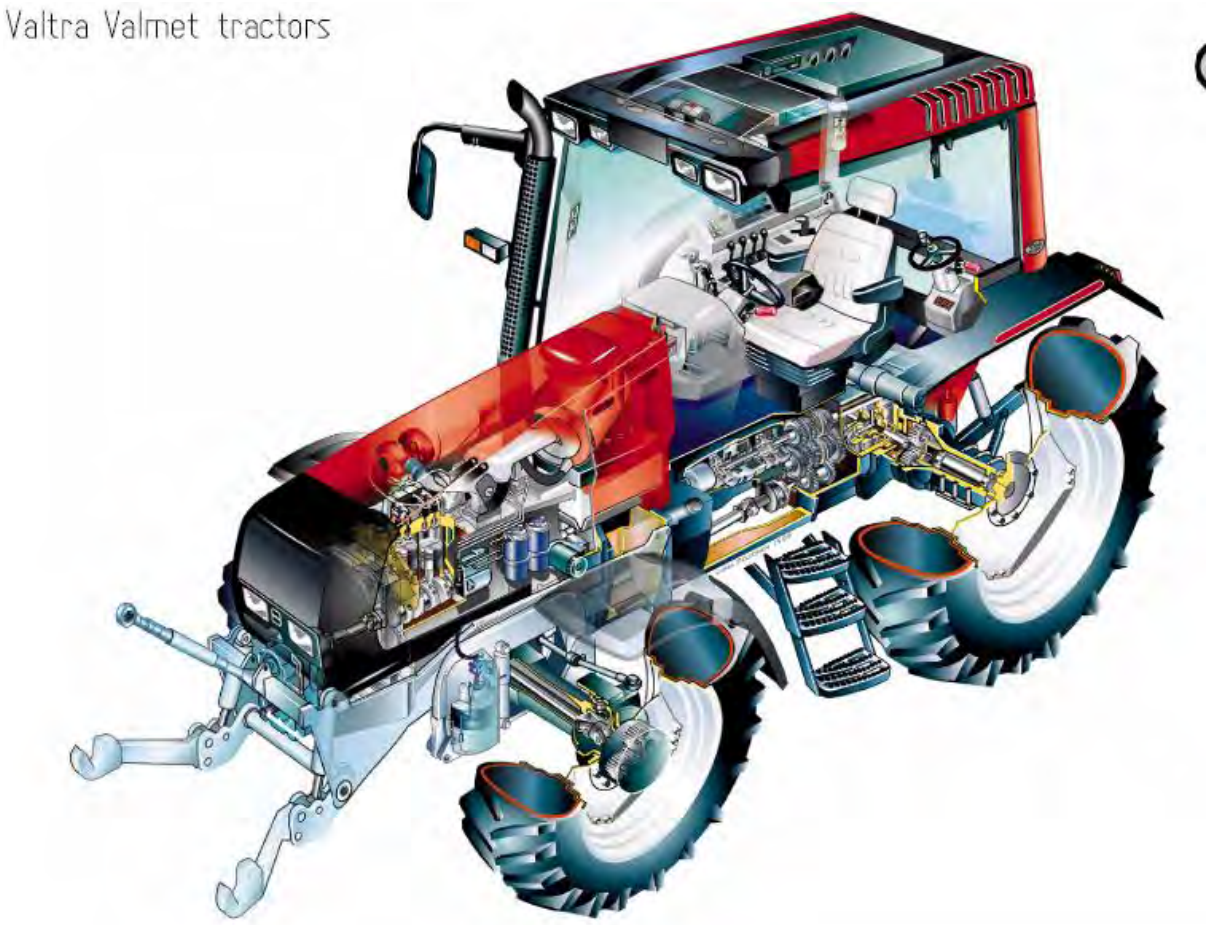
VALTRA – VALMET

MEGA MEZZO HI-TEC



WORKSHOP MANUAL

VALTRA

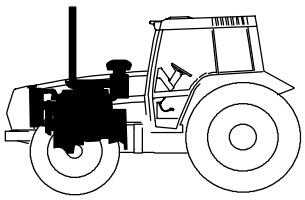
Service Manual

Tractors

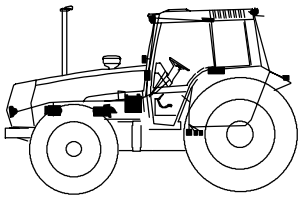
Groups 10–100

Valtra Inc.
44200 Suolahti, Finland

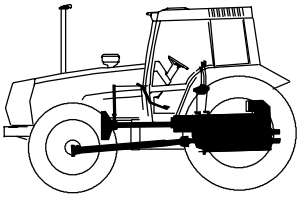
10 General



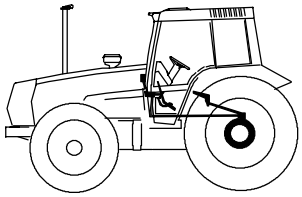
20 Engine



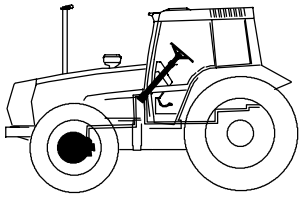
30 Electrical system



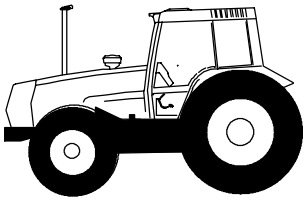
40 Power transmission



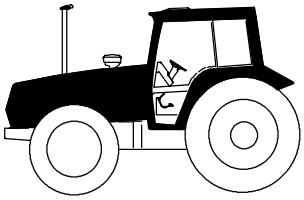
50 Brake system



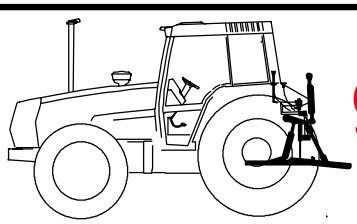
60 Steering system and Front axle



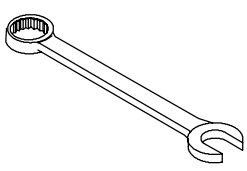
70 Frame and Wheels



80 Cab and Shields

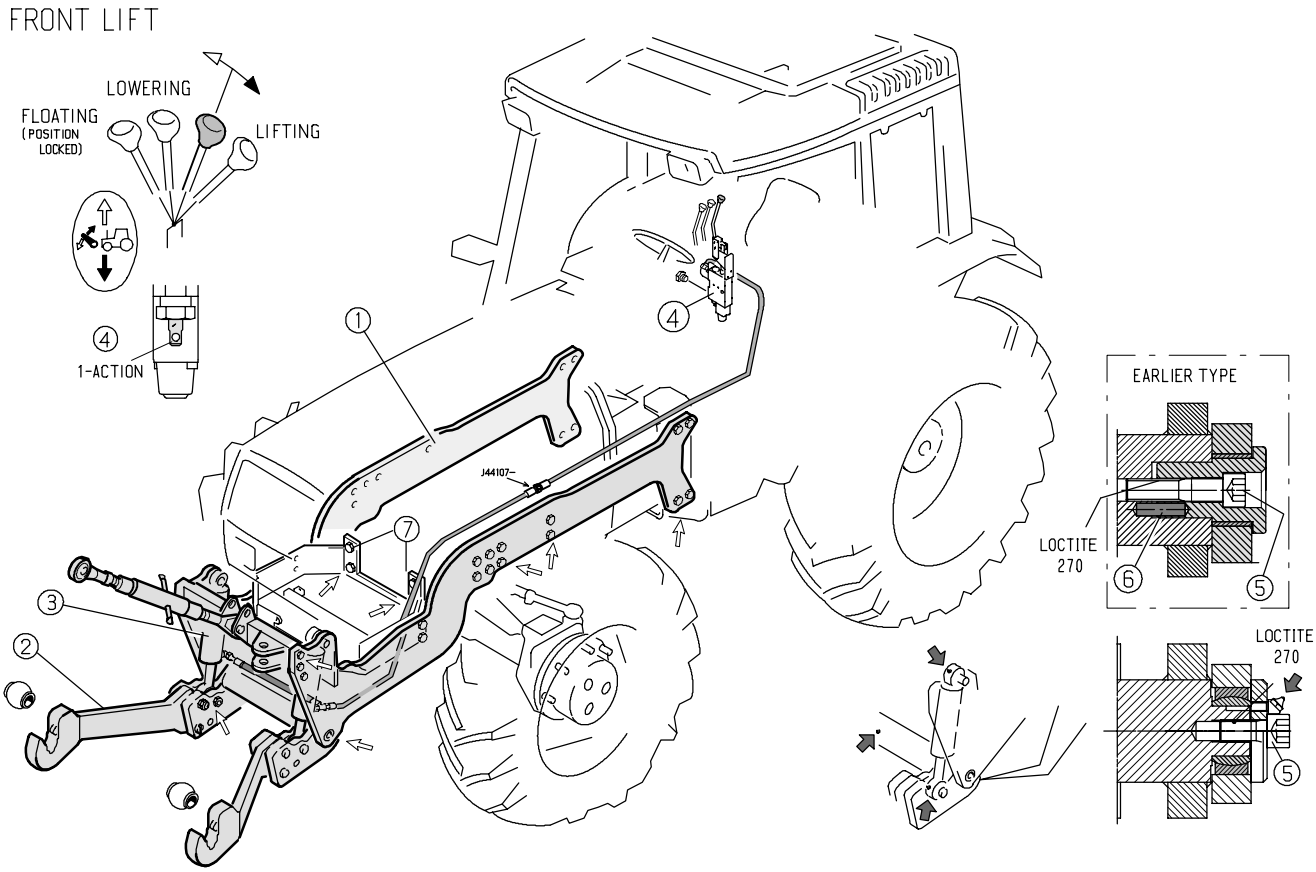


90 Hydraulics



100 Tools

Front power lift



Picture 21. Front power lift, 30 kN (6200–8150), 35 kN (8350–8950).

1. Frame
2. Lower links can be turned and removed
3. Lifting cylinder, 2 pcs, ø 80 mm (6200–8150), ø 90 mm (8350–8950).
4. Control valve
5. M14 (8.8), 140 Nm
   M16 (8.8), 220 Nm
   M16 (12.9), 360 Nm
6. Tension pin prevents the shaft from rotating in relation to the lower links
7. Tightening torque of upper bolts is 400 Nm..

Note! The control valve (out–hold–in–float, floating position can be locked) is fitted to the third valve in the valve set. Ordering number of the control valve is 32532700 (with lever), or 32536500 (only valve block).

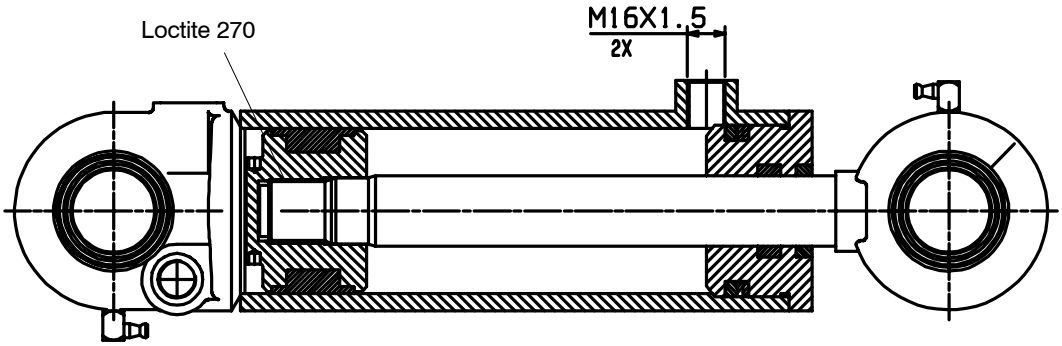
It is possible to order the front lift together with the front PTO. The standard front piece of the tractor is not needed, when the front lift is mounted. All moveable parts of the front lift have bearings.

Maintenance

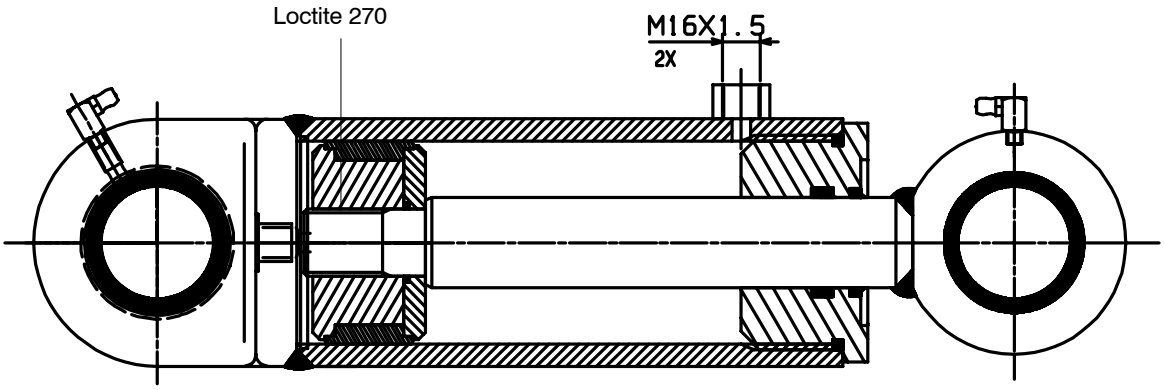
a) Grease the lifting cylinder joint pins and the lift main shaft nipples at intervals of 250 running hours, depending on use.
b) Retighten all front lift bolts after the first 100 running hours.

M14x25 m 8.8	140 Nm
M16x30 m 8.8	220 Nm
M16x50 m 12.9	360 Nm
M18x60 m 8.8	320 Nm
M20x60 m 8.8	430 Nm
M20x50 m 12.9	750 Nm
M20x60 m 10.9	600 Nm
M20x60 m 12.9	750 Nm
M20x70 m 12.9	750 Nm

Lifting rams of front lift



Picture 22. Lifting ram on 6300–8150 (ø 80 mm).



Picture 23. Lifting ram on 8350–8950 (ø 90 mm).

Repair instructions

1. Low pressure circuit (Op. no. 911)

A. Measuring pressure

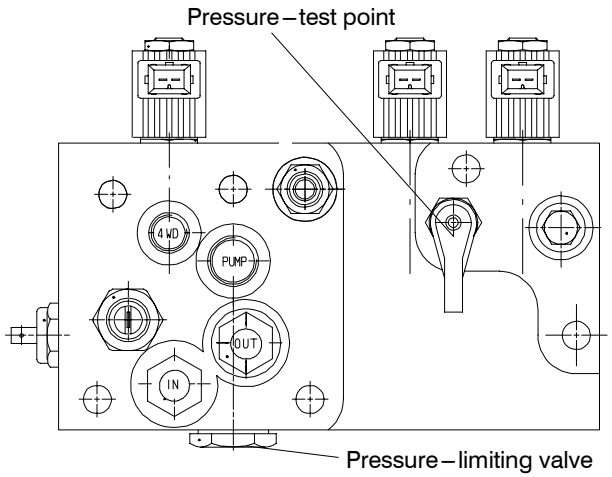
1. Start the engine and run it at **1500 revs/min**.

2. Warm up the transmission/hydraulic oil to **40–65°C**.

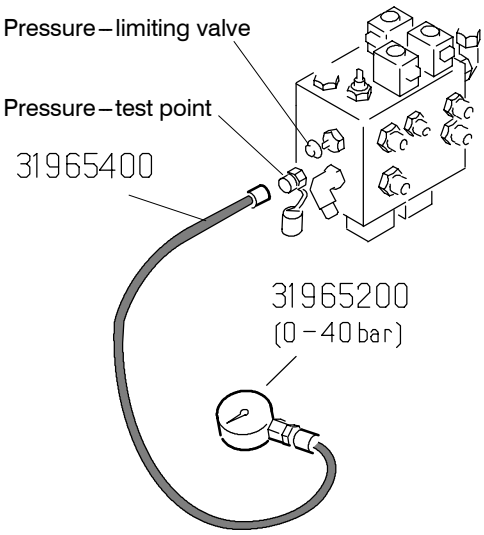
Note! The oil warms up faster if the steering wheel is held against the stop.

3. Disengage as many servo functions as possible (clutches unpressurised in order to eliminate a pressure drop caused by leakages in clutch piston seals).

Note! When the 4WD is engaged, the clutch is unpressurised. On 2–step speedshift should theTORTOISE range be engaged (Trac–Trol) or HARE range engaged (Overdrive). On HiTech models the shuttle must be in the neutral position. Two DPS clutches are always pressurised, when the engine is running.



4a. Earlier valve block (–660070): Connect a pressure gauge to the test point on the servo valve block (on the LH side of the gearbox). Read the pressure. It should be between **2,1–2,3 MPa.** Pressure measuring equipment, see page 910/5.

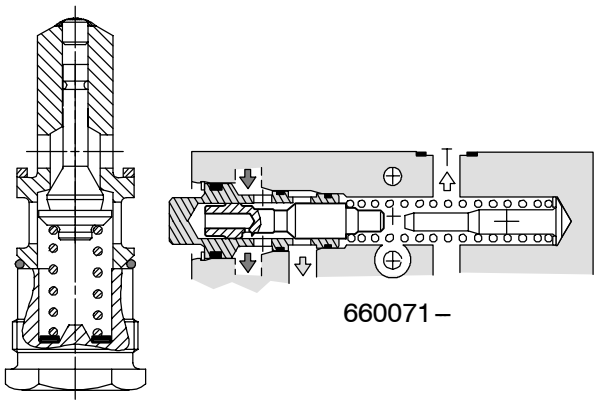


4b. Later valve block (660071–): Connect a pressure gauge to the test point on the servo valve block and read the pressure value. It should be **1,8–1,9 MPa.**

4c. On tractors which have been equipped with HiTech Shuttle, the low pressure circuit test point is placed on the outer face of the valve block, see page **440/24**. The pressure value is **1,8–1,9 MPa**.

Note! These pressures are maintained by the low pressure limiting valve and seals at various solenoid valves (and clutch piston seals in pressurised clutches).

Pressure–limiting valves (1,8 MPa)



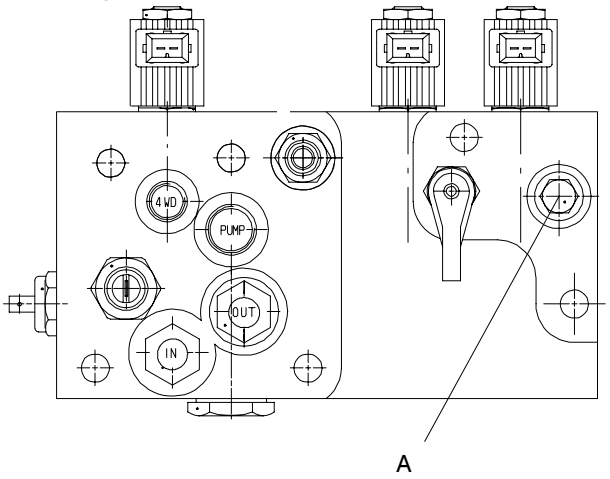
5. If the pressure gauge reading deviates much from the correct value, the fault can lie in the pressure–limiting valve or the low–pressure pump is worn out. Also excessive leakage can cause pressure loss.

6. Then activate each service in turn. The pressure should momentarily drop but quickly re–stabilise. A constant pressure drop of about 0,1–0,2 MPa indicates excessive leakage and therefore pressure loss in that service.

Note! Pressure measuring equipment, see page 910/5. It is available a pressure–test kit which order no is 31965000. It includes all equipment needed for pressure measurement on Valmet tractors. The parts can also be ordered separately.

B. Diff. lock clutch pressure

Note! Engine revs **1500 r/min**. Oil temperature **40–65 °C.**

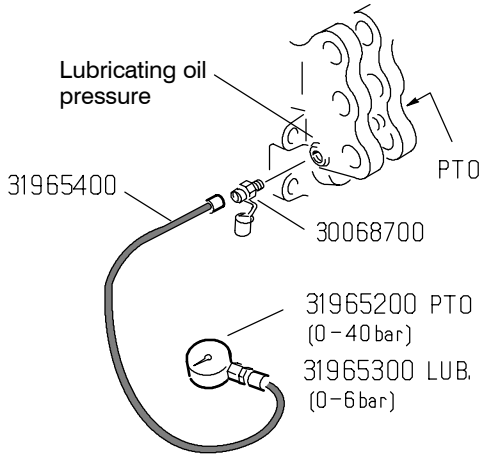


1. The diff. lock clutch pressure can be measured separately by connecting a pressure gauge to the hole A on the servo valve block. The hole has thread M14X1,5 and connector 30068700 fits into the hole.

Important! The picture above shows the earlier valve block (–660070)**.** The plug is situated on the rear face of the later valve block, see pages **420/17A** and **17B** point 16**.** Valve block on HiTech Shuttle tractors, see page **420/20C** point A.

C. Lubricating pressure and PTO clutch pressure

Note! Engine revs **1500 r/min**. Oil temperature **40–65 °C.**



1a. The lubricating oil pressure can be measured by connecting a pressure gauge to the hole on the LH side of the PTO housing. The lubricating oil pressure minimum value is **0,03 MPa**. On HiTech tractors the min. value is **0,12 MPa** measured at test point (HPR) in the rear part of the suction strainer housing on the gearbox, see page **440/25**.

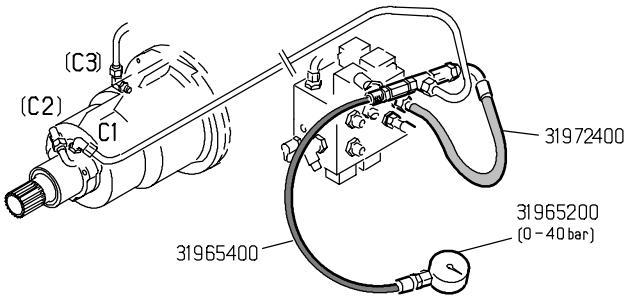
1b. The PTO clutch pressure is measured by connecting a pressure gauge to the hole on the RH side of the PTO housing. The pressure should be **0,05–0,1 MPa** lower than pressure measured at the pressure–test point on the servo valve block. **Note!** In HiTech 2.0 tractors there is a Valmet HPR pressure–test point in the hole.

2. Both holes have thread M14X1,5 and connector 30068700 can be screwed into them.

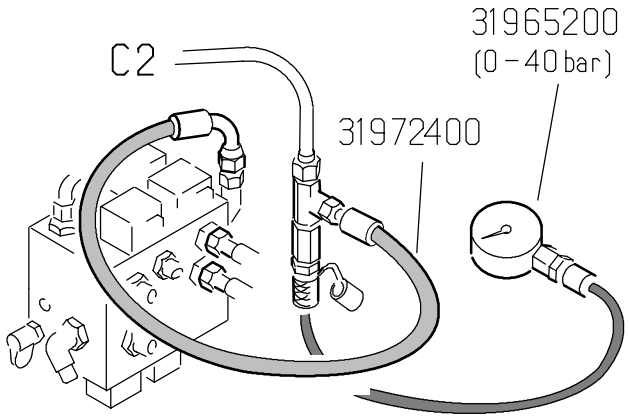
D. DPS clutch pressures

NOTE! Concerning HiTech tractors, see code **370** (Autocontrol V). Position of test–points on these tractors, see picture on page **440/25**.

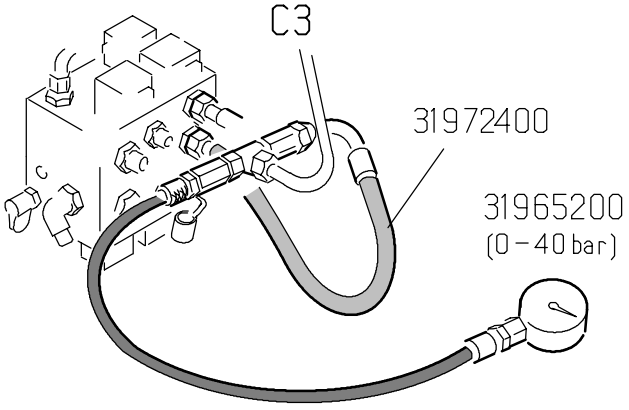
Note! The pressures are measured at engine revs of **1500 rpm** and with an oil temperature of **40–65 °C.**



C1=DPS foremost clutch



C2= DPS middle clutch



C3=Clutch in planetary gear (rearmost)

All three pressures should be between **1,8–1,9 MPa.** Pressure measuring equipment in pictures above are included in pressure–test kit 31965000**.**

NOTE! On tractors which have a lock valve (see page **420/20B**), the piping deviates from the pictures above**.** The lock valve is fitted in transmissions 460 and 650, but the lock valve is not fitted on HiTech tractors.

IMPORTANT! On the HiTech tractors, there are fitted Valmet HPR test points to measure the DPS clutch pressures (see picture on page **440/25**). Under code **370** (AC V) there are shown calibrations of the DPS clutches.

NOTE! Under code **370** there are also shown calibrations and resettings of HiTech Shuttle clutches **F**– and **R**. Concerning pressure test points, see page **440/25**.

Mechanical shuttle

POWERSHIFT				
STEP	C1	C2	C3	
I	X	X	–	i=1,0
II	X	–	X	i=0,811
III	–	X	X	i=0,651
I	X	–	X	i=1,233
II	X	X	–	i=1,0
III	–	X	X	i=0,803

X = ENGAGED
– = DISENGAGED
= PRESSURISED OIL

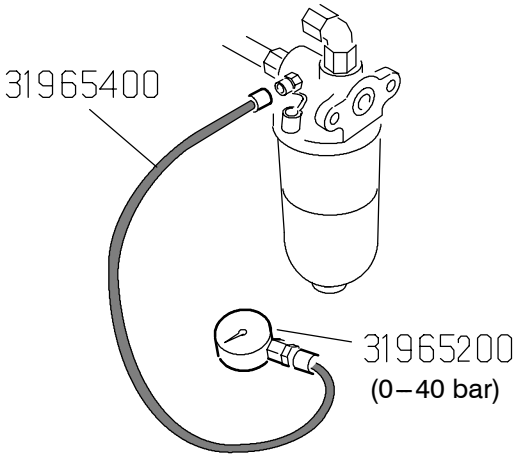
HiTech shuttle

POWERSHIFT				
STEP	C1	C2	C3	
I	+	+	–	i=1,0
II	+	–	+	i=0,811
III	–	+	+	i=0,651

+ = SOLENOID ENGAGED
– = SOLENOID DISENGAGED
= PRESSURISED OIL

2. High pressure circuit

A. Measuring free circulation pressure



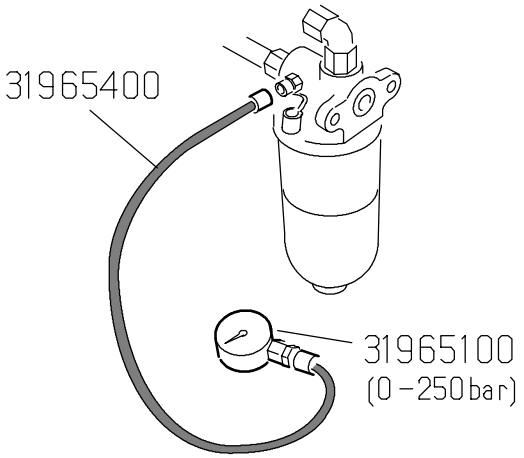
The free circulation pressure can be measured by connecting a pressure gauge to the pressure–test point at the pressure filter bracket. When measuring this pressure, the steering wheel must not be turned. The auxiliary hydraulic valve levers should be in the neutral positions. In addition, the power lift position control potentiometer must not be in the lowest position.

Pressure values at engine revs of 1500 r/min:
– ~**1,5 MPa** (+50°...+65°C)
– ~**1,7 MPa** (+30°...+32°C)
– ~**2,0 MPa** (+20°...+25°C)

Note! Possible extra hydraulic equipment raise the free circulation pressure value. For instance, on tractor that has three valve blocks and a front loader, the pressure value is about **2,1 MPa** (+50...+65° C).

Note! Pressure measuring equipment above are included in the test kit 31965000.

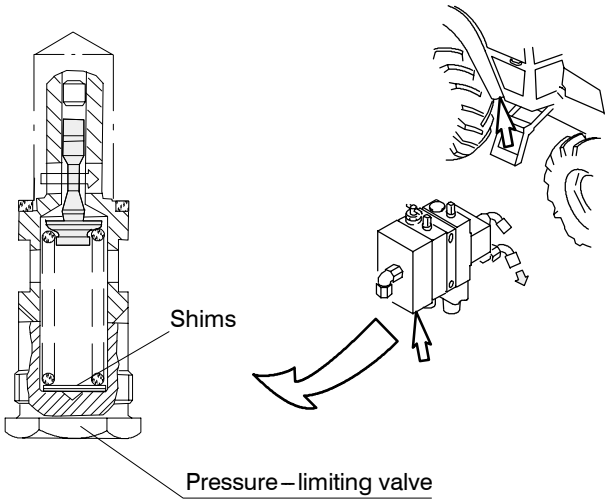
B. Working pressure



1. Connect a pressure gauge (pressure measuring equipment, se page **910/5**) to the pressure–test point at the pressure filter.

2. Adjust engine revs to **1500 r/min**. Warm the hydraulic oil to **50–65°C**.

3. Move an auxiliary hydraulic valve lever to the pressure position and read off the gauge reading which should be **19,0–19,8 MPa.**



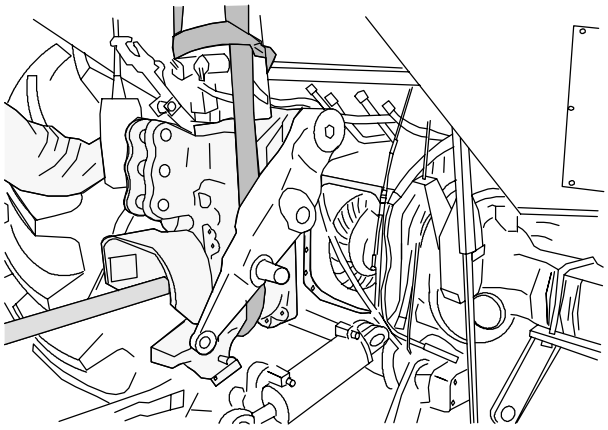
Note! The pressure is maintained by the pressure limiting valve on the underside of the front plate of the auxiliary hydraulic valve set.

4. If the pressure reading deviates much from the correct value, change pressure limiting valve spring or adjust it with shims. Shims thickness of 0,2 mm raises the pressure value about 0,4 MPa.

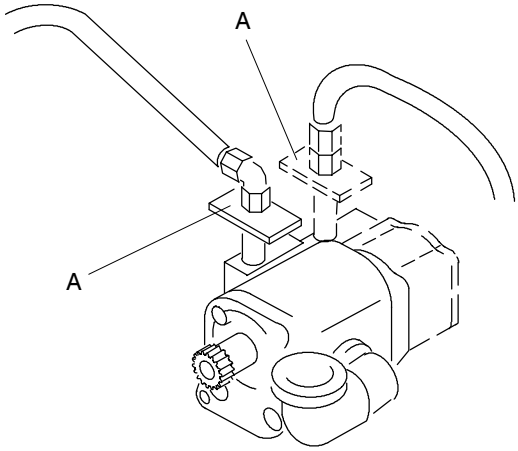
Note! Possible deviation can also be caused by a dirty or faulty safety valve (23 MPa) in the hydraulic pump or the pump can be rundown.

D. Removing hydraulic pump

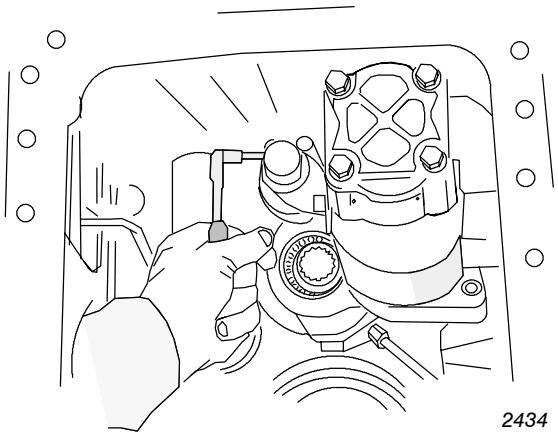
1. Drain the oil from the transmission.



2. Remove the PTO housing (**see Op. 462 1A**).

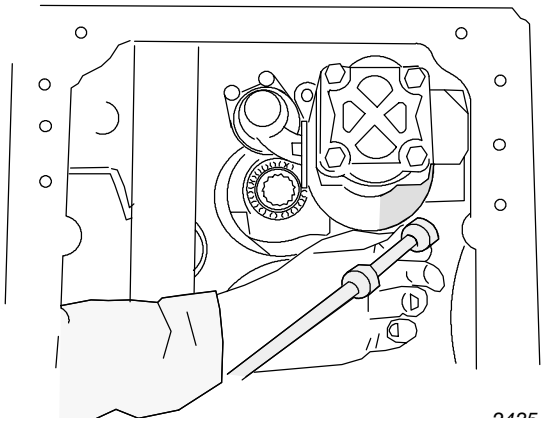


3. Remove the RH side brake cylinder. Disconnect the connectors from the pressure pipes. Slacken the sealing pieces (A) and unscrew the pressure pipes from the pump.



4. Slacken the pump suction pipe clip.

Note! The differential can be in place because it does not prevent removal of the pump.



5. Unscrew the pump fixing bolts and remove the pump from the gearbox housing.

E. Fitting hydraulic pump

1. Fit the pipe clip (screw upwards) onto the suction pipe. Fit the pump coupling sleeve into the pump drive mechanism (if removed).

2. Fit a new pump. Turn the pump clockwise and tighten the fixing bolts to **40–50 Nm**.

Check, that the pump goes fully home by hand and the main axle of the pump is not pressed axially. There should not be gap between flange of the pump and frame of the gearbox.

3. Push the pressure pipes through the sealing pieces and screw the pipes into the pump thread to a torque of **60 Nm**.

4. Apply sealing compound Hylosil RTV Grade 102 Black between the gearbox and sealing pieces. Apply Loctite 542 to the sealing piece screws and tighten them.

5. Connect the pressure hoses to the pressure pipes. Fit the brake cylinder.

6. Tighten the suction pipe clip to a torque of **2 Nm**.

7. Fit the PTO unit (**see Op. 462 1G**).

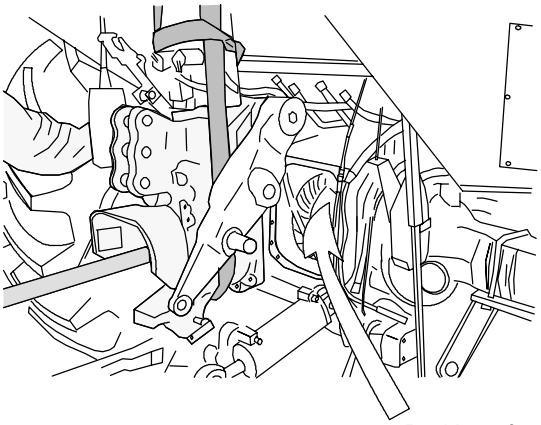
8. Fill the transmission with oil and test–drive the tractor. Make sure that the new pump is functioning by measuring hydraulic pressures.

Note! For the pump is available a seal kit no. 32664100. The high pressure pump safety valve (and separate parts) are available as a spare part. During warranty period the pump is changed as a complete unit.

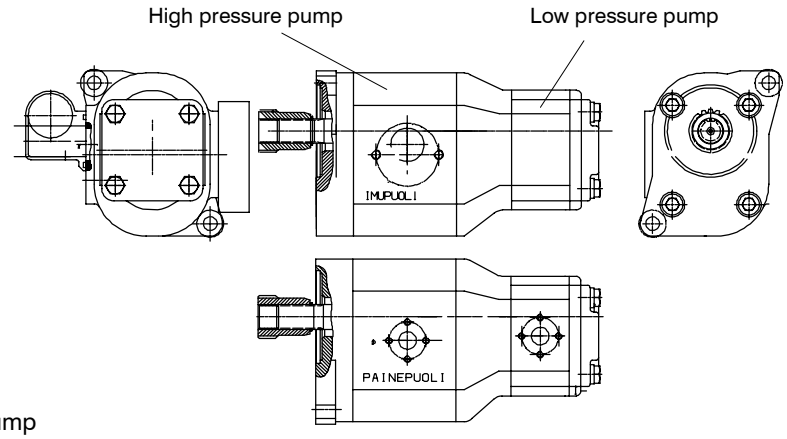
Important! From ser. no. **H19317** incl. (in transmission 650) there is a Bosch–make pump in the hydraulic system. From ser. no. **H18329** incl. the pump pressure pipe lead–in plates and their seals have been changed in transmissions 650, 300 and 390.
The new Bosch pump is replaceable with the earlier pump, when the pump connection parts are changed (suction connection is not necessary to change). A new part is fitted between the pump and the suction connection, and the pressure connection has been changed. The safety valve body has been changed, the other parts as earlier. In connection with possible repair work new lead–in plates and seals must be fitted.

Note! On HiTech tractors, the low pressure pump output is greater than in earlier tractors, which have a mechanical shuttle (25+11 cm^3/r).

2. Pump and pipes, fault tracing



Position of pump



Technical data of pump, see page **910/3**
Removing and fitting pump, see page **911/3**
Pump and pipes, see pages **910/11–11A**

A. General

The condition of the pump can be checked e.g. by measuring pump output at different counter pressures. A worn pump has a lowered output and it cannot maintain enough high pressure. In this case the hydraulic circuit does not function as it should.

The lowered output causes the hydraulic cylinder movements to be slower than normal.
The lowered pressure means that the hydraulic cylinder cannot raise heavy loads. E.g. the lifting cylinder cannot raise the load even thought its weight is below the max permissible load.

A possible reason can also be a faulty pressure–limiting valve or shock valve. In addition, oil leaks in various components and seals can also cause corresponding malfunctions.

The pump can be tested e.g. by measuring the pump output with a flow meter. Use of a separate loading valve makes it possible to measure the output at different pressures. The pump output must not vary much at different counter pressures. The working hydraulic pump output can be measured from the quick–action couplings. The low pressure pump output can be measured by connecting the flow meter on the pressure hose between the pump and the servo valve block.

It is difficult to determine a certain reject limit to the pump. In a light agricultural use even a worn pump can function satistactorily. Just when a tractor has extra hydraulic equipment (front loader, timber loader etc.), a worn pump cannot maintain the hydraulic circuit and it should be changed.

B. Fault tracing by inspecting oil:

1. Air in oil – If there is too much air in oil, the result is that oil foams in the tank. In this case, check all seals and connectors in the suction side. Also the suction strainer cover seal can be faulty. Check the condition of the pump drive shaft oil seal. Change oil if necessary.

2. Water in oil – Water in oil causes the oil to be milky. The system must be emptied and filled with new oil. In addition, prevent water from entering into the hydraulic system. Water causes corrosion to the various parts in the hydraulic circuit.

3. Impurities in oil – Impurities can be verified by taking a sample of oil and by pouring it through a filter paper. The suction strainer and the pressure filter should be serviced according to the maintenance schedule. Impurities can enter into the system from the auxiliary hydraulic cylinders. The hydraulic oil and the pressure filter must be changed according to the instructions.

4. Impaired properties of oil – Mineral oil loses some lubricating properties in prolonged use. This can appear in change of colour, change of smell or change of viscosity. For these reasons, it is necessary to change the oil according to the maintenance program. Also oil level should be checked regularly.

C. Fault tracing without removing pump

If the hydraulic system functions when the oil is cold, but in the operating temperature different functions are slow or powerless, this indicates that the oil pump is worn–out.

The high pressure pump can be tested by connecting a pressure gauge to the circuit and by pulling one auxiliary hydraulic valve lever to the pressure position. Now if the pressure gauge reading follows clearly the engine revs alteration, this indicates that the pump is worn.

The faulty pump can be noisy which indicates a damage in the pump. Note that a blocked suction strainer causes a shrieking sound to the pump.

A worn pump "whips" oil and due to the fluid friction the whole hydraulic system overheats. This can be verified by feeling the temperatures of the pipes and the oil reservoir. In this case, for instance, the pump pressure pipe can be essentially warmer that other pipes and the oil reservoir.

D. Internal inspection of pump

Note! Never dismantle the pump if the warranty is valid, but in this case change a new spare pump.

1. Detach the damaged pump from the tractor. Make sure that the pump and a fitting table are clean before dismantling the pump.

3. Mark all removed parts in relation to each other for easier assembling.

4. Fit always new seals. A seal kit no. 32664100 is available for the pump.

Note! When the hydraulic system is in a perfect condition, the pump housing surfaces are smooth and shiny as well as the bearing surfaces. Text below presents how faults in the hydraulic system affect the oil pump.

1. Impurities in oil – Impurities cause clear dragging grooves on the pump housing and bearing surfaces in the direction of rotation. The most evident damage caused by impurities are deep grooves on the gearwheel side surfaces. Impurities wear the pump fast resulting lowered output value.

2. Cavitation damages – Mineral oils contain 10 percent of air. In the pump suction side if suction is too high, air bubbles are formed, which fasten onto the pump housing. When pressure in the pressure side rises rapidly, the bubbles "explode" causing deep pits on the pump housing. In certain cases the cavitation generates sound, which can be heard from the pump.

Possible reasons:
1. Suction pipe or suction strainer blocked.
2. Wrong oil viscosity.
3. Air enters into system.

3. Air in oil – If air enters into the system via the suction side or via the pump drive shaft seal, this causes the same damages as cavitation. If there is too much air in oil, the oil in the reservoir foams.

4. Pump drive shaft loading – If the pump drive shaft has a strong radial loading caused by the pump drive mechanism, this causes damages to the shaft seal and air and oil leaks by the seal and after a prolonged use, the drive shaft bearings are worn unevenly. For the same reason, the pump gears cut the pump housing on one side resulting internal leakages in the pump.

Observe the following when assembling the pump

Assemble the low pressure pump and tighten the end cover bolts to a correct torque. Assemble the high pressure pump and tighten the end cover bolts only to finger tight. Blow compressed air (~ 5 bar) through the pressure side hole (suction side hole open) at which time the shafts and gear wheels are centered and at the same time tighten the end cover bolts to a correct torque of **61–68 Nm**.

Note! Without this centering the pump will probably damage after a very short operating time.

E. Maintenance

1. Check the hydraulic oil weekly/at every 50 running hours. Oil quality: 10W/30, 5W/30 or 5W/20, API GL–4 (STOU) according to the outdoor temperature.

2. The pressure filter is changed the first time at 100 hours warranty service. The second change is done at 250 running hours and the third change at 500 running hours. After that the filter is changed at every 500 running hours.

3. Hydraulic oil should be changed at intervals of 1000 running hours or yearly which one is reached first. The suction strained should be cleaned always when the oil is changed. The suction strainer should be changed more often when necessary.

Note! If You use continually the auxiliary hydraulics, the hydraulic oil and the pressure filter should be changed more often.

4. The high pressure and the low pressure can be measured according to instructions. Also different clutch pressures can be checked. The pressure limiting valve and the shock valve can be opened and cleaned. These valves can also be adjusted by changing shims.

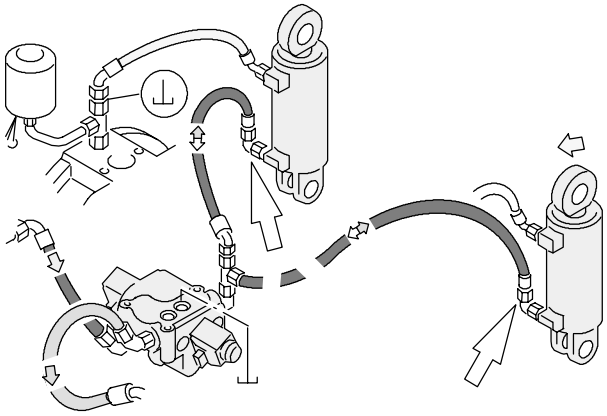
Important! If the hydraulic power lift or the Delta Powershift have malfunctions, the pressure filter insert should be changed immediately.

Hydraulic power lift

1. Control valve

A. Checking shock valve opening pressure

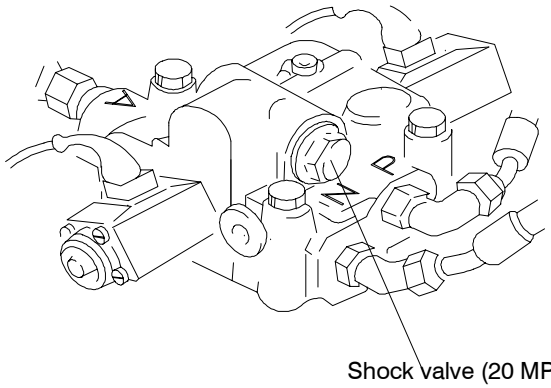
1. Lower the lower links to the lowest position.



2. Connect a pressure gauge and a hand pump to one pressure hose of the lifting cylinder (see arrows) (measuring equipment, see page **910/5).**

3. Raise the lower links to the upper position, stop the engine and switch off current.

4. Pump with the hand pump pressure into the control valve and read the opening pressure, which should be **20–21 MPa**.



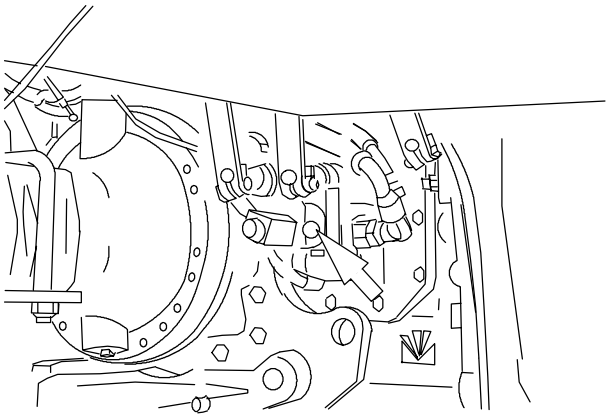
Note! The shock valve is accessible without removing the control valve.

Note! If you want to lower the lower links without starting the engine (e.g. during repair work), unscrew the shock valve after which the lower links can be pressed to the lower position.

B. Removing control valve

Note! The control valve is fitted on the RH side of the gearbox housing.

1. Remove the RH side rear wheel. Disconnect the solenoid valve leads from the control valve.



2. Disconnect all oil hoses from the control valve. Unscrew the control valve fixing bolts (3 pcs) and remove the valve.

Note! There is an oil hole between the control valve and the selector cover. This hole has been sealed with an o–ring, which must be fitted back when the control valve is fitted.

C. Fitting control valve

1. Make sure that the o–ring is in place between the control valve and the selector cover.

2. Fit the control valve and tighten the fixing bolts evenly to **23–27 Nm**.

3. Connect the solenoid valve leads and all oil hoses.

4. Test–drive the tractor and check the function of the hydraulic power lift.