FLYCOLOR®

User Manual
High-voltage Brushless ESC

(Aircraft ESC)

FlyDragon

Thank you for purchasing our brushless electronic speed controller (ESC) . Any Improper operation may cause personal injury,damage to the product and related equipments. This high power system for RC model can be dangerous ,we strongly recommend reading the user manual carefully and completely. We will not assume any responsibility for any losses caused by unauthorized modifications to our product. We have the right to change the design, appearance, performance and usage requirements of the product without notice.

01 Main Features

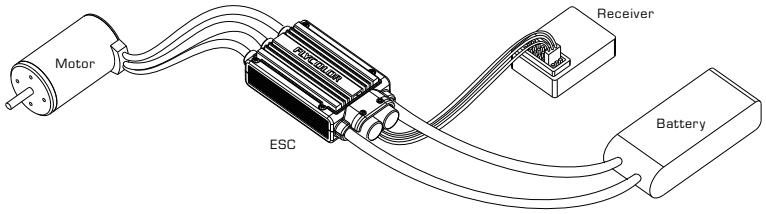
- Use powerful & high performance microprocessor. Users can set functions as their demand, fully embody Intelligent characteristics.
- Unique circuit design, strong anti-interference.
- Start mode can be set. throttle response fast, and it has a very smooth speed control linearity. Compatible with fixed wing aircraft and helicopters.
- Low-voltage protection threshold value can be set.
- Multiple protection features: Input voltage abnormal protection/Low-voltage cut-off protection / over-heat protection / throttle signal loss protection/power reduction protection.
- High power safety performance: wherever the throttle lever is, the motor will not start immediately.
- Judge the working condition via alarm.
- Cycle programming menu which easy to operate. Support with remote control or programming card operation.
- Built-in SBEC , high output power ,less power loss.

02 Specification

Manufacture Model	Con. Current	Burst Current (10S)	BEC	LiPo cells	Weight	Size
A-FW060006	60A	80A	5.5V/5A	2-6S	88g	84x38x19mm
A-FW080006	80A	100A	5.5V/5A	2-6S	88g	84x38x19mm
A-FW100006	100A	120A	5.5V/5A	2-6S	93g	84x38x19mm
A-FW120006	120A	140A	5.5V/5A	2-6S	94g	84x38x19mm

03 Wiring Diagram

*Please ensure all solder joints are insulated with heat shrink where necessary.



04 Operation instruction

Part of the models support the whole process of voice broadcast, the operation of the process and steps are the same with the ESC with "Beep-" prompt tone, more intuitive understanding of the current situation of ESC.

1 Normal start-up

Turn on the transmitter, move the throttle stick to the bottom position. → Connect ESC with battery, wait for 2 seconds,motor emits short "BEEP-" few times, sound times is Lipo battery cells. → Wait for 1 second, It means "No Brake" when motor emits continuously 1 long and 1 short tone. It means "Brake is available" when motor emits a long tone. → ESC is ready for working now

2 Throttle Range calibration

Turn on the transmitter, move the throttle stick to the top position. → Connect ESC with battery. Wait for 2 seconds, after motor emits 2 short "BEEP-BEEP",the full throttle position is memorized. → Move the throttle stick to the bottom position in 3 seconds. Then waits for 1 second, the"zero throttle" position is memorized. Motor emits short "BEEP-" few times, sound times is Lipo battery cells. → Wait for 1 second, It means "No Brake"when motor emit continuously 1 long and 1 short tone. It means "Brake is available" when motor emits a long tone. ESC is ready for working now.

3 Programming

Turn on the transmitter, move the throttle stick to the top position. → Connect ESC with battery. Wait for 2seconds, motor emits 2 short "BEEP-BEEP". Then still wait for 5 seconds. motor emits special tone "ϕ12321",it has entered programming mode.

Select setting options(Level 1)
After entering programming mode, you will hear 12 groups tone which emits in a loop as following sequence .

	ϕ12321	(Note: "ϕ12321" is the start of option.)	
1	Brake	1 short	Beep-
2	Battery type	2 short	Beep-Beep-
3	Low-voltage protection threshold	3 short	Beep-Beep-Beep-
4	Timing	4 short	Beep-Beep-Beep-Beep-
5	Startup mode	1 long	Beeeep--
6	Constant speed	1 long &1short	Beeeep--Beep-
7	PWM freq.	1 long &2short	Beeeep--Beep-Beep-Beep-
8	BEC voltage	1 long &3short	Beeeep--Beep-Beep-Beep-
9	Low-voltage protection	1 long &4short	Beeeep--Beep-Beep-Beep-Beep-
10	Lipo cells	2 long	Beeeep--Beeeep--
11	Restore factory default	2 long &1short	Beeeep--Beeeep--Beep-
12	Exit	2 long &1short	Beeeep--Beeeep--Beep-Beep-

Note:
Usually,1 long tone "Beeeep--" equals to 5 short tone"beep-", for example:1 long tone"Beeep--" and 1 short tone "beep-" equals to 6.

When motor emits "Exit" tone (No.12), move throttle to the zero position in 3 seconds, then motor emits special tone "ϕ765765", it will exit the programming mode.

Select parameter(Level 2) ↓ ↑ **Back to Setting Options(Level 1)**

After motor emits a setting option tone ,move the throttle to the zero throttle position, then will enters this setting option, and motor will emits the parameter tone in a loop . please see the table below)

Move throttle stick to the top position after a certain tone that the parameter you want, the parameter of this option is selected, then motor emits special tone "ϕ1212", this parameter will be stored. just wait If you still want select other options, it will go back to the Level 1 menu to select setting options, the operate method is the same.

Prompt tone / Iterm	1	2	3	4	5	6	7	8
	1 short	2 short	3 short	4 short	1 long	1 long & 1short	1 long & 2short	1 long & 3short
1.Brake	NO	Soft	Heavy	Very heavy				
2.Battery type	LiPo	NiCb/NiMh						
3.Low-voltage protection threshold	2.8V	3.0V	3.2V					
4.Timing	0°	3.75°	7.5°	11.25°	15°	18.75°	22.5°	26.25°
5.Startup mode	Normal	Soft	Very soft					
6.Constant speed mode	OFF	Low	High					
7.PWM freq.	12KHz	8KHz						
8.BEC voltage	5.5V	6V						
9.Low-voltage protection	Soft cut off	Cut off						
10.Lipo cells	Auto	2S	3S	4S	5S	6S		

*Shadow parts are factory default value

If don't want select other parameter, move throttle to the zero position in 3 seconds, then motor emits special tone "ϕ765765", it will exit the programming mode.

05 Programming parameter

1. Brake : [1]NO(factory default) [2]Soft [3]Heavy [4]Very heavy
2. Battery type : [1] LiPo(factory default) [2] NiCb/NiMh
3. Low-voltage protection threshold : Low/medium/high [1] 2.8V [2]*3.0V (factory default) [3]3.2V
For Ni-xx battery packs : Low/medium/high cut off voltage is 50%/65%/75% of the battery packs' initial voltage.
For LiPo battery: can count battery cells automatic. Low voltage protection threshold :Low (2.8V) / medium (3.0V) / high (3.2V) .Eg:For 4S/14.8V Lipo battery packs, low voltage protection threshold is 11.2V low/12.0V medium /12.8Vhigh.

4. Timing :
[1]0° [2]3.75° [3]7.5° [4]11.25° [5]15°(default) [6]18.75° [7]22.5° [8]26.25°
Low (0°/ 3.75°/ 11.25°/15°/ 18.75°) --for most inner rotor motors
High (22.5°/ 26.25°) --For 6 poles or higher poles outer rotor motors
As usual, 15° applies to all the outer rotor motors , but for improving efficiency ,recommend that set low timing for 2 poles motor(most inner rotor motors), set high timing for 6 poles and high poles motors(most outer rotor motors). If need high speed motor, you can set high timing. Some motors should set special timing, if not sure, you'd better to set timing as motor manufacturer recommended ,or set 15°.
Note: After changing timing, please test on the ground before flying.

5. Acceleration setting: Startup with linear accelerator
[1]Normal*: It's preferred for fixed wing. (default)
[2].Soft: It's preferred for helicopter, it will take 3 seconds from 0% throttle to 100% throttle.
[3].Very soft: It's preferred for helicopter, it will take 8 seconds from 0% throttle to 100% throttle.

6.Constant speed mode : [1]OFF(default) [2]Low constant speed [3]High constant speed
If the constant speed mode is activated, ESC will try to keep the motor in a fixed speed (usually the throttle curve is a horizontal line, you can change the preset motor speed by changing the height of the line).
The "Low constant speed" mode , 10000-45000RPM for 2 poles brushless motor .
The "High constant speed" mode , 46000-200000RPM for 2 poles brushless motor .
How to calculate the speed of the main rotor blades of your helicopter
The rotation speed for the main rotor blades= (the speed of 2 poles motor *13)/3/150
Note: the constant speed mode function is automatically disabled if the throttle value less than 60%.

7. PWM frequency: [1] 12KHz(default) [2] 8KHz
For high poles and high speed motors, 12KHz can make motor drive smoothly, but the higher PWM frequency will make ESC hotter .Generally,8KHz is suitable for most motors.

8 . Built-in BEC voltage: [1]5.5V (default) [2]6V.
(this option is available for partial models)

9. Low-voltage protection types:(default is soft cut-off)
[1]Soft cut-off— the voltage drops to the set low-voltage protection threshold , ESC will reduce the power.(recommend)
[2]Hard cut-off— the voltage drops to the set low-voltage protection threshold , ESC will cut off the motor output.

10.Battery cells: Available for Lipo battery only.
[1] Automatic judgment(default) [2]2S [3]3S [4]4S [5]5S [6]6S .
You also can select the options according to your battery cells.

11.Restore factory default
After a kind of sound "BEEP-"in 5 second ,move the throttle stick to the bottom position, enters to the item of restoring factory default, motor emits sound "♪765765" the same time, it represents that it has restored factory default and ESC enters normal operation mode.

12.Exit program mode
After a sound "BEEP-" , move throttle stick to the bottom position, enters the item of exit program mode, motor emits sound "♪765765" the same time, it represents ESC enters normal operation mode.

06 Protections

Start-up Protection	ESC will cut off output if it fails to start the motor within 3 seconds by accelerating throttle. you need to move the throttle stick back to the bottom position and restart the motor.(The possible causes : Bad connection or disconnection between ESC & motor , propellers are blocked, etc)
Over heat protection	When ESC temperature is higher than 110°C,it will reduce output power (throttle will be limited below 40%) for protection, leave some power for motor to land , when temperature is become lower , ESC recover to normal running mode.
Throttle Signal Loss Protection	When ESC detects the loss of throttle signal for over 0.25 seconds, it will cut off power or output immediately to avoid an even greater loss caused by the continuous high speed rotation of propellers. ESC will resume the corresponding output after the normal signal is restored.

Alarm tone: (To judge the abnormal cases via alarm tone)
1.Alarm tone of signal loss : when ESC detects no signal , motor will emit the alarm tone "Beep- Beep -Beep-" (alarm tone emits every 2 seconds)
2.Alarm tone of throttle not in the zero throttle position: throttle not in the zero throttle position, motor will emit "Beep-Beep-Beep-Beep-Beep-" (urgent single short tone).
3. Alert tone of narrower throttle range: when throttle range is set too narrow, motor emits "Beep-Beep-Beep"(alarm tone emits every 2 seconds). You must set throttle range again.

07 First time to use ESC

1.When first time to use ESC, you must set throttle range.
You just need to calibrate throttle range only once, but you must set again if you change transmitter.
2.Before connecting battery packs, please check if all the connectors polarity are correct , to avoid ESC damage for false connection or short circuit .
3. If motor stops suddenly during flying, please move throttle stick to the zero position immediately, then push the throttle stick to make the motor restart, then move throttle tick to a small range to land the aircraft immediately.

08 Safety Cautions

- Please don't remove or modify any components on ESC, or it may cause permanent damage or data losing.
- First time to test ESC and motor, please don't install propeller and driving gear before receiver is set correct .
- Please don't use broken, short-circuited and over-heated battery pack.
- Please don't use substandard cables and cords and connectors.
- Battery cells and servo number can't be exceed ESC's requirement.
- Please pay attention to the polarity of the battery, wrong polarity connection will damage ESC.
- Please don't put ESC in a moist and highlight place.
- Please don't remove battery when motor is rotating, it will cause the huge peak current and ESC burning.
- Please install ESC in the ventilated place, don't wrap anything around the ESC.

09 Trouble Shooting

Troubles	Possible causes	Solutions
After powering up, motor doesn't run and doesn't emit any sound.	Bad connection between ESC and battery.	Clean the connectors or replace them, check the connection polarity.
	Signal wire connects with wrong polarity of receiver.	Check signal wire and make sure the right polarity.
	Bad soldering cause bad contact.	Solder the wires again.
	The wrong polarity connection between each battery.	Check battery pack, connect the wire again.
	Quality problem of ESC.	Change ESC.
After powering up, ESC emits the sound of battery cells, but motor can't run.	ESC doesn't set throttle range.	Set throttle range again.
After powering up,ESC works ,but motor can't run and doesn't emit any sound. After powering up ESC, motor doesn't run and emits warning tone"BBEP-BEEP".(a short stop after "BBEP-BEEP")	Bad connection between ESC and motor, or bad soldering.	Check the connectors or replace the connectors or solder the motor wire again.
	Bad motor.	Change motor.
	ESC is low-voltage protected , battery voltage is out of the acceptable range.	Check the voltage of battery pack and use full-charged battery to replace.
After powering up, motor doesn't work and emits warning tone"BEEP-" (a short stop after "BEEP-")	No output throttle signal from receiver.	Check if right connection between signal wire and receiver throttle channel. Check transmitter and receiver, make sure there are signal outputs.
After powering up, motor doesn't work and emits continuous warning tone"BEEP-"	Throttle doesn't in the zero position.	Push the throttle to the zero position, or set throttle range again.
After powering up, motor doesn't work .ESC emits 2 long "BEEP" and 2 short "BEEP".	The positive and negative of throttle channel is wrong. So ESC enters programming mode.	Refer to the user instruction of transmitter, adjust the setting of throttle channel.
Motor rotates in the opposite direction.	The wrong sequence of connection wires between motor and ESC.	1.Exchange random 2 of the 3 connection wires between ESC and motor. 2.Change motor rotation direction via transmitter or programming card.
Motor stops during running	Battery voltage is lower than low-voltage protection threshold and low-voltage protection mode is cutoff output.	1.Set right low-voltage protection threshold. Run with full-charged battery pack. Choose reduce power as Low-voltage protection .If power is decreasing during running, please fly back soon. 2.Make sure your aircraft in the range available to control with your transmitter. 3.Attention to the voltage of transmitter, if it will run out of the battery, please fly back soon.
	Loss throttle signal	1.Check if the transmitter operation correct. 2.Check if transmitter match with receiver. 3.Strong electromagnetic interference around the used environment, try to turn off and power up again, to see if it recovers normal work, if the problem come up again and again, please change to another field.
	Bad connection between wires	Check the connectors of battery pack, battery wires ,motor wires connections are good.

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251400-1021-EN V2.0