. A higher value indicates a smoother acceleration The default setting is Normal

### 11, Startup Powe

This parameter adjusts the startup power of the motor. The options are Low, Medium, and High. A higher setting provides more startup power. The default setting is Medium

12, Flight Mode Fixed-wing Mode: Suitable for fixed-wing aircraft and multirotor aircraft. In this mode, the motor starts only when the throttle is above 5% (including 5%),

and the throttle response is quick. Helicopter Mode: Suitable for helicopters that require governor mode. In this mode, the motor starts only when the throttle is above 30% (including 30%).

The motor starts in an ultra-smooth manner and enters a stable RPM state after a gradual startup. When switching to this mode from other modes, a governor calibration is required for normal operation of the governor function. Once in this mode, repeated governor calibration is not necessary. The default setting is Fixed-wing Mode. 13. Governor Parameter P

# This parameter controls the amount of compensation the speed controller applies to maintain the target RPM. A higher value results in greater

compensation when the RPM is too low or too high. This parameter should be adjusted in conjunction with the Governor Parameter I. The range is 1 to 10, with a default setting of 4 14. Governor Parameter T

When the RPM is below or above the set target, the speed controller applies compensation. This parameter adjusts the level of compensation. A higher value can lead to excessive compensation, while a lower value may result in insufficient compensation. The range is 1 to 10, with a default setting of 3. 15. Motor Pole Count

This parameter sets the number of poles in the motor. The range is 1 to 30, with a default setting of 1. For example, if the motor has 5 pole pairs, the value

## **Speed Governing Function Explanation and Settings**

### 1.Speed Governing Explanation

By calibrating the RPM (Rotations Per Minute), a motor speed-throttle value curve is established. Then, the throttle value is set to a fixed value on the remote control, which corresponds to the desired RPM output. The speed controller maintains this RPM even when the motor load changes.

# 2.RPM Calibration Process

Defore RPM calibration, perform throttle range calibration (if the speed controller has already been calibrated, this step is not necessary).

# ②Set the main rotor pitch to 0 degrees.

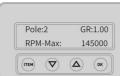
3) Set the throttle value on the remote control to the lowest position and wait for the speed controller self-check to complete

(4) Then, slowly increase the throttle to 50%, and the main rotor will start to slowly accelerate (since the main rotor pitch is set to 0 degrees, the helicopter will not lift off). Once the main rotor reaches a stable RPM, reduce the throttle to the lowest position, and the main rotor will gradually decelerate and stop. This completes the RPM calibration

⑤For M4/M4MAX speed controllers, calibration is not required. You can directly select the helicopter type. For other helicopters, select "Other" first, and then proceed with the calibration

### 3 How to Calculate 100% Throttle RPM for the Main Rotor

(1) First, check the maximum calibrated RPM using the LCD programming card.



2)100% throttle RPM for the main rotor = Max RPM ÷ (Number of Motor Poles ÷ 2) ÷ Gear Ratio. For example, if the motor has 10 poles, 13T motor pinion, and 120T main gear, resulting in a gear ratio of

Use the above formula to calculate the 100% throttle RPM for the main rotor

If you need to maintain a main rotor speed of 2500 RPM during 3D flight, you need to set the throttle value to 2500 ÷ calculated 100% throttle RPM.

Alternatively, you can directly set the number of motor poles and gear ratio on the LCD programming card to obtain the 100% throttle RPM for the main rotor.

## **Protection Function Explanation**

## 1.Abnormal Input Voltage Protection

When the speed controller is connected to a battery or power supply, it checks the input voltage. If the input voltage is not within the working voltage range of the speed controller, it will enter a protection state and flash the LED lights while emitting an alarm sound

# 2.Startup Protection

If the motor fails to start normally within two seconds after applying throttle, the speed controller will shut down the motor. The throttle needs to be reset before the motor can be restarted. Possible reasons for startup failure include loose or disconnected motor connections, obstruction of the propeller by foreign objects, or a jammed gearbox. 3.Temperature Protection

### When the working temperature of the electronic speed controller exceeds 110 degrees Celsius, it will automatically reduce the output power to protect itself. However, it will not completely shut off the power output but will reduce it to a maximum of 70% of full power. This ensures that the motor still has some power to prevent a crash.

4. Throttle Signal Loss Protection If the speed controller detects a loss of throttle signal for one second, it will automatically reduce the output power to the motor. If the throttle signal remains lost for more than two seconds, the speed controller will shut off the motor. If the throttle signal is restored during the power reduction process, the speed controller can immediately resume throttle control. This protection mechanism is designed to prevent sudden loss of control, but it only activates when the throttle signal is genuinely lost for an extended period.

# 5.Overload Protection

When the load suddenly increases, the speed controller may cut off power or automatically restart. A sharp increase in load is usually caused by a motor ctall

# 6.Low Voltage Protection

If the working voltage of the speed controller drops below the set protection voltage, it will gradually reduce the output power to protect itself. However, it will not completely shut off the power output but will reduce it to a maximum of 50% of full power. This ensures that there is still enough power for a controlled landing. Once a new battery is connected and the power is restored, the speed controller will return to normal operation 7.Over-current Protection If the current exceeds the specified limit during operation, the speed controller will immediately cut off the output power. It will then quickly restore power.

# but if the current exceeds the limit again, it will permanently cut off power. Normal operation will resume after power is disconnected and reconnected.

Over-current protection is usually triggered by overload or motor failure If the motor and speed controller are not properly connected, the speed controller will detect the disconnection and trigger a protection mechanism. It is

# **Alarm Sound Explanation**

Problem	Alarm sound
1.Throttle Signal Loss	"Beep-Beep" (repeated every 2 seconds)
2.Temperature Protection	"Beep Beep-Beep Beep" (repeated every 2 seconds)
3.Low Voltage Protection	"Beep Beep Beep-Beep Beep" (repeated every 2 seconds)
4.Throttle Not at Zero on Power-Up	"Beep-Beep" (repeated every 200 milliseconds)
5.Voltage Out of Supported Range	"1-2-3-1-2-3" (repeated every 200 milliseconds)

important to check the motor and speed controller connections to ensure they are secure and properly soldered.