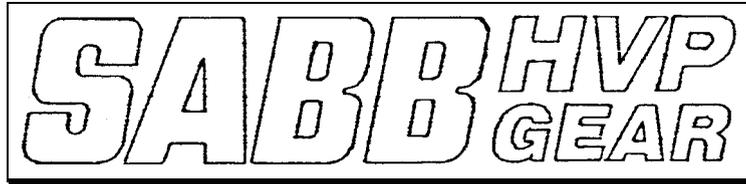


Form.: 977.642

February 2003



HYDRAULIC CONTROLLABLE PROPELLER

SABB HVP-45E

**DESCRIPTION-
MAINTENANCE-REPAIR-
PARTS LIST.**

SABB MOTOR A.S

P.O.Box 7170 - 5020 BERGEN - NORWAY

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WARNING

Always follow these health and safety recommendations carefully:

Loose or baggy clothing can be extremely dangerous when working on running engines or machinery.

So far as possible, work on or close to engines and machinery only when stopped. If this is not practicable, remember to keep tools, test equipment and all parts of the body well away from moving parts of the engine and or its equipment. Avoid contact with hot exhaust pipe, manifold and silencer. These can be very warm and cause severe burns.

Many liquids used in engines and for cleaning are harmful if accidentally swallowed or splashed into the eyes. In the event of swallowing diesel fuel, rinsing liquid, lubricating oil or similar liquids ALWAYS OBTAIN MEDICAL ASSISTANCE IMMEDIATELY.

SPECIFICATION

Type.....HVP-45E
Reduction ratio.....2,2:1 , 3,05:1 , 3,82:1
Max. input torque.....450Nm
Rotation, output flange.....Clockwise seen from aft.
Oil pressure, pitch control... ..65 bar
" " clutch.....24 bar
Oil type.....Engine oil SAE 20/30
Oil quantity10 litres
Movement of pull rod.....48 mm
Drop, output shaft.....140 mm
Weight.....150 kg
Adapter.....SAE 3 (dia. 409,55 mm)

MAINTENANCE

Routine maintenance is limited to checking oil level, oil change, filter change and greasing of rear end oil seals.

OIL CHANGE

Oil is pumped out by means of the oil drain pump while oil is still warm. Drain as much as pump can take in order to prevent sedimentation.

Fill approx. 10 liters engine lubricating oil SAE 20/30 through the dipstick plug hole.

For gearbox with Power Take-Off: Fill through plug hole in P.T.O. housing.

Check oil level regularly.

Change the oil first time after 50 hours running and then every year or 450 hours running.

CHANGING OIL FILTER

The oil flow is passing through the high pressure oil filter situated behind the oil pressure pump.

Replace oil filter element when changing oil: Unscrew filter housing using a 22 mm pipe wrench or ring spanner. Remove the old filter element and insert a new. Replace O-rings if damaged.

GREASING OIL SEALS

Grease the seals by giving grease cup one turn a day.

If greaser is difficult to reach by hand, install a remote greaser with pipe/hose connection for the 1/4 " BSP threads.

TIGHTENING TORQUES:

M8 bolts, hex.heads.....	25 Nm
M10 bolts, hex.heads.....	50 Nm
M12 bolts, hex.heads.....	88 Nm
M16 bolts, hex.heads.....	220 Nm
M16 UNBRAKO bolts.....	350 Nm

DESCRIPTION

HVP-45 is designed for fishing boats and similar boats for commercial use. Robustness is emphasized, and the gearbox must meet with the required loads and durability.

The reduction ratio is 2,2:1 , 3,05:1 and 3,82:1. Direction of rotation is left hand input, and right hand output.(viewed from rear)

The torque is transmitted from engine flywheel through the flexible coupling 25 to the hydraulic disc clutch 18.

The intermediate flange 3 has a shrunk-on gear 27 for driving the hydraulic pump 46 and Power Take-Off (PTO) if fitted.

From the clutch the torque is transmitted to drive shaft 37 and gear 39. The drive shaft is supported by taper roller bearings.

The intermediate shaft 94 and gear 40 are running in the two taper roller bearings 67 and 101 (thrust bearings). The intermediate flange 92 is fitted to the intermediate shaft and locked by the shaft guide 106 and four bolts 131.

The sealing is by oil seals 91, 97 and O-ring 107.

PROPELLER CONTROL SYSTEM

The system comprises following parts:

The servo cylinder 77 with front and rear end plates 81 and 72, servo cylinder end cover 79, servo piston rod 89 and servo piston 76. The piston has high pressure sealing ring 75. The piston rod is connected to the flange 87 which has two unions 170 and internal bores for oil supply to fore and aft side of the servo piston.

The servo piston/cylinder unit does not rotate, but is connected to the rod 95 via two taper roller bearings 65. The rod runs through the intermediate shaft 94 supported by two bushes 93.

The connection to propeller shaft system is by means of a split coupling and a split union.

The oil flow to both sides of the servo piston is controlled by the servo spool 155 in the servo valve housing 154. The latter is bolted to the gear housing with 2 bolts 152. The pipes 162 and 166 take the oil to fore and rear side of the servo piston 76.

The pitch arm 191 is hinged to front end of servo spool 155. The other end of pitch arm is connected to the pitch slide block 183, pitch lever shaft 182 and pitch lever 181.

Lower part of pitch arm will follow the axial movement of servo cylinder via sliding bolt 192.

Function:

The slide spool is pulled forward or astern by the external pitch control lever 181, and oil is fed to fore or at side of servo piston.

The servo cylinder will then move correspondingly and act on the pitch arm 191 which will take the servo spool back into zero position and close oil flow. Thus any position of the pitch arm 191 will make the servo cylinder/rod unit remain in the corresponding position.

This pre-selector system also acts opposite way:

If the propeller pitch tends to alter due to thrust force, the slide spool will automatically conteract by admitting oil pressure to fore or rear of servo piston. The propeller will then regain the pitch determined by the position of the pitch control lever 181

The oil pressure for pitch control system is set for 45 bar.

CLUTCH.

The clutch is a hydraulic operated disc clutch unit. The oil pressure will keep the clutch engaged, and oil is led in through bore in the pinion shaft 37.

When disengaging clutch the oil will flow back to the sump, and the clutch discs are separated by means of springs.

Only the clutch drum and the outer discs will rotate when disengaged. The hydraulic pump will always rotate with running engine.

HYDRAULIC SYSTEM

The high pressure oil pump 46 is fitted on port side of the gearbox and driven by the gears 27 and 52.

The pump shaft 58 has female spline and is connected to the pump via the sleeve 48 which has male spline.

Oil is sucked from the sump strainer 197 and is fed through the high pressure filter 149 to the valve base bracket 218. The valve base bracket comprises the following parts:

Oil pressure valve 225, pressure reducing valve 207, clutch direction valve 209, oil supply sleeve 123 and the oil pressure gauges 213 and 230.

Oil pressure valve 225 is adjusted for 45 bar, and pressure is registered by the pressure gauge 230. The valve controls the oil pressure for the hydraulic propeller pitch system. The pressure setting may be altered by removing the protective cap, loosen the lock nut and turn screw in (increase) or out

using a screw driver.

The pressure reducing valve 207 controls pressure for the clutch system. Setting value is 24 bar. Clutch pressure is registered by the gauge 213 mounted in the reducing valve. Adjust by loosening the lock nut in front of valve, and turn screw in or out using a screw driver.

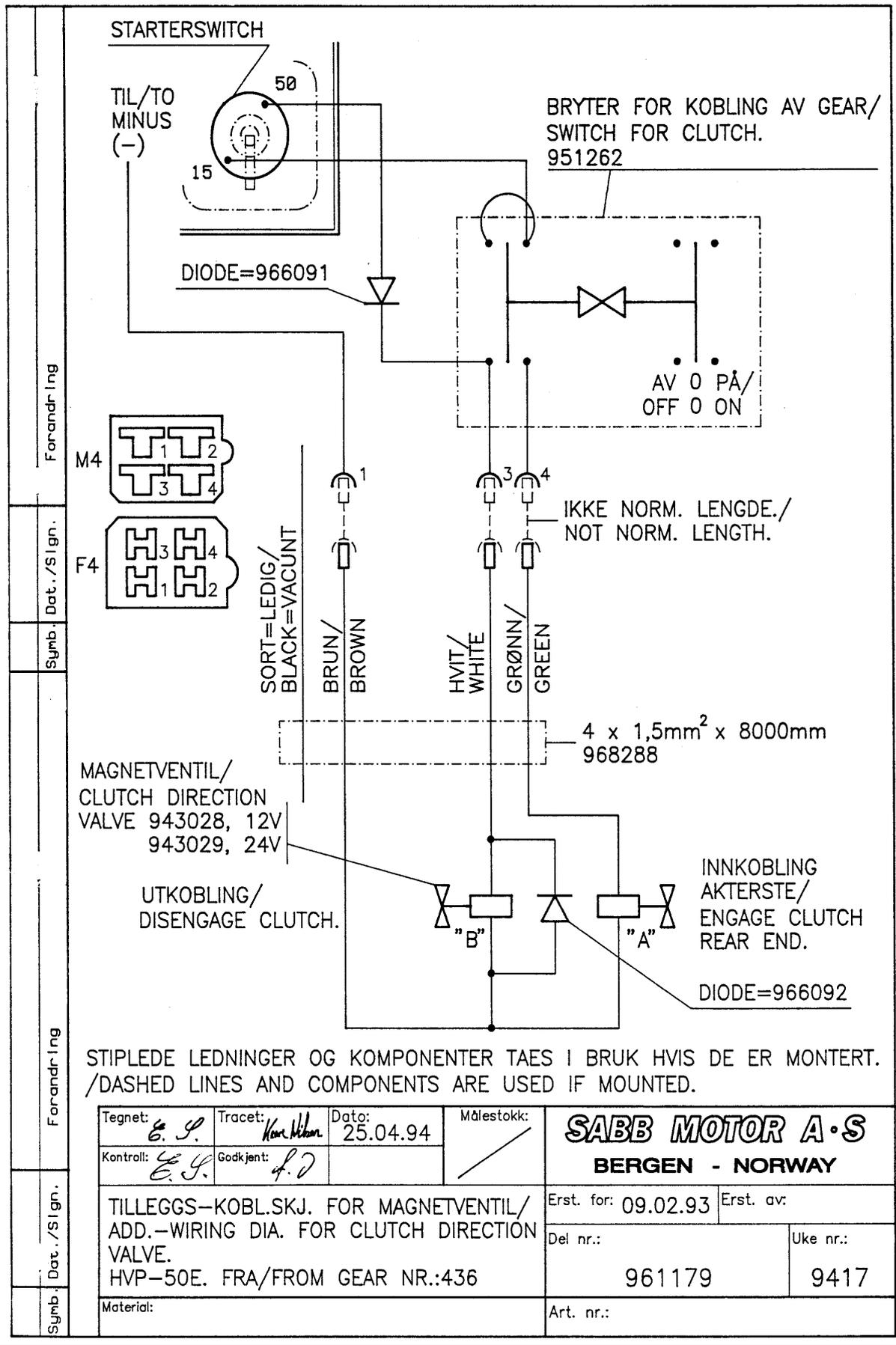
Oil to the clutch flows from reducing valve 207 to the direction valve 209 which is operated electrically (12 or 24 volt) by a switch in the pilot house. The oil continues via the oil supply sleeve 123 through the pinion shaft bore to the clutch. When disengaging clutch oil will return to the direction valve and to the sump.

WIRING OF CLUTCH DIRECTION VALVE.

The electric operated clutch direction valve has two solenoids (i.e. electric engaging and disengaging) In case of circuit break-down the direction valve will remain in latest position.

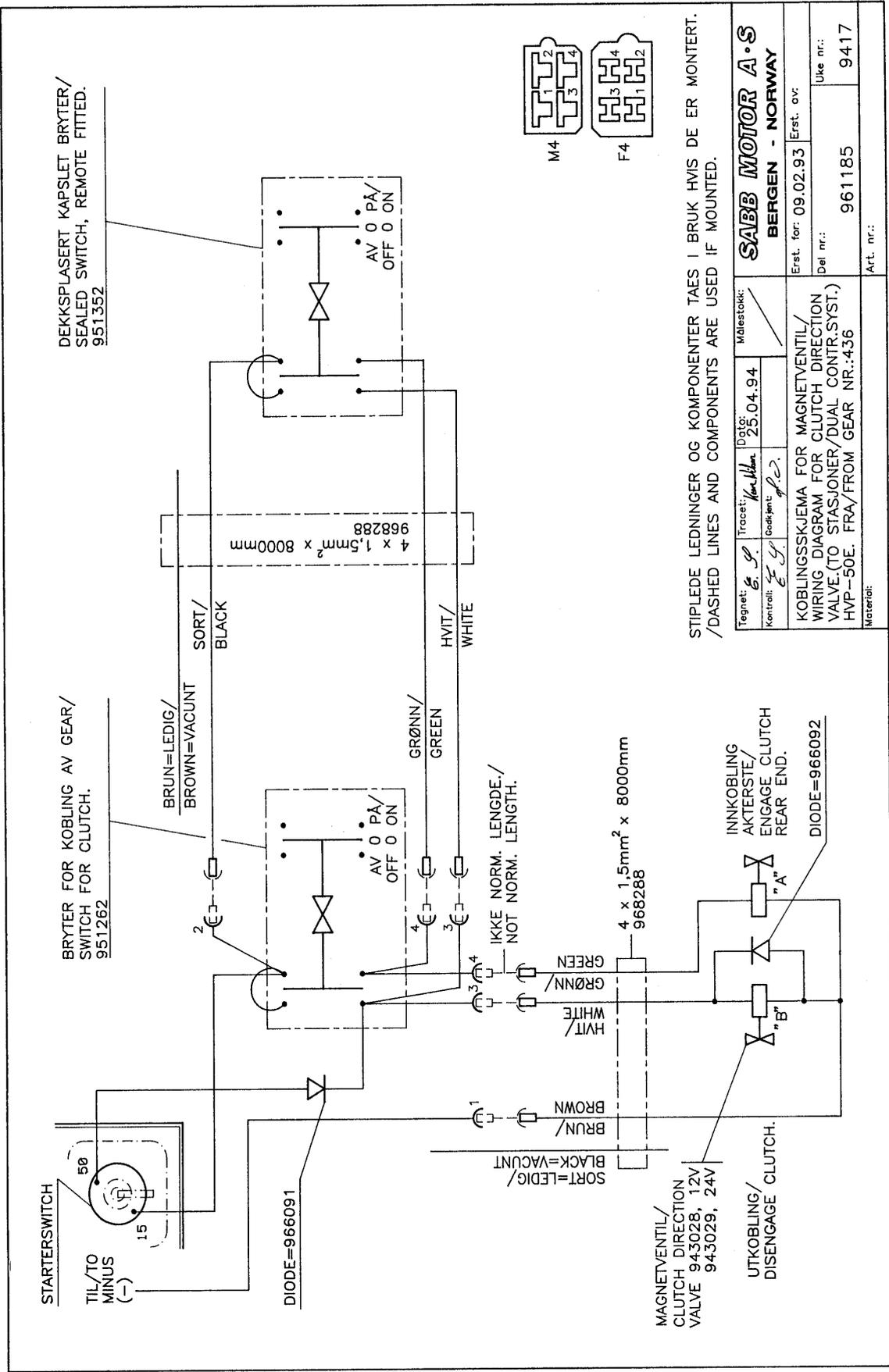
The direction valve is marked "SOL A" rear end and "SOL B" fore end. The corresponding plugs are grey for "SOL A", and black for "SOL B". Thus the grey plug is for rear solenoid. The switch should have "ON" and "OFF", wiring "ON" to "A" and "OFF" to "B".

See diagrams next pages.



STIPLEDE LEDNINGER OG KOMPONENTER TÆS I BRUK HVIS DE ER MONTERT.
 /DASHED LINES AND COMPONENTS ARE USED IF MOUNTED.

Tegnet: <i>E. S.</i>	Tracet: <i>Karl Nelson</i>	Dato: 25.04.94	Målestokk:	SABB MOTOR A·S BERGEN - NORWAY	
Kontroll: <i>E. S.</i>	Godkjent: <i>f. d.</i>				
TILLEGGS-KOBL.SKJ. FOR MAGNETVENTIL/ ADD.-WIRING DIA. FOR CLUTCH DIRECTION VALVE. HVP-50E. FRA/FROM GEAR NR.:436				Erst. for: 09.02.93	Erst. av:
Material:				Del nr.: 961179	Uke nr.: 9417
				Art. nr.:	



Tegnet: <i>E. S.</i>	Tracert: <i>Harald</i>	Dato: 25.04.94	Malestokk:
Kontroll: <i>E. S.</i>	Godkjent: <i>pl</i>		
KOBLINGSSKJEMA FOR MAGNETVENTIL/ WIRING DIAGRAM FOR CLUTCH DIRECTION VALVE.(TO STASJONER/DUAL CONTR.SYST.) HVP-50E. FRA/FROM GEAR NR.:436			
SABBB MOTOR A.S BERGEN - NORWAY		Erst. for: 09.02.93	Erst. av:
Material:		Del nr.: 961185	Uke nr.: 9417
		Art. nr.:	

REMOVING GEARBOX FROM ENGINE

1. Undo the shaft coupling from propeller shaft. Drive out the thrust pin and pull shaft coupling backwards.
2. Unscrew the split union. Using a slide gauge measure distance between rod ends and note the figure.
3. Undo remote control cable, and remove the plugs from direction valve. Loosen the gearbox fixing bolts from flywheel housing. Pull gearbox aft and lift. If the gearbox sticks in the elastic coupling, use screwdrivers or similar tools between the flanges.
Further dismantling depends on the job to be done.

DISMANTLING CLUTCH

1. Drain gearbox oil by operating the drain pump 199.
2. Remove cover 32. If PTO, remove it.
3. Unscrew the centre bolt 11 by means of an air driven 24mm socket wrench.
4. Extract the coupling hub by means of 4 pcs. 12 mm bolts.
5. Unscrew 6 pcs. bolts 23 in the ball bearing flange 23 and pull off the flange together with coupling flange and the outer clutch drum. Observe that the ball bearing 9 may stick to the pinion shaft due to tight fit.
6. Bend the tongue of the lock washer 15 and unscrew ring nut 14, using a hook spanner SKF No HN8.
The clutch is now free to be pulled off.
7. Replacement of burnt clutch discs or defective oil seals should be done by the factory. If you wish to have it done locally, please study the separate clutch drawing behind. Release the spring force on the lock ring 7; in a press. Take care not to lose the springs which separate the clutch discs. Note the position of inner and outer discs. It is essential these are fitted again in the same order: inner disc aftmost, then every other outer and inner. Fit the springs between the inner discs.
The O-ring 2 and 3 and the seal 11 are high temperature resistant and should always be replaced by new original rings in connection with clutch repair.
8. Pull the ball bearing flange 13 and the coupling flange 3 apart.
9. Remove the seal 70 and replace. Inspect the sleeve 67 for wear and replace if necessary.
10. Assembling of clutch is carried out in opposite direction to dismantling. First push the clutch unit into position on shaft. Then tighten ring nut 27 firmly and lock it. See that the clutch discs slide into their grooves to avoid bending. If the bolts 23 have been out, apply loctite to secure.
Replace the gasket 16.
Mount the remaining parts and tighten the bolt 6 with 20 kpm torque. Secure with lockwasher 7.

DISMANTLING GEARS AND SERVO CYLINDER

1. Remove four bolts 131 in intermediate shaft guide 106.
2. Use extractor to pull off intermediate shaft flange 92. The extractor pin should press against the pull rod when this is in foremost position.
3. Remove seal flange 96. Keep the shims 137 for later use.
4. Undo hoses and wires from valve base bracket 218.
5. Remove four bolts 220 and pull off base bracket. Keep the shims 138.
6. Unscrew the ten bolts 102. And remove cover 2
7. Note: To remove the pinion shaft 37, first take off the clutch. See DISMANTLING CLUTCH.
Unscrew the four bolts 29 and remove the collar 31.
8. Push out the drive shaft 37 from the frontside. The double taper bearing 35 has tight fit on the shaft, so a pressing device is necessary.
The shaft may also be pushed forward from the rear side after the circlip 120 has been removed and the bearing 107 has been pulled off. Push out the remaining parts of the bearing 35.
9. Take out the intermediate shaft 94.
10. Unscrew 8 bolts 142, 144 and 148 keeping the side cover 142. Remove the cover.
10. Remove pressure pipes 162 and 166.
11. Remove two bolts 152 and take out servo valve housing 154 with servo spool 155 and pitch arm 191. Take care of the pitch arm plug 193 and the sliding bolt 192.
12. Unscrew four bolts 88.
13. The complete servo cylinder with attachment flange 87 may be pulled backwards and out.
Further dismantling of servo cylinder as follows:
14. Remove circlip 61.
15. Pull out rod 95 with bearing sleeve 63 and bearings.
16. Fix front end plate 81 in a bench vice. Use a pin through the side bores to unscrew the cylinder.
17. The servo piston is unscrewed by means of special wrench, using the two end bores.
18. Now the cylinder end cover 79 and end plate 81 are free and can be pulled off.
19. Rear servo cylinder end plate 72 is pushed out of cylinder.
20. Check all parts for damage and wear. The surfaces of cylinder and servo piston rod 89 must be smooth and without scratches.
21. Replace seals 75 and 82. Also replace all O-rings. Use only original seals and O-rings.
22. Replace servo piston rod 89 if damaged or scratched. Unscrew the ring nut 84 and use pressing device to press out the piston rod from the attachment flange 87.
23. Fit new piston rod. Note the punch mark on piston rod

just in front of M30 threads and see that the marks are flush with mark in flange 87. The position is essential for functioning of the hydraulic system.

24. Tighten the ring nut and lock it.
25. **Utmost care and cleanliness are important in order to obtain correct function and long life of the hydraulic system. All parts should be cleaned and dried using soft rags. Oil bores are blown through with dry compressed air.**
Also check carefully that metal particles and burrs from machining are completely removed before assembly.
26. Fit servo cylinder opposite sequence to disassembly. The hydraulic seal 82 has a nylon ring which is facing forward. Apply Loctite 242 to the threads of servo cylinder and piston, and tighten well.
27. Inspect the rod 95 for wear or damage. Replace rod if necessary.
28. Inspect the taper roller bearings 65 and replace if worn. Fit again without axial clearance, but permit rollers to move freely. Adjust axial clearance by means of ring nut 68. The outer nut should be tightened well after clearance is set. Lock the nuts with the lock washer between the two nuts, bending one tongue over each nut.
29. The clearance between roller bearing sleeve 63 and the circlip 61 is adjusted to zero by means of shim 62.
30. The complete servo cylinder is now fitted. Use new gasket 86. Tightening torque for bolts 88 is 5 kpm.
31. Check pinion on drive shaft 37 and gear wheel on intermediate shaft 94 for damage or wear before installing.
If the gear wheel 38 has to be replaced, unscrew the bolts and remove the gear ring 64. The gear wheel has press fit and a hydraulic press must be available.
New gear wheel is heated on electric cooker or in oven to 150 centigrade before mounting. Check the taper bearings 35, 67, 101 and the spherical roller bearing 107 for wear or damages.
If worn, use a clamp to remove the bearings. The bearings 67 and 69 on the intermediate shaft 94 may be hammered out with a drift through the holes.
Fit new bearings and make sure that the bearings bottom all round.
The bearing 35 consists of two identical taper bearings plus a spacer between.
The bearing can only be replaced as one unit, supplied from Sabb Motor AS.
33. Inspect bushes 93 for wear. Replace if required. After fitting use an adjustable reamer (supported) to smooth bushings to 25 H8, i.e. +0,033/0,000. File three grooves for lubrication of the bushes, 3x0,5 mm.

34. First fit the complete intermediate shaft 94. Then fit the pinion shaft 37 with bearing 107 in position in the gearbox housing.
The bearing 35 is mounted as follows:
Push into position in housing the rear outer race.
Heat the two inner races to 150 centigrade and push into position on the shaft. Then fit the spacer and finally the fore outer race. Fit the collar 31 and tighten the screws 29 with spring washers 108.
35. If new bearings have to be replaced. They have to be placed in cover with new gasket. Position it on the dowels and tighten up with 5 kpm torque.
36. Check the axial clearance for the intermediate shaft, using original shims 137 and with seal flange 96 fitted and tightened up. The pinion shaft 37 is positioned by the bearing, and need no shimming. Axial clearance between bearing and valve base bracket 218 should be 0-0,1 mm.
Use a rubber mallet to hammer the intermediate shaft in both directions.
There should be no axial movement, but the shaft must not jam between the bearings.
Measure axial clearance with a micrometer gauge, and add corresponding shims until zero.
37. Before fitting finally the seal flange 96 replace both oil seals 97. The seals are fitted "back-to-back" with sealing lips apart. The space between seals is filled with grease. The outer seal has a bronze spring. The inner seal is without spring.
38. Before fixing the valve base bracket 218 check wear of sleeve 259. The sleeve is easily pushed out after unscrewing bolt 235. Use a socket wrench or similar hooking device from behind.
Replace the O-rings together with the sleeve. Apply some grease to the O-rings. Align sleeve bores horizontally and push home until bolt 235 enters its hole to prevent rotation.
39. Check the sleeves 109, replace if worn or damaged.
40. Intermediate flange 92 is heated on a cooker to approx 100 centigrade, and fitted rapidly so that it does not bite on the shaft.
41. Fit intermediate shaft guide 109, new O-ring 107 and seal ring 91.
42. Tighten the bolts 131 to 8,8 kpm

SLIDE SYSTEM

1. Inspect carefully the servo valve housing 154 and the servo spool 155. No scratches or scores are accepted in these parts. The edges should be sharp. The servo spool is lapped into the housing and the two parts should be replaced as one unit.

All parts of the slide system must operate smoothly without backlash. Worn parts should be replaced. Use new circlips and make sure these are correctly positioned in their grooves. All parts to be rinsed and cleaned before assembling again.

2. Fit slide system with new O-ring 78 and tighten bolts to 5 kpm.
3. Fit oil pressure pipes 162 and 166.
4. Fit the nylon pitch arm plug 193.
5. Fit the complete gearbox side cover 140.

NOTE: When fitting, lower part of cover should rest against the nylon plug to prevent the sliding bolt 192 from dropping out, until slide block 183 is positioned in the fork.

6. Fit external hoses again.

VALVE HOLDER AND VALVES

See also HYDRAULIC SYSTEM

Replacing the press. reducing valve 207 or direction valve 209:

1. Remove wires from direction valve, and unscrew the four cap screws 211 securing the valve to the holder. The valves are now free and may be replaced.
2. In the "P"-connection bore of the reducing valve an orifice nozzle is fitted, the function of which is to reduce the shock during engagement of clutch. The nozzle is easily removed and should be fitted again with the new valve.
3. Make sure the O-rings are properly fitted again.
4. Fit the four cap screw, and connect wires again.

FITTING GEARBOX TO ENGINE

1. Check rubber element in elastic coupling before lifting gearbox into position. Tighten bolts evenly as gearbox enters its guide in flywheel housing.
2. Connect pull rods with the split union, so that the rods maintain their previous position. Measure distance between rod ends, this should be same as before dismantling.
Tightening torque for split union bolt: 12 kpm.
3. Connect the shaft coupling with thrust pin positioned in the groove. Tightening torque for M16 Allen screws is 35 kpm and for the 16 flange screws 20 kpm.
4. Connect oil hoses and control cable.
5. If Power Take-Off: Clean sealing faces and apply liquid joint as required.
6. Fill up with lubricating oil SAE 20/30 to upper mark on dipstick.

DISASSEMBLING AND ASSEMBLING OF OIL PUMP WITH DRIVESHAFT

1. Remove hoses and high pressure filter 149. Unscrew the bolts 44 and pull out the pump.
2. Check the spline connection for wear.
3. If the spline connection is worn, pump shaft 58 and spline sleeve 48 have to be replaced.
4. The shaft is only removable with gearbox detached from engine.
5. Remove the clutch. See "DISMANTLING CLUTCH".
6. Remove the circlip 49 and pull out the end cover 57, using a screwdriver. Unscrew the nut 55 and knock the shaft backwards. The gearwheel 52 is now loose and will fall down.
Keep the key 59.
7. Inspect the ball bearings 120 and 50 and replace if necessary.
8. Insert the shaft and fit the parts in opposite way to disassembling.
9. If the spline connection has been replaced, fit a new spline sleeve 44 on the pump shaft. Secure the nut with Loctite.
10. Smear the spline connection with molycote grease, fit a new gasket 43 and the pump. Fit the hoses and high pressure filter. Prime the suction hose opening with oil in order to ease the pump function during initial start.
11. Assemble the clutch and the elastic coupling. See "DISMANTLING CLUTCH".

STARTING

1. Before start, if pressure reducing valve 207 has been replaced, unscrew pressure adjusting screw fully. This will prevent damage to the clutch if oil pressure is too high.
2. Also unscrew the adjusting screw in pressure valve 225 to lower the start pressure.
3. Disengage clutch before starting the engine. Adjust pressure on valve 225 until pressure gauge shows 83 bar.
4. Permit engine to idle until gearbox oil is warm.
5. Adjust again pressure on valve 225 to 45 bar.
6. Adjust pressure on reducing valve 207 until gauge 213 reads 35 bar. Tighten lock nut. Test clutch and pitch controls when engine is idling.
7. Check pitch and clutch function on running engine.

NOTE: ALWAYS ADJUST PROPELLER PITCH TO NEUTRAL BEFORE ENGAGING THE CLUTCH

8. Check that all external seals and hose connection are oil tight.
9. Re-tighten external bolts, nuts and hose connections after some hours of operation.
Top up with lub.oil as required.

OIL COOLER

The gear oil temperature should not exceed 70 degrees C. Maximum allowable temp. is 80 degrees C. Higher temps. will cause increased wear and reduce the life of gaskets and seals.

The internal leak will cause sluggish and delayed control of entire system.

The oil cooler capacity depends mainly on water temperature and water flow through cooler. In general our standard gearbox oil cooler is adequate. As a rule of thumb calculate necessary capacity of oil cooler to be 10% of engine rating.

The cooler is installed in the sea flow line from water inlet, at pump suction and before the heat exchanger, and the sea water flow should be opposite to the oil flow. The gearbox oil temperature should be checked after the cooler has been installed to make sure the temp is below 70 degrees C.

Our standard coolers have large inlet/outlet (45 mm) suitable for keel cooling.

TROUBLE SHOOTING

Following information may be to some use for trouble shooting and repair.

The oil pressures stated are for warm gearbox.

Oil pressure for pitch control is set for 45 bar and for the clutch pressure is set for 35 bar.

The oil pressure settings are for gearboxes running at max. ratings. For lower ratings, some pressure drops may be accepted.

Too low pitch control pressure may cause slow and sluggish pitch movement, and too low clutch oil pressure may cause slipping and disc damage.

Check oil gauges regularly.

Low oil pressure for pitch control is normally caused by:

1. Lack of oil in sump. Check level.
2. Clogged high pressure oil filter. Check.
3. If oil pump takes in air the gauge will show unstable pressure. If oil tends to foam, the reason is probably a leaky suction hose. Check hose fittings.
4. Loose oil pressure relief valve. Adjust oil pressure and tighten lock nut.

5. Clogged sump strainer. If normal oil/filter service is followed the sump strainer does not require attention. The strainer is serviced at major overhauls only. Access to strainer: Pump out sump oil and remove the sump strainer bracket 194.
6. Worn hydraulic pump. Check as follows:
Undo pressure hose 223 at pressure gauge end, and connect hose to a pressure gauge direct, leaving out the pitch control system.
Start engine with clutch disengaged. If pressure is still low, the pump is leaking or worn and must be replaced.

When replacing the pump also check the spline connection. If pressure is normal, 45 bar, the fault is in the pitch control system.
7. Remove cover 140 (see DISMANTLING GEAR AND SERVO CYLINDER)
Check that pressure pipe 162 and 166 are tight and fixed. If the pipes are OK, check the oil seal 82 visually. If oil leaks through this seal, it should be replaced. Sump oil level must be lowered some so that the seal is visible. Press the servo cylinder backwards and note if any oil is leaking through the seal. This check will always cause some oil leaking out of the gearbox. Clutch should be disengaged during the check.
8. If the reason for oil pressure drop is still not found, contact your nearest SABB Service or the factory .
9. Irregular oil clutch pressure, with pitch control system in order, is likely caused by defective clutch direction valve or pressure reducing valve .
The valve may be sent to the factory or to specialist for inspection.
10. If pitch control function becomes sluggish and slow, and oil pressure is OK, the reason is likely undue friction in the propeller. Stern grease of unsuitable make is slowly washed away from the propeller boss, increasing the internal friction. Always use water resistant grease. The ship must be beached for checking propeller.
11. If oil pressure drops completely the pump drive components will need attention:
First check oil level and oil filter. If these are OK, remove oil pump and check the pump drive components. Also see that the pump shaft is free to rotate.
12. If the clutch does not permit engaging or disengaging: Defective direction valve/solenoid, ineffective electric wiring or voltage drop. Check fuses and wire connections.
If the defect is traced to the solenoid this should be replaced. The defective unit may be checked by specialist.

EMERGENCY "COME HOME" DEVICE
IN CASE OF DEFECTIVE CLUTCH DIRECTION VALVE THE CLUTCH MAY BE
ENGAGED MANUALLY.

The gearbox has double-acting direction valve. In case of break-down of electric supply to the solenoids the valve will remain in its latest position. Thus there is no danger that the clutch will engage or disengage when the electric circuit is cut off.

The valve may be operated manually by pushing forward (engage) and backwards (disengage).

Use a thin piece of metal to push the valve.

INSTALLING ENGINE/GEARBOX TO PROPELLER SHAFT

Correct alignment of gearbox output shaft against the shaft coupling is essential. The final adjustment should be done when boat is afloat.

The shaft coupling should be fixed to the shaft and bolts properly tightened-up before final alignment. The cap screws are tightened to 35 kpm, and the flange bolts to 22 kpm.

Thrust pins and bolts should be matched to the slots in propeller shaft as required.

First rotate shaft coupling by hand and use a rigidly mounted clock gauge to check that the machined face runs true axially. Repeat the procedure for the gearbox flange.

Then holding the two flanges firmly together use a feeler blade to measure the parallel alignment in four positions. The alignment is acceptable if a feeler 0.05 mm can not enter between the flanges. Rotate shaft coupling and check again every 1/4 turn. Bolts tightened with 8,8 kpm.

Check alignment again after appr. 150 operating hours. At the same time re-tighten the foundation mounting bolts.

The propeller blades are set with max astern pitch , i.e. the operator control and pull rod in rearmost position. In this position connect the rods with the split union. Bolt is tightened to 9 kpm.

ADJUSTMENT OF PROPELLER PITCH:

The movement of pitch control lever is limited by the screw 175. Determine the pitch which is best for boat speed at max. operating rpm., and adjust the screw accordingly.

ORDERING SPARE PARTS

Use the parts list, and state:

Gearbox type and serial No.

Part name and part No.

Quantity

Name and address/forwarding address

Required transport (airmail/surface mail or other) Spares are ordered through your SABB agent or direct to:

SABB MOTOR A.S, 5020 BERGEN, NORWAY. P.b 7170

Any information in this booklet is subject to change without prior notice to the customer.

February 2003

SABB MOTOR A.S.
Bergen, Norway