

Construction Manual High-Torque LRK 280/5 and 280/10

You find this instruction with colored pictures under [www.high-torque](http://www.high-torque.de) menu item 'manuals'

The High-Torque LRK 280/5 was invented as a specially light and high torque engine for models up to departure dimensions of approx. 600 g

It is very lightweight with a mass of 36 g and permits to construct, together with lithium-polymeric storage batteries, that weigh only about 200 g, stunt flying models for indoor use.



This kit has the advantage, that you can vary the windings of the stator especially for the using purpose and the used number of batteries.

The accompanying, double laquered nealed wire with a caliber of 0,6 mm permits the use of the engine with a flow of above 12 ampere. But especially with the use of LP-cells you have to attend, that the engine flow is adapted to the capability of the batteries.

The build up of the engine results from individual parts of the kit, that are CNC manufactured and facilitate the installation.



The rotor bell with the integrated carriers for the magnets and the radialcooling is a masterwork of the CNC- mill and turning art, what we are very proud about.

We assume, that our High-Torque LRK 280/5 is also build up by many 'newbies' in the engine building. Because of its easy build up, is this construction manual for many old stager in some point a little at a great length. But you can easily jump over, can't you??

Among the kit you need the following things, that nearly every model maker has in his workshop:

- Thin fluid superglue
- Bolt-assurance-laquer
- A needle-nosed pliers
- A waterproof marker
- A soldering gun
- Ease and comfort



Construction stage 1 The Stator

First you assure the two ball bearings with some bolt-assurance-laquer in the stator casing. Important: Only a little laque in order that the bearings do not stuck together.

The next step is to glue the stator-laminations together to a solid packet. Before we glue it is important, that the laminations lay exact among each other, because only in that way they can be ideal wound later.





The laminations are punched so they are buckled a little, but that is irrelevant for the engine, but on this account they should glue in the way they were delivered. Because the laminations are coated with baking-laquer, they can be baked together in the oven for an hour by 150 degree. But there is also an easier way by gluing the face sides together with thin fluid superglue. By the capillary effect the glue drafts enough in the laminations to guarantee a safe assembly. Waste superglue should be removed with a cloth.

Now the isolation discs are cutted with a sharp cutter from the blanks. There it is important that the burrs are grinded exactly, that they do not get stuck later on the rotor.

Then the ISO-discs are glued with the superglue on either side of the statorpacket.

There you have to attend that the discs are glued

good in the area of the statorheads. Of course they have to lay exactly over the laminations to do not harm the winding space.

If the glue is dry, the finished stator packet can be glued with the bolt-assurance-laquere on the statorcarrier.



Construction Stage 2 The Rotor



The installation of the rotor begins with adjusting the engine angle, consisting of the 3mm steelbolt. Because of inevitable tolerances it may be that it is difficult to plug the bolt through the the bearings. If that's the case, it should be grinded with 400 grinding-paper so that it goes just even through the bearing.

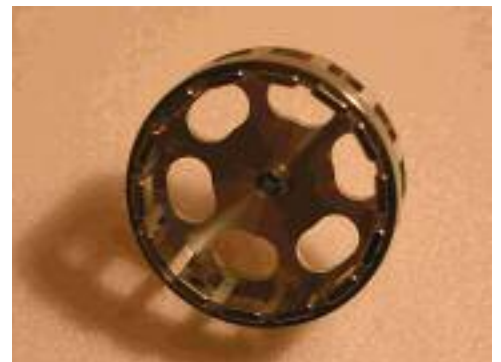
Now the conclusion ring is pushed as far as it will go on the cogs and it is locked with a little assurance-laque. Now we can begin to paste the magnets in.

The magnet have to be inserted with rotational priority, so that the engine runs solid later.

To make that sure, there are several methods. It has been proofed to

mark the magnets. For that purpose the magnets are packed together to a packet that is marked by a waterproof marker with a dot on one side.

Now the magnetpack is turned and a magnet is pushed in every second break. Following the remaining packet is marked on the other side with a cross and the magnet with the dot is pushed in a free break in the bell. The cross remains at the bottom and other magnets are pushed in.



So the procedure goes on till all breaks in the bell are filled out. That sounds more detailed than it is and the marking takes just longer as the actual act, but so an optical control of the work is always possible. Because of the guideways the magnets sit absolutely accurate in the bell and if it jams, the magnets can be pushed with a needle-nosed pliers carefully in the breaks.

To adjust the magnets at the edge, they are pushed a little over the edge. Then the bell is pushed on a hard underground, so that the magnets are flush with the conclusion ring.

At least we give a small drop of superglue in the blank that is build by the rounding between the magnet and the conclusion ring.



Now the bell is ready and we come to the most exciting part of the engine build up.

Construction Stage 3 The Winding

The Winding of the engine is important for its attributes later. We advise to wind the engine with 14 – 15 windings and the included 0.6mm conductor

14 windings per cog for 2 LiPol- batteries and prop 10x4,7 für 3 LiPol-batteries and prop 8x3,8 to 9x4,7	15 windings per cog für 3 LiPol-batteries and prop 9x4,7 to 10x4,7
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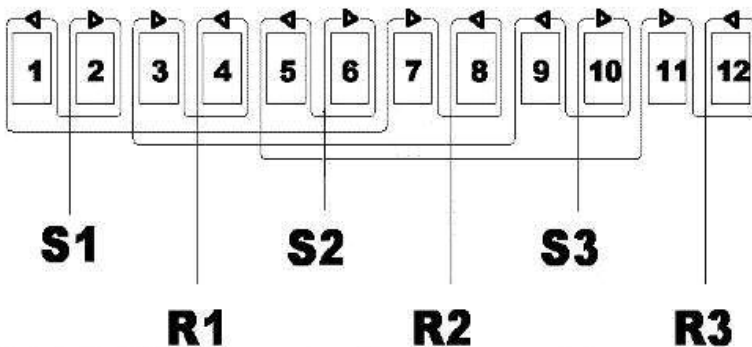
On the High-Torque LRK 280/5 we advise to wind every cog. That is at first sight more complicated but keeps the winding-heads at the end of the stator smaller. With it the particular cogs are numbered clockwise from 1 to 12.

Windingpattern:

Nach diesem Schema ist das Wickeln wirklich einfach.
Nummerieren Sie alle Zahn-Köpfe des Stators mit Filzstift durch von 1 - 12.
Die Zeichnung unten zeigt alle Zahn-Köpfe des Stators als Abwicklung.

Beginnen Sie bei S1 auf Zahn 2 und wickeln den Draht laut Pfeilrichtung.
Sie enden bei R2 auf Zahn 8.
Dann weiter mit S2 auf Zahn 6, Sie enden bei R3 auf Zahn 12.
Dann weiter mit S3 auf Zahn 10, Sie enden bei R1 auf Zahn 4.

Die Drahtanfänge S1, S2, S3 zu einem Punkt zusammenfassen und verlöten.
Der Regler an R1, R2, R3 anschließen. Fertig. Nicht sehr schwer, oder?



Das Original der Zeichnung stammt aus einem Beitrag auf www.rc-network.de.
Es wurden die Richtungspfeile hinzugefügt.



make the first winding **S1 – R2**

Begin in place **S1**. left beneath cog 2 from the bottom with the conductor in and wind the cog clockwise. Finally you come out downward with the conductor from cog 2. Now between cog 2 and 1 up again and wind cog 1 anti-clockwise. In conclusion you come out downwards left beneath cog1. Now you make a loop on the other side of the stator and wind cog 7 clockwise. Then cog 8 anti-clockwise. End at **R2**. With **S2 - R3** and **S3 - R1** you deal in the same manner.

Quite simply, isn't it? You will recognise soon: It is more difficult for me to explain as for you to do.

Completion

Now the ending of the conductors are stripped on approx. 6cm. With an ohmmeter you have to proof, if between the windings and the stator a short-circuit is. So take one probe of the ohmmeter at a conductor ending and the other at the metal of the stator. The ohmmeter have to show a max resistance.



If this test shows, that we have no short circuit, we can begin with the circuit of the windings. For the advised star connection take **S1**, **S2** and **S3** together and twist, solder and isolate them.

R1, **R2** and **R3** will connect to the control unit. Also them get the tube as bend protection before the plugs are solded.

More capacity gives the engine in the delta connection. For this S1 and R1, S2 and R2, S3 and R3 are put together get twisted and soldet

They have 3 connections to the control unit, too. Now the coefficient of the engine rotational speed is 1,73 more. But this can only be realised with a small propellar and a higher engine flow. Finally the the holder plater ist ist screwed on the stator-holder and the rotor is put on.

In the delivery condition the angle of the rotor is left knowingly long and can now be shortened with a mini-drill machine and a grinding disc or a grinding stone. The angle is baked and has to be grinded through. Sawing won't work.

The angle is pushed as far as it will go from behind through the stator-holder and then the rotor is pushed from ahead on the angle. The installation is done with 2 grub screws. So the rotor can't get off by the draft of the propeller. The end of the angle that is standing over is cut as aforementioned.

The propeller has to have a bore of 6mm and is fixed with a nylon-nut.

Do you want a Propsayer? Then cut the M6 winding except a small accretion (the angle according to this also has to be cut) and replace the grub screws with longer screws. Put on the propeller, span a rubber over the propeller and the screws and the Propsayer is ready.



Now we wish you a lot of fun in flying with your new High-Torque LRK 280/5