

**EMAX User Instruction for BLHeli Series ESC**

Thank you for purchasing EMAX ESC, please read this manual carefully before you use the ESC and strictly follow the instructions. EMAX accepts no liability for damage(s) or injuries incurred directly or indirectly from the use of this product, or modification of this product. Due to unforeseen changes or product upgrades in design, appearance, performance, the information contained in this manual is subject to change without notice.

**A. Features**

A1: Based on BLHeli firmware, further optimized to the perfect drive performance.

A2: Low-voltage protection, over-heat protection and throttle signal loss protection.

A3: Separate power supply for MCU and BEC, enhancing the ESC's ability of eliminating magnetic interference.

A4: Parameters of the ESC can be set via program card or transmitter.

A5: Throttle range can be set to be compatible with different receivers.

A6: Equipped with built-in linear BEC or switch BEC.

A7: Max speed: 210,000 rpm for 2-pole, 70,000 rpm for 6-pole, 35,000 rpm for 12-pole.

**B. Product specification**

Item	Continuous Current	Burst current (10S)	Li-xx Battery (cell)	Dimension L*W*H(mm)	Weight (g) wires Included	BEC Mode	BEC Output	Programmable
EMAX BLHeli-6A	6A	8A	1-2	22×13×5.5	6	Linear	0.8A/5V	YES
EMAX BLHeli-12A	12A	15A	2-4	42×20×8	11	Linear	1A/5V	YES
EMAX BLHeli-20A	20A	25A	2-4	52×26×7	28	Linear	2A/5V	YES
EMAX BLHeli-25A	25A	30A	2-4	52×26×7	28	Linear	2A/5V	YES
EMAX BLHeli-30A	30A	40A	2-4	52×26×7	28	Linear	2A/5V	YES
EMAX BLHeli-30A-OPTO	30A	40A	2-6	67×26×10	25	----	----	YES
EMAX BLHeli-40A-UBEC	40A	50A	2-6	73×28×12	41	Switch	3A/5V	YES
EMAX BLHeli-50A-UBEC	50A	60A	2-6	73×28×12	41	Switch	3A/5V	YES
EMAX BLHeli-60A-UBEC	60A	80A	2-6	73×36×12	63	Switch	5A/5V	YES
EMAX BLHeli-80A-UBEC	80A	100A	2-6	86×38×12	81	Switch	5A/5V	YES

**C. Instructions****C1. Normal startup procedures**

Move throttle stick to the bottom position and then switch on transmitter→ Connect battery pack to ESC→ The long “beep” sound should be emitted, means the bottom point of throttle range has been detected→ Several “beep” tones should be emitted to present the amount of battery cells→ When self-test is finished, a “1 2 3” tune should be emitted→ Move throttle stick upwards to go flying.

**C2. Throttle range setting procedures** (when users change a transmitter, throttle range setting is recommended.)

Switch on the transmitter, move throttle stick to the top position→ Connect battery pack to ESC→ Two “beep” sounds should be emitted, means the top point of throttle range has been confirmed and saved→ Move throttle stick to the bottom position (within 2s), a long “beep” sound should be emitted, means the bottom point of throttle range has been detected→ Several “beep” tones should be emitted to present the amount of battery cells→ When self-test is finished, a “1 2 3” tune should be emitted, Move throttle stick upwards to go flying.

If the throttle stick is neither at the bottom position nor the top position after powered on, it will constantly make “beep” sounds.

**D. Programmable parameters**

**D1. Brake Type** There are six brake types including OFF, Low, Mid-low, Middle, Mid-high and High. The default is OFF.

**D2. Timing Mode** There are five options: Low: 0°, Mid-low: 8°, Middle: 15°, Mid-high: 23° and High: 30°. The default is Middle: 15°. Low advance timing is recommended for high inductance and low KV motors. High advance timing is recommended for low inductance and high KV outrunner motors.

For some high KV motors, if it shakes while rotating in high speed, the High timing mode is recommended.

**D3. Start Force** There are 13 options: 0.03, 0.05, 0.06, 0.09, 0.13, 0.19, 0.25, 0.38, 0.50, 0.75, 1.00, 1.25, 1.50. The default is 0.75. Select the corresponding start force according to the load of motor.

**D4. Reserved for new programmable parameters.**

**D5. Control Frequency**: 2 options: 8KHz and 22KHz. The default is 8KHz. This option is the drive frequency of the motors.

**D6. Low-voltage Protection**: 4 options: 2.8V/cell, 3.0V/cell, 3.2V/cell, Off the low voltage protection. The default is 3.0V/cell. The system will automatically identify the battery cell. E.g. suppose there're 3 cells, if the voltage is lower than 9V, the system will work according to the current cutoff option.

**D7. Cutoff Mode**: There are two options: Soft-Cut and Cut-Off. The default is Soft-Cut. Soft-Cut option: Gradually reduce throttle power to 31% of the current power when the voltage is lower than the programmed low-voltage protection threshold. Cut-Off Option: immediate motor shutdown occurs in low-voltage.

When low-voltage protection, Push the throttle stick to the bottom position and then to the top position, the motor will be restarted. But since it is low-voltage condition, the output power is low or stopped at once.

**E. Protection setting**

**E1. Low-voltage Protection** Whether to shut down the motor immediately or to lower the power when the input voltage drops below the programmed low-voltage protection threshold depends on the values set as Cutoff Mode. (Please refer to D7 for Cutoff Mode)

**E2. Loss of Signal Protection** Power will be gradually lower to 0 when signal lost, and motor stops. Motor will resume to the current power when the signal is detected again.

**E3. Over-heat Protection** When the temperature of the ESC MOSFETS exceeds 100 Celsius degree, power will be lowered gradually and will resume when the temperature decreases.

**F. Programming via program card**

Step 1. Pull the PPM signal wire out from the receiver, and plug it into the program card jack. Please pay attention to the direction.

Step 2. Connect the ESC to the battery, after 2 seconds you will hear “1 2 3 1” tune.

Step 3. The program card automatically reads parameters from the ESC and the corresponding LED will be on.

Step 4. Button 1 is for choosing program items. Button 2 is for choosing different parameters for each item. Button 3 is ‘write’ button. All parameters can be viewed and modified by pressing corresponding and press button 3 to write the new parameters to the ESC.

Step 5. Cut off the power.

**G. Programming via Transmitter****Step 1: Enter program mode**

Switch the transmitter on→Pull the throttle stick to the top position→Switch the ESC on, wait 2 seconds, you will hear two “beep” sounds, which denotes that Max. throttle has been confirmed→Hold the throttle stick at the top position, and then wait 2 seconds until you hear tune “1 2 3 1” that means you have entered the transmitter programming mode.

**Step 2: Select program parameters**

Hold the throttle stick on top position, there're 7 parameters can be set by using your transmitter. You would hear 7 different indicating sounds which correspond to 7 different parameters. Pull the throttle stick to the bottom position (full Off throttle) within 2 seconds after you hear the correspondent sound will brings you to the correspondent parameter setting status. The indicating sounds will repeat in turn as follow.

1. “beep-” (a short sound) which indicates the Brake Type
2. “beep-beep-” (two short sounds) which indicates the Timing Mode
3. “beep-beep-beep-” (three short sounds) which indicates the Start Force
4. “beep-beep-beep-beep-” (four short sounds) -----
5. “beep-----” (a long sound) which indicates the Control Frequency
6. “beep-----beep-” (a long sound and a short) which indicates the Low-voltage Protection
7. “beep-----beep-beep-” (a long sound and two short) which indicates the Cutoff Mode

**Step 3: Select program values**

After entering parameter setting status, hold the throttle stick on the bottom position, you will be led to the repeat selection of that parameter setting status. Each sound likes 4 short sounds and one long sound (1 long sound=5short sounds), and by that analogy. After some sound, pull the throttle stick to the top position in 2 seconds, after you hear a tune “1 2 3 2 1 1 2 3 2 1” which means the correspondent value has been chosen and saved. Hold the stick on the top position, return to the second step and continue programming.

**Step 4: Exit program**

Pull the throttle stick to the bottom position within 2 seconds and hold on after saving parameters, until you hear a tune “beep----- beep-beep-beep- 1 2 3” Set the Min. Throttle at this moment and exit program and operate as normal (beep-----means Loading parameter, beep-beep-beep-means numbers of cells and 1 2 3 means ready.)

**Restore Factory settings**

To restore Factory settings, pull the throttle stick to the bottom position (full Off throttle) within 1s after entering program mode (Step 1)→Pull the throttle stick to the top position within 2s, then you will hear a tune, which means that the factory settings have been restored. Pull the throttle stick to the bottom position within 2s, the ESC is ready with factory settings.