User Manual Series Brushless Speed Controller

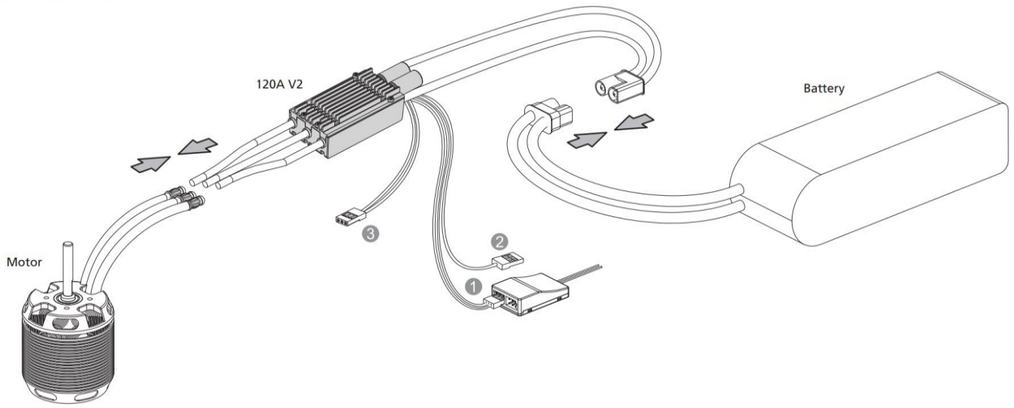
01 Specifications

Model (Regular)	Cont. Current	Peak Current	Input Voltage	BEC Output	Weight	Size
ESC 120A V2	120A	150A	3-8S LiPo	Switch Mode，Output: 5V/6V/7.4V/8.4V adjustable, Current cont./Peak:10A/30A	117g	83*35*22mm

02 User Guide

Attention! The default throttle range of this ESC is from 1100μs to 1940μs (Futaba's standard); users need to calibrate the throttle range when they start to use a new SKYWALKER brushless ESC or another transmitter.

I. Connections



Signal cable description:

①Throttle Signal Cable (Long White/Red/Black Tri-color Cable): plug it into the TH channel on the receiver or flight controller. The White wire is for transmitting throttle signals, the Red & Black wires are BEC output wires.

②Reverse Brake Signal Wire (Yellow Wire): it must be plugged into any vacant channel on the receiver (when using the Reverse Brake mode) to control the ON/OFF of the Reverse Brake function.

③Programming Cable (Short White/Red/Black Tri-color Cable): connect it to a LED program box if users want to program the ESC.

II. ESC/Radio Calibration

Turn on the transmitter and move the throttle stick to the top position. → Connect a battery to the ESC; the motor will sound "♪123" to indicate the ESC is normally powered on. → Then the motor will beep two short beeps to indicate the maximum throttle endpoint is accepted. → Move the throttle stick to the bottom position within 5 seconds after the two short beeps, the minimum throttle position will be accepted 1 second later. → The motor will beep "Number" beeps to indicate the number of LiPo cells you have plugged in. → The motor will beep a long beep to indicate the calibration is complete.

III. Normal Start-up Process

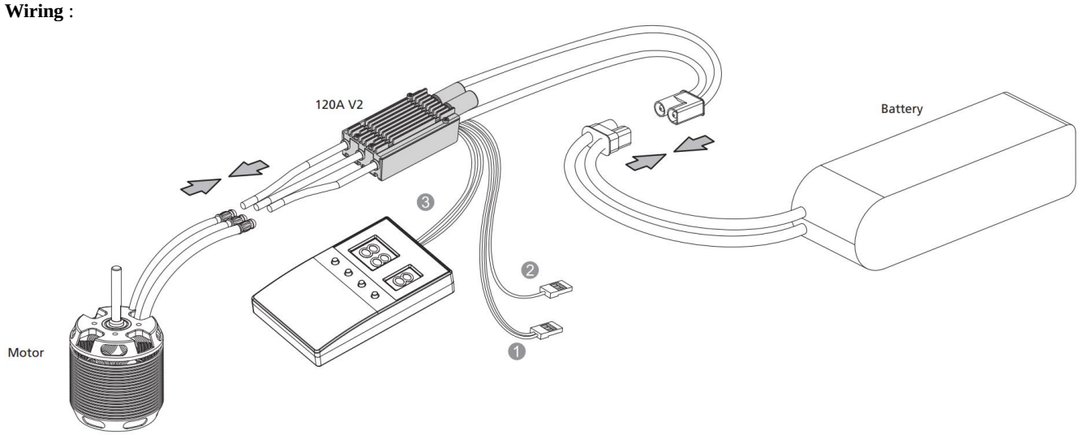
Turn on the transmitter, and then move the throttle stick to the bottom position. → After connected the ESC to a battery, the motor will emit "♪ 123" indicating the ESC is normally powered on. → The motor will emit several beeps to indicate the number of LiPo cells. → The motor emits a long beep to indicate the ESC is ready to go.

Note: In order to shorten the ESC chirping battery number time. The number of lithium batteries is displayed as follows: one long beep means 5cells, so:
3S: three short beeps; 4S: four short beeps; 5S:one long beep; 6S: one long one short beep; 7S: one long two short beeps; 8S: one long three short beeps

03 ESC Programming

I. Program your ESC with a LED Program Box

Wiring :



1). Plug the programming cable (on your ESC) into the programming port on the LED program box.

2). Connect a battery to your ESC after connecting a LED program box to the ESC, all programmable items will show up a few seconds later. (If the ESC is already connected to the battery, disconnect the battery and then reconnect it.)

3）You can select the item you want to program and the setting you want to choose via "ITEM" & "VALUE" buttons on the program box, and then press the "OK" button to save all new settings to your ESC.

4） Disconnect ESC and battery, then reconnect them, the ESC will start up and run with the new parameters.

II. Program your ESC with the Transmitter

It consists of 4 steps: Enter the programming → Select parameter items → Select parameter values → Exit the programming

I. Enter the Programming

Turn on the transmitter, move the throttle stick to the top position, and connect a battery to the ESC, 2 seconds later, the motor will beep "B-B-" first, then emit 5 6 7 1 2 5 seconds later to indicate that you are in the ESC programming mode.

II. Select Parameter Items

After entering the programming, you'll hear the following 12 kinds of beeps circularly. Move the throttle stick to the bottom position within 3 seconds after you hear some kind of beeps, you'll enter the corresponding parameter item.

1. "B-"	Brake Type	(1 Short B)	7. "B——B-B-"	Timing	(1 Long B & 2 Short Bs)
2. "B-B-"	Brake Force	(2 Short Bs)	8. "B——B-B-B-"	Active Freewheeling	(1 Long B & 3 Short Bs)
3. "B-B-B-"	Voltage Cutoff Type	(3 Short Bs）	9. "B——B-B-B-B-"	Search Mode	(1 Long B & 4 Short Bs)
4. "B-B-B-B-"	LiPo Cells	(4 Short Bs)	10. "B——B——"	BEC Voltage	(2 Long Bs)
5. "B——"	Cutoff Voltage	(1 Long B)	11. "B——B——B-"	Factory Reset	(2 Long Bs & 1 Short B)
6. "B——B-"	Start-up Mode	(1 Long B & 1 Short B)	12. "B——B——B- B-"	Exit	(2 Long Bs & 2 Short B)

Note: A long "B——" equals to 5 short "B-", so a long "B——" and a short "B-" represent the 6th item in "Select Parameter Items".

III. Select Parameter Values

The motor will beep different kinds of beeps circularly, move the throttle stick to the top position after you hear some kind of beeps will get you to the corresponding parameter value, then you'll hear the motor emit "1 5 1 5" to indicate the value is saved, then get back to "**Select Parameter Items**" and continue to select other parameter items that you want to adjust.

Items \ Values (Bs)		1 B-	2 B-B-	3 B-B-B-	4 B-B-B-B-	5 B--	6 B—B-	7 B—B-B-
1	**Brake Type**	Disabled	Normal	Reverse	Linear Reverse			
2	**Brake Force**	Low	Medium	High				
3	**Voltage Cutoff Type**	Soft	Hard					
4	**LiPo Cells**	Auto Calc.	3S	4S	5S	6S	7S	8S
5	**Cutoff Voltage**	Disabled	Low	Medium	High			
6	**Start-up Mode**	Normal	Soft	Very Soft				
7	**Timing**	Low	Medium	High				
8	**Acitve Freewheeling**	On	Off					
9	**Search Mode**	Off	5min	10min	15min			
10	**BEC Voltage**	5V	6V	7.4V	8.4V			

VI. Exit the Programming

Move the throttle stick to the bottom position within 3 seconds after you hear "Two long and Two short beeps" (emitting from the motor) can get you exit the programming mode. The motor beeps "Number" beeps to indicate the number of LiPo cells you have plugged in, and then a long beep to indicate the power system is ready to go.

04 Programmable Items

Items \ Values		1	2	3	4	5	6	7
1	**Brake Type**	***Disabled**	Normal	Reverse	Linear Reverse			
2	**Brake Force**	***Low**	Medium	High				
3	**Voltage Cutoff Type**	***Soft**	Hard					
4	**LiPo Cells**	***Auto Calc.**	3S	4S	5S	6S	7S	8S
5	**Cutoff Voltage**	Disabled	***Low**	Medium	High			
6	**Start-up Mode**	***Normal**	Soft	Very Soft				
7	**Timing**	Low	***Medium**	High				
8	**Active Freewheeling**	On	***Off**					
9	**Search Mode**	***Off**	5min	10min	15min			
10	**BEC Voltage**	***5V**	6V	7.4V	8.4V			

Note: Those values marked with * in the form below are the factory default settings.

1. Brake Type

1.1 Normal Brake

After selected this option, the brake function will be activated when you move the throttle stick to the bottom position. In this mode, the brake amount equals to the brake force you've preset.

1.2 Reverse Brake

After selected this option, the Reverse Brake signal wire (its signal range must be the same as the throttle range) must to be plugged into any vacant channel on the receiver, and you can control the motor direction via that channel. The channel range of 0-50% is the default motor direction, and the channel range of 50% to 100% will cause the motor to spin counterclockwise. The channel stick should be within the channel range of 0-50% (0 would be better) when the first time you power on the ESC. After the Reverse function is activated, the motor will stop first and then spin in the reversed direction and then increase to the speed corresponding to the throttle input. Either signal loss, no matter reverse brake signal loss or throttle signal loss during the flight, can cause the throttle signal loss protection to be activated.

1.3 Linear Reverse Brake

After selected this option, the Reverse Brake signal wire must to be plugged into any vacant channel on the receiver, and you can control the motor direction via that channel. This channel should be set to a linear switch (usually a knob on the transmitter).Turn the linear channel switch to activate the reverse function. The speed of the motor is controlled by the linear channel switch. When reversed, the initial throttle value is started at 10%, and the throttle stroke of the linear switch is cured to 1.34ms-1.79ms. The channel stick should be at 0% throttle position when the first time you power on the ESC. Either signal loss, no matter reverse brake signal loss or throttle signal loss during the flight, can cause the throttle signal loss protection to be activated.

2. Brake Force

This item is only effect in the "Normal brake" mode ,The higher the level, the stronger the braking effect , where the low/medium/high corresponds to the braking force: 60%/90%/100%

3. Voltage Cutoff Type

3.1 Soft Cutoff

After selected this option, the ESC will gradually reduce the output to 60% of the full power in 3 seconds after the low-voltage cutoff protection is activated.

3.2 Hard Cutoff

After selected this option, the ESC will immediately cut off the output when the low-voltage cutoff protection is activated.

4. LiPo Cells

The ESC will automatically calculate the number of LiPo cells you have plugged in as per the "3.7V/Cell" rule if "Auto Calc." is selected, or you can set this item manually.

5. Cutoff Voltage

If set off, the low-voltage protection function is disabled. In addition, the protection voltage value of the low-voltage protection function corresponding to the low/medium/three modes is about 2.8V/ section, 3.0V/ section and 3.4V/ section. This value is the voltage of a single battery, multiplied by the number of lithium batteries automatically identified by the electronic governor or the number of lithium batteries manually set, which is the protection voltage value of the battery. (For example, if the low voltage protection threshold of 3 lithium batteries is medium, the protection voltage of the batteries is 3X3.0=9.0V)

6. Start-up Mode

This is used to adjust the throttle response time of ESC acceleration from 0% to 100%. Normal/Soft/Very Soft correspond to approximately 200ms/500ms/800ms respectively

7. Timing

Can adjust the drive motor timing value. The low / Medium and high are respectively: 5°15°25°.

8. Active Freewheeling (DEO)

This item is adjustable between "Enabled" and "Disabled", and it is enabled by default. With it enabled, you can have better throttle linearity or smoother throttle response.

If the braking effect affects the feeling of flight during 3D flight, this function can be turned off.

9. Search Mode

After selected this option, ESC will drive the motor chirping prompt when the throttle is keep 0% and continues to the set time.

10. BEC Voltage

Set BEC output Voltage, 5V/6V/7.4V/8.4V adjustable.

05 Troubleshooting & Multiple Protections

Troubleshooting

Troubles	Warning Tones	Causes	Solutions
The ESC didn't work after it was powered on while the motor kept beeping.	"BB, BB, BB……"	The input voltage was beyond the operating voltage range of the ESC.	Adjust the power-on voltage and ensure it's in the operating voltage range of the ESC.
The ESC didn't work after it was powered on while the motor kept beeping.	"B-, B-, B-, B-……"	The ESC didn't receive any throttle signal from the receiver.	Check if the transmitter and receiver are well bound, if any poor connection exists between the ESC and receiver.
The ESC didn't work after it was powered on while the motor kept beeping.	"B, B, B, B……"	The throttle stick has not been moved to the bottom position.	Move the throttle stick to the bottom position and calibrate the throttle range.
The ESC didn't work after the throttle calibration while the motor kept beeping.	"B, B, B, B……"	The throttle range you set was too narrow.	Re-calibrate the throttle range.
The ESC output suddenly reduced to 50% during the flight, the motor kept beeping after the flight completed but the battery was still connected to the ESC.	"BB, BB, BB……"	The ESC thermal protection has been activated	Improve the heat dissipating condition (i.e. add a cooling fan) or reduce the ESC load.
The ESC output suddenly reduced to 50% during the flight, the motor kept beeping after the flight completed but the battery was still connected to the ESC.	"BBB, BBB, BBB……"	The low-voltage cutoff protection has been activated.	Change another pack; lower down the cutoff voltage or disable the LVC protection (we do not recommend this).

Multiple Protections

1. Start-up Protection:

The ESC will monitor the motor speed during the start-up process. When the speed stops increasing or the speed increase is not stable, the ESC will take it as a start-up failure. At that time, if the throttle amount is less than 15%, the ESC will try to restart automatically; if it is larger than 20%, you need to move the throttle stick back to the bottom position first and then restart the ESC. (Possible causes of this problem: poor connection/ disconnection between the ESC and motor wires, propellers are blocked, etc.)

2. ESC Thermal Protection:

When the operating temperature of the electric regulation exceeds 120 degrees Celsius, the electric regulation will reduce the output power for protection, and the output throttle will be proportional to the maximum output throttle of 60% to ensure that the motor is still powered to avoid falling due to insufficient power. After the throttle returns to zero, the electric modulation will drive the motor to sound the alarm.

3. Throttle Signal Loss Protection:

When the ESC detects loss of signal for over 0.25 second, it will cut off the output immediately to avoid an even greater loss which may be caused by the continuous high-speed rotation of propellers or rotor blades. The ESC will resume the corresponding output after normal signals are received.

4. Overload Protection:

The ESC will cut off the power/output or automatically restart itself when the load suddenly increases to a very high value. (Possible cause to sudden load increase is that propellers are blocked.)

5. Low Voltage protection:

When the battery voltage is lower than the cutoff voltage set by the ESC, the ESC will trigger the low-voltage protection. If the battery voltage is set to soft cutoff, the battery voltage will be reduced to a maximum of 60% of the full power. When set to hard cutoff, the output is cutoff immediately. After the throttle returns to 0%, the ESC will drive the motor to sound the alarm.

6. Abnormal voltage input protection:

When the battery voltage is not within the input voltage range supported by the ESC, the ESC will trigger the Abnormal input voltage protection, ESC will drive the motor to sound the alarm.

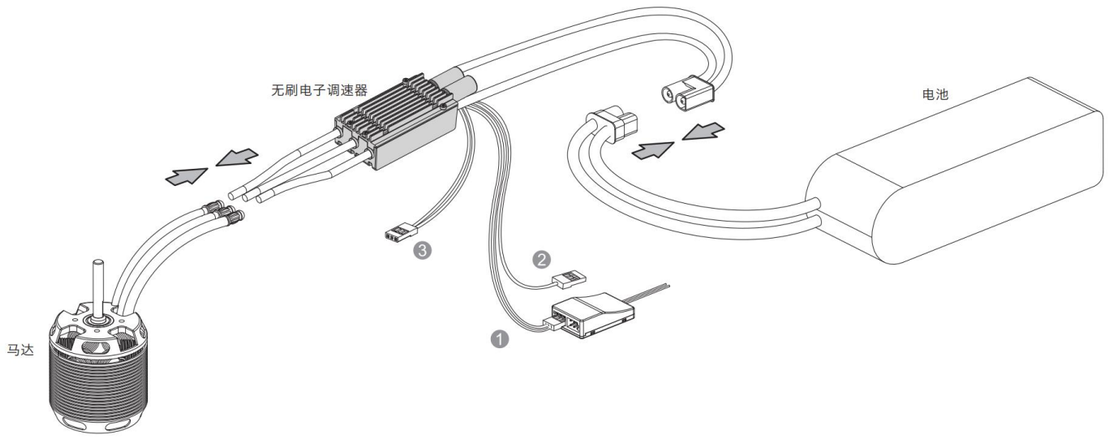
01 产品规格

型号	持续电流	瞬时电流	输入电压	BEC	重量	尺寸
120A V2	120A	150A	3-8 节锂电池	开关稳压 BEC，5V/6V/7.4V/8.4V 可调，输出电流持续/瞬间：10A/30A	117g	83*35*22mm

02 使用向导

注意：电调的油门行程出厂默认值为 1100μs—1940μs（Futaba 标准）,当首次使用电调或者更换其他遥控器使用时，均应重新设定油门行程。

一、接线示意图：



信号线说明：

①　油门信号线（长的白红黑线组）：插入接收机油门通道或飞控油门通道，其中白线用于传送油门信号，而红线和黑线为 BEC 的输出线。

②　反推刹车信号线（黄）：使用反转刹车时，必须将该信号线接入到遥控器的其他空闲通道上，使用该通道来控制反转刹车功能的开启与关闭。

③编程线（短的白红黑线组）：连接 LED 编程设置盒进行参数设置。

二、油门行程校准操作方法：

开启遥控器，将油门打到最高点 → 电调接上电池，马达鸣叫“♪123”提示音，表示上电正常 → 随后马达发出“哔-哔-”双短鸣音，表示油门最高点校准成功 → 5 秒钟之内将油门摇杆推到最低，等待 1 秒，油门最低点校准成功 → 马达发出 N 声短鸣音“哔-”，表示锂电节数 → 马达发出一声长鸣音“哔——”，表示系统准备就绪，可随时起飞

三、正常开机过程：

开启遥控器，将油门摇杆打到最低点 → 电调接上电池，鸣叫“♪123”提示音，表示上电正常 → 马达发出 N 声短鸣音“哔-”，表示锂电节数 → 马达发出一声长鸣音“哔——”，表示系统准备就绪，随时可以起飞

注意：为了缩短电池节数的鸣叫时间，锂电池节数的鸣叫规则如下：

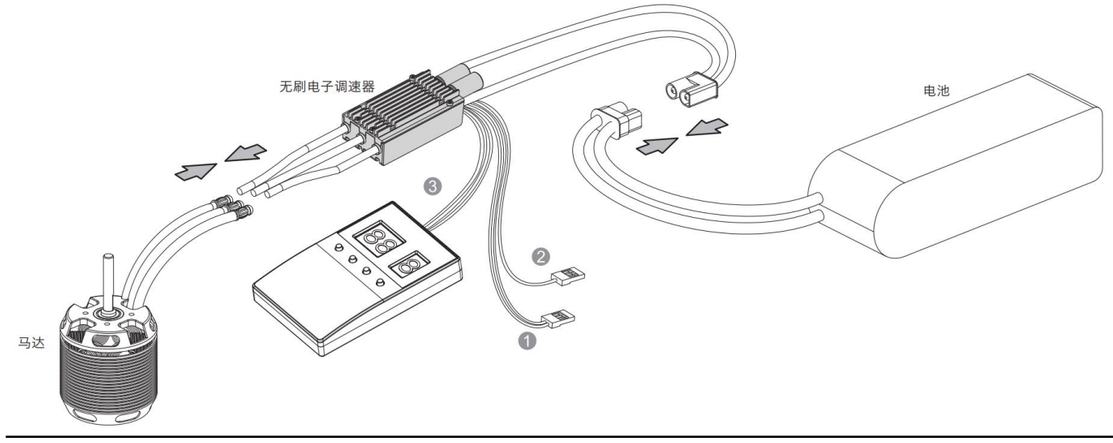
3 节：3 声短鸣；4 节：四声短鸣；5 节：一声长鸣（代表五节）；6 节：一长一短鸣叫；7 节：一长两短鸣叫；8 节：一长三短鸣叫。

03 参数设定方法

电调参数设定方法有两种：

一、通过 LED 参数设定盒进行参数设定（详见 LED 参数设定盒说明书）：

1.接线示意图：



1）将电调编程线（短白红黑）连接至 LED 参数设定盒编程线接入口。
2）电调上电（已通电的需断开电源重新上电），电调进入参数设置模式，读取、设定电调参数。

2.参数设定方法：

1）电调和 LED 参数设置盒连接后，给电调接上电源，数秒后该电调的各项参数即可显示出来。
2）选择 LED 参数设置盒上的“ITEM”键可选择编程项目；
3）选择“VALUE”按键设置该编程项目下的参数值；
4）按“OK”键保存新参数到电调内部。

注意：更改任意参数设定值后，电调均需重新上电，新的参数设定值才可生效。

二、通过遥控器进行参数设定：

1.参数设定方法：

使用遥控器油门摇杆设定参数分为四个步骤：

进入编程→选择参数项目→选择该参数项目下的参数值→退出

一、 进入编程模式：

开启遥控器，将油门打到最高，电调接上电池，等待2秒，鸣叫“哔-哔-”提示音，再等待5秒，会鸣叫“ 5671̇2̇ ”特殊提示音,表示已经进入编程模式。

二、选择参数项目：

进入编程设定后，会听到12种鸣叫音，按如下顺序循环鸣叫，在鸣叫某个提示音后，3秒内将油门打到最低，则进入该设定项。

1.“哔”	刹车类型	（1短音）	7.“哔——哔-哔-”	进角	（1长2短音）
2.“哔-哔-”	刹车力度	（2短音）	8.“哔——哔-哔-哔-”	同步整流	（1长3短音）
3.“哔-哔-哔-”	低压保护模式	（3短音）	9.“哔——哔-哔-哔-哔-”	寻机模式	（1长4短音）
4.“哔-哔-哔-哔-”	锂电池节数	（4短音）	10.“哔——哔——”	BEC电压	（2长音）
5.“哔——”	低压保护阈值	（1长音）	11.“哔——哔——哔-”	回复出厂默认值	（2长1短音）
6.“哔——哔-”	启动模式	（1长1短音）	12.“哔——哔——哔-哔-”	退出	（2长1短音）

注：一长音“哔——”相当于5声短音“哔-”，所以在第二步“选择设定项”中，一长一短“哔——哔-”表示第6选项。

三、选择参数值：

马达会循环鸣叫，在鸣叫某个提示音后将油门摇杆打到最高点，则选择该提示音所对应的参数值，接着鸣叫特殊提示音“i5i5”，表示该参数值已被保存。退回第二步选择参数项目，再选择其它参数项目。

参数项目 \ 参数值（提示音）		1 “哔”	2 “哔，哔”	3 “哔，哔，哔”	4 “哔，哔，哔，哔”	5 “哔--”	6 “哔—哔-”	7 “哔—哔-哔-”
1	**刹车类型**	无刹车	普通刹车	反推刹车	线性反推刹车			
2	**刹车力度**	低	中	高				
3	**低压保护模式**	软关断	硬关断					
4	**锂电节数**	自动计算	3 节	4 节	5 节	6 节	7 节	8 节
5	**低压保护阀值**	关闭	低	中	高			
6	**启动模式**	普通	柔和	超柔和				
7	**进角**	低	中	高				
8	**同步整流**	开	关					
9	**寻机模式**	关	5 分钟	10 分钟	15 分钟			
10	**BEC 电压**	5V	6V	7.4V	8.4V			

四、退出设定

当电机鸣叫出 12.“哔——哔——哔-哔-”（即第 12 个设定项）2 长 2 短音后，3 秒内将油门打到最低点，则退出设定。马达发出 N 声短鸣音“哔-”，表示锂电节数，随后马达发出一声长鸣音“哔——”，表示系统准备就绪。

06 可编程参数

参数项目 \ 参数值		1	2	3	4	5	6	7
1	**刹车类型**	***无刹车**	普通刹车	反推刹车	线性反推刹车			
2	**刹车力度**	***低**	中	高				
3	**低压保护模式**	***软关断**	硬关断					
4	**锂电节数**	***自动计算**	3 节	4 节	5 节	6 节	7 节	8 节
5	**低压保护阀值**	关闭	***低**	中	高			
6	**启动模式**	***普通**	柔和	超柔和				
7	**进角**	低	***中**	高				
8	**同步整流**	***开**	关					
9	**寻机模式**	***关**	5 分钟	10 分钟	15 分钟			
10	**BEC 电压**	***5V**	6V	7.4V	8.4V			

带*的为出厂默认时的设置；

可编程参数说明：

1. **刹车类型：**

   1）普通刹车：油门归零以后，触发刹车，刹车力度为设定的刹车力度；

   2）反推刹车：开启反推刹车功能后，须将反推刹车信号线（信号范围和油门行程一致）插入到接收机的一个空闲通道上，通过该通道控制电机正反转，通道行程 0-50%为电机默认设置转向，通道行程 50%-100%触发电机反转。初次上电该通道摇杆所处位置建议为该通道行程 0-50%范围内（最好为 0），否则有可能会出现推动油门后电机先正转后反转得情况。触发反转时，电机先刹停，再反转加速至油门摇杆输出的油门量。

   3）线性反推刹车：开启此功能以后，须将反推刹车信号线插入到接收机的一个空闲通道上，该通道需设置为线性开关（一般为遥控器上的旋钮），推动该线性开关启动油门反推。启动时反推油门大小为 10%，此后反推油门大小由该线性开关控制。线性反推刹车油门行程固化为 1.34-1.79ms。电调上电时该通道需和油门通道一样保持在 0%油门位置。该通道和油门通道中任何一个丢失信号，均会触发油门信号丢失保护。

2. **刹车力度：**

   设置的刹车力度越大，螺旋桨由旋转到停止的时间越短；该功能仅在普通刹车模式下有效，其中低/中/高分别对应刹车力度：60% /90% /100%.

3. **低压保护模式：**

   软关断：触发低压保护后输出功率将逐渐降低为总功率的 60%；

   硬关断：立即断开输出。

4. **锂电节数：**

   选择自动计算，将按单节电池 3.7V 计算电池节数，也可手动设置电池节数。

5. **低压保护阈值：**

   设置关闭则低电压保护功能关闭，另外低/中/高三种模式对应的低电压保护功能的保护电压值为约 2.8V/节 / 3.0V/节和 3.4V/节；该值为单节电池的电压，与电子调速器自动识别的锂电节数或手动设置的锂电节数相乘，即为电池的保护电压值。（例：3 节锂电池，低压保护阈值为中，则电池的保护电压为：3x3.0=9.0V）

6. **启动模式：**

   普通：推动油门摇杆以后电机会立即启动并快速达到相应的油门值(加速率为 200ms)；

   柔和：推动油门摇杆以后电机会先缓慢启动然后再快速达到相应的油门值（加速率为 500ms）；

   超柔和：推动油门摇杆以后电机会先缓慢启动然后再快速达到相应的油门值（加速率为 800ms）；

7. **进角：**

   可以调节驱动电机的进角值。其中低中高分别为：5°/15°/25° 。

8. **同步整流：**

   默认为开启，开启同步整流将带来更好的油门线性与响应。进行 3D 特技飞行时，如过收油门时刹车影响飞行手感。可以关闭该功能。

9. **寻机模式：**

   开启以后，油门为 0%的情况下，持续保持至设定的时间后，电调将驱动电机鸣叫。

10. **BEC 电压：**

    用于调节 BEC 的输出电压，5V/6V/7.4V/8.4V 四档可调。

07 故障及保护功能说明

一、故障处理：

故障描述	提示音	说明	解决办法
电调通电以后不工作，鸣叫报警	“哔哔，哔哔，哔哔，……”	输入的电压不在电调的工作电压之内。	调节通电电压至电调的工作电压范围内。
电调通电以后不工作，鸣叫报警	“哔，-，哔，-，哔，-，……”	油门信号丢失。	接入油门信号。
电调通电以后不工作，鸣叫报警	“哔，哔，哔，……”	油门摇杆没有归零。	油门摇杆归零，进行油门行程校准。
进行油门行程校准后，电调不工作，鸣叫报警	“哔，哔，哔，……”	所设定油门总行程过窄（电调设计时，要求油门总行程不得小于三格油门）,本次行程设定无效。	重新进行油门行程校准
飞行过程中电调输出功率突然下降至 60%，停止飞行后不断电情况下，鸣叫报警	“哔哔，哔哔，哔哔，……”	触发电调温度保护。	改善散热； 降低电调负载。
飞行过程中电调输出功率突然下降至 60%，停止飞行后不断电情况下，鸣叫报警	“哔哔哔，哔哔哔，哔哔哔，……”	触发电调低压保护。	更换电池； 降低低压保护阈值。

二、保护功能说明：

1. **启动保护：**

   启动过程中，电调会检测电机转速，当转速出现停止上升或者转速提升不稳定的情况，则判断启动失败，若此时油门小于 15%，电调会自动尝试重新启动；若此时油门大于 20%，需将油门归零后重新启动。（出现这种情况的原因可能有：电调和马达连线接触不良或有个别输出线断开、螺旋桨被其他物体阻挡、减速齿卡死等）

2. **油门信号丢失保护：**

   当电调检测到油门遥控信号丢失 0.25 秒以上即立即关闭输出，以免因螺旋桨继续高速转动而造成更大的损失。信号恢复后，电调也随即恢复相应的功率输出。

3. **堵转保护：**

   当负载突然变得极大时，电调会切断动力并自动重启动。（出现负载急剧增大的原因通常是螺旋桨堵转）

4. **温度保护：**

   当电调工作温度超过 120 摄氏度时，电调会降低输出功率进行保护，此时输出油门按比例将至最大 60%输出油门，以保证马达仍有动力，避免因动力不足而摔机。油门归零以后，电调会驱动电机鸣叫报警提示。

5. **低压保护：**

   当电池电压降低至电调低压保护阈值设定的电压以下时，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 60%，以保证马达仍有动力，避免因动力不足而摔机。油门归零以后，电调会驱动电机鸣叫报警提示。

6. **上电电压异常保护：**

   当接入的电池电压不在电调支持的输入电压范围内时，会触发电调接入电压异常保护，电调会驱动电机鸣叫报警提示。