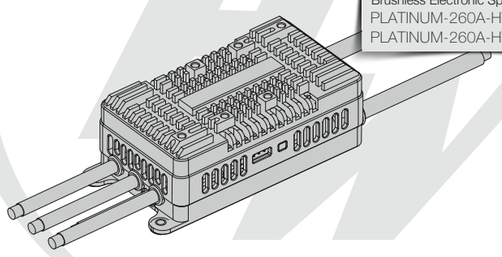
USER MANUAL

PLATINUM

Brushless Electronic Speed Controller

PLATINUM-260A-HV-SBEC-V5

PLATINUM-260A-HV-OPTO-V5



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Thank you for purchasing this HOBBYWING product! Please read this declaration carefully before use, once you starts to use, we will assume that you have read and agreed with all the content. Brushless power systems can be very dangerous and any improper use may cause personal injury and damage to the product and related devices, so please strictly follow the instruction during installation and use . Because we 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. We, HOBBYWING, are only responsible for our product cost and nothing else as result of using our product. Regarding the possible semantic different between two different versions of declaration, for users in mainland China, please take the Chinese version as standard; for users in other regions, please take the English version as standard.

01 Warnings

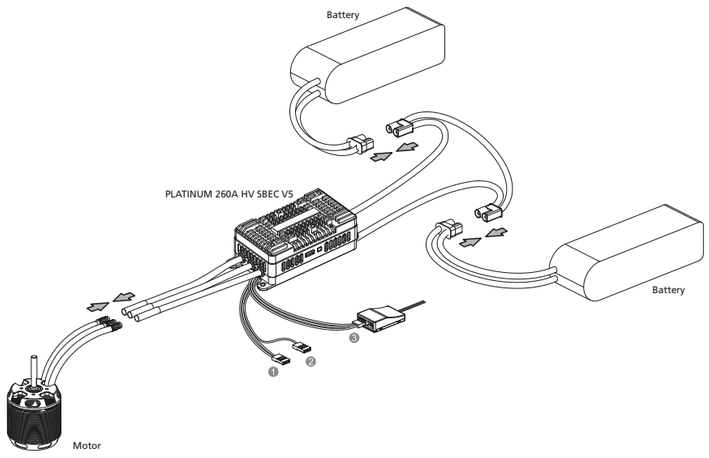
- Before using this product, read the instruction manual carefully. Ensure that the equipment is used appropriately to avoid damaging the ESC. The wrong usage will overheat the motor and may damage the electronics.
- it is important to ensure that all wires soldered are properly secured to avoid short circuits from happening. A good soldering station is recommended to do such a job to avoid overheating the circuit board as well as to ensure connections are properly welded.
- Even though the product has relevant protective measures, always use it in a safe manner in accordance with the operating environment noted in the manual (e.g, voltage, current, temperature and etc).
- Always remember to disconnect the battery each time after using it. Failure to do so will caused the battery to be completely discharged, resulting in an unpredictable danger.

02 Specifications

Model	PLATINUM 260A HV SBEC V5	PLATINUM 260A HV OPTO V5
Continuous/Peak current	260A / 400A	
Input voltage	6-14S LiPo battery	
BEC	Switch Mode BEC; output voltage 5-12V adjustable (adjusted 0.1V); output current cont. 10A, Peak 30A	No BEC
Input/Output wires	1 x black and 1x red 8AWG silicone wires / 3 x black 10AWG silicone wires	
Independent parameter programming interface	Connect LCD program box or OTA module, or to power the cooling fan	
LED light	Display the statuses and fault alerts	
Size/Weight	89 x 50 x 34mm / 297g (With wires)	89 x 50 x 34mm / 287g (With wires)
Mounting holes	M3, 39 x 98mm	
The scope of application	700-800 class electric helicopter (main rotor length 700-880mm), or fixed-wing	

03 User Guide

1 Wiring diagram



① BEC output wire (red, brown): The additional BEC output wire is plugged into the receiver battery dedicated channel or any available channel. (For better BEC power output, it is recommended to insert the BEC cable into a battery-specific channel or any available channel)

② RPM signal wire (yellow): electrical RPM output line of the motor needs to be connected to the RPM in of an external device (such as a Flybarless system gyro).

③ Throttle signal wire (white, red, black): Insert into the receiver throttle channel. Depending on the receiver type, the white wire is to transmit the throttle signal, whereas the red and black lines are parallel to the output of the internal BEC (e.g. the BEC voltage output wire and ground wire)

2 Normal boot process

Turn on the transmitter and push the throttle stick to the lowest point → The ESC is connected to the battery, the motor will sound off with "♪123", indicating that power turned on is normal → A "beep" tone is sounded off to indicate the number of lithium batteries. → Finally, a long "beep" tone indicates that the ESC self-check is complete and the motor can be driven at any time

3 Throttle stick calibration operation method

Turn on the transmitter and push the throttle to the 100% TH point → ESC connect battery, motor will sound "♪ 123", indicating that power turned on is normal → Then motor will sound off with a "beep-beep, indicating calibration for the highest point is successful. → Next, push the throttle stick to the minimum with in 5 seconds, and wait 1 second for the throttle lowest point to be calibrated successfully.. → A "beep" tone is then sounded off to indicate the number of lithium batteries. → Finally, a "beep" tone indicates that the system is ready to take off at any time

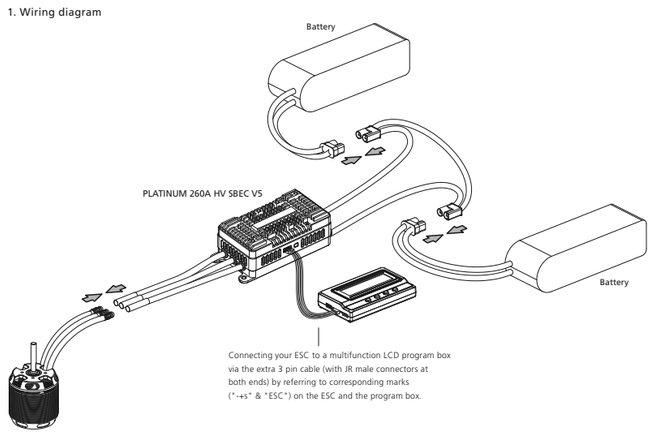
- ESC default throttle range is 1100μs-1940μs (Futaba standard). The throttle range should always be re-calibrated for the first time or when transmitter have been replaced.
- Before calibration, always have the throttle curve set to default. Ensure that the throttle value corresponds to the highest point(100%) of the remote control throttle and the lowest throttle point (0%).

04 ESC programming and Data checking

- The ESC parameters can be programmed specifically to meet different flight needs.
- The ESC will be able to record the calibration speed of the current flight (only in storage fixed speed mode), the minimal voltage, maximum temperature and other information. Please do not disconnect the power from the battery as the information will not be saved after the power has been disconnected. Connect LCD program box or OTA module to view.

1 Use Multifunction LCD program box to program ESC parameters (need to purchase separately)

1. Wiring diagram



2. Setting methods

- Connect ESC to LCD program box as shown above, and then connect the battery to ESC.
- The current firmware version will be reflected once the power is turned on.
- Press "ITEM" to browse through the parameters, and press "VALUE" to change the settings;
- Press OK to save the settings;
- Repeat step 3) and step 4) to modify the settings of other parameters.
- Once completed, disconnect the ESC from the battery and unplugging wire between ESC and LCD program box. Power up again and you are ready to run the new settings.

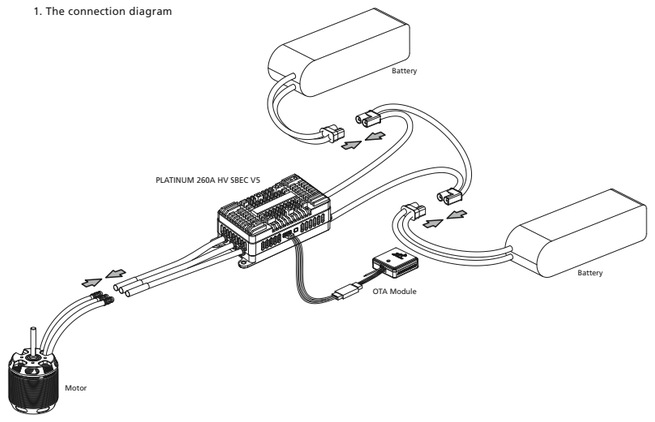
Note: Any parameter changes will require the ESC to be re-powered to take effect.

3. Chack ESC running data

- Do not disconnect the ESC after the flight, then connect the ESC and LCD program box as shown above;
- The version of the current firmware will be reflected once you have connected the LCD program box to the ESC.
- Press "ITEM" key continuously, and after browsing the parameter items of ESC, the status data (minimum voltage, maximum temperature, maximum speed, etc.) of ESC will appear.

2 Use OTA Module to program ESC parameters (need to purchase separately)

1. The connection diagram



2. Setting methods

- Connect the ESC and OTA module as shown above, then connect the battery to ESC.
- Turn on your phone's Bluetooth and connect to the OTA module。
- Once connected, open "HW Link" software from the mobile phone and click on "connection" to make changes to the parameters, view data records and other operations.
- Once completed, disconnect the ESC from the battery by switching off and unplugging the OTA module. Power up again and you are ready to run the new settings.

3. Chack ESC running data

- Do not disconnect the ESC after the flight, then connect the ESC and OTA modules as shown above;
- Turn on your phone's Bluetooth settings and connect to the OTA module。
- Open "HW Link" and click on the icon to connect. Click on "data record" to select and "empty mode" to view the record data.

05 Programmable parameter items and instructions

Programmable parameter items and parameter values

	Item	Value					
1	Flight mode	Fixed-wing	Helicopter external Governo		*Helicopter Elf Governor	Helicopter store Governor	
2	LiPo cells	*Auto Calculation	6S	8S	10S	12S	14S
3	Low-Voltage Cutoff Type	*Soft Cutoff			Hard Cutoff		
4	Cutoff Voltage	Disabled	2.8V-3.8V (Default *3.0V)				
5	BEC Voltage	5-12V(Default: *6.0V)					
6	Response time	4-25(Default *15)					
7	Governor parameter P	0-9(Default *5)					
8	Governor parameter I	0-9(Default *5)					
9	Auto Restart Time	0-90 seconds(Default *25 seconds)					
10	Restart acceleration time	1-3 seconds(Default *1.5 seconds)					
11	Brake Type	* Disabled			Normal brake		
12	Brake Force	0-100%(Default 0%)					
13	Timing	0°-30°(Default 25°)					
14	Motor direction	*CW			CCW		
15	Active Freewheeling	*Enabled			Disabled		
16	Start-up force	1-7 (Default *3)					

"*" in the form below indicate factory defaults.

Programmable parameters project description

1. Flight mode

1.1. Fixed-wing mode: Suitable for fixed-wing. In this mode, the throttle has to be more than 5% (including 5%) to start the motor and the throttle response is rapid.

1.2. Helicopter external Governor mode: Suitable for helicopter aircraft without any fixed speed equipment or helicopter aircraft using external speed control equipment. The throttle has to be higher than 5% (including 5%) before starting the motor. After the slow start is completed, the motor will start off in a smoother manner, followed by a faster throttle response accelerated to the current throttle value;

1.3. Helicopter Elf Governor Mode: Suitable for helicopter aircraft flying at fixed speed. The throttle has to be higher than 40% (including 40%) before starting the motor. In the slow start process, the motor starts off in an ultra-smooth acceleration to complete the speed calibration.

1.4. Helicopter store Governor mode: Suitable for the use of fixed speed flight helicopter aircraft. The throttle in this mode has to be more than 40% (including 40%) before starting the motor. The motor starts in an ultra-smooth manner, after the completion of slow start speed into the fixed speed operating state.

***Note that speed calibration must be done each time other modes are switched to using this mode.**

2. LiPo cells

The number of battery cells can be calculated automatically and set manually. Select Auto-calculation to calculate the number of battery cells. Error on battery cells will be detectable during self-test and can be adjusted accordingly.

3. Low-Voltage Cutoff Type

Soft Cutoff: The output power will be gradually reduced to 50% of the total power output after low voltage protection is triggered.

Hard Cutoff: Disconnect the power output immediately after low-current protection is triggered.

4. Cutoff Voltage

2.8V-3.8V with 0.1V step adjustability. When using 6 lithium batteries, the final protection voltage should be set by ×6.

5. BEC Voltage

The ESC is built-in with a BEC of 5-12V and has the capability to adjust 0.1v per step.

6. Response time

Adjust the response speed of the throttle in "helicopter elf Governor" or "store Governor". The higher the value, the slower the throttle response speed. 4-25 fully adjustable.

7. Governor parameter P

This item is for controlling the ESC compensate the amount of the motor speed during the process of maintaining the speed-governing effect; the higher the value, the bigger the amount; and vice versa. This function functions together with the Governor Parameter I.

8. 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.

9. Auto Restart Time

This feature is only available in helicopter elf or storage fixed speed modes. It is the time set to push the throttle from more than 40% to 25% to 40% throttle range, and then push back more than 40%. The parameter will not take effect when the throttle range is below 25% or between 25%-40% beyond the set time. The ESC will execute the "helicopter elf / storage fixed speed" modes of the default start-up process only if the throttle range is above 40%.

10. Restart acceleration time

1-3 seconds, with 0.5 seconds step adjustability . This parameter controls the time required for the motor to accelerate from zero to full speed during a quick restart. (This is an auxiliary function and is only valid if the "time to turn off and land" function is valid)

11. Brake types

Normal brake: This function will stop the motor from braking during operating according to the value set on the braking force.

12. Brake Force

The greater the value, the shorter the time taken for the motor to come to a standstill. 0-100%, with 1% step adjustability. This function is only valid in normal brake mode.

13. Timing

This item is for adjusting the ESC timing, it's adjustable between 0 and 30° with the step of 1°.

14. Motor direction

This item is for setting the rotation direction of the motor, it's "CW" by default. After connecting the motor to the ESC, (if the motor rotates clockwise); when setting this item to "CCW", the motor will rotates counterclockwise; (if the motor rotates counterclockwise), when setting this item to "CCW", the motor will rotates clockwise.

15. Active Freewheeling

This item can be enabled or disabled when the "Flight Mode" is set to the "Fixed-wing" or "Helicopter (External Governor) mode; it's fixed at "Enabled" when the "Flight Mode" is set to the "Helicopter (Elf Governor)" or"Helicopter (Store Governor)" mode. With this item enabled, the throttle linearity will be great.

16. Start-up force

This item is for adjusting the start-up force of the motor (during the start-up process). The higher the value, the larger the start-up force. It's adjustable between 1 and 7.

06 Speed Governor Function

1 Explanation for ESC Speed-governing

Establish the "Motor RPM-Throttle Amount Curve" via the speed standardization, and then set the throttle amount to some fixed value on the transmitter, in that condition, the motor will output the RPM corresponds to the throttle amount and keep rotating at that speed.

- In the "Helicopter (Elf Governor)" mode, the ESC won't save the "Motor RPM-Throttle" curve after it's disconnected from the battery, so every time the ESC is connected to the battery, it will standardize the speed, otherwise you cannot use the speed-governing function normally. In this mode, due to the differences like batteries' different discharge capacity, the standardized RPM is a little different every time. In consequence, at the same throttle amount, the RPM may be a bit different when using different batteries, but this won't affect the speed-governing effect.
- In the "Helicopter (Store Governor)" mode, the ESC will save the "Motor RPM-Throttle" curve after the speed standardization. So after adjusting to this mode from any other mode, you need to standardize the speed when the ESC is connected to the battery for the first time and you needn't standardize the speed again after disconnecting the ESC from the battery first and then connecting it to the battery again. If adjusting to any other mode from this mode and saving the "Motor RPM-Throttle" curve, and then adjusting back to this mode, the "Motor RPM-Throttle" curve saved by the ESC will be cleared, and you need to standardize the speed once again. If your ESC remains in this mode in future, then it will always carry out its operation as per the saved "Motor RPM-Throttle" curve. When standardize the speed for the first time, we recommend using a battery in good condition. After the RPM standardization, change another battery with the same number of cells to fly your aircraft. At the same throttle amount, the RPM should be consistent with the RPM of the first flight.

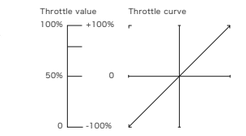
2 RPM Standardization

1) Theory of RPM Standardization

During the RPM standardization, the ESC will establish a "Motor RPM-Throttle" curve by itself based on the actual battery voltage and the actual KV rating of the motor. Therefore , you need to standardize the speed with a fully charged battery, and ensure the main blade pitch is 0° (in order to make the helicopter not take off).

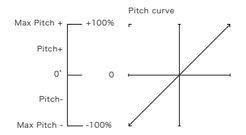
In general, people use the default "Throttle Curve & Pitch Curve" of the transmitter (as shown below) when they standardize the speed.

Attention! Please ensure the main blade pitch is 0° and the throttle amount is above 40% (we recommend using 50%) when standardizing the speed.



2) Procedures of RPM Standardization

- We recommend using the default "Throttle Curve & Pitch Curve". (If you don't want to use the default setting, then please ensure the throttle amount is 50% and the main blade pitch is 0° when the motor rotates.
- Turn on the transmitter, move the throttle stick to the bottom position and then wait for the ESC completing the self detection.
- If you've set the "throttle cut" function, please lock the "throttle cut", and then move the throttle stick to the 50% position and then unlock the "throttle cut". If there is no "throttle cut", then you can move the throttle stick to the 50% position directly.
- The ESC drives the motor to rotate, the main blades start to accelerate slowly (because the main blade pitch is 0°, so the helicopter won't take off, but you still needs to be careful), you need to wait for the acceleration completing and the speed getting stable, and then lock the "throttle cut" or move the throttle stick to the bottom position.
- The ESC will stop driving the motor, the main blades start to slow down and then stop rotating.
- The RPM standardization completes.



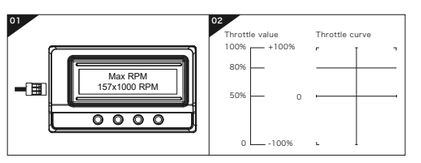
Attention! Please calibrate the throttle range before the RPM standardization. There will be no need if you've carried out the ESC/Radio Calibration when the first time you used this ESC or you didn't restore the settings to factory defaults after the calibration (changing the transmitter & receiver is an exception).

3 How to Set the Speed-governing Function

- The best throttle amount (set in the Helicopter "Store Governor" mode) of the ESC ranges from 70% to 90%, so please try to set the throttleamount (set in the Helicopter "Store Governor" mode) within this range. A low throttle amount (set in the Helicopter "Store Governor" mode) will make the ESC always function inefficiently; while a high throttle amount (set in the Helicopter "Store Governor" mode) will leave the ESC a very small compensation space, then compensation insufficiency issue may happen and cause (speed decrease) problem when the load is high. In that case, we recommend changing the motor or drive gear ratio (you need to re-standardize the speed after you change the motor or drive gear ratio).
- In the "Helicopter (Store Governor)" mode, if fly your aircraft with a low performance battery after standardizing the speed with a high performance battery may cause damage to the low performance battery.
- In "Helicopter (Store Governor)" mode, different battery packs can bring the same stable RPM only if they have the same cell count. This won't change even when you change the battery pack. However, battery packs with different cell count don't have the same effect. For instance, in "Helicopter (Store Governor)" mode, you can`t use a 4S to calibrate the motor RPM and then use a 6S to drive the motor, hoping it can run at the same RPM.
- You can decide the control feel via adjusting Governor Parameter P/I. In "Helicopter (Store Governor) or Helicopter (Elf Governor)" mode, connect your ESC to a smart phone or PC, then you can check the "throttle vs speed" chart.

1. In "Helicopter (Store Governor)" mode, you can check the standardized speed (Max. RPM) and needn't standardize the speed every time when the ESC is connected to the battery as in the "Helicopter (Elf Governor)" mode, so it's more convenient. We recommend using this mode in the condition that you're using fixed motor, drive gear ratio and battery (with same cell count). In this mode, only if the drive gear ratio is accurate, the main blades' RPM corresponds to the throttle amount (set in the Helicopter "Store Governor" mode) you will get will be accurate as well. About how to "set the speed-governing function" in this mode, let's take an example .1.

- In "Helicopter (Store Governor)" mode, connect the ESC to the LCD program box or WIFI Express module when the RPM standardization completes, and then find the record (as shown below) as per the instruction about the " data checking" process.
  The value shown in the image is just an example, pleas take the value actually displayed on your LCD program box as standard. This value is the max. electrical RPM the motor can reach at the 100% throttle.
- Take a helicopter with single reduction gear unit as an example, with the motor poles is 10, the motor drive gear is 13T and the main drive gear is 120T (that the drive gear ratio is 9.3), then you can get the main blades' RPM at the 100% throttle.



Formula: Main Blades' RPM (at the 100% throttle)=Max. RPM÷ (Motor Poles ÷2)÷Drive Gear Ratio

The Main Blades' RPM (at the 100% throttle) in the example is: 157*1000÷(10÷2)÷(120÷13)≈3400 RPM If the Main Blades' RPM needs to remain at 2700RPM during the 3D flight process, then you need to set the throttle amount (set in the Helicopter "Store Governor" mode) to 2700÷3400≈ 0.8, that is you need to set the throttle amount to 80%. At this time, you need to set the value of the 3D throttle curve (i.e. IDLE1) to 80% (as shown below):So next time, when you fly your helicopter, let it take off in the "Normal" mode first and then switch to the "IDLE1" mode directly, then your helicopter can starts the 3D flight with 80% throttle amount (that's the standardized speed of 2700 RPM).

Notes: in general, you can set and save 2/3 sets of throttle curve IDLE settings on a high quality transmitter (and you need to adjust the main blade pitch of each set of IDLE setting as per the actual demand), and switch between these settings during the flight and have the different throttle amount (set in the Helicopter "Store Governor" mode) to meet the different RPM demands (i.e. when setting IDLE1 to 70%, IDLE2 to 80%, IDLE3 to 90% in the way as explained earlier, then you will have three different throttle amounts (set in the Helicopter "Store Governor" mode) to meet different flight demands.

2. In the "Helicopter (Elf Governor)" mode, you are not allowed to check the Max. RPM, so you need to set the transmitter in advance and check the main blades' RPM with the help of some external device (like RPM viewer) and then decide the throttle amount you need to set. Here you can calculate the throttle amount roughly. For example, if the KV rating of the motor is 480KV, the battery is a 12S LiPo, the motor drive gear is 13T and the main drive gear is 110T, then the main blades' RPM is: KV Rating × Battery Voltage ÷Drive Gear Ratio (480*12*4.2*13÷110≈2850). So if you want your motor to rotate at the speed of 2150RPM, then the throttle mount is: 2150÷2850≈ 0.75 (that is 75%), and then you adjust it accordingly as per your preference or the data you read on the RPM viewer.

07 Warning Tones and Protection

1. LED indicators and warning notes

Protection	Tone	LED indicator	Instruction
The input voltage is abnormal	"BB, BB, BB, BB..."	Red LED, followed by the tone	The input voltage is not within the input voltage range
Throttle signal loss	"B,—,B,—,B,—...	Red LED, followed by the tone	The throttle signal input was not detected
The throttle stick is not moved to the 0% position.	"B, B, B, B..."	Red LED, followed by the tone	The throttle value is not at 0% throttle
The throttle range is too small	"B, B, B, B..."	Red LED, followed by the tone	When calibrating the throttle stroke, set the throttle travel too small
Temperature protection	"BB, BB, ..." or "BBB, BBB..."	Red LED, followed by the tone	The internal temperature of the ESC exceeds the protection temperature
Low voltage protection	"BBBB, BBBB..."	Red LED, followed by the tone	The operating voltage is lower than the set protection voltage
Current protection	None	Red is always bright	The operating current is higher than the set current

2. Protection function description

- **Abnormal power-on voltage protection**

  The ESC enters a protective state once the input voltage detected is not in the operating range. Prompting LED light to flash.

- **Start-up protection**

  The start-up protection will be able to detect the motor speed from when the speed stops rising or the rising speed is unstable. If the throttle input is less than 15%, the ESC will try to restart automatically; (This may occur due to; Poor contact between the ESC and motor connections, individual output wires, faulty motor, propellers blocked by other objects, Binding gears, etc.)

- **Temperature protection**

  When the operating temperature of the ESC has exceeded 110 degrees Celsius, power will be gradually reduced for safety, but will not be turned off. There will still be up to 50% of power, to ensure that the motor has the power to land. After the temperature drops, the ESC will gradually be restored back to maximum power. ESC temperature must not exceed 70 degrees or it will not work. Prompting LED light to flash (above is the soft-off protection mode, if you choose hard-off, cut off the power directly)

- **Throttle signal loss protection**

  When the throttle signal is lost for more than 0.25 seconds, the output is immediately switched off to avoid further damage due to the propeller rotating at a high speed. Once the signal has been restored, the power output will be restored.

- **Overloading protection**

  When there is a sudden surge of current, power will be cut off and will be restarted. If the load is still abnormal after the restart, the power will be completely cut off.

- **Low voltage cutoff protection**

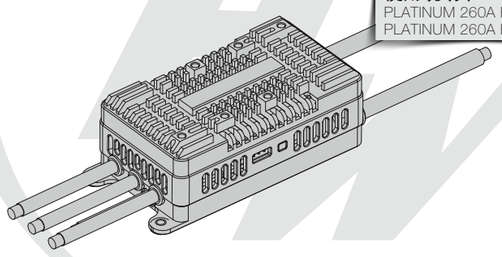
  When the operating voltage of the ESC has exceeded the protection voltage set, power will be gradually reduced for safety, but will not be turned off. There will still be up to 50% of power, to ensure that the motor has the power to land.

- **Over-current protection**

  The current will be cut off immediately once the set value has been breached.

HOBBYWING®

PLATINUM
空模无刷电子调速器
使用说明书
PLATINUM 260A HV SBEC V5
PLATINUM 260A HV OPTO V5



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01 产品注意事项

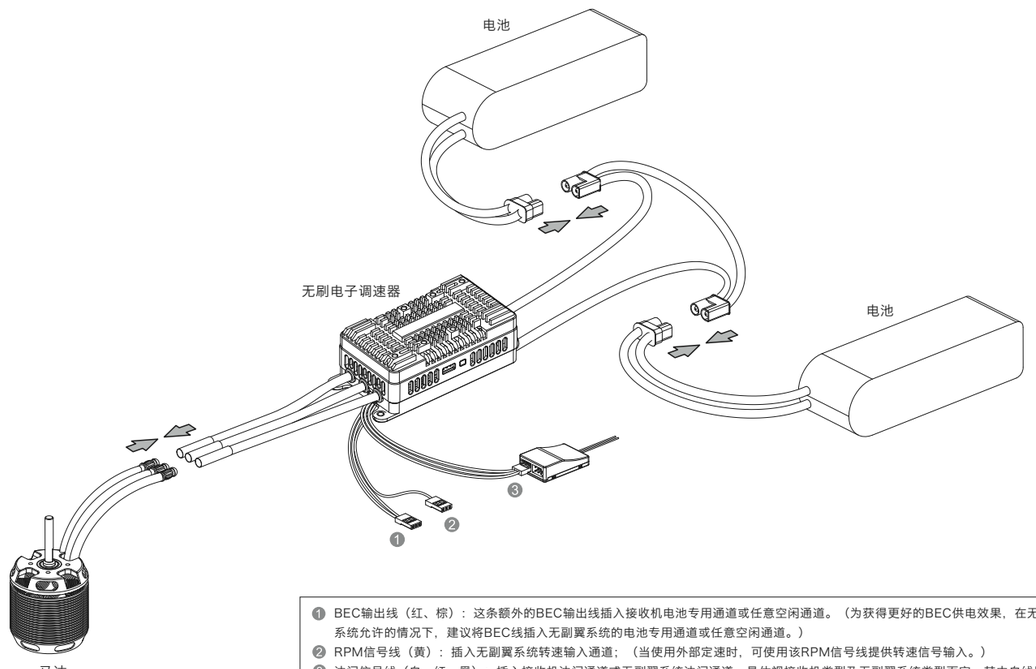
- 使用本产品前，请认真查看各设备以及飞行器的使用说明书，确保动力搭配合理，避免因错误的动力搭配导致电机超载，最终损坏电调。
- 安装本产品时，由于需要进行焊接，连接等操作，所以请务必确保所有电线和连接部件绝缘良好，短路将会毁坏本产品。对本产品的相关线材进行焊接操作时，为保证焊接牢靠，请使用足够功率的焊接设备进行焊接。若连接不良，您可能不能正常控制飞行器，或出现设备损坏等其他不可预知的情况。
- 使用本产品时请远离不安全因素，如障碍物，人群，高压线等。请严格按照本手册中规定的工作环境置（如电压，电流，温度等参数）使用，虽然本产品有相关保护措施，但极限的使用还是有可能会对本产品造成永久性的损坏。
- 使用完毕后，切记将电源切断。如使用电池未断开，电调有可能会误驱动电机转动，造成不可预知的危险，若长时间连接电池，电池最终会被完全放电，进而导致电池或电调出现故障。

02 产品规格

型 号	PLATINUM 260A HV SBEC V5	PLATINUM 260A HV OPTO V5
持续/瞬间电流	260A / 400A	
输入电压	6-14节锂电池	
BEC	开关稳压BEC；输出电压5-12V可调(调整量0.1V)；输出电流持续10A，瞬间30A	无BEC
输入/输出线	1*黑色&1*红色8AWG硅胶线 / 3*黑色10AWG硅胶线	
独立参数编程接口	用于连接LCD参数设定盒或OTA模块，或为散热风扇供电	
LED指示灯	用于显示电调运行状态以及故障提示	
尺寸/重量	89 x 50 x 34mm / 297g（含线）	89 x 50 x 34mm / 287g（含线）
安装孔	M3，39 x 98mm	
应用范围	700-800级电动直升机（主旋翼桨长690-880mm），大型电动固定翼	

03 使用向导

1 接线示意图



❶ BEC输出线（红、棕）：这条额外的BEC输出线插入接收机电池专用通道或任意空闲通道。（为获得更好的BEC供电效果，在无副翼系统允许的情况下，建议将BEC线插入无副翼系统的电池专用通道或任意空闲通道。）
❷ RPM信号线（黄）：插入无副翼系统转速输入通道；（当使用外部定速时，可使用该RPM信号线提供转速信号输入。）
❸ 油门信号线（白、红、黑）：插入接收机油门通道或无副翼系统油门通道，具体视接收机类型及无副翼系统类型而定。其中白线用于传送油门信号，而红线和黑线分别并联在内部BEC的输出端（即BEC电压输出线和地线）。

2 正常的开机过程

开启遥控器，将油门摇杆保持在最低点 → 电调接上电池，鸣叫“♪123” 提示音，表示上电正常 → 随后发出N声短鸣音“哔-”，表示锂电池节数 → 最后发出一声长鸣音“哔——”，表示系统准备就绪，随时可以起飞

3 油门行程校准操作方法

・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。
・进行油门行程校准时，请将油门曲线设置为Normal，并确保遥控器油门最高点对应的油门值为100%，油门最低点对应的油门值为0%。

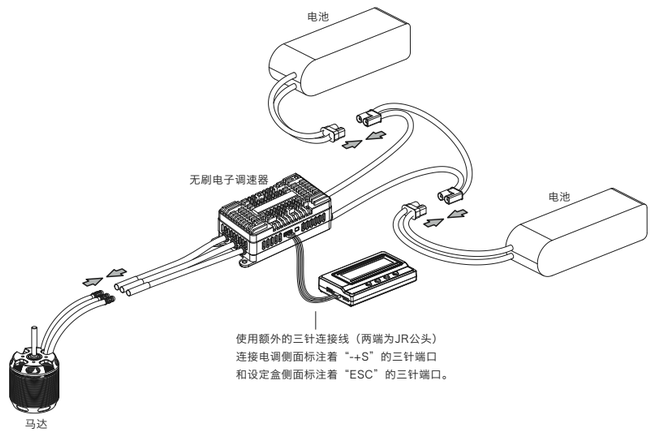
开启遥控器，将油门打到最高点 → 电调接上电池，电机鸣叫“♪123”提示音，表示上电正常 → 然后电机发出“哔-哔-”双短鸣音，表示油门最高点校准成功 → 5秒内将油门摇杆推到最低，等待1秒，油门最低点校准成功 → 马达发出N声鸣音，表示锂电节数 → 马达发出长鸣音“哔——”表示系统准备就绪，可随时起飞

04 参数设定与电调运行信息查看方法

・本电调可进行参数设定，以满足不同的飞行需求。
・本电调会记录当次飞行的标定转速（仅在存储定速模式下可查看且断电不会消失）、最低电压、最高温度等信息，所以当此飞行结束后如需查看，请不要断开电源保持电调处于供电状态，连接LCD参数设定盒或OTA模块即可查看。断电后信息将不会保存。

1 使用LCD参数设定盒调参（需另购）

1.1 接线示意图



1. 2 参数设定方法

・按上图连接电调与LCD参数设定盒，将电调连接电池；
・按“OK”键连接设定盒与电调，连接成功后将显示电调当前的固件版本号；
・成功进入参数界面以后，按“ITEM”键即可浏览参数项，按“VALUE”键即可更改该参数项的设定值；
・更改设定值以后，按“OK”键即可保存修改后的设定值；
・重复第三第四步操作可修改其他参数项设定值；
・参数设定完成后，断开电调与电池连接，拔掉电调与参数设定盒连接线，将电调断电以后重新上电即可运行新的参数设置进行工作。

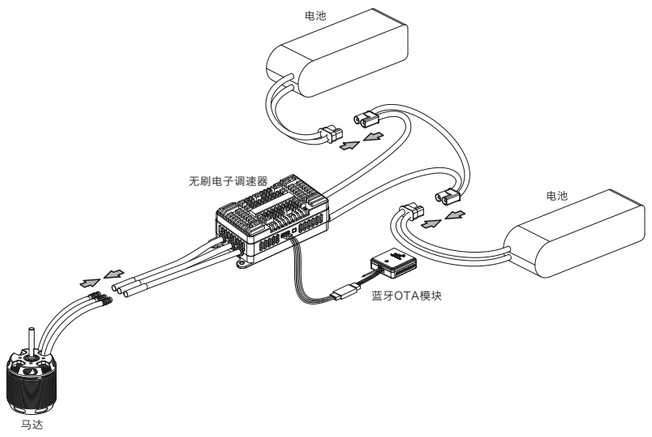
更改任意参数设定值后，电调均需重新上电，新的参数设定值才可生效。

1. 3 电调运行信息查看方法

・按上图连接电调与LCD参数设定盒；
・按“OK”键连接设定盒与电调，连接成功后将显示电调当前的固件版本号；
・成功进入参数界面以后，按“ITEM”键，在翻过电调参数设定后，即可进入浏览电调运行信息；

2 OTA模块调参（需另购）

2.1 接线示意图



2.2 参数设定方法

・按上图连接电调与OTA模块，将电调连接电池；
・打开手机蓝牙设置，连接OTA模块。
・成功连接以后，打开手机端“HW Link”软件，点选连接电调按钮，即可对电调进行参数更改，查看数据记录等操作。
・成功保存参数以后,断开手机APP与电调的连接，拔掉OTA模块，将电调断电以后重新上电即可运行新的参数设置进行工作。

2.3 电调运行信息查看方法

・按上图连接电调与OTA模块；
・打开手机蓝牙设置，连接OTA模块。
・成功连接以后，打开手机端“HW Link”软件，点选连接电调按钮，成功连接后，点击数据记录按钮选择空模即可查看记录数据。

05 可编程参数项及说明

一、可编程参数项目

1）电调有四种飞行模式，每种模式下的可调参数见下表：

	参数项目	参 数 值					
1	飞行模式	固定翼模式	直升机外部定速模式		*直升机精灵定速模式		直升机存储定速模式
2	锂电节数	*自动计算	6节	8节	10节	12节	14节
3	低压保护模式	*软关断			硬关断		
4	低压保护阈值	关闭	2.8V-3.8V(默认3.0V)				
5	BEC 输出电压	5.0-12.0V（默认：6.0V）					
6	响应时间	4-25（默认15）					
7	定速参数P	0-9（默认5）					
8	定速参数I	0-9（默认5）					
9	熄火降落反悔时间	0秒-90秒（默认25秒）					
10	快速重启加速时间	1秒-3秒（默认1.5秒）					
11	刹车类型	*无刹车			普通刹车		
12	刹车力度	0-100%（默认0%）					
13	进角	0°- 30°（默认25°）					
14	电机转向	*默认			反转		
15	DEO开关	*开启			关闭		
16	启动力度	1-7（默认3）					

带*的为出厂默认设置。

二、可编程参数项目说明

1. 飞行模式：
电调可以设置四种飞行模式，以适应不同的飞行器。
1.1固定翼模式：适用于固定翼飞行器，选择该模式后，油门高于5%启动电机，以固定的油门响应速度跟随摇杆加减速，响应较快；
1.2直升机外部定速模式：适用于不使用任何定速设备的直升机飞行器或者使用外部定速设备的直升机飞行器，该模式下油门高于5%（包含5%）才启动电机，电机以较柔和方式启动，在缓启动完成后以较快的 油门响应加速至当前油门值；
1.3直升机精灵定速模式：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，在缓启动过程中完成转速标定，待转速稳定后进入定速运行状态。
1.4直升机存储定速模式：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。每次从其他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。

2. 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，将按单节电池3.7V计算电池节数。若出现电调自检过程中鸣叫电池节数错误，可调节此项纠正检测；

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50%；
硬关断：触发低压保护后，立即关闭动力输出；

4. 低压保护阈值：
2.8V-3.8V可调，步进为0.1V，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×6；

5. BEC输出电压：
设置电调内置BEC的输出电压，5-12V可调，调节步进为0.1V；

6. 响应时间：
调节直升机精灵定速或者存储定速模式下油门的响应速度，数值越大，油门响应速度越慢。4-25可调，调节步长为1；。

7. 定速感度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；

8. 定速感度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；

9. 熄火降落反悔时间：
该功能仅在“直升机精灵/存储定速”两种模式下有效。在设定的时间内将油门摇杆从40%以上推至25%~40%之间任意位置后，再推回40%以上，电调从输出关闭状态可以不经过缓启动快速起动电机并将电机加速至油门摇杆当前油门值应有的转速（加速率为设定的快速重启加速时间），完成熄火重启。油门低于25%，或者将油门摇杆保持在25%-40%的时间超过设定的反悔时间，熄火降落反悔时间设置都将不生效，油门再次高于40%以后电调将执行“直升机精灵/存储定速”两种模式下默认的启动过程。

10. 快速重启加速时间：
1-3秒可调，步长为0.5秒。该参数控制在设定的熄火降落反悔时间内若执行快速重启时，电机从静止加速到全速所需的时间。（该功能为熄火降落反悔时间设置功能的附属功能，仅在熄火降落反悔时间功能有效的情况下才有效）

11. 刹车类型：
普通刹车：设置为该功能时，油门摇杆归零后，电调将按照设定的刹车力度使电机停转。

12. 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就越短。0-100%可调，步长为1%；（该功能仅在普通刹车模式下有效）

13. 进角：
调节电调驱动电机的进角，0-30°可调，步长为1°；

14. 电机转向：
设置电机转向，若您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；

15. 同步整流：
当飞行模式为固定翼模式或者直升机外部定速模式时，可选择开启\关闭，当飞行模式为直升机定速（精灵\存储）模式时，固定为开启，开启同步整流将带来更好的油门线性。

16. 启动力度：
调整电机启动时的启动力度，数值越大启动力度越大，1-7可调。

06 定速功能说明及设置

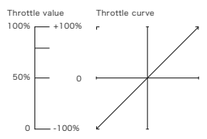
1 电调定速说明

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。
・在“直升机精灵定速模式”下，电调在断电以后不会存储电机转速-油门值对应曲线，所以每次电调通电以后，都要执行一遍转速标定，然后才能正常使用定速功能。该模式下，由于电池放电能力等差异，将导致每一次标定的转速有细微区别，最终将导致在同一个油门值下，使用不同的电池会有转速上的细微差别，但并不影响定速效果。
・在“直升机存储定速模式”下，电调在转速标定以后会存储电机转速-油门值对应曲线。所以从其他模式调整到该模式后，首次通电使用时需要执行一次转速标定，以后电调断电并重新上电就不需要再去执行转速标定。若从存储定速模式调到其他模式并保存，再调回存储定速模式，电调存储的电机转速-油门值对应曲线就被清除，因此需要再次执行一遍转速标定。以后保持在存储定速模式下，就会一直执行保存的电机转速-油门值对应曲线。第一次转速标定建议使用状态较好的电池，标定完成后，更换不同放电能力的同节数电池再次飞行，在同一油门值下的转速将与第一次飞行时一致，保持手感一致性。

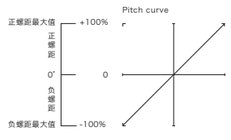
2 转速标定

1. 转速标定原理：
转速标定过程中电调会根据实际输入的电池电压结合电机的实际KV值，自建一个电机转速-油门值对应曲线。因此标定时需要电池为满电，为了不使直升机起飞，需要保持主旋翼螺距为零度。
一般标定转速时使用遥控器默认设置的油门曲线与螺距曲线，如图所示：

油门曲线：



螺距曲线：



注意：转速标定的时需保持主旋翼螺距为0°，油门值高于40%（建议使用50%）。

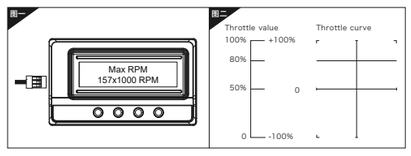
2. 转速标定过程：
・建议用户使用默认的油门曲线与螺距曲线。（若不想使用默认的设置，请保证电机转起来时的油门为50%，主旋翼螺距为0度）
・遥控器开机，油门在最低位值，等待电调自检完成。
・若设置了油门锁请将油门加锁，随后将油门摇杆推至50%，然后解锁油门锁，未设置油门锁的可直接将油门推至50%。
・电调驱动电机旋转，直升机主旋翼会开始缓慢加速旋转（由于主旋翼螺距为零度，直升机不会升空，但请注意安全），等待缓慢加速完成，主旋翼转速稳定后，将油门锁加锁，或将油门摇杆推至最低。
・电调不再驱动电机旋转，直升机主旋翼开始减速停转。
・转速标定完成。

注意：执行转速标定前请先做油门行程校准。首次使用该电调已做过油门校准的无需重复操作，一般新电调使用时做完油门行程校准后，不恢复出厂设置就不需再次做油门行程校准（更换遥控器与接收机除外）。

3 定速功能设置

・电调的最佳定速油门区间为70%-90%，设置定速油门请尽量在这个范围内，较低的定速油门会使电调一直在低效率工作，较高的定速油门给电调预留的补转空间就会很小，负载较高的时候有可能会出现补转不足导致掉转的问题。若出现此情况，建议更换电机或更换齿比；（更换电机、齿比后均需重新标定转速）
・直升机存储定速模式下，使用性能较好的电池完成转速标定后，若使用性能较差的电池飞行，可能对该电池造成损害。
・在存储定速时，不同的电池包只要里面电芯数一样就能带来稳定的转速，即使是在更换电池时都不会变化。但是不同电芯数的电池包不能得到补偿。比如，在存储定速时，不能用4S电池包的来校准转速，然后用6S电池包以相同转速运行。
・通过设定PI参数，用户选择自己合适的手感。存储定速模式下，连接手机或者PC可查看油门和速度的对应表。

1、在“直升机存储定速模式”下可以看到标定的转速（Max RPM），并且不必如“直升机精灵定速模式”每次上电均需要进行标定转速，所以更加方便一些，建议装好机后电机与齿比、电池节数固定的用户使用该模式，此模式下只要齿比准确，计算得出的定速油门对应的主桨转速也是比较准确的。下面举例说明该模式下的定速设置：
・在“**直升机存储定速模式**”下，转速标定完成后连接LCD参数设置盒或者OTA模块，参考电调运行信息查看方法的操作，
找到如图所示记录：
图中数值只是举例，具体以实际显示数值为准。该值为电机在100%油门下所能达到的最大电气转速。



・以一级减速器的直升机为例，电机为10极，电机齿为13T，主齿为120T。即齿比为9.3，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
例中的主旋翼100%油门转速即为157*1000÷（10÷2）÷（120÷13）可得约为3400转
・如果3D飞行时的主旋翼需要保持2700转，即需要设定的定速油门为2700÷3400可得约0.8，即需要设定油门值为80%。
此时需要将3D（比如IDLE1）的油门曲线设置为80%一条水平线，如图：
以后飞行的时候从Normal油门曲线起飞以后直接切到IDLE1就可以以80%油门2700转的定速进行3D飞行了。
注意：一般来说，高级一些的遥控器可以设置并保存2-3组油门曲线的IDLE设置（每组IDLE下的螺距根据实际需求自己调整），并且可以在飞行过程中来回切换这些设置，从而达到设置多个定速油门来满足不同的飞行转速需求（比如如图设置方法设置IDLE1为70%油门，IDLE2为80%油门，IDLE3为90%油门，这样就有三个不同的定速档，来满足不同的飞行需要）。
2、在“**精灵定速模式**”下，由于无法查看Max RPM，所以用户需要提前将遥控器设置好，并借助外部设备（如转速查看器）查看主旋翼的转速，最终确定需要设置的油门值。这里也可以粗略预算一下需要设置的油门值，比如电机KV值为480KV，12S满电锂电池，电机齿13T，主齿110T，这样可以得到主旋翼的最大转速大致为：电机KV值×电池电压÷齿比即为480*12*4.2*13÷110=约2850转，若要飞2150转，2150÷2850=约0.75即75%油门，实际再根据个人感觉或者转速查看器看到的转速做调整。

07 LED指示灯，警示音及保护功能说明

一、LED指示灯，警示音及保护功能说明：

保护情况	提示音	LED指示灯	说明
输入电压不正常保护	“哔哔、哔哔、哔哔、哔哔…”	红色，跟随提示音闪烁	输入的电压不在规定的输入电压范围内
油门信号丢失保护	“哔、一、哔、一、哔、一…”	红色，跟随提示音闪烁	电调未检测到油门信号输入
油门摇杆未归零保护	“哔、哔、哔、哔…”	红色，跟随提示音闪烁	电调检测到油门值不为0%油门
油门行程过小保护	“哔、哔、哔、哔…”	红色，跟随提示音闪烁	进行油门行程校准时，设置的油门行程过小
电调温度保护	“哔哔，哔哔…”或 “哔哔哔，哔哔哔…”	红色，跟随提示音闪烁	电调内部温度超过规定的保护温度
电调低压保护	“哔哔哔哔,哔哔哔哔…”	红色，跟随提示音闪烁	工作电压低于设置的保护电压
电流保护	无	红色常亮	电调工作电流高于设定的电流

二、保护功能说明：

1. 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，高低音循环鸣叫并闪灯提示。
2. 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：电调和电机连线接触不良或有个别输出线断开、电机自身有故障，螺旋桨被其他物体阻挡、减速齿卡死等）
3. 温度保护：
当电调工作温度超过 110 摄氏度时，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%，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；上电时电调温度不可超过70度，否则无法启动。并闪灯鸣叫提示温度过高(以上为软关断保护方式，若选择硬关断，则直接切断动力)
4. 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。
5. 过载保护：
当负载突然变得极大或者电机失步时，电调会切断动力，并自动重启动，重启动后若负载依旧很大或者电机依旧出现失步，将彻底切断动力。
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%，以保证马达仍有动力可以降落，更换新电池重新上电后恢复正常。
7. 电流保护：
当次使用过程中，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输出不再恢复，断电重连后恢复正常。