3.4 Flashing the travel circuit

Cleaning the hydraulic oil tank

1. Pump the hydraulic oil from the hydraulic oil tank into a clean container or an oil bag using the filling and filtering unit.
2. Mark all hoses (Fig. 1) and disconnect them from the tank cover.
3. Unscrew the fastening screws for the cover and remove the cover.

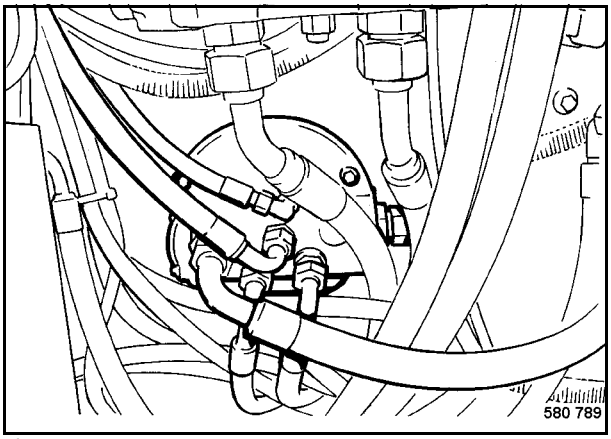


Fig. 1

Environment

Catch hydraulic oil and dispose of environmentally!

4. Clean the hydraulic oil tank thoroughly from inside, reassemble cover and hoses.

Filter installation for flushing the travel circuit

Caution

Before installing the flushing filter check hoses and connections for cleanliness, clean if necessary.

1. Disconnect the upper high pressure hose (Fig. 2) from the travel pump.

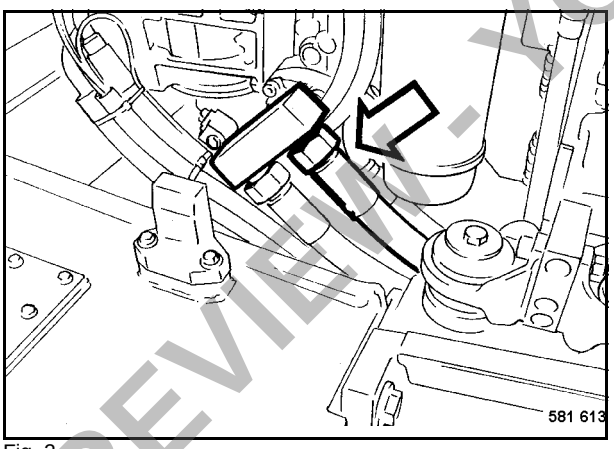


Fig. 2

2. Connect flushing hose 7 (Fig. 3) from the filter outlet to the travel pump using elbow (5) and reducing fitting (6).
3. Connect flushing hose (4) from the filter inlet to the disconnected high pressure hose (1) using reducing fitting (3) and double end union (2).

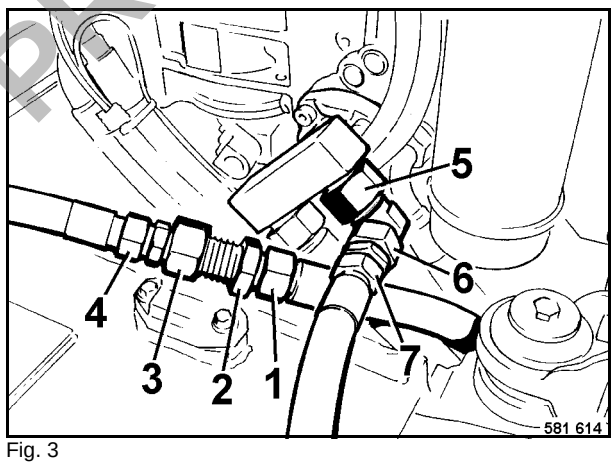
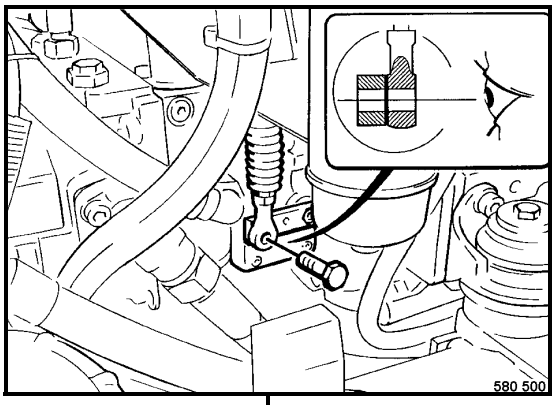


Fig. 3

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4.2 Trouble shooting diagram

The machine drives with the travel lever in „NEUTRAL“

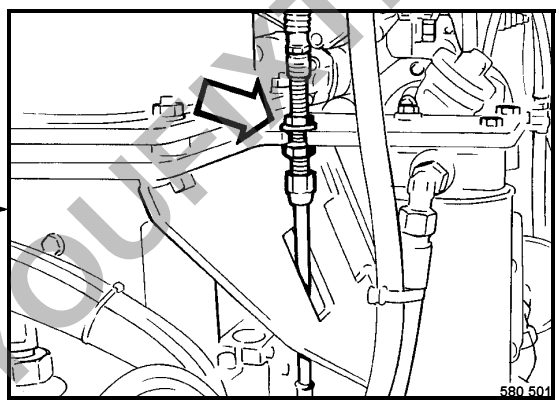


Check the neutral position

- Set the travel lever to „Neutral“
- Detach the travel cable from the pump
- check, whether bores of ball socket and control lever are in line.

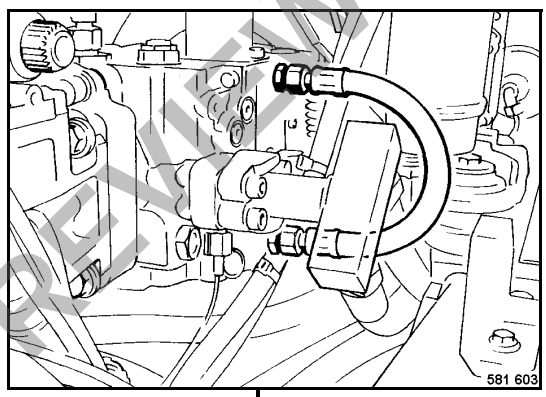
Bores are in line?

no



Adjust the travel control cable

yes



Check the mechanical 0-position

- Connect the control chambers with a hose

Neutral position OK?

no

yes

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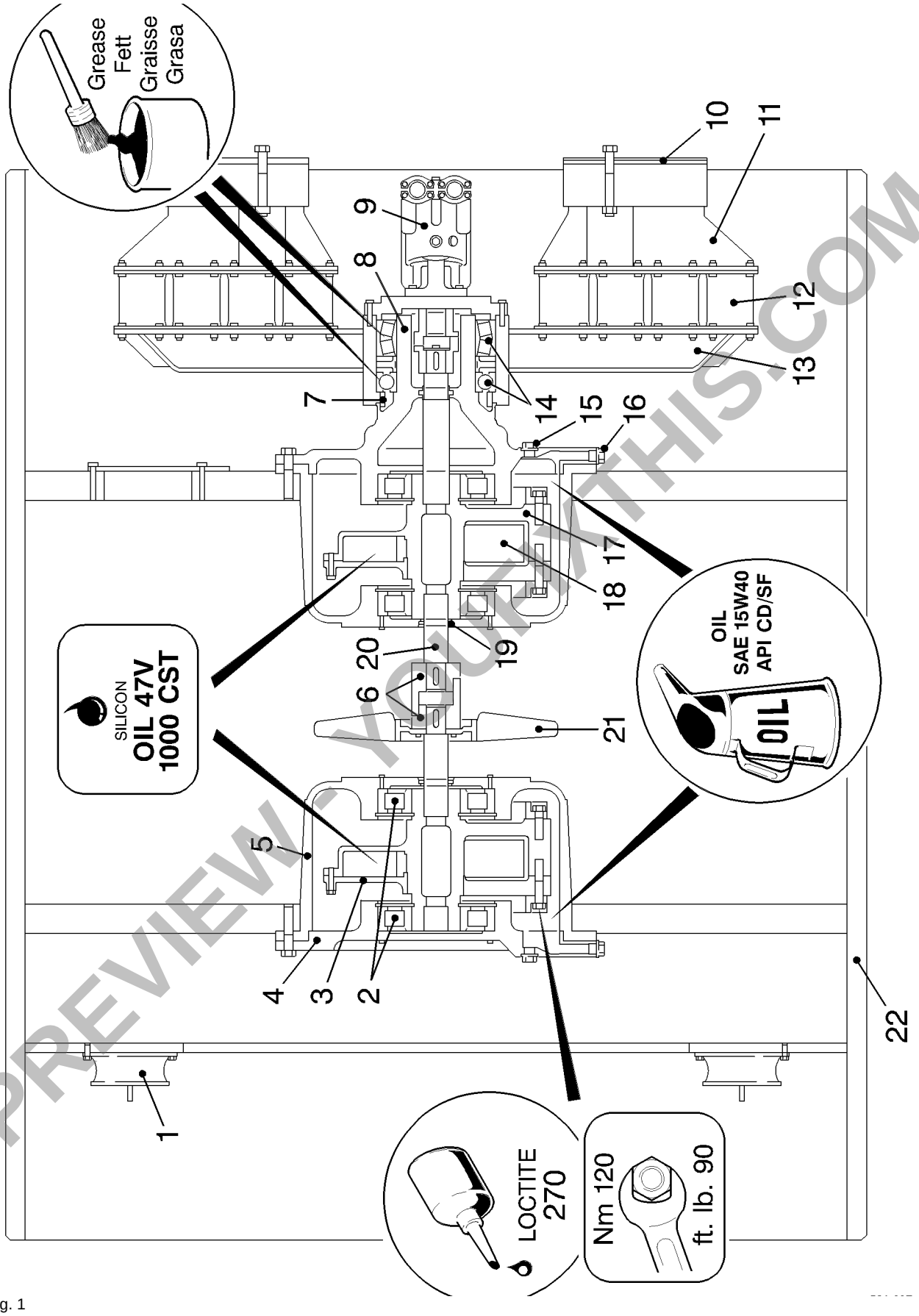


Fig. 1

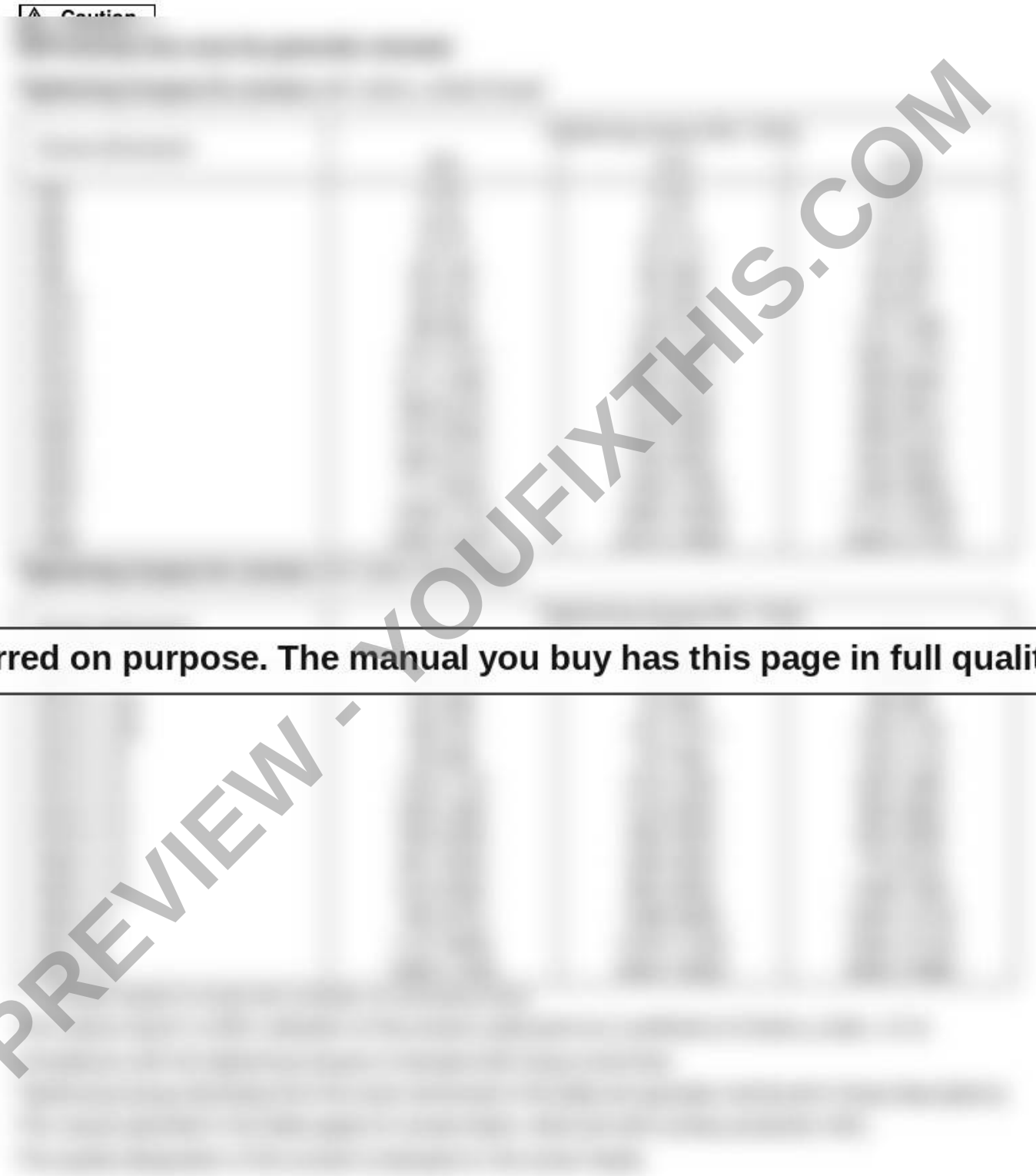
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Tightening torques

Tighten fastening screws and nuts according to the table of tightening torques.

Tightening torques deviating from the ones in the table are specially mentioned in the repair instructions.



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General		**5**
	1.1 Foreword	6
	1.2 Safety regulations	7
	1.3 General repair instructions	9
	1.4 Tightening torques	11
	1.5 Connection overview	12
Tests and adjustments		**15**
	2.1 Technical data	16
	2.2 Technical data	19
	2.3 Technical data	22
	2.4 Technical data	25
	2.5 Special tools	28
	2.6 Checking the rotation speeds	29
	2.7 Checking / adjusting the mechanical neutral position of the travel pump	31
	2.8 Pressure tests in the travel circuit	34
	2.9 Checking / adjusting the vibrator shaft speeds	36
	2.10 Pressure measurements in the vibration circuit	38
	2.11 Checking the leakage rate of the vibration motor	39
	2.12 Pressure test in steering circuit	40
Flushing		**43**
	3.1 Special tools for flushing	44
	3.2 Flushing schematic for drum drive	46
	3.3 Flushing schematic for axle drive	48
	3.4 Flashing the travel circuit	50
	3.5 Flushing schematic for vibration drive	60
	3.6 Flushing the vibration circuit	62
Trouble shooting		**69**
	4.1 General	70
	4.2 Trouble shooting diagram	71
Drum		**95**
	5.1 Special tools	96
	5.2 Repair overview for drum	98
	5.3 Removing and installing the drum	100
	5.4 Repairing the drum	104
	5.5 Dismantling, assembling the change-over weights	136
	5.6 Changing the rubber buffers	139
Drum		**141**
	6.1 Repair overview drum, Vario	142
Oscillating articulated joint		**145**
	7.1 Special tools	146
	7.2 Repair overview oscillating articulated joint	148
	7.3 Removing and installing the oscillating articulated joint	150
	7.4 Dismantling the oscillating articulated joint	152
	7.5 Assembling the oscillating articulated joint	155
Suppliers documentation		**159**
	8.1 Travel pump series 90R	161

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8.2 Vibration pump 42R 041 251
8.3 Travel drive series 51 289
8.4 Transmission CR 371
8.5 Brake system, axle 397

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2.10 Pressure measurements in the vibration circuit

Special tools

Hydraulic test case

⚠ Caution

Perform measurements at operating temperature of the hydraulic oil (40 °C).

1. Drive the drum of the machine on an elastic base (rubber buffers) (Fig. 1) and block drums and wheels additionally with suitable chocks.

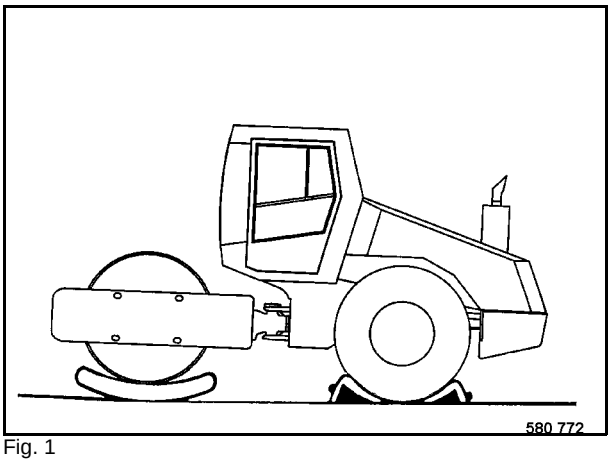


Fig. 1

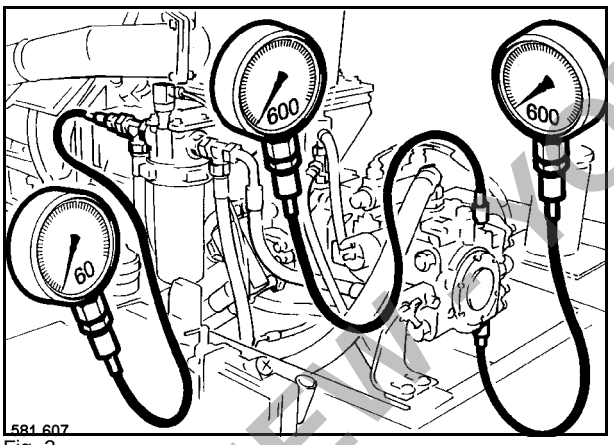


Fig. 2

2. Connect 600 bar pressure gauges to high pressure test ports MA and MB and a 60 bar pressure gauge to the charge pressure test port (Fig. 2).
3. Start the diesel engine and shift the throttle lever to max. speed position.

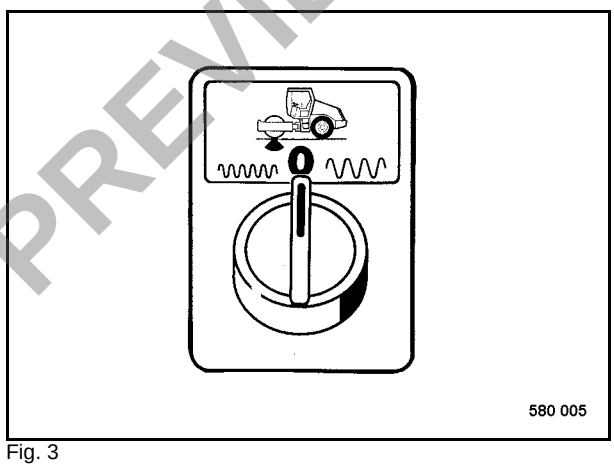


Fig. 3

4. Switch on vibration with high or low frequency (Fig. 3).

Nominal value

Charge pressure 24 bar

Starting pressure 390 ... 430 bar (both frequencies)

Operating pressure (soil dependent) approx. 100 ... 150 bar

Evaluation of test

If the charge pressure drops below 24 bar during the high pressure test, check the individual components.

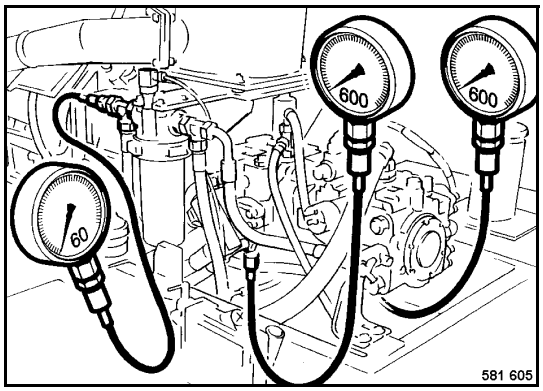
If the starting pressure is not reached, check the vibration pump.

If the starting pressure is only reached for one frequency, check the high pressure relief valves.

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The machine does not drive (to both travel directions)



Check high and charge pressure

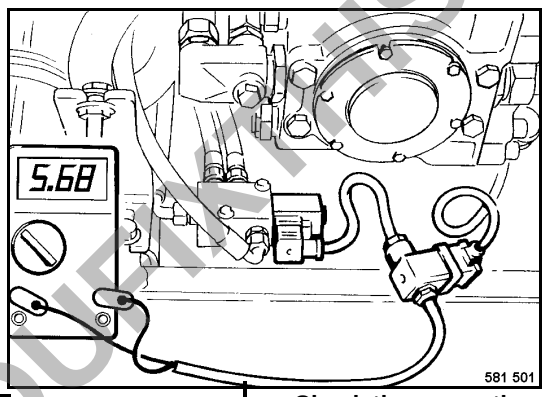
- Install 600 bar pressure gauges to the high pressure test ports
- Install 60 bar pressure gauges to the charge pressure test ports
- Pull the plug off the brake solenoid valve
- Start the engine and run it with max. speed
- Drive the machine against the closed brake, actuate the travel lever for a moment and read the pressure gauges

Nominal value:
High pressure approx. 425 bar
Charge pressure approx. 25 bar

High pressure OK?

yes

no



Check the magnetic coil of the brake valve

- Start the engine and release the brake (disengage the travel lever)
- Check voltage and current consumption of the coil with a measuring instrument

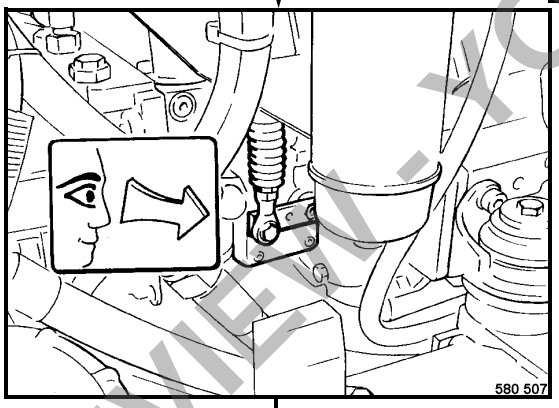
Nominal value:
14V / approx 5A

Magnetic coil OK?

no

Perform trouble shooting in the electric system

yes



Check the travel control cable

- Check whether the pump control lever is actuated when operating the travel lever.

Control cable OK?

no

Replace the travel control cable

yes

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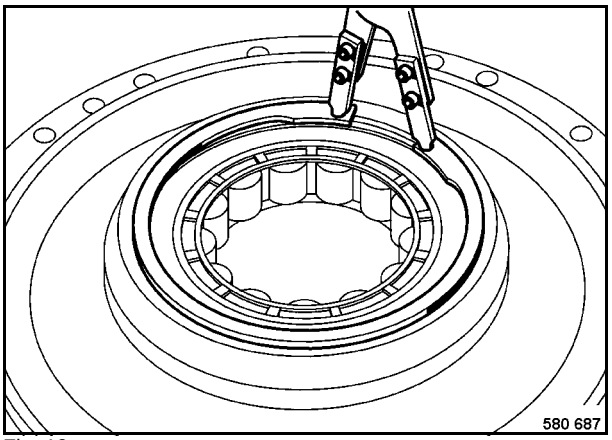


Fig. 10

8. Unclip the circlip from the groove in the flange (Fig. 10).

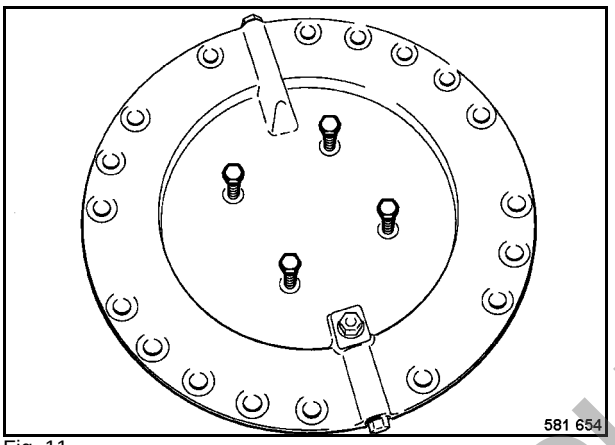


Fig. 11

9. Press the vibration bearing out of the flange (Fig. 11) with forcing screws.

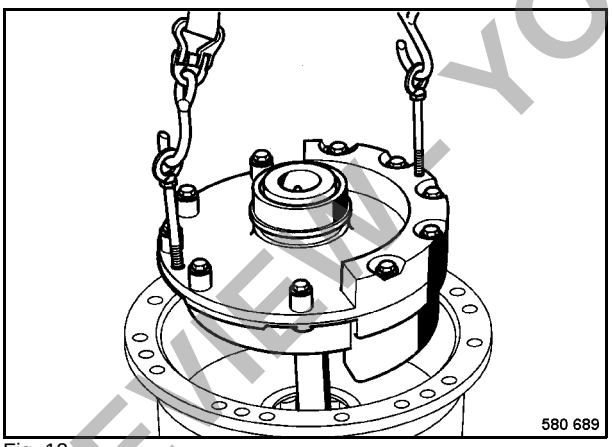


Fig. 12

10. Take the exciter unit (Fig. 14) out of the flanged housing.

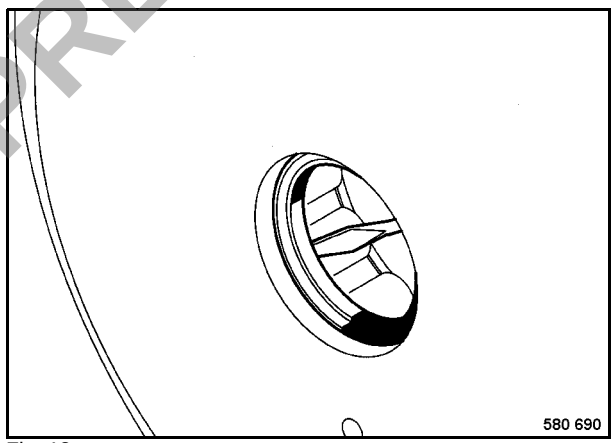


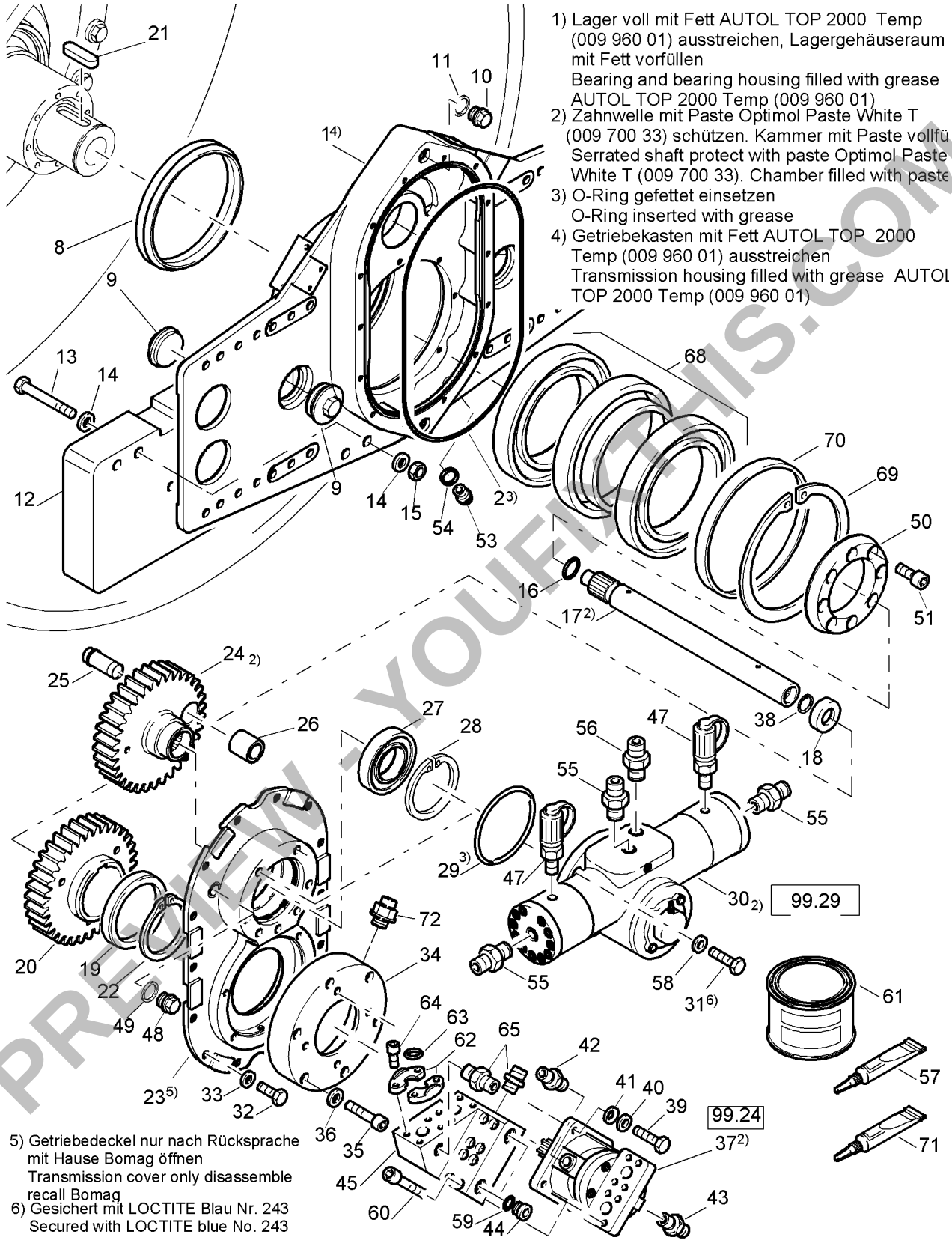
Fig. 13

11. Knock the radial seal (Fig. 13) out of the flanged housing.

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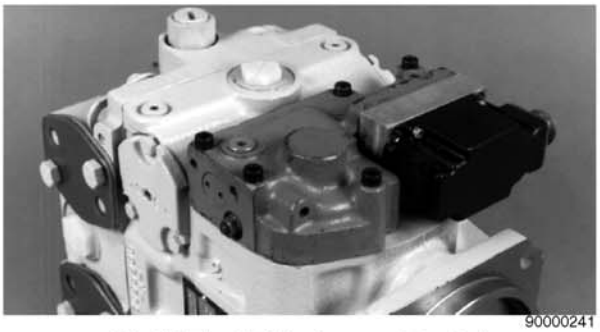
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6.1 Repair overview drum, Vario



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90000241

PV with Electric Displacement Control

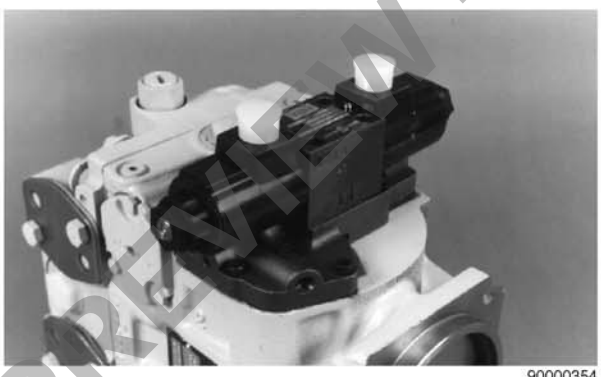
Electric Displacement Control (EDC)

The electric displacement control is similar to the hydraulic displacement control with the input signal pressure controlled by a pressure control pilot (PCP) valve. The PCP valve converts a DC electrical input signal to a hydraulic signal which operates a spring- centered four-way servo valve. This valve ports hydraulic pressure to either side of a dual-acting servo piston. The servo piston rotates the cradle swashplate through an angular rotation of ±17°, thus varying the pump's displacement from full displacement in one direction to full displacement in the opposite direction. The control is designed so the angular position of the swashplate is proportional to the EDC input.

Automotive Control (FBA II B)

Automotive Control allows a vehicle to be driven in a manner similar to an automobile with an automatic transmission.

The Automotive Control includes a three-position electric control to provide direction control.


90000354

PV with 3-Position (FNR) Electric Control

3-Position (FNR) Electric Control

This control utilizes a 12 or 24 VDC electrically operated spool valve to port pressure to either side of the pump displacement control piston. Energizing one of the solenoids will cause the pump to go to its maximum displacement in the corresponding direction.

All functions of the three-position (FNR) electric control are preset at the factory.

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Displacement Limiter Adjustment (MV)

Both the maximum and minimum displacement may be limited.

1. Remove the tamper resistant cap from the displacement limiter screw. Loosen the seal lock nut retaining the displacement limiter adjusting screw with a 19 mm wrench.

Caution
The displacement limiters act as travel stops for the swashplate. Do not turn the limiter screws counterclockwise beyond the point of contact with the swashplate for either the maximum or minimum displacement position.

S000015E

2. All adjustments can only be done when the motor is running and the pump is in neutral position. Steer the respective displacement limiter by the control.

   Rotate the adjusting screw with a 6 mm internal hex wrench. Rotating the maximum displacement adjusting screw clockwise will decrease the maximum displacement of the motor. Rotating the minimum displacement adjusting screw clockwise will increase the minimum displacement of the motor.

Caution
Care should be taken in adjusting displacement limiters to avoid undesirable flow or speed conditions. See corresponding section for speed and pressure limits.

The seal lock nut must be retorqued after every adjustment to prevent an unexpected change in operating conditions and to prevent external leakage during unit operation.

S000016E

3. After establishing the desired displacement setting, tighten the lock nut on the adjusting screw to 54 Nm (40 lbf•ft). Install a new tamper resistant cap.

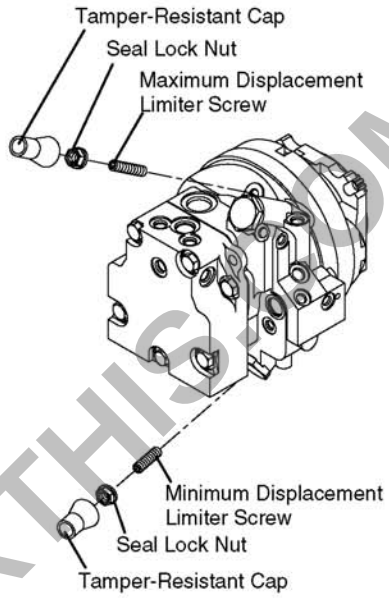
4. One turn of the adjusting screw will change the maximum or minimum displacement according to the following chart.

Frame Size	Approx Change in Disp per Rev of Adjusting Screw
055	5.6 cm^3 / Rev (0.34 in^3 / Rev)
075	7.1 cm^3 / Rev (0.43 in^3 / Rev)

T002 280E

Displacement Control Adjustments

All variable motor displacement control settings do not require adjusting.



SAE Flange Version shown
(Cartridge Version similar)

90000837E

MV Displacement Limiters



90000359

Rotate Adjusting Screw for Minimum Displacement Limiter



90000360

Tighten Lock Nut for Minimum Displacement Limiter



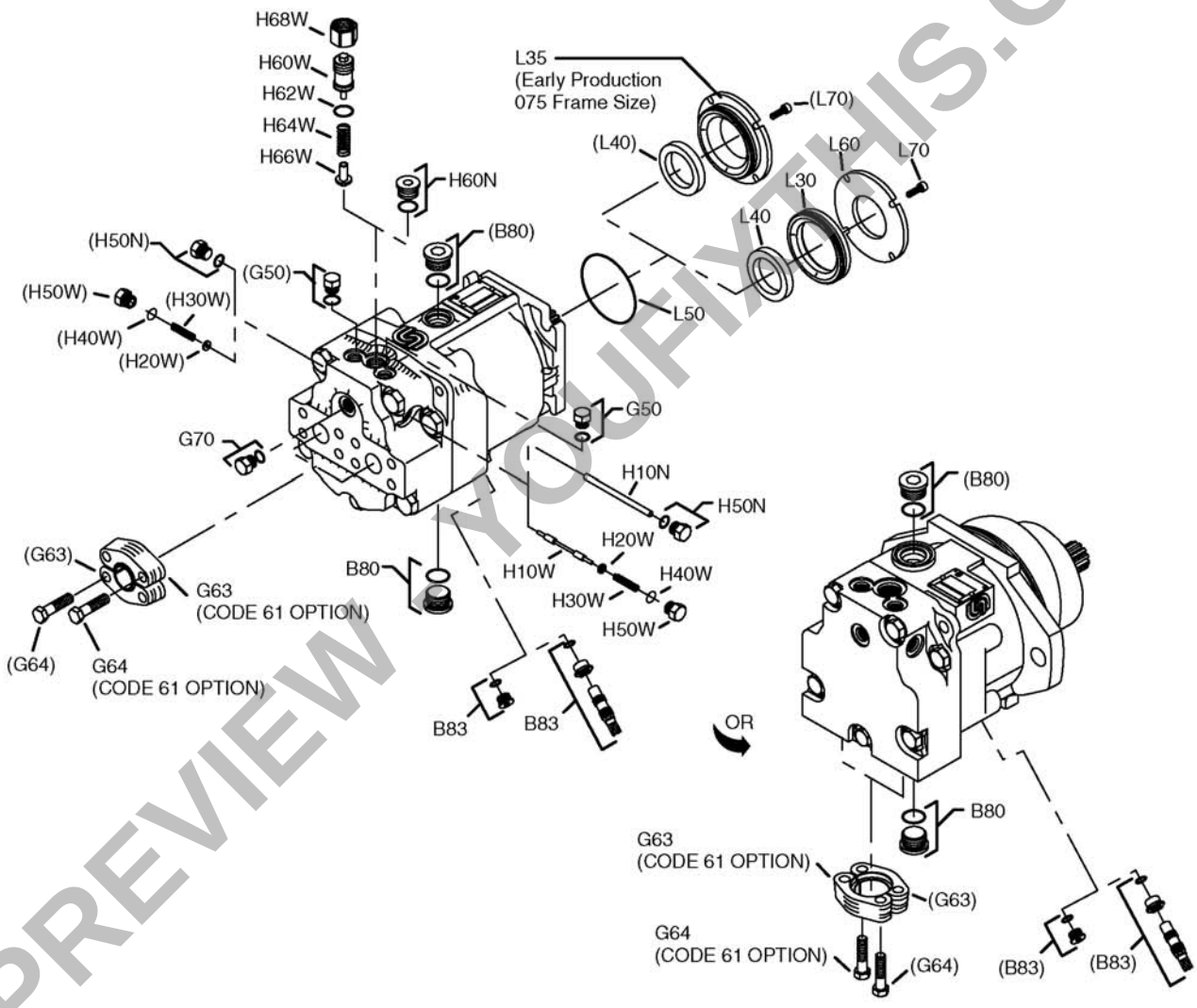
90000352

Maximum Displacement Limiter

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Fixed Motor

Minor Repair Parts



90000864E

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4.16 Filtration

Filtration of foreign matter from the hydraulic fluid is of primary importance. Dirt and foreign fluids within the hydraulic circuit will greatly reduce the life of the hydraulic equipment.

Filter-Related Pump Hardware

Filtration mechanisms for the Series 42 pump may be before (suction filtration) or after (charge pressure filtration) the charge pump. Sauer-Sundstrand provides a filtration adapter to provide for each type of filtration configuration. If filtration is provided for elsewhere in the hydraulic circuit, the pump will not have a filtration adapter.

Pumps equipped with housings without filtration adapters have an additional construction bore next to the charge relief valve which is unused and plugged [5/8 in Hex, 21-33 Nm (15-25 ft•lbf)]. When these pumps are equipped with suction filtration, the external charge inlet is plugged [5/16 in Int. Hex, 41-94 Nm (30-70 ft•lbf)].

Pumps equipped with housings that include filtration adapters have the appropriate adapter and gasket fastened to the housing with screws [Torx T30, 16 Nm (12 ft•lbf)]. The position of the M3 gauge port [11/16 in Hex, 11-13 Nm (8-10 ft•lbf)] will vary depending on filtration type.

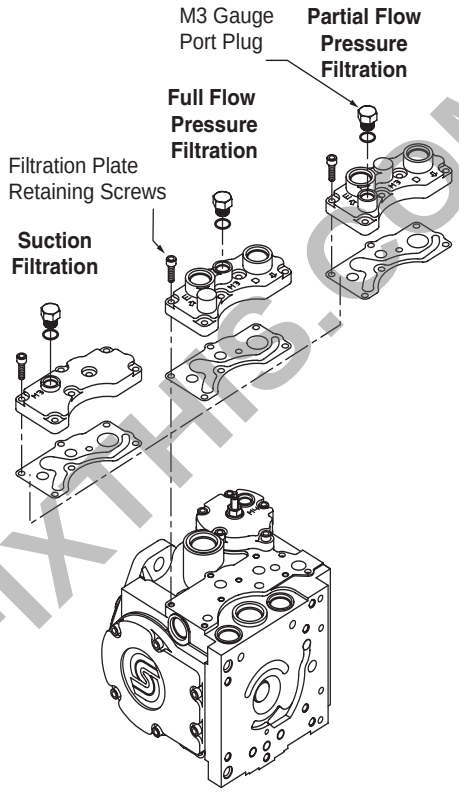
Filter Specifications

The selection of a filter depends on a number of factors including the contaminant ingression rate, the generation of contaminants in the system, the required fluid cleanliness, and the desired maintenance interval. A filter capable of controlling the fluid cleanliness to ISO 4406 Class 18/13 or better is recommended and may be located either on the inlet (suction filtration) or discharge (charge pressure filtration) side of the charge pump.

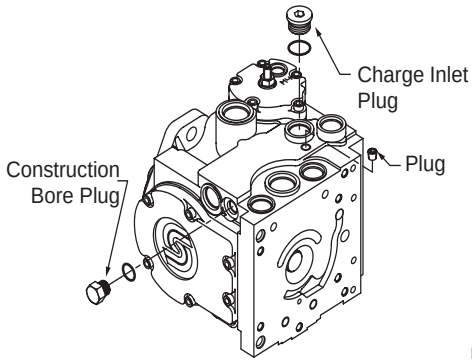
Filter capacity depends on desired maintenance levels. As a rough guide, a capacity in grams equal to twice the charge flow in gpm or 1/2 charge flow in l/min has been found to be satisfactory for many closed circuit systems.

Filter efficiency as measured by a "Beta" (β) ratio* should be as in the table at right.

See Sauer-Sundstrand publication BLN-9887 or 697581 and ATI-E 9201 for more information on filtration.



Housing with Filtration Adapter



E100025 E

Housing without Filtration Adapter (Suction Filtration Only)

Filtration Type	β-ratio
Closed Circuit Suction Filtration or Open Circuit Return Line Filtration	$\beta_{10} \geq 2$
Systems Sharing a Reservoir with Other Gears, Clutches, or Cylinders	$\beta_{10} \geq 10$
Charge Pressure Filtration	$\beta_{10} \geq 10$

* Filter $ß_x$-ratio is a measure of filter efficiency defined by ISO 4572. It is defined as the ratio of the number of particles greater than a given size (x) upstream of the filter to number of particles greater than the same size downstream of the filter. The $ß_x$-ratio applies to a specific particle size, measured in microns.

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Start-Up Procedure and Maintenance

Start-Up Precautions

Cleanliness

Ensure that all system components, including fittings, pipes, and hoses, are completely clean. If cloths are used for cleaning components, they must be made of lint-free materials.

Follow the guidelines presented in Sauer-Sundstrand publication BLN-9887 or 697581 for required fluid cleanliness levels at machine start-up.

Reservoir and Fluid Level

The reservoir should be designed to accommodate maximum volume changes during all system operating modes, and to promote de-aeration of the fluid as it passes through the tank. The reservoir outlet (charge pump inlet) and the reservoir inlet (fluid return) must always be below the normal fluid level. A sight glass is the preferred method for checking fluid level.

The reservoir inlet (fluid return) should be positioned so that flow to the reservoir is directed into the interior of the reservoir for maximum dwell and efficient de-aeration. A baffle (or baffles) between the reservoir inlet and outlet ports will promote de-aeration and reduce surging of the fluid.

No funnel-shaped eddying at the reservoir outlet (charge pump inlet) or formation of foam at the reservoir inlet (fluid return) is permitted.

Start-Up Procedure

The following start-up procedure should always be followed when starting-up a new Series 51 installation or when restarting an installation in which either the pump or motor has been removed from the system.

WARNING

The following procedure may require the vehicle/machine to be disabled (wheels raised off the ground, work function disconnected, etc.) while performing the procedure in order to prevent injury to the technician and bystanders. Take necessary safety precautions before operating the vehicle/machine.

Prior to installing the motor, inspect the unit for damage incurred during shipping and handling. Make certain all system components (reservoir, hoses, valves, fittings, heat exchanger, etc.) are clean prior to filling with fluid.

Fill the reservoir with recommended hydraulic fluid, which should be passed through a 10 micron (nominal, no bypass) filter prior to entering the reservoir. The use of contaminated fluid will cause damage to the components, which may result in unexpected vehicle/machine movement.

The inlet line leading from the reservoir to the pump must be filled prior to start up. Check inlet line for properly tightened fittings and make sure it is free of restrictions and air leaks.

Be certain to fill the pump and motor housing with clean hydraulic fluid prior to start up. Fill the housing by pouring filtered oil into the upper case drain port.

Install a 0 to 60 bar or 0 to 1000 psi pressure gauge in the charge pressure gauge port to monitor the charge pressure during start-up.

The external control input signal should be disconnected at the pump control during initial start-up. This will allow the pump to remain in its neutral position.

"Jog" or slowly rotate prime mover until charge pressure starts to rise. Start the prime mover and run at the lowest possible RPM until charge pressure is established. Excess air may be bled from the high pressure lines through the high pressure gauge ports.

Once charge pressure is established, increase speed to normal operating RPM. Note the charge pressure. If charge pressure is incorrect, shut down and determine cause for improper pressure.

Shut down prime mover and connect external control input signal. Start prime mover, checking to be certain pump remains in neutral. With prime mover at normal operating speed, slowly check for forward and reverse machine operation.

Charge pressure should be maintained during forward or reverse operation. Continue to cycle slowly between forward and reverse for at least five (5) minutes.

Shut down prime mover, remove gauges, and plug ports. Check reservoir level and add fluid if necessary.

The transmission is now ready for operation.

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Minor Repair and Replacement - Variable Motor (Continued)

Hydraulic Proportional Control (Type HZ)

Thoroughly clean external surfaces prior to removal of control.

Remove the four (4) screws retaining the valve housing to the end cap with an 8 mm internal hex wrench (060, 080, and 110 units) or a 10 mm internal hex wrench (160 and 250 units). Remove the valve housing. Remove the O-rings between the valve housing and end cap, and the O-ring on the valve spool sleeve.

The plugs on the control housing may be removed with a 7/16" or 11/16" hex wrench. When reinstalling, torque the 5/16" plugs to 9 Nm (7 ft•lbsf), and the 9/16" plugs to 37 Nm (27 ft•lbsf)

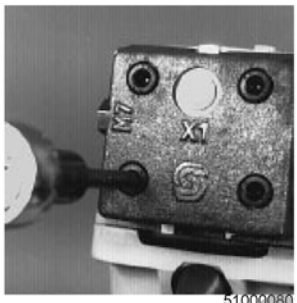
The valve housing is equipped with filter screens in the passages between the housing and the end cap. Units with internal servo pressure supply have a filter screen installed in the end cap passage leading to the valve spool sleeve. These screens should be pressed into position (with the rounded edge of the filter screens facing “out”) until they are flush to 2.0 mm (0.08 in.) below the machined surface of the valve housing or end cap.

Units with external servo pressure supply have a plug installed in the end cap passage leading to the valve spool sleeve. This plug may be removed with a 2.5 mm internal hex wrench. When installing this plug, torque to 2 Nm (18 in•lbsf).

Install a new O-ring onto the valve spool sleeve in the end cap. Install new O-rings onto the end cap.

Install the valve housing onto the multi-function block, and install the screws.

Torque the screws to 78 Nm (58 ft•lbsf) for 060, 080, or 110 units, or to 110 Nm (81 ft•lbsf) for 160 or 250 units.



51000080

Fig. 50-42 - Remove HZ Control Housing Screws

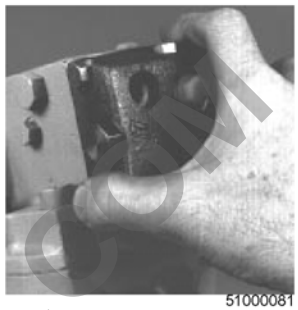

51000081

Fig. 50-43 - Remove HZ Control Housing

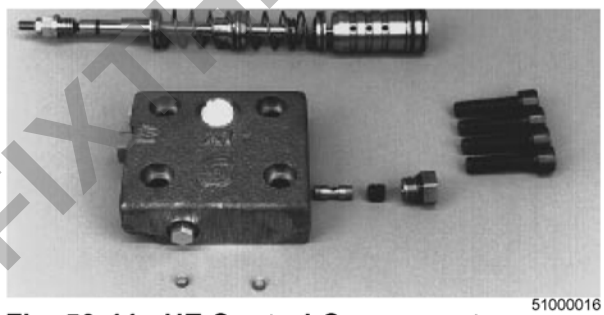

51000016

Fig. 50-44 - HZ Control Components

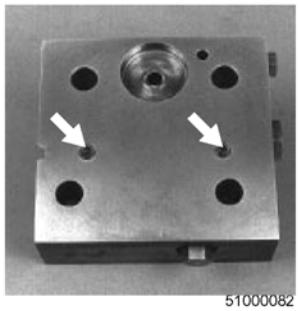

51000082

Fig. 50-45 - HZ Control Housing Screens

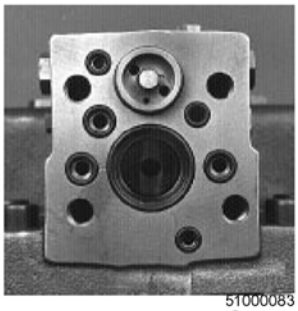
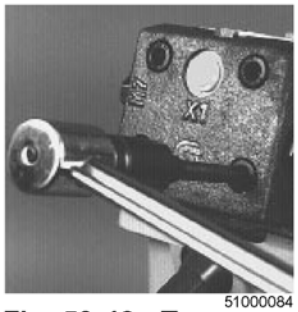

51000083

Fig. 50-46 - End Cap O-Rings Installed


51000081

Fig. 50-47 - Install HZ Control Housing



51000084

Fig. 50-48 - Torque HZ Control Valve Housing Screws

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Series CR – Compact Roller Drive
Service Manual and Repair Instruction
Repair Instruction

GENERAL

Repair of spindle-group (B010) requires special assembly tools (to tighten the nut), hence we recommend that any repairs of this group should be performed by Sauer-Danfoss, Neumünster. Sauer-Danfoss expressly disclaims any liability for workmanship related failures resulting from repairs performed by any person.

This instruction describes procedures for replacement of brake, gears, carriers and bearings of planet gearboxes for CR-series Compact Gear drives.

The gearbox must be removed from the vehicle, oil drained and the exterior cleaned before performing this service procedure.

Disassembly and assembly of gearbox must be done in clean and dustless places.
Item numbers of the parts used in this instruction are related to drawings - see *chapter Exploded views on pages 16-18.*

DISASSEMBLY

Gears and planet carriers disassembly

CR31

1. Remove screws (D180) from back cover (D170).
2. Remove back cover (D170).
3. Remove sun pinion gear (D020).
4. Remove spacer ring (D030).
5. Remove 1st stage carrier (D040) with planet gears (D060) and 2nd stage sun gear (D080).
6. Remove retaining rings (D070) and pull out the planet gears (D060) with bearings using suitable tool.
7. Remove retaining rings (D115) from planet gears (D060) and push out the bearing (D050) using suitable tool.
8. Remove retaining ring (D090) and pull out the 2nd stage sun gear (D080) from the carrier (D040).
9. Remove retaining rings (B050) and pull out the planet gears (B040) from the spindle group (B010) using suitable tool.

CR51

1. Remove screws (D180) from back cover (D170).
2. Remove back cover (D170).
3. Remove sun pinion gear (D020).
4. Remove 1st stage planet carrier (D040) with planet gears (D060) and 2nd stage sun gear (D080).
5. Remove retaining rings (D070) and press out the 2nd stage planet gear (D060) from planet carrier using a suitable tool.
6. Remove retaining ring (D090) and pull out the 2nd stage sun gear (D080) from carrier (D040).
7. Pull out 2nd stage carrier (D100) with planet gears (D120) and 3rd stage sun gear (D140).
8. Remove retaining rings (D130) and pull out planet gears (D120) with bearings from carrier using a suitable tool.
9. Remove the retaining rings (D115) from planet gears (D120) and push out the bearing (D110) using a suitable tool.
10. Remove the retaining ring (D150) and pull out the 3rd stage sun gear (D140) from the carrier (D100).
11. Remove the retaining rings (B050) and pull out the planet gears (B040) from the spindle group (B010) using a suitable tool.

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