

There are no propellor forces (axial load) allowed to the output shafts, more informations at the end of this manual

Gearbox assembly manual

Dear friend of fast boats,
you have bought a gearbox kit. With this kit you are able to assemble a clutch- and gearbox unit, this will be called CGU further on. This CGU is based on the in Germany well known MATHO-gearbox, so it could be defined as well engineered.

Fits to?

This CGU fits all Zenoah 230, 231 and 260 engines, it does not matter whether these engines are water or air cooled (maybe air cooled engines have a after market water cooling).

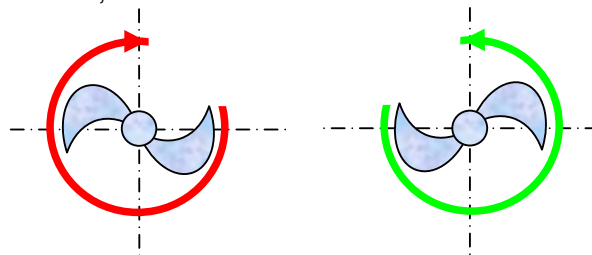
The CGU fits RCMK, ChungYang, SIKK, J&G, Quickdraw and so on engines up to 29ccm also. It does not matter if these engines have a power increase by modifications or not.

The CGU can handle the power of all 1- or 2-cylinder engines which have been built based on the engines listed above. For example: RCMK (K600), MTC, MHZ and Michi Manz 2-cylinders plus the brand new MOUSE HOUSE of MATHO (www.matho-powertrain.de)

At the end of this manual you'll find how to make a carb linkage for the ChungYang engines of model year 2008.

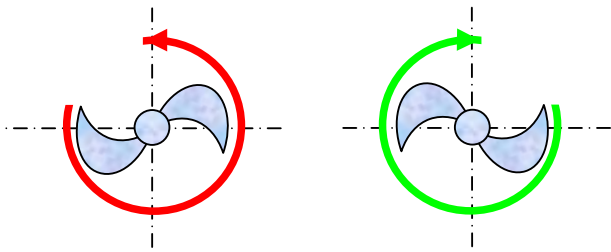
Different assembly modes are possible:

1. CGU with 2 counter rotating output shafts for inside rotating propellers: this means, that from the aft the right propeller (the starboard one) is rotating counter clockwise, looks like this scetch:



mostly best for small mono hulls like Apaches or smaller (higher chine angle)

2. CGU with 2 counter rotating output shafts for outside rotating propellers: this means, that from the aft the right propeller (the starboard one) is rotating with the clock, looks like this scetch:



recommended for catamarans and wider mono hulls (smaller chine angle) like MHZ-Showtime & NoMercy

- CGU with 1 counter rotating output shaft. In this configuration the CGU has only one output shaft which rotates in opposite to the engine's rotating direction. You don't need to change the engine's rotating direction if you want to install 2 engines in a catamaran besides the tunnel. And if you like you may change the engine (fix the CGU to another engine) if necessary with ease.

What you've got for CGU variant 1 & 2

The following parts are inside the kit, partially pre assembled:

Pos.	name	material	pcs.
K1	housing	strong aluminium	1
K2	ball bearing, small	689 RSR	3
K3	shaft seal ring	9 x 13 x 3	2
K4	leading guide	strong aluminium	2
K5	bolt M3 x 6	stainless steel	6
K6	bolt M5 x 16	stainless steel	10
K7	gearbox plate	strong aluminium	1
K8	ball bearing, big	6001 RSR	1
K9	snapping for shaft	steel	1
K10	snapping for bore	steel	1
K11	distance tube	stainless steel	4
K12	bolt M5 x 60	stainless steel	4
K13	clutch shaft, long	stainless steel	1
K14	clutch bell	stainless steel	1
K15	bolt M6 x 12	stainless steel	1
K16	bolt M3 x 6	stainless steel	3
K17	gear wheel	hardened steel	2
K18	counter shaft	stainless steel	1
K19	M5 nipple	brass	2
K19.1	bolt M5 x 6	stainless steel	2
K20	tube, 12cm	Silikon	1
K21	cable strap		2
K26	clutch shoes, set	incl. 2 special bolts	1
K27	clutch shoe adaptor	aluminium	1
K30	engine adaptor plate	strong aluminium	1

pre assembled sub systems:

sub system 1 (B1): K1 with 2 ball bearings K2

sub system 2 (B2), 2 sets: K4 with pressed in shaft seal rings K3

sub system 5 (B5): sub system **B4** with assembled K14, K15 & K16

sub system 4 (B4): K7 with installed **B3**, K2 (1x) and K10

sub system 3 (B3): K13 with K8 & K9 and pressed on gear wheel K17

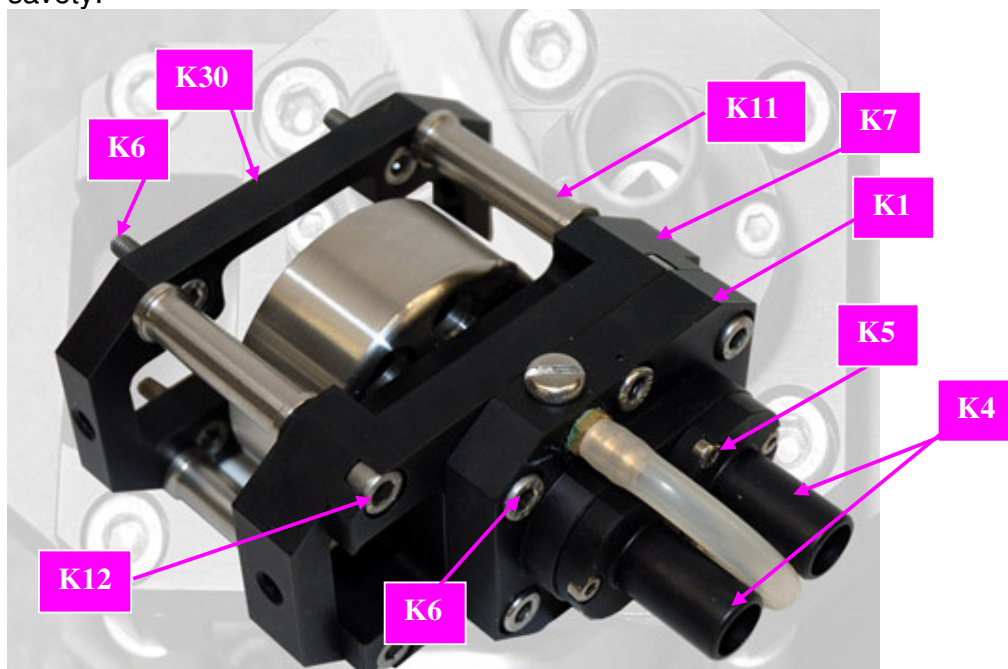
sub system 6 (B6): K18 with pressed on K17

Before you can start with the assembly, you should have further parts (material):

1. liquid screw locking as LOCTITE Typ 243 or similar, further called LOCTITE
2. liquid sealant. You may use various types of liquid sealants for example silicon or LOCTITE 5203 (avail at BMW dealers part-no 7838948, this one is taken by us) or OMNIVISC 1002, etc
3. a small syringe (up to 0.3 cubic inch or 5ml)
4. 3 cubic inches (or 50ml) gear box oil (out of any passenger car gearbox, does not matter which type)
5. one bolt M6 x 12 plus flat washer to fix the clutch shoe adaptor to the crank
6. industrial grease

Shipped condition

is showed on the following pic, sub systems are pre assembled caused by shippment savety:



Disassemble 6 bolts K6 and 4 bolts K12 and disassemble the parts

The assembly processes:

because we know, that nearly no boat modeller enthusiast owns a small torque wrench we don't give torque data. We think that a serious modeller has a lot of experience how to fix screws and bolts, especially small ones.

Chapter 1: engine adaptor plate

Take 4 bolts K6 and fix K30 to the engine. Attention: the screwing torque is not allowed to be too high or too low. Before screwing the bolts into the engine's bore: put a bit LOCTITE onto the screws' threads. The following pic shows the how to. Above: too much. Below: ok.



engine adaptor plate K30 fixed to crank house:



Chapter 2: clutch assembly

2.1.

First unscrew the spark plug and screw in a piston stopper. Or use a piece of wood and stick it into the exhaust port.

2.2.

Unscrew the clutch shoes from their adaptor and put the adaptor onto the crank's cone. Fix it with the bolt M6 x 12 plus flat washer. Use LOCTITE onto the bolt's thread. But do not use oil, grease or LOCTITE at the cone!

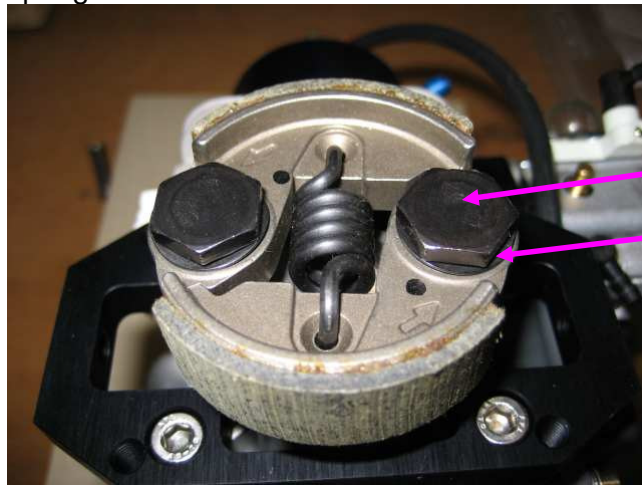


4 washers came with the clutch set: 2 thick sliding washers & 2 bended spring washers.

Put the thick sliding washers onto the clutch shoe adaptor, don't use oil or grease:



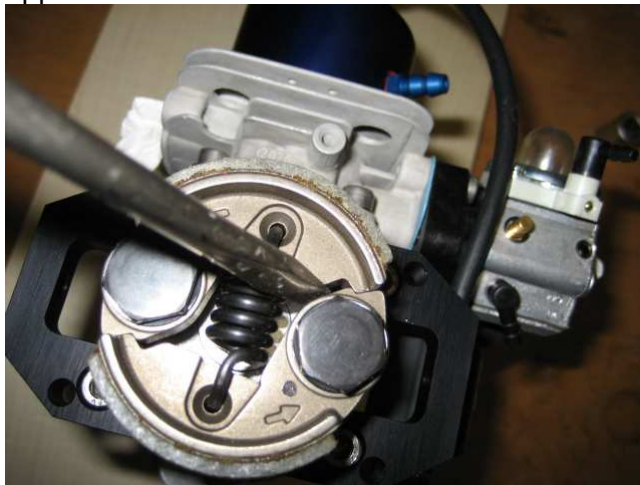
Then put a bit LOCTITE onto the threads of the 2 special clutch bolts, bring the spring washers under the bolts' heads and assemble it. Don't use oil or grease.



special clutch bolt

spring washer

Important: the fixing torque must be high, but the shoes must be moveable. This could be checked with a big screw driver as shown below. Twist the screw driver, the shoe must come back to it's normal spring loaded position. If you have tightened these 2 bolts too much: loose them a very little bit because the LOCTITE needs approx 10...15 minutes to harden.



Chapter 3: Distance tubes

Set the 4 distance tubes K11 (the pic shows this w/o the clutch shoes for better understanding)



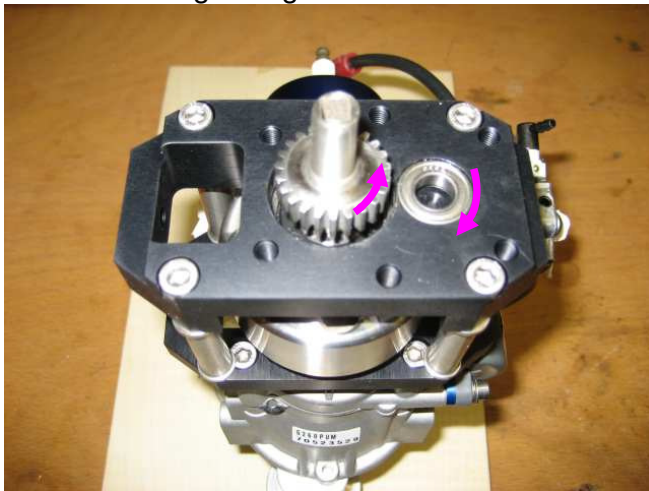
Chapter 4: propellor rotating decision

This is the latest point to decide which version should be assembled: inside or outside rotating propellers.

inside rotating configuration



outside rotating configuration



The CGU is designed completely symmetric. The following steps and pics show the inside rotating configuration. If you assemble it in outside rotating configuration you have to imagine thru a mirror.

Chapter 5: gearset and housing

5.1.

Slide 4 bolts K12 thru the bores of K7, don't use LOCTITE for the threads at this moment. Then tighten these 4 bolts. Remember: use your experience for the tightening torque. Now check: is there any drag torque between clutch shoes and bell? If yes: disassemble K7 and put 1 washer under each distance tube K11, then try again. If ok: disassemble again and apply a bit LOCTITE onto the threads of the screws.

Now sub system B6 will be installed:



5.2.

For the next step you should do a preparation: put a drop LOCTITE to the threads of the remaining 6 bolts K6 and stand them with their heads onto your work bench.

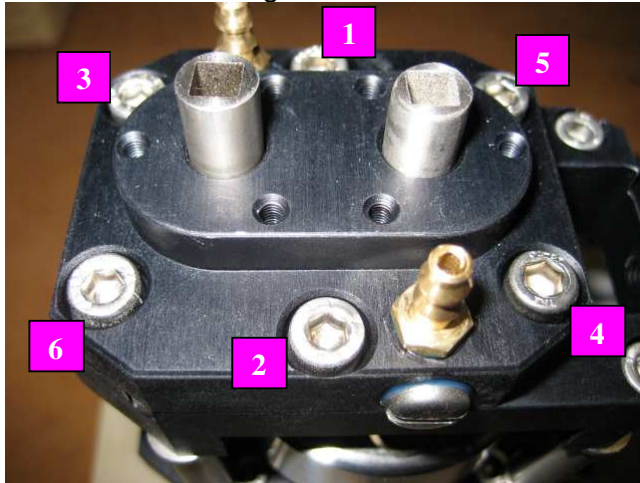
Then inject a small sealing bead of liquid seal onto the flange surface of K1 (B1) as shown below:



The sealing bead shown on this pic is border line thick, that means: do not apply more liquid sealing as shown.

Don't use a paper seal or s.th. like that, this will lead to leakage for sure

Now B1: put on B1 by moving it a bit, don't use a hammer or something like that. Put in the 6 bolts K6. Tighten crosswise as shown below:



Chapter 6: leading guide tubes

Last Step is the assembly of the 2 sub systems B2.

First put a bit grease onto the seal rings, don't work with a hard tool not to damage the seal lips.



Now slide the leading guides B2 by turning onto the 2 output shafts, you may use a bit oil onto the shafts. Rotate the guides when sliding them onto the shafts.

Fix them with 6 bolts K5. Don't use LOCTITE here.

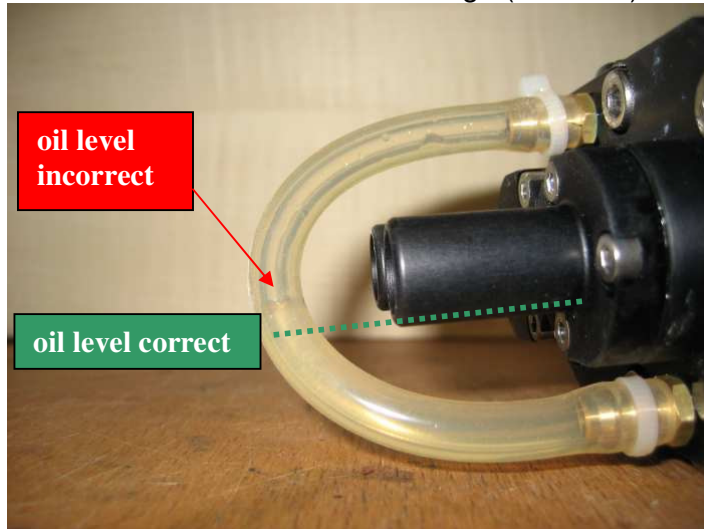
And pay attention to the fixing torque, these bolts are really small.



By turning the clutch bell now you'll find out that the turning torque is higher than without these leading guides. This depends on the friction of the 2 shaft sealings. After approx. 1 hour or running this drag torque will go down.

Chapter 7: oil content

Put the silicon tube K20 onto the below nipple and fix it with a cable strap K21. Then take the syringe and fill it with 0.122 cubic inch (or 2ml) gear box oil and press the oil thru the tube into the gearbox. Then put the silicon tube onto the above nipple. Install the whole unit (engine plus CGU) into your boat and check the oil level. This level must be as shown below. If correct: you could use the cable straps onto the silicon tube. If the oil level is too high (incorrect): let a bit drain out



Very important: please check oil level after each run, especially if the run had last moren than 15 minutes.

What you've got for CGU variant 3

The following parts are inside the kit, partially pre assembled:

Pos.	name	material	pcs.
K1	housing	strong aluminium	1
K2	ball bearing, small	689 RSR	3
K3	shaft seal ring	9 x 13 x 3	1
K4	leading guide	strong aluminium	1
K5	bolt M3 x 6	stainless steel	6
K6	bolt M5 x 16	stainless steel	10
K7	gearbox plate	strong aluminium	1
K8	ball bearing, big	6001 RSR	1
K9	snapping for shaft	steel	1
K10	snapping for bore	steel	1
K11	distance tube	stainless steel	4
K12	bolt M5 x 60	stainless steel	4
K14	clutch bell	stainless steel	1
K15	bolt M6 x 12	stainless steel	1
K16	bolt M3 x 6	stainless steel	3
K17	gear wheel	hardened steel	2
K18	counter shaft	stainless steel	1
K19	M5 nipple	stainless steel	2
K19.1	bolt M5 x 6	stainless steel	2
K20	tube, 12cm	Silikon	1
K21	cable strap		2
K26	clutch shoes, set	incl. 2 special bolts	1
K27	clutch shoe adaptor	aluminium	1
K28	clutch shaft, short	stainless steel	1
K29	cover plate	aluminium	1
K30	engine adaptor plate	strong aluminium	1

pre assembled sub systems:

sub system 1 (B1): K1 with 2 ball bearings K2

sub system 2 (B2): K4 with pressed in shaft seal ring K3

sub system 5 (B5): sub system **B4** with assembled K14, K15 & K16

sub system 4 (B4): K7 with installed **B3**, K2 (1x) and K10

sub system 3 (B3): K28 with K8 & K9 and pressed on gear wheel K17

sub system 6 (B6): K18 with pressed on K17

Before you can start with the assembly, you should have further parts, see above (assembly of variant 1)

Shipped condition

See above at variant 1, it's nearly the same

The assembly processes:

because we know, that nearly no boat modeller enthusiast owns a small torque wrench we don't give torque data. We think that a serious modeller has a lot of experience how to fix screws and bolts, especially small ones.

Chapter 1: see above

Chapter 2: see above

Chapter 3: see above

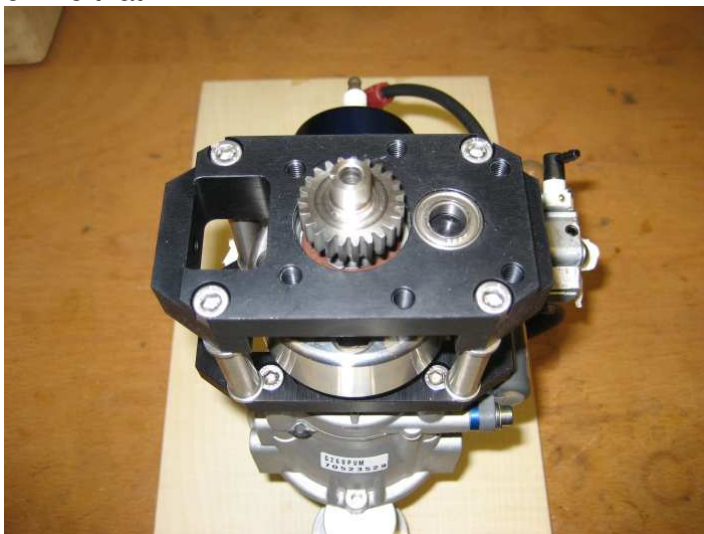
Chapter 4: position of output

This is the latest point to decide on which side the output shaft should come out of the CGU.

like this



or like that

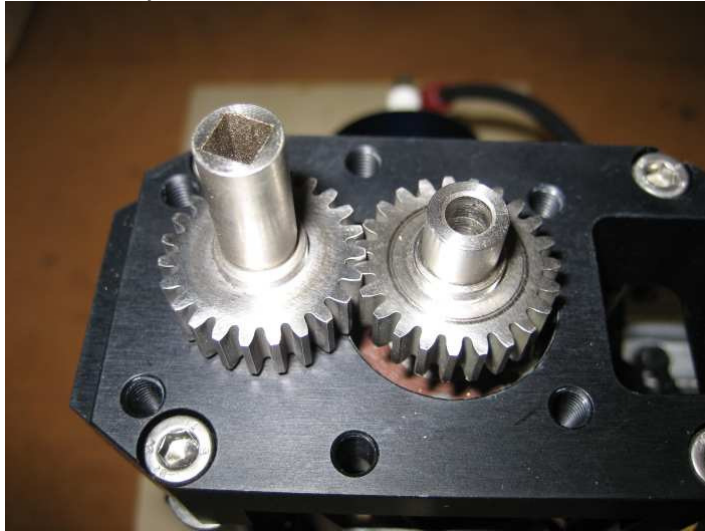


Chapter 5: gearset and housing

5.1.

Slide 4 bolts K12 thru the bores of K7, don't use LOCTITE for the threads at this moment. Then tighten these 4 bolts. Remember: use your experience for the tightening torque. Now check: is there any drag torque between clutch shoes and bell? If yes: disassemble K7 and put 1 washer under each distance tube K11, then try again. If ok: disassemble again and apply a bit LOCTITE onto the threads of the screws.

Now sub system B6 will be installed



For the next step a preparation would be helpful: put a drop LOCTITE to the threads of the remaining 6 bolts K6 and stand them with their heads onto your work bench.

5.2.

For the next step you should do a preparation: put a drop LOCTITE to the threads of the remaining 6 bolts K6 and stand them with their heads onto your work bench.

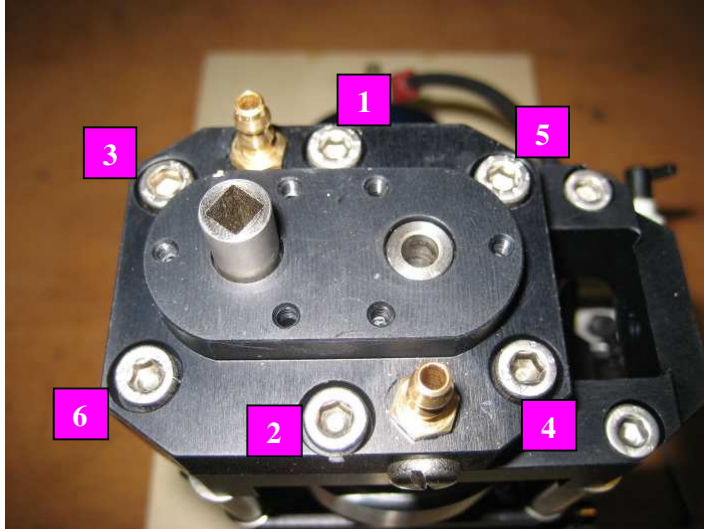
Then inject a small sealing bead of liquid seal onto the flange surface of K1 (B1) as shown below:



The sealing bead shown on this pic is border line thick, that means: do not apply more liquid sealing as shown.

Don't use a paper seal or s.th. like that, this will lead to leakage for sure

Now B1: put on B1 by moving it a bit, don't use a hammer or something like that and put in the 6 bolts K6. Tighten crosswise as shown below



Chapter 6: leading guide tube and cover

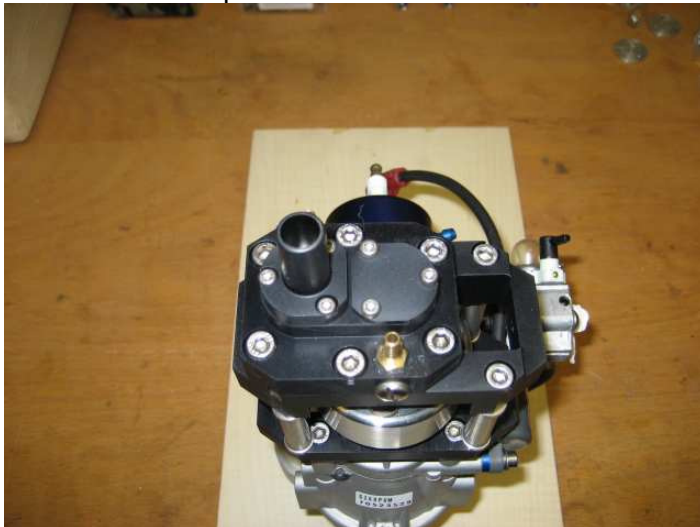
Last Step is the assembly of the sub system B2.

First put a bit grease onto the seal ring, don't work with a hard tool not to damage the seal lip.



Now slide the leading guide B2 by turning onto the output shaft, you may use a bit oil onto the shafts. Rotate the guide when sliding it onto the shaft. Fix it with 3 bolts K5. Don't use LOCTITE here.

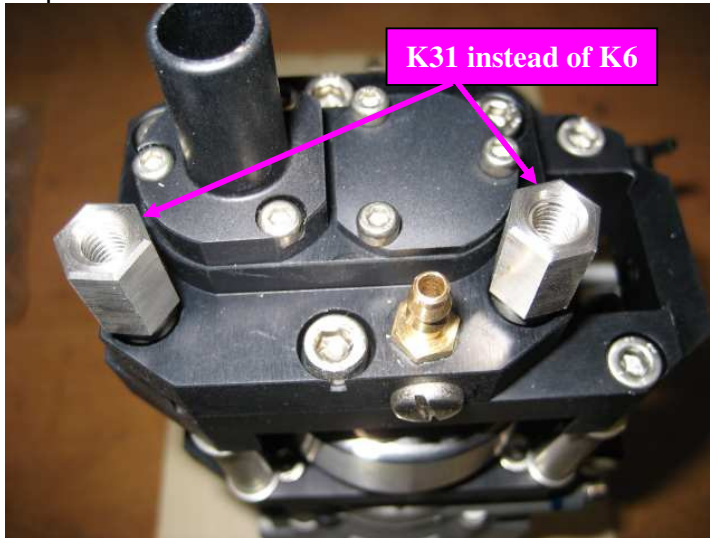
Install the cover plate K29 also.



By turning the clutch bell now you'll find out that the turning torque is a bit higher than without these leading guide. This depends on the friction of the shaft sealing. After approx. 1 hour or running this drag torque will go down.

Chapter 7: stainless steel bolts

To fix the whole unit (engine & CGU) into the boat you can use the threaded M6 bores on the side (rubber mounts). On special request (additional costs) you can buy 2 special stainless steel bolts K31. These K31 were set instead of 2 K6.



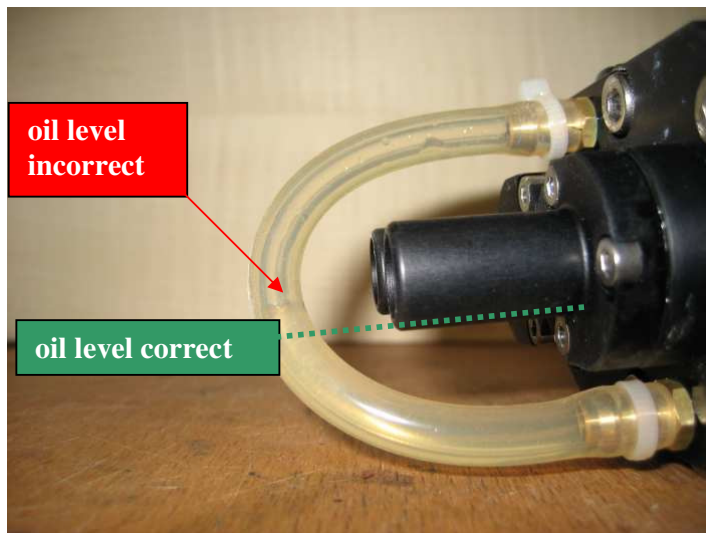
These K31 have M6 bores and will fit to the well known M6 rubber mounts. Could be helpful to save sideways room, useful for catamarans. The mass production rubber mounts of the new ChungYangs don't fit because these have a M5 thread! Maybe you have to shorten the thread of the rubber mounts a bit. And don't forget LOCTITE.



Chapter 8: oil content

Don't forget the lubrication also. Put the silicon tube K20 onto the below nipple and fix it with a cable strap K21. Then take the syringe and fill it with 0.122 cubic inch (or 2ml) gear box oil and press the oil thru the tube into the gearbox. Then put the silicon tube onto the nipple above.

Install the whole unit (engine plus CGU) into your boat and check the oil level. This level must be as shown below. If correct: you could use a cable strap also.



Very important: please check oil level after each run, especially if the run had last moren than 15 minutes.

The carb linkage of the ChungYang is different to the Zenoah, here is a howto prepare:

(could be helpful for Zenoah applications also)

First disassemble all plates, bolts, linkage-parts and rubber mounts at the output side which came with the ChungYang. You need all parts of the original linkage again.

Take a piece of M3 threaded rod (length: 32mm or 1.26inch) made of brass or stainless steel and bend it how the pic shows.

Cut a piece of heat shrink tube (length: 22mm or 0.866inch)



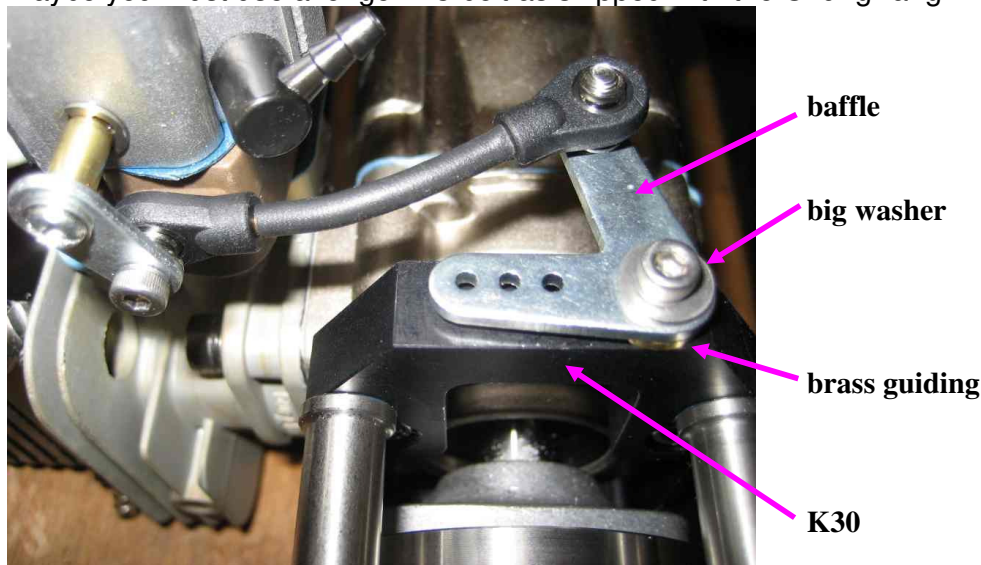
Put the shrink tube onto the threaded rod (in the middle) and heat it.

Then pre-assemble the unit as shown below, take the shorter of the small M3 bolts, use LOCTITE for the bolt's thread.



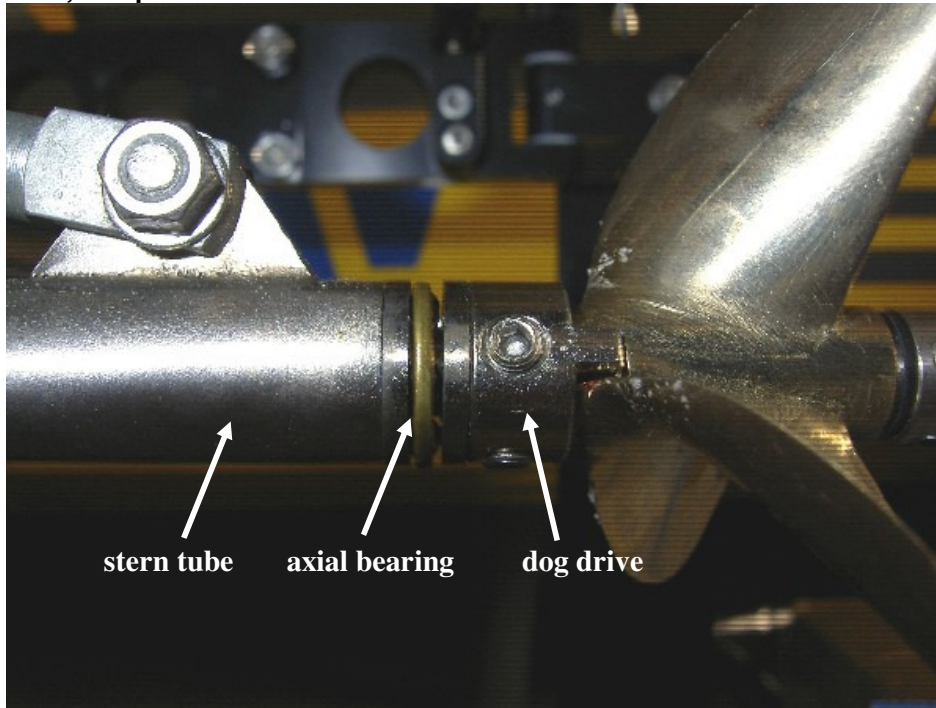
Take this pre-assembled linkage and fix this first to the carb's lever by using the shorter one of the remaining M3-bolts and LOCTITE onto the thread. Then take 1 big washer and slide it under the head of the remaining longer M3 bolt. Take the small brass guiding, slide it from the rear side thru the baffle, slide the M3 bolt with the washer thru it and fix it to the M3-bore of the engine adaptor plate K30. And don't forget LOCTITE.

You may use 1 or 2 washers between the brass guiding and K30, this depends on your favourite linkage to your servo. Depending on the thickness of the washers: maybe you must use a longer M3 bolt as shipped with the ChungYang.



Additional important informations:

1. If the customer does not follow this manual or if the customer makes changes to the parts: This leads to a lost warranty claim! All items listed below have to be considered.
2. You are not allowed to use a paper gasket instead of the described liquid sealing, see assamblemanual
3. The output shafts have squared inner bores which fit to the squared ends of all known flex cables with diameters of 1/4" (or 6.35mm).
4. **The CGU can not handle axial forces coming from the props thru the cables to the output shafts.** So you need axial bearings between dog drive and stern tube, see pic:



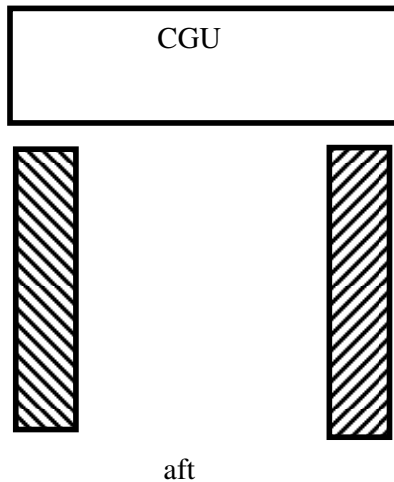
This axial bearing must not be a ball bearing as shown on the pic, it could be a washer bearing with Teflon (PTFE) or PEEK washers as well. And the length of the flex cable is important, too: it must be 1...2mm shorter than measured, to insure, that the squared end of the flex cable does not come to axial contact to the output shaft's bore-end. **If you don't make this with extremely accuracy, the bearings will be damaged very soon.**

5. Please check the oil level after each heat, especially if the heat was longer than 15 minutes. Do it with the correct method: disassemble the tube from the upper fitting and put this end onto the hull's bottom. There must oil drain. If not: no more oil in the box. Ensure the correct level: too low means: damage of speed gears and bearings, too much oil will lead to damaged parts also due to overheating.
6. After the first hour of running: please make an oil change to fresh oil. After the next 5 hrs an additional oil change should be done. And so on.

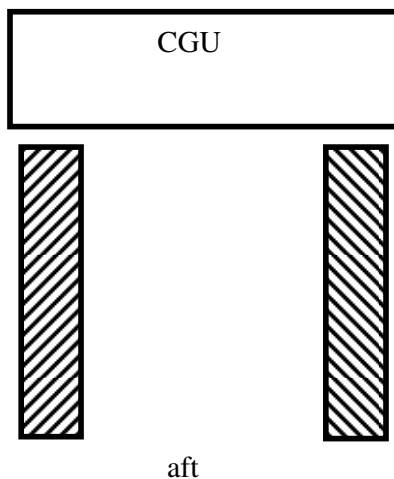
7. If your boat flips or is sunk (the engine compartment is full of water) it's for sure that water is inside of the gearbox. This will cause rust issues for the bearings and the gears. Ho to avoid such kind of problems: disassemble the tube and let the water-oil mixture drain. Then blast WD40 or CARAMBA or similar into the upper nipple until it comes out of the nipple below. Then let the WD40 or similar drain. You may accelerating this draining procedure by using pressed air into the upper nipple. Then install the tube again and don't forget fresh oil.

8. winding direction of flex cables, top view

7.1 outside rotating props (prop on right side rotates clockwise seen to the aft, see page 1):



7.2 inside rotating props (prop on right side rotates counter clockwise seen to the aft):



HAVE a lot of FUN!!!!