

MSHeli 60A brushless Electronic Speed Controller (ESC)

Technical data:

- 2 to 6s LiPo, with under voltage protection by power reduction.
- 6 to 18 cells NiMH, with under voltage protection by power reduction.
- the specified current is the maximum continuous full power current with adequate cooling.
- under voltage detection (can be switched off).
- switching BEC: 5.5V, 3A continuous, 5A peak.
- Governor mode for Helicopters.
- Soft start.
- Active free-wheel, for efficiently part-load operation.
- Automatic or 6 step adjustable timing.
- adjustable F3A brake.
- 3 steps adjustable regular back EMF brake.
- Switching rate: 8 to 16 kHz
- Speed limit: 240,000 RPM (2-Pole motors)
- Temperature and overload warning.
- Anti sparking circuit: reduces connection sparkles.
- Programming with the ProgCard II or RC-Setup.
- Overall dimensions in mm: 62 x 25 x 8
- Weight in g without/with wires: 19 / 35
- Cable diameter Battery/Motor: 2.5mm² / 2.5mm²

Initial setup:

Connect the Motor to the ESC to hear the beeps. After connecting the battery (red = plus, black = minus) you hear 3 descending tones. Subsequently, follows a number of beeps according to the cell number of the connected Lipo battery. In case the transmitter stick is in throttle off, you hear now 3 ascending tones. If you here the interval-beep disconnect the battery and reverse the servo-signal in the transmitter.

Especially if you use a Futaba transmitter you have to reverse the servo-signal.

Note: Wrong Battery polarity leads to heavy damage and to the loss of warranty!!!

If the motor turns in the wrong direction, simply exchange 2 of the 3 motor wires.

Helicopter settings

For helicopters in governor mode, the full throttle range (100%) must be calibrated once. For some transmitters, this range is indicated in the helicopter menu, throttle curve 0...100% and some other transmitters -100...+100. Please refer the RC-Setup especially the Basic Setup or ProgCard.

--- The ESC is ready for use. ---

On delivery all relevant heli parameters are set to default. This default will fit nearly all setups.

You don't need to program further at a first step.

Here a listing of the default settings.

- Timing 18°
- Brake off
- under voltage recognition adjusted to Lipo mode 3.1 V
- automatically cell count
- throttle curve 1.15...1.95ms
- Act. Freew. on
- Governor Mode on
- P-Gain 0.7
- I-Gain 0.03
- Startup Speed = Heli middle
- PWM-Frequency 9 kHz
- Startup Power = Auto 1-32%

You can modify the settings of P-Gain, I-Gain and PWM frequency (with ProgCard II) but usually is not necessary.

Use only clean and tight gold connectors for motor and battery. The 3.5 mm PK connectors have proven to be the best choice up to 60A. Pay attention for the battery connector to choose a polarity safe system. Exchange low-friction or oxidized plugs and sockets. Because only tight sitting contacts will ensure a high current flow, protect the speed controller against dangerous voltage peaks and avoid disturbances.

Trouble shooting:

1 Beeps/flashes: Incorrect throttle curve for Gov.-Store Mode

2 Beeps/flashes: Under-voltage identification

3 Beeps/flashes: Temperature rise warning

5 Beeps/flashes: Receiver signals failed

6 Beeps/flashes: start up failed

Any error that happens during flight is signaled by the ESC after motor stop (flashing LED and beeps).

In case the ESC reduces power completely because of low-voltage, critical temperature, receiver signals lost or the startup failed, the error levels 2,3,5 and 6 will be stored permanently (crash analysis). To reset these errors connect the ESC to the battery with the stick at full power and/or with 100% throttle pre-selection (throttle curve), and disconnect it after the interval beep. Please leave the stick at full power, while disconnecting, otherwise you activate the RC-Setup.

Alternatively the errors can be cleared by connecting the ProgCard.

With an activated brake, the error is only signaled after a tension reset or in wind milling position.

Plane settings

The ESC has a fixed throttle curve setting, so that with all usual transmitters the stop and full power points are linearly connected. With all programmable transmitters, the throttle range should be set to default ($\pm 100\%$), the center point set to zero and throttle trim enabled. Nevertheless, with some transmitter types the range needs to be adjusted. For that the throttle endpoints have to be set so that one notch before lowest stick position the motor is stopped and that one notch before full power the motor is actually at full power. Full power is indicated by the LED that is completely turned off.

If during spin up rpm variations (wowing or erratic sound) are experienced, the timing must be increased. If no improvement can be obtained at 30° , then the motor is overloaded. Here a smaller propeller, a one cell smaller battery or a stronger motor will help. If after motor stop you hear 2 beeps repeating, it means that the battery voltage dropped down below the setting value. Eventually try a cutoff voltage of 2.9 or 3.0V per cell. If there is still no improvement, then the battery is discharged or too weak, the wires are too long or too small or a connector is out of order.

With an active brake you can hear these warning tones only in windmill position. This is the small range on the throttle stick between brake and motor start. You can reach this position with 2 notches or with a high trim and a short gas start.

If no automatic timing is wished, it can be adjusted according to the following guideline.

Inrunner	0 to 12°
Outrunner	18 to 30°

If your motor manufacturer indicates a timing recommendation, it is of course preferable to use it.

Basic rule: the higher the timing the higher the full power rpm.

The easiest to make these changes is the ProgCard II. There is also the possibility to perform the setup with the RC-Setup.

Please notice that the complete features set can only be reached through the ProgCard II.

In case you get inadvertently in the programming mode during a normal start-up (throttle stick at full power), simply disconnect the battery, lower the stick to stop, and connect the battery again. Thus you won't modify the adjustments.

Lipo protection / under-voltage protection:

By default the Power will be reduced, when then battery reaches undervoltage detection threshold.

Active free-wheel:

The unlimited partial load capability refers to the maximum full power current of the ESC.

Temperature / overload warning:

If the speed controller's temperature exceeds its limit, because of overloading or lack of cooling, after landing and/

or motor stop, a warning signal is issued (3 Beeps in the interval). But the motor is **not switched off** in flight unless the temperature becomes extremely critical, then the motor switched off.

The partial load operation between half and nearly full power is the most difficult area for an ESC. In addition the running time becomes longer and longer with the Lipo technology. If it should come to repeated temperature warnings, better cooling should be provided or current should be reduced. These warnings are to be regarded as overload warnings and **not as normal operating condition**. Because at high temperature the components are strongly stressed, this leads to a decreased life time.

You achieve a better cooling not only through sufficiently dimensioned air intake, but even more efficiently through a larger air outtake, in order to avoid a heat accumulation. You achieve smaller currents by using a smaller propeller or a one cell smaller battery.

BEC:

Additionally to the use of the BEC a 4 cell NiCd/NiMH receiver buffer battery can be connected through a switch cable into a free plug of the receiver or a through Y-cable.

The buffer battery avoids tension drops on hard servo maneuvers, protecting the receiver's functionality.

Make sure that no discharged receiver battery is used, because this would load the BEC additionally by charging the battery. A half or fully loaded Battery will not be charged and is only discharged in extreme conditions. The plus (red) wire of the receiver cable does not need to be disconnected.

Several ESC's can be connected to a **single** receiver without any special precautions (Parallel use of all the BECs). The total maximum available load is the sum of the individual BECs.

A configuration without BEC and with galvanic separation is also possible. For that please use our opto coupler module.

Caution:

Fundamentally it is important to make sure that no objects are within the propeller circle when batteries are connected. The use of this speed controller is therefore allowed only in situations where damages and personal injuries are impossible. A damaged governor (e.g. broken, damaged by polarity inversion or humidity) must not be reused under any circumstances. Otherwise it can come to a later malfunctions or failures.

The ESC may only be powered from batteries, a use from power supplies is not allowed.

Warranty:

We give 6 months warranty on this speed regulator. Any other requirements are excluded. That applies in particular to requirements for damage or injuries compensation due to malfunction or failure. For damages to property or personal injuries and their consequences, which developed from our supply or craftsmanship, we do not take any liability, since we have no control on handling and use.

