



## **Building Instructions & Manual**



**KH-257D Outrunner Motor Kit**



## Introduction

Congratulations on your purchase of a KH-257D Outrunner Motor Kit. KH-257D is a powerful and high efficiency outrunner motor. This motor kit includes two 12-tooth 22mm diameter stators and sixteen pieces N50 magnet. It gives highest flexibility to you to tailor make a perfect motor for your model. Please take time to read through this manual before building this powerful KH-257D outrunner motor kit.

## 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 spin propeller. It is capable of causing property damage and all bodily harm to operator or spectators. If you are a novice motor builder, please seek assemble and operational help from an experienced motor builder.

## Be Careful!!!

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

## Parts List

(QTY)	Items
(1)	Pre-pressed End-Bell and Flux Ring
(2)	22mm 12-tooths Stator
(1)	Bearing Tube
(2)	3.17mm x 6.35mm Ball Bearing
(1)	3.17mm Hardened Steel Shaft
(1)	30feet, #24 Enameled Magnet Wire
(16)	4 x 9 x 1.7mm N50 Magnets
(3)	Connector Pairs (Male and Female)
(7)	Shrinking Tubes
(3)	M3 x 3 Screws
(1)	C-Clip

Optional Parts: (Not included in this kit)

10 magnet spacer

14 magnet spacer

16 magnet spacer

**Note: In order to prevent confusion to beginner, this manual mainly concentrated on assembling 14 magnet poles and distributed LRK winding. In appendix II, there is shown the winding method for 16 magnet poles.**



## 1. Marking Magnets

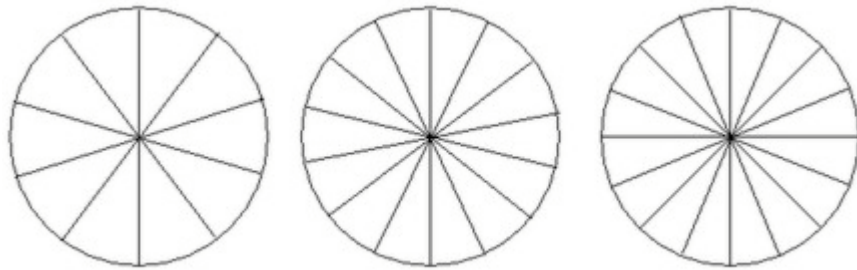


Stack all magnets together. This will assure all the magnet poles facing one end of the stack are the same polarity. Use a marker to mark the face of one of the end magnets, then move that magnet to the other end of the stack. Continue marking and moving magnets until all magnets have one face marked.

## 2. Place magnets inside the bell

Before placing magnets inside the bell, you need to choose the number of magnet poles from the table below.

The characteristics of different magnet pole set-ups			
	10 magnet poles	14 magnet poles	16 magnet poles
Magnetic Pattern	NSNSNSNSNS	NSNSNSNSNSNSNSNS	NSNSNSNSNSNSNSNSNS
RPM	High	Middle	Low
Torque	Low	Middle	High



Note: In this manual, we choose 14 magnet poles for example.



Place the endbell on the template with the center hole over the center point.



Use a marker to copy all lines onto the flux ring.



Align the magnets with every other mark and secure them with a small drop of thin CA glue.



Place seven more magnets into the bell, but this time the marked faces will not show. They will be against the flux ring. Check to be sure every other magnet has the marked face showing and the magnets are evenly spaced. Then apply a small drop of thin CA to secure the magnets.



Now you have the magnets installed in the desired NSNSNSNSNSNSNS pattern.





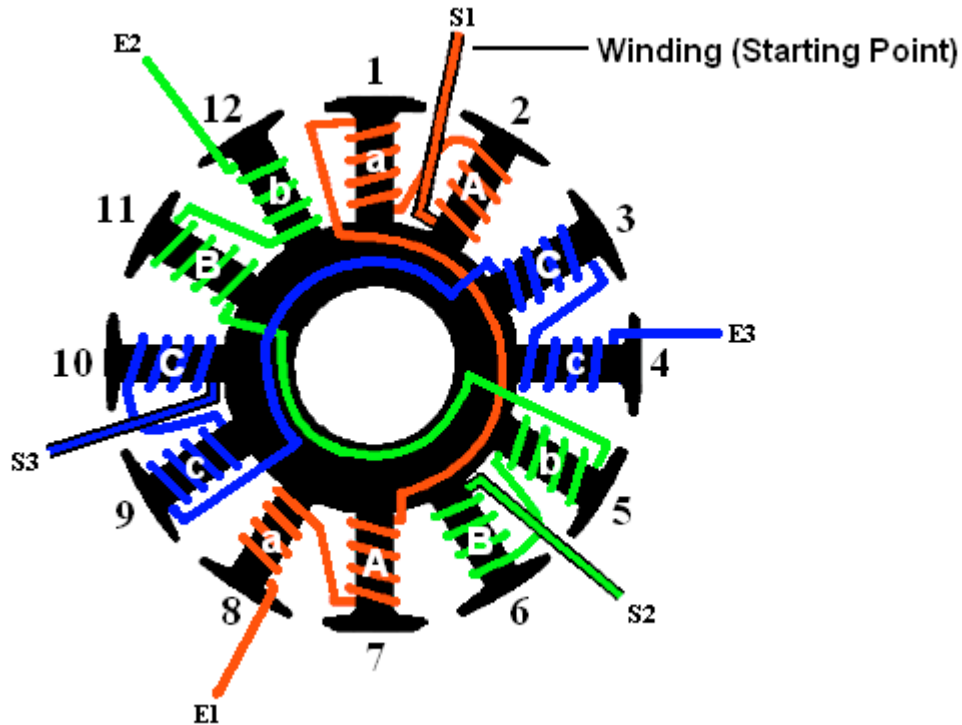
**3. Insert bearing tube into stator.**



Apply a drop of Loctite (#411, 480 or equivalent) to the bearing tube and insert it in the stators until the shoulder of the bearing tube touching the face of the stator.



#### 4. Winding



Distributed LRK Winding Diagram (DLRK) for 10 or 14 Magnet Poles

	10 magnet poles	14 magnet poles	16 magnet poles
<b>Magnetic Pattern</b>	NSNSNSNSNS	NSNSNSNSNSNSNSNS	NSNSNSNSNSNSNSNSNS
<b>DLRK Winding</b>	AabBCcaABbcC	AabBCcaABbcC	ABCABCABCABC
<b>LRK Winding</b>	A-b-C-a-B-c	A-b-C-a-B-c	

- "A" and "a" are first phase wire S1
- "B" and "b" are second phase wire S2
- "C" and "c" are third phase wire S3
- Capital (upper case) letter means Clockwise
- Small (lower case) letter means Anti-Clockwise
- "-" means the stator tooth not wind

We recommend you mark the stator teeth 1-12, as shown above. It will reduce the chance of winding the wrong tooth by mistake.



## Distributed LRK Winding: AabBCcaABbcC

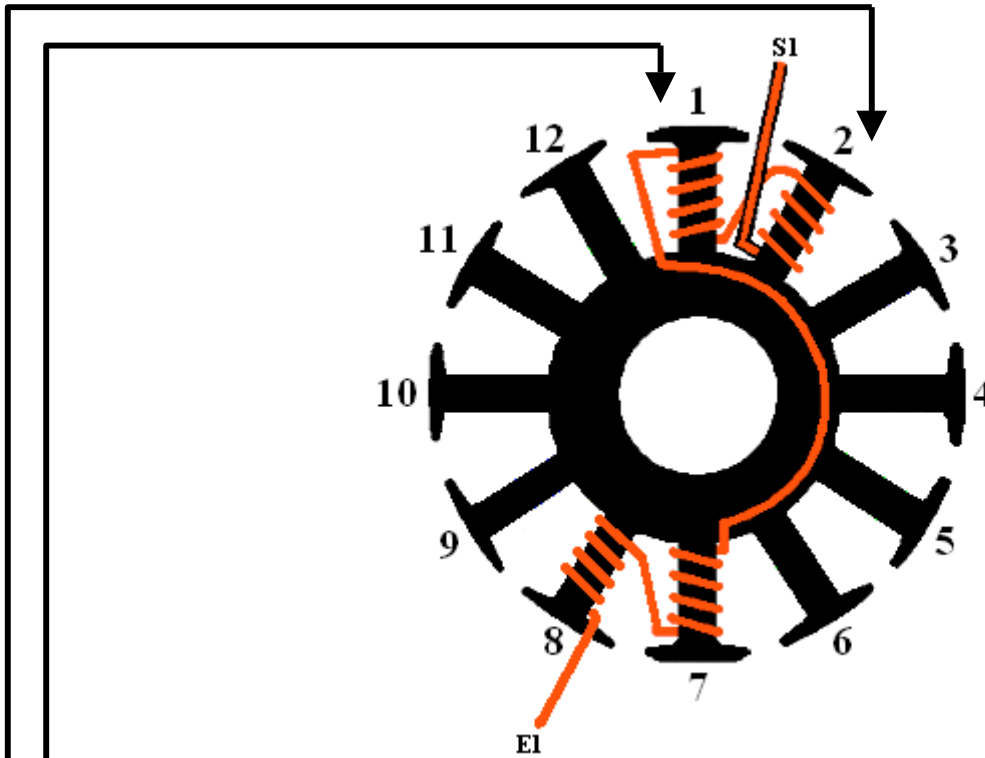
Please note that this winding can be used for  
10 magnet poles (NSNSNSNSNS)

or

**14 magnet poles (NSNSNSNSNSNSNS)**

It is an example of using three individual magnet wires to complete a 3-phases system. We recommend beginners to wind 7 turns for their first motor. Please make sure every coil has same number of turns.

### Phase 1 (Tooth 1 & 2)



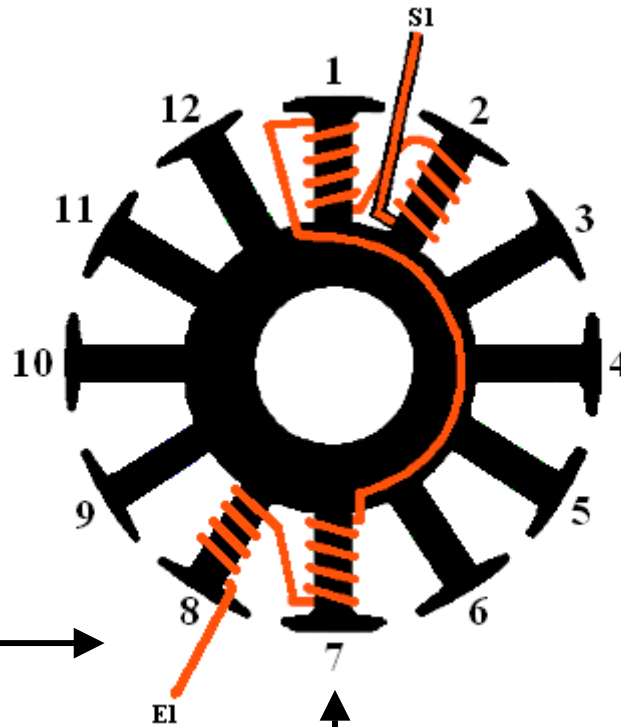
**Step 1: Leave 7-8 cm for making connections, later.**

**Step 2: Start the first wire "S1" on tooth No. 2. Wind 7 turns from the hub to the hammerhead in clockwise direction.**

**Step 3: Continue this wire to the base of tooth No. 1 and wind 7 times from the hub to the hammerhead in anti-clockwise direction.**



**Phase 1 (Tooth 7 & 8)**



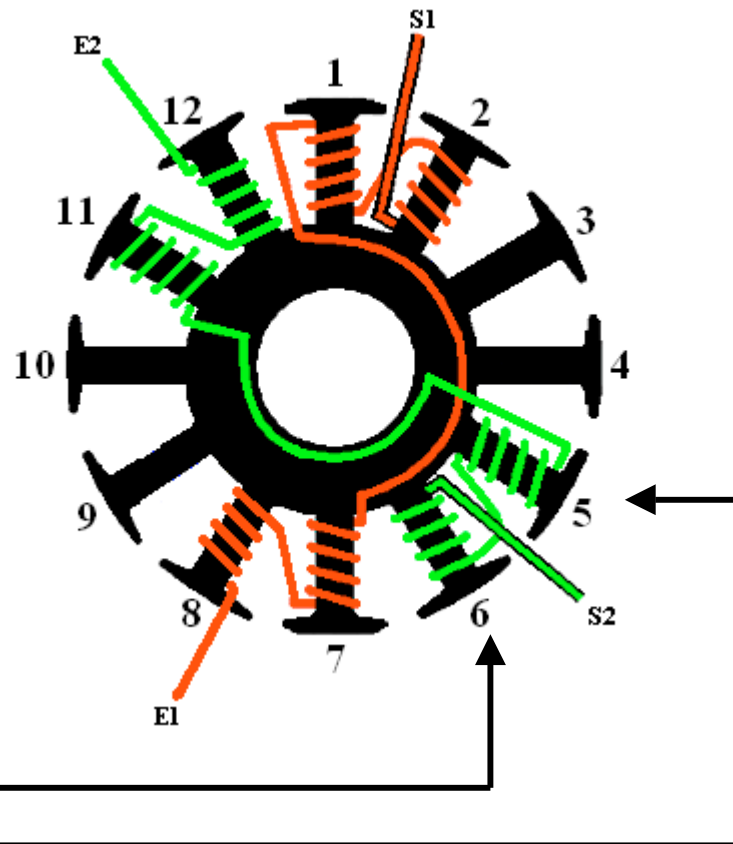
**Step 4: Jump to tooth No. 7 and wind 7 turns from the hub to the hammerhead in clockwise direction.**

**Step 5: Continue this wire to the base of tooth No. 8 and wind 7 turns from the hub to the hammerhead in anti-clockwise direction.**

**End wire "S1" by cutting it off leaving 7-8 cm for connections.**



Phase 2 (Tooth 5 & 6)



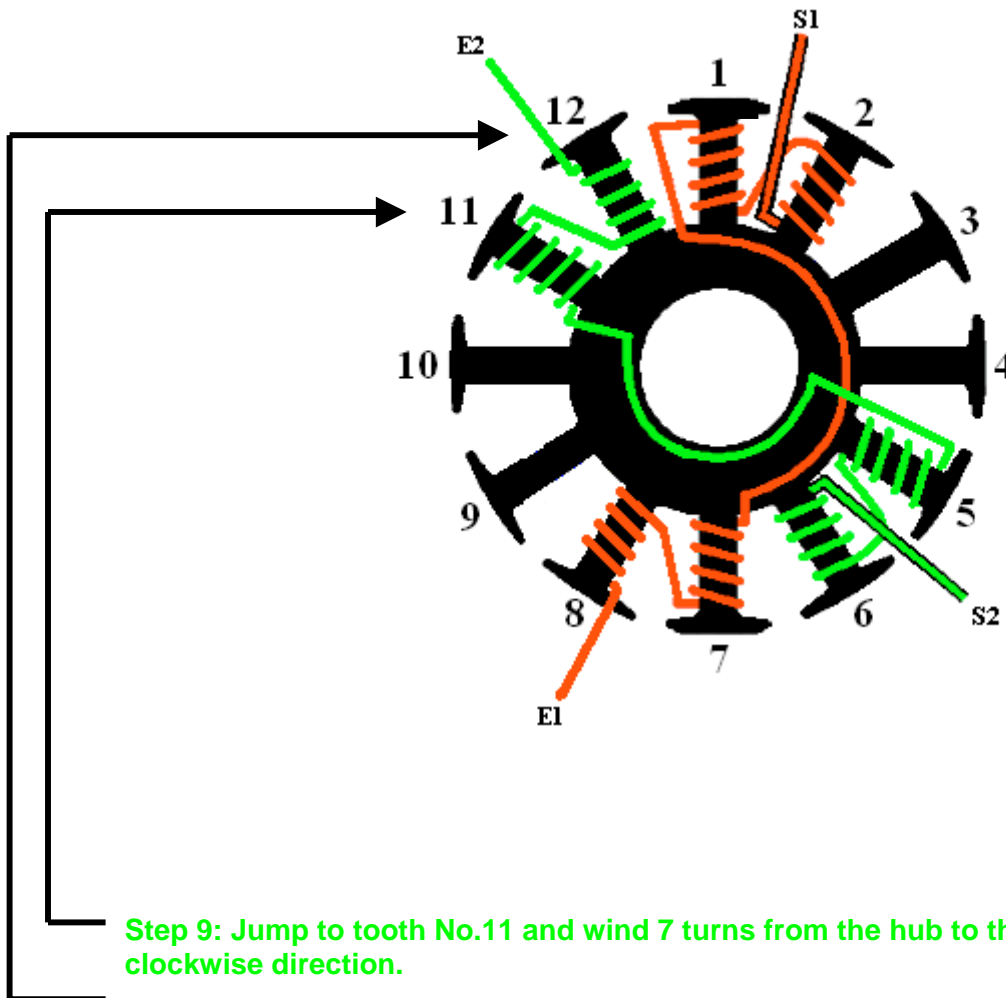
**Step 6:** Leave 7-8 cm for making connections, later.

**Step 7:** Start the second wire "S2" on tooth No. 6. Wind 7 turns from the hub to the hammerhead in clockwise direction.

**Step 8:** Continue this wire to the base of tooth No. 5 and wind 7 times from the hub to the hammerhead in anti-clockwise direction.



Phase 2 (Tooth 11 & 12)



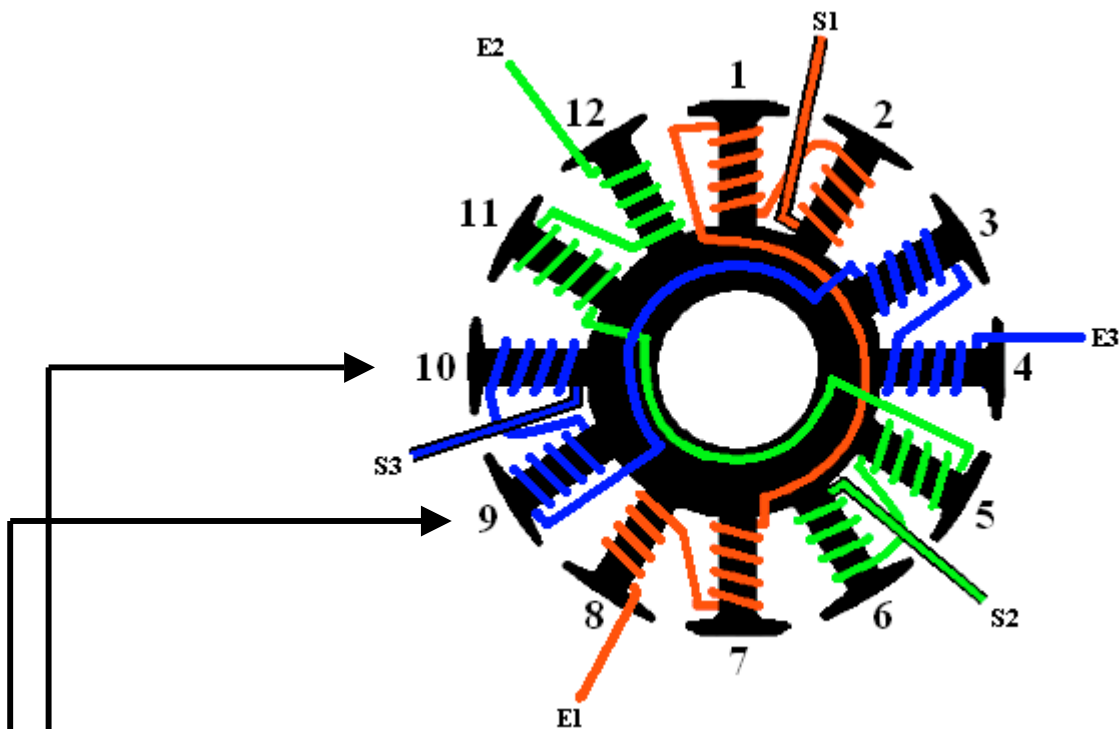
**Step 9:** Jump to tooth No.11 and wind 7 turns from the hub to the hammerhead in clockwise direction.

**Step 10:** Continue this wire to the base of tooth No.12 and wind 7 turns from the hub to the hammerhead in anti-clockwise direction.

**End wire "S2"** by cutting it off leaving 7-8 cm for connections.



Phase 3 (Tooth 9 & 10)



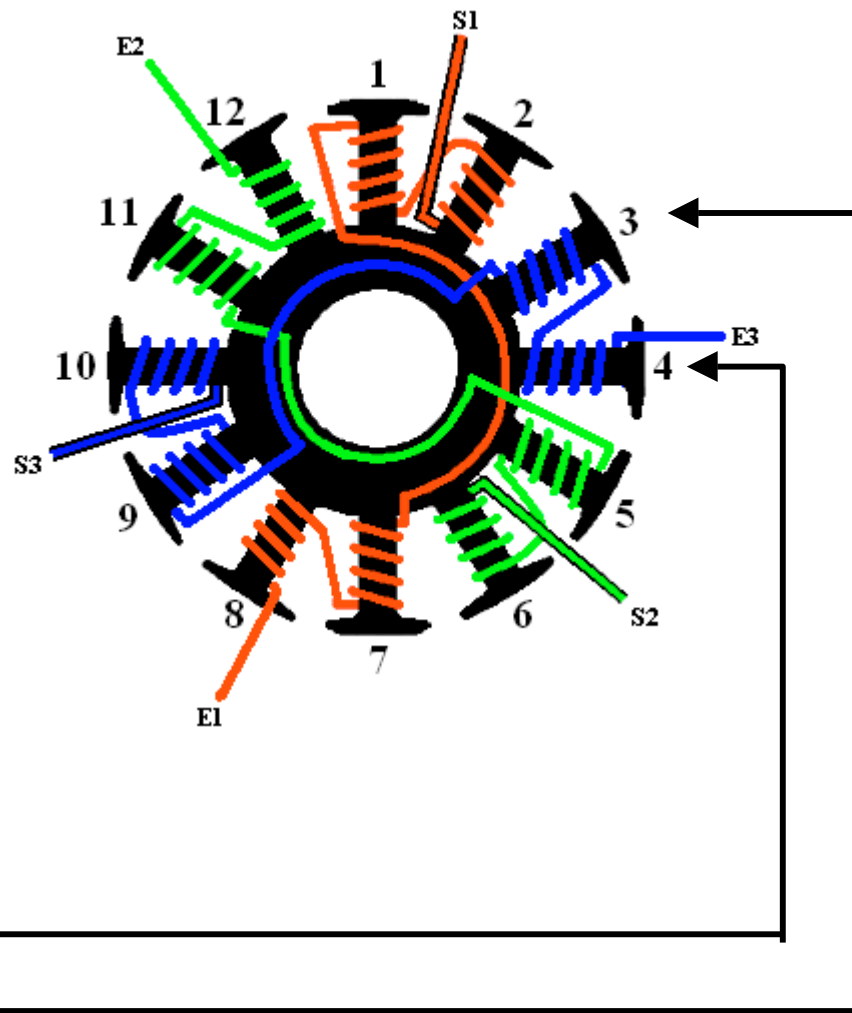
Step 11: Leave 7-8 cm for making connections, later.

Step 12: Start the first wire "S3" on tooth No.10. Wind 7 turns from the hub to the hammerhead in clockwise direction.

Step 13: Continue this wire to the base of tooth No.9 and wind 7 times from the hub to the hammerhead in anti-clockwise direction.



Phase 3 (Stator Tooth 3 & 4)



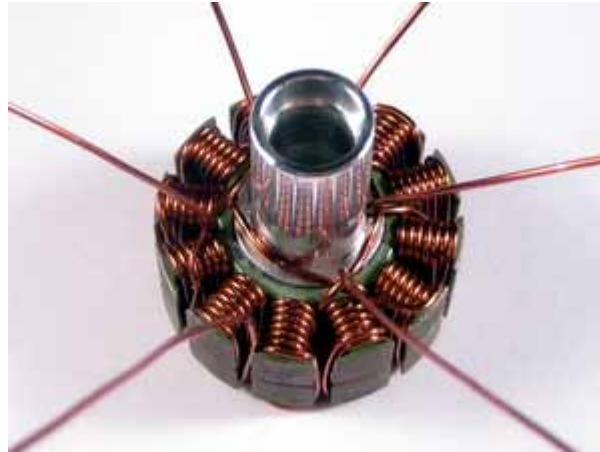
**Step 14:** Jump to tooth No. 3 and wind 7 turns from the hub to the hammerhead in clockwise direction.

**Step 15:** Continue this wire to the base of tooth No. 4 and wind 7 turns from the hub to the hammerhead in anti-clockwise direction.

End wire "S3" by cutting it off leaving 7-8 cm for connections.



**Picture of a completed 7 turns winding**





#### 4. Remove the coating of magnet wires

Now you have 6 wire ends attached to the coils. Use a sharp knife to scrape off the coating from the last cm of each wire.

Now, check for any possible shorts between the stator and each wire or between wires S1, S2 and S3. If any shorts are found the wire should be removed and new wire installed. Attempting to run a motor with a short can damage your electronic speed control, battery, or receiver.

#### 5. Connecting wires, Delta or Wye system

Now, you need to make your own decision to solder the magnet wires to either Star (wye) or Delta system.

##### Star vs Delta

- ✓ Star (wye) 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

For the winding example above (7Turns), we recommend you to make Wye system.

7 Turns, Wye's Data:

1320Kv

No load current / 8v : 0.9A

No load current / 10v: 1.0A

Resistance (Ohms): 0.1150

For other constant information, please refer to Appendix I



## **Delta System**

Point 1: Solder S1 and E3 together

Point 2: Solder S2 and E1 together

Point 3: Solder S3 and E2 together

Note: Point 1, Point 2 and Point 3 are connected to Electronic Speed Control (ESC)

## **Star (Wye) System**

Solder E1, E2, E3 together

Note: S1, S2 and S3 are connected to ESC.

### **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. Put three insulated wires together**



Put three wires together and use a short shrinking tube to secure it.



**8. Place ball bearings to bearing tube.**



**9. Insert a main shaft to endbell and put the wound stator into the bell.**



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



Put a C-clip to the slot of main shaft to secure whole motor system.

**11. Place three screws in the end-bell.**



Place three M3 x 3 screws into the end bell to secure the position of the main shaft. Each screw must be turned a little at a time until all screws tighten up.

Note: Light press action can make sure the motor bell will not move and out of align during flying, especially you do "punch" action.



## **Congratulations!**

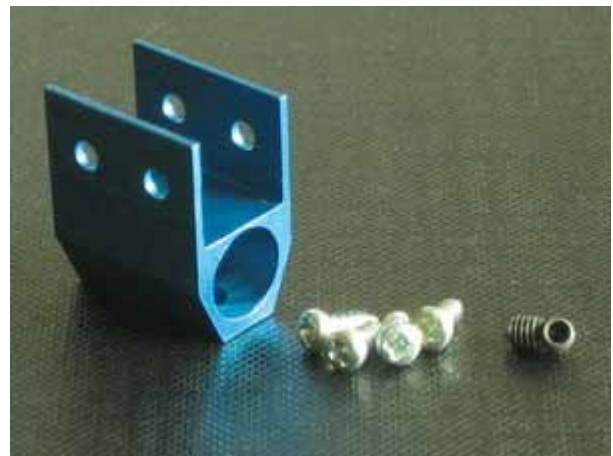
You finished the assemble work of your KH-257D outrunner motor.

Should you have any comments on this outrunner motor kit, please feel free to contact us at [enquire@komodohobby.com](mailto:enquire@komodohobby.com)

For other selections of outrunner motor kit, please visit [www.komodohobby.com](http://www.komodohobby.com)



Firewall Motor Mount



Stick Motor Mount

Firewall Motor Mount and Stick Motor Mount for KH-257D Outrunner Motor are available at [www.komodohobby.com](http://www.komodohobby.com).



## Appendix I

### Constants of Different Winding

Magnet: 14 Poles (NSNSNSNSNSNSNSNS)

Winding: Distributed LRK

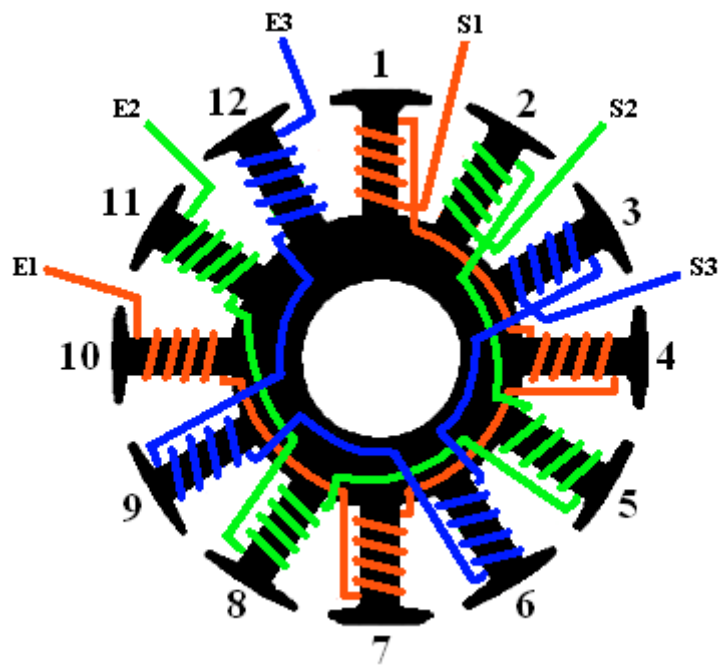
Turns	4	5	6	7	8	9	10
Wire	#22	#23	#24	#24	#24	#24	#25
Configuration	Wye	Wye	Wye	Wye	Wye	Wye	Wye
Kv	2260	1790	1510	1320	1150	1020	930
No Load Current / 8v	2.3A	1.7A	1.1A	0.9A	0.8A	0.6A	0.5A
No Load Current / 10v	2.7A	2.1A	1.3A	1.0A	0.9A	0.7A	0.6A
Resistance (Ohms)	0.0458	0.0742	0.0988	0.1150	0.1284	0.1469	0.1925
Weight	1.31oz	1.31oz	1.34oz	1.34oz	1.37oz	1.37oz	1.37oz
	37g	37g	38g	38g	39g	39g	39g



Appendix II

**Winding: ABCABCABCABC**  
**(For 16 magnet poles)**

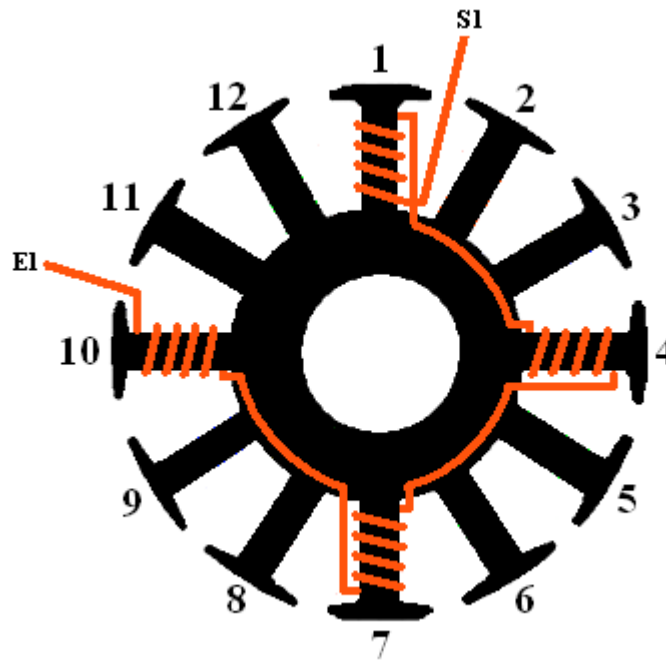
Wind magnet wire in clockwise direction on all stator teeth.



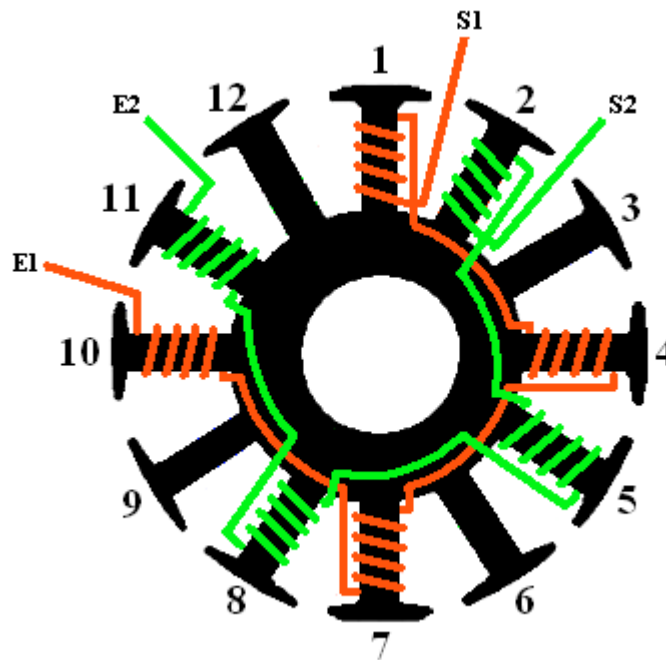
**Winding Diagram for 16 Magnet Poles**



Phase 1 (Tooth 1, 4, 7 & 10)

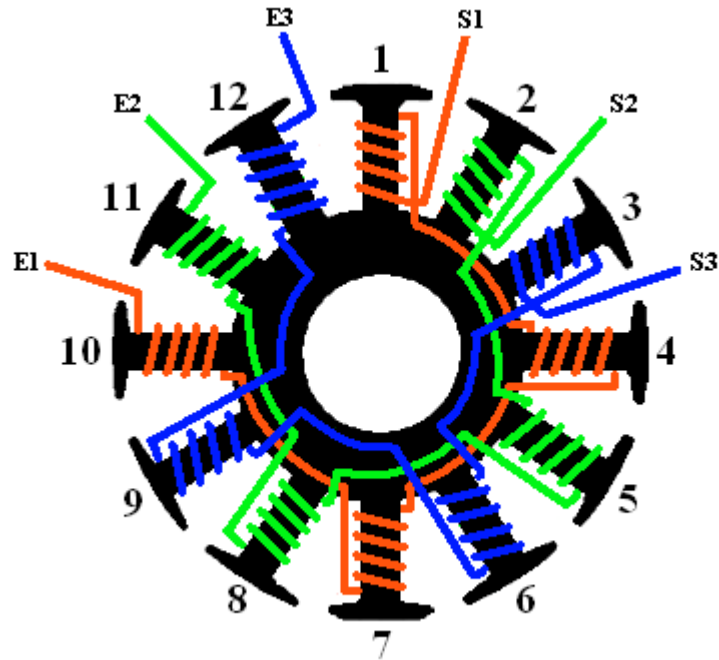


Phase 2 (2, 5, 8 & 11)



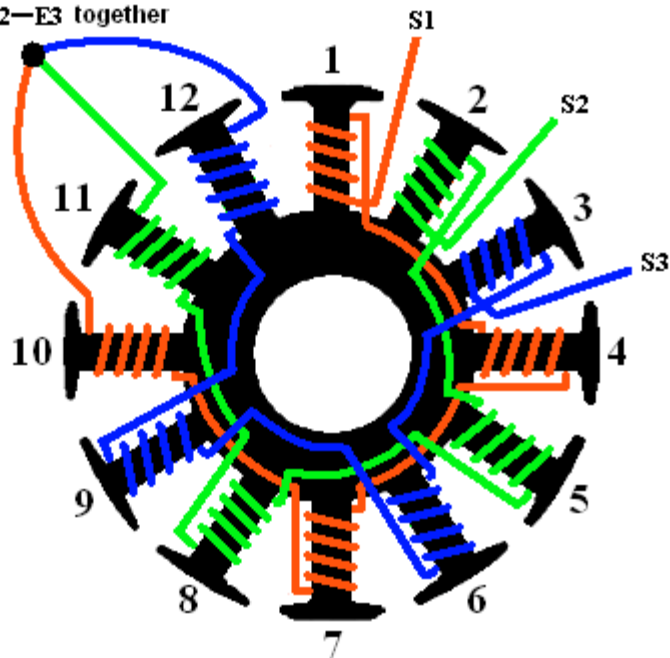


Phase 3 (3, 6, 9 & 12)



Star (Wye) System

Solder E1-E2-E3 together





### Delta System

