

RCE-BL80A Brushless ESC INSTRUCTION MANUAL

ALIGN

RCE-BL80A無刷調速器 使用說明書

(HES08003)



**Superior 32 bits
M4 RAM Processor**
採用32位元高速運算處理器



Superior governor feature
優異定速性能



High Quality MOSFET
高品質MOSFET



**Cool ESC Temperature Keep
it Much Reliable**
更低的電變溫度，工作更加可靠



**Adjustable Voltage
and 10A Large BEC**
電壓可調、大電流10A BEC



**Support ASBOX Multifunction
Programmer Set Up**
支援ASBOX控制盒調整

Thank you for purchasing of Align products. Please read the manual carefully before installing and be sure to retain the manual for future reference. Specifications, contents of parts and availability are subject to change, ALIGN RC is not responsible for inadvertent errors in this publications.

承蒙閣下選用亞拓遙控世界系列產品，謹表謝意。使用前，請務必詳閱本說明書，相信一定能夠給您帶來相當大的幫助，也請您妥善保管這本說明書，以做為日後參考。本公司將不對此印刷物之異動負責，也無法主動通知消費者任何更新或異動。本說明書內記載的材質、規格或零件包裝之內容物如有異動，請依亞拓官網公告為主。

1. IMPORTANT WARNINGS

注意事項

- Read through the manuals of all power devices and aircraft instruction, double confirm the power configuration is rational before using the ESC.
- Make sure all wires and connections are well insulated before connecting the ESC to related electronic devices, for example: if any short circuit may burn or damage the ESC. For ESC input/output wire or connectors soldering, make sure to use a soldering iron with sufficient power. For any poor connection may cause unpredictable damage or out of control issue to your devices, so ensure all devices are well connected before using the unit.
- Never locked the motor up during high-speed rotation, otherwise the ESC may get serious damaged and may also result in motor damaged. (Note: Make sure to move the throttle stick to the bottom position or disconnect the battery immediately if the motor locked up.)
- Never use the unit in the extremely hot weather or continue to use it when it gets really hot. Because high temperature will activate the ESC thermal protection or even damage your ESC.
- Always disconnect and remove batteries after usage or flight, for ESC may continue spinning and consume current if it's still connected to battery. The battery may be completely discharged and even broke down if ESC is connected to a battery for a long period of time but not under well operation.
- 使用此無刷調速器前，請認真查看各動力設備以及飛行器說明書，確保動力搭配合理，避免因錯誤的動力搭配導致馬達超載，最終損壞無刷調速器。
- 無刷調速器裝入飛行器後，使用飛行器前，請確保所有電線和連接部件絕緣良好，短路將會毀壞無刷調速器。請務必仔細連接好各部件，若需對無刷調速器的輸入輸出線、插頭做相關焊接時，為保證焊接牢靠，請使用足夠功率的焊接設備進行焊接。若連接不良，您可能無法正常控制飛行器，或出現設備損壞等其他不可預知的情況。
- 無刷調速器使用過程中，請勿將馬達堵轉，否則將會毀壞無刷調速器並且可能導致馬達損壞。如因特殊原因導致馬達堵轉，請立刻將油門歸零，或者拔掉電池。
- 勿使無刷調速器置於高溫環境中或者由於無刷調速器自身發熱導致溫度過高的情況下使用或繼續使用，高溫將會觸發無刷調速器溫度保護，嚴重時將毀壞無刷調速器。
- 使用完畢後，切記斷開電池與無刷調速器的連接。如電池未斷開，無刷調速器有可能會誤驅動馬達轉動，造成不可預期的危險，若長時間連接電池，電池最終會被完全放電，進而導致電池或無刷調速器出現故障。

2. FEATURES

產品特色

- High performance microprocessor for excellent motor speed-governing and super soft start-up.
- Microprocessor powered by independent DC regulator has better anti-interference performance, which greatly reduces the risk of losing control.
- DEO (Driving Efficiency Optimization) Technology adopted greatly improves throttle response & driving efficiency, reduces ESC temperature.
- New switch-mode BEC with adjustable output voltage ranges from 5V to 8V and continuous/peak current of 10A/25A.
- BEC is separated from other circuits of the ESC, it may keep normal output even when MOSFET board of the ESC is burnt or breakdown.
- Multiple flight modes: Fixed-wing, Helicopter (Linear Throttle), Helicopter (Elf Governor), Helicopter (Store Governor).
- New governor program with adjustable governor parameter P/I brings excellent speed-governing function, keep the propeller revs stability when the load changes dramatically.
- Data logging records the standardized RPM, minimum voltage and maximum temperature of the flight.
- "Auto restart function" can manually interrupt the auto rotation and quickly restart the motor to avoid crashes caused by incorrect operations.
- Independent output port for RPM (that is: motor speed) signals. • Separate programming port for ESC parameter setup through ALIGNASBOX Multifunction Programmer.

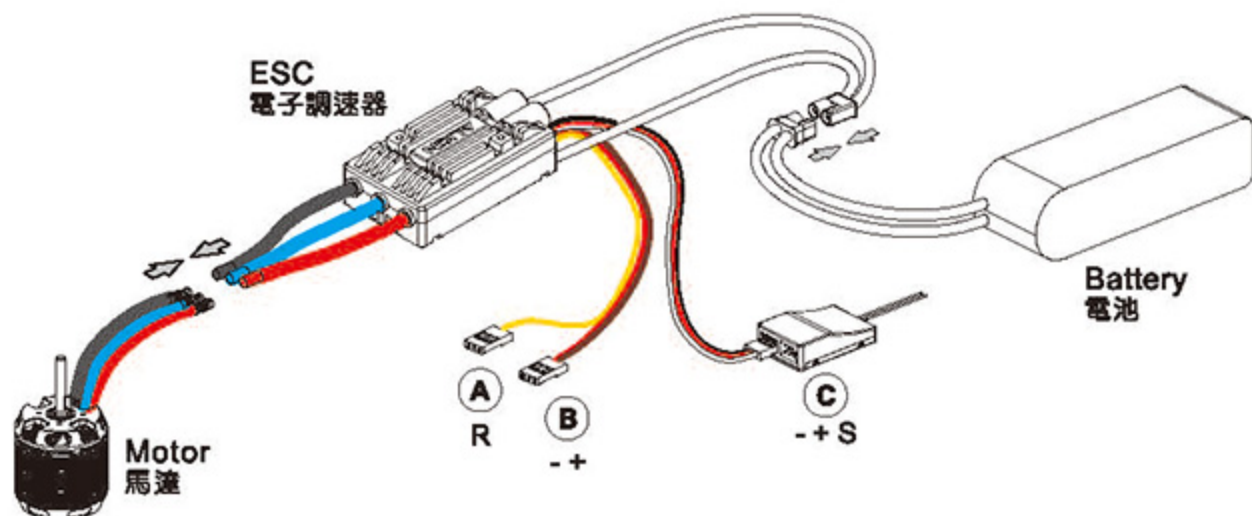
- WIFI module for programming the ESC wirelessly with your smart phone (IOS or Android).
- Allow for data checking, ESC programming, speed curve checking, and firmware upgrade online. (ALIGN ASBOX Multifunction Programmer or WIFI Express is needed)
- Multiple protections like start-up protection, ESC thermal protection, capacitor thermal protection, over-current protection, overload protection, and throttle signal loss protection.
- 使用高性能微處理器，相容多種無刷馬達，具備優異的定速和緩啟動性能
- 微處理器採用獨立的穩壓IC給供電，具有更好的抗干擾能力，降低失控的可能性。
- 採用同步整流驅動效率優化技術（DEO，Driving Efficiency Optimization），油門回應更快，驅動效率更高，電子調速器溫度更低。
- 使用新的大功率開關穩壓BEC，輸出電壓在5-8V之間可調，瞬間輸出電流提升至25A。
- BEC模組和電子調速器其他電路相互獨立，當電子調速器功率板出現燒毀等故障時，最大限度保證BEC正常輸出，提供救機機會；
- 具有“固定翼模式/直升機線性油門模式/直升機定速模式/直升機存儲定速模式”4種飛行模式。
- 使用新的直升機定速程式，定速感度可調，易於操作；具有優異的定速效果，在負荷急劇變化的情況下，保證螺旋槳轉速穩定。
- 具有飛行資料記錄功能，可記錄當次飛行的最低電壓、最高溫度資料、最大電流、標定轉速。
- 具有熄火降落保護功能，在保護時間內可手動中斷熄火降落過程並快速重新啟動馬達，避免因失控而墜機。
- 具有轉速（RPM）訊號輸出介面。
- 具備獨立參數設定介面，用於連接多功能LCD專業程式設計ALIGN ASBOX 多功能設定盒進行參數設定。
- 支援WIFI無線設定，通過手機端(蘋果&安卓)軟體可完成所有參數設置（需要WIFI模組）。
- 支援線上讀取、設定電壓參數，查看速度曲線表（存儲模式下），升級電子調速器固件（需要ALIGN ASBOX多功能設定盒或WIFI模組）。
- 具有啟動保護、溫度保護、電容溫度保護、電流保護、過負荷保護、油門信號丟失保護、輸入電壓異常保護多重保護功能，有效延長電調使用壽命

3. SPECIFICATIONS

產品規格

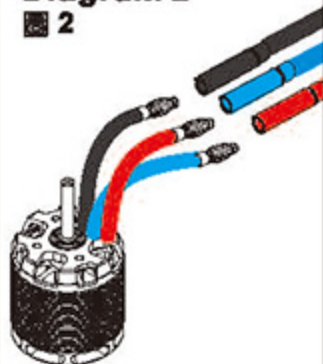
Model 型號	RCE-BL80A Brushless ESC
Main Applications 應用範圍	For 450-500 Class Helicopter (Propeller: 380~470mm) 450-500級電動直升機（槳長：380~470mm）
Input Voltage 輸入電壓	3~6S LiPo Battery / 11.1V~22.2V 3~6S鋰電池/11.1V~22.2V
Cont./Peak Current 持續/瞬間電流	80A / 100A
BEC Voltage BEC輸出	Switch-mode, 5V~8V Adjustable Voltage (Step: 0.1V), 10A / 25A Cont./Peak Current 開關穩壓BEC，輸出電壓5V~8V可調 (調整幅度為每階0.1V)，輸出電流持續10A，瞬間25A
Throttle Signal/BEC Output Wire/ RPM Signal Transmission Wire 油門信號/BEC輸出線/RPM信號傳輸線	White/Red/Black: Throttle Signal Wire ; Red/Brown: BEC Output Wire ; Yellow: RPM Signal Transmission Wire 白、紅、黑三色線為油門信號線；紅、棕二色線為BEC輸出線； 黃色為RPM信號傳輸線
Size/Weight 尺寸/重量	70x38.2x20.4mm / 97g
Separate Programming Port 獨立參數程式設計介面	For connecting ALIGN ASBOX Multifunction Programmer, WIFI module. 用於連接ALIGN ASBOX多功能設定盒或WIFI模組

I. Connections 接線示意圖



- A RPM Signal Wire (Yellow):** plug it into the RPM input channel on the flybarless system. (This wire can provide RPM signal data when using external speed-governing device.)
- B BEC Output Wire (Red/Brown):** plug it into the battery channel or any unoccupied channel on the receiver. (For better BEC power supply, we recommend plugging this wire into the battery channel or any unoccupied channel on FBL system if the FBL system is permitted.)
- C Throttle Signal Wire (White/Red/Black):** plug it into the throttle channel on the receiver or the corresponding channel on the FBL system. For which channel you should plug it in, it depends on what kind of receiver and FBL system you use. The White wire is for transmitting throttle signals, the Red & Black cables are parallelly connected in the BEC output wire, which means BEC voltage output wire and ground cable.
- A RPM信號線(黃):** 插入無平衡翼系統轉速輸入通道; (當使用外部定速時, 可使用RPM信號線提供轉速信號輸入。)
- B BEC輸出線(紅、棕):** 這條額外的BEC輸出線插入接收機電池專用通道或任意空閒通道。(為獲得更好的BEC供電效果, 在無平衡翼系統允許的情況下, 建議將BEC線插入無平衡翼系統的電池專用通道或任意空閒通道。)
- C 油門信號線(白、紅、黑):** 插入接收機油門通道或無平衡翼系統對應通道, 具體視接收機類型及無平衡翼系統類型而定。其中白線用於傳送油門信號, 而紅線和黑線分別並聯在內部BEC的輸出端(即BEC電壓輸出線和地線)。

CAUTION 注意

Diagram 2
圖 2

The motor rotates in different direction with different brand ESCs. If the wrong rotating direction happens, there are two ways to adjust it:

1. Please switch any two cables to make the motor rotates in right direction and follow the instruction in Diagram 2.
2. Please refer to page 6 on the manual, change " #14 Motor Rotation" settings in ALIGN ASBOX Multifunction Programmer to correct the motor rotation direction.

由於各品牌的馬達啟動轉向及機型配置不盡相同, 若發生轉向錯誤時, 可透過下列兩種方式調整轉向:

- 方式 1: 請將馬達與無刷調速器的接線任兩條對調, 如圖2所示, 即完成設定。
- 方式 2: 詳閱本說明書第6頁, 透過ALIGN ASBOX 多功能設定盒, 進入參數設定中第14項調整 "馬達轉向", 即完成設定。

II. Throttle Range Calibration

油門行程校準操作方法



注意

1. The default throttle range of this ESC is from 1100 μ s to 1940 μ s, so you need to re-calibrate the throttle range on the first time you use this ESC or after you replace the transmitter.
2. During the ESC/Radio calibration, please set the throttle curve to NORMAL and ensure the corresponding throttle amounts to the maximum throttle endpoint and the minimum throttle endpoint on your transmitter are respectively 100% and 0%.

1. 無刷調速器的油門行程出廠預設值為1100 μ s~1940 μ s,當首次使用無刷調速器或者更換其他遙控器使用時,均應重新設定油門行程。
2. 進行油門行程校準時,請將油門曲線設置為NORMAL,並確保遙控器油門最高點對應的油門值為100%,油門最低點對應的油門值為0%

1. Turn on the transmitter and move the throttle stick to the top position.
開啟遙控器,將油門打到最高點

2. Connect the ESC to a battery. The motor will emit "123" indicating the ESC is powered on normally.
無刷調速器接電池,馬達鳴叫"123"提示音,表示供電正常

3. 5 seconds later, the motor will emit two short beeps indicating the maximum throttle position has been successfully calibrated and accepted.
等待5秒,馬達發出"嗶-嗶"雙短鳴音,表示油門最高點校準成功

4. Move the throttle stick to the bottom position. 1 second later, a short beep will emit indicating the minimum throttle position has been accepted.
將油門搖杆推到最低,等待1秒,油門最低點校準成功

5. The ESC will keep beeping indicating the number of LiPo cells you have plugged in.
馬達發出N聲鳴音,表示鋰電池Cell數

6. A long beep represents system is well done, ready to fly.
馬達發出"嗶"一聲長音表示系統準備就緒,可隨時起飛

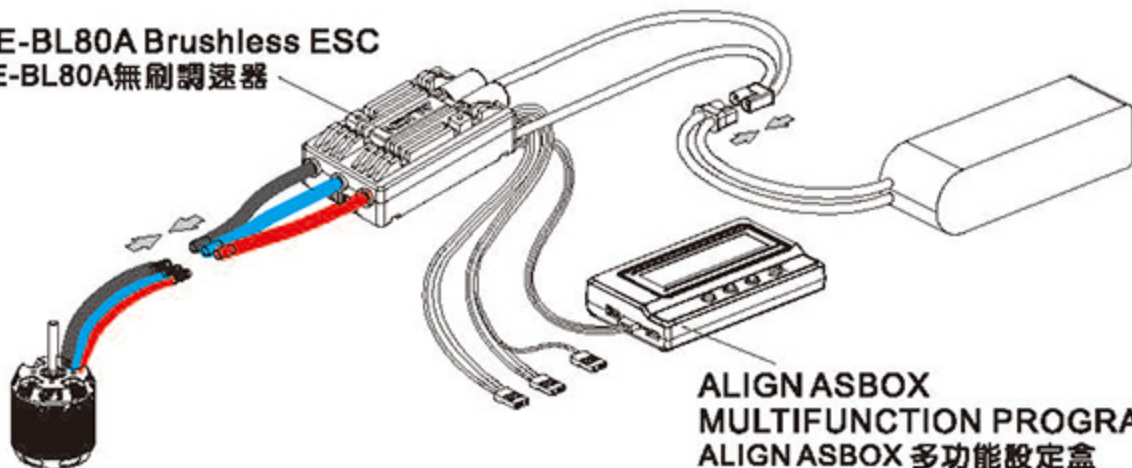
5. ESC & ASBOX MULTIFUNCTION PROGRAMMER SETTING

無刷調速器與ALIGN ASBOX 多功能設定盒參數設定

I. ESC & ALIGN ASBOX MULTIFUNCTION PROGRAMMER WIRING DIAGRAM

無刷調速器與ALIGN ASBOX 多功能設定盒接線示意圖

RCE-BL80A Brushless ESC
RCE-BL80A無刷調速器

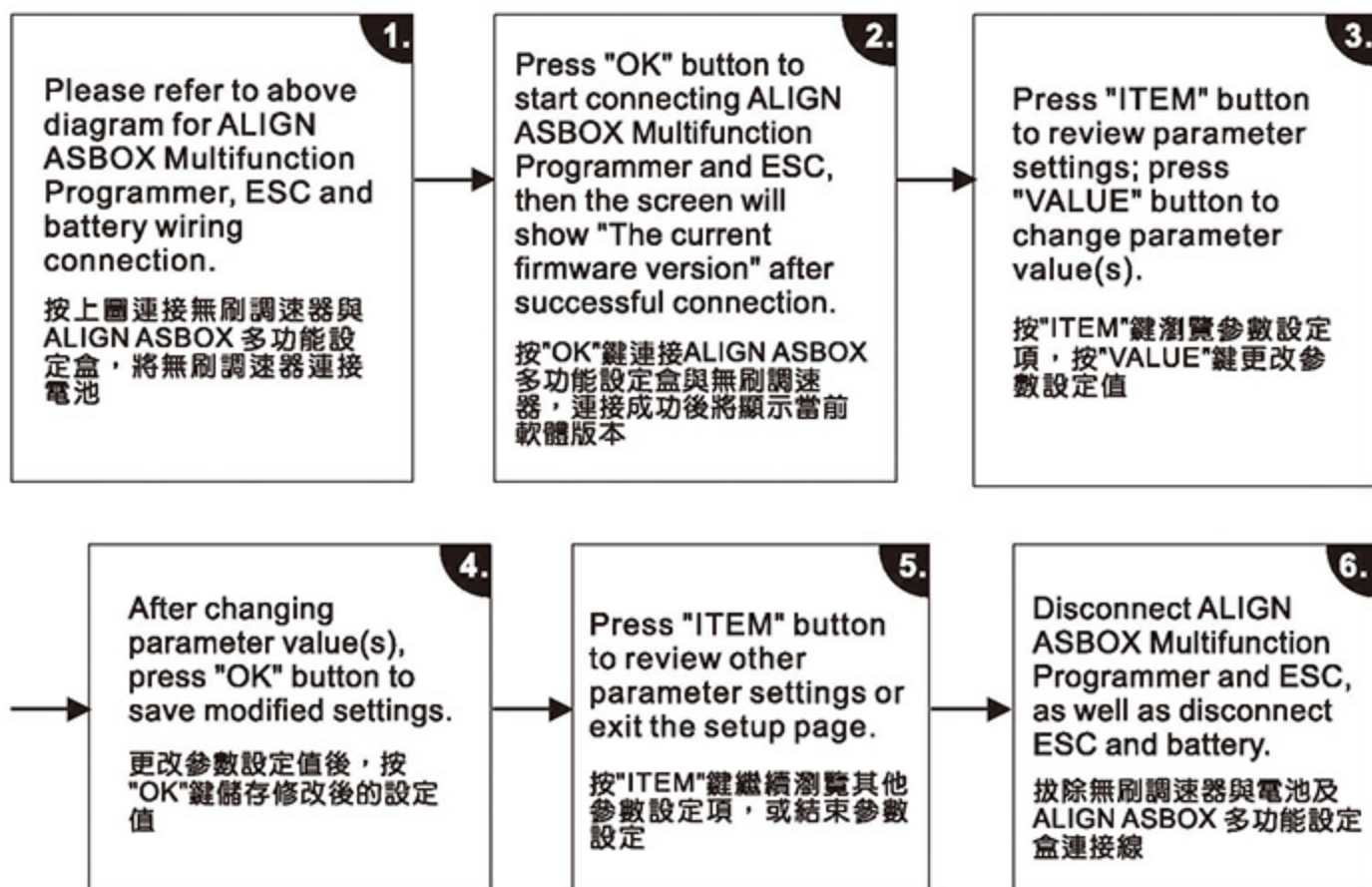


ALIGN ASBOX
MULTIFUNCTION PROGRAMMER
ALIGN ASBOX 多功能設定盒

Apply another three-pin wire (with JR male connectors at both ends for connecting ESC and Multifunction Programmer. Plug the three-pin wire into ESC "-+P" port, and also plug into multifunction programmer "ESC" port.

使用額外的三針連接線（兩端為JR公頭）連接電調標註著"-+P"的三針埠和多功能LCD專業程式設計設定盒側面標註著"ESC"的三針埠

II. ESC & ALIGN ASBOX MULTIFUNCTION PROGRAMMER PARAMETER SET UP 無刷調速器與ALIGN ASBOX 多功能設定盒參數設定步驟



After parameter adjustment, make sure to re-power the ESC again, or the new parameter settings won't be activated.

更改任意參數設定值後，無刷調速器均需重新開機，新的參數設定值才可生效。

RCE-BL80A brushless ESC can be set up by ALIGN ASBOX Multifunction Programmer.
RCE-BL80A無刷調速器可透過ALIGN ASBOX 多功能設定盒進入參數設定，



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<http://www.align.com.tw/download-en/asbox/>

6. ALIGN ASBOX MULTIFUNCTION PROGRAMMER PROGRAMMABLE ITEM LIST

ALIGN ASBOX 多功能設定盒參數設定表

I. General Settings

一般設定

1	Flight Mode 飛行模式	Fixed-wing 固定翼模式	*Helicopter Linear Throttle Mode *直升機線性油門模式	Helicopter Elf Governor Mode 直升機精靈定速模式	Helicopter Store Governor Mode 直升機儲存定速模式
2	LiPo Cells 鋰電池Cell數	*Auto Calculation *自動計算	3~6 Cell		
3	Voltage Cutoff Type 低電壓保護模式	*Soft Cutoff *軟切斷	Hard Cutoff 硬切斷		
4	Cutoff Voltage 低電壓保護閾值	Disabled 關閉	2.8V~3.8V		
5	BEC Voltage BEC 輸出電壓	5.0V~8.0V			
6	Start-up Time 啟動時間	4s~25s 4秒~25秒			

*Default Setting * 出廠預設值

II. Advanced Settings

進階設定

7	Governor Parameter P 定速參數 P	0~9			
8	Governor Parameter I 定速參數 I	0~9			
9	Auto Restart Time 熄火降落保護時間	0s~90s 0秒~90秒			
10	Restart Acceleration Time 熄火降落重啟加速時間	1s~3s 1秒~3秒			
11	Brake Type 剎車類型	*Brake Disabled *無剎車	Normal Brake 普通剎車	Proportional 比例剎車	Reverse Brake 反轉剎車
12	Brake Force 剎車力度	0~100%			
13	Timing 進角	0°~30°			
14	Motor Rotation 馬達轉向	CW 正轉	*CCW *反轉		
15	Active Free Wheel 同步整流	*Enable *開啟	Disabled 關閉		

*Default Setting * 出廠預設值

7. ALIGN ASBOX MULTIFUNCTION PROGRAMMER EXPLANATIONS FOR PROGRAMMABLE ITEMS

ALIGN ASBOX 多功能設定盒參數設定說明

1. Flight Mode:

- 1.1 **Airplane Fixed Wing** : The motor will start up when the throttle amount reaches 5% or more. There is no soft start-up, the motor responds to the throttle increase rapidly.
- 1.2 **Helicopter (Linear Throttle) mode** : The motor will start up in a soft way with the throttle (from 0 to 100%) acceleration time is fixed to 3.5 seconds. The motor will accelerate to completes the target rev standardization.
- 1.3 **Helicopter (Elf Governor) mode** : the motor will start up when the throttle amount reaches 40% or more, it will start up in a very soft way. And it will complete the speed standardization and enter the speed-governing operation in the preset start-up time. In this mode, the motor will standardize its speed every time it starts up. Due to different discharge rates/capabilities of different batteries, the RPM you standardize each time may be a little different. In consequence, at the same throttle amount, the RPM may be a bit different when using different batteries.
- 1.4 **Heli Governor Store mode** : Helicopter (Store Governor) mode : the motor will start up when the throttle amount reaches 40% or more. It will also start up in a very soft way. And will also complete the speed standardization and enter the speed-governing operation in the preset start-up time. In this mode, the motor will only standardize its speed at first time when it starts up. When performing RPM standardization for the first time, we recommend using a fully-charged battery with good discharge capability. After the RPM standardization, while you change another battery to fly your aircraft, at the same throttle amount, the RPM will always be the same as the RPM of the first flight. Here we suggest pilots take the "Governor Store" mode as their first option.

About RPM Standardization :

- I. The motor will enter the soft start-up when user switches the throttle amount from 0 to 40% or above (50% throttle is recommended). The pitch of main blades should be 0 degree during the soft start-up process, the RPM standardization completes when the soft start-up ends, and the ESC enters the speed-governing state. In "Helicopter (Store Governor)" mode, if user wants to re-standardize the speed, he needs to set the flight mode to "Helicopter (Elf Governor)" and save this mode first, and then reset the flight mode back to "Helicopter (Store Governor)", then the ESC will re-standardize the motor speed when the motor rotates for the first time after the ESC is re-powered on.
 - II. For ensuring the speed-governing effect, we recommend setting the throttle amount to 90% or below in both speed-governing modes for Helicopter (Store Governor) & Helicopter (Elf Governor), so there will be sufficient compensation to maintain the consistency of the RPM. We recommend replacing the motor or adjusting the gear ratio if the expected RPM still cannot be reached when the throttle amount exceeds 90%.
(Note: You need to re-standardize the RPM after replacing the motor, blades, main frame or adjusting the gear ratio.)
 - III. **Heli Store Governor mode** : if you fly your aircraft with another battery pack that has poor discharge capability after the RPM standardization (with a pack which has good discharge capability), the pack has poor discharge capability may be damaged potentially.
2. **LiPoCells** : It can be set as auto or manual calculation. For auto calculation, the ESC will automatically calculate the number of LiPo cells you have plugged in as per "3.7V/Cell" rule, if "Auto Calc." is selected. Or user can set this item manually.
 3. **Voltage Cutoff Mode** : If soft mode is selected, the ESC will gradually reduce the output to 50% of the full power in 3 seconds after the voltage cutoff protection is activated. When hard mode is selected, it will immediately cut off all the output.
 4. **Cutoff Voltage** : From 2.8V to 3.8V (customized). Default value: 3.0V

- 5. BEC Voltage :** From 5V to 8V (Adjustable) in 0.1V (Increments). Default value:
- 6. Start up Time :** From 4s to 25s (Adjustable) in 1s (Increments). Default value: 15s. (Note: It only available in Helicopter (Elf Governor) mode and Heli Governor Store mode function.)
- 7. Governor Parameter P :** Control the ESC maintaining the stability of the current motor speed.
- 8. Governor Parameter I :** Control the dynamic response. The ESC will automatically supplement based on the governor parameter I value while the actual motor speed is under expectation. The supplement may be too much if the value is set too big; on the contrast, the supplement may be insufficient if the value is too small.
- 9. Auto Restart Time :** The ESC will cut off its output when the throttle amount goes between 25% and 40%. If the throttle amount is set to be more than 40% within preset time period (0-90s), the motor will rapidly start up and accelerate to the speed (in the programmed Restart Acceleration Time) corresponds to the specific throttle amount, complete the shutdown and restart up. If you move the throttle stick to over 40% beyond the preset time period, the ESC will activate the soft start-up process. (Note: This function won't be activated unless the throttle amount is lower than 25% and it only effects in "Helicopter (Store Governor) and Helicopter (Elf Governor)" mode.)
- 10. Restart Acceleration Time :** 1-3s (adjustable), 0.5s (step), 1.5s (default). Control the time the motor will take to restart and accelerate to the full speed. (This function is only activated in "Helicopter Governor Elf/Store" mode)
- 11. Brake Type :**
 - 11.1. Proportional Brake :** the brake force is related to the position of the throttle stick. Maximum brake force refers to the force when the throttle stick is located at the top position. The throttle range on the transmitter is between 20% and 0%, the corresponding brake force is between 0 and 100%.
 - 11.2. Reverse Brake :** After activating this option, the RPM signal wire will turn into a reverse signal wire (the signal range will be the same as the throttle range). After assign a channel for reverse brake on transmitter, the reverse brake will be activated when the reverse signal value goes more than 20%. When ESC power on at the first time, the reverse signal must be lower than 20% signal, 0% - 100% throttle corresponds to "CW"; when the reverse signal goes more than 20%, the motor will stop spinning CW (and then spin CCW); at this time, 0-100% throttle corresponds to "CCW". During the flight, either RPM signal or throttle signal loss will activate the throttle signal loss protection.
- 12. Brake Force :** 0-100% (adjustable), 1% (step), 0 (default). (Note: this function only activated in "Normal Brake" mode.)
- 13. Timing :** 0-30° (adjustable), 1° (step), 15° (default).
- 14. Motor Rotation :** CW/CCW. User can adjust this function through ALIGN ASBOX Multifunction Programmer.
- 15. Con. Freewheel :** In "Fixed Wing" mode or "Helicopter (Linear Throttle)" mode, user can set the function to "Enabled" or "Disabled". This function has been fixed to "Enabled" in "Helicopter (Store Governor) and Helicopter (Elf Governor)" mode. To activate this function can support better throttle linearity.

1. 飛行模式：

- 1.1 固定翼模式下，油門達到5%啟動馬達，無緩啟動，油門回應迅速。**
- 1.2 直升機線性模式下，油門達到5%啟動馬達，馬達以較柔和方式啟動（0-100%油門加速時間固定為3.5秒），在固定的加速率下加速至當前油門應有的轉速。**
- 1.3 直升機定速模式下，油門達到40%啟動馬達，有緩啟動，馬達在設定的緩啟動時間內完成轉速標定進入定速運行狀態。該模式下每一次開機啟動都會進行轉速標定，由於電池放電能力等差異，將導致每一次標定的轉速有細微區別，最終將導致在同一個油門值下，使用不同的電池會有轉速上的細微差別，但並不影響定速效果。**
- 1.4 直升機儲存定速模式下，油門達到40%啟動馬達，馬達以超柔和方式啟動，在設定的緩啟動時間內完成轉速標定進入定速運行狀態。該模式下僅第一次開機啟動會進行轉速標定，第一次轉速標定建議使用狀態較好的電池，標定完成後，更換不同電池再次飛行，在同一油門值下的轉速將與第一次飛行時一致，為保持手感一致性，建議使用該模式。**

關於轉速標定

- I. 將油門從0切換至40%（建議使用50%油門），馬達將進入緩啟動階段，緩啟動期間需保持主槳螺距為0°，緩啟動結束後轉速標定完成，無刷調速器進入定速運行狀態。直升機儲存定速模式下，若需重新標定轉速，需首先將飛行模式設置為直升機定速模式並保存，然後再次設置為直升機儲存定速模式，重新開機後馬達首次運轉過程中將進行轉速標定。
 - II. 為保證定速效果，建議在定速飛行模式下的油門範圍不超過90%，確保有足夠的補償空間維繫馬達轉速恒定，若超過90%油門仍未達到理想轉速，建議更換馬達或更換齒比；（更換馬達、齒比、槳、機身後均需重新標定轉速）
 - III. 直升機儲存定速模式下，使用性能較好的電池完成轉速標定後，若使用性能較差的電池飛行，可能對該電池造成損害。
 - IV. 在儲存定速時，不同的電池包只要裡面電芯數一樣就能帶來穩定的轉速，即使是在更換電池時都不會變化。但是不同電芯數的電池包不能得到補償。例如：在儲存定速時，不能用4S電池包的來校準轉速，然後用6S電池包以相同轉速運行。
 - V. 通過設定PI參數，用戶選擇自己合適的手感。儲存定速模式下，連結手機或者PC可查看油門和速度的對應表。
2. 鋰電池Cell數：選擇自動計算，將按單Cell電池3.7V計算鋰電池Cell數，也可手動設置鋰電池Cell數。
 3. 低電壓保護模式：軟關機，啟動低電壓保護模式後3秒內輸出功率將逐漸降低為總功率的50%；強制關機，直接切斷動力。
 4. 低電壓保護閾值：2.8V-3.8V自訂，預設為3.0V。
 5. BEC輸出：5-8V可調整，調整刻度為0.1V，預設為6.0V。
 6. 啟動時間：4-25秒可調，調整刻度為1秒，預設為15秒；（該功能僅在直升機定速（精靈/儲存）模式下有效）。
 7. 定速感度P：控制無刷調速器維持當前轉速的穩定程度。
 8. 定速感度I：當轉速低於預期值時，無刷調速器會進行轉速補償。該參數用於調整補轉的程度大小。參數過大將造成補轉過度，參數過小將引起補轉不足。
 9. 熄火降落保護時間：當油門在25%-40%之間時，無刷調速器輸出關閉，0-90s的範圍油門再次高於40%，馬達將快速啟動加速到當前油門值（加速時間為設定的熄火降落重啟加速時間）應有轉速，完成熄火重啟，如果時間超過設置值，將退出熄火降落，油門再次高於40%將恢復正常緩啟動。油門低於25%熄火重啟保護設置將不生效。（該功能僅在直升機定速（精靈/儲存）模式下有效）。
 10. 熄火重啟加速時間：1-3秒可調，步長為0.5秒，預設1.5秒。該參數控制熄火重新啟動時，馬達從靜止加速到全速所需的時間。（該功能僅在直升機定速（精靈/儲存）模式下有效）。
 11. 剎車類型：
 - 11.1. 比例剎車：遙控器上的油門行程20%-100%對應無刷調速器油門輸出0%-100%，遙控器上的油門行程20%-0%對應剎車力度0-100%。
 - 11.2. 反轉剎車：開啟反轉剎車功能後，RPM訊號傳輸線將變為反轉訊號輸入線（訊號範圍和油門行程一致），通過遙控器一個通道設置，反轉訊號大於20%油門訊號時，觸發反轉標誌。初次開機反轉訊號必須低於20%油門行程，反轉訊號低於20%油門0-100%對應正轉，反轉訊號高於20%，馬達先剎車停轉，此時油門0-100%對應反轉。運行過程中RPM訊號傳輸線和油門訊號線其中任意一個訊號遺失都會觸發油門訊號遺失保護。
 12. 剎車力度：0-100%可調，刻度為1%，預設為0；（該功能僅在普通剎車模式下有效）
 13. 進角：0-30°可調，刻度為1°，預設為15°。
 14. 馬達轉向：正轉\反轉，連接ALIGNASBOX多功能設定盒更改該項參數可改變馬達轉向。
 15. 同步整流：當飛行模式為固定翼\直升機線性時，可選擇開啟/關閉，當飛行模式為直升機定速（精靈/儲存）模式時，固定為開啟，開啟同步整流將帶來更好的油門線性。

8. DATA CHECKING CONNECTIONS

無刷調速器設定資訊

The ESC will record the standardized RPM, minimum voltage, maximum current and maximum temperatures of the flight but won't save these data, so you need to keep the ESC on if you want to check the information of the flight.

無刷調速器會記錄當次飛行的標定轉速、最低電壓、最高溫度、最大電流資訊，斷電後資訊將不會保存，查看當次飛行資訊需保持無刷調速器處於供電狀態。

1. Follow above instruction to connect ALIGN ASBOX Multifunction Programmer to a battery and ESC.

按上圖連接無刷調速器與ALIGN ASBOX 多功能設定盒，將無刷調速器連接電池

2. Press "OK" button to connect ALIGN ASBOX Multifunction Programmer to the ESC. "The current firmware version" will show on screen for successful connection.

按"OK"鍵連接ALIGN ASBOX 多功能設定盒與無刷調速器，連接成功後將顯示目前軟體版本

3. Press "R/P" button to view over all flight information on the ESC.

按"R/P"鍵調閱瀏覽無刷調速器運行資訊

Notes:

1. you can only check the standardized RPM in "Heli Store Governor" mode, the record won't disappear after you turn off the ESC.
2. The recorded revs are electric revs. If the electric RPM is R, then the actual rev of the main blades = $R \div \text{Motor Poles} \div 2 \div \text{Gear Ratio} \times \text{Throttle Amount} (\%)$.

備註：

1. 標定轉速僅在定速存儲模式下可查看，且記錄不會因斷電而消失
2. 記錄的轉速為電氣轉速，例如電氣轉速為R，實際螺旋槳轉速 = $R \div \text{馬達極對數} \div \text{齒比} \times \text{油門百分比}$ 。

9. NORMAL START-UP PROCESS

正常開機過程

1. Turn on the transmitter, and then move the throttle stick to the bottom position.

開啟遙控器，將油門搖杆打到最低點

2. Connect the ESC to a battery. The motor will emit "♪123" indicating the ESC is powered on normally.

無刷調速器接電池，鳴叫"♪123"提示音，表示供電正常

3. The ESC will keep beeping indicating the number of LiPo cells you have plugged in.

馬達發出N聲短鳴音"嗶-"，表示鋰電池Cell數

4. A long beep represents system is well done, ready to fly.

馬達發出一聲長鳴音"嗶——"，表示系統準備就緒，隨時可以起飛

10. EXPLANATIONS FOR WARNING TONES

警示音說明

1. Input voltage is abnormal: The ESC will measure the input voltage the moment when it's powered on. The motor will keep beeping "BB, BB, BB" (the interval between two BBs is 1 second) when the input voltage is beyond the normal range. The warning tone won't stop until the voltage turns normal.
 2. Throttle signal loss protection is activated: The motor will beep "B-, B-, B-" (the interval between two B-s is 2 seconds) when the ESC doesn't detect any throttle signal.
 3. Throttle stick is not at the bottom position: The motor will beep "B-B-B-B-B-" when the throttle stick is not moved to the bottom position.
 4. Throttle range is too narrow: The motor will beep "B-B-B-B-B-" when the throttle range you set is too narrow (when designing this ESC, it requires that the entire throttle range you set cannot be less than 50% of the whole throttle range available on the transmitter.) The warning tone indicates the throttle range you set is void and you need to set it again.
1. 輸入電壓不正常警示音：無刷調速器開機時，會對輸入電壓進行檢測，當輸入電壓不在正常範圍內時，馬達會發出"嗶嗶、嗶嗶、嗶嗶"的警示音（每組嗶嗶聲的間隔為1秒），直到電壓正常為止。
2. 油門訊號遺失警示音：當無刷調速器未檢測到油門訊號時，無刷調速器會作如下警示："嗶-、嗶-、嗶-"（每聲之間的間隔為2秒）。
3. 油門未歸零（油門搖杆未置於最低位置）警示音：當油門未打到最低時，無刷調速器會作如下警示："嗶-嗶-嗶-嗶-嗶-"（很急促的單音鳴叫）。
4. 油門行程過小警示音：當所設定油門總行程過窄時（無刷調速器設計時，要求油門總行程不得小於三格油門），無刷調速器會做警示，表明本次行程設定無效，需重新設定。警示方式為："嗶-嗶-嗶-嗶-嗶-"（很急促的單音鳴叫）。

11. EXPLANATIONS FOR MULTIPLE PROTECTIONS 其他保護功能說明

- 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 enough, the ESC will take it as a start-up failure. At that time, if the throttle amount is less than 15%, the ESC will automatically try to restart it up. If the throttle amount is more than 15%, you need to move the throttle stick back to the bottom position and then restart up the ESC. (User may meet this problem due to poor connection, poor disconnection between the ESC and motor wires, or propellers are blocked, etc.)
 - 2. ESC Thermal Protection :** The ESC will gradually reduce the output value but will not cut it off completely when the ESC temperature goes above 110°C. To ensure the motor can still get power supply and will not crash, so the maximum output reduction is about 50% of the full power. The ESC will gradually resume to its maximum power after the temperature cools down. In addition, the ESC temperature cannot exceed 70°C while power on, or it cannot be started up. (Above all, this is the way how soft cutoff mode does to the ESC, but it will cut off the power immediately in hard cutoff mode on the other hand.)
 - 3. Capacitor Thermal Protection :** The ESC will activate this protection when the operating temperature of capacitors goes over 130°C. It protects capacitors in the same way as the ESC thermal protection does to the ESC.
 - 4. Loss throttle signal protection is activated :** When the ESC loss throttle signal for over 0.25 second, it will cut off the output immediately to avoid any unexpected damaged due to the high-speed propeller rotation. The ESC will resume the corresponding output after signals turns to normal.
 - 5. Overload Protection :** The ESC will cut off the power/output or automatically restart itself when the load suddenly increases too much. (Normally, the overload protection will be activated when propellers are blocked.)
 - 6. Over-current Protection :** The ESC will cut off the power when the instant current value goes over 300A. (This protection may be activated caused by the burnt motor).
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- 1. 啟動保護：**啟動過程中，無刷調速器會檢測馬達轉速，當轉速出現停止上升或者轉速提升不穩定的情況，則判斷啟動失敗，若此時油門小於15%，無刷調速器會自動嘗試重新啟動；若此時油門大於20%，需將油門歸零後重新啟動。（出現這種情況的原因可能有：無刷調速器和馬達連線接觸不良或有個別輸出線斷開、螺旋槳被其他物體阻擋、減速齒卡死等）。
 - 2. 溫度保護：**當無刷調速器工作溫度超過攝氏110度時，無刷調速器會逐漸降低輸出功率進行保護，但不會將輸出功率全部關閉，最多只降到全功率的50%，以保證馬達仍有動力，避免因動力不足而摔機。溫度下降後，無刷調速器會逐漸恢復最大動力；開機時無刷調速器溫度不可超過攝氏70度，否則無法啟動。（以上為暖切斷保護方式，若選擇硬切斷，則直接切斷動力）。
 - 3. 電容溫度保護：**當電容工作溫度超過攝氏130度時，無刷調速器會觸發電容溫度保護，保護方式與溫度保護相同。
 - 4. 油門訊號遺失保護：**當無刷調速器檢測到油門訊號遺失0.25秒以上即立即關閉輸出，以免因螺旋槳繼續高速轉動而造成更大的損失。訊號恢復後，無刷調速器也隨即恢復相應的功率輸出。
 - 5. 過載保護：**當負載突然變得極大時，無刷調速器會切斷動力，或自動重新啟動。（出現負載急劇增大的原因通常是螺旋槳堵轉）。
 - 6. 電流保護：**瞬間電流超過300A，無刷調速器會立即切斷輸出。（出現這種情況的原因可能有：馬達連線短路。）