CYCLON Heli 4000 From Electronic Model - Instruction

Congratulations, you have just acquired a Brushless motor from Electronic Model. This motor is intended only for powering helicopters. This motor is not for use in a boat, in a car or a plane. The motor is best powered by sub-c cells 1200 to 3300 mAh capacity or good quality Li-Po's. Using 10 cells at a power consumption of 35 amps, this motor can fly with ease models up to 2 Kg with a rotor diameter of 80 cm to 110 cm. The main technical features of this motor were studied and calculated in order to optimise the output during the flight phase and not to look good on a bench test. The range Heli Cyclon motors use the NFS Principle (Noro Fabrice System). This process allows the motor to attain considerable power for very low weight. Your Cyclon Motor possesses a record power to weight ratio, as it can develop 400 W continuous and more than 600 W in peak power a weight of only 120 grms.

Characteristics of the motor using timing of 4-15 °

Power with 10 Cells : 400 W continuous , 600 W peak (30 seconds)
Efficiency : 84 % At 11 ,5 V – 44A. , Timing 4 °
Current : 35 A Continuous , 60 A peak (30 seconds).
Winding Resistance : 0,010 Ohm /Phase , 0,021 Ohm total.
KV = 3740 tours/ Min / Volt Io = 3,5 A (6v)
Dimensions : Diameter 36 mm , Length 43 mm (without shaft) , weight : 120 gms

Controller

Like all brushless sensorless motors (without sensors), this motor needs to be used with an adequate controller. The utilisation of a maladjusted controller can greatly lower the performance of your motor at the same time overheat it, creating irreparable damage. The output is directly bound to the compatibility of the whole Motor/Controller/Battery combination. Being given the important number of available controllers on the market, It is difficult of prepare an exhaustive list, more so as many have a variety of programming options, which can make them compatible or not compatible. In all events, we advise you to use a controller of variable timing. Attention, it doesn't mean to say that these motors could be controlled by all the controllers with variable timing!!
The timing is only one of the numerous features of a controller! It is important that the controller is also designed to control a Multi pole motor.

The timing to use is from 4 to 15°

Battery

Choice of battery for propulsion is just as important as the other components in the chain of propulsion. Never forget that the batteries constitute the reservoir of your motor. The capacity of the battery plays on its structure and its internal resistance as a check on the output. On these grounds, always use batteries designed for high output. E.g.: A battery of 1800 mAh with low output of LR type is unusable. Preference therefore is for cells of RC type 1200, RC 1600, RC 2400, RC 3000 HV, RC 3300 HV, GP 1100 SCH, GP 2200 SCHR, GP 3000 SCHR, GP 3300 SCHR or all other cells having a low internal resistance. Attention do not use cells designed, for example, to supply low currents for the use in transmitters or receivers.

Installation

Your CYCLON motor has M3 threaded holes for fixing a mount to the stationary part of the motor. It is recommended that you use these as your method for mounting the motor. It is important that the length of the screws is such that they do not pass further than 3 mm in to the interior of motor. It is greatly advised against fixing your motor by a system of a clamp or collar around the stationary cover of the motor.
Your CYCLON motor can be easily disassembled for exchange of the shaft or in order to change the exit end of the shaft. If you want to disassemble your motor in order to switch the shaft around or for any other reason, it is essential to replace the hexagonal screw that keeps the end bell in place on the shaft, on every re-assembly. On re-assembly this screw must be new and very tight because the forces passing through this fixing are very high on this part. A bad assembly could cause the destruction of the motor! We recommend you also regularly check that this fixing is very tight.
Attention, the bell of this motor could reach of very high speeds of active rotation until 40000 towers/ minutes.
It is indispensable to take all precautions in order to protect the health of motor and the security of the user.
Never run this motor unconnected to the main rotors of your helicopter.

The motor must be connected to the controller by the 3 wires. We recommend you solder the wires of the motor to the wires of the controller. In case you would wish to use connectors, it is indispensable that they are of quality, of PK 4 mm or PP 3.5 mm types. It is indispensable to have a length of flexible wire between the motor and the controller. Never join the cables of motor directly on to the controller, use some flexible wire.
If no flexible wire is used there is a high possibility that the stiff motor wires will fracture due to the vibration with the possibility of damage to controller and motor.
The motor & controller need ventilation. The apertures in the motor are there for this reason, to assure correct cooling. Thus if the motor or controller is enclosed you need to make sure you have apertures to feed the motor/controller with an airflow, it is as important to have an exit for the air as well, this should be at least 1.5 times the area of the inlet. Be sure there is a hole for air intake on the top of the motor , make sure the cold air can come inside and flow around the motor & controller. It is very important of taking care of this point because the air circulation can vary in the cockpit of a helicopter.

Transmission connection & gearing ratio

The choice of the ratio of reduction is very important. It is this which is going to determine the speed of rotation of your rotor and load on the motor. This must be adapted to the helicopter, to the motor, to the number of cells and your style of flight.
It is very important when selecting the best combination of gearing. The lowest gearing that produces the optimum rotor head speed is best. The motor must therefore turn as quickly possible and the gear ratio be the highest possible.
Never choose a combination of reduction that will would push your rotor to 2000 Revs at full power, then use the throttle to come down to 1200 Revs at the rotor. This abuse will have for consequence of overheating your motor and your controller causing their destruction. In any event this set-up combination will produce mediocre performance from your helicopter (and only for a short time before you destroy your motor and controller).

It is therefore preferable to power with the throttle from 85 to 95% while stationary, and throttle up
to the maximum in transition to flight. If in this case you see that the speed of rotor rotation is too high, you must decrease the number of teeth and not the percentage of throttle on your radio. If your rotor doesn't turn enough quickly, you must of course use a pinion with more teeth.
Your Cyclon Heli 4000 motor turns to 3740 revs per volt with no load. The mid load speed is in the region of 3200 revs per volt.
In order to calculate your reduction ratio you must know what speed of rotation the rotor needs to run at.
Some helicopters require 1200 Revs only, some other need 1700 or 1800 revs in order to fly correctly.

Below therefore is the formula in order to calculate the ratio:

$$\frac{\text{(Number of NiMh cells used x 1.1 V) x speed of motor under load (3200 revs per volt)}}{\text{Speed or rotor wanted}} = \text{Reduction ratio to use}$$

An example for the ECO 8: 8 Cells x 1.1 x 3200/ 1600 Revs = 17.6 (reduction Ratio).

The Eco 8 uses a crown 180 teeth, you therefore divide this by the reduction ratio 180/ 17,6= 10.22 (10 TEETH).

Below are some ***examples*** of settings for some of the most popular Heli types, this data is just a starting point , you may need to adjust ratio to tune the flight characteristics to the feel of the helicopter and your style of flying.

Eco 8	7 Nimh	10 teeth (standard)	Good power
Eco 8	8 Nimh	10 teeth (standard)	Very powerful, good for aerobatics
Eco 8	10 Nimh		Has to be avoided MUCH too powerful
Eco 8	2 Lipo	11 teeth	Good Power
Eco 8	3 Lipo	10 teeth	Very strong strength, Aerobatics and 3D
Eolo R22/ Spirit/ Pro Spirit	7 Nimh	17 teeth	low power, for beginners and test only
Eolo R22/ Spirit/ Pro Spirit	8 Nimh	16 teeth	medium power, good for beginning
Eolo R22/ Spirit/ Pro Spirit	8 Nimh	17 teeth	Good power, transition and basic flight
Eolo R22/ Spirit/ Pro Spirit	8 Nimh	18 teeth	medium power, basic Aerobatics
Eolo R22/ Spirit/ Pro Spirit	10 Nimh	16 teeth	High power, advanced Aerobatics
Eolo R22/ Spirit/ Pro Spirit	2 Lipo 1	8-19 teeth	Good power, conversion and basic flight
Eolo R22/ Spirit/ Pro Spirit	3 [lipo]	16 teeth	High power, advanced Aerobatics
Eolo R22/ Spirit/ Pro Spirit	3 [lipo]	17 teeth	Very high power, Aerobatics and 3 D
JR Travel E	8 NiMh	19 teeth	Good power, conversion and standard flight
JR Travel E	8 NiMh	21-22 teeth	High power, advanced Aerobatics
JR Travel E	10 NiMh	15 teeth (Origin)	Good power, conversion and standard flight
JR Travel E	10 NiMh	16-17 teeth	High power, advanced Aerobatics
JR Travel E	3 Lipo	17 teeth	Good power, conversion and standard flight
JR Travel E	3 Lipo	18 teeth	High power, advanced Aerobatics and 3D
JR Travel E	4 Lipo	14-15 teeth	Very high power, Aerobatics and 3 D
CORONA	Standard set Up		
EP concept	Standard set Up		