



Building Instruction & Manual



KH -278 Outrunner Motor Kit Version 2



Introduction

Congratulations on your purchase of KH-278 outrunner motor kit version 2. It is a modified outrunner motor kit designed for 3D aerobatics and parkflyer models. KH-278 V.2 powered with 1.9mm-curved NdFeB magnets. It covers 80% inner circumference of flux ring. By this latest design, the motor can deliver excellent acceleration for hovering and performing aggressive 3D aerobetic maneuvers at high efficiency rate. In addition, high quality hardened steel main shaft and precision CNC rotor allows the motor running at high rpm without vibration. The three-screw lock system at the top of end-bell can let you to install and change main shaft without gluing, while pre-assembled end-bell and flux ring can let you to build the motor easier and faster. We would say such easy-to-assemble motor kit is hard to find in DIY motor world. We highly recommend this motor kit to beginner.

Warning

Radio Control Model and Outrunner Motor Kit are not toy!!! It contains sophisticated small parts and is designed for hobby use only. All parts of this outrunner motor kit have to be assembled and operated with great care. Outrunner motor can produce very high power to turn gear or spindle propeller. It is capable of causing property damage and all bodily harm to operator or spectators. If you are a beginner of motor builder, please seek assemble and operational help from experienced motor builder.

Be Caution!!!

If this outrunner motor kit is not assembled and operated properly, it can destroy your electronic speed control, receiver, batteries and relevant equipment completely.

Parts List

(QTY)	Items
(1)	Pre-assembled End-Bell and Flux Ring
(1)	23.8mm Stator
(1)	Bearing Tube
(2)	Ball Bearings
(1)	3.17mm Hardened Steel Shaft
(1)	30feets, AWG 24 Enameled Magnet Wire
(12)	NdFeB N48M Curved Magnets
(1)	Propeller Saver Hub
(2)	Propeller Saver Replacement Rings
(1)	O'ring
(3)	Connector Pairs (Male and Female)
(7)	Shrinking Tubes
(3)	M3 x 4 Screws
(2)	M3 x 8 Screws
(1)	C-Clip



1. Mark color to magnets



Use marker to mark different color to North Pole and South Pole magnets.

2. Place magnets inside the bell



First, place six South Pole magnets inside the bell and aligned it with six vent holes. Then, use a drop of CA to secure the position of magnet.



Second, place six North Pole magnets in between South Pole magnets. Use a small clip to adjust the magnets until all magnets placed evenly. Then, use a drop of CA to secure the position of magnet.



3. Winding

It is an example of using three individual magnet wires to complete a 3-phases system. We recommend beginners to wind 12turns for their first motor. For experienced motor builders, they can wind more or less turns to get different potential power. Note: Since the last turn is not a complete circle, you need to wind 13times to get 12turns' power. Make sure that every coil has same number of windings.

In this manual, we would like to share another winding method with you. This winding method can let you to use stock wire to wind a 12-16turns motor easier. For the beginner, you should use labels marked "S1", "S2" and "S3" and stick on magnet wire before wind your coil.

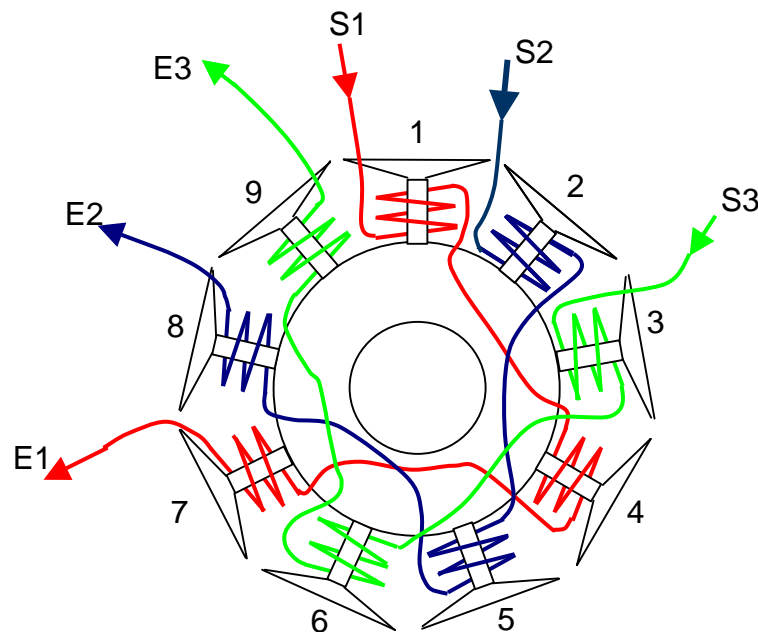


Diagram of winding system of 9-pole stator



Step 1



- 1: Cut a 3ft-magnet wire "S1"
- 2: Remain 7-8cm long magnet wire for connection use afterward.
- 3: At tooth No.1, start to wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

Step 2



- 1: Cut a 3ft-magnet wire "S2"
- 2: Remain 7-8cm long magnet wire for connection use afterward.
- 3: At tooth No. 2, start to wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

Step 3



- 1: Cut a 16ft magnet wire "S3"
- 2: Remain 7-8cm long magnet wire for connection use afterward.
- 3: At tooth No. 3, start to wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

Step 4



- 1: Put the magnet wire "S1" to tooth No.4
- 2: At tooth No. 4, wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

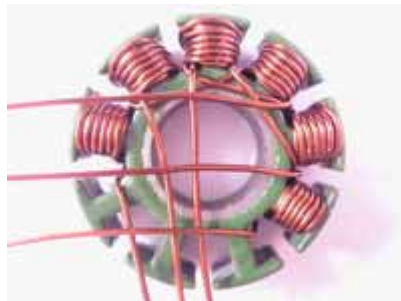


Step 5



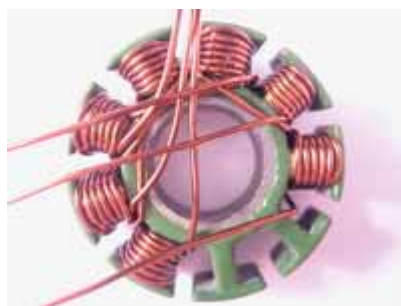
- 1: Put the magnet wire "S2" to tooth No.5
- 2: At tooth No. 5, wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

Step 6



- 1: Put the magnet wire "S3" to tooth No.6
- 2: At tooth No. 6, wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

Step 7



- 1: Put the magnet wire "S1" to tooth No.7
- 2: At tooth No. 7, wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

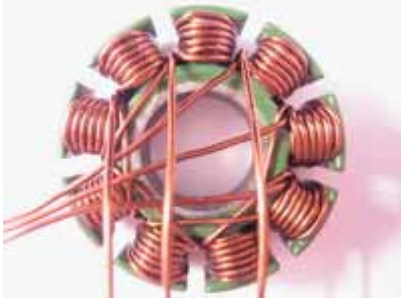
Step 8



- 1: Put the magnet wire "S2" to tooth No.8
- 2: At tooth No. 8, wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.



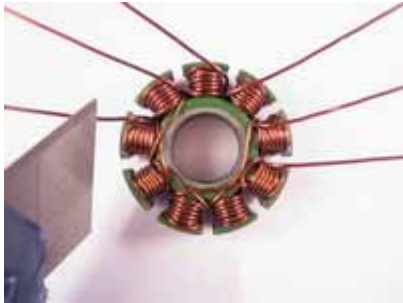
Step 9



1: Put the magnet wire "S3" to tooth No.9

2: At tooth No. 9, wind 7times from the hub to the outer edge of hammerhead. Then wind 6times back to the hub.

4. Remove the coating of magnet wires



When you finish the winding steps above, you have 6 ending of magnet wires attached to coils. Use a shape model knife to scrape off the coating of these six magnet wires.

Then, it is necessary to check any short between magnet wire and stator metal, and need to check any short between magnet wires, S1, S2 and S3. If you find any short between them, please be patience to rewind them again.

Note: your Electronic Speed Controller, Receiver and Battery can be destroyed by part defect of windings.

5. Solder magnet wires to Delta or Wye system

Now, you can make you own decision to solder the magnet wires to either Star (we) or Delta system.

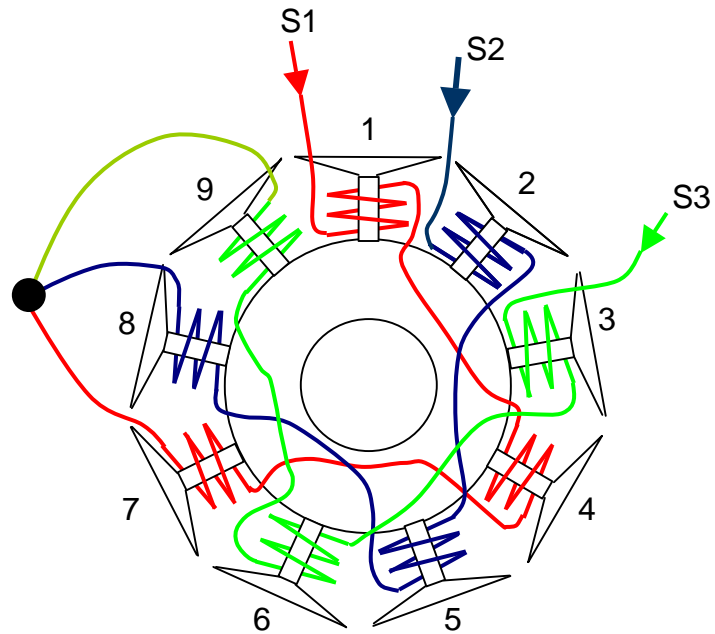
Star vs Delta

- ✓ Star (we) system gives more torque and uses fewer amps.
In Star system, 1.73 less turns needs to be wound to get the same power and Kv as DELTA system does.
- ✓ Delta system gives 1.73 higher power and amps draw compare to STAR system.
In Delta system, the Kv is 1.73 higher than Star system while the Kt (Torque) is 1.73 lower



Star (wye) system

Solder E1, E2 & E3 Together

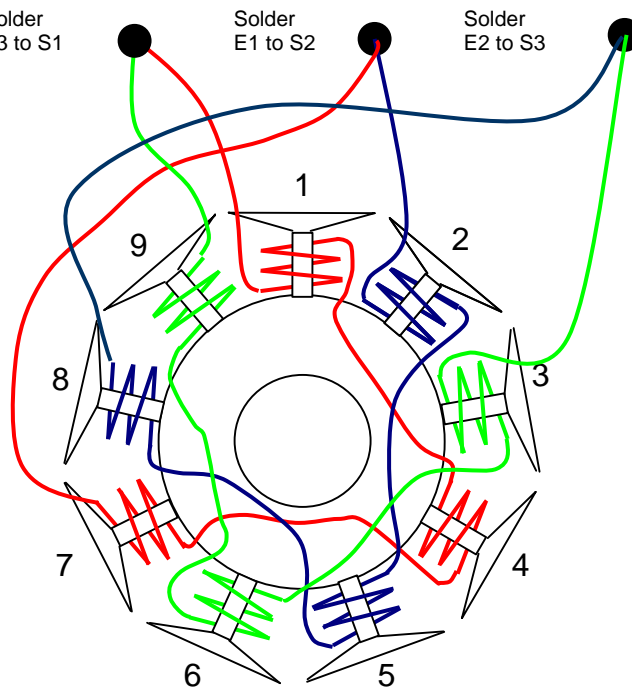


Delta System

Solder E3 to S1

Solder E1 to S2

Solder E2 to S3





6. Insert three soldered wires to Shrinking Tubes

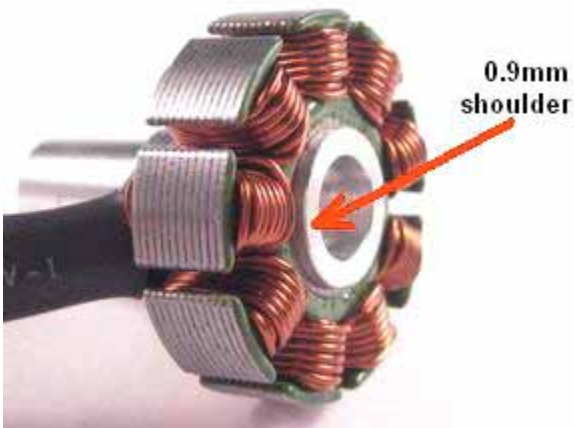


Now, you have three soldered wires attached to coils. Insert those soldered wires into shrinking tubes for insulating.

7. Insert Bearing Tube to Wound Stator



First, drop some Loctite to bearing tube. (No. 272 Red Loctite is one of the best choice to glue bearing tube)



Second, insert bearing tube to stator until you get 0.9mm shoulder. Then, wait for the Loctite dry.



8. Place two ball bearings into bearing tube.



9. Insert a main shaft to endbell.



Insert a main shaft to endbell

10. Put a c-clip to the slot of main shaft.



Install wound stator inside the bell and put a C-clip to the slot of main shaft to secure whole motor system.

11. Place three screws at the end-bell.

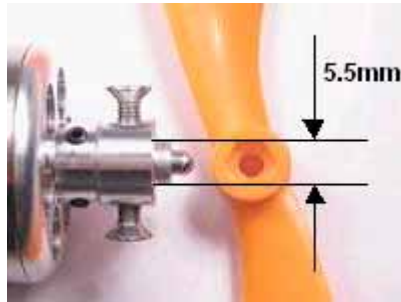


Place three M3 x 4 screws to end bell to secure the position of main shaft. Each screw must be turned a bit each time until all screws tighten up.

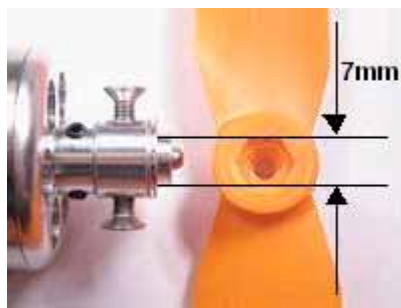


12. Propeller saver and Replacement rings

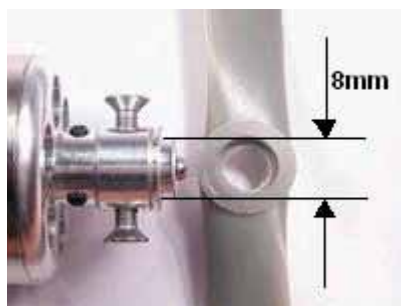
By using the propeller saver and replacement rings, it can protect your propeller from hitting the ground but also let you install different brand of propeller easily.



GWS 5.5mm



GWS 7mm



APC 8mm



Congratulation!

You finished the assemble work of your unique outrunner motor project. Thank you for your purchase. Should you have any comment of this outrunner motor kit, please feel free to contact us at enquire@komodohobby.com