ROTARY SLOPE MOWER

Dvořák®
MACHINE DIVISION

SERVICE MANUAL
SPIDER ILD01 G

spider

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TECHNICAL SPECIFICATION

Parameter	Unit	Value
Length/width	mm	1300x1300
Height	mm	850
Mowing width	mm	800
Mowing blade height	mm	60 - 110; 30 - 80
Weight	kg	245
Driving speed L/H	km/h	0 – 3, 0 - 7
Mowing mechanism	-	Single - blade with a fixed blade attached by flange in the middle
Mowing clutch	-	Electromagnetic with friction clutch and brake
Hydraulic drive		Hydro Gear BDP 21L
Hydraulic motor	-	Sauer Danfoss OMP 40
Propelled wheels	-	4 x 4
Travel wheels	palce	16 x 6,5 - 8 with an arrow (V) tread pattern
Accumulator		12 V, 18 Ah, gel-based
Fuel	-	Unleaded gasoline
Fuel tank capacity	l	12
Winch - rope length	m	33
Rope pulling force	N	2000
Engine		Air-cooled four-stroke two-cylinder engine Kawasaki FS541V
Cylinder volume	cm^3	603
Performance	HP/min-1	18/3600
Torque	N . m/min-1	46/2200
Ignition		Electronic
Starter		Electric
Control unit radio frequency NBB for EU a USA	MHz	433.100 - 434.750

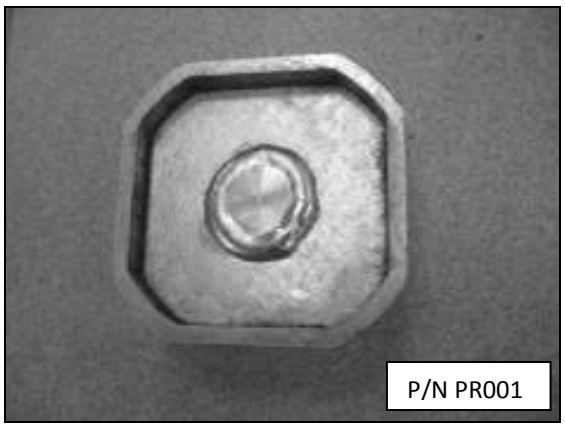
1 Special service tools

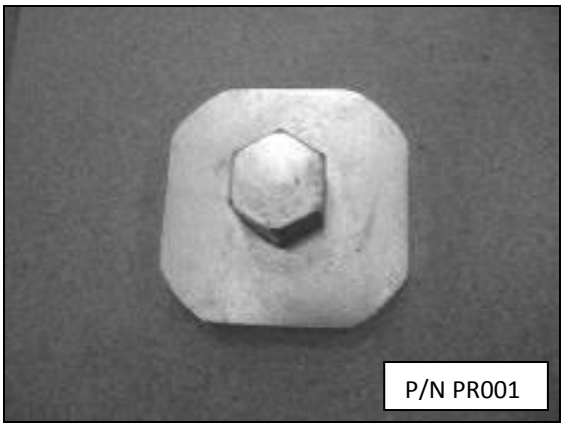
Chunk for lifted mower (150 x 130 x 80) – 2 or 4 pieces

Straight lath for adjustment of wheel geometry (length 1300 mm)

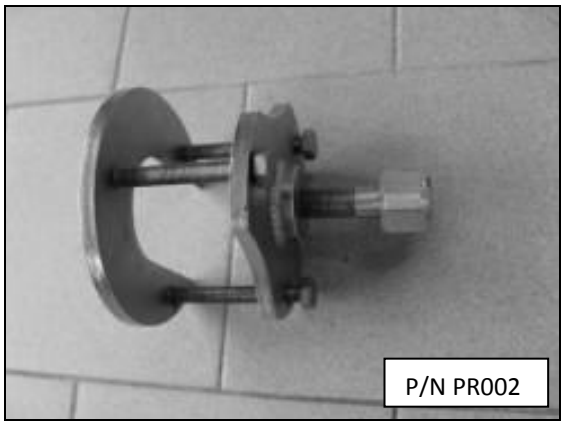
Engine oil filter loosen jig

Hydraulic oil filter loosen spanner

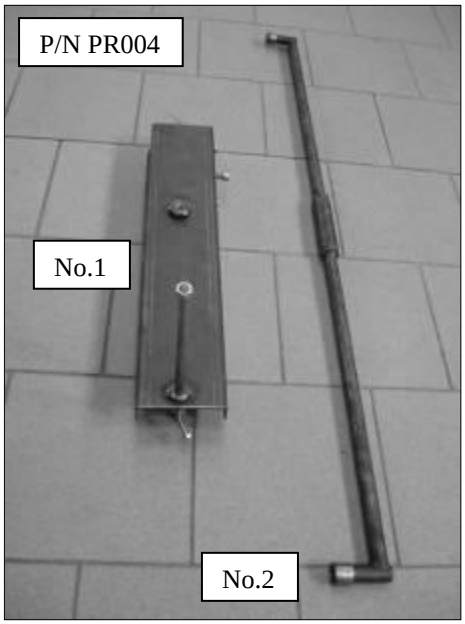




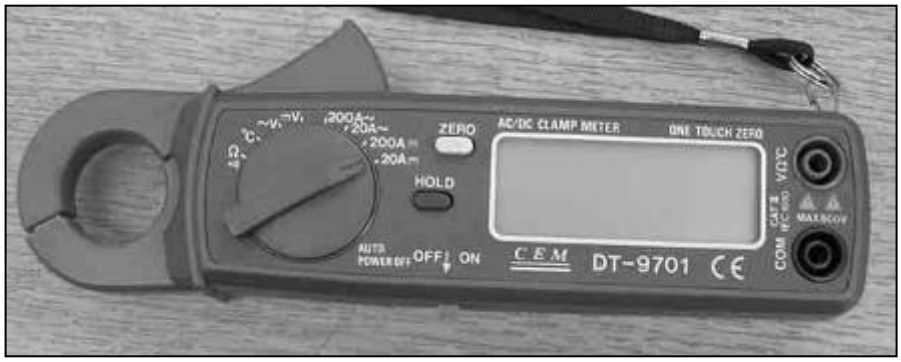
Wheel hub puller



Geometry adjustment tools



Ampere meter: CEM DT – 9701



Voltmeter: Ben electronic DT - 830 D+

2 Troubleshooting

Problem	Possible cause	Correction
Nothing appears on the display when the RC is turned on	RC battery is exhausted	Replace the battery with a charger one Charge the battery
	Insufficiently connected switch	Switch on RC properly
Engine does not start	Accumulator is discharged	Charge the battery Check the fuse
	Accumulator is disconnected	Attach terminal connectors to the battery
	Cable lines are broken	Check/replace the cables lines Check the fuse
	Spark plug does not spark	Clean the spark plug and contacts
	Fuel filter is clogged	Change it
	Not enough fuel	Refuel
	Not enough oil in engine	Refill oil up to the required level
	No signal or the mower is out of the signal range	Check the aerial attachment/ move closer to the mower
	Emergency button on the mower is pressed	unlock the button
	Damaged hydraulic pump servomotor-neutral position	Change it
	Blade on the RC is switched on	Switch it off
	Broken driving belts are wrapped on the mowing device	Release/change them
	Faulty starter relay	Change it
	Burned fuses	Check them
	Wrong fuel	Use BA 95 only
The mower does not travel properly/at all	Not enough oil in the hydraulic circuit	refil oil and de-aerate properly
	Driving belts are broken	Change them
	Oil is overheated	Clean the fan area, wait till oil cools down
	Mechanic elements of the hydraulic drive are worn out	Change them
	Hydraulic pump filter is clogged	Change it
	By-pass is released	Tighten it
The mower canot climb slopes	V-belts are worn	Replace them
	V-belts are not tensioned enough	Tension them
	Damaged hydraulic pump servomotor	Change it
	By-pass is released	Tighten it
The mower vibrates when started	Blade carrier shaft is curved	Replace the shaft
	Blade is damaged	Replace the blade
	Blade is not attached properly	Change the blade bolts and tighten them properly
	Unevenly worn out or damaged blade	Replace it
	Damaged blade hub bearings	Change them
Bad mowing quality	Grass is overgrown, too high	Mow only grass which is maximum 3x taller that the pre-set stubble height. We recommend to mow the grass, let it dry and mow it again
	Worn/blunt cutting edge of the blade	Sharpen or replace the blade
	Grass is too wet	Wait till the grass dries
	Low engine speed	Set the engine to maximum
	Too high driving speed	Lower the driving speed

3 Basic technical specifications

Type	SPIDER ILD 01 G
Engine: Kawasaki FS 541V	
Oil	10W40 / API SG
Quantity	1,5 l
Spark plugs	NGK BPR4ES
Fuel	Unleaded petrol
Hydrostatic system:	
Oil	HV 68
Quantity	6,5 l
Electronic system:	
Accumulator	12V/18Ah FBTX20L
Fuses	5A /15A /15A /20A /20A
Tires:	
Type	16 x 6,50 - 8
Pressure	max. 250kPa / 36 PSI
Lubrication:	
Chains	INTERFLON FIN LUBE TF
Sliding surfaces	INTERFLON FIN LUBE TF

Wheel RPM/min

Wheel RPM/min - wheels off the ground, blades off				
SPIDER	**turtle**	**rabbit**	**engine RPM**	**hydr.oil temperature**
ILD01	25/min	51/min	2750 /min	70°C/158°F

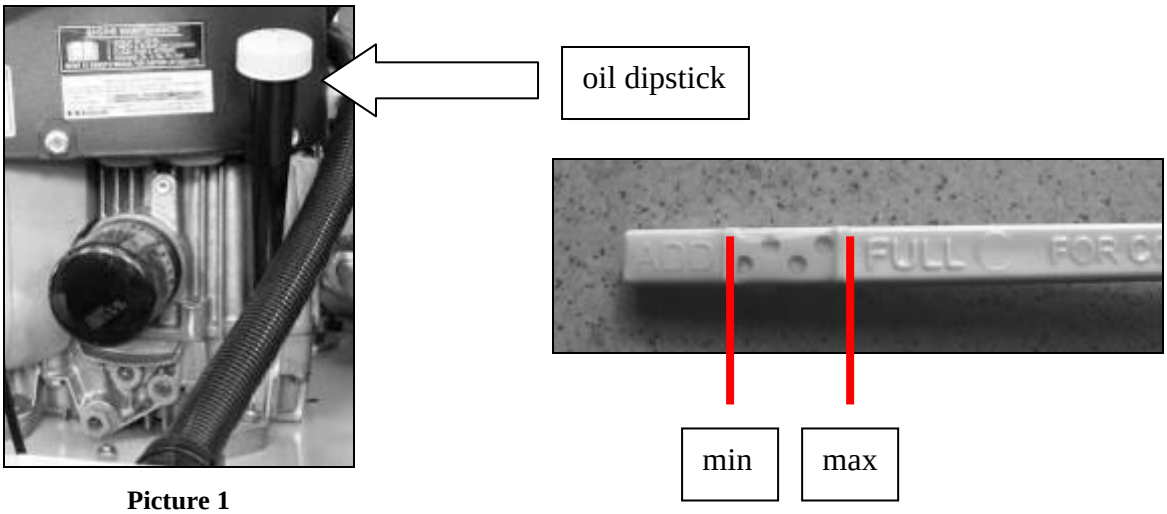
4 Regular maintenance SPIDER

WARNING

Always remove the spark plug caps from spark plugs when servicing the engine to prevent accidental starting

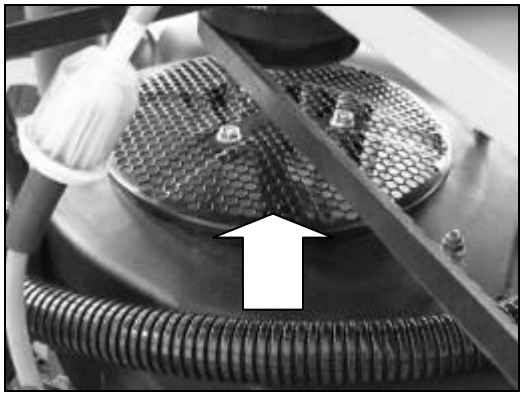
4.1 Daily:

a) Check the oil level in engine

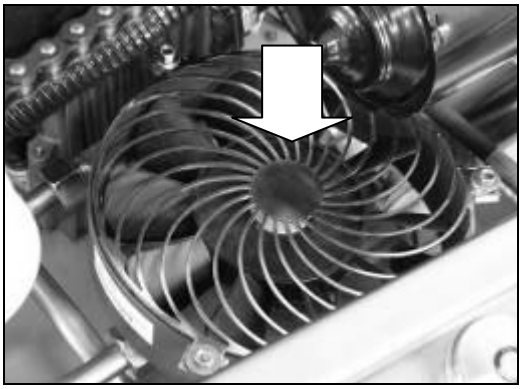


Picture 1

b) Clean the inlet of cooling air for the engine and pump

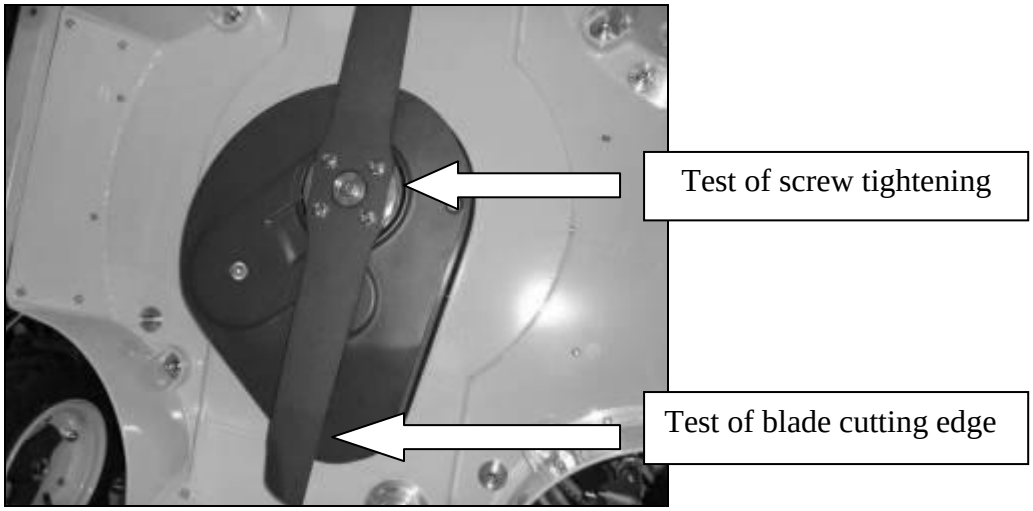


Picture 2



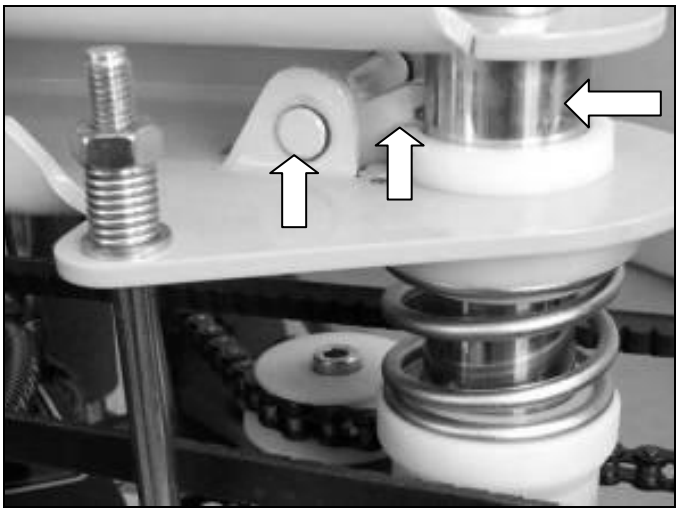
Picture 3

c) Check the blade mounting, sharpening and balance



Picture 4

d) Lubricate the teeth segment, guide bushing of the cross - Interflon FIN LUBE TF



Picture 5

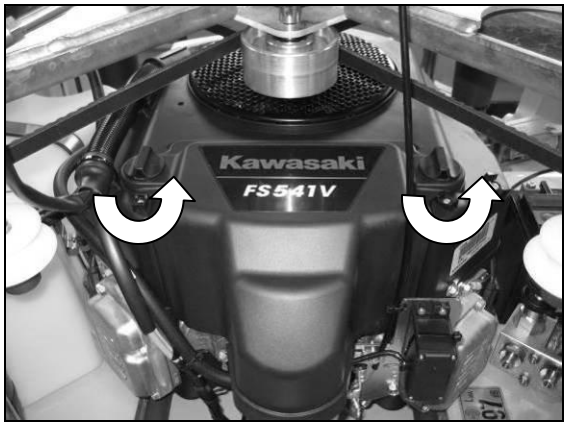
4.2 After first 8 hours:

a) Exchange engine oil

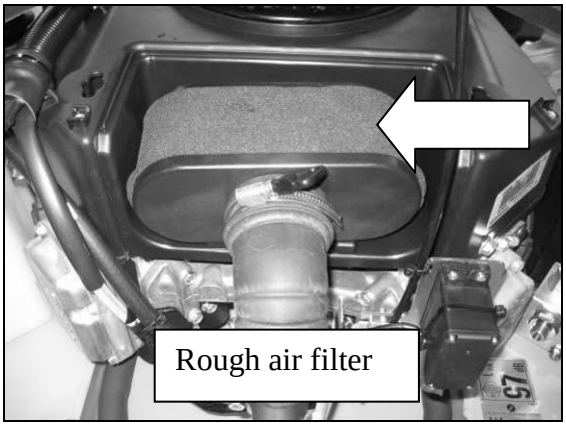
- see 6.2 Exchange of the engine oil filter

4.3 After 25 hours:

a) Clean the rough air filter



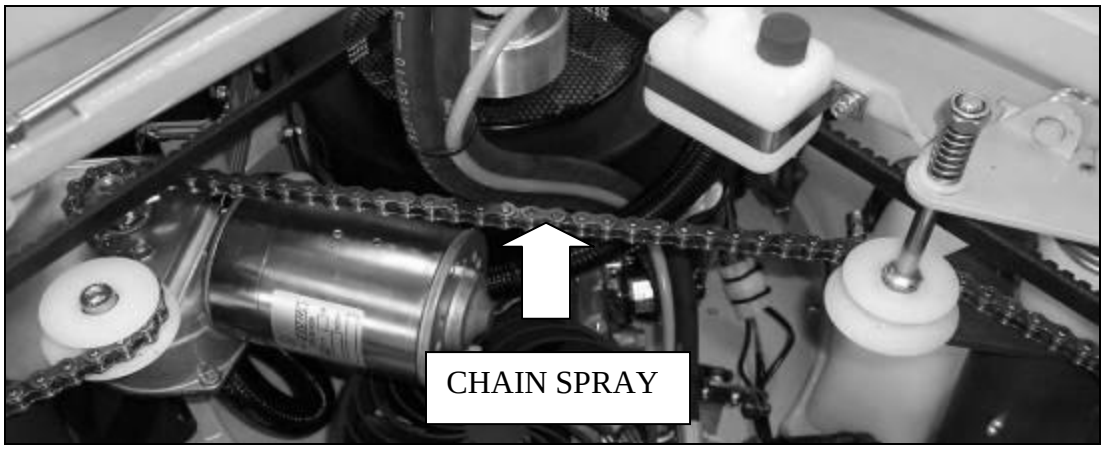
Picture 6



Picture 7

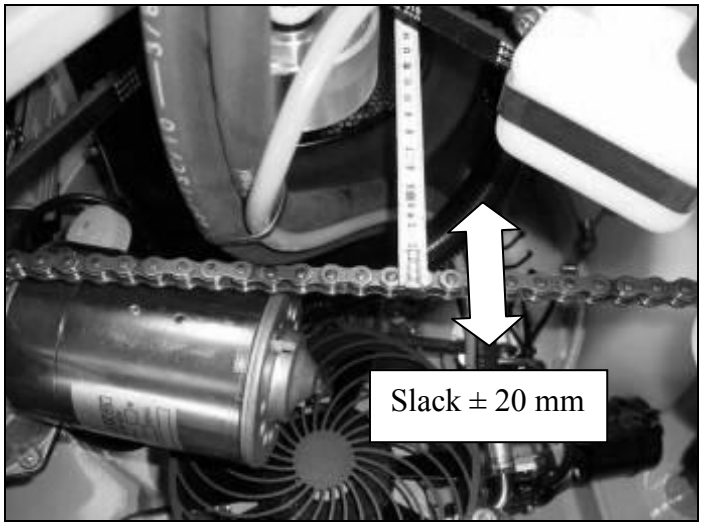
4.4 After 50 hours:

b) Lubricate the steering chain - spray Interflon FIN LUBE TF

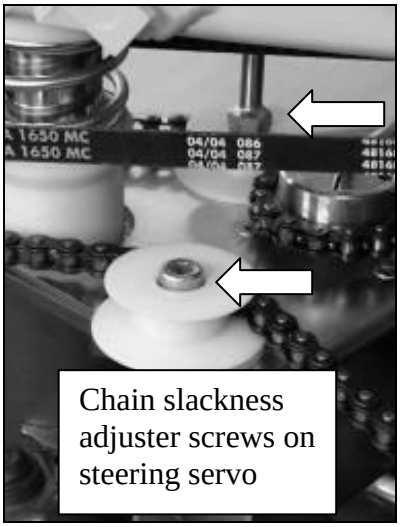


Picture 8

c) Tighten the steering chain



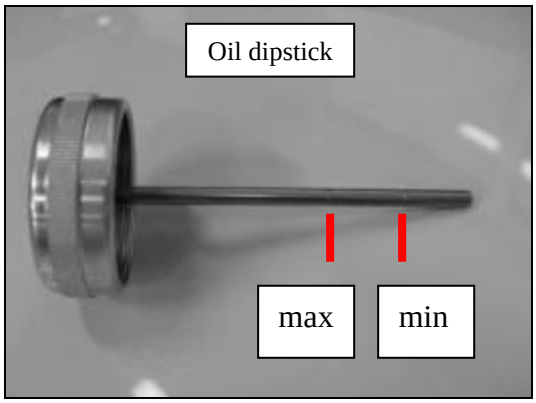
Picture 9



Picture 10

d) Check the hydraulic oil level – HV68

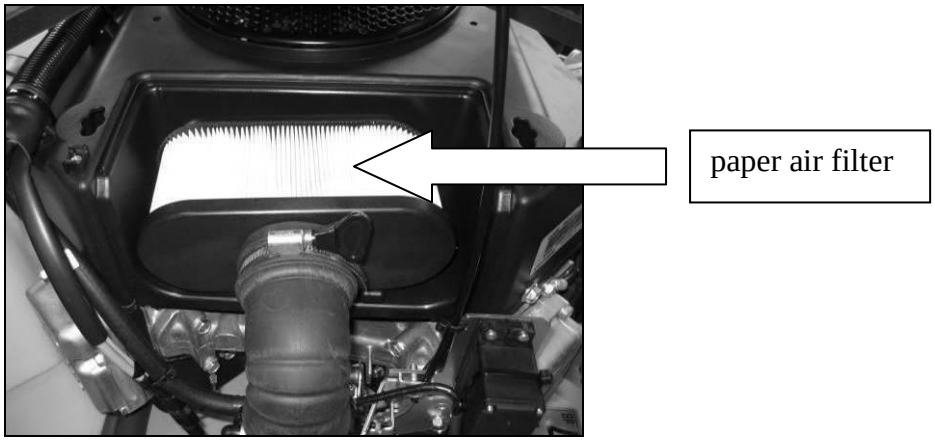
Picture 11



Picture 12

4.5 After 100 hours:

a) Clean the paper air filter



Picture 13

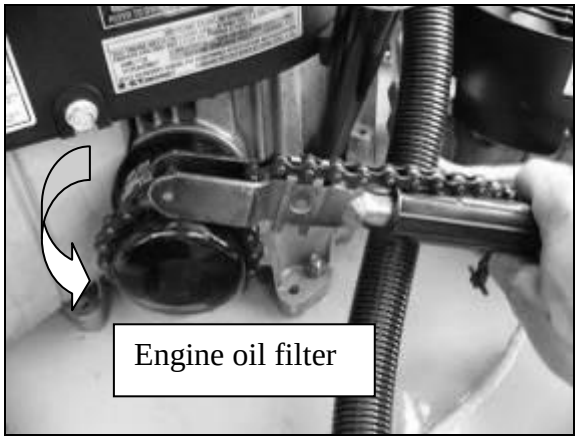
b) Exchange engine oil

c) Clean the spark plugs

d) Clean the cooling engine ribs

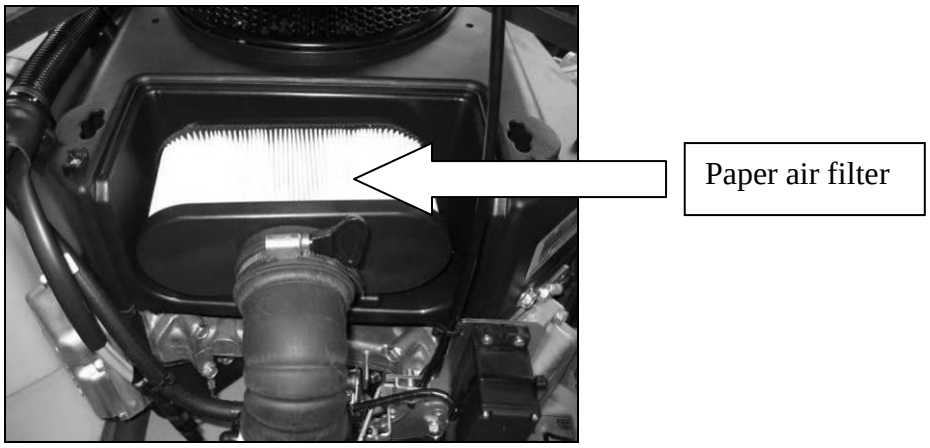
4.6 After 200 hours:

a) Exchange engine oil filter



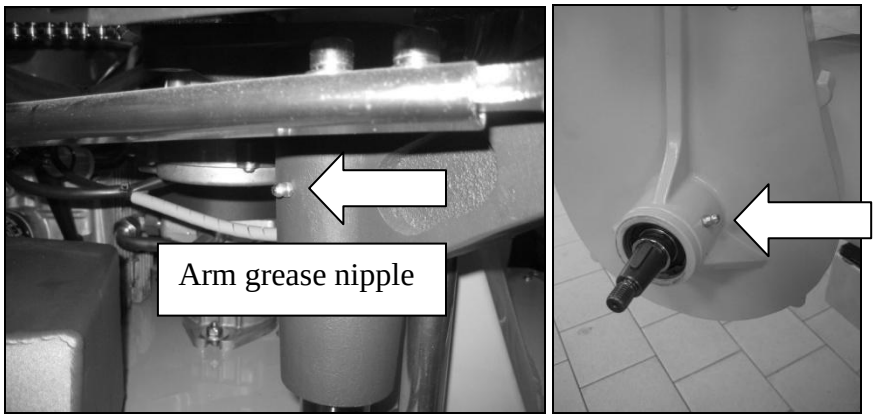
Picture 8

b) Exchange the paper air filter 2



Picture 9

c) Lubricate the wheel arms and wheel bearings Mobilgrease XHP/222



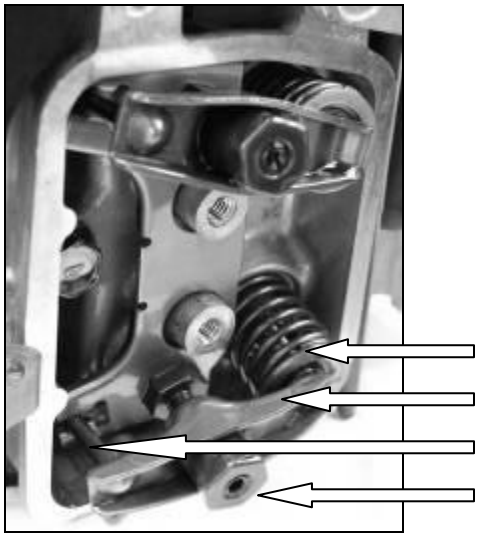
Picture 10

d) Check or refill oil inside angular gears – MOBILUX EP004

e) Lubricate wheel housing chains – Interflon Fin Lube TF

4.7 After 300 hours:

a) Adjust the valve clearance



valve clearance:
intake - 0,10 – 0,15 mm
exhaust - 0,10 – 0,15 mm

adjustment:
Turn the adjustment screw to adjust the clearance between the valve and arm (when the piston is in T.D.C)

valve
balance arm
lifting bar
adjustment screw

Picture 11

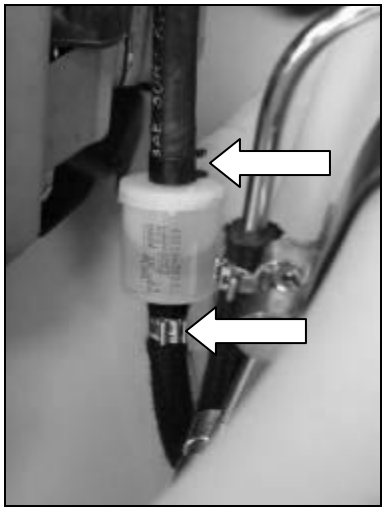
4.8 Seasonal period:

a) Change the spark plugs NGK BPR4ES

b) Change the hydraulic oil 6.3 Exchange the hydraulic oil filter

c) Change the engine oil 6.2 Exchange of the engine oil filter

d) Change the fuel filter



Picture 18

5 ENGINE MAINTENANCE CHART

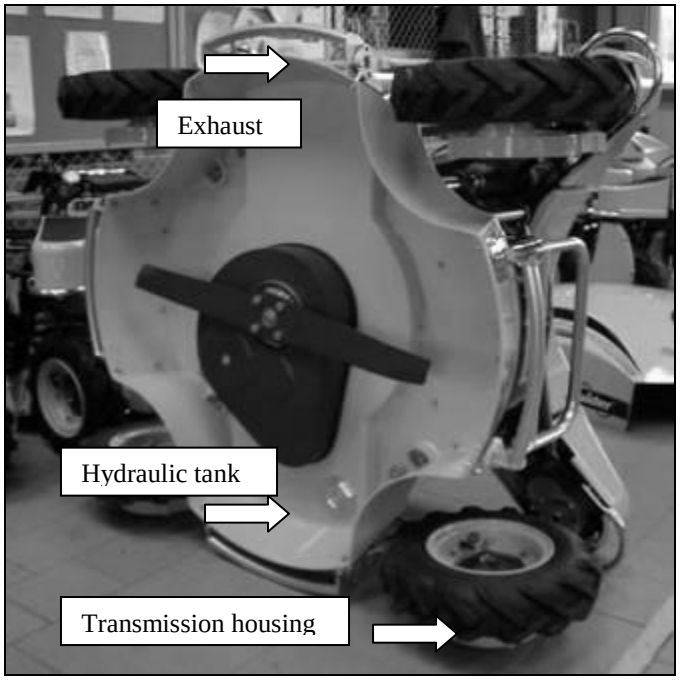
Engine maintenance chart: Kawasaki FS 541V						
Maintenance * = Perform more often in dusty conditions K =Performed by authorized Kawasaki service/dealer	**Period according to the operating hours counter**					
	Daily	**After first 8 hours**	**Every 25 hours**	**Every 100 hours**	**Every 200 hours**	**Every 300 hours**
Check and add engine oil	X					
Check for loose or lost nuts and screws	X					
Check for fuel and oil leakage	X					
Check or clear air intake screen	X					
* Clean air cleaner foam element			X			
* Clean air cleaner paper element				X		
* Clean dust and dirt from cylinder and cylinder head fins				X		
Tighten nuts and screws				X		
Change engine oil		X		X		
Clean and set spark plug				X		
Change oil filter					X	
* Replace air cleaner paper element					X	
K Clean combustion chamber						X
K Check and adjust valve clearance						X
K Clean and lap valve seating surface						X
_____	= Device check					
	= Element replacement					

6 Instruction Manual SPIDER

6.1 Tilt of the mower for the service maintenance

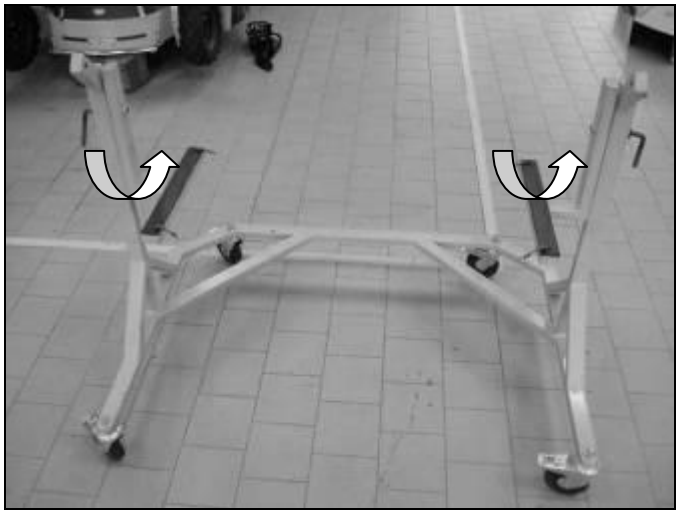
- Always remove spark plug caps and disconnect battery when servicing the machine to prevent accidental starting and possible injury

- Turn the wheel transmission housing in the direction to which you will be tilting the mower.
- Always tilt the mower exhaust up in order to prevent the oil from leaking to the air filter and carburetter.
- Only tilt the mower for the time necessary for maintenance.



Picture 19

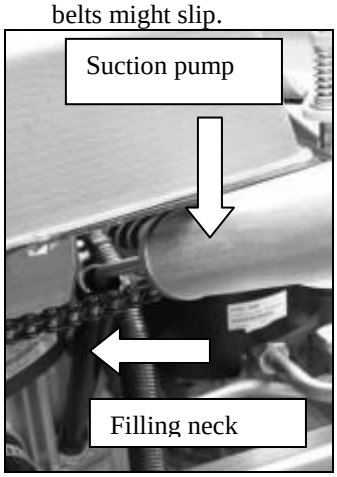
- Further possibility is to use a service stand for SPIDER ILD01



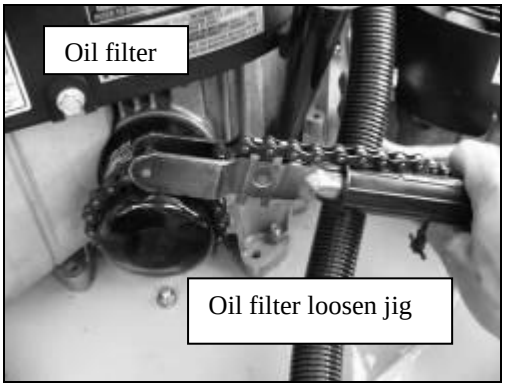
Picture 20

6.2 Exchange of the engine oil filter

- Clean thoroughly the area around oil filter and filling neck
- Suck out the oil from the crankcase through the filling neck (or discharge the oil with a discharge screw when the mower is tilted) ATTENTION! The oil must not get under the engine in the clutch space – the belts might slip.

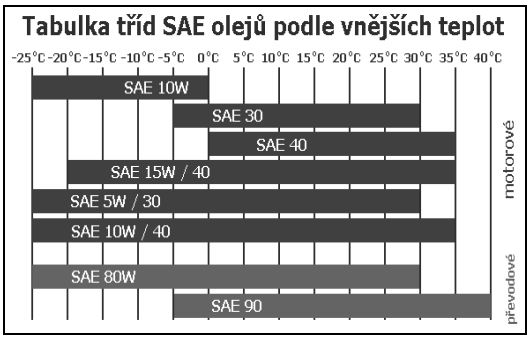


Picture 21

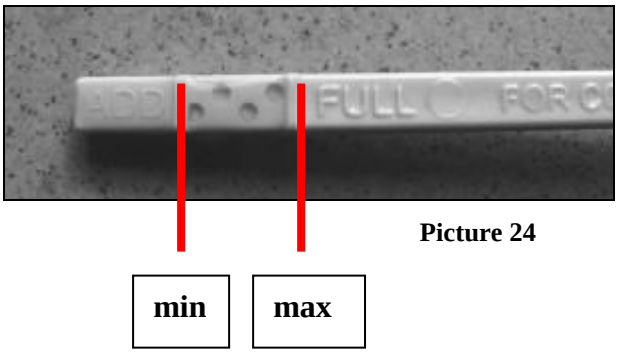


Picture 22

- Dismount and exchange oil filter (put some oil on the filter sealing during assembly)
- Fill up engine oil, approximately 1,5 l (1,7 l – when exchanging oil filter)



Picture 23



Picture 24

- Check the oil level with the dipstick (up to the upper dipstick line to increase the slope accessibility)
- Recommended engine oil: SAE 10W40

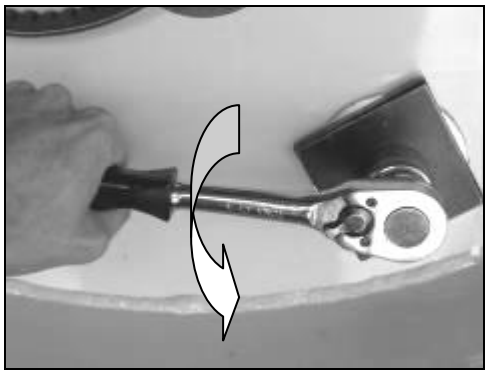
The producer recommends the following oil brands:

- Per API classification: SF, SG, SH, SJ
- Per viscosity, see table 1
- Oil consumption increases in case of multistage king of oil (5W-20, 10W-30, **10W-40**). In such a case, check the oil level more frequently.

6.3 Exchange the hydraulic oil filter

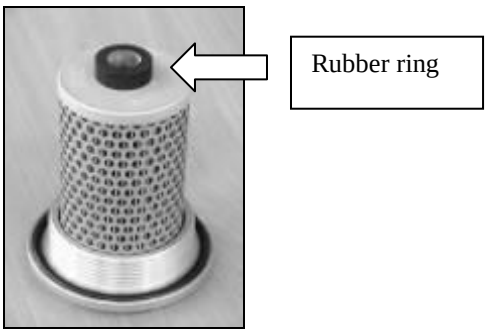
- Suck out the oil through the filling neck from the hydraulic tank
- Lean the mower on side of the hydraulic tank
- Clean thoroughly lower part of the mower. (ATTENTION, dirt must not get in the hydraulic tank!)
- Loosen the hydraulic filter lid (Spanner 63mm)

Picture 25

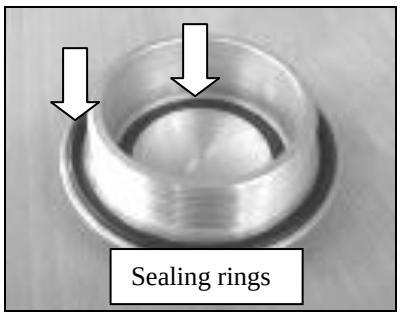


Picture 26

- Remove and exchange the filter - MANN FILTER H 601/4 (MIND correct position of the sealing rings!)
- Lubricate the rings slightly with some oil, so that they can seal tight



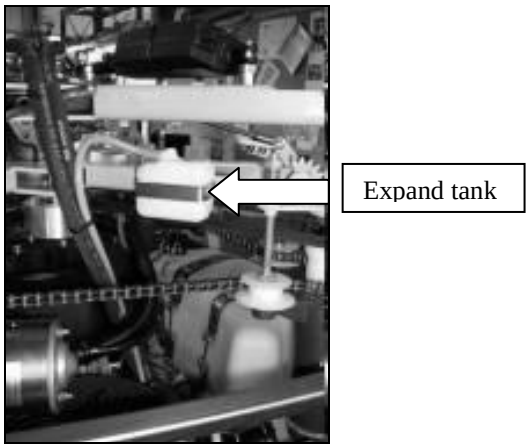
Picture 27



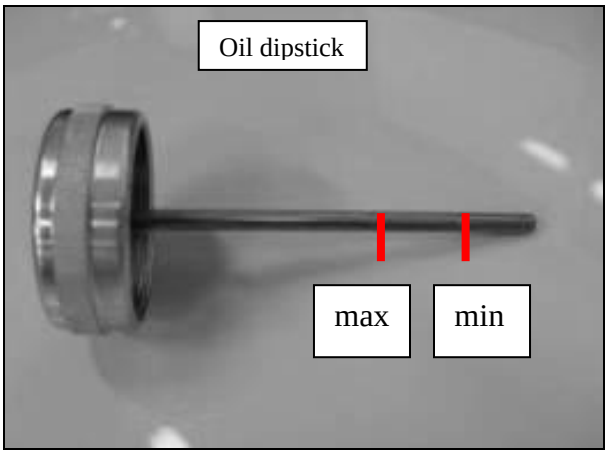
Picture 28

- Fill up the hydraulic oil HV68 (approximately 6,5 l)
- Start the motor a move forward and backward to get rid of air in the hydraulic system (the wheels must move smoothly)
- Fill up the oil so that the level falls between the dipstick lines
- Drive to warm up the oil to operating temperature and check tightness of the oil filter lid and tank cap
- If oil gets in the expand tank, suck it out

!!!ATTENTION!!!When the hydraulic oil is warm, its level gets up to the hydraulic tank filling neck!
Fill the oil up the dipstick line only when it is cold!



Picture 29

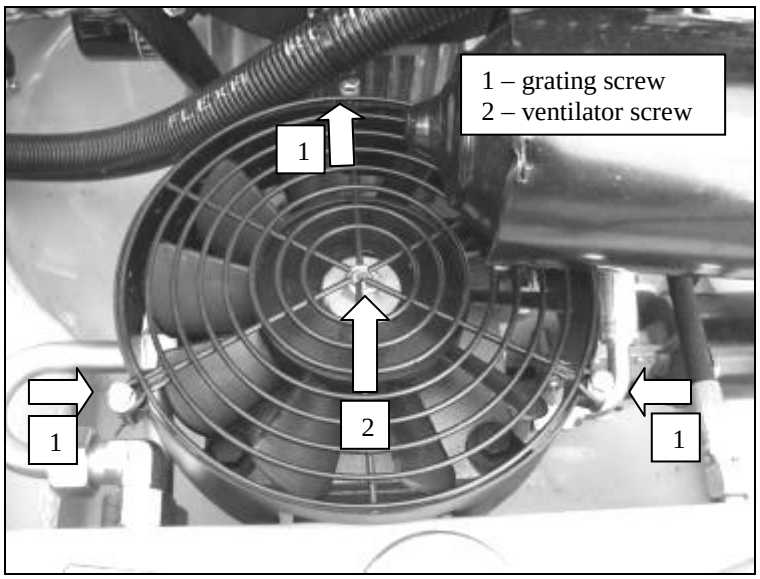


Picture 30

6.4 Exchange of the hydraulic pump

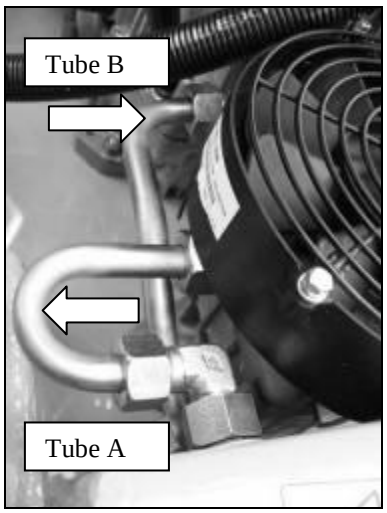
- Suck out oil from the hydraulic tank

Dismount:
- Stabilizer on the left side for better access to the pump
- Remove the ventilator grating
- Ventilator
- Ventilator cover (3 screws of the pump head)
-

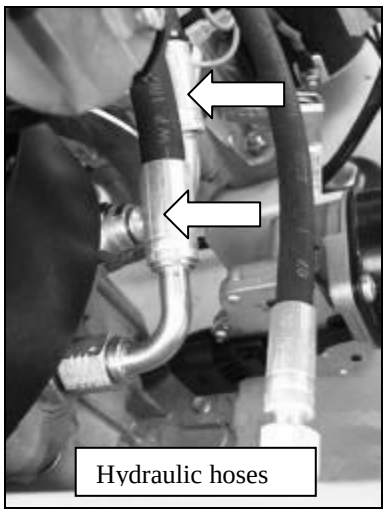


Picture 31

- Tighten the screws back in the pump head
- Hydraulic tube A - short (nuts 2 and 3 simultaneously, then 4) (Picture 32, 35)
- Hydraulic tube B - long (loosen nut 5, then simultaneously 6 and 7) (Picture 32, 35)
- Hydraulic hoses
- ATTENTION: The oil must not get in the case and clutch!
- Operating rod of the pump

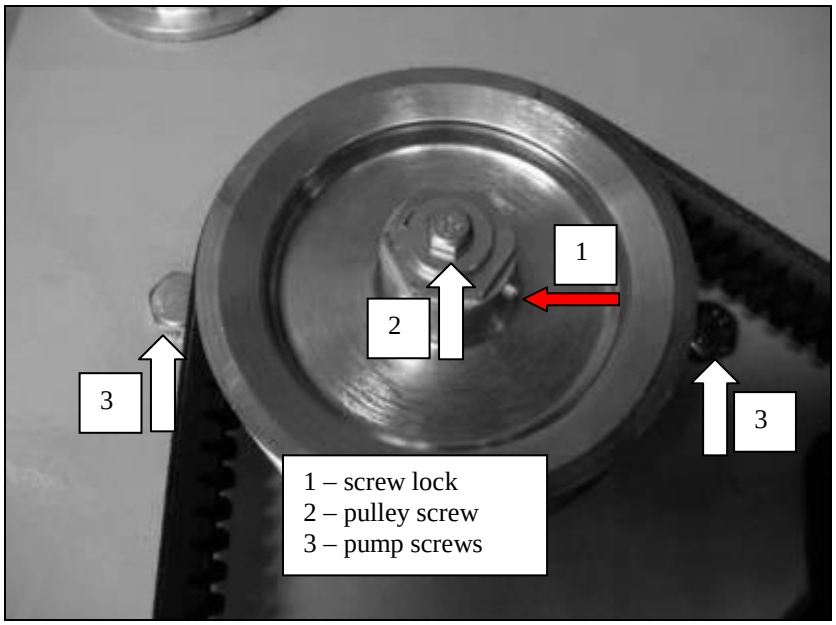


Picture 32



Picture 33

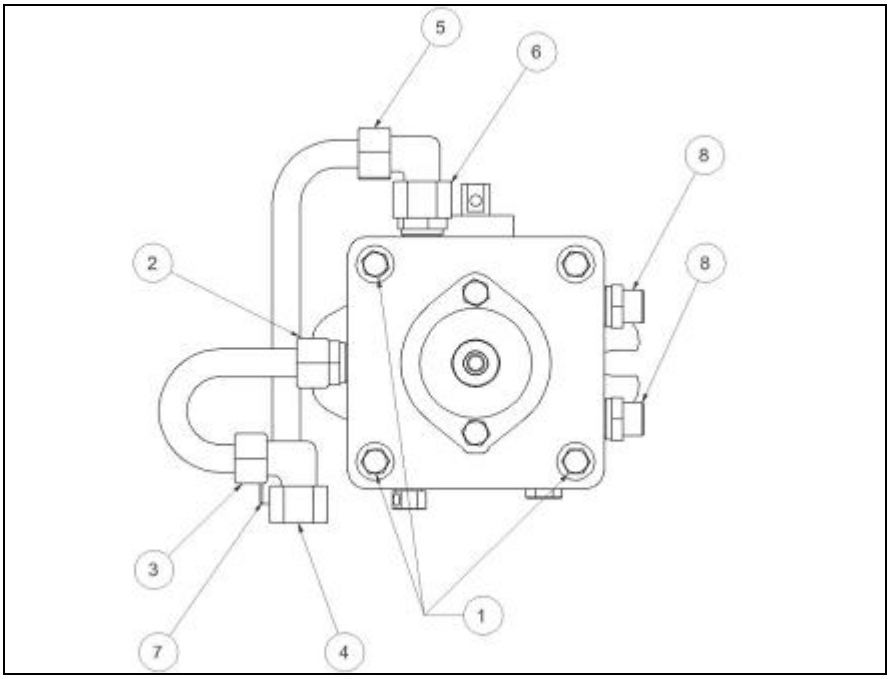
Underneath of the mower:
- Belts from the pump pulley
- Pump pulley (ATTENTION! There is a screw lock on pulley side!)
- Hydraulic pump



Picture 34

Mounting: (Take the above steps in reverse order)
- Glue the screw on the pump shaft (LOCTITE 243)
- Seal the contact surface of the pump and screw heads with silicone sealing

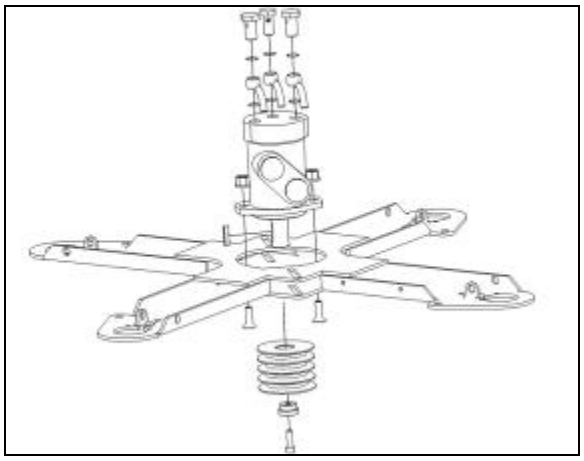
Note.
- After exchanging the pump, you need to fill up about 0,5 l of hydraulic oil more.
- After start, slowly increase the driving speed (air in the system – high noise of hydraulic system for about 1 minute)



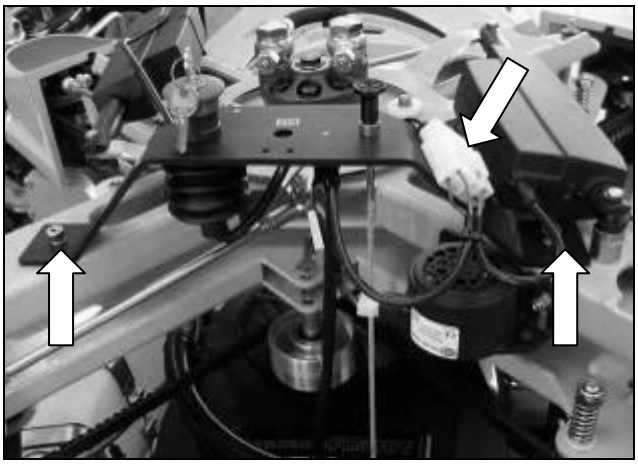
Picture 35

6.5 Exchange of the hydraulic motor

Dismount:
- Hydraulic motor hoses (ATTENTION! The oil must not get on the V-belts!)
- Expand tank
- Control unit
- Dismount the console with control elements from the beam and disconnect the plug of electric motor
- Dismount the beam and cross - see 6.16 Exchange of the driving belts SPA1650L
- Dismount the pulley and hydraulic motor from the cross (Picture 36)

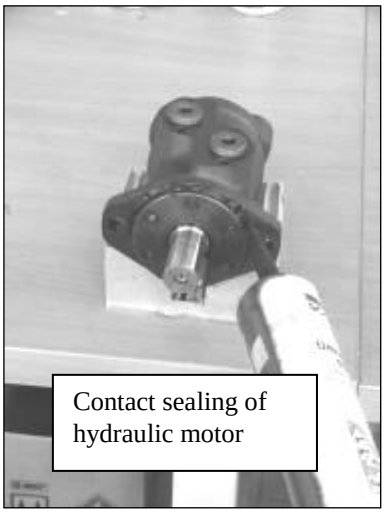


Picture 36

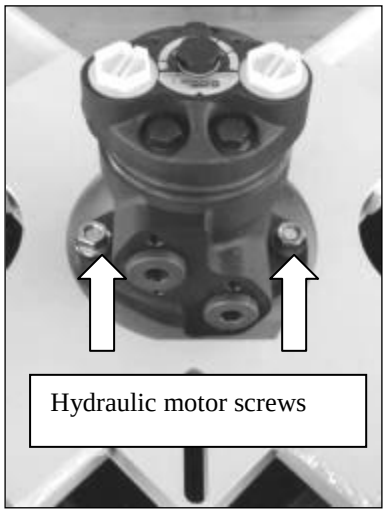


Picture 37

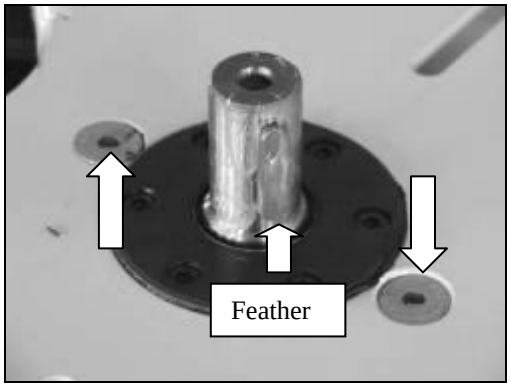
Mounting: (Take the above steps in reverse order)
- Seal the hydraulic motor and screws with silicone sealing
- Glue the screw on the pulley shaft (LOCTITE 243)
- Tighten the screws of hydraulic motor pressure hoses to 95 Nm
- MIND the correct position of sealing rings!
- After start, slowly increase the driving speed (air in the system – high noise of hydraulic system for about
- 1 minute)



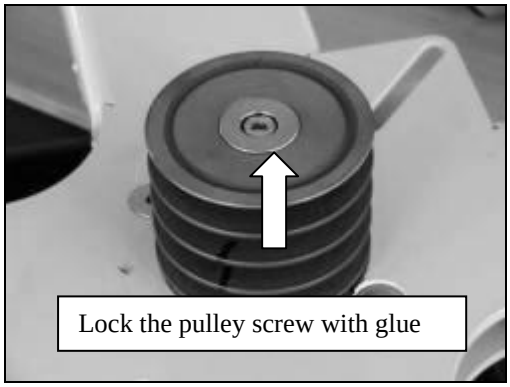
Picture 38



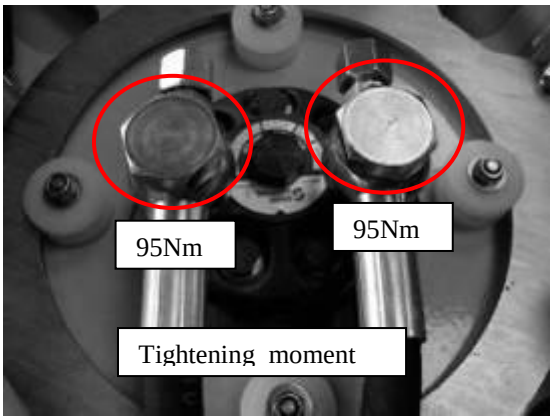
Picture 39



Picture 40



Picture 41



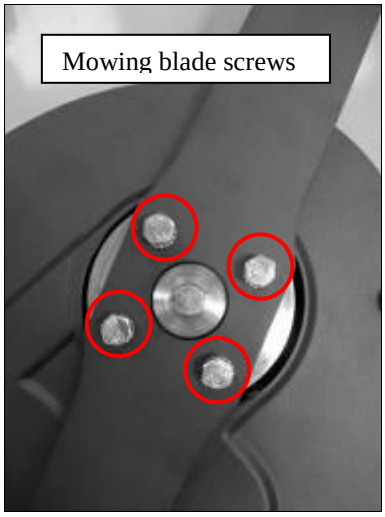
Picture 42

6.6 Exchange of the blade driving belt

- Lift the mower and tilt it to the side of hydraulic tank!

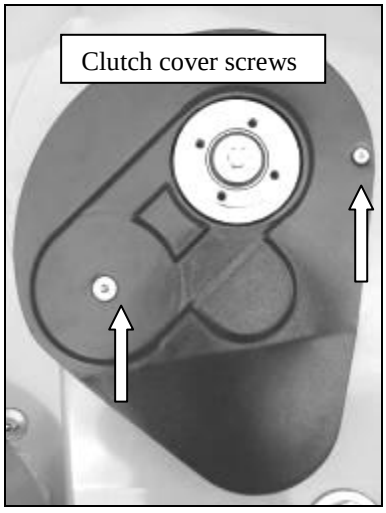
Dismount:

- Mowing blade and clutch cover (Picture 43, 44)



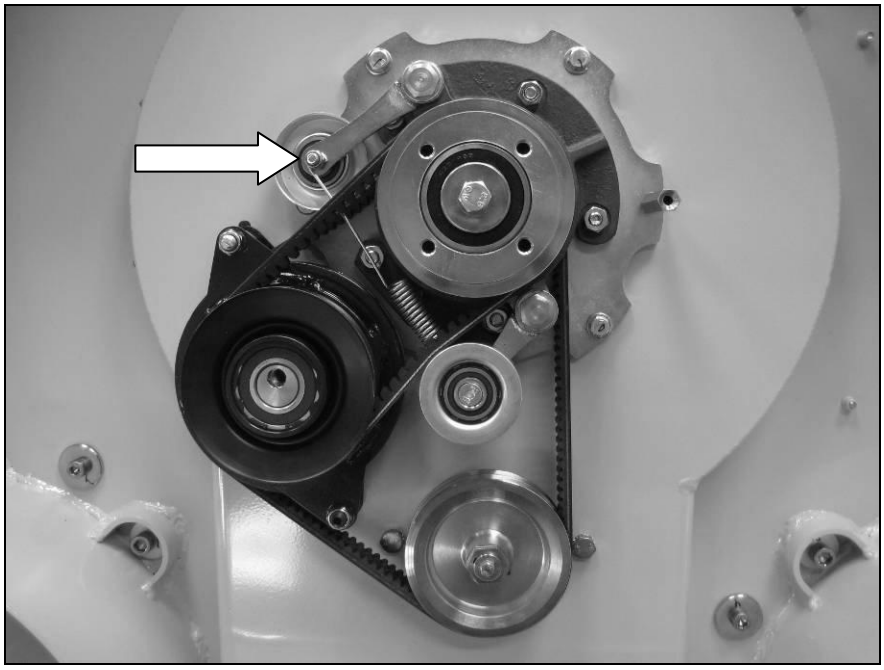
Picture 43

Picture 44

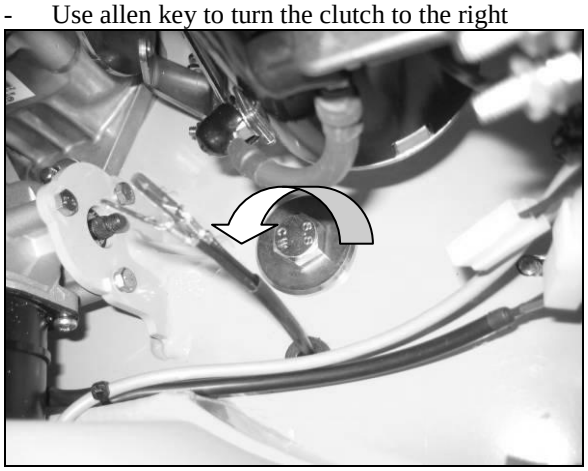


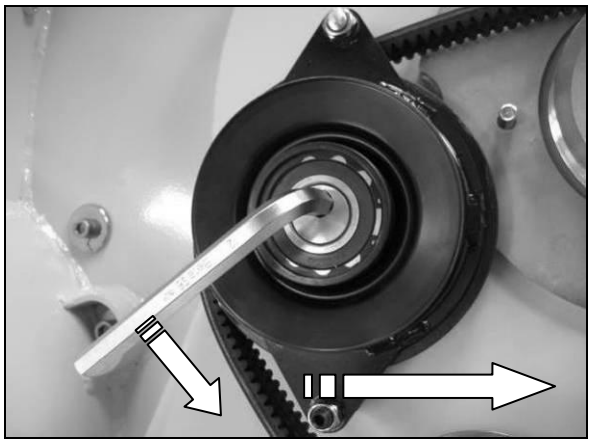
Picture 45

- Loosen a securing nut of the spring and loosen the belt slack adjuster



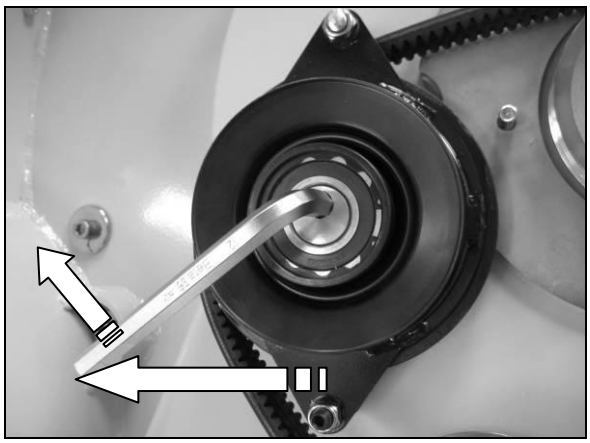
- Loosen securing bolt holding the clutch
- Use allen key to turn the clutch to the right

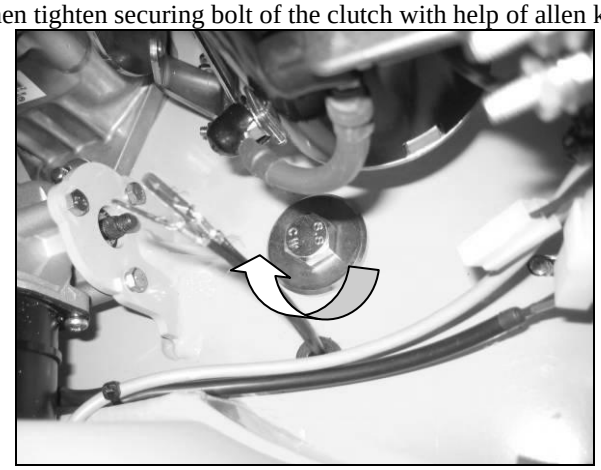




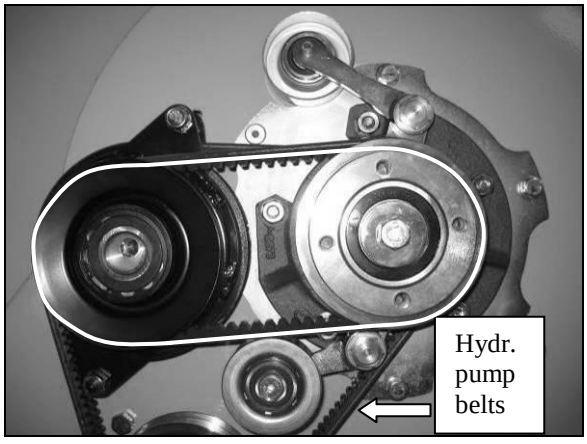
- Remove the belt (Picture 46)

Mounting: (Take the above steps in reverse order)
- Install V-belt Optibelt SUPER TX BX28 x 17 750Lp (Picture 46)
- Turn the clutch to the left to tension all the belts. Then tighten securing bolt of the clutch with help of allen key

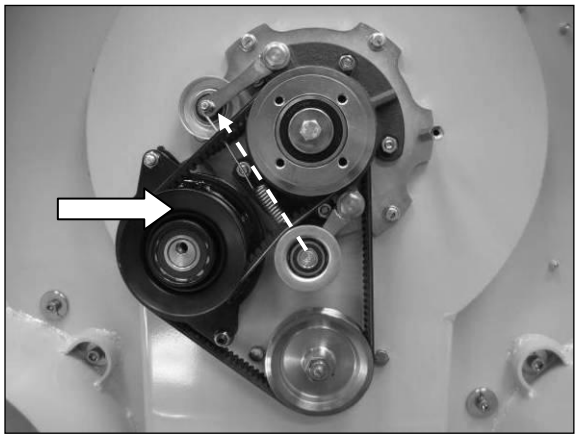




- Install tensioning spring back (Picture 47)
- Don´t tighten self-securing nut – there must be gap between the spring and the nut min. 2mm
- Install clutch cover and blade – LOCTITE the bolts



Picture 46



Picture 47

6.7 Exchange of the bracket hub of the blade

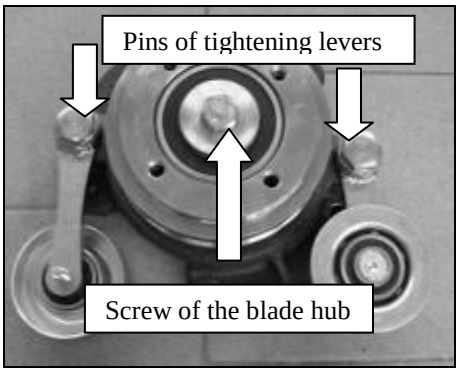
- Lift the mower or tilt it to the side of hydraulic tank!

Dismount:

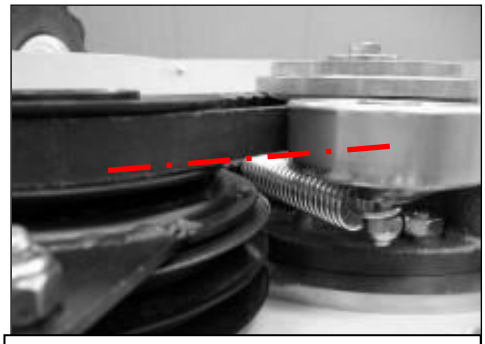
- see 6.6 Exchange of the blade driving belt
- Console of the blade hub including the tensioning levers
- Tensioning levers with a roller
- Securing screw of the blade hub
- Pull out the blade hub

Mounting:

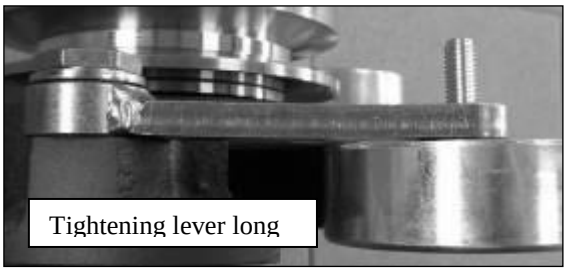
- When exchanging the blade hub bearings, glue the bearings (LOCTITE 638)
- Press in the blade hub
- Clean the roller pins, lubricate them with grease and glue the thread (LOCTITE 243)
- Check the belt position in middle of the tensioning roller (Picture 49)
- Tensioning levers with rollers must turn free
- Glue the central screw securing the blade pulley (LOCTITE 243)
- Tighten the console screws to 70 Nm
- Next see 6.6 Exchange of the blade driving belt



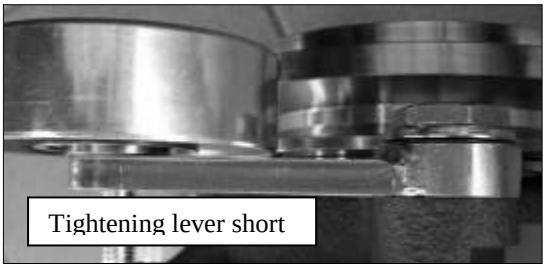
Picture 48



Picture 49



Picture 50



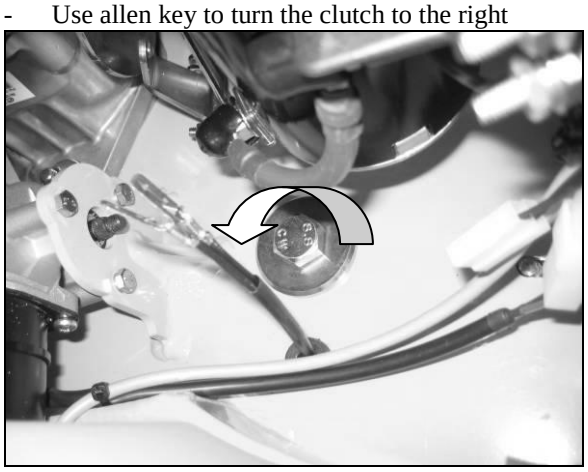
Picture 51

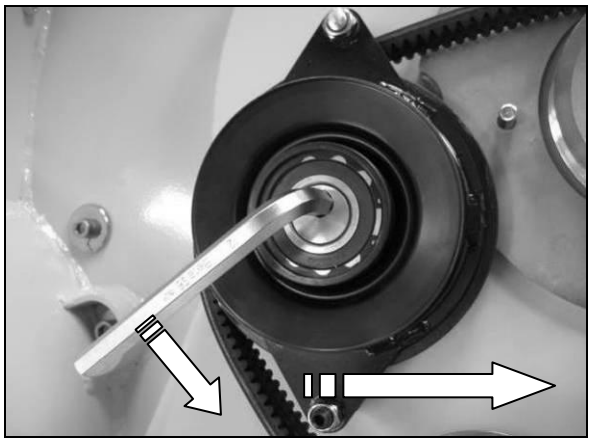
6.8 Exchange of the pump driving belt SPA1060Lw

- Lift the mower or tilt it to the side of hydraulic tank!!!!

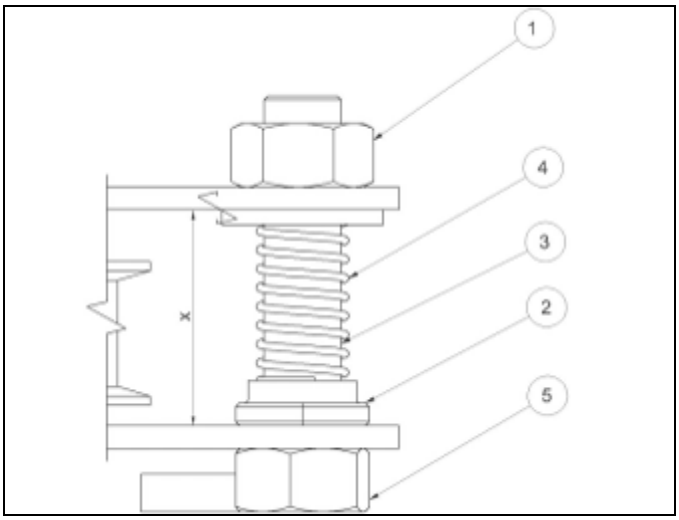
Dismount:

- Mowing blade, clutch cover and console of blade hub – see 6.6 Exchange of the blade driving belt
- Measure the distance of the brake wheel of the clutch x (Picture 52) and make a note of it (approx. 28 mm)
- Loosen securing bolt holding the clutch
- Use allen key to turn the clutch to the right





- Loosen the adjustment nut 1 and securing nut 2
- Remove bolt 3 and remove spring 4 with nut 2
- Replace the belts SPA1060Lw



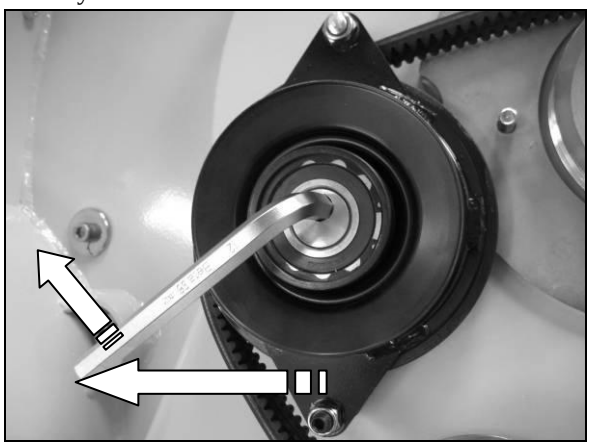
Picture 52

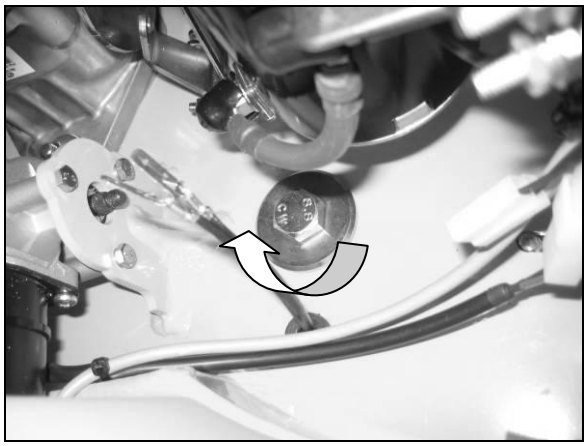
Picture 53

Mounting:

- Install the belts SPA1060 LW
- Put the screw 3 through spring 4 and screw in slightly on the securing nut 2. Tighten the nut 2 then.
- Set the distance x with the adjustment nut 1, tighten slightly the nut 1- both sides are closely each other, brake is activated promptly but the brake disc must not warm up!. Eventually loosen the nut 1(Picture 52)

- Install back bracket of the blade with adjusters and the belt and belts
- Turn the clutch to the left to tension all the belts. Then tighten securing bolt of the clutch with help of allen key

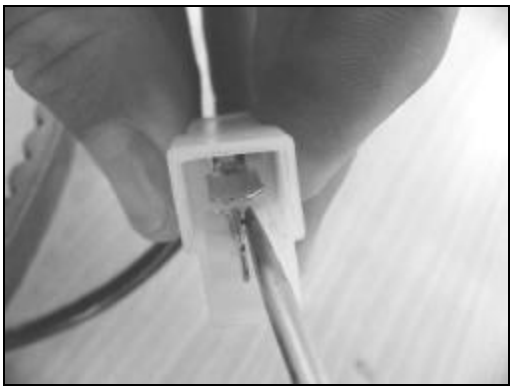




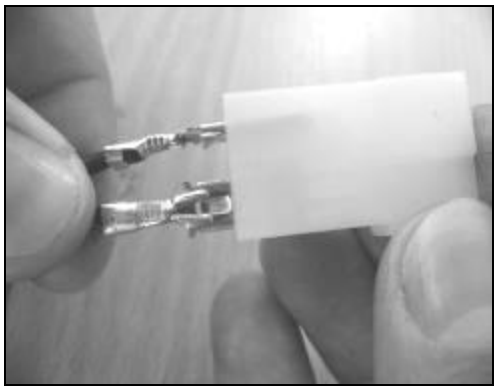
- Install the spring of tensioning pulleys – see 6.6 Exchange of the blade driving belt
- Put the machine to the working position on the ground
- Test the clutch operation (DON'T START THE ENGINE) – when activated, both sides of the clutch brake disc must move by 0,5 to 1 mm closer - further on, see 6.9 Exchange of the clutch
- Start the motor and test the activation of mowing mechanism (DON'T MOUNT THE BLADE)
    - Activated clutch must not activate the brake
    - Deactivated clutch has to stop the mechanism within 0,5s (within 5 seconds with the mounted blade)
    - When the clutch is activated, the brake disc must not warm up
    - Both sides of the brake must be adjusted equally
- Check tightness of the nuts and the belt slack.
- Mount the clutch cover and seal it with silicone. Secure the screws with glue (LOCTITE 243)
- Mount the blade with using LOCTITE 243

6.9 Exchange of the clutch

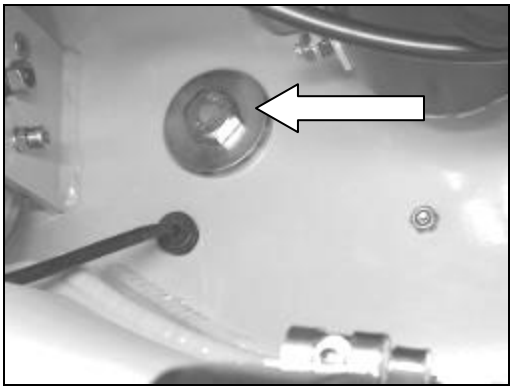
Dismount:
- see 6.8 Exchange of the pump driving belt SPA1060L
- Disconnect the battery
- Disconnect clutch cables and the FASTON plug (Picture 54,55)
- Unscrew the main clutch screw (Picture 56)
- Dismount the clutch (Picture 57)



Picture 54



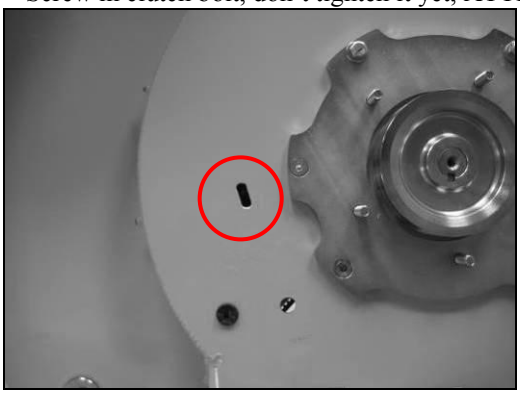
Picture 55



Picture 56

Picture 57

Mounting:
- Put the clutch cables through the inlet bushing of the case
- Screw in clutch bolt, don´t tighten it yet, ATTENTION, locking pin must match the notch in the skeleton



- Turn the clutch to the left to tension all the belts. Then tighten securing bolt of the clutch with help of allen key – see 6.8 Exchange of the pump driving belt SPA 1060 LW, 6.6 Exchange of the blade driving belt
- LOCTITE and tighten securing bolt of the clutch
- Install the spring of tensioning pulleys
- Install clutch cover and the blade – use LOCTITE 243

Clutch adjustment:

- Set the distance x with the adjustment nut 1, tighten slightly the nut 1- both sides are closely each other, brake is activated promptly but the brake disc must not warm up!. Eventually loosen the nut 1(Picture 52)
- Activated clutch must not activate the brake
- Deactivated clutch has to stop the mechanism within 0,5s (within 5 seconds with the mounted blade)
- When the clutch is activated, the brake disc has to move 0,5 to 1 mm closer
- When the clutch is activated, the brake disc must not warm up
- Both sides of the brake must be adjusted equally

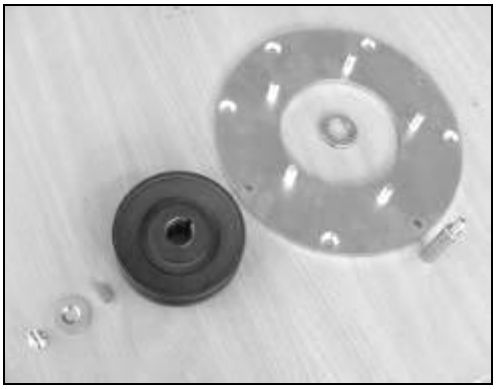
6.10 Exchange of the engine pulley

Dismount:

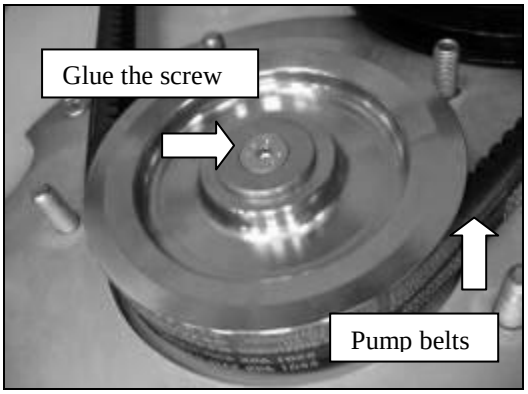
- see 6.6 Exchange of the blade driving belt

PAY ATTENTION:

- To the correct position of the distance washer (recess facing the motor)
- Glue the central sink-head screw (LOCTITE 243)



Picture 58



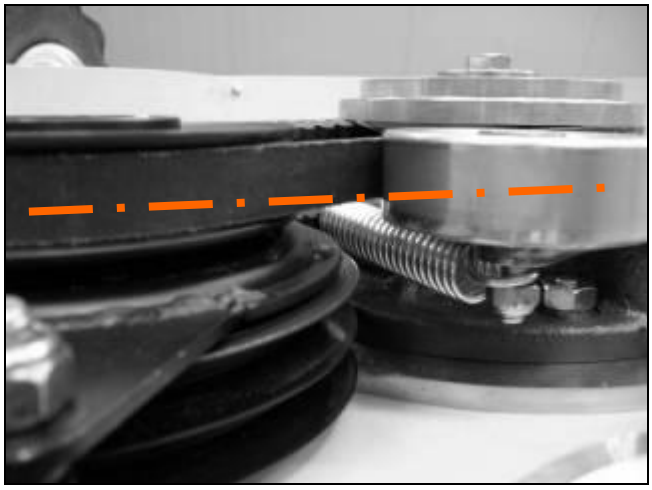
Picture 59

6.11 Adjustment of the tightening belt rollers of the pump and blade drives

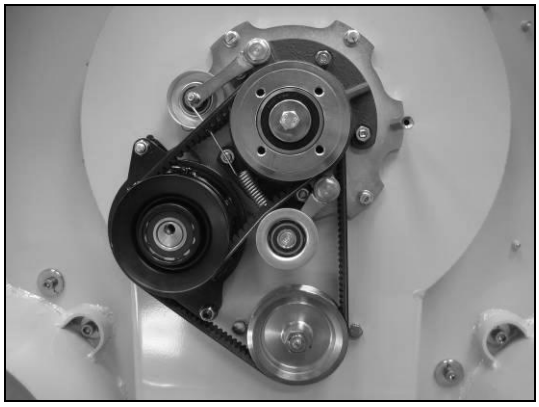
LOCTITE:
- Central screw of the blade hub console
- Screws of the tightening roller pins
- Pulley bearings
- Screws in the roller of the tightening lever

Lubricate the pins in tightening rollers – Interflon Fin Lube TF

- Do not tighten the self-securing nut holding the spring as far as the spring - check the clearance of about 1 mm, the belt must be positioned in the middle of tightening roller (Picture 60)



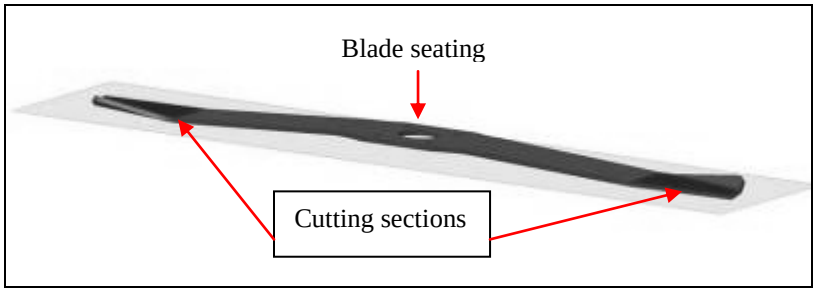
Picture 60



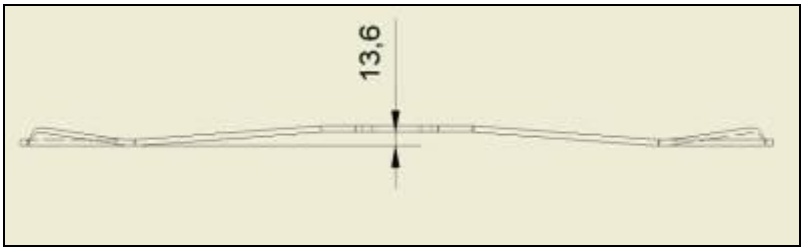
Picture 61

6.12 Sharpening and exchange of the blade

Check the blade geometry:
- The blade hasn´t to be twisted
- Twisted blade mustn´t be straightened, use a new one
- Cutting sections of the blade must be in one level (Picture 62)
- Distance between the blade seating and cutting section level should be 13-14 mm (Picture 63)



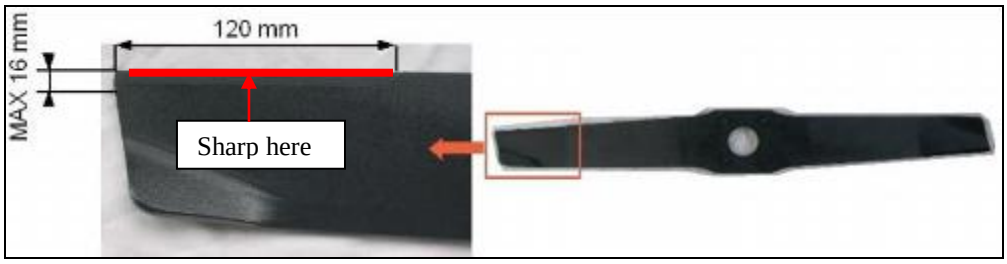
Picture 62



Picture 63

Sharpening:

- Along the blade
- Blade angle about 40°
- Sharp evenly on both sides of the blade



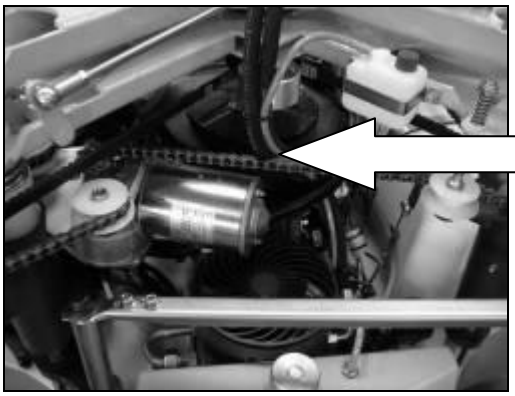
Blade wear allowed

6.13 Exchange of the steering chain

- The exchange is necessary when the chain extension is too big and it cannot be adjusted any more (the first occurrence of this can be fixed by removing one chain-link)

Exchange steps:

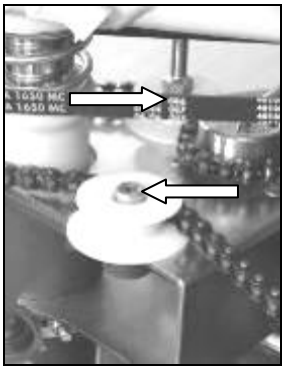
- Lift the mower (wheels must be over the ground)
- Turn the driving to move the connecting link to the side of electric motor.



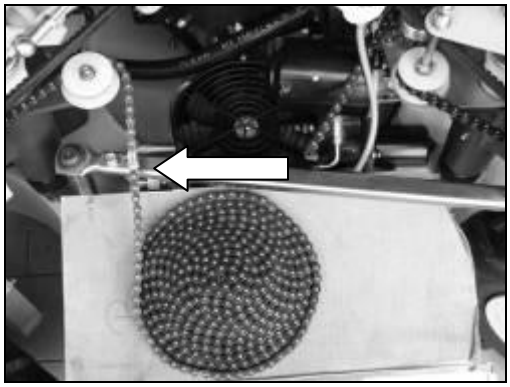
Picture 65

Picture 66

- Loosen the chain tension as much as possible (Picture 71)
- Disconnect the chain and connect the free chain section (the left one) to the new chain with a connecting link (roller chain 084-1 * MOFA 1/2“ x 3/16“)

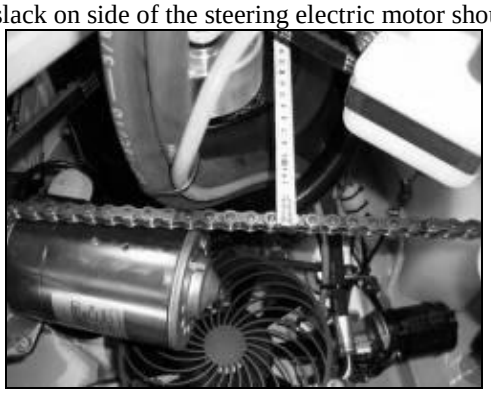


Picture 67



Picture 68

- Turn the driving wheels to replace the old chain with a new one (this way we cannot impair the wheel geometry too much)
- Disconnect the chains and connect the new one (!!! Lock the clip up !!!)
- Check the position of the chain in the pulleys
- Tighten the chain (the chain slack on side of the steering electric motor should be ± 20 mm)

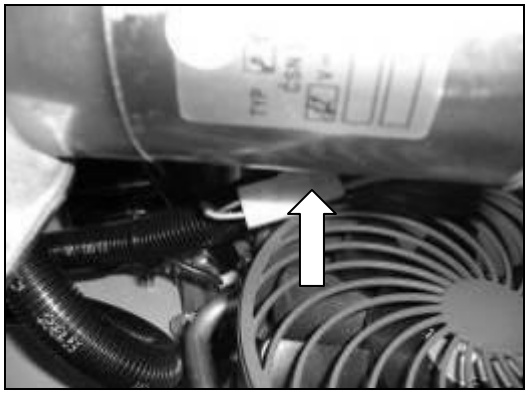


Picture 69

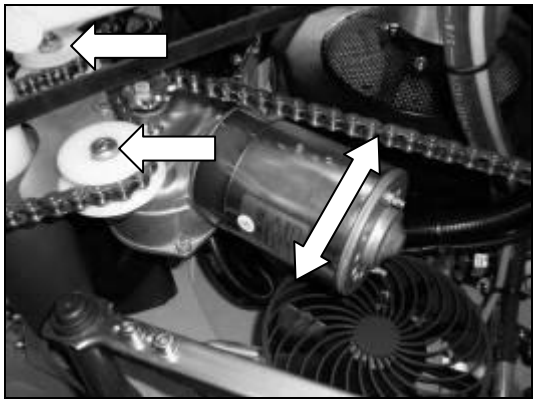
- Lubricate the chain with a chain lubrication spray Interflon Fin Lube TF - see 6.31 Lubricators
  After the aplication let´s it penetrate for 25 minutes then blow the rest out with pressurized air
- Check the wheel geometry - see 6.22 Adjustment of the wheel geometry

6.14 Exchange of the steering motor

- Lift the mower (wheels must be over the ground)
- Disconnect the battery
- Disconnect the supply cables of the electric motor (Picture)
- Loosen the driving chain
- Disconnect the chain and remove it from the motor teeth wheel
- Loosen the screws of steering motor and exchange the motor (Picture 71)



Picture 70



Picture 71

Mounting:

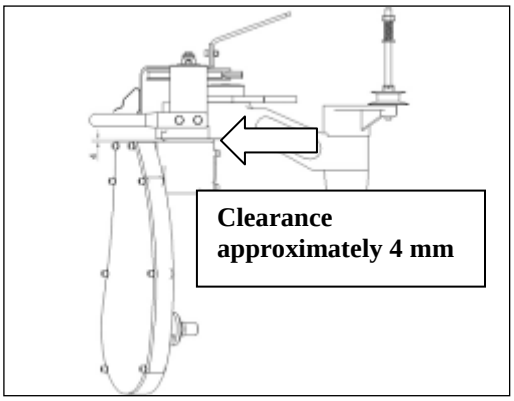
- Mount the new steering motor - set (Picture 72)
- Tighten the chain - see 6.13 Exchange of the steering chain

Picture 72

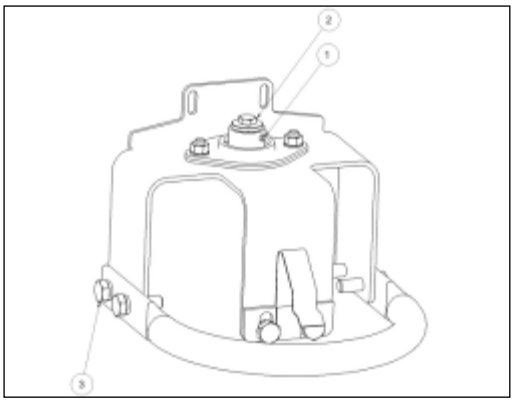
6.15 Exchange of the angle gear UNI M8

Dismount:
- First, mark the original position of the wheel suspenders, console, and distance rings
- Lift the mower (the wheels must be at least 150 mm over the ground)
- Turn the suspenders in the straight direction
- Dismount the console - see 6.16 Exchange of the driving belts SPA1650L
- Pull the pulley out
- Support the wheels to secure them against slipping out
- Dismount the wheel housing - see 6.20 Exchange of the wheel housing
- Dismount the cover of angle gear on the bottom part of the arm (ATTENTION – this sheet secures the wheel suspension from slipping out) (Picture 76)
- Pull out the angle gear

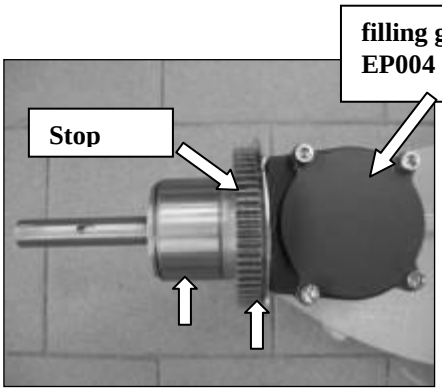
Mounting:
Don´t forget to put on the Stop ring on the new angle gear (Picture 75)
- Screws of the angle gear cover have to be glued (LOCTITE 243)
- The wheels place in the teeth in straight direction (or adjust the steering geometry after mounting)
- MIND a position of the needle bearing securing ring in the arm groove
- Lubricate the needle bearings, pulley shaft and the steering teeth transmission (grease) (Picture 75)
- ATTENTION!!! Mount by hands only – clean the shaft, lubricate it and push in smoothly by hands!!!
- Tighten 4 screws, use thread glue LOCTITE 243
- Put on spacing ring 17-22 v41, key, belt pulley, spacing ring 17-22-v5,5
- Mount the belt on the hydraulic motor pulley and console pulley
- Push the console on the shaft by hands
- Tighten the screws, follow the order 3, 2 a 1 (Picture 74)
- Secure the screw 2 with glue (LOCTITE 243)
- Check the clearance between transmission and the arm, approximately 4mm (Picture 73)
- Mount the wheel housing - see 6.20 Exchange of the wheel housing
- In case the oil of the gear is empty, refill it with cca 100cm^3 MOBILUX EP004
- Tighten the by-pass valve of the pump



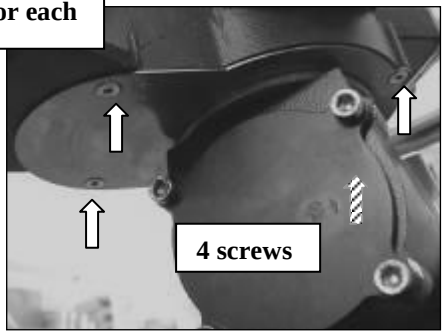
Picture 73



Picture 74



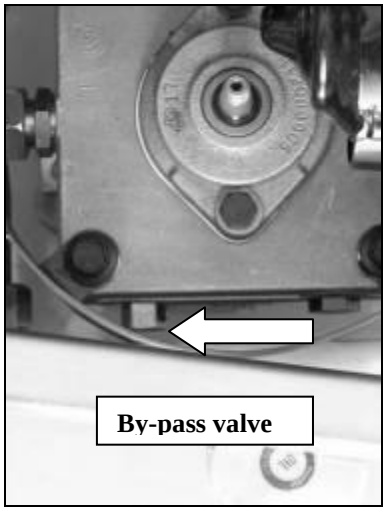
Picture 75



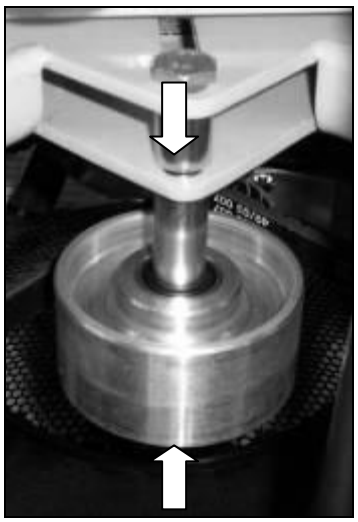
Picture 76

6.16 Exchange of the driving belts SPA1650Lw

Dismount:
- Adjust the mower to the lowest mowing height
- Lift the mower (wheels over the ground)
- Disconnect the battery
- Loosen the by-pass valve of the pump (1 – 2 revolutions)
- Loosen the tightening pulleys of the belt



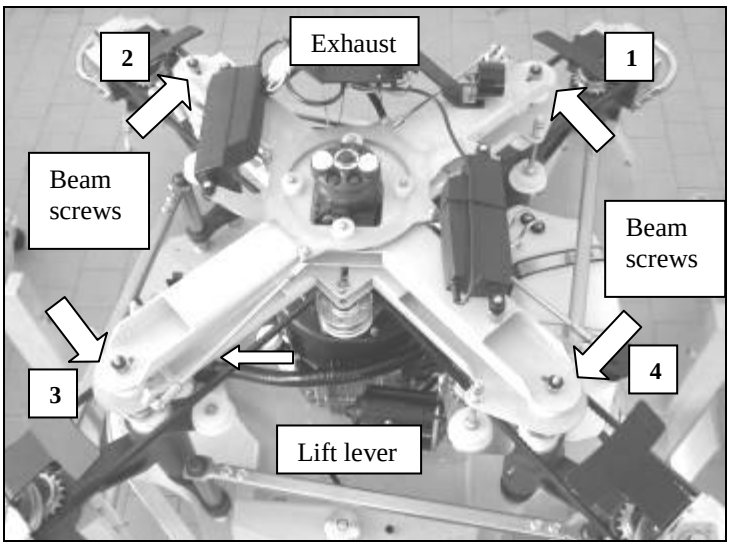
Picture 77



Picture 78

- Pull out the console from the shaft after unscrewing the screws 1,2 and 3 (Picture 74)
- Remove the belts from the pulley
- Disconnect the following: STOP button, plug of the electric motor, control unit, horn, choke pull rod, hydraulic oil overflow hose, pull rods of the lift (near pinions), hydraulic hoses can stay connected!
- Dismount the springs of the lift stop (Picture 79)
- Dismount the screws holding the beam and loosen the beam
- Turn the lift levers and pull out the beam and cross
- Exchange the belts SPA1650Lw GOODYEAR
-

Picture 79



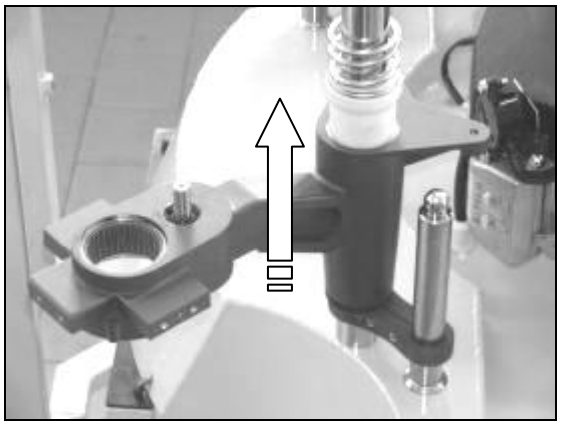
Picture 80

Mounting:

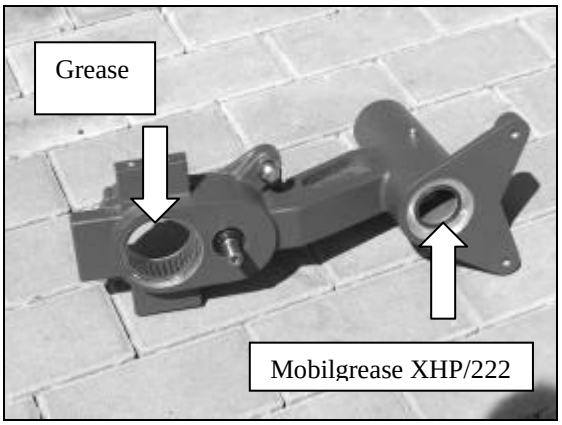
- Place the belts in space between the guide bars and bolts of the lift stop
- Pull the beam and cross on the guide bars and place the teeth segment in the teeth of the guide bar (1st tooth in the 1st groove)
- Mount springs of the lift stop, pull rods of the lift, choke pull rod, horn, control unit, plug of the electric motor and STOP button
- Mount the belts on the pulleys, follow the order 1, 2, 3, 4 (Picture 80)
- Push the console on the shaft by hands
- Tighten the screws, follow the order 3, 2 a 1 (Picture 74)
- Secure the screw 2 with glue (LOCTITE 243)
- Check the clearance between transmission and the arm, approximately 4mm (Picture 73)
- Check the clearances of the pull bar lifts (all of them must pull equally)
- Lubricate the pinion and cross bushing
- Tighten the by-pass valve of the pump

6.17 Exchange of the wheel suspension arm

Dismount:
- Lift the mower (the wheels must be at least 150 mm over the ground)
- Dismount the wheel suspensions
- Dismount the belts and consoles - see 6.16 Exchange of the driving belts SPA1650L
- Dismount the stabilizers
- Loosen the chain slack adjuster
- Pull out the steering clamp bushings - see 6.22 Adjustment of the wheel geometry
- Dismount the crosses - see 6.16 Exchange of the driving belts SPA1650L
- Pull out the arms
- Dismount the rollers from the arms and the pull rod from the ball journal



Picture 81



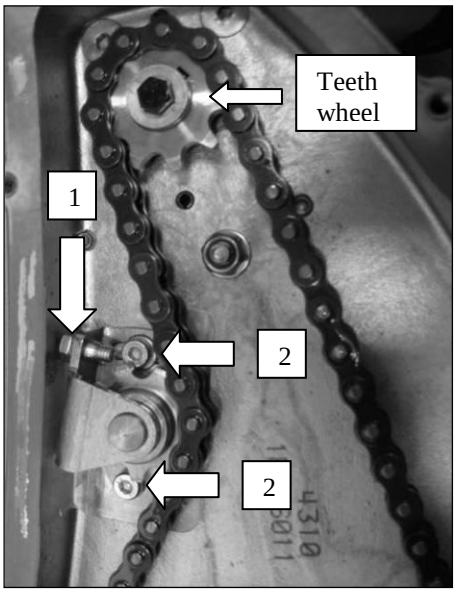
Picture 82

Mounting:
- Lubricate the guide bushings (Mobilgrease XHP 222) and slide the arms in
- Mount the rollers on the arms (MIND the distance ring under the rollers)
- Mount the pull rod on the ball journal (warm up the stabilizer journal in hot water for about 5 minutes and press on the ball journal)
- Mount the clamp bushings on the steering shaft and tighten it smoothly - see 6.22 Adjustment of the wheel geometry
- Slide on the spring and the distance silicone ring
- Place the driving belts between the guide bars and the clamping bolts of the lift stop
- Mount the cross and the beam - see 6.16 Exchange of the driving belts SPA1650L
- Mount the wheel suspensions
- Mount the console - see 6.16 Exchange of the driving belts SPA1650L
- Use a lubrication nipple to lubricate the arms (Mobilgrease XHP 222), wheel segment, guide bushing of the cross (Interflon FIN LUBE TF) and grease the needle bearing with steering transmission
- Adjust the length of pull rods - see 6.21 Adjustment of the stabilizer length
- Tighten the chain - see 6.13 Exchange of the steering chain
- Adjust the geometry - see 6.22 Adjustment of the wheel geometry
- Check the driving, lift and turning the mower wheels

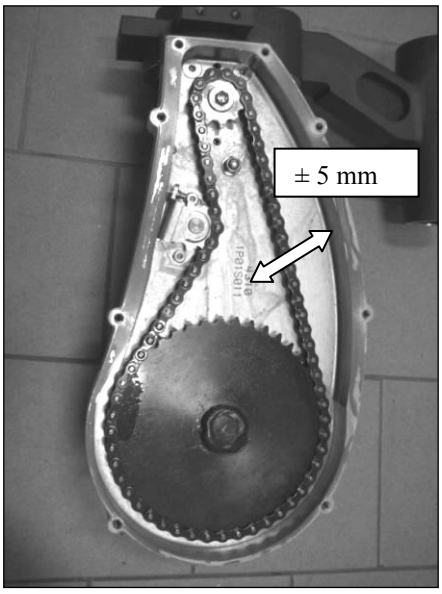
6.18 Adjustment and exchange of the wheel driving chain

Dismount:
- Wheel suspension lid
- Tightening segment of the chain (Picture 83)
- Pull out the teeth wheel from the transmission shaft (Picture 83) – MIND the spring!!!

Mounting:
- Mount the chain on the chain wheels (roller chain 084-1 * MOFA 1/2“ x 3/16“)
- Mount the feather in the transmission shaft groove
- Mount the chain wheel and tighten it with a screw (longer than 30 mm), after tightening replace the screw for the original screw. Secure it with glue (LOCTITE 243) and tighten it
  ATTENTION !!! Do not knock the wheel – transmission clearance!!!
- Mount the tightening segment
- Tighten the chain with the adjustment screw 1 (± 5 mm). ATTENTION – the chain must move free!!! (Picture 83)
- Glue and slightly tighten screws 2. (Picture 83)(LOCTITE 243)
- Lubricate with a chain lubrication spray Interflon Fin Lube TF
- After the aplication let´s it penetrate for 25 minutes then blow the rest out with pressurized air
- Tighten the lid (seal with silicone)
- Tightening moment 9 Nm



Picture 83

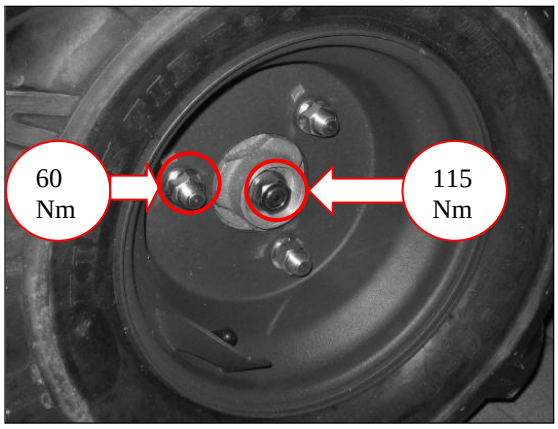


Picture 84

6.19 Exchange of the wheel axis

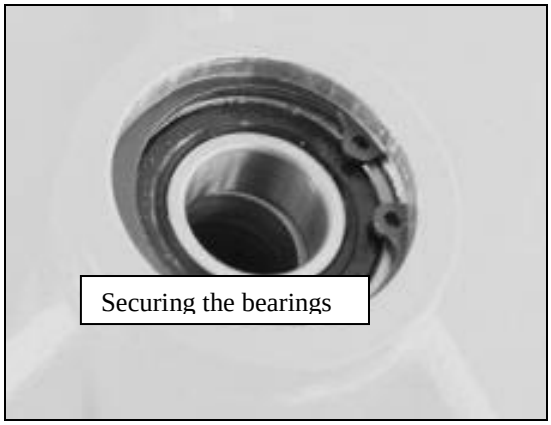
Dismount:
- Wheel (3 screws fixing the wheel)
- Dismount the main wheel nut (Picture 85)
- Remove the wheel hub (use wheel hub puller), spacing ring and spring
- Clean the wheel shaft (it must get through the bearings)
- Dismount the lid, tightening segment and chain - see 6.18 Adjustment and exchange of the wheel driving chain
- Pull the wheel shaft with the chain disc out of the bearings
- If the bearings need to be exchanged, dismount the securing ring of the bearings and press the bearings out.

Mounting: (Take the above steps in reverse order)
- Lubricate the shaft with grease.
- Degrease the cone seating of the wheel shaft and wheel hub
- Put on new spacing ring, spring, wheel hub, washer
- Check a good seating of the wheel hub to the cone of the wheel shaft
- Secure the main wheel nut with glue (Picture 85)(LOCTITE 243) and tighten it. (115 Nm)
- check the gap between wheel housing and wheel hub it should be cca 1-2 mm
- mount the wheel back

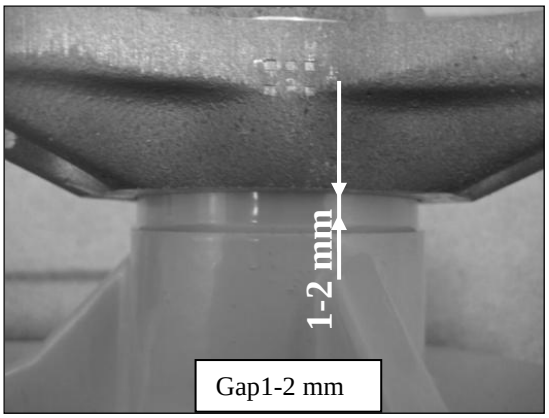


Picture 85

Picture 86



Picture 87

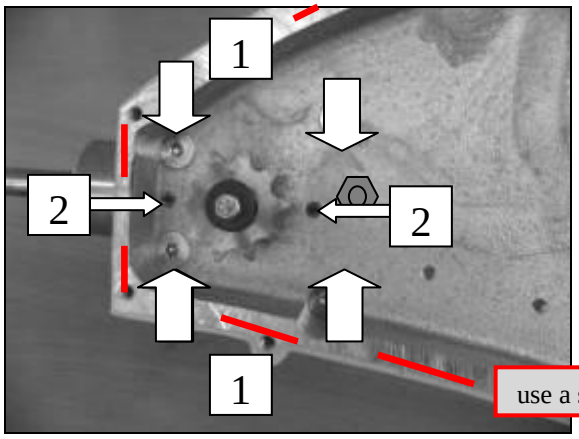


Picture 88

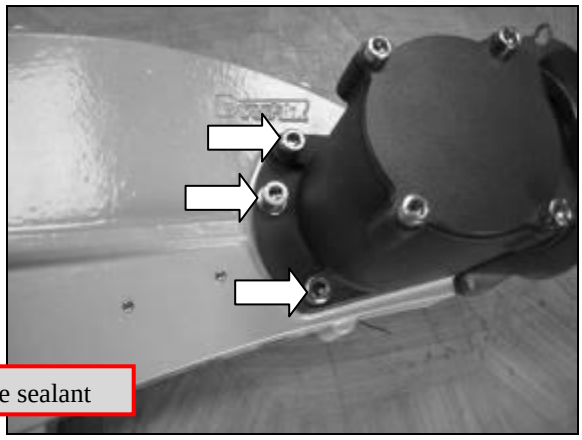
6.20 Exchange of the wheel housing

Dismount:
- Dismount the housing lid
- Dismount the wheel shaft - see 6.19 Exchange of the wheel axis
- Dismount the small chain wheel (Picture 89)
- Dismount 2 sink-head screws no.1 (Picture 89) , 3 hex-bolts (Picture 90)
- Dismount the wheel housing

Mounting: (Take the above steps in reverse order)
- Clean wheel housing contact surface
- Mount the all screws no.1 and secure them with LOCTITE 243 glue and middle one by self-securing nut
- (Picture 89, 90)
- Secure the wheel housing – spring pin no.2 (Picture 89)
- Mount the big chain wheel and wheel hub - see 6.19 Exchange of the wheel axis
- Mount the chain and small chain wheel, use LOCTITE 243 for bolt
- Mount the tightening segment
- Tighten and lubricate the chain - see 6.18 Adjustment and exchange of the wheel driving chain
- Use a silicone sealant for sealing wheel housing lid to the wheel housing and screw it.
- Eventually glue the screws of housing lid with LOCTITE 243



Picture 89



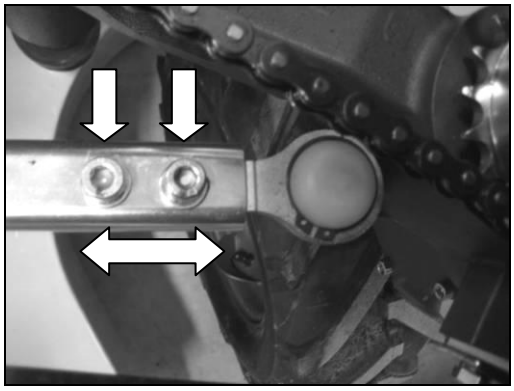
Picture 90

6.21 Adjustment of the stabilizer length

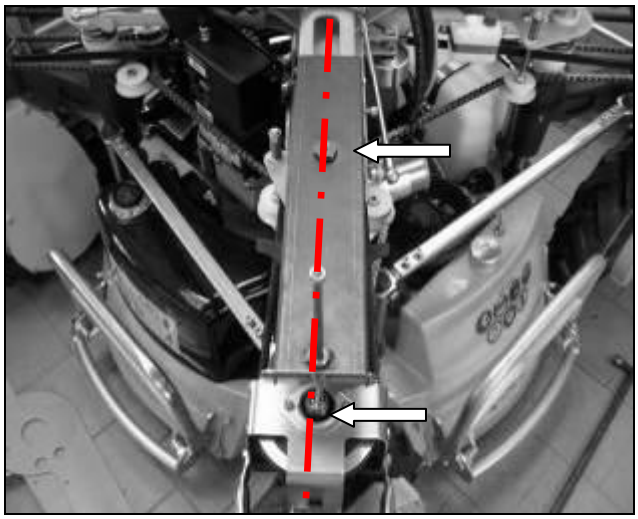
- Tighten the left side to the minimum length (Picture 91)
- Loosen the right side so that the arm can move (Picture 92)
- Adjust the axes of the pulley, pillar and hydro motor in one line use the geometry adjustment tool no.1 (Picture 93) or laser tool (Picture 95, 96)
- Use the geometry adjustment tool no.2 for distance adjustment between the rest of arms (Picture 94)
- Tighten the right side of the stabilizer
- Check the clearance between the wheels and case
- Following adjustment of the stabilizer length, it is necessary to check the chain tension and wheel geometry and make possible adjustment (see 6.22 Adjustment of the wheel geometry)

ATTENTION: see section Service Bulletin 8.2 Stabilizer – pressed in – 1S01K271 8.10 Stabilizer – pressed in

Picture 91

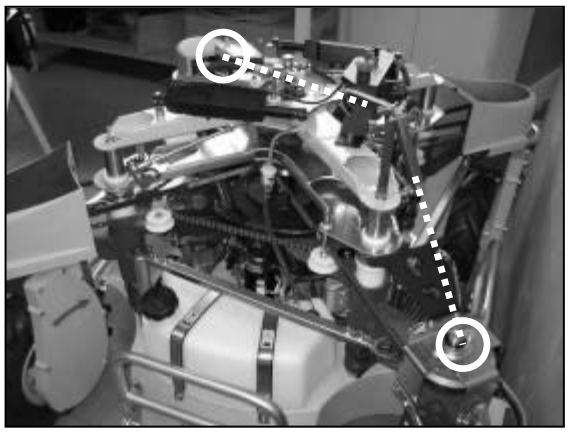


Picture 92

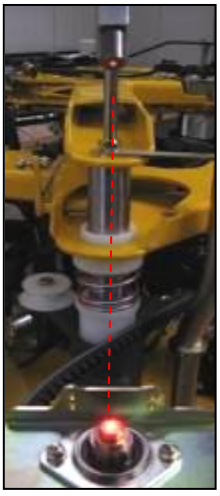


Picture 93

Picture 94



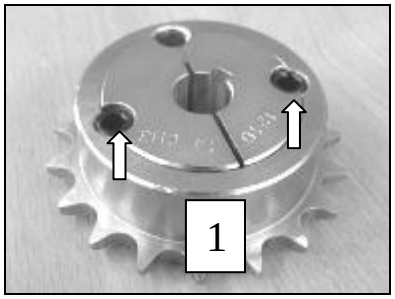
Picture 95



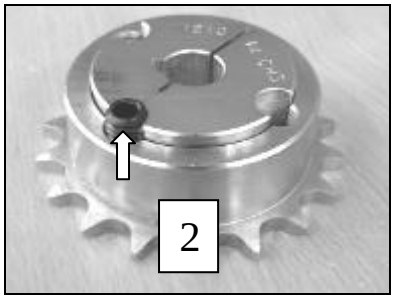
Picture 96

6.22 Adjustment of the wheel geometry

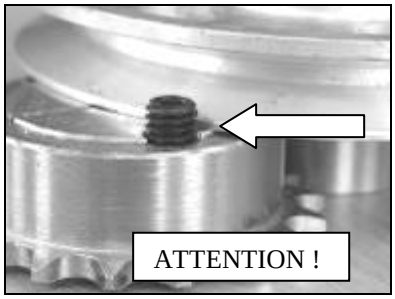
- Lift the mower (the wheels must be over ground)
- Adjust the wheels in straight direction
- Loosen the clamp bushings of the steering chain
    - Unscrew the sink-head screw 1 (Picture 97)
    - Screw one of the screws in the thread used to loosen the clamp bushing 2 (Picture 98)
    - Tighten the screw to loosen the clamp bushing
    - Return the sink-head screws in the thread 1 (screw then in but do not tighten them – the wheels must be lose so that they can be turned by hand)
- When turning MIND a possible collision of the screw and driving pulley (Picture 99)
- Put a straight lath along the wheel portals on the left side and to the tyre discs on the right side. Adjust the wheels to be parallel. (Picture 100, Picture 101)
- Tighten at least one screw of the clamp bushing (an accessible one). Do not turn the wheels prior tightening the screw otherwise the geometry is impaired!
- After the first screw is tight, turn the wheels (ATTENTION! The wheels must be over the ground!)
- Tighten the second screw
- Check the geometry with the lath
- Turn alternatively the wheels and Tighten both screws of the clamp bushings of all wheels till the clamp bushings are fully tight (approximately 23 Nm)



Picture 97



Picture 98



Picture 99

Picture 100

Picture 101

6.23 Exchange of the electric motor LINAK

Dismount:
- Adjust the mower to the minimum mowing height
- Disconnect the battery
- Loosen the supply cables
- Dismount the electric motor and exchange it (MIND the correct polarity of the electric motor!)

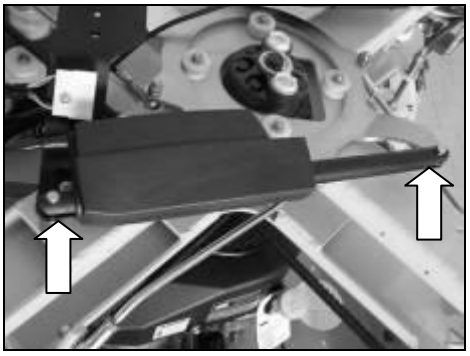
Mounting:
- PAY ATTENTION to the colours of supply cables and their position in the connector!!! (Wrong wiring may result in destruction of the electric motor!!!) (Picture 102)

Br	B	
Br	B	

	Bl	R
	Bl	R

Picture 102

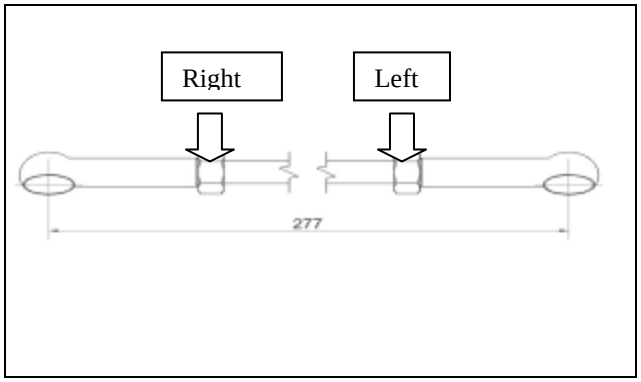
Br – brown
B – blue
Bl – black
R – red



Picture 103

6.24 Adjustment of the lift pull rods

- ATTENTION! The securing nuts have left and right thread.!!!



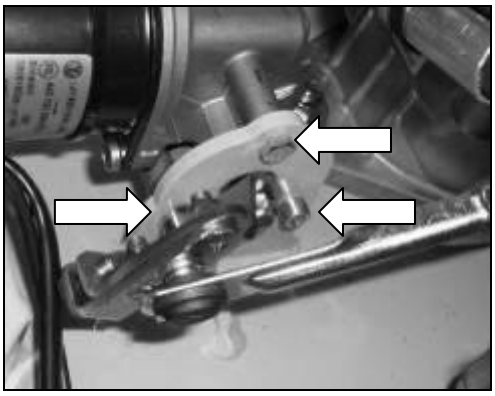
Picture 104

6.25 Exchange of the drive control servomotor NBB

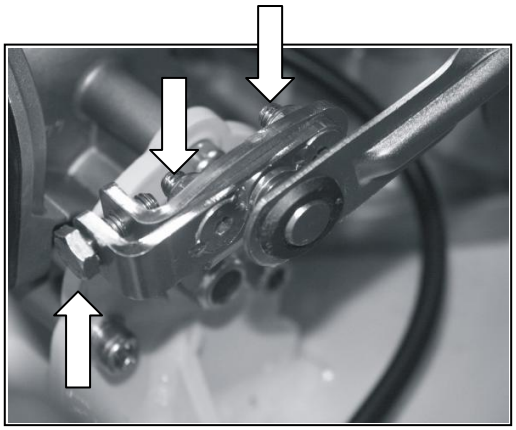
Dismount:
- Disconnect the battery
- Disconnect the supply cables
- Dismount the lever of servomotor and servomotor

Mounting:
- Mount the servomotor
- Mount the pull bar on the pin of the pump lever and pin of the servomotor
- Set the servomotor and hydraulic pump shafts to zero (central) position
- Mount the lever on servomotor and tighten the securing nut
- Connect the regulation cables and supply control cables of servomotor
- Connect the battery
- Tighten the lever nut (30 Nm)

Adjustment of neutral position:
- Support the mower (the wheels must get over the ground)
- Loosen the securing nuts of servomotor pull bars (left and right thread)
- Start the mower – ATTENTION! The mower can start only when the servomotor lever is in zero (central) position. If it is not in zero position, move the lever until the neutral LED on the control panel lights up. Test driving in both directions and leave the neutral gear. When returning to the neutral gear from both directions, the wheels have to stop. If not, turn the central nut of the adjustment pull rod of servomotor till the wheels stop from both directions.
- Tighten the securing nuts. (Picture 106)



Picture 105



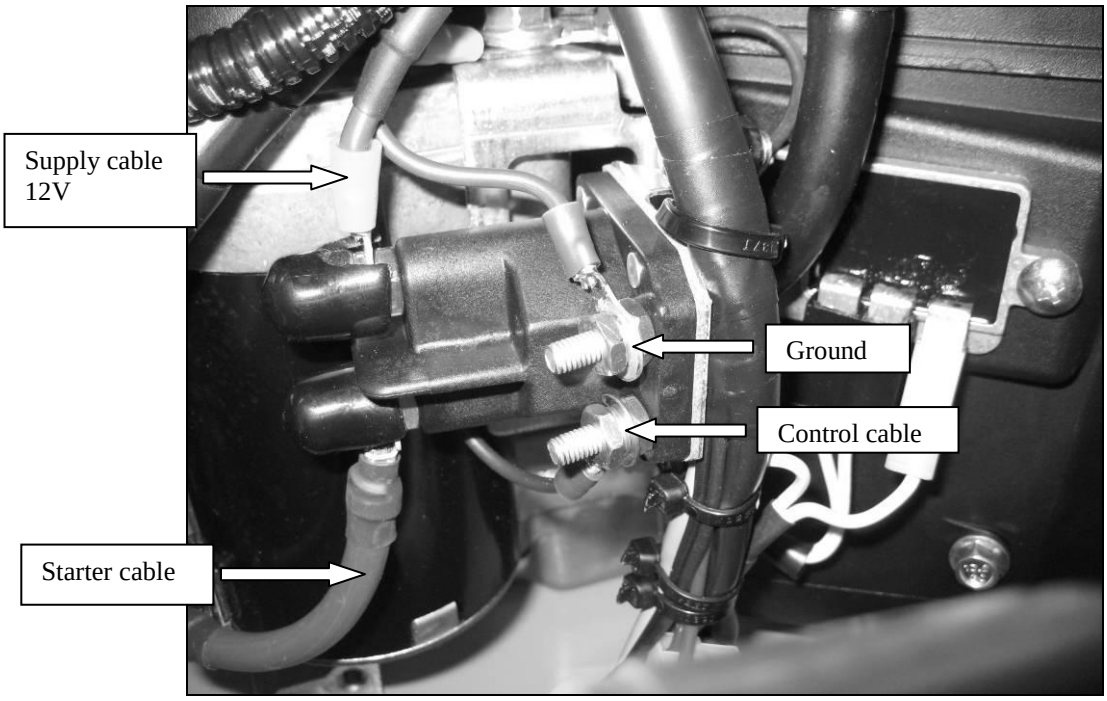
Picture 106

6.26 Exchange of the starter switch relay

- Disconnect the battery
- Dismount the relay cables
- Connect the ground cable under the relay fixing screw during mounting

Check:

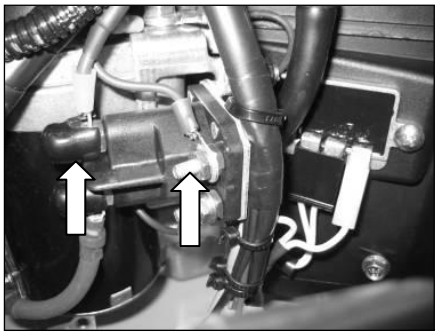
- When the relay switches on, the voltage must be on both heavy-current relay connectors.
- If not, check the relay control voltage of the supply cable (brown). It should be U = 12V when the relay is on.



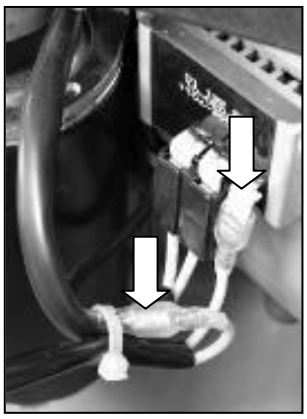
Picture 107

6.27 Exchange of the main harness

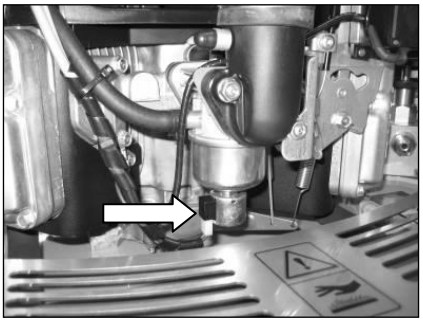
- **<u>Disconnect the battery</u>**
- Disconnect the jointing sleeves of all parts: control unit, throttle control, carburettor solenoid, electric motor, STOP button, horn, charger, clutch, driving servomotor, steering motor, starter relay and control panel
- Unscrew the fuse box lid
- Dismount the fuse box



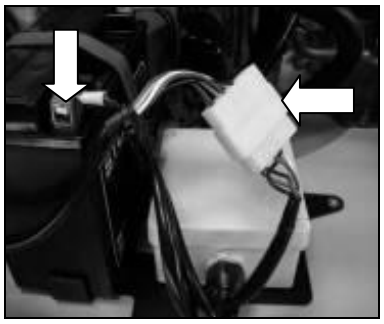
Starter relay



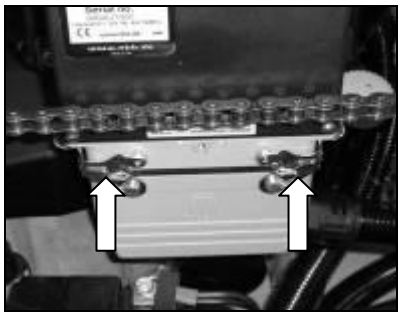
Charging



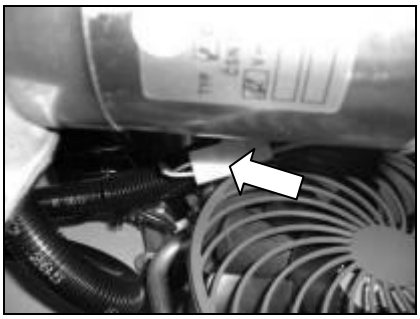
Carburetter solenoid



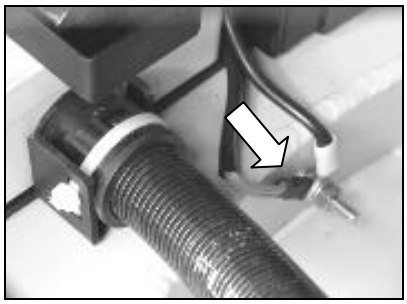
Control panel



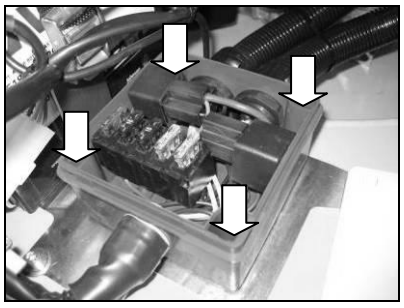
Connector



Driving electric motor



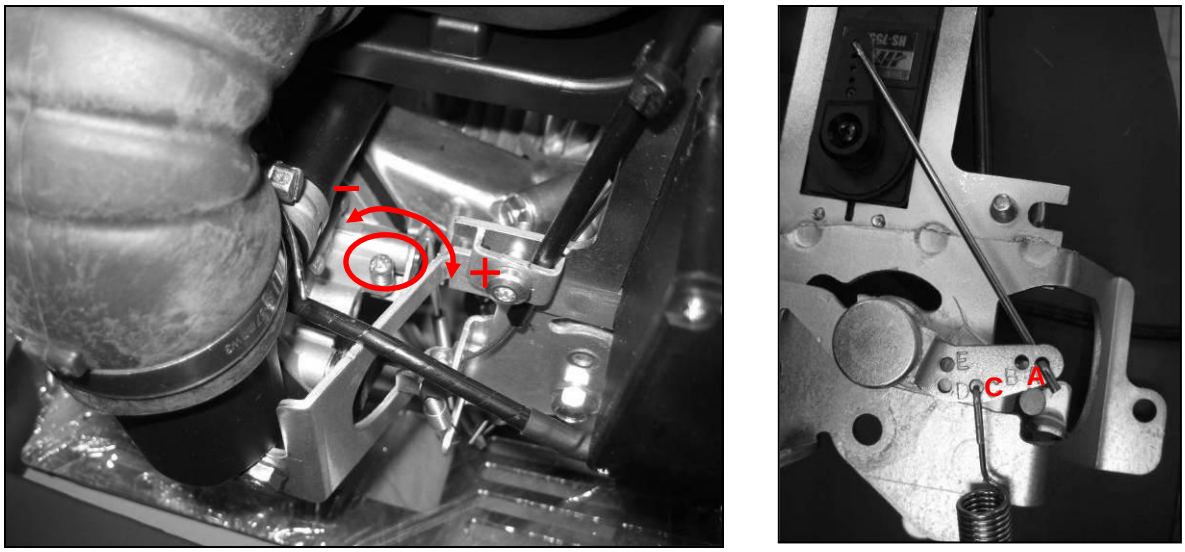
Battery ground



Fuse box

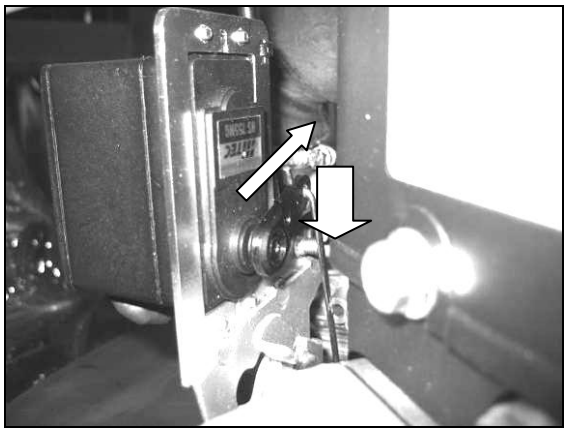
6.28 Carburettor maintenance

- Adjustment of idle revolutions (Picture 108 –Kawasaki motor)
  Kawasaki minimum revolutions – 1350 rpm
  Kawasaki maximum revolutions – 2800 rpm
  Correct possition for the spring in the RPM bracket is C and for the servomotor rod is A
- seasonal maintenance – discharge of sludge from the float chamber by the solenoid –loosen it (Picture 111)



Picture 108

Picture 109 – maximum revolutions

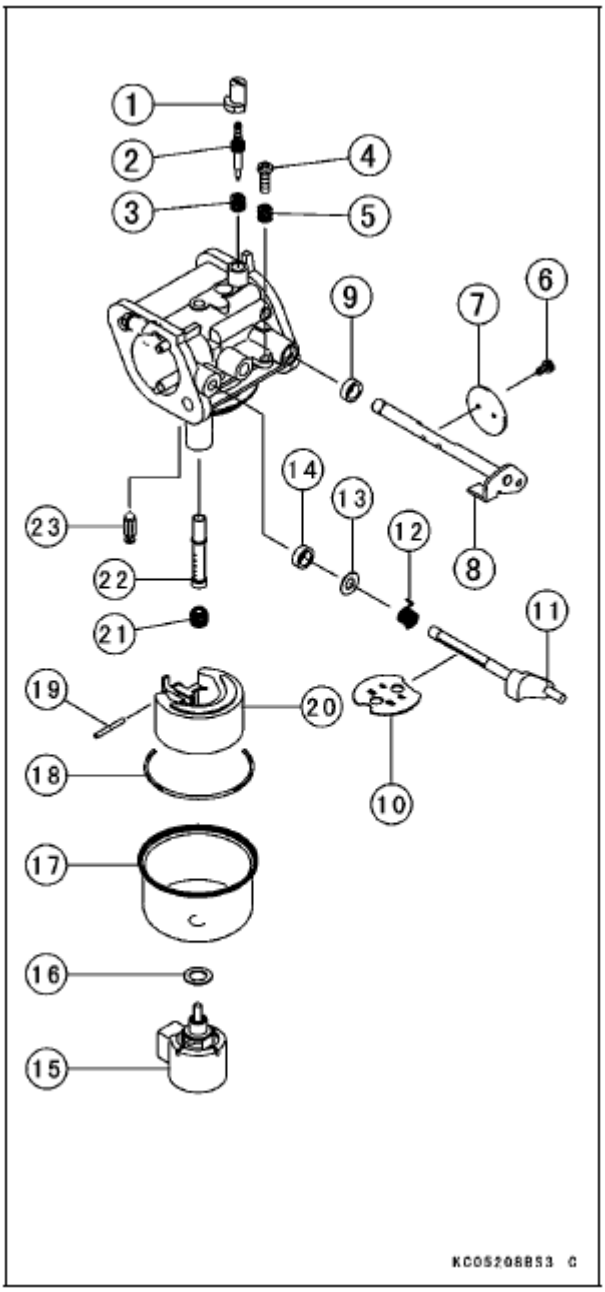


Picture 110 – minimum revolutions

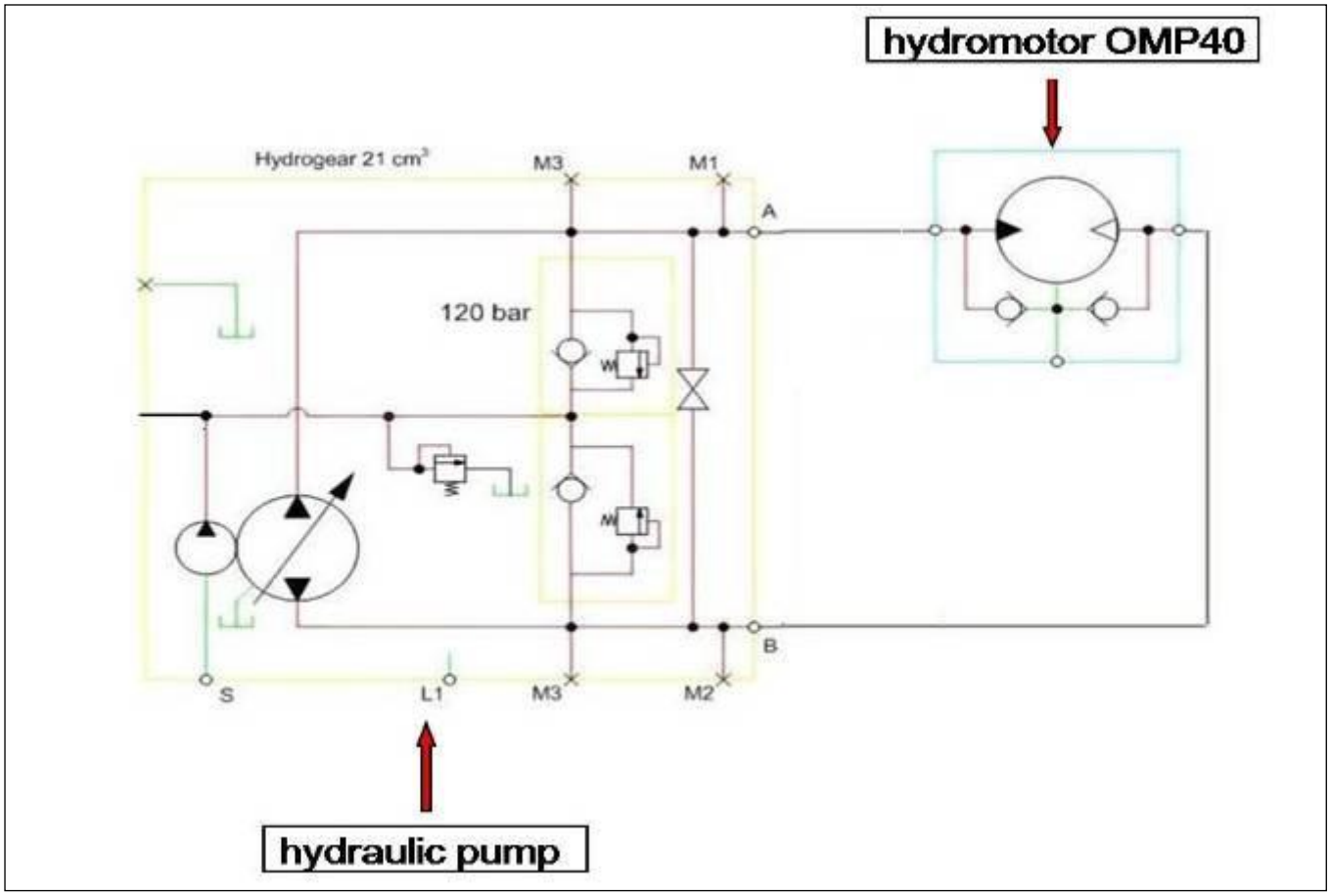
Picture 111

Carburettor parts diagram

1. Limiter
2. Pilot Screw
3. Spring
4. Low Idle Speed Screw
5. Spring
6. Screws
7. Throttle Valve
8. Throttle Shaft
9. Dust Seal
10. Choke Valve
11. Choke Shaft
12. Spring
13. Washer
14. Dust Seal
15. Solenoid Valve
16. Gasket
17. Float Chamber
18. Gasket
19. Float Pin
20. Float
21. Main Jet
22. Main Nozzle
23. Float Valve



6.29 Hydraulic diagram



Hydraulic oil pressure: - nominal 90 bar
- maximal 120 bar

6.30 Torque

Bolt material		5D	6S	8G	10K	12K
Material strength [MPa]		480 – 680	580 – 780	780 – 980	980 – 1180	1180 - 1380
Torque $M_{U\,max}$ [N.m]	M 6	4,3	7,3	9,7	13,5	16,5
	M 8	10	17,5	23	33	39,5
	M 10	20,5	35,5	47,5	67	80,5
	M 8x1	10	17,5	23	32,5	39
	M 10x1,25	20,5	35	47	66	79,5
	M 12x1,5	35,5	61	81	114	137
	M 14x1,5	56	96	128	180	216
	M 16x1,5	87	149	199	281	338

6.31 Lubricators

Interflon Fin Lube TF	Chain spray, spray for sliding surfaces – water resistant, anti-adhesive surface
Mobilgrease XHP/222	Plastic grease, high endurance insoluble lubricant
Mobilux EP004	Lubricant for angular gears
Standard grease	

Picture 112

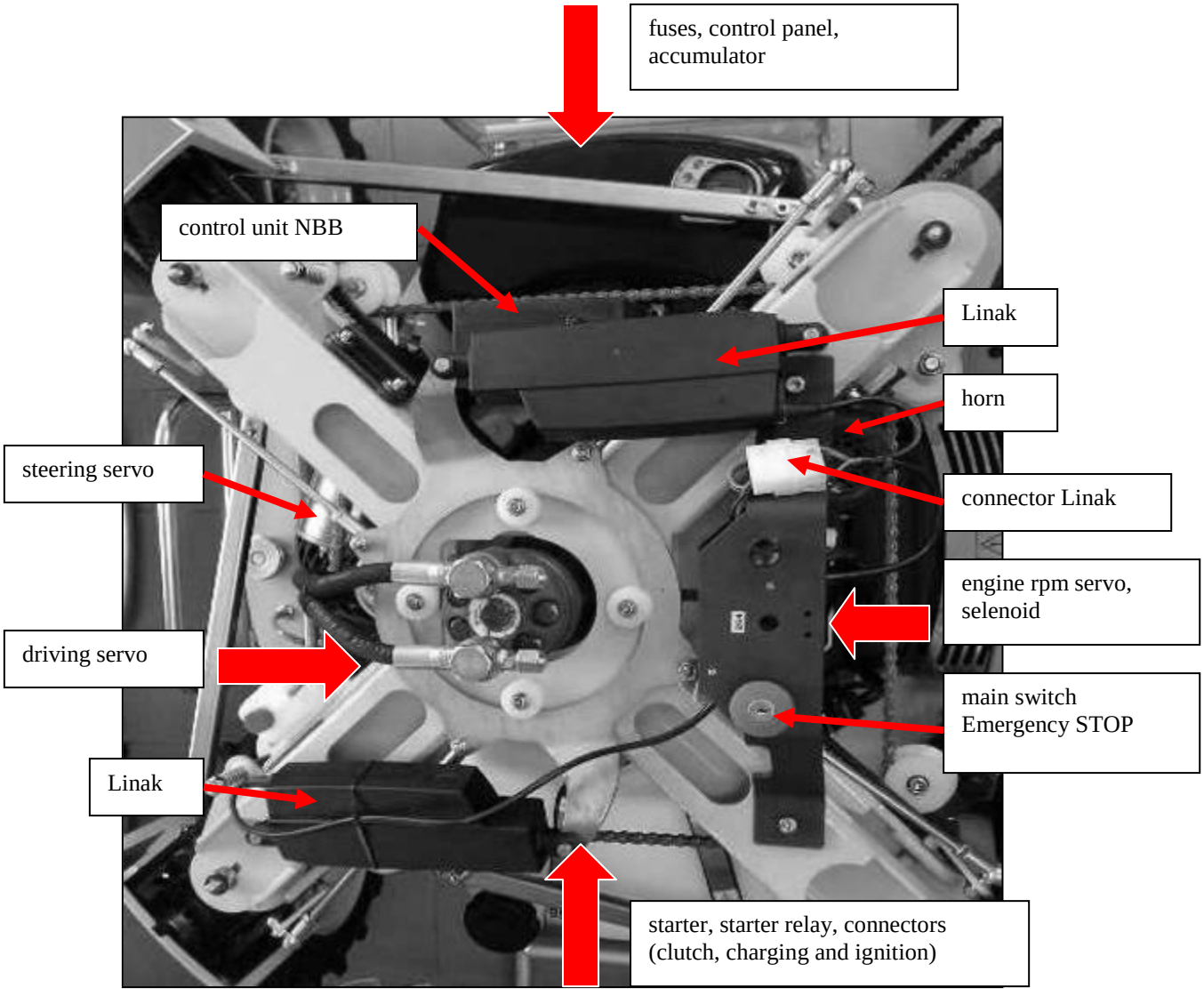
Picture 113

7 Electrical system

CAUTION

Remove and replace parts only with the **battery disconnected**

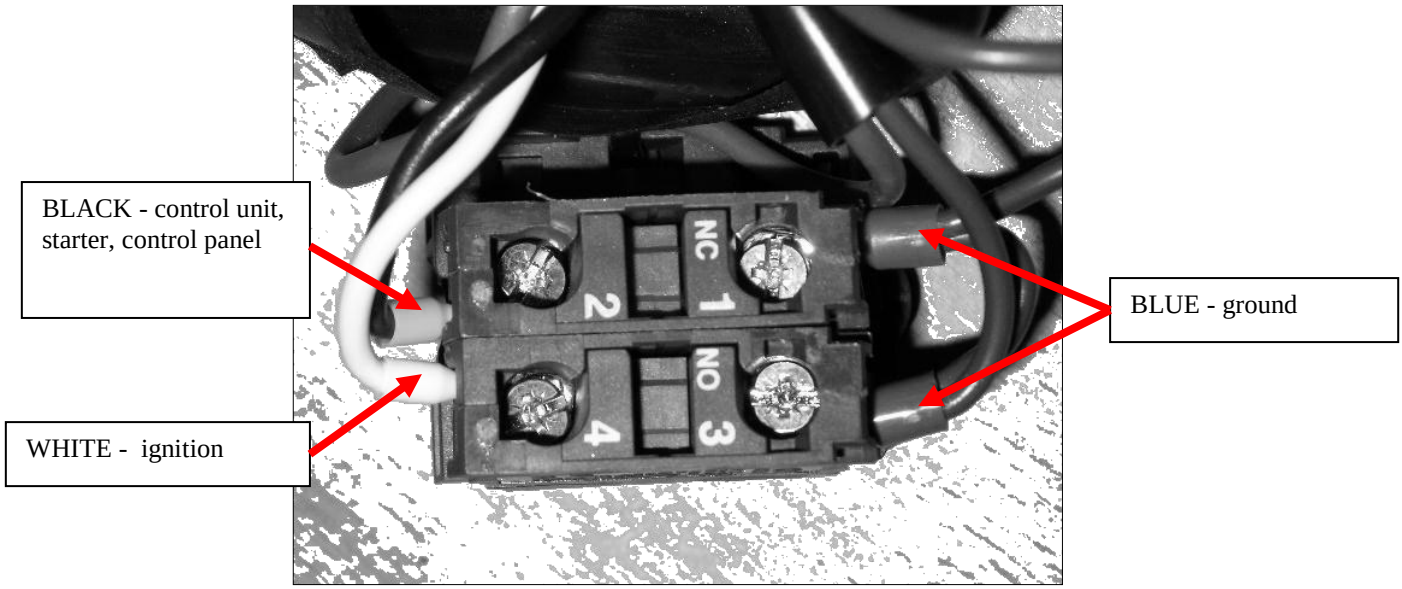
7.1 El. component placement



7.2 Main switch – Emergency STOP

- use like main switch of power supply. (ATTENTION – dismount only with disconnect accumulator)

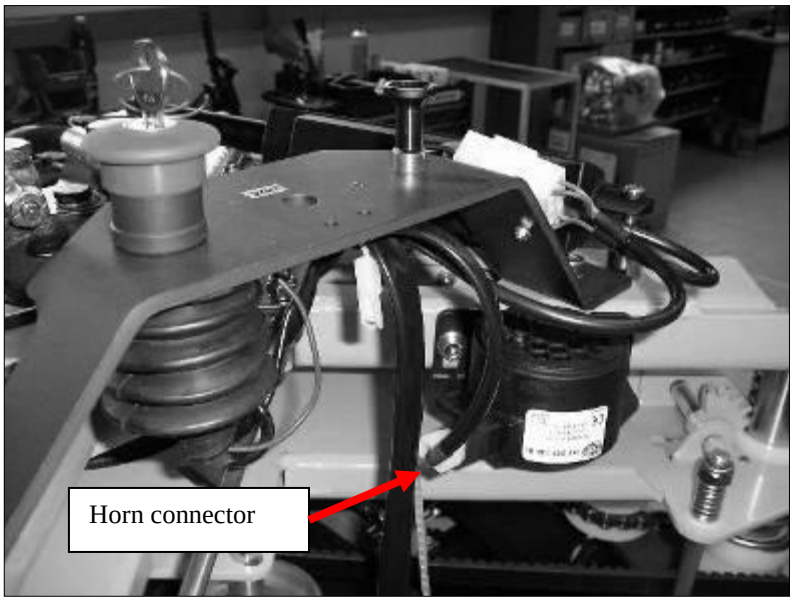
Check: If you press main switch: contact 1-2 switch off and 3-4 switch on.



Main switch

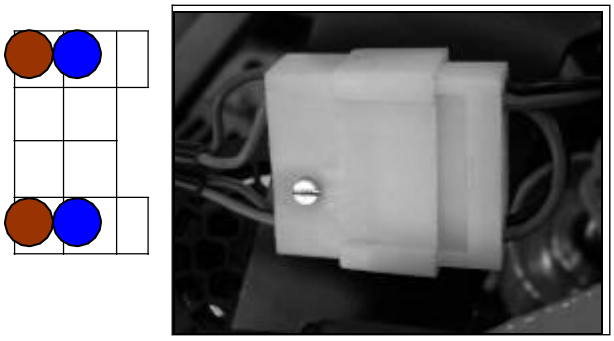
7.3 Horn

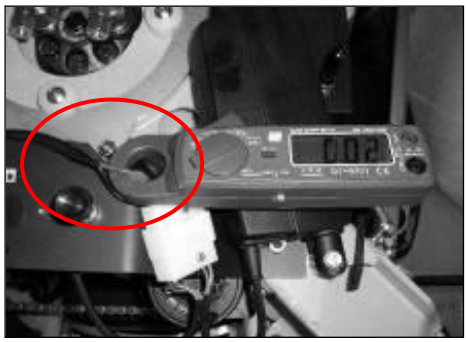
Characteristics: supply voltage = 12 V (+ red)



Horn

7.4 Linak connector



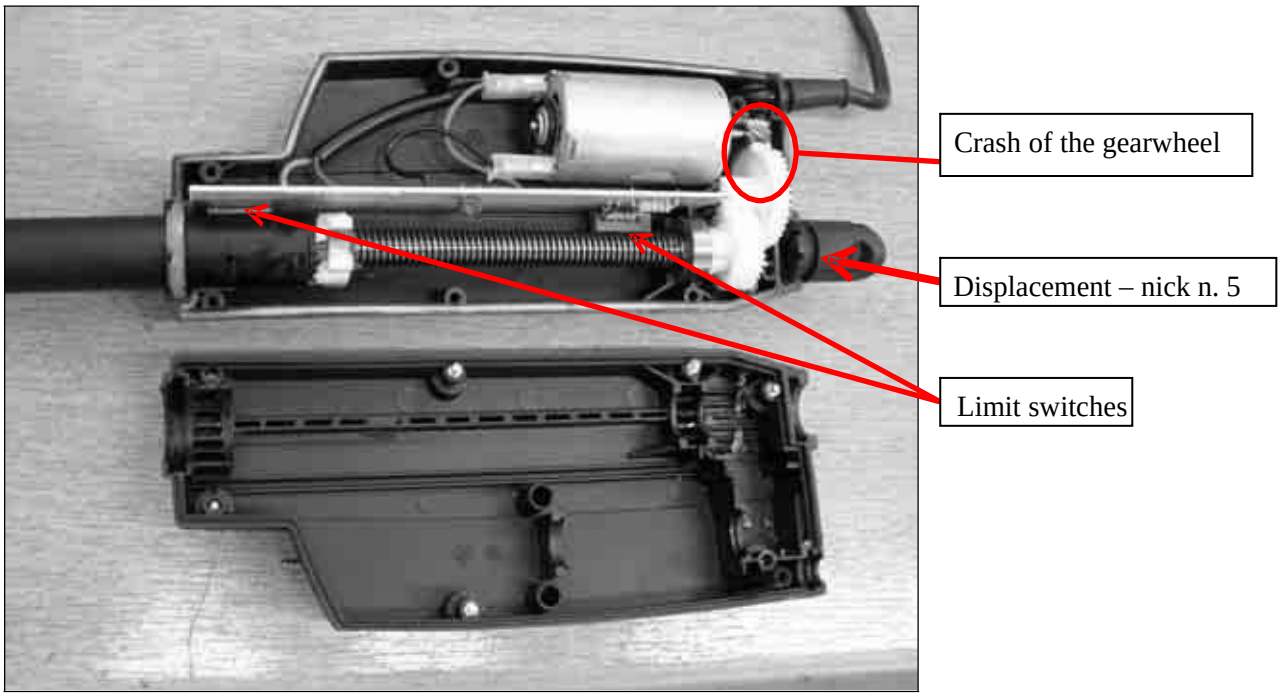


Linak connector **Current measuring**

7.5 Linak

Characteristics: power supply = 12 V
current drain (both Linak) = 1 A (down) - 7 A (up) - by Spider loading

Check: By connectors we connect power supply 12 V
We changing power polarity and check if it switching off in end positions.
For light moving is possible lubricate gear bushing segment, sliding bar and every gears.

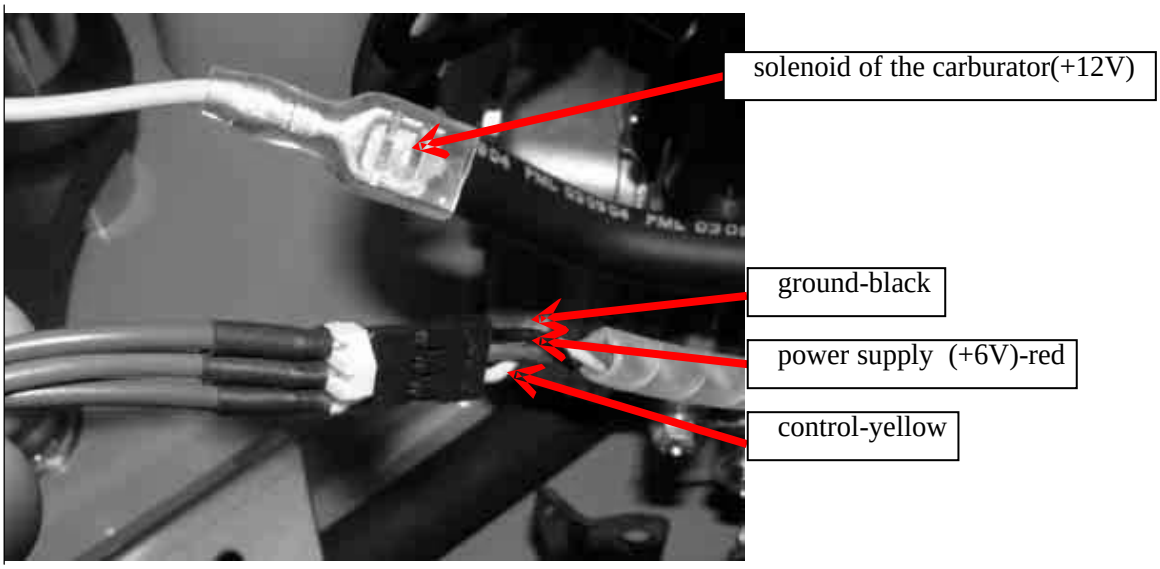


Linak motor

7.6 Engine rpm servomotor

- Using like gas accelerator

Characteristic: Power supply = 6 V
control f = 50 Hz

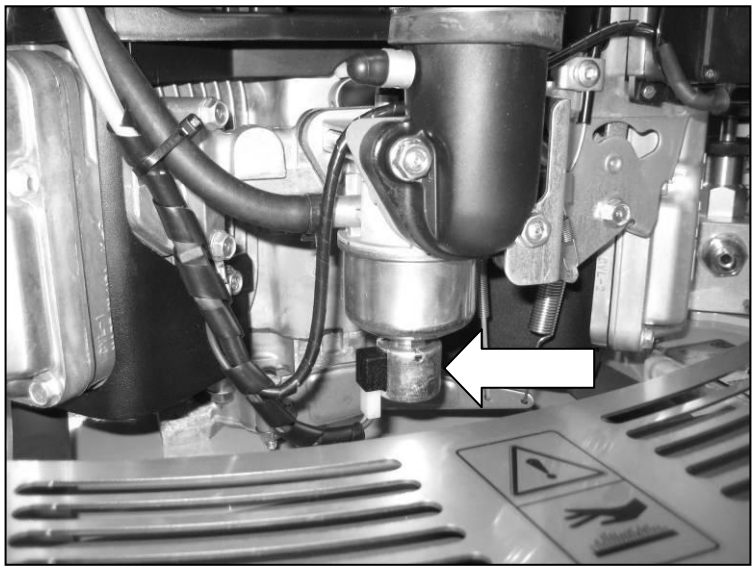


Engine rpm servomotor

7.7 Carburettor solenoid

- electromagnetic valve for fuel closing

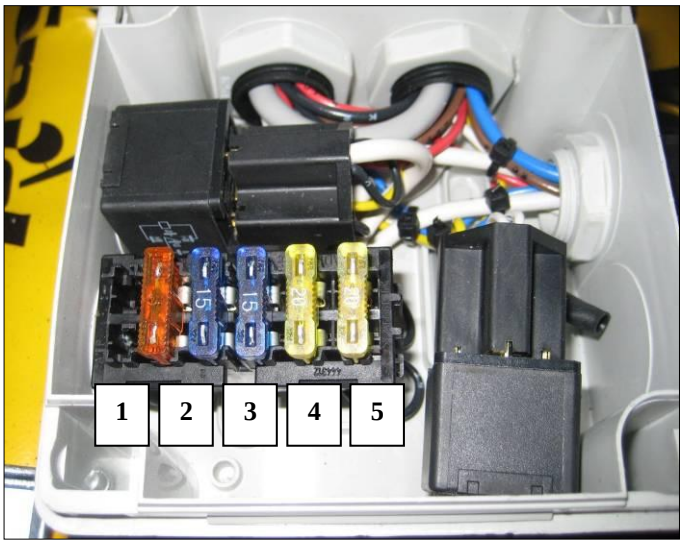
Characteristic: power supply = 12 V, current drain = 0,4A
coil resistance = approx 40 ohm



Carburettor solenoid

7.8 Fuses

1. 5 A – control panel
2. 15 A – alternator
3. 15 A – alternator
4. 20 A – logic, steering servo
5. 20 A – logic, steering servo

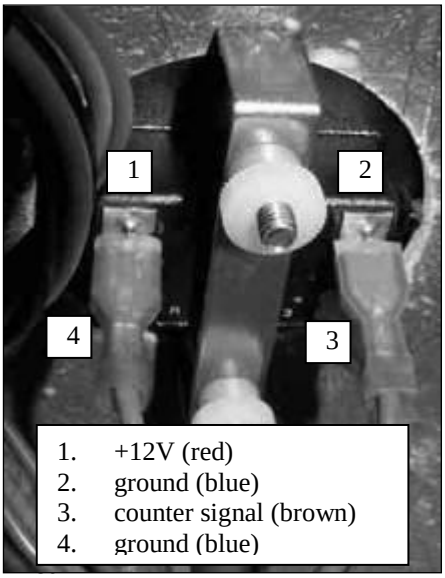


Fuses box

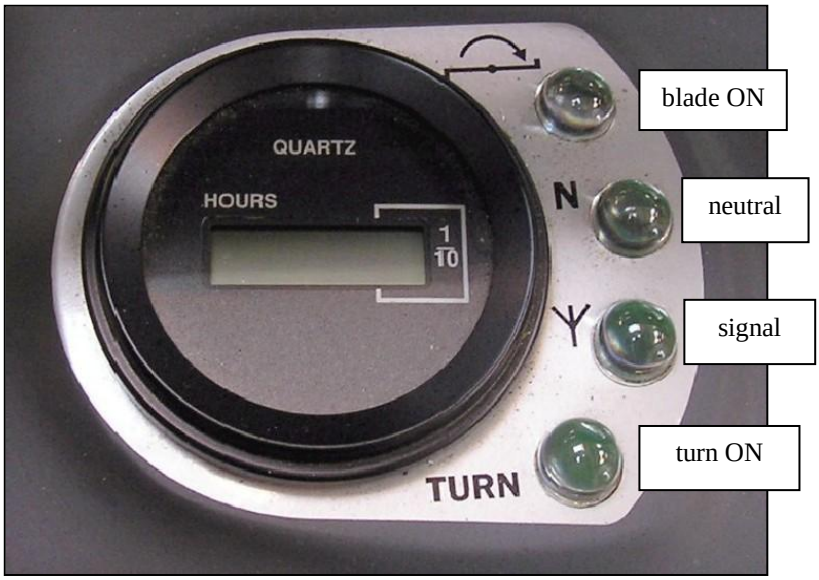
When changing fuses strictly follow the electric current value for which the fuses are designed. Do not replace damaged fuses with fuses with a higher or lower electric current value. These could cause large damage or even fire to the mower!

7.9 Control panel

- signaling + hour meter
  1. Power indicator (shines green if power is on)
  2. Signal reception (shines green if signal reception is correct)
  3. Neutral position (shines green if neutral pos. is correct)
  4. Blade (shines red when blade is engaged)



Hour meter



Control panel

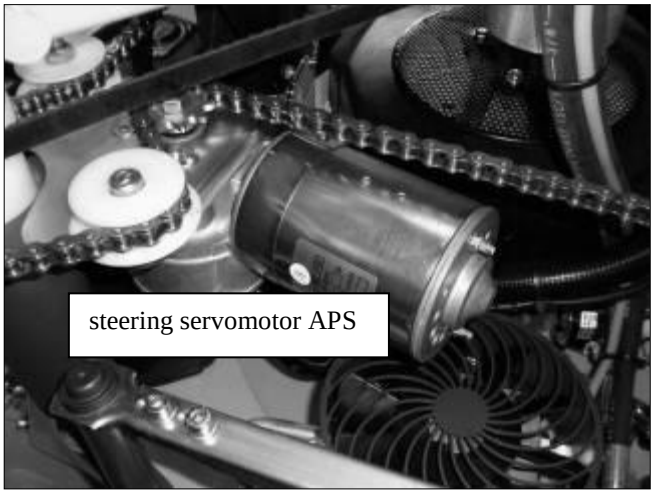
7.10 Accumulator

Characteristic:	Gel accumulator STORM FBTX 20L – BS (12V-18Ah)
Charging:	only charge for gel accumulator (INHACO ACL-1)
danger supply:	long time lower 12,16 V - quick accumulator destruction

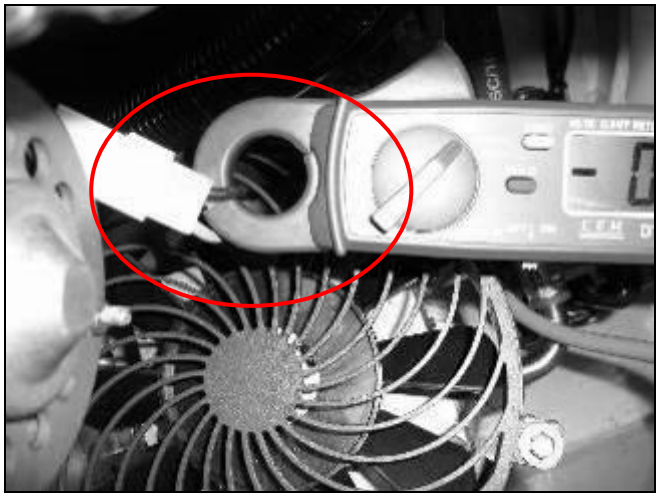
Accu current

7.11 Steering servomotor APS

Characteristic:	12 V, APS 8132186
	power supply 12V
	wheels above the ground =10A
	max. steering load = 30 A



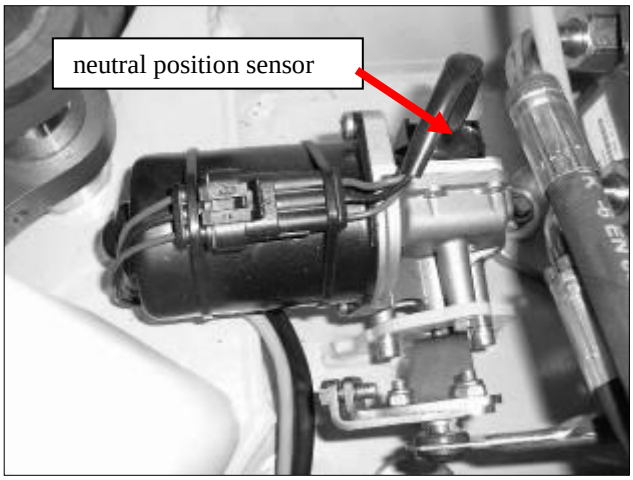
Steering servomotor APS



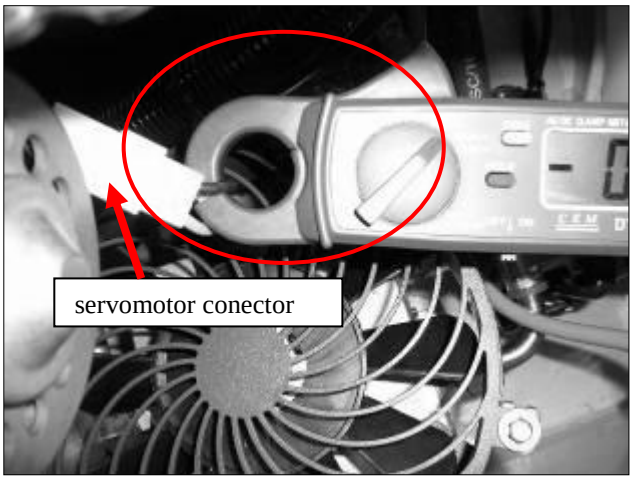
Current measuring

7.12 Servomotor of the drive control

Characteristic:	12 V PAL, both directions max. 2 A
Motor:	power supply = 12 V
controlling:	power supply = 12 V



Driving servomotor NBB

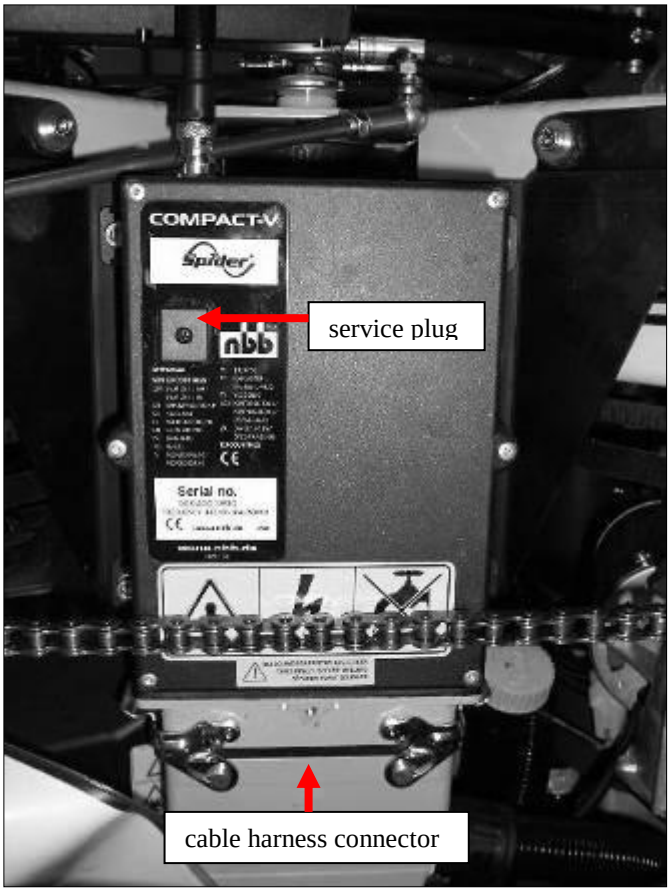


Current measuring

7.13 Control unit NBB

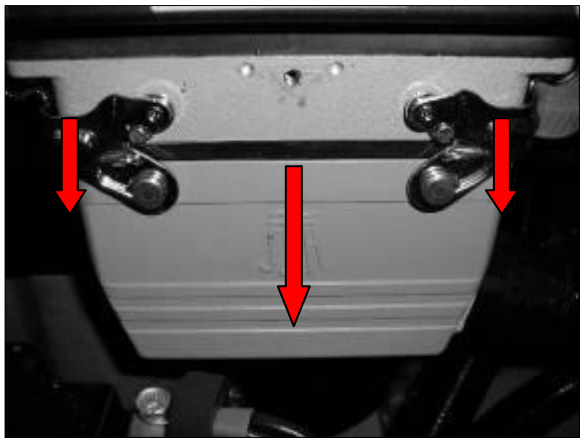
Characteristic: transmission and reception frequency range 400 – 477 MHz

With loosen and reconnecting cabel harness connector to the control unit be careful to the contacts in the connector



Control unit NBB

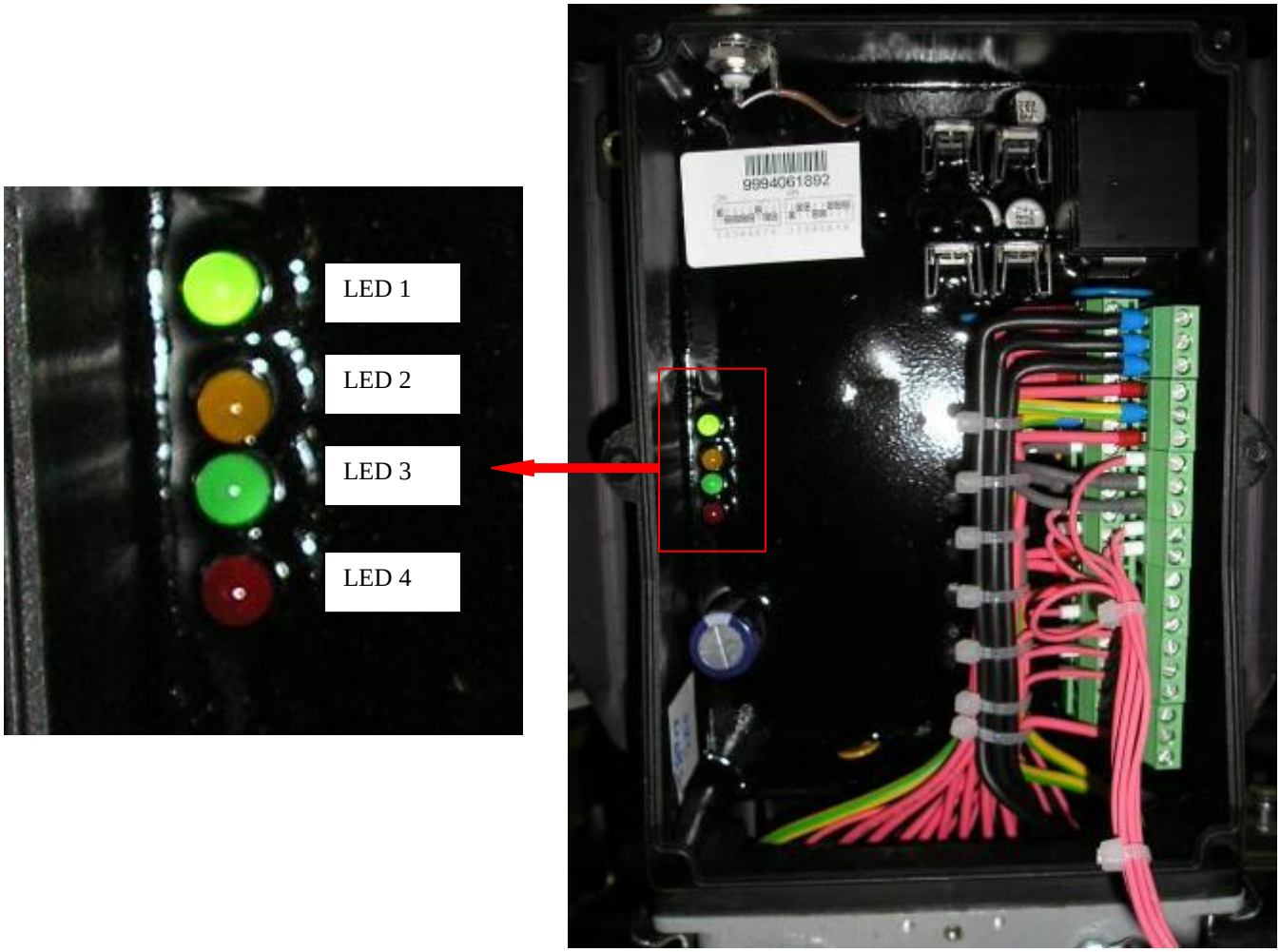
Serial number



Cable harness connector

Diagnostic leds:

LED 1 green:	POWER ON. If led fails to come on, check the power suplly. If the power lead is OK, control unit is probably at fault
LED 2 yellow:	HF PRESENT. Steady light when transmitter is switched on (insignificant for scanner operation)
LED 3 green:	Flashes evenly during fault-free operation. Irregular flashing means that the HF channel is probably at fault-please set another channel.
LED 4 red:	If this led flashes, the HF channel is at fault (not in the scanner operation). Steady light notifies the operator that an output function is critical due to over current.



!!!Attention!!!: During electro-welding on the machine, dsconnect the receiver from the current supply!
Otherwise there is a risk of damane to the receiver´s electronic systém!

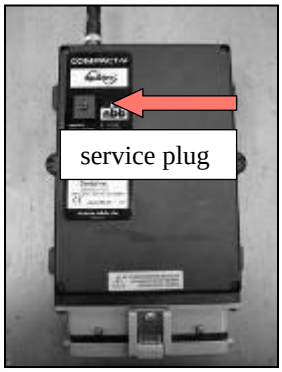
Programing of the control unit

CAUTION

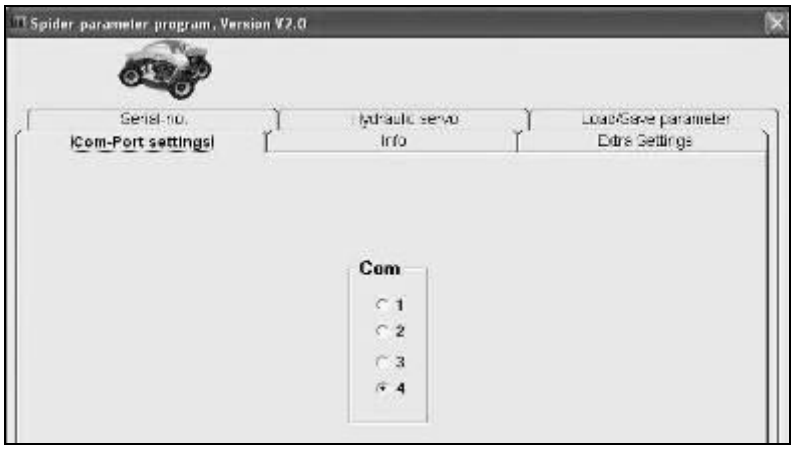
Switch off machine before connecting programming cable
Never use machine with connected programming cable

SPIDER PARAMETER PROGRAM

Getting Started:
- Ensure the power on the SPIDER is off
- Connect the programming cable between the NBB control unit (service plug) and your Computer
- Set the switch on the cable in the direction OFF or O (depends on the cable version)
- Switch on the power on the Spider

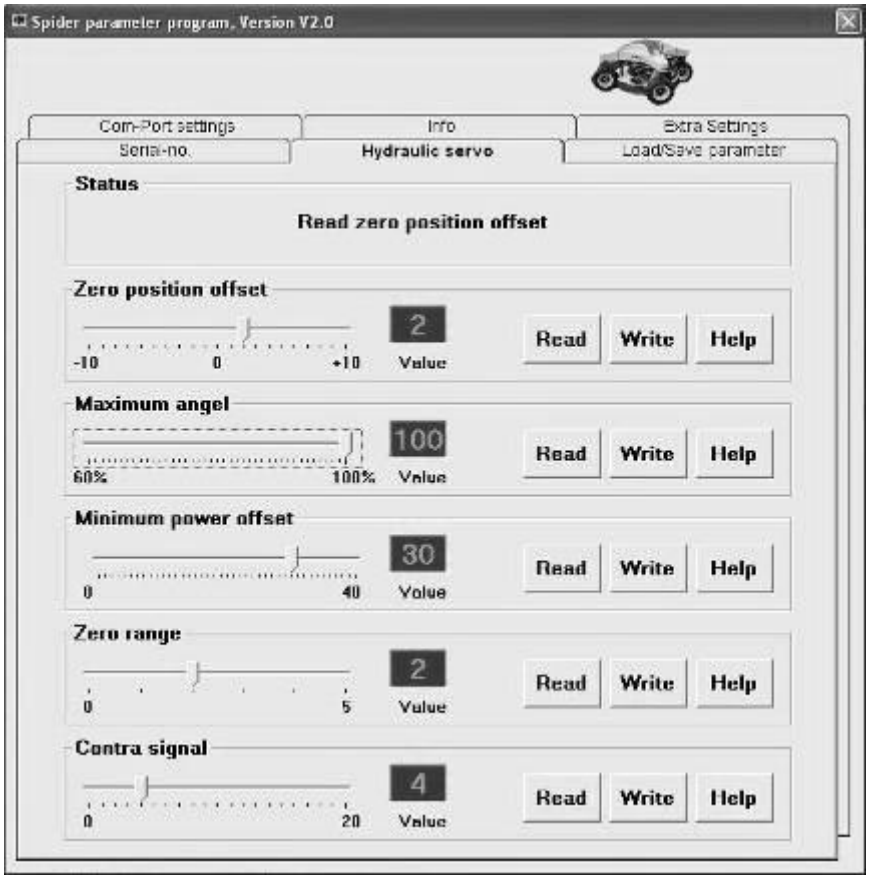

service plug

Operating with Spider Parameter Program:
- Select the tab "**Com-Port settings**" and select the com port you are using on your computer




programming cable

- When you select the tab "**Hydraulic servo**" you can read individual parameter from the \NBB control unit (receiver)
- You can change them and write them back to the NBB control unit. Use this function to set up parameters for the hydraulic pump servo.



	Default values:	Recommended range:
Zero position offset	**-1**	-5 +5
Maximum angle	**100**	90 – 100
Minimum power offset	**30**	25-30
Zero range	**2**	2-4
Contra signal	**4**	4-6

Possible adjustments:

Zero Position Offset

- To set an offset to the neutral (middle) position of the hydraulic servomotor.

Maximum angle

- To set the limit (range) angle of the hydraulic servomotor –max. speed for both sides

Minimum power offset

- To set the minimum power. When the reactions of the servo are too slow, it can be set higher.
- Oscillation of the servo can be correct with decreasing to value 25

Zero range

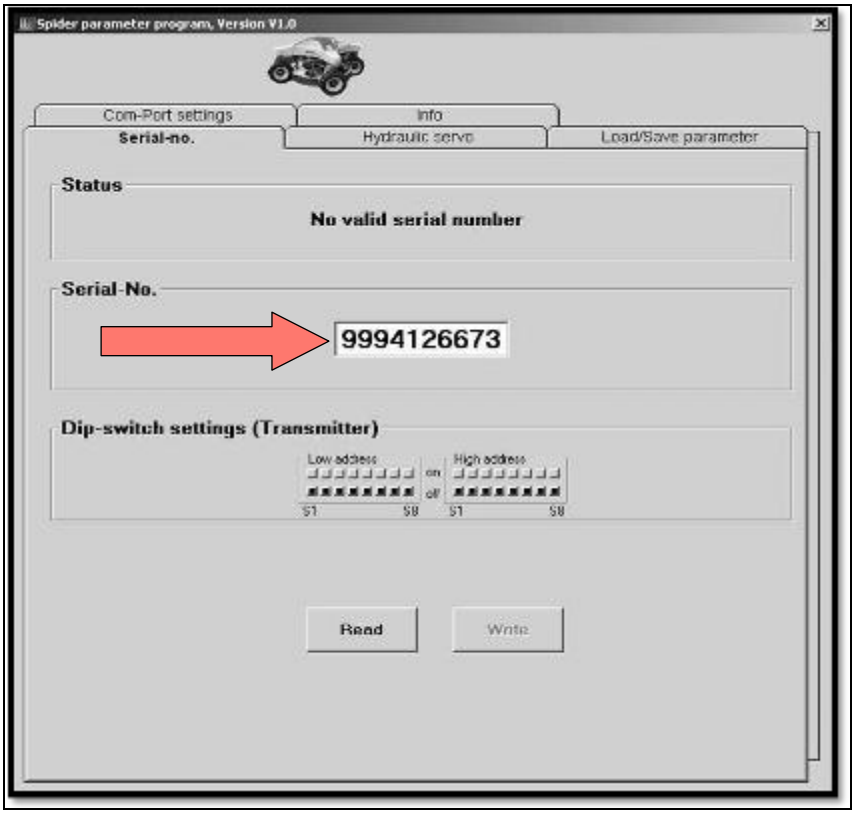
- To set the tolerance of the set point of the hydraulic servomotor. When it is 0 the motor will adjust to the exact angle-range for the neutral is 0 so servo will oscillate. This can be resolved with increasing to value above 2 up to 4

Contra signal

- To set the value of the contra signal. When joystick returns to the zero position the receiver generates a short contra (reverse) signal in the backward direction. This will stop the slow drive of the hydraulic drive. Visible mainly in Turtle mode

Match Handset to Control Unit

- When you select the tab "**Serial-no**" you can set the system address of the NBB control unit-receiver. Use the serial number of the hand set-transmitter (under battery) and "**Write**" it to the NBB control unit. Use this fntion to match the control unit with a new hand set.



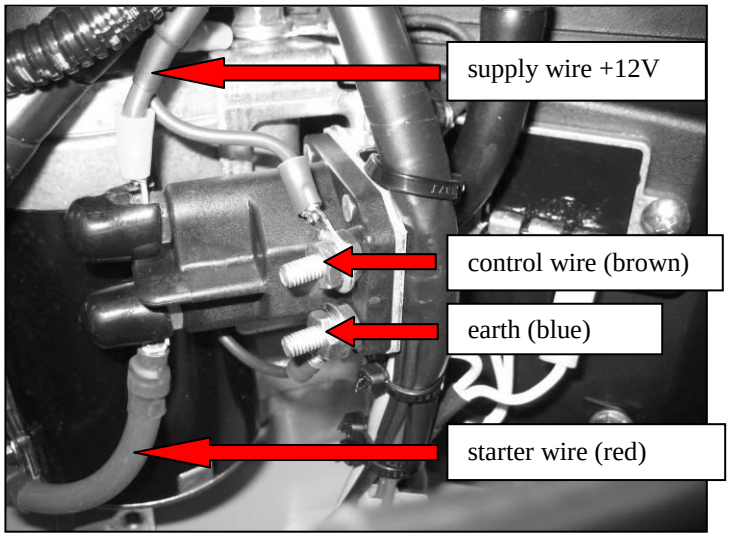
Finish:

- After you have changed any parameter in the receiver, you can select the tab "**Load/Save parameter**" to read all data from the NBB receiver and save them in a file. You can also load a parameter file and write that to the NBB receiver.

- When you have completed all parameter settings, switch off the power on the Spider and remove the programming cable from the receiver. Replace service plug

7.14 Starter – starter solenoid

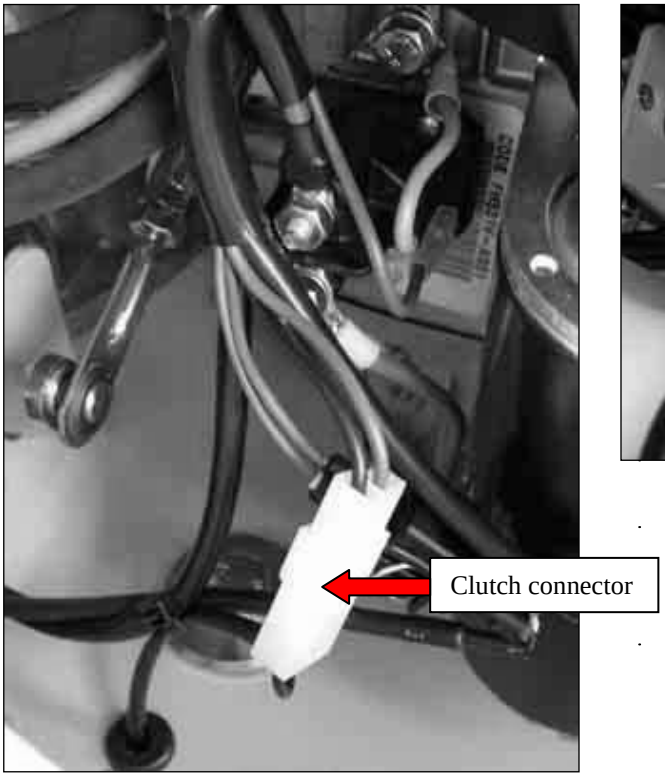
Characteristic: solenoid 12 V
control cable: switch on = 12 V and main cable voltage = 12 V
coil resistant = 4,1 ohm



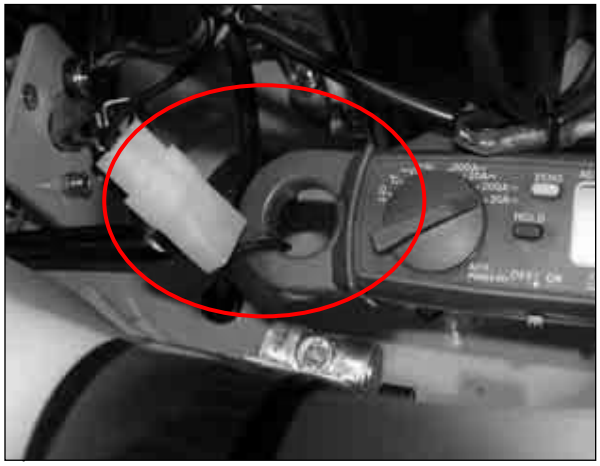
Starter relay

7.15 Clutch

Characteristic: switching voltage = 12 V
coil resistance. = 3,4 ohm
current (switch on) = 4,2 A



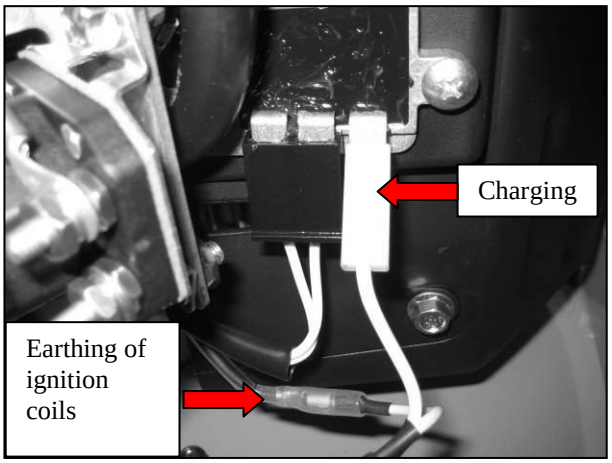
Clutch connector



Current measuring

7.16 Charging and ignition cables

Charging: voltage = 13,8 V
max. current = 13 A (FH 531) , 18 A (FH 500)
Ignition: cable grounding ignition by STOP (If is cable disconnect, engine is impossible turn off)



Charging and ignition cables

Current measuring

7.17 Measuring list

Measuring current, voltage and resistance

Drains	Current	Voltage	Resistance
	A	V	ohm
Solenoid carb.	0,4	12	40
Clutch-switch on	3,5	12	2,9
Charging (max)	13 (18)	12	
Steering (max)	30	12	
Linak	1 (down) 3 - 7 (up)	12	
starter - relay coil	3	12	4,1
moving servo	max 2	12	
engine rpm servo		6	
panel	0,1	12	
CU	2,1	12	

7.18 Cable harness circuit NBB

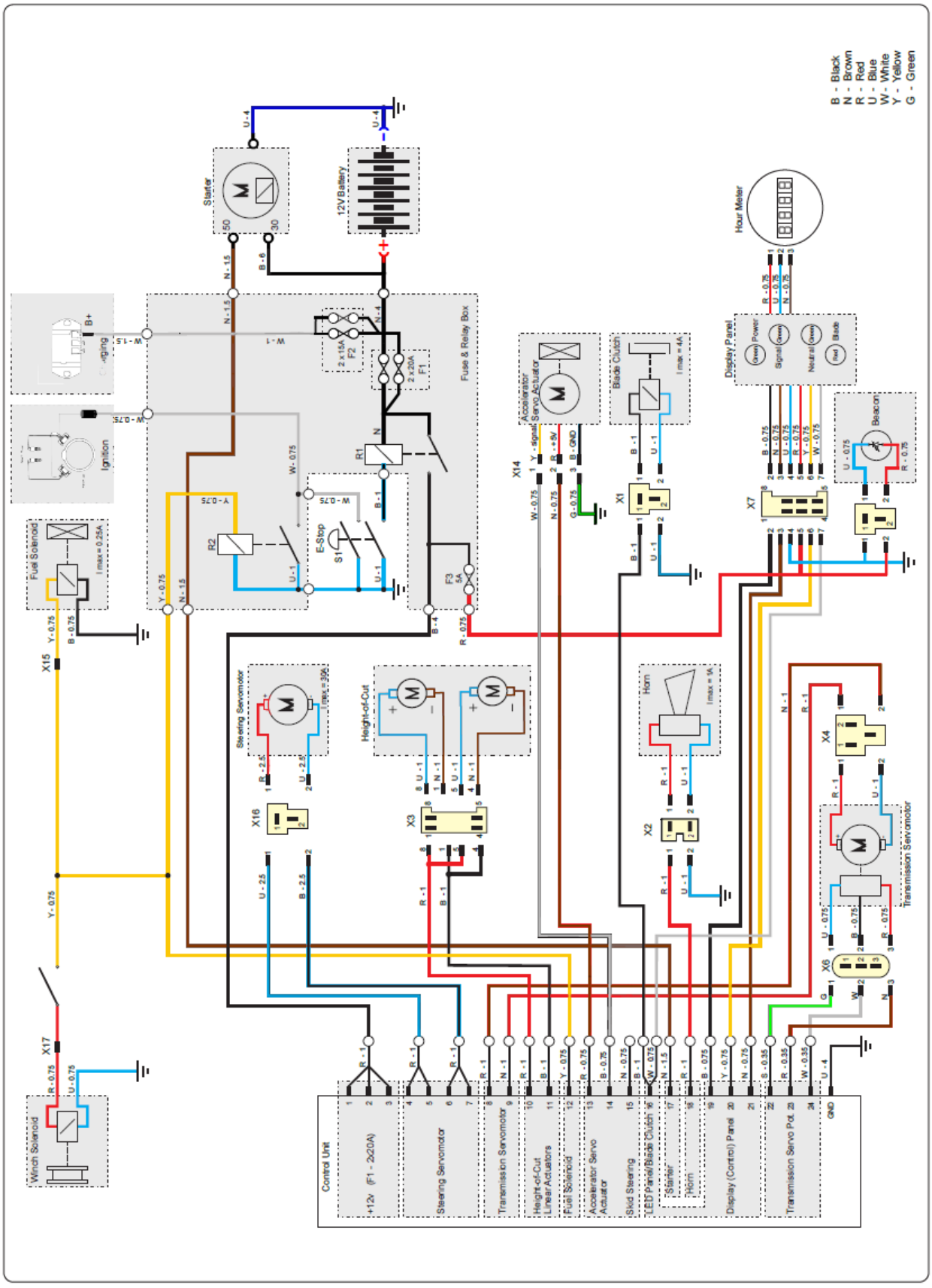


Diagram NBB ILD01 G