E3 MAX

User Manual

Brushless Electronic Speed Controller

www.xc-bldc.com

Disclaimer

First of all thank you very much for using this product!
This product has high power and incorrect use may cause equipment damage or personal injury. Please read this statement carefully before using this product. Once this product is used, it means that you agree to all the terms of this statement. Please use this product strictly in accordance with the instructions in this manual. We do not assume any liability arising from misuse, illegal modification or improper operation of this product, including butnot limited to indirect losses or joint and several liabilities.

Cautions

Before connecting the ESC to related equipment, please ensure that all wires are well connected and the connecting equipment are in well insulated protection to avoid damaging the ESC due to short circuit.
Before using the ESC, please carefully read the instructions of the matching power equipment and frame to ensure a reasonable power combination, thereby avoiding improper power combination that may lead to motor overload and damage to the ESC.

1. Specifications

Item	Description	Cautions
Current	500A Continuous Current	Current control is similar to wave-by-wave current limiting which effectively limit peak current to avoid motor damage.
Power supply	6~12S LiPo	When using DC power supply, discharge/brake energy recovery capacity should be considered. If output is limited, reduce value of parameters (acceleration and braking options) properly.
Recommended motor	Sensored or sensorless square wave brushless motors	
Motor speed	When the number of pole pairs is 1, the electrical speed is exactly equal to the mechanical speed. Others: Electrical speed = Mechanical speed × Number of pole pairs = KV value × Bus voltage × Number of pole pairs Note: max electric speed 240,000rpm.	Speed of the motor is very high when idling. Stay safe.
BEC	Voltage: 6.0V/7.4V/8.4V, it can be switched through the mobile APP. Current: 18A continuously, 35A short-term.	
Fan	Temperature > 55℃, powersupply to the fan turns on. Temperature < 50℃, powersupply to the fan turns off.	1. The fan powered by BEC 2. When a short-circuit current occurs to the fan, the power will be cut off. Power recovered in 1 second.
Bluetooth	1. All parameters of the ESC can be adjusted by using the mobile APP. 2. The ESC firmware can be upgraded by using the mobile APP. 3.Motor operation data observation: data log and real-time data.	
Dimension	127.50(L)*85.00(W)*59.50(H)mm / ≈782g (with wire)	

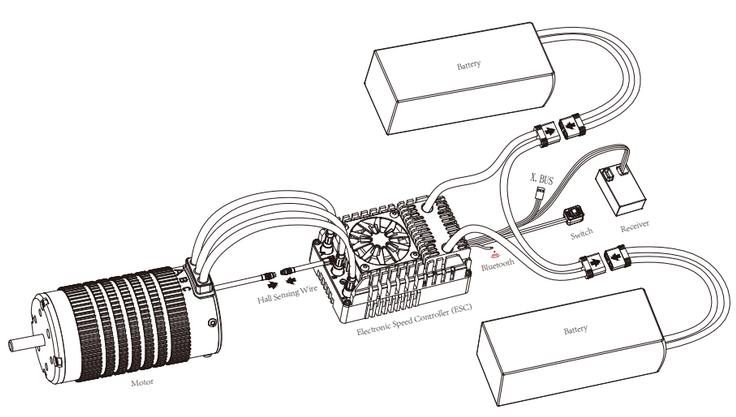
2. Features

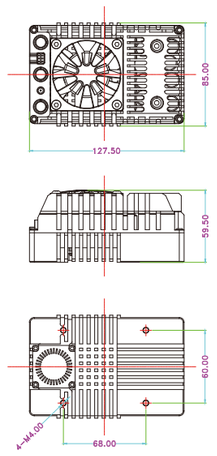
2.1 Meticulously proved commutation scheme, even in sensorless mode.
2.2 Active freewheeling technology can reduce MOS heating while avoiding excessive current pulses.
2.3 Current limiting in each PWM cycle reduces the impact of pulse current on the motor.
2.4 Dual smart fans for efficient heat dissipation. Fans stay quiet at low temperature.
2.5 Built-in Bluetooth connects Mobile APP for firmware upgrade and parameter setting.
2.6 Mobile APP data observation interface for viewing ESC recording data (static data) and real-time debugging data.
2.7 High-power DC/DC conversion circuit makes BEC a potent loading capacity.
2.8 Full protection: low voltage, over voltage, throttle loss, abnormal braking, over temperature etc.
2.9 Turbo timing available.
2.10 No need to buy additional modules, you can completely control the ESC.
2.11 Supporting X.BUS protocol, real-time control of ESC and reading of operation data through Bus. It can be used for robot control or other automated programming control.

3. Connections

Remark: A/B/C of Motor and ESC must be connected correspondingly,
That is: Wire A of motor matches wire A of ESC, wire B of motor matches wire B of ESC,
wire C of motor matches wire C of ESC

Switch wire: red and black
Throttle wire: red: BEC+, black: BEC-, white: throttle
X.BUS wire: red: BEC+, brown: BEC-, yellow: X.BUS





***Precautions:**

1. Please do not connect the ESC input wires DC+ and DC- in reverse. Reverse connection may damage ESC. If the ESC is damaged in this case, the relevant warranty service will not be provided.
2. If a Hall sensor is used, be sure to check the motor phase wires and Hall wiring.
3. For motors without temperature sensors, long-term high-power operation may cause burnout.
4. The mechanical structure of some motors cannot support high speed. If the speed is forcibly increased, the motor may be damaged.
5. If not used for more than 1 hour, it is recommended to unplug the power wires of the ESC.
6. If there are any modifications to the connection line, check the circuit carefully before putting in use. It is recommended to open the throttle slowly and confirm that there are no errors before advancing it normally.

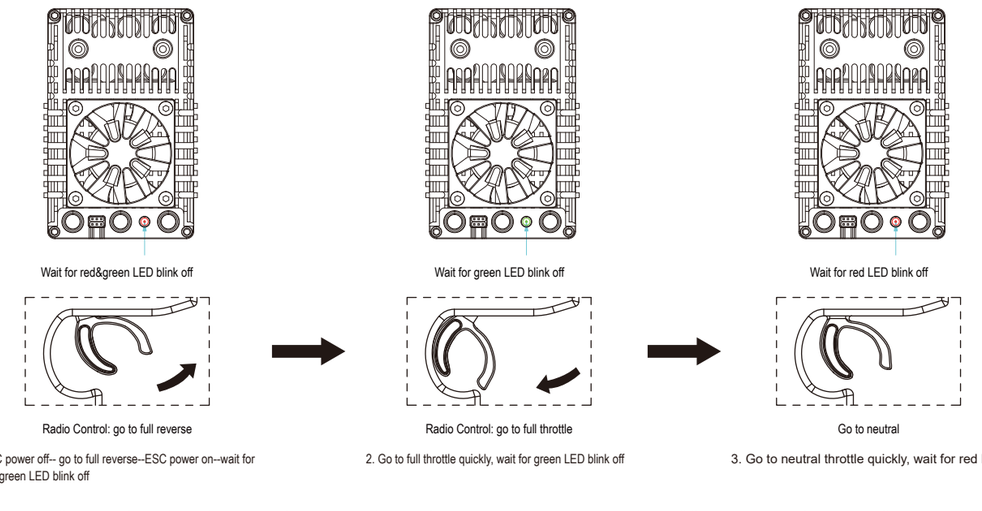
4. Start the process

Steps:

1. Check whether the circuit is open, short circuit or in poor contact.
2. Check whether the motor is stuck.
3. Plug in the power cable.
4. Turn on the power button.

When you hear the battery prompt tone (described in the "Normal Startup" prompt in the light/sound prompt section), the startup is normal. If the throttle is normal, you canperform the throttle operation normally.

5. Set the throttle range



1. ESC power off-- go to full reverse--ESC power on--wait for red/green LED blink off
2. Go to full throttle quickly, wait for green LED blink off
3. Go to neutral throttle quickly, wait for red LED blink off

4. Prompt for success setting: prompt repeats four times(red light and green light on + motor beep"so, mi, do" + red/green lights off + 0.2s vacancy); prompt for failure setting: no signs, ESC powers on.

6. Bluetooth

The naming rule of Bluetooth name is "general model" + "-" + "ESC code ID", for example, where "XC_E3-1C89", XC_E3 is the general model, and "1C-89" is the hexadecimal code ID of the ESC.
Even if the user sets the Bluetooth name by himself, the ESC code ID is still retained to avoid two devices with the same name，Default password "1234".

7. Configurable items

Seq	Item		Description		Default
1	Running mode	Forward with brake	Forward&Reverse and Brake	Forward with reverse	Forward&Reverse and Brake
2	Lipo Cells	Auto	6 ~ 12S		Auto
3	BEC voltage	6.0V	7.4V	8.4V	6V
4	Cutoff Voltage	Disabled	2.9~3.6V		3.2V
5	Motor Rotation	Forward	Reverse		Forward
6	Max.Brake Force	0~100%			60%
7	Max.Reverse Force	0~100%			25%
8	Punch	0~12 level			6 level
9	Drag Brake Force	0~100%			0%
10	Turbo Timing	0~26 degree			26 degree
11	Turbo Delay	0~1s			1s
12	Initial PWM	1~10%			3%
13	Neutral Range of Throttle	2~15%			10%
14	Motor Pole Pairs	1~64			2
15	Communication BUS	X.BUS Protocol			X.BUS Protocol
16	PLine	X.BUS	6	7	8	9	X.BUS
17	X.BUS-ID	0~15			0

1. Running Mode:
Option 1: Forward with brake
The vehicle can only move forward and has brake function. This is also commonly acceptable at races.
Option 2: Forward/Reverse and Brake
This mode is provided with “Forward/Reverse with Brake” function, known as "training" mode.
When it's in "Forward" state, if throttle is pushed to reverse/brake zone for the first time, it brakes only and won't reverse. Push throttle to reverse zone for the second, it will reverse.
Option 3: Forward and Reverse
When the throttle trigger is pushed from neutral to reverse point, the motor reverses. This mode is generally used in special vehicles.

2. Lipo Cells:
Set the correct value according to the actual number of Lipo batteries used. The default is automatically calculated.

3. BEC Voltage:
BEC voltage support 6V/7.4V/8.4V. Generally, 6.0V is suitable for standard servos, while 7.4V/8.4V is suitable for high-voltage servos. Please set according to the servo specifications.
WARNING! Do not set the BEC voltage above the maximum operating voltage of the servo, as this may damage the servo or even the ESC.

4. Low Voltage Cut-Off:
This function is mainly to prevent excessive discharge of lithium batteries causing damage. The ESC monitors the battery voltage at all times, and once the voltage falls below the set threshold, the power output is reduced and the power output is completely cut off after a few seconds,and generates a 10% braking force. ForNiMH batteries, it is recommended to set this parameter to “Disabled”.

5. Motor Rotation:
Setting the rotation of the motor. Due to some differences with the drivetrains on different car kits, it is possible to that the car will go in the opposite directionupon full throttle. In the event that this happens, you can set the“motor rotation direction” to the opposite direction; “CW” or “CCW”.

6. Max. Brake Force:
This ESC provides proportional braking function; the braking effect is decided by the position of the throttle trigger. It sets the percentage of available brakingpower when full brake is applied.
Large amount will shorten the braking time but it may damage your pinion and spur gear.

7. Max. Reverse Force:
Refers to the reversing speed. Selecting different parameter values can produce different reversing speed. It is recommended to use a smaller reversing speed toavoid errors caused by reversing too quickly.

8. Punch:
Set in 1-9 stages, the higher the set value, the faster the acceleration. Kindly take into consideration according to the site, tire grip characteristics, vehicleconfiguration, etc.
An aggressive setting may cause the tire to slip, the starting current to be too large and adversely affect the electronics performance.

9. Drag Brake Force:
Refers to the brake force generated by the motor when the throttle trigger returns to neutral position. Choose the appropriate value according to the type of vehicle, configuration, site, etc.

10. Turbo Timing:
The Turbo timing can additionally increase the motor rpm.It will initiate at full throttle. It is usually used on a long straight road to release the maximum power of the motor. The higher this value is, the more the rpm of the motor will increase, and the greater the running current will be, the higher the temperature of the motor and esc. Therefore, please set this value reasonably.

11. Turbo delay:
It refers to the duration of continuous full throttle required to trigger Turbo. When the full throttle time reaches this set value, Turbo can be triggered to turn on.

12. Initial PWM:
Also called minimum starting force, it refers to the starting force acting on the motor at the initial position of the throttle. The required starting force can be set according to the tires and site grip. If the venue is too slippery, set a smaller starting force to avoid slipping.

13. Neutral Range of Throttle:
Neutral range could be adjusted according to usage habits. Neutral range may deviate in some radio control, leading to move forward or reverse slowly. If this happens, neutral range needs to be set larger.

14. Motor Pole Pairs:
For setting pole pairs. Motor Rotation speed=Electrical Speed / Pole Pairs, To get the precise mechanical rotational speed, the pole pairs must be set correctly.

15. Communication BUS:
X.BUS Controls the throttle of ESC in the form of programming, or dynamically adjust the motion parameters, read operation parameters of ESC, etc. It can be used in automation or robot situations. For specific content of the protocol, please refer to the X.BUS Control Protocol.

16. PLine
X.BUS to program real-time data by PWM width 1ms-2ms.
For example, PLine1 selected as acceleration. Adjust PWM width to 1ms, the acceleration is set to 0 level, and PWM width 2ms will set acceleration to 12 level.If X.BUS function is required, then set PLine1 as X.BUS

17. X.BUS-ID:
If X.BUS is selected, this item will take effect, and the bus supports 16 ECSs.

8. Recover factory parameters

How to restore Bluetooth to factory settings:
If the Bluetooth password is lost or if you need to forcibly enter Boot, please follow the instruction:
1: Connect ESC wire(the white wire) to BEC+(red wire)
2: Turn on ESC
3: Disconnect from BEC when green light off and red light on
4. Remove short circuiting
When boot activated, the status of Bluetooth will restore to factory value(password will be restored to “1234” , and the name will be restored to the factory state), then restart ESC,
If there is a hardware error, Boot can be activated in this way to upgrade hardware.

How to restore parameters to factory settings:
If you want to restore the parameters to factory settings, just click the default button on the APP parameter page.

9. LED status & beep instructions

Item	Type description		Light cue	Sound cue	Remark
Basic information	Throttle not zeroed		Red light flashes quickly	Short tone "beep"	Red light flashes quickly
	Throttle signal lost		Red light flashes slowly	Long tone "beep"	In cycle of 2s
	Voltage detection	Low voltage protection	(Redx1 Greenx2) …	Long tone "beep"x1, Short tone "beep"x2	Check the input voltage or setting of number of cells if no "beep" before MOSFET detecting.
		Over voltage protection	(Redx1 Greenx3) …	Nil	Voltage is too high, check whether the voltage is over the withstand value of ESC
	The MOS temperature is too high, operating temp. > 125 ℃ / startup temp. > 110 ℃		(Redx1 Greenx4) …	Long tone beepx1, short tone beepx4	The temperature of MOS is too high. ESC can resume normal operation when the temperature drops below 100 degrees Celsius
	The capacitor temperature is too high, operating temp. > 105 ℃ / startup temp. > 100 ℃		(Redx1 Greenx5) …	Long tone beepx1, short tone beepx5	The temperature of capacitor is too high. ESC can resume normal operation when the temperature drops below 100 degrees Celsius
Throttle parameters	Abnormal throttle parameters		(Redx1 Greenx7) …	Long tone beepx1, short tone beepx7	If there is still an abnormal promp when positioming throttle to neutral point, throttle calibration process needs to be initiated.
Hall sensing abnormality	Hall output logic abnormality		(Redx1 Greenx8) …	Long tone beepx1, short tone beepx8	Re-plug Hall wire. If the abnormality persists, it may be a problem with the internal Hall of the motor, and the Hall wire needs to be unplugged.
Throttle parameter	Throttle calibration prompt	Calibrate low range	(Red Green) …	Nil	If the calibration process is irregular or unsuccessful, the ESC will exit the calibration process and enter the normal Startup process.
		Calibrate high range	(Green) …		
		Calibrate neutral throttle	(Red) …		
		Calibration success	(Red Green) x4	(so-mi-do) x4	
Normal operation	All normal and no action to throttle		(Green) …	Nil	
	Throttle operation	Normal	The greater the accelerator, the faster the green light flashes		
		Turbo timing is on	Green light remains on		
	Braking		Red light is on	Nil	Red light off when release brake
Boot	Entering boot forcibly			Nil	Follow the process of Bluettoth factory reset
	Boot in progress		Green light: On 2s&Off 2s	Nil	CPU enter Boot mode
			Red light remains flashing		CPU enter Boot, program upgrade in progress
Normal startup	Prompt for the number of battery cells after normal startup		Quinary prompt light signal, long tone with red light on, short tone with green light on	do, mi, so + quinary prompt sound	do, mi, so: prefix of quinary number Quinary definition Long tone = 5 cells, short tone = 1 cell Example: 8-cell lithium battery prompt sound do, ri, mi + long tone x1 + short tone x3
Fault warning	ESC self check abnormality		(Redx2) …	Nil	Disconnect the motor wires, power on. if it is still abnormal,return it for maintenance
			(Redx2 Greenx1) …	Nil	
			(Redx2 Greenx2) …	Nil	

***Notes:**
1. Red light matches long tone, gree light matches short tone.
2. For saving power, all "beep" lasts for 5mins; if all fault recovered, it takes effect again in next 5 mins.
3. Ellipsis"..." in light cue represents repetition of previous action.