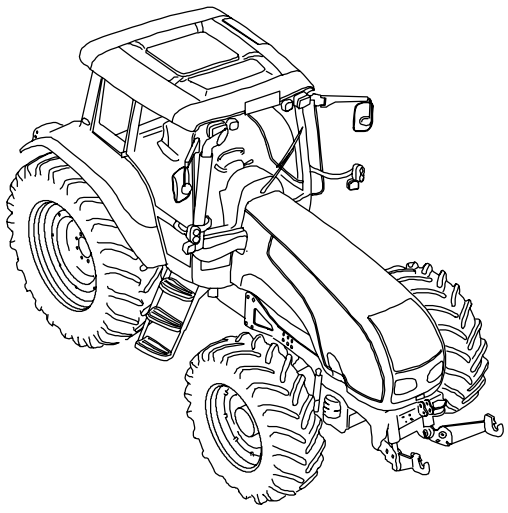
VALTRA

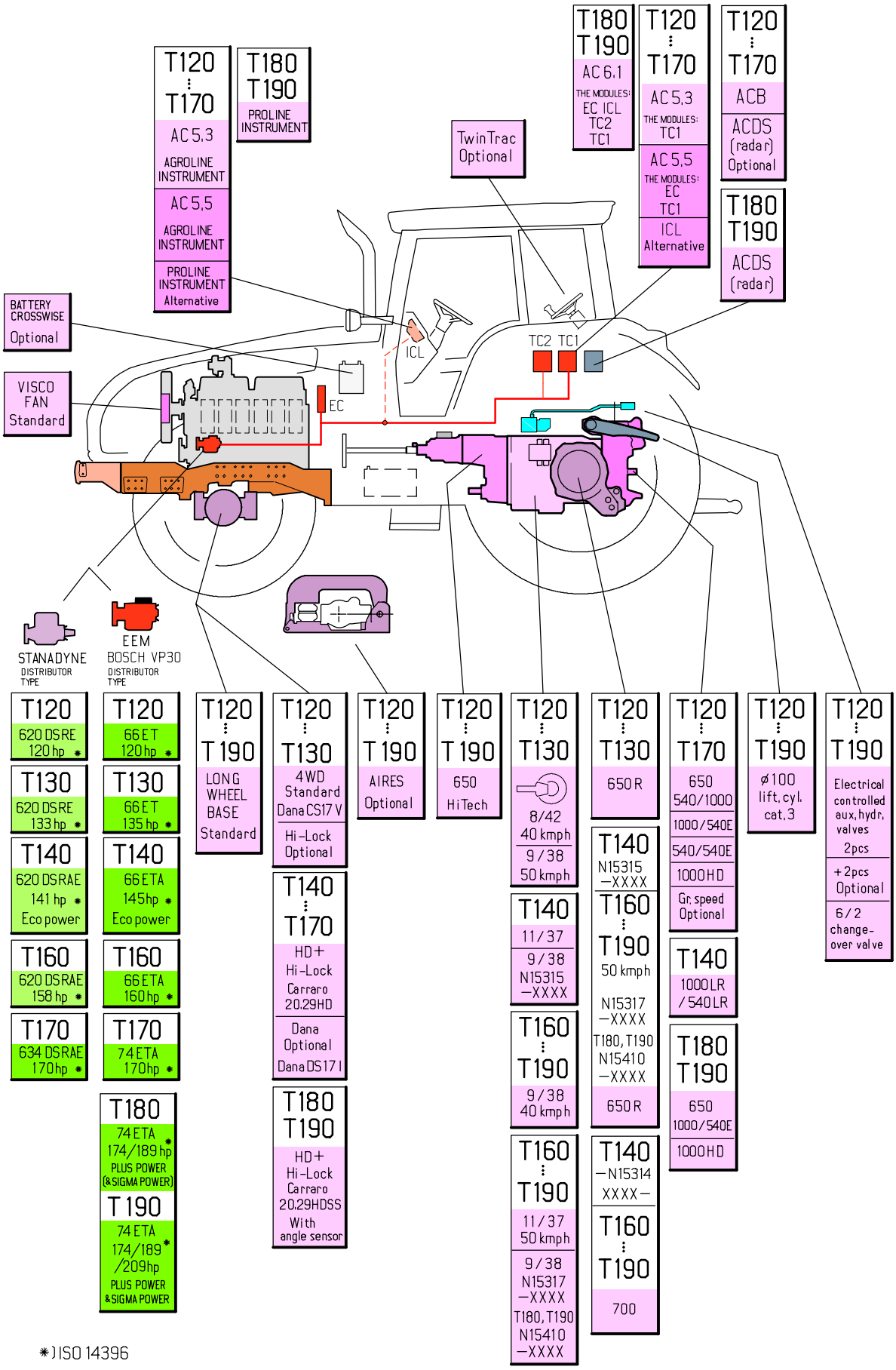
M120 M130
M150
T120 T130
T140, T160
T170 T180
T190



Service Manual

Tractors

T120–T190 series, construction



Cylinder head and valve mechanism

Removing cylinder head

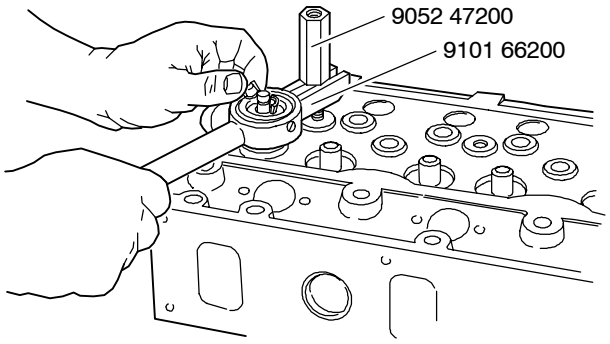
1. Clean the engine externally and drain the coolant. Disconnect the coolant hoses from the cylinder head and the thermostat housing.
2. Remove the suction hoses between the turbocharger and the air filter and between the turbocharger and the inlet manifold.
3. Disconnect the turbocharger pressure and return oil pipes.
4. Disconnect the current from the main switch. Disconnect wires from the intake air heater.
5. Remove the injector leak-off fuel pipes and the delivery pipes. Remove the injectors. Fit blanking-off caps on all open connections.
6. Remove the inlet and exhaust manifolds and the thermostat housing.

Note! It is possible to remove the cylinder head even thought these parts are attached to the head.

7. Remove the valve cover.
8. Remove the rocker arm mechanism and the push rods.
9. Loosen all the cylinder head bolts first by a 1/4 turn and then remove them. Remove the cylinder head.

Removing valves

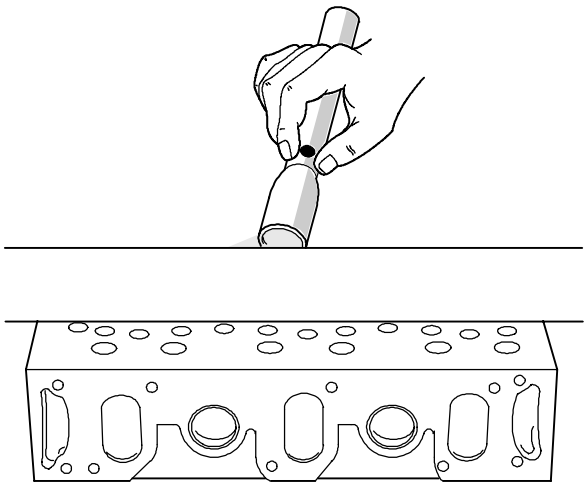
Ensure that valves which are to be re-used are marked, so that they are fitted in their original locations.



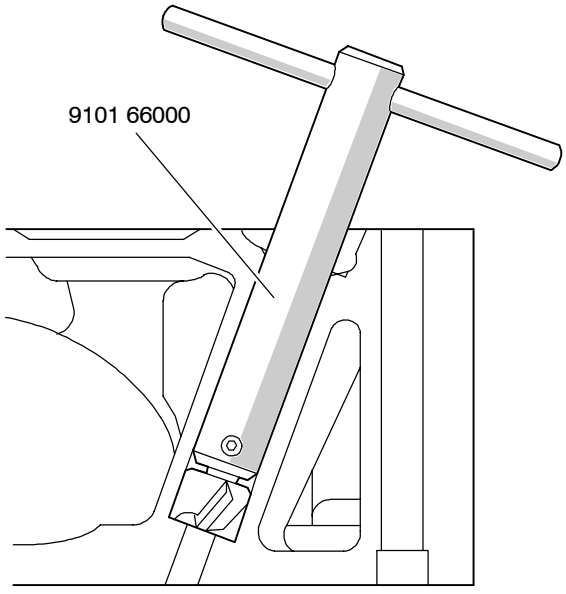
1. Install the counter screw 9052 47200 for the valve spring installing tool in the rocker arm cover bolt. On the 66– and 74-engines there is not a screw stud at the valves for the centre cylinder. A bolt of suitable length should be used instead.
2. Compress the valve springs using lever 9101 66200. Remove the valve cotters, spring guide and spring. Remove the valves.

Checking cylinder head

1. Remove the soot from the exhaust ports, clean the sealing surfaces and wash the cylinder head.
2. Check for cracks and other damage.



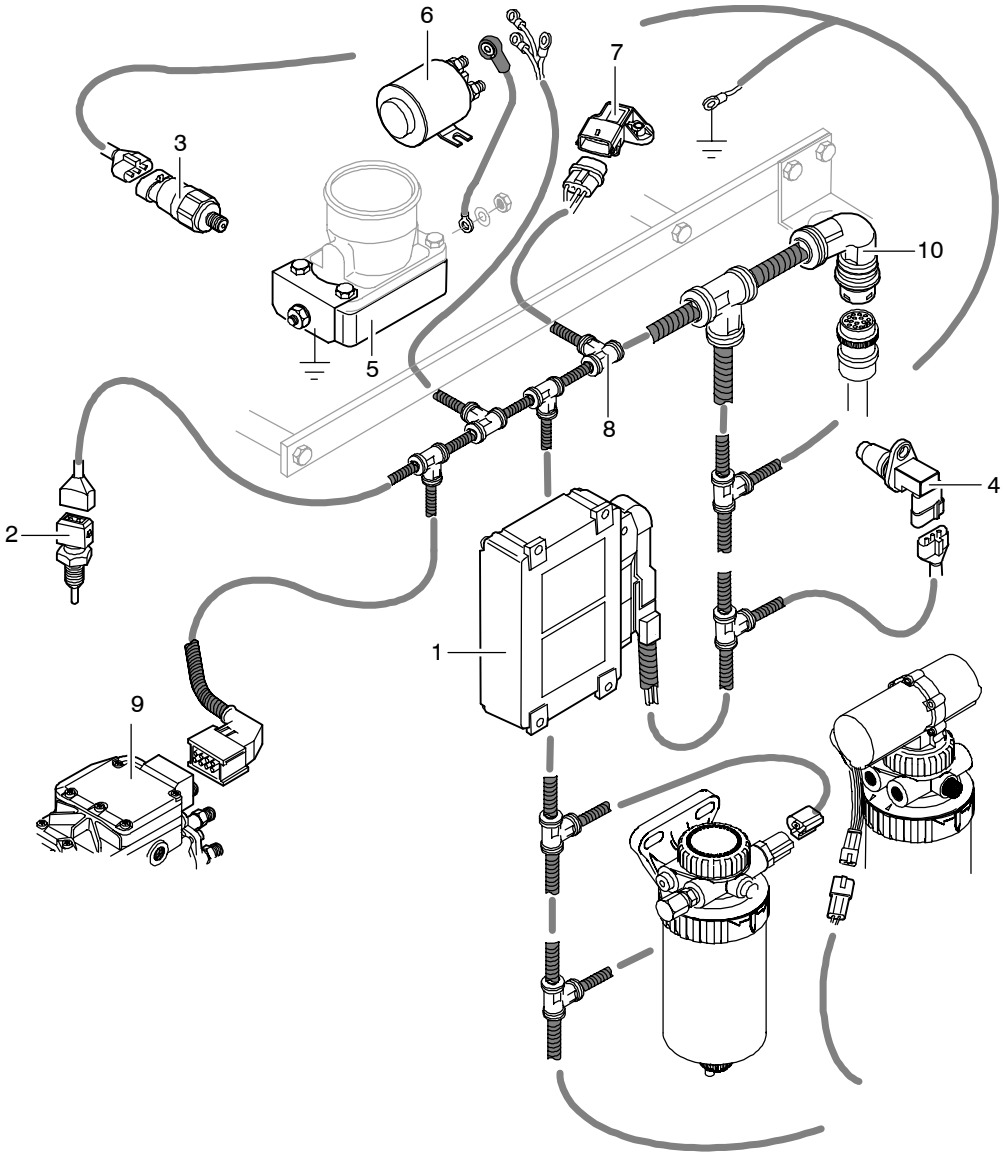
3. Check the flatness of the cylinder head by using a straight edge. An uneven or warped surface should be surface ground. The height of the cylinder head, after grinding, should not be less than **104,00 mm**. The valve disc depth from the cylinder head surface should be **0,60 mm** for the exhaust valves and **0,70 mm** for the inlet valves.



4. Straighten and clean the injector location seat in the cylinder head with cutter 9101 66000.

Engine Control System, EEM2

Construction



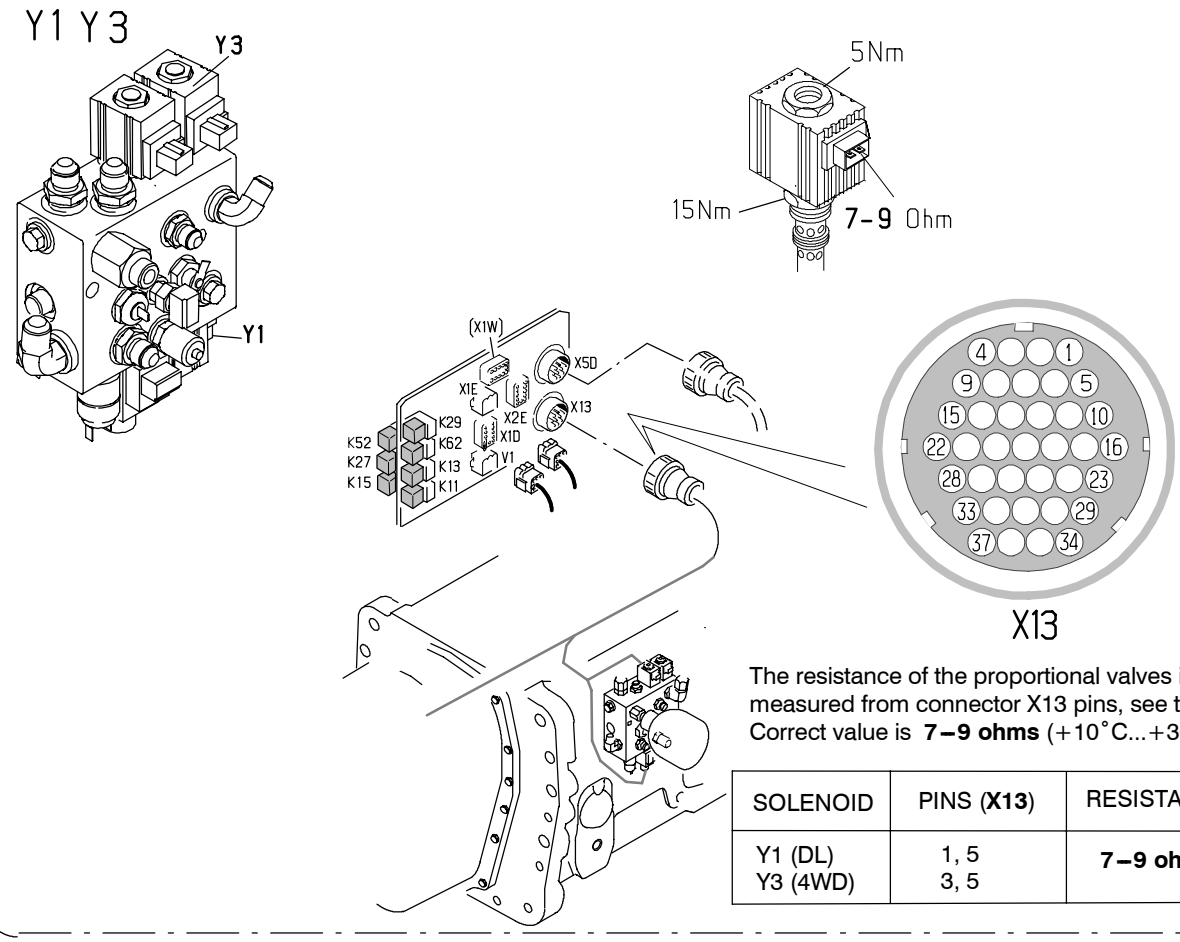
Parts of engine control system EEM 2

1. Electronic control unit (ECU)
2. Coolant temperature sensor
3. Oil pressure sensor
4. Speed sensor 1
5. Electric intake air heater
6. Solenoid for intake air heater
7. Boost pressure sensor
8. Wiring set of engine
9. Pump control unit (PCU)
10. Vehicle connector

Equipment list of the wiring diagram, T120–T170 (M39149–), AC5.3

Symbol	Description	Page and position	Location
–A15	Control unit, front PTO	/10.B15	Cab
–A15	Control unit, front PTO	/11.B15	Cab
–A1A	TC1 control unit,	/1.C4	Cab
–A1A	TC1 control unit,	/2.B9	Cab
–A1A	TC1 control unit,	/5.A13	Cab
–A1A	TC1 control unit,	/6.B9	Cab
–A1A	TC1 control unit,	/8.C9	Cab
–A1A1	Connector, 9–POLE	/6.B8	Cab
–A1A1	Connector, 9–POLE	/8.B9	Cab
–A1A2	Connector,9–POLE	/12.B4	Cab
–A1A2	Connector, 9–POLE	/6.B9	Cab
–A1A2	Connector, 9–POLE	/8.C7	Cab
–A1A3	Connector, 8–POLE	/1.C4	Cab
–A1A3	Connector, 8–POLE	/5.A13	Cab
–A1A3	Connector, 8–POLE	/6.B10	Cab
–A1A4	Connector, 8–POLE	/6.B15	Cab
–A1A4	Connector, 8–POLE	/8.B2	Cab
–A1A5	Connector, 10–POLE	/2.B7	Cab
–A1A5	Connector, 10–POLE	/8.B12	Cab
–A1A6	Connector, 10–POLE	/2.B11	Cab
–A1A7	Connector, 8–POLE	/2.B5	Cab
–A1A7	Connector, 8–POLE	/8.B10	Cab
–A1A8	Connector, 8–POLE	/2.B12	Cab
–A1A8	Connector, 8–POLE	/8.B9	Cab
–A1D	Control card, Danfoss	/12.B7	Cab
–A1D	Control card, Danfoss	/13.D7	Cab
–A1E	EHRB control unit, power lift	/11.B8	Cab
–A1E	Connector, 25–POLE	/11.B8	Cab
–A1P	Instrument	/1.B7	Cab
–A1P	Instrument	/1.B7	Cab
–A1P	Instrument	/4.B3	Cab
–A1P	Instrument	/5.D3	Cab
–A1P	Instrument	/6.C2	Cab
–A1P	Instrument	/10.B7	Cab
–A2	Radio	/1.D2	Cab
–A2E	EHRB control unit, power lift	/11.B13	Cab
–A2E	Connector, 26–POLE	/11.B13	Cab
–A3	Distribution box	/1.A4	Cab
–A3	Distribution box	/3.C10	Cab
–A5	Air suspension seat	/9.C6	Cab
–B1	Sensor, engine temperature gauge	/10.C10	Engine
–B11	Speed sensor, engine	/6.D9	Transmission
–B12	Sensor, F/R power shuttle	/6.D7	Transmission
–B13	Sensor, F/R power shuttle	/6.D8	Transmission
–B14	Temperature sensor, gearbox	/2.D6	Transmission
–B15	Hall–Angle sensor, accelerator pedal	/2.D7	Engine
–B16	Hall–Angle sensor, clutch pedal	/2.C4	Cab
–B17	Temperature sensor, outdoors	/2.D8	Engine
–B1E	Position sensor	/11.B2	Transmission
–B1W	Hall–Angle sensor, clutch pedal	/8.C10	Cab
–B2	Sensor, fuel gauge	/10.C11	Engine
–B2E	Draft sensor, r.h	/11.C2	Transmission
–B3	Temperature sensor, gearbox	/6.D4	Transmission
–B3E	Draft sensor, l.h	/11.C2	Transmission
–B6	Speed sensor, gearbox	/6.D5	Transmission
–B7	Speed sensor, PTO	/6.D4	Transmission

Measurements of the TC2 unit proportional valves 4/4



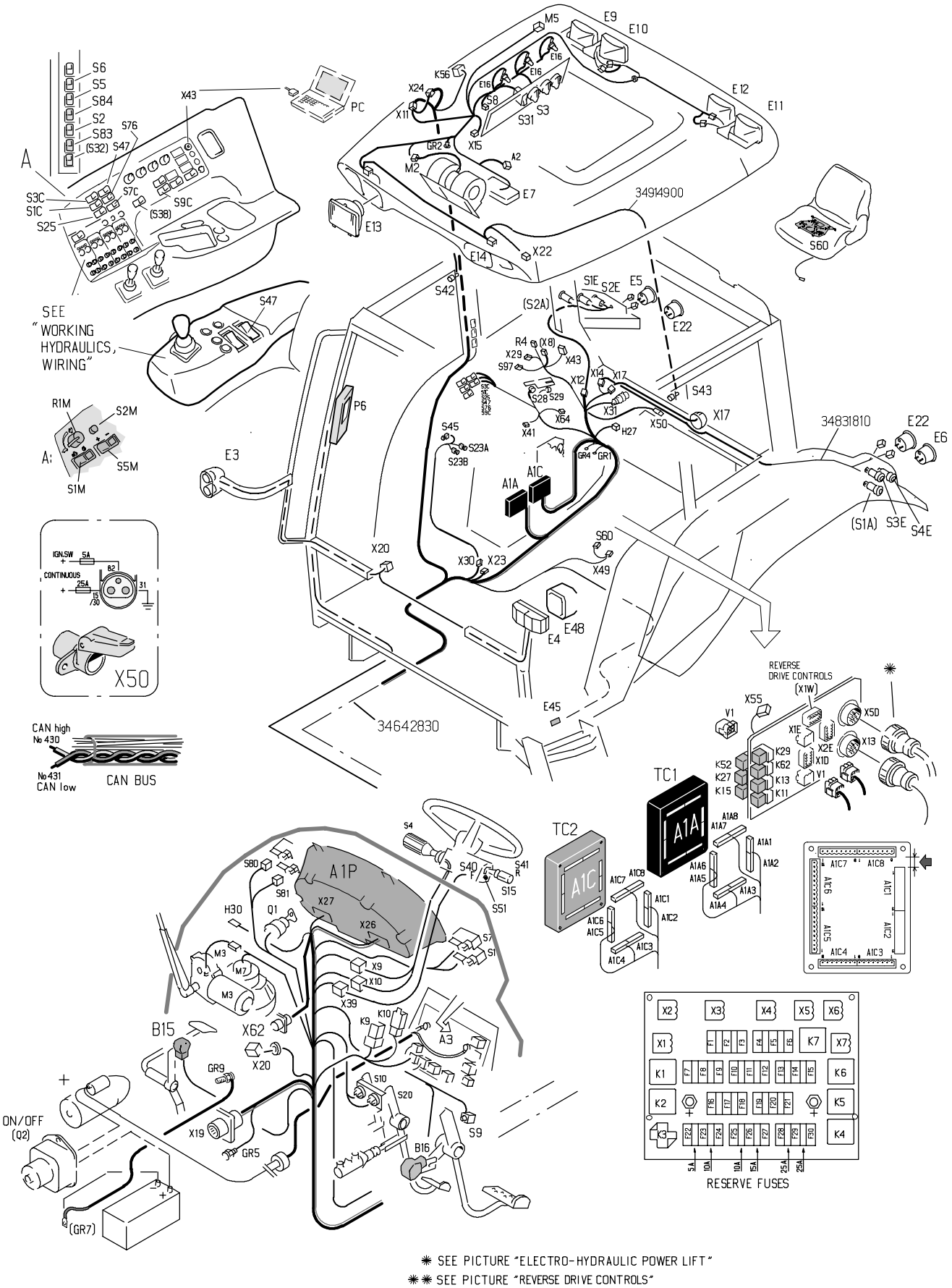
The resistance of the proportional valves is measured from connector X13 pins, see table. Correct value is **7–9 ohms** (+10˚C...+30˚C).

SOLENOID	PINS (**X13**)	RESISTANCE
Y1 (DL) Y3 (4WD)	1, 5 3, 5	**7–9 ohmia**

Location of the proportional valves in wiring diagram:

Symbol	**Description**	**Page+position** (in wiring diagram)	**Location**
Transmission:			
–Y1	Valve, differential lock	/14.C11	Transmission
–Y3	Valve, 4WD	/14.C12	Transmission

The electrical equipments of the cab



✳ SEE PICTURE "ELECTRO-HYDRAULIC POWER LIFT"

✳✳ SEE PICTURE "REVERSE DRIVE CONTROLS"

8. Take the hold of the rail and move it. It must move loosely.

9. Then push the rail (together with the fork) to the front position. Move the rail again. It must move loosely.

10. Adjust if necessary and finally tighten the adjusting piece nut.

11. In the same way adjust the selector fork for gears 3–4.

Note! Selector fork for gears 3–4 is easiest to adjust by moving the fork so that the groove on it is opposite the groove on the fork for gears 1–2 when the gears are in neutral position.

12. Check the adjustment in the extreme positions, so that the rail/fork for gears 3–4 moves loosely in these positions.

13. Adjust the selector fork for range gears (H–M) in the middle position and check the adjustment in the extreme positions as above.

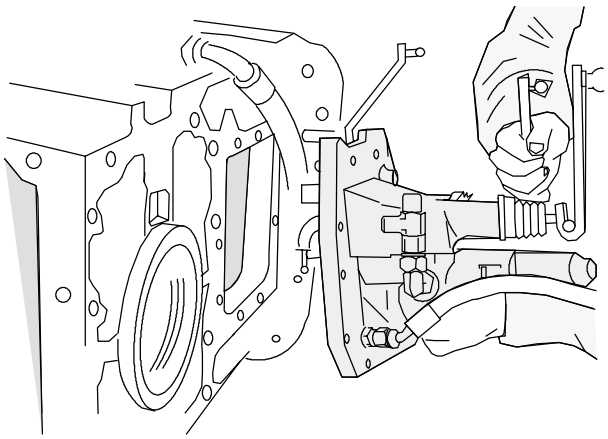
14. Move the fork for range LL (and fork for ground speed PTO, if fitted) to the neutral position and make sure that the groove on the M–H fork is exactly opposite the groove on the fork for range LL (gears in neutral).

Note! If the LL–fork has to be adjusted, the tractor frame must be split between the gearbox and fuel tank and the reverse shuttle housing must be detached. Thus the nut at the front end of the LL–fork rail can be opened and the rail can be turned.

Fitting the side cover

15. Make sure that the selector fork rail locking pins are in their holes.

16. Move all selector forks to the neutral position. Apply sealing compound (e.g. Silastic) to the contact surface between the cover and the gearbox. Clean mating surfaces if necessary.



17. Fit the side cover (upper end first).

18 Tighten the bolts to **50 Nm**.

19. Connect the oil hoses to the cover and to the control valve.

20. Connect the cables and the shifter rods to the shifter levers on the cover

21. Pour the oil into the gearbox.Test–drive the tractor and check that the gear change mechanism functions properly.

Changing selector forks

1. Drain the oil from the gearbox.

2. Split the tractor between the gearbox and the fuel tank.

3. Remove the quick–shift gear from the gearbox front side.

4. Remove the gearbox side cover.

5. Remove the selector fork locking pins. Pull out the rails forwards and remove the forks through the side opening in the following order:

– fork for ranges M–H (remove first the LL/PTO–rail)
– fork for ground speed PTO (if fitted)
– fork for gears 3–4
– fork for range LL
– fork for gears 1–2

6. Fit the forks in the reverse order.

Note! The rail, fork and the locking pin for gears 1–2 must be fitted before other parts are fitted into the gearbox. In addition, the fork for ranges M–H must be fitted onto the sliding coupling before fitting the rail for range LL (and ground speed PTO (if fitted))

Sliding pieces on the selector forks

Forks 1–2, 3–4, M–H and F–R have each 4 pcs sliding pieces and they are all similar (spare part number 32888200, 16 pcs).

Fasten the sliding pieces on the forks with a little grease during fitting.

Also the later AVO and LL forks have sliding pieces.

Reconditioning final drives

Note! Both final gear types appear in the illustrations

Removing final drives

Note! The brake housing is not removed from the tractor. E–models have a rotation speed sensor on the RH side final drive.

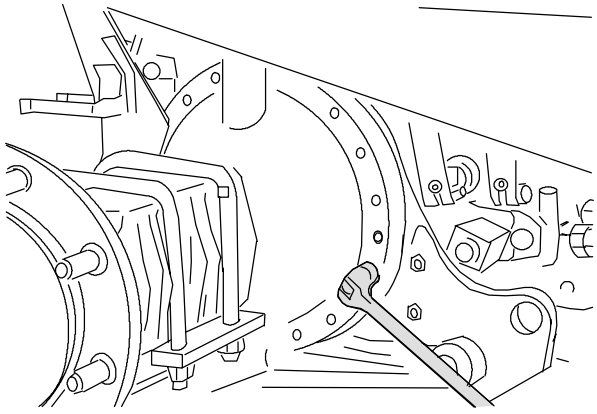
1. Drain the transmission oil (22 mm, 3 plugs). Disconnect the check links from the rear axle housings.

2. Slacken the rear wheel nuts. Raise the rear wheel and remove it. Block up the tractor with an axle stand placed under the front edge of the brake housing.

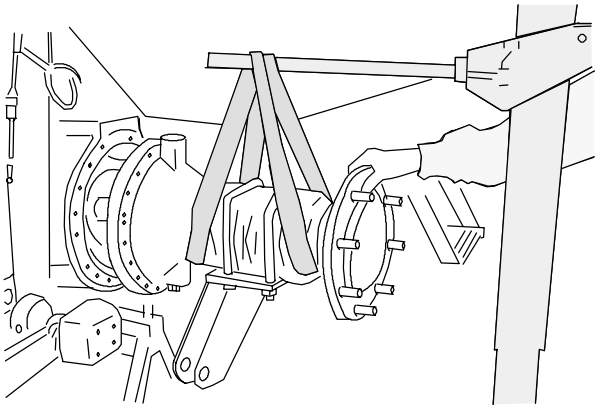
3. Unscrew the cab rear attaching bolts. Disconnect the PTO control cable, pick–up hitch release control and the joint at the lower end of the lewelling screw control rod. Remove all engine hood plates.

4. Raise the cab rear end about 6 cm and support it.

Note! The lifting rope can be attached to the lewelling screw control rod support on the cab rear wall. Do not damage the rear window.



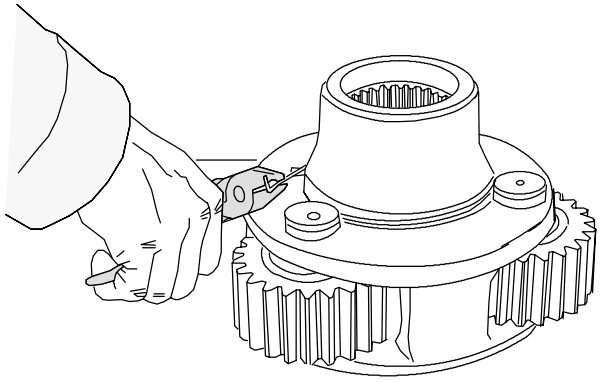
5. Connect a suitable hoist to the rear axle housing. Unscrew the final drive attaching bolts.



6. Pull the housing straight outwards so that it clears the brake housing.

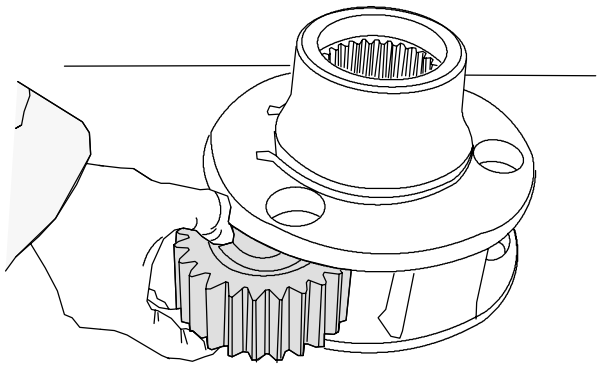
Changing needle bearings in planetary gears

1. Remove the lock washer from the centre screw securing the outer drive shaft to the planetary gear and unscrew the screw. The attaching plate remains inside the planetary retainer.



2. Pull the planetary gear off the drive shaft. Cut the locking wire under the locking spring for the planetary gear shaft studs. Remove the locking wire.

3. Compress the locking spring with a pair of pliers and pull the shaft studs out of the planetary retainer.



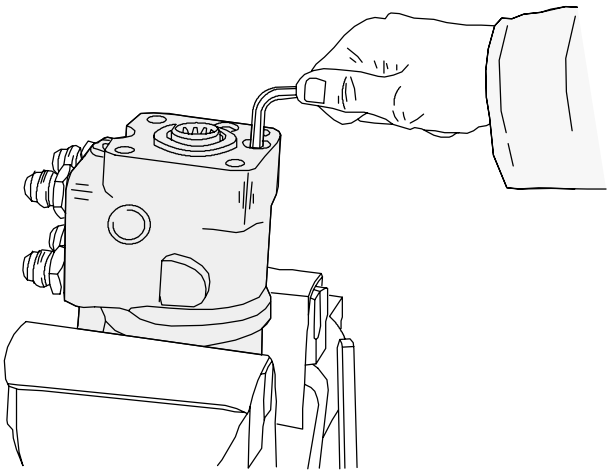
4. Remove the planetary gears from the retainer. Push at the wear washers in order to prevent the 2x25 needles in each bearing from falling out. Change the needles. When assembling, fix the needles in position with a little grease.

Note! Note the spacers between the two rows of needles.

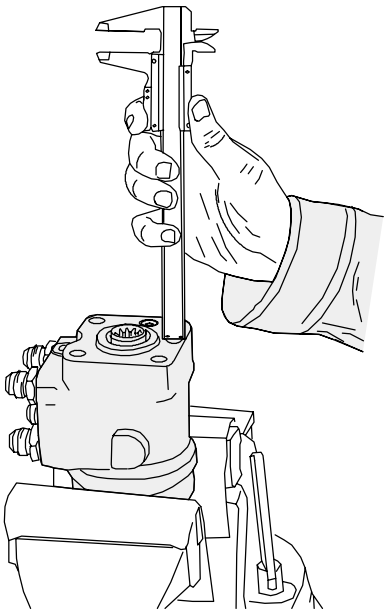
Cleaning shock valves and pressure–limiting valves

1. Remove the steering valve (**see instr D**). Secure the valve in a vice with soft jaws.

Note! There are two shock valves in the steering unit. Both valves are similar.



2. Remove the plug on the shock valve (6 mm socket head) and remove the sealing ring of the plug.



3. Measure and make a note of the distance between the adjusting screw and the upper face of the steering valve to facilitate the setting of the opening pressure of the shock valve.

4. Remove the adjusting screw (6 mm socket head). Shake out a spring, washer and a ball.

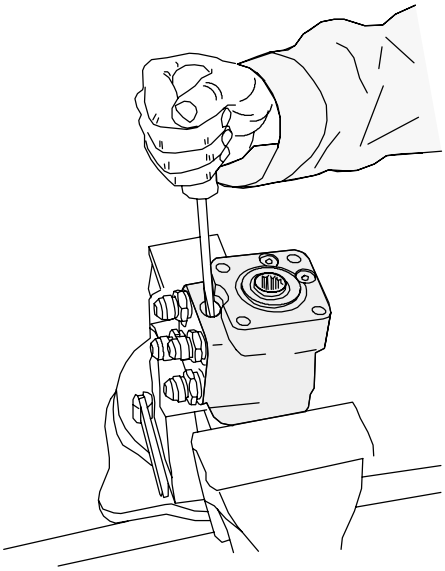
5. Clean and check the parts and change faulty ones. Lubricate all parts with oil before assembling. Minor damage to the seat can be polished with a ball and fine grinding paste.

6. Fit the valve ball, washer and the spring.

7. Apply a little locking fluid to the threads on the adjusting screw. Screw in the screw to the depth as measured in paragraph 3.

8. Fit the sealing ring and the valve plug and tighten to a torque of **40–60 Nm**.

9. Unscrew the pressure–limiting valve plug (8 mm socket head).



10. Remove the pressure–limiting valve insert by unscrewing it with a 12 mm Allen key.

11. The pressure–limiting valve insert can be disassembled by unscrewing the plug with a 4 mm Allen key. After that the valve spring, seat and the ball can be removed.

Note! When assembling the valve, screw the plug to the same depth as it was before disassembling.

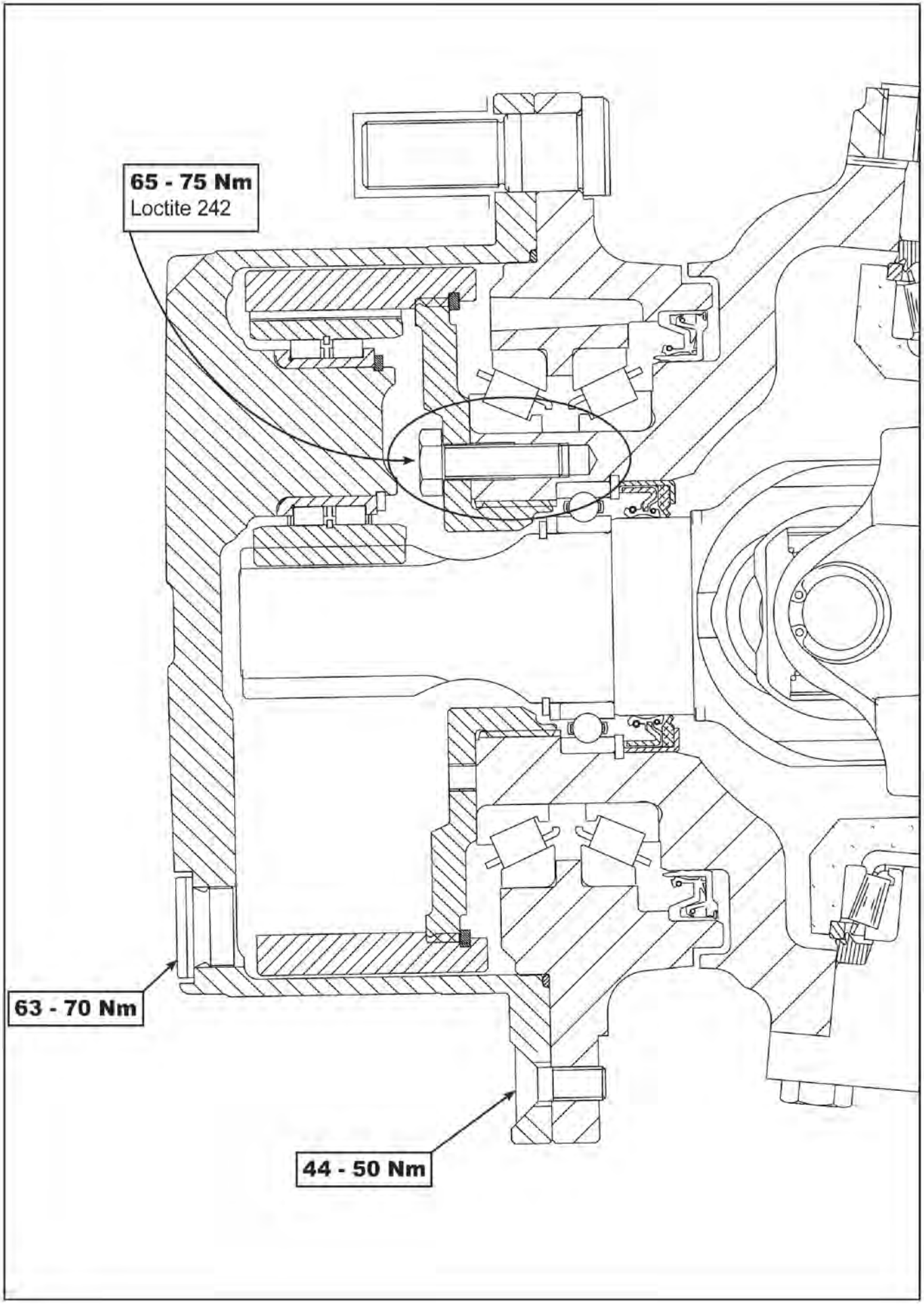
12. Clean all parts and the valve bore and lubricate the parts with oil.

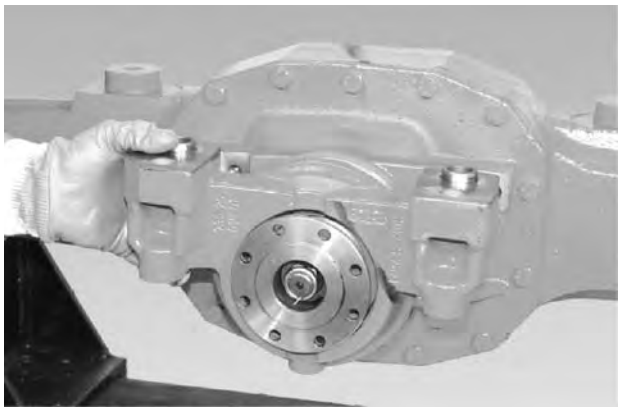
13. Make sure that there is a sealing ring on the pressure–limiting valve insert. Fit the valve insert and tighten it to **40–60 Nm**.

14. Fit the plug sealing ring and tighten the plug to **40–60 Nm**.

15. Fit the steering valve (**see instr. G**) and check the steering system pressures (**see instr. A and B**).

Assembling the planetary reduction

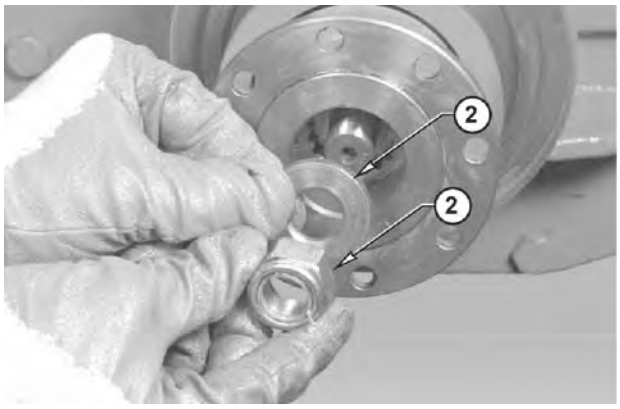




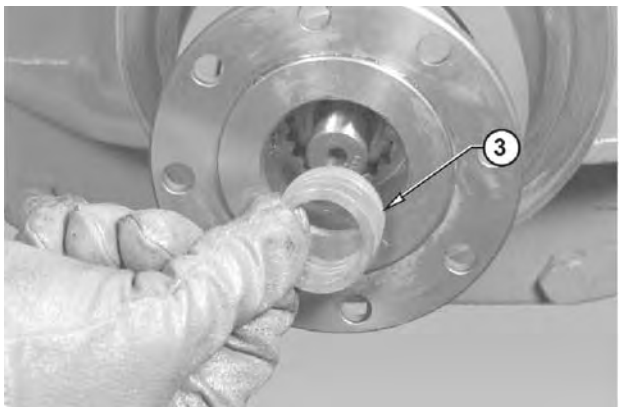
Remove the swinging support.

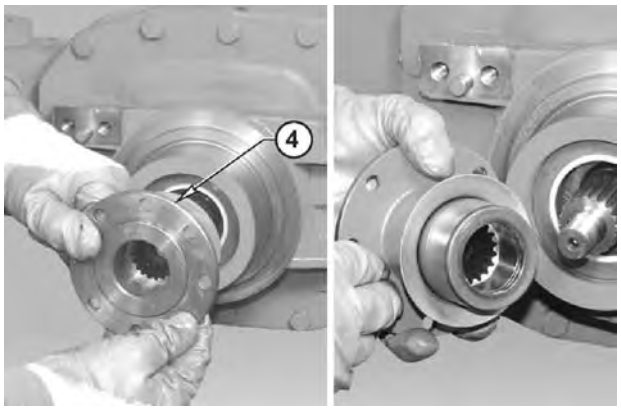
Remove the bottom front sealing ring and shims.

Position tool, so as to avoid pinion rotation.
Unloose and remove the nut (1).



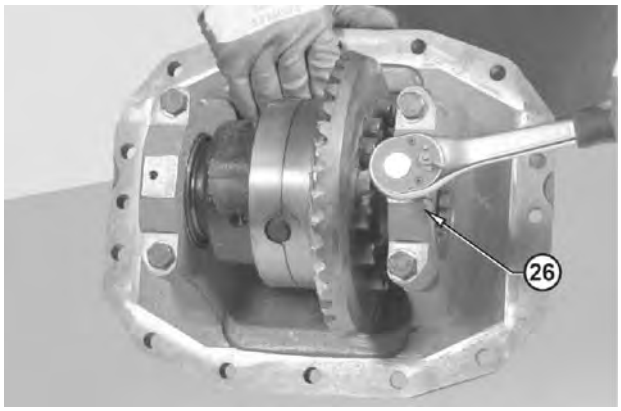
Unloose and remove the nut (1); also remove the washer (2) and (2) and shims (3).



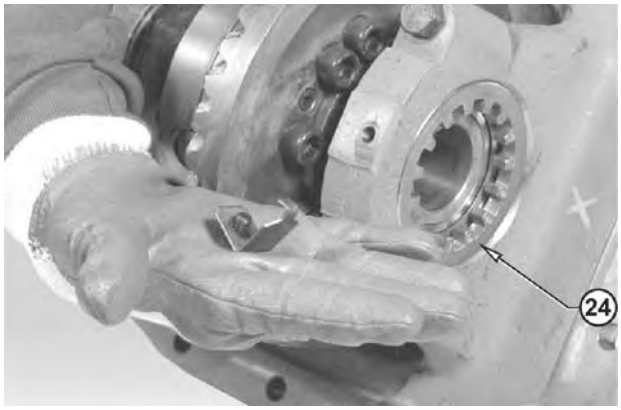


Remove the flange (4).

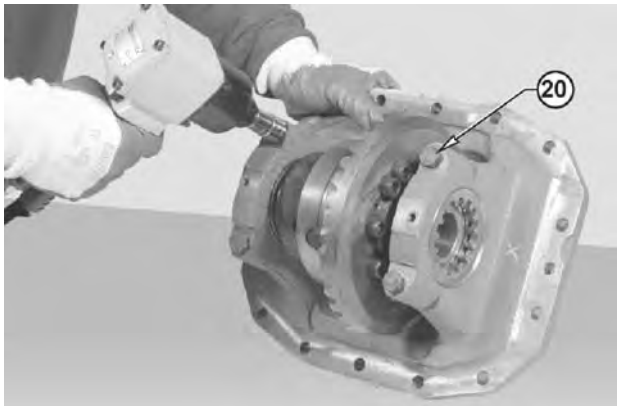
Remove the O–ring (5).



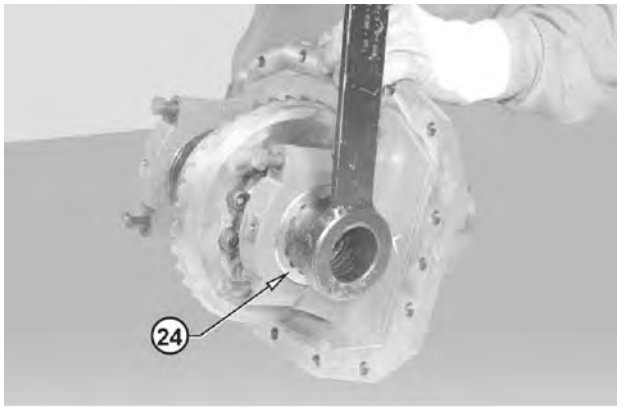
Remove the screw (26).



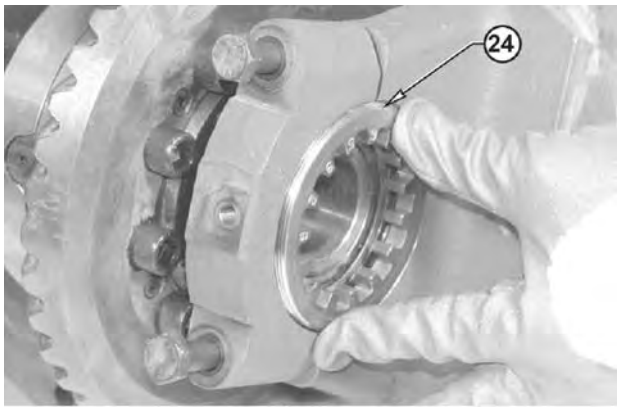
Mark the position of the ring nuts (24) and differential support (19)(13).



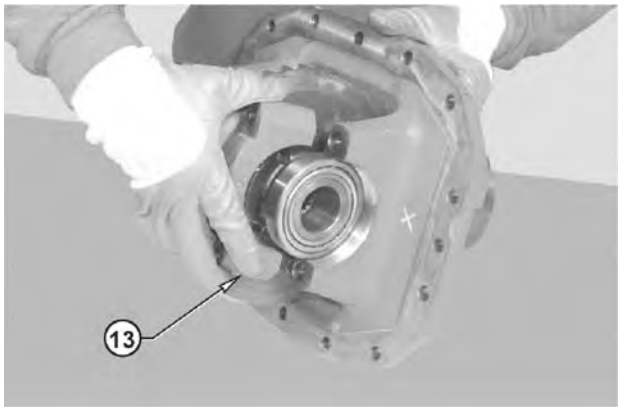
Remove the bolts (20).



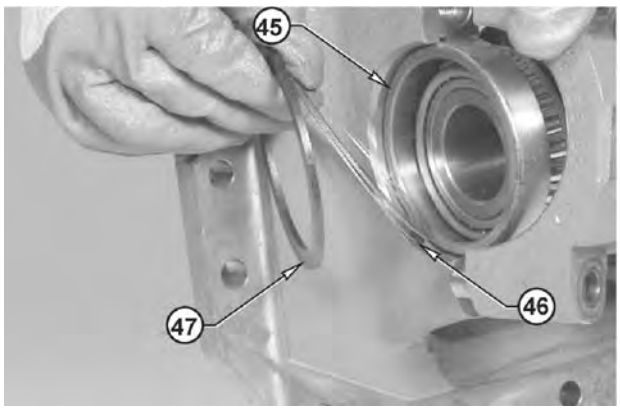
Remove the ring nuts (24).
NOTE. Accurately clean the threaded portions on ring nuts of body and cover.



Mark the position of the ring nut (24) and differential support (13).



Remove the differential support (13).



Remove the thrust block of the internal bearing (45) as well as the shim washers (46)(S).

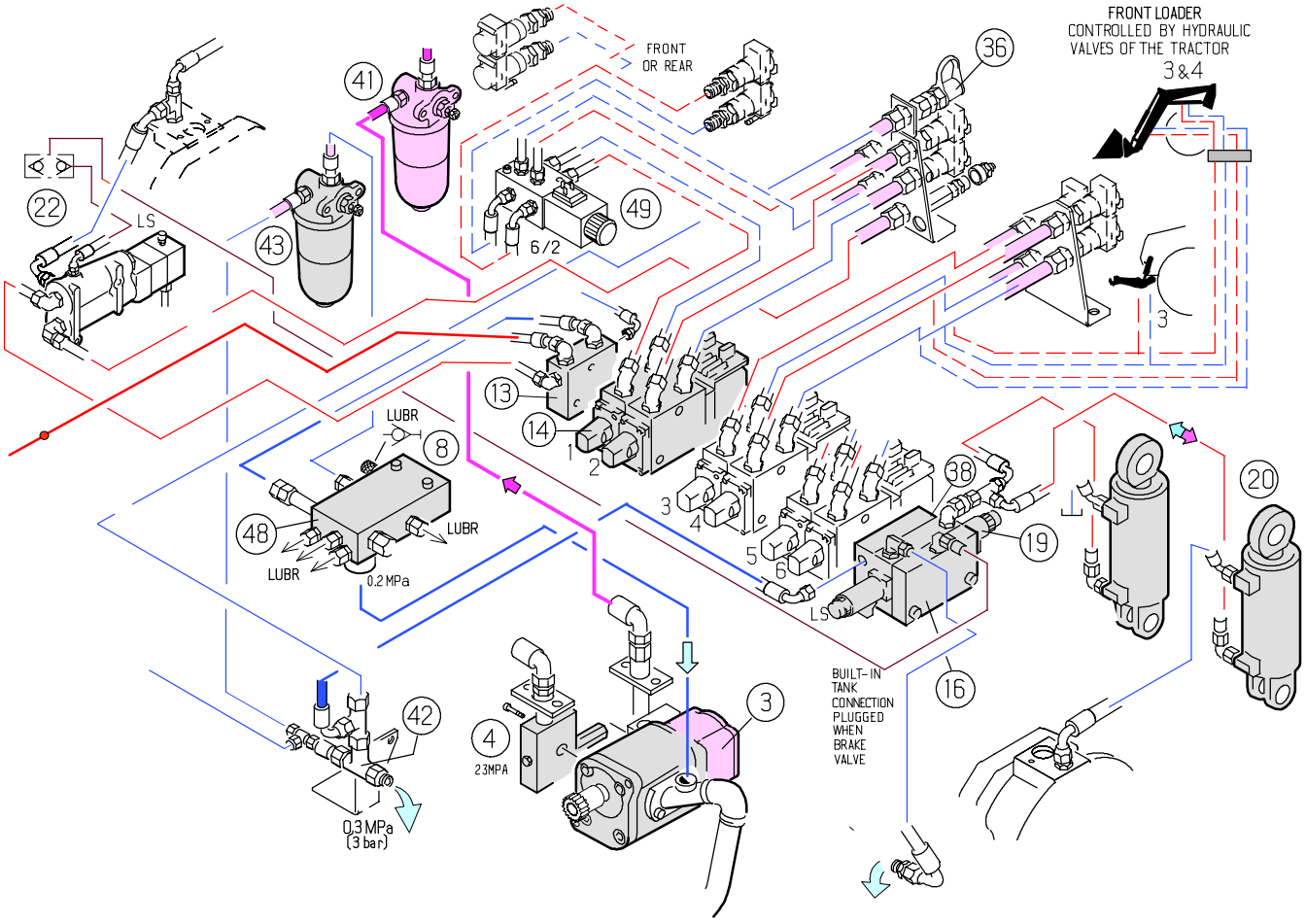
Tyre loadings and pressures, T120–T170

Rear axle			Front axle		
Tyre/Tire	**Max loading per tyre/tire** (kg)	**Pressure** (kPa)	**Tyre/Tire**	**Max loading per tyre/tire** (kg)	**Pressure** (kPa)
680/75R32	5000 kg	160 kPa	540/65R30	2725 kg	160 kPa
460/85R38	3250 kg	160 kPa	380/85R28	2060 kg	160 kPa
18.4R38/8	3000 kg	160 kPa	14.9R28/8	1800 kg	160 kPa
18.4–38/8	2725 kg	140 kPa	14.9–28/6	1650 kg	140 kPa
520/70R38	3875 kg	160 kPa	420/70R28	2060 kg	160 kPa
	2185 kg	60 kPa		1160 kg	60 kPa
520/85R38	3875 kg	160 kPa	420/85R28	2430 kg	160 kPa
20.8R38/8	3650 kg	160 kPa		2430 kg	160 kPa
20.8–38/10	3475 kg	160 kPa	16.9R28/8	2240 kg	160 kPa
540/65R38	2390 kg	120 kPa	16.9–28/8	2180 kg	170 kPa
	1810 kg	60 kPa	440/65R28	1450 kg	120 kPa
580/70R38	3875 kg	120 kPa		1060 kg	60 kPa
	2185 kg	60 kPa	480/70R28	2500 kg	160 kPa
600/65R38	3075 kg	160 kPa		1410 kg	60 kPa
	2150 kg	70 kPa	480/65R28	1850 kg	160 kPa
600/65R38 E1	3650 kg	160 kPa		1300 kg	70 kPa
650/65R38	3350 kg	120 kPa	480/65R28	1850 kg	160 kPa
	2510 kg	60 kPa		1300 kg	70 kPa
650/65R38 E1	3320 kg	100 kPa	540/65R28	2070 kg	120 kPa
650/75R38	5800 kg	240 kPa		1540 kg	60 kPa
18.4R42	3150 kg	160 kPa	540/65R28	2070 kg	120 kPa
20.8R42	3875 kg	160 kPa		1540 kg	60 kPa
	4875 kg	240 kPa	600/65R38	3075 kg	120 kPa
480/80R42	3450 kg	160 kPa		3650 kg	160 kPa
	1840 kg	60 kPa	16.9R28	2240 kg	160 kPa
520/85R42	4125 kg	160 kPa	460/85R30	2900 kg	160 kPa
	4750 kg	240 kPa	540/65R30	2360 kg	120 kPa
650/65R42	4250 kg	160 kPa		2725 kg	160 kPa
	5150 kg	240 kPa	480/70R30	2575 kg	160 kPa
620/70R42	4500 kg	160 kPa	230/95R36	980 kg	110 kPa
270/95R48	1465 kg	110 kPa		1165 kg	160 kPa
	1225 kg	160 kPa	14.9R28 IND	3350 kg	320 kPa
20.8R38 IND	5460 kg	260 kPa	16.9R28IND	3765 kg	300 kPa
600/65R38 IND	5350 kg	230 kPa	480/65R28 IND	3765 kg	320 kPa
600/65–34 FOR	4410 kg	240 kPa	500/60–26.5 FOR	3290 kg	320 kPa
18.4–38/14 FOR	3110 kg	260 kPa	14.9–28/14 FOR	2024 kg	300 kPa
600/65R38 FOR	4375 kg	240 kPa	500/65R28 FOR	2800 kg	240 kPa
650/65R38 FOR	5000 kg	240 kPa	540/65R28 FOR	3250 kg	240 kPa
20.8–38/14 FOR	4340 kg	230 kPa	16.9–28/14 FOR	3120 kg	270 kPa

When using twin–mounted wheels note the following:

– the loading on these two wheels together can be multiplied by 1.76 of the permissible loading on one wheel.
– using twin–mounted wheels is for decreasing the surface pressure, not for obtaining better side support
– do not exceed tyre/tire size stated for the model in table J 3. when using dual/extension wheels
– the track width of the inner wheels has to be adjusted to minimum value.
– if necessary limited turning axle.

Hydraulic valves in the working hydraulics



3. . Double pump (**32**+**11** cm^3/r T140: **36**+**11** cm^3/r, i=1,32)
4. Press. relief valve, 23 MPa, besides the pump
8. Pressure checking point (lubrication)
13. Inlet flange (pump side)
14. Directional control valve
16. End flange (tank side)
19. Control valve (Bosch)
20. Lift cylinders
22. Brake valve (optional equipment)
36. Auxiliary hydraulic system return coupling
38. Adapter flange (Danfoss/Bosch)
42. Valve, 0,3MPa (3 bar)
43. Filter, aux. return oil
48. Valve block (0,2 MPa)
49. 6/2–valve

See more about electrical control of the working hydraulics from code 360.