

# KDS-120A-HV ESC 无刷电子调速器使用说明书

感谢您使用KDS无刷电子调速器，在使用之前请仔细阅读该使用说明书。

## 一、产品简介

1. 全部采用正品器件制造，保证了产品的一致性和一流的品质
2. 采用极低阻抗PCB（电路板），耐电流能力极强，完全能达到所标称的电流规格
3. 具有良好的抗干扰能力，有效的降低失控的可能性
4. 具有温度保护电路
5. 具有过压、欠压保护电路
6. 具有细腻、优越的调速线性手感，使您感到速度平稳而有力的输出
7. 支持定速功能

注：1:HV电调无内置BEC，在使用时需要为接收机配备单独的电源，或者使用外接的UBEC为接收机供电。

## 二、产品规格

KDS-120A-HV ESC 型

额定电流：120A

持续电流：120A

最大电流：150A（不低于10秒钟）

BEC电流：无

锂电支持节数：5S - 12S

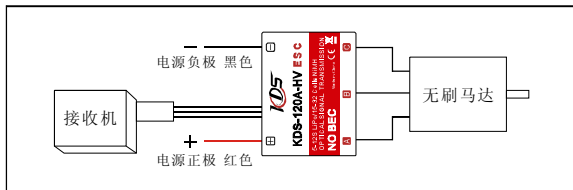
镍氢支持节数：15S - 32S

重量：135g

## 三、产品功能

1. 安全启动模式：调速器接通电源时，遥控器油门摇杆无论在什么位置都不会使调速器启动，安全可靠。
2. 欠压保护：输入电压低于设定值时，调速器自动降低或关闭功率输出，有效保护动力电池。
3. 过压保护：输入电压高于调速器的额定电压时，调速器提示音报警，此时调速器不工作，有效保护调速器的损坏。
4. 过温保护：当温度超出范围时自动关闭功率输出，有效的保护电子调速器。
5. 电池类型选择：具有两种电池选择。
6. 启动模式：具有三项启动模式选择，适用于所有模型飞行器使用。
7. 遥控器兼容：可设定油门行程，兼容所有品牌遥控器。
8. 安全性：在正常使用时如果丢失遥控信号，调速器会自动关闭输出，有效的防止因失控造成的损失。

## 【接线示意图】



## 【可编程参数说明】

1. 刹车设定：\*Off(无刹车)/Soft(软刹车)/Hard(重刹车)/Very Hard(很重刹车)，出厂默认值为Off。
2. 电池类型：\*LiPo/NiMH（锂电/镍氢），默认值为LiPo。
3. 低压保护模式：\*Soft Cut/Hard Cut（降低输出功率/立即切断输出），默认值为Soft Cut。
4. 低压保护阈值：Low/\*Middle/High/Custom（低/中/高/自定义），默认值为Middle。
  - (1). 当设定为LiPo电池时，电调根据锂电节数自动计算出整个电池组的低压保护阈值。每节锂电池的截止电压分别为：2.75V/3.00V/3.25V。
  - (2). 当设定为NiMH电池时，低/中/高情况下截止电压为开机时输入电压的50%/62.5%/75%。例如：使用15节充满电的镍氢电池组，开机上电时电压为1.44×15=21.6V，当低压保护阈值设定为“低”时，则电池组的保护电压阈值为：21.6×50%=10.8V。
5. 启动模式：\*Normal/Mild/Soft（普通/温和/柔和），默认值为Normal。

普通启动适用于固定翼飞机，温和启动/柔和启动适用于直升机。温和启动和柔和启动的初始转速都较低，从启动到全速分别需要3秒和8秒。需要注意的是，以温和启动或柔和启动方式起飞后，若关闭油门，3秒内再次启动时均会临时自动切换至普通启动模式，以免在做一些特技飞行动作时因反应过慢而导致摔机。
6. 进角：0°/3.75°/7.5°/11.25°/\*15°/18.75°/22.5°/26.25°，默认值为15°。

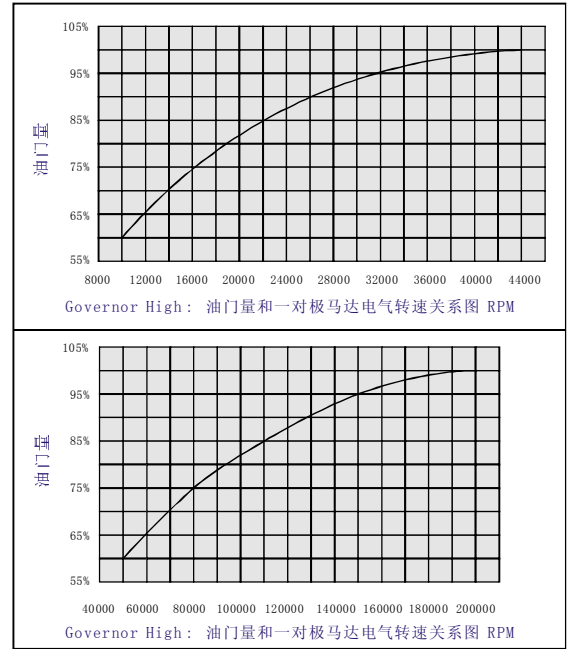
一般情况下，低进角可以适应大部分马达。但是因为马达结构差异很大，请试用各个进角以获得满意的驱动效果。为提高转速，可以将进角设为高进角。改变进角设置后，建议先在地面进行测试，然后再飞行。
7. 定速模式：\*Off/Governor Low/Governor High（关闭/低速定速/高速定速），默认值为Off。

定速模式下，启动后不论油门摇杆处于何种位置及负载如何变化，电调都会尽力维持恒定的转速（在定速模式下，遥控发射机中的油门曲线应设置为水平直线，通过调整该直线的高度可以预设期望的转速值）低速定速模式下，2极马达的定速范围是10000-45000RPM；高速定速模式下，2极马达的定速范围是46000-200000RPM（请参考下面的“油门量和马达电气转速关系图”）。需要注意的是，此处的RPM都是指马达的电气转速，即2极马达在无减速组情况下的转速。实际应用时，用户需要知道马达的极对数、减速组齿轮比才可以算出对应的大浆转速。

例如：你使用6极马达（即3对极），大齿盘150T，马达小齿13T，则根据如下公式就可计算出直升机主旋翼的转速：

$$\text{主旋翼转速} = (\text{一对极马达的电气转速} * 13) / 3 / 150$$

请注意：油门量在60%以下时，禁止使用定速模式（即油门量在60%以下时，电调会自动关闭定速功能）。



8. 备用参数1：暂未使用。
9. PWM频率：\*12KHz/8KHz，默认值为12KHz。对于一些极数多且转速高的马达，设置12KHz的PWM频率可以使马达驱动更平滑，但也同时导致电调的开关损耗加大，发热更严重。多数电机可使用8KHz的PWM频率。
10. 备用参数2：暂未使用。
11. 备用参数3：暂未使用。

锂电节数：\*Auto/5S/6S/8S/10S/12S（自动/5节/6节/8节/10节/12节），默认值为Auto。此参数在电池类型选择为锂电时才有效。开机后，电调会根据自动检测出来的结果或手工设定的锂电节数，驱动马达发出N声“滴”鸣音来表示当前锂电节数。请注意如果选择了“Auto（自动）”，当单节锂电电压低于3.7V时，会导致误判。

注2：高压电调（支持5-12节锂电）鸣报锂电节数时，5节锂电的表示方式为一声长音“滴—”，6节锂电的表示方式为“滴—滴—”（一声长音和一声短音=5+1=6），以此类推二声长音表示10节锂电，二声长音和二声短音表示12节锂电。

注3：高压电调不支持7节、9节和11节的锂电。

## 【首次使用您的无刷电子调速器】

在使用全新的调速器之前请您仔细检查各个连接是否正确可靠（此时请勿连接电池）。检查无误后，请按以下顺序启动电子调速器。

1. 将发射机油门摇杆推至最低位置，接通发射机电源；
2. 将电池组接上无刷电子调速器，调速器开始自检，马达发出“♪123”上电提示音后，接着发出N声短促的“滴”鸣音表示锂电池节数，然后马达发出一声“滴——”长鸣音表示自检正常，系统准备就绪，等待您加大油门启动马达。

(1)若无任何反应，请检查电池是否完好，电池连线是否可靠。电池组电压过低或过高，请检查电池组电压。

(2)若上电后2秒马达发出“滴—滴—”的鸣音，5秒后又发出“♪56712”特殊提示音，表示电调进入参数编程设定模式，这说明您的遥控器未设置好，油门通道反向，请参考遥控器说明书正确设置油门通道的“正/反”向。

3. 特别强调！为了让电调适应您的遥控器油门行程，在首次使用本电调或更换其他遥控器使用时，均应重新设定油门行程，以获得最佳的油门线性。具体操作请参阅本页下端的说明。

### 【警示音说明】

1. 油门信号丢失警示音：当电调未检测到油门信号时，电调会作如下警示：“滴-滴、滴-滴-”（每声之间的间隔为 2秒）。
2. 油门未归零（油门摇杆未置于最低位置）警示音：当油门未打到最低时，电调会作如下警示：“滴-滴-滴-滴-滴-”（很急促的单音鸣叫）。
3. 油门行程过小警示音：当所设定油门总行程过窄时（电调设计时，要求油门总行程不得小于三格油门），电调会做警示，表明本次行程设定无效，需重新设定。警示方式为：“滴-滴-滴-滴-滴-”（很急促的单音鸣叫）。

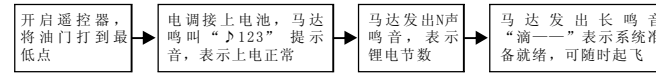
### 【其他保护功能说明】

1. 启动保护：当加大油门时，两秒内未能正常启动马达，电调将会关闭马达，油门摇杆需再次置于最低点后可以重新启动。（出现这种情况的原因可能有：电调和马达连接接触不良或有别出线断开、螺旋桨被其他物体阻挡、减速齿卡死等）。
2. 温度保护：当电调工作温度超过 110 摄氏度时，电调会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40%，以保证马达仍有动力，避免因动力不足而摔机。温度下降后，电调会逐渐恢复最大动力。
3. 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。
4. 过负荷保护：当负载突然变得极大时，电调会切断动力，或自动重启。出现负载急剧增大的原因通常是螺旋桨堵转。

### 【故障快速处理】

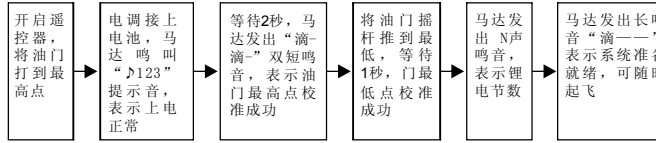
故障现象	可能原因	解决方法
上电后马达无法启动，无任何鸣音	电源接头接触不良、电池组电压不正常	重新插好接头或检查电池组电压
上电后马达无法启动，马达鸣叫“滴-滴、滴-滴-”警示音（每声之间的间隔时间为2秒）	接收机油门通道无信号输出	检查发射机和接收机的配合是否正常，油门控制通道接线是否插紧
上电后马达无法启动，马达鸣叫“滴-滴、滴-滴、滴-”急促单音	油门未归零或油门行程设置过小	将油门摇杆置于最低位置；重新设置油门行程
上电后马达无法启动，马达鸣叫“滴-滴-”提示音，然后发出“♪56712”特殊提示音	油门通道“正/反”向错误	参考遥控器说明书，调整油门通道的“正/反”向设置
马达反转	电调输出线和马达线连接的线序错误	将三根输出线中的任意两根对调
马达中途停转	油门信号丢失保护 电池电压不足，进入低压保护状态 接线接触不良	检查遥控器和接收机的配合是否正常，检查油门通道接线是否接触良好 重新给电池充满电 检查电池组插头是否正常、电调输出线和马达线连接是否稳固可靠
随机性的重新启动和工作状态失常	使用环境中具有极强烈的电磁干扰	电调的正常功能会受到强烈电磁波的干扰，出现这种情况时，请参照说明书的指示，尝试重新上电启动来恢复正常的工作状态；当故障反复出现时，说明使用环境中的电磁波干扰过于强烈，请在其他场所使用该产品。

### 【正常开机过程】



### 【油门行程设定】

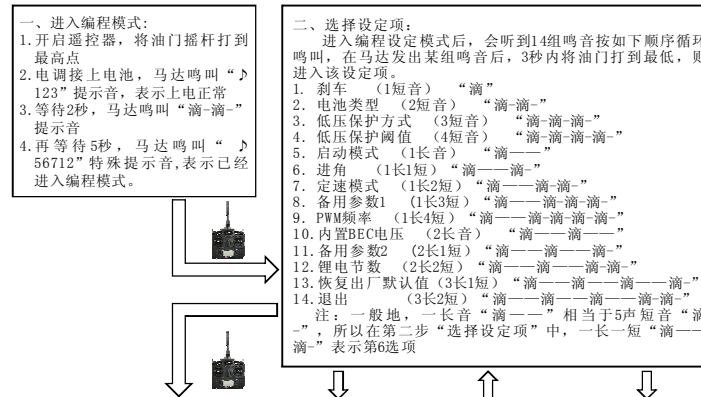
强调！当首次使用电调或者更换其他遥控器使用时，均应重新设定油门行程，其他时候则不用。



### 【使用遥控器进行参数编程设定的说明】

使用遥控器油门摇杆设定参数分为四个步骤：

- 一、进入编程模式；
- 二、选择设定项；
- 三、选择设定项下的参数值；
- 四、退出。



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设定值，接着马达鸣叫特殊提示音“♪1515”，表示该参数值已被保存。（此时如果不想再设定其它选项，则在3秒内将油门摇杆打到最低，即可快速退出编程设定模式；如果还要设定其它选项，则继续等待，退回第二步骤，再选择其它设定项）

(下表中带\*符号的数值为出厂默认值)

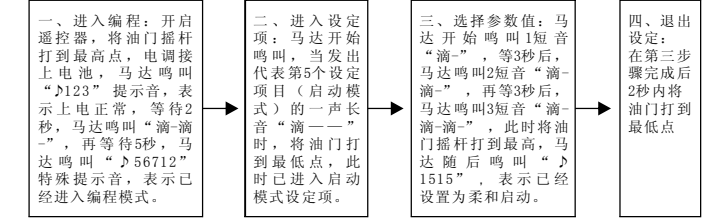
提示音	1	2	3	4	5	6	7	8
设定项	1短音	2短音	3短音	4短音	1长音	1长	1长	1长
1刹车	*Off	Soft	Hard	Very Hard		1短	2短	3短
2电池类型	*LiPo	NiMH						
3低压保护方式	*Soft Cut	Hard Cut						
4低压保护阈值	Low	*Middle	High	Custom				
5启动模式	Hard Cut	Soft	Very Soft					
6进角	0°	3.75°	7.5°	11.25°	*15°	18.75°	22.5°	26.25°
7定速模式	*Off	Governor Low	Governor High					
8备用参数1								
9PWM频率	*12KHz	8KHz						
10备用参数2								
11备用参数3								
12锂电节数	*Auto	5S	6S	8S	10S	12S		

四、退出设定：  
有如下两种方式退出设定。  
1. 在第三步骤，选择设定值时，鸣叫特殊提示音“♪1515”后，  
2. 在第二步骤，选择设定项时，当马达鸣叫出代表第14设定项的3长2短的鸣音后，3秒内将油门打到最低点，则退出设定。

注意：使用油门摇杆或者参数设定卡更改电调参数后，保存退出，电机将长鸣5声“滴——”，5秒后电调方可重新启动。

### 【编程设定示例】

本例中，将启动模式设为“柔和启动”，即第5设定项的第3个参数值。



Thank you for buying KDS brushless ESC. Please read this manual thoroughly before using the product.

**● INSTRUCTIONS**

- Made of high quality components, guaranteeing the consistency of first-rate quality product.
- Adopt PCB of ultra-low impedance, strong ability to bear current. Current marked and explain consistent.
- Good capacity of anti-jamming, efficiently reduced the possibility of out of control.
- Equipped with over-heat protection circuit.
- Equipped with over/under voltage protection circuit.
- Smooth and superior speed linear feel; Stable and powerful speed output.
- Support the governor function.

Note: The HV ESC has no intern BEC. A separate power supply or external UBEC is required for receiver when you use the ESC.

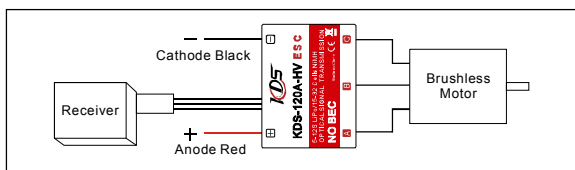
**● SPECIFICATIONS**

- KDS ESC120A-HV
- Rated Current: 120A
- Continuous Current: 120A
- Max. Current: 150A (No less than 10 seconds)
- BEC Current: None
- LiPO Cells Supported: 5S-12S
- NiMH Cells Supported: 15S-32S
- Weight: 135g

**● FUNCTIONS**

- Safe startup mode: when ESC gets power, the throttle stick of transmitter which is in any point can't make ESC switch on.
- Low-voltage protection: when input voltage is lower than set value, ESC will decrease or close power input automatically and protect drive battery effectively .
- Over-voltage protection: when input voltage is higher than set value, ESC will emit the warning and stop working, which prevent ESC from damaging.
- Over-heat protection: when the temperature is out of range, ESC will break off power output automatically.
- Battery type option: there are two options, Lipo or NiMH battery
- Startup mode: there are three modes which can be used for all model aircrafts.
- Transmitter compatibility: throttle travel can be set; Being compatible with all brand transmitters.
- Safety: when your use ESC properly, ESC will close output automatically if ESC lose remote control signal, which will avoid loss caused by losing control.

**【Wiring Diagram】**



**【PROGRAMMABLE ITEMS】**

- Brake Setting: \*Off/ Soft/Hard/ Very Hard, default is “off”.
- Battery Type: \*Lipo/NiMH, default is “Lipo”.
- Low Voltage Protection cutoff mode: \* Soft Cut/Hard Cut(Gradually reduce the output power/Immediately cut off the output power), default is “Soft cut”.
- Low Voltage Protection Threshold(Cutoff Threshold)Low/\*Middle/High/ Custom, default is “Middle”.
  - For Lipo batteries, the cutoff threshold of the whole battery pack is calculated according to the cells number. The value of each cell is 2.75V/ 3.0V/3.5V respectively.
  - For NiMH batteries, the cutoff threshold of the whole battery pack is calculated by 50%(low) / 62.5%(Middle) / 70%(High) of the full charged voltage. For example, 1 pack with 15cells battery full charged is 1.44V X15=21.6V. When the cutoff threshold is set to “Low”, the voltage protection threshold is 21.6 V X 50%=10.8V.
- Startup Mode: \*Normal/Mild /Soft, default is “Normal”.
 

“Normal” mode is suitable for fixed-wing aircrafts, and “Mild mode” or “Soft” mode is suitable for helicopters. The initial acceleration of the “Mild Mode” and “Soft” mode is slower than the “Normal mode” . Usually it takes 3 seconds for “Mild mode”and 8 seconds of “Soft”mode from 0% throttle advance to full throttle. After startup, if the throttle is closed(throttle stick is moved to the bottom position) and opened again(throttle stick is moved upwards) within 3 seconds, the restart will be temporarily changed to “Normal” mode to avoid crash caused by slow response when helicopter or aircraft is doing aerobatic flying.
- Timing: 0°/ 3.75°/ 7.5°/ 11.25°/ \*15°/ 18.75°/ 22.5°/ 26.25°, default is 15°.

Usually, low timing value is suitable for most motors. But there are many differences among structures and parameters of different motors, so please try and select proper timing value according to the motor you are just using. The correct timing value makes the motor run smoothly. And generally, higher timing value brings out higher output power and higher speed.

After changing the timing setting, please test your RC model on the ground prior to flight.

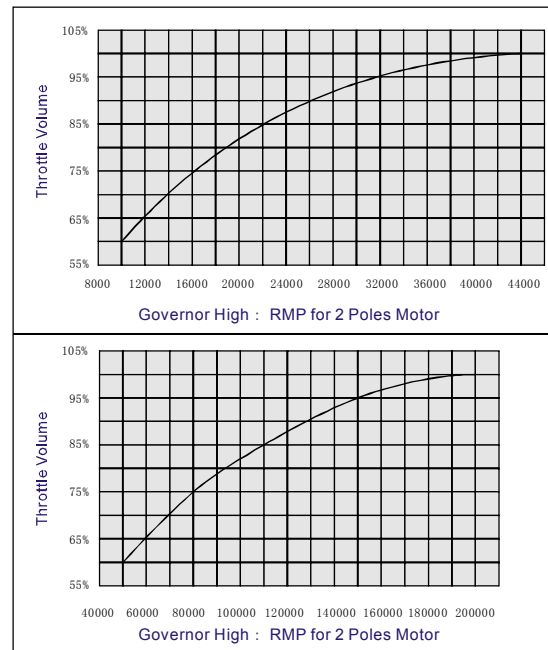
- Governor Mode: \* Off / Governor Low/ Governor High, default is “Off”.The speed range of “Governor Low” mode is 10000 RPM to 45000RPM for 2 poles brushless motor, and “Governor High” mode is 46000 RPM to 200000RPM for 2 poles brushless motor. (Please refer to the following throttle volume and electrical motor speed relationship chart). Please note that RPM refers to the electrical 2 poles motor speed in no slow down group. In order to calculate the speed of the main rotor blades of your helicopter, you need to know the motor poles number and the gear rate of main drive gear vs. the pinion.

For example, if you are using a 6 poles motor (that is: 3 pair poles), and the main drive gear is 150T, the pinion is 13T, so you can calculate it as follows:

The rotation speed for the main rotor blades=(The speed of 2 poles motor\*13)/3/150

When you adjust the throttle curve, please make sure that the motor can run at this preset speed even if the motor load is heaviest. Please note that the governor mode function is automatically disabled if the

throttle volume is less than 60%.



- Reserved Item #1: Reserved for future.
- PWM Frequency: \*12 KHz/8KHz, default is 12 KHz.

For some motors with high KV (high speed) and several poles, the 12 KHz PWM frequency may let them work more smoothly. But the higher PWM frequency will make the ESC hotter. Generally, the 8 KHz PWM frequency is suitable for most of motors.

- Reserved Item #2: Reserved for future.
- Reserved Item #3: Reserved for future.

Lipo Cells:For high voltage ESC, the values are\*Auto/ 5S/ 6S/ 8S/ 10S/ 12S, the default is “Auto”.This programmable item is available for lipo battery. In the startup process, the motor will emit several “Beep-” tones to represent the Lipo cells number, it is helpful for you to check whether it is coincident with the actual battery pack or not.

If you choose “Auto”, the ESC may mistakenly judge the battery cells when the voltage is less then 3.7V per Cell. So we strongly suggest setting the “Lipo Cells” manually.

Note 2 : For high voltage ESC(support 5 to 12 cells Lipo battery), when the motor emits the “Beep” tones to represent the cells number, a long “Beep-” tone = 5 short “Beep-” tone. So 5S= “Beep —”, 6S = “Beep— Beep-” (1 long 1 short), 8S = “Beep—Beep-Beep-Beep-”(1 long 3 short), 10S = “Beep—Beep-”(2 long), 12S = “Bee — Beep—Beep-Beep-”( 2 long 2 short). While for normal voltage ESC(supports 2 to 6 cells Lipo battery), we still use 5 short “Beep-” tones to represent 5S Lipo battery, and 6 short “Beep-” tones to represent 6S Lipo battery. ( High voltage ESC does not support 7 cells, 9 cells and 11 cells lipo batteries).

**【USE THE ESC FOR THE FIRST TIME】**

Please check the wiring and connections carefully, and then start the



ESC in the following sequences:

1. Move the throttle stick of transmitter to the bottom position, and then switch on the transmitter.
2. Connect the battery pack to the ESC, and then the ESC begins the self-test process, a special tone “♪123” is emitted, which means the voltage of the battery pack is in normal range, and then several “Beep” tones will be emitted, which means the number of Lipo battery cells. Finally a long “Beep—” tone will be emitted, which means the self-test is OK, the helicopter or aircraft is ready to fly.
  - (1) If nothing is happened, please check the battery pack and all the connections;
  - (2) If a special tone “♪56712” is emitted after 2 “Beep-” tones, which means the ESC has entered the program mode. That is because the throttle channel of the transmitter is reversed. Please set the channel correctly.
3. **IMPORTANTANCE:** Different transmitter has different throttle travel, you need to calibrate the throttle travel and let the ESC save it to get the best throttle linear for the first time using or changing another transmitter.

Please read the instruction “THROTTLE TRAVEL SETTING” in the middle bottom of this page.

### 【WARNING TONES】

1. The throttle signal lost. When the ESC can not detect the throttle signal, such warning tones will be emitted “Beep-, Beep-, Beep-” (Every “Beep-” has a time interval of about 2 seconds).
2. Throttle stick is not in the bottom position. When the stick is not in the bottom position, a very rapid warning tone will be emitted “Beep-, Beep-, Beep-, Beep-”.
3. The throttle travel is too small. The required throttle travel for the ESC shall be higher than the third positioning gauge near the throttle stick on the transmitter panel. When the throttle travel is under the third positioning gauge, the ESC will emit warning tone “Beep-, Beep-, Beep-, Beep-”. Then you need to reset the travel.

### 【PROTECTION FUNCTIONS】

1. **Startup protection.** When the throttle stick is being moved up, If the motor fails to start within 2 seconds, the ESC will cut off the output power. In this case, the throttle stick must be moved to the bottom position again to restart the motor. (This happens in the following cases: the connection between ESC and motor is not reliable, the propeller or the motor is blocked, the gearbox is damaged, etc..)
2. **Temperature protection.** When the temperature of the ESC is over 110 degree, the ESC will reduce the output power to 40% (maximum) of all output power, which can ensure motor has power to avoid crashing because the power is not enough. The ESC will resume power after the temperature drops.
3. **Throttle signal loss protection.**

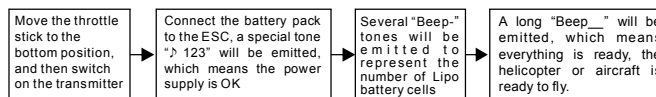
The ESC will cutoff the output power if throttle signal is lost for more than 0.25 second. When the signal recover, the output power will be resumed.
4. **Overload protection.** When the load become big suddenly, the ESC will cut off the power or restart.

### 【TROUBLE SHOOTING】

TROUBLE	POSSIBLE CAUSE	SOLUTION
After power on, motor does not work, no sound is emitted	The power connection is not reliable, or input voltage is abnormal	Reconnect the battery pack, or check the voltage of battery pack

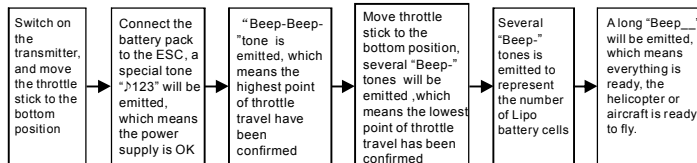
After power on, motor does not work, such a warning tone is emitted “Beep-, Beep-, Beep-” (Every “Beep-” has a time interval of about 2 seconds)	No signal output from throttle channel of receiver	Check the receiver and transmitter, and the throttle control cable connection
After power on, motor does not work, such a warning tone is emitted “Beep-, Beep-, Beep-”.	The throttle stick is not in the bottom position or the throttle travel setting is too small	Move the throttle stick to bottom position; Reset throttle travel setting
After power on, motor does not work, a special tone “♪56712” is emitted after “Beep-, Beep-”	The REVERSE setting of throttle channel is not correct	Please read the instruction of transmitter to adjust the setting of channel REVERSE
Motor runs in the opposite direction	The sequence of the connection of ESC output wire and motor wire is not correct	Swap any two wire connections between ESC and motor
Motor stops running while working	Throttle signal is lost	Check the receiver and transmitter, and the throttle control cable connection
	ESC has entered Low Voltage Protection mode	Charge the battery
	Some connections are not reliable	Check battery pack connector Check the connection of ESC wire and motor wire
Abnormal restart and working state	There is strong electromagnetic interference	Reconnect battery to make ESC be back to normal working condition. If that often happens, please go to other places for flying.

### 【NORMAL STARTUP PROCEDURE】



### 【THROTTLE TRAVEL SETTING】

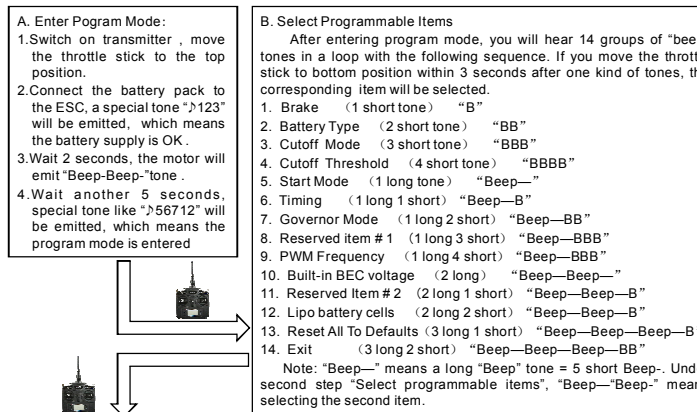
**IMPORTANTANCE.** When you use the ESC for the first time or change another transmitter, you need to reset throttle travel.



### 【PROGRAM THE ESC WITH TRANSMITTER】

There are four steps for the parameter program setting:

- A. Enter program mode;
- B. Select programmable items;
- C. Set the item's value;
- D. Exit program mode.



### C. Set Item value (Programmable value):

You will hear several “Beep” tones in loop. Set the value matching to a tone by moving the throttle stick to top position when you hear the tone. Then a special tone “♪1515” will be emitted, which means the value is set and saved. (If you do not need to set other items, please move the throttle stick to the bottom position within 3 seconds to exit program mode; if you want to set other items, please go on waiting, and then return to the second step to set them)

(The value with symbol \* is the factory-preset value (That is default value).)

Warning tone	1	2	3	4	5	6	7	8
ITEMS	1 short	2 short	3 short	4 short	1 long	1 long	1 long	1 long
1 Brake	* Off	Soft	Hard	Very Hard		1 short	2 short	3 short
2 Battery Type	* LiPo	NIMH						
3 Cutoff Mode	* Soft Cut	Hard Cut						
4 Cutoff Threshold	Low	*Middle	High	Custom				
5 Startup Mode	Hard Cut	Soft	Very Soft					
6 Timing	0°	3.75°	7.5°	11.25°	* 15°	18.75°	22.5°	26.25°
7 Governor Mode	* Off	Governor Low	Governor High					
8 Reserved Item #1								
9 PWM Frequency	* 12KHz	8KHz						
10 Reserved Item #2								
11 Reserved Item #3								
12 Lipo Cells	* Auto	5S	6S	8S	10S	12S		

### D. Exit Program Mode:

There are 2 ways to exit the program mode.

1. In step # 3, after special tone “♪1515”, please move the throttle stick to the bottom position within 2 seconds.
2. In Step # 2, after tone Beep—Beep—Beep—BB” (3 long 2 short Beep tones, which means the item # 14), move the throttle stick to the bottom position within 3 seconds.

**Note:** After setting the programmable item by the throttle stick or a program card, you will hear 5 long “Beep—” tones when the ESC exits the program mode. You can restart the ESC 5 seconds later.

### 【Program Setting Example】

In this sample, we set the startup mode to “soft”, that is the third value under the fifth selected item.

Switch on transmitter, move the throttle stick to the top position. Connect the battery pack to the ESC, a special tone “♪123” will be emitted, which means the battery supply is OK. Wait 2 seconds, the motor will emit “Beep-Beep-” tone. Wait another 5 seconds, special tone like “♪56712” will be emitted, which means the program mode is entered.

Entering program mode: when you hear “Beep—” tone (a long tone of start up mode), please move the throttle stick to the bottom position, and then ESC will enter startup mode item.

Select parameter value. Motor emits a short tone “Beep-”; 3 seconds later, it will emit 2 short tones “Beep-Beep-”; Another 3 seconds later, you will hear 3 short tones “Beep-Beep-Beep-”, and then please move the throttle stick to the top position. Motor will emit “♪1515”, which means the startup mode is changed to “soft” mode.

Exit program mode. After completing the setting under the third step, please move the throttle stick to the bottom position within 2 seconds.