

TECHNICAL TRAINING

CLAAS ACADEMY



TARGO C

Chapter

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1.0 Data table

	C 40	C 50
Specification		
Lifting capacity (max)	2200kg	2500kg
Lifting height (max)	5018mm	5540mm
Reach (max)	2820mm	3110mm
Load centre from the back of the forks	500mm	500mm

Measurements	C 40	C 50
Total length	3650mm	3850mm
Total width	1800mm	1900mm
Total height	1960mm	2130mm
Wheel spacing	2300mm	2300mm
Ground clearance	320mm	320mm
Outer turning circle	3000mm	3100mm

Weight	C 40	C 50
Total weight	5160kg	5400kg
Weight, engine without oil	273kg	273kg
Weight, front axle (approx)	390kg approx	390kg approx
Weight, rear axle (approx)	370kg approx	370kg approx

Engine	C 40	C 50
Type	Perkins 1004-42	Perkins 1004-42
Power	64Kw/106 hp	64KW/106 hp
Full load speed	2200 min ⁻¹	2200 min ⁻¹
Top speed	2250-2400min ⁻¹	2250-2400min ⁻¹
Idle speed	850 min ⁻¹	850 min ⁻¹
Coolant capacity	26 litres	26 litres
Coolant thermostat opening	70°C - 80°C approx	70°C - 80°C approx
Engine oil capacity with filter	9 litres	9 litres
Oil pressure at maximum no load speed	3.5 bar	3.5 bar
Oil pressure at minimum no load speed	1.5 bar	1.5 bar
Fuel tank	85 litres	85 litres

	C 40	C 50
Transmission	Hydrostatic	Hydrostatic
Charge pump	Max 19 l/min	Max 19 l/min
Charge pressure	30 bar	30 bar
Control	Hydrostatic with module (Susmic)	Hydrostatic with module (Susmic)
Standard speed	20 km/h	20 km/h
Speed option	25 km/h	25 km/h
Speed option	30 km/h	30 km/h
Pump (Hydrostatic)	90R75 NFPE series	90R75 NFPE series
Motor (Hydrostatic)	51D 110 series	51D 110 series
Operating pressure min (hydrostatic)	10 bar	10 bar
Operating pressure max (hydrostatic)	480 bar	480 bar
Oil quantity (Hydrostatic)	80 litres	80 litres
Oil quantity (distribution gearbox)	0.7 litres	0.7 litres
Hydraulic filter	10µm	10µm

Axle	C 40	C 50
Type	Mod. 26. 16M+TB172	Mod. 26. 16M+TB172
Drive axle	2	2
Self lock differential	1	1
Steering axle	2	2
Differential gearbox capacity front axle	9.5 litres	9.5 litres
Differential gearbox capacity rear axle	10 litres	10 litres
Planetary gearbox capacity	0.7 litres	0.7 litres

Tyres	C 40	C 50
Series	10,5-20	10,5-20
Option	See operator's book	See operator's book

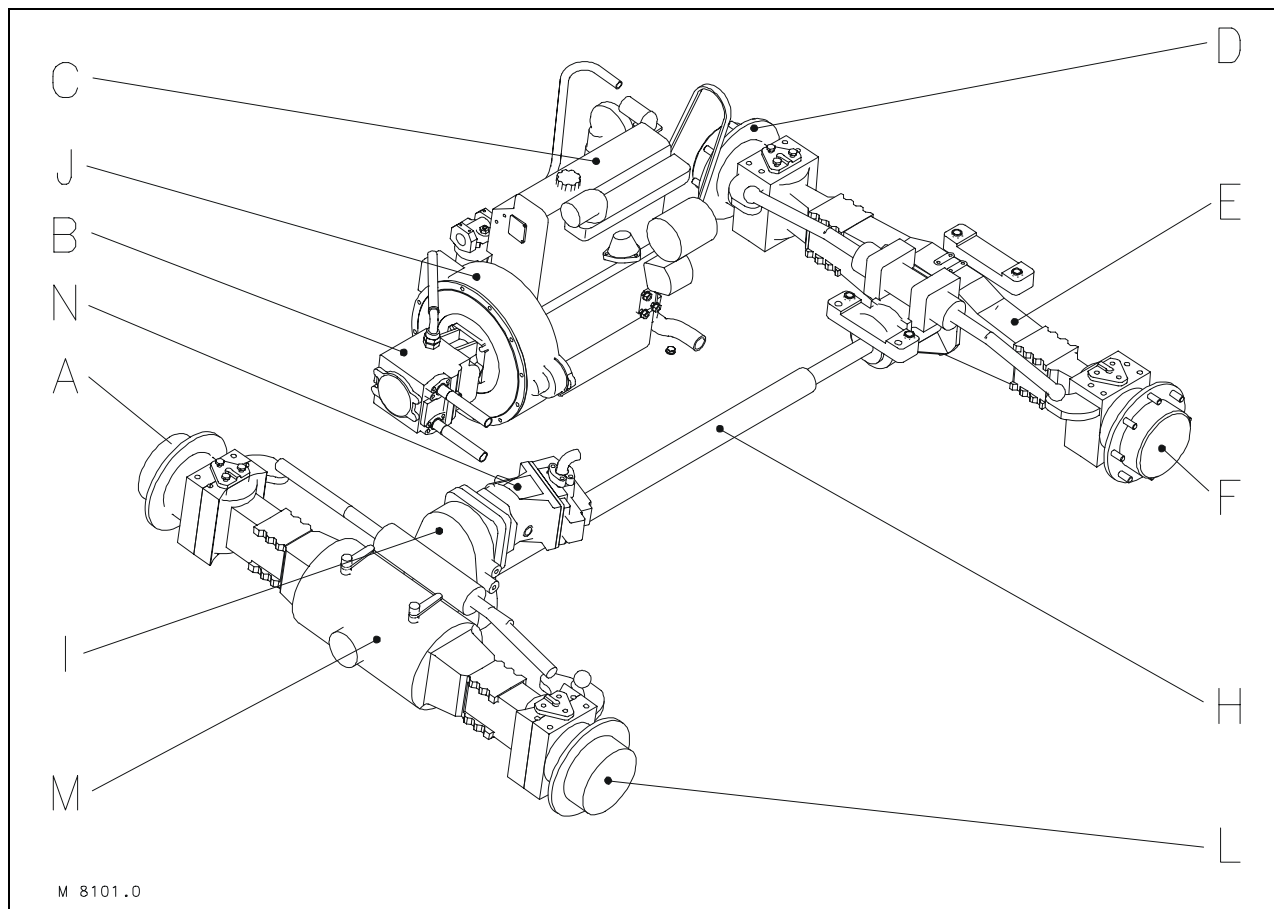
Hydraulics	C 40	C 50
Pump capacity	80 l/min	80 l/min
Pump type	Constant	Constant
Pressure relief valve	240 bar	240 bar
Shock valve, front attachment incline	210 bar	210 bar
Shock valve, front attachment incline back	125 bar	125 bar
Hydraulic tank	55 litres	55 litres
Complete hydraulic oil	80 litres	80 litres
Hydraulic filter	10µm	10µm

Air conditioning	C 40	C 50
Gas R134A	1.1kg	1.1kg
Oil	250ml	250ml

Electrics	C 40	C 50
Battery	110Ah	110Ah
Alternator output	65 Amps	65 Amps

2.0 Drive axle

2.1 C40, C50



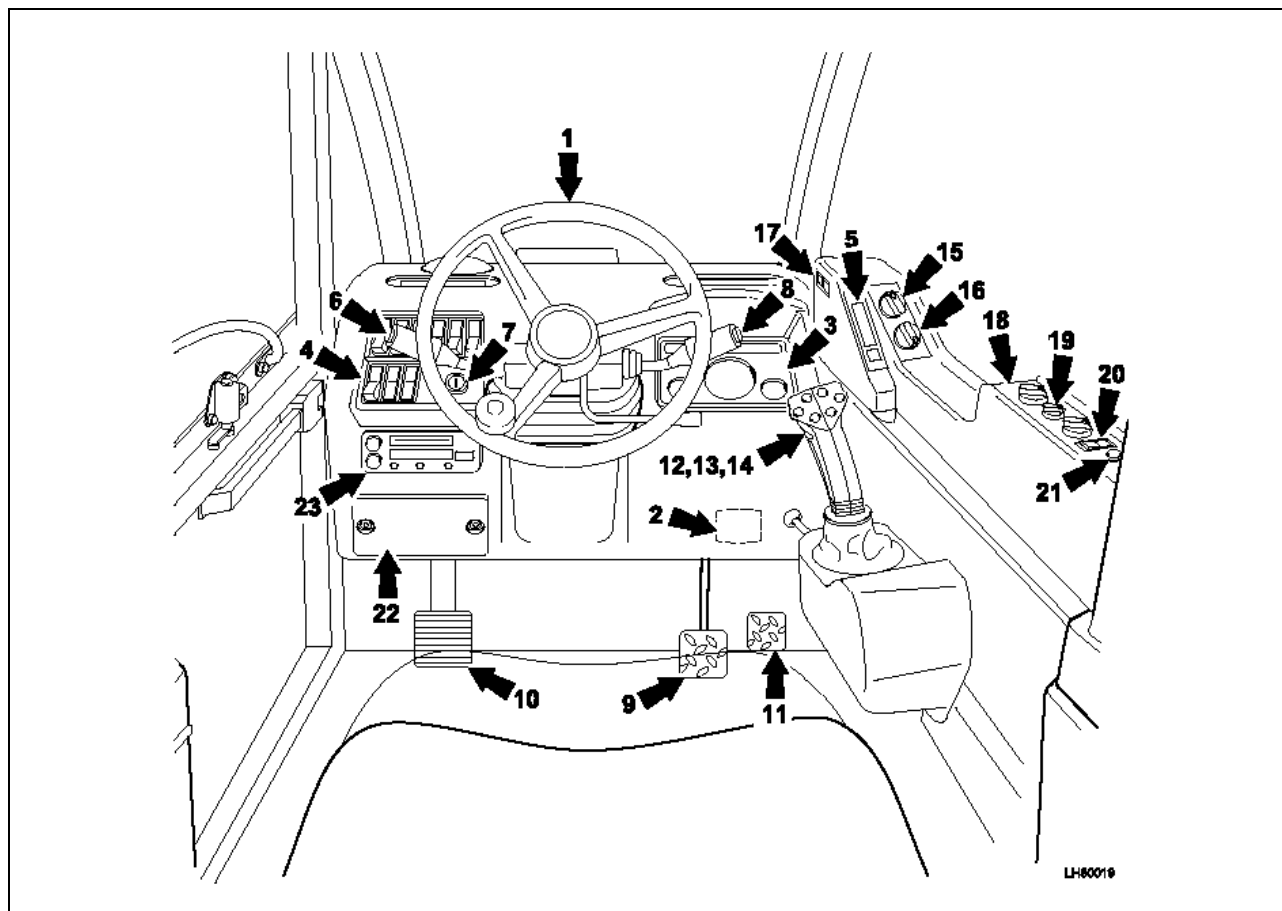
- A Front axle final drive
- B Sauer 90 hydrostatic pump
- C Perkins engine 1004-42
- D Rear axle final drive
- E Rear axle differential
- F Rear axle final drive
- H Drive shaft
- I Transfer gearbox
- J Torque converter
- L Front axle final drive
- M Self locking front differential
- N Sauer 51 hydrostatic motor

Contents

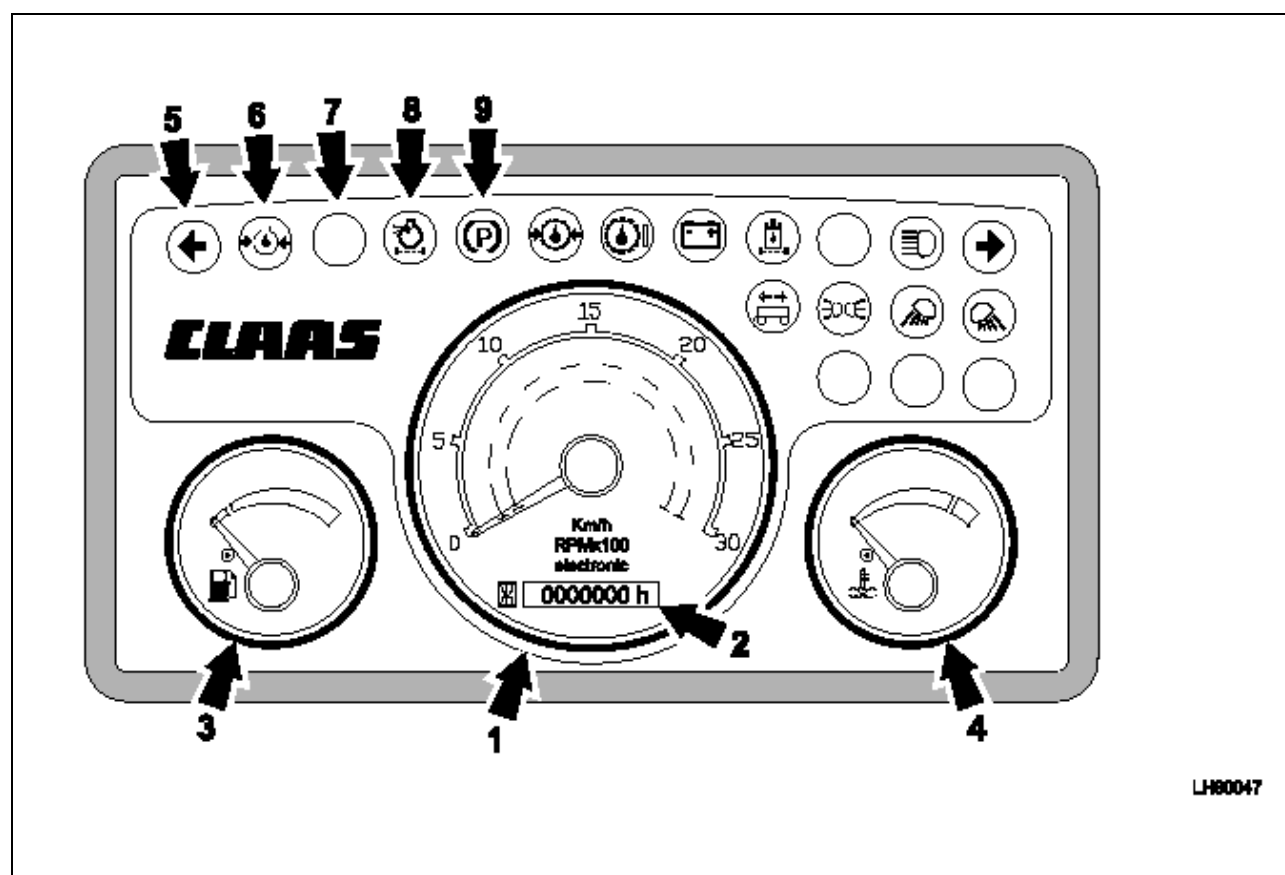
From operator's manual 319 550.1

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1.0 Cab and operating components

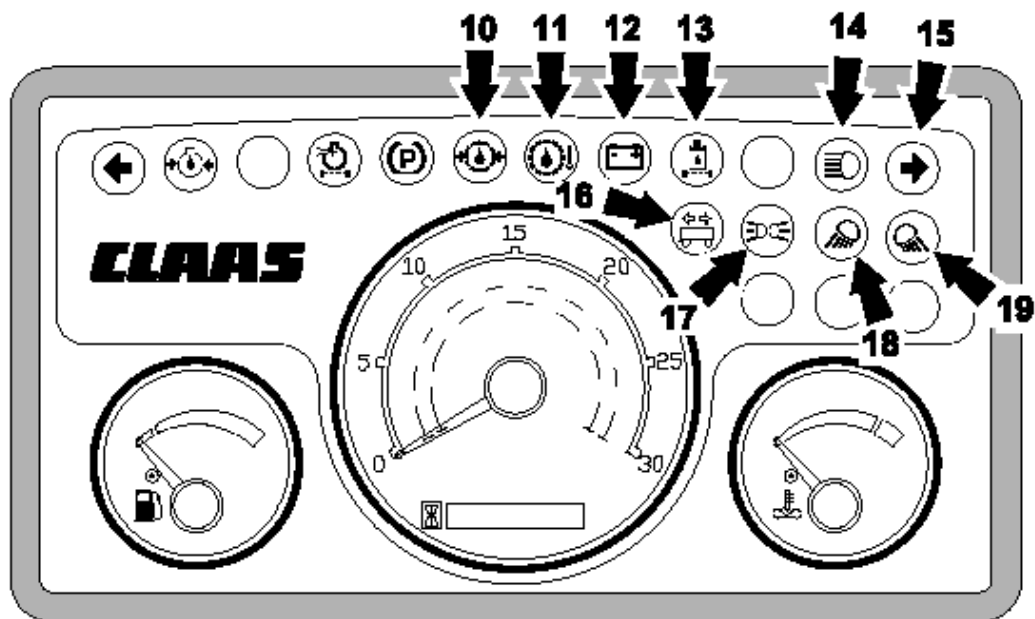


Pos.	Description	Comments
1	Steering wheel	
2	Hydrostatic module (SUSMIC)	Behind guards
3	CLAAS display	
4	Switches on instrument panel	
5	Load monitor	
6	Drive lever	
7	Ignition	
8	Multifunction lever	
9	Accelerator	
10	Brake pedal	
11	Parking brake	Fitted to machines floor
12	Joystick	
13	Standard front attachment	
14	Front attachment	
15	Road travel switch	
16	Steering mode switch	
17	Wheel position lights	
18	Switch	On the side console
19	Operating components	Switch (activates the change over valve)
20	Switch (activation of change-over valve)	For additional rear hydraulics
21	Power socket	
22	Fuses and relays	
23	Radio position	



The instruments and warning lights can be found to the right hand side of the steering column on the instrument panel.

1. **Instrument: Rev counter**
The rev counter shows the speed of the engine in revs per minute.
2. **Operating hour counter**
The operating hour counter displays the total number of hours the engine has run. The hours are used to calculate the maintenance intervals.
3. **Instrument: Fuel gauge**
4. **Instrument: Engine coolant temperature**
This displays the temperature of the engine coolant. The value can vary slightly.
The machine must NOT be worked, when the display stays for a long period of time in an abnormally high position or if the red light is ILLUMINATED.
5. **Indicator:**
This flashes when the left hand indicator is flashing.
6. **Engine oil pressure:**
This illuminates when the engine oil pressure drops below the normal pressure. The light may come on when the engine is started, but should go out once the engine is running.
The machine must NOT be operated when the light is illuminated.
7. **Not used**
8. **Air filter blocked:**
This is illuminated when the air supply to the engine is restricted.
The machine must NOT be operated if this light is illuminated.
9. **Parking brake:**
This warning light is illuminated, when the parking brake has been applied.
Do not try and move the machine with the parking brake applied.

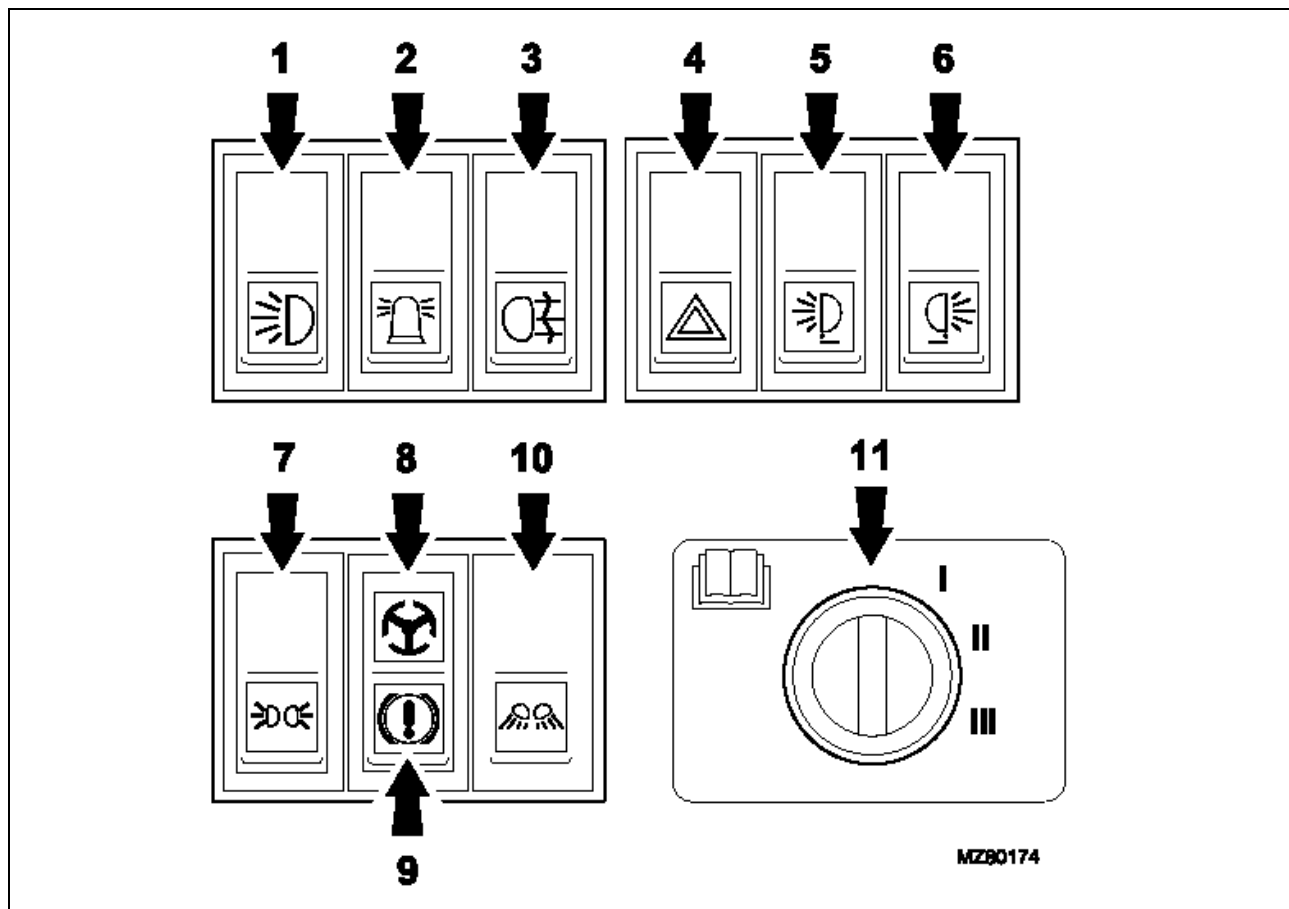


LH80048

Continuation

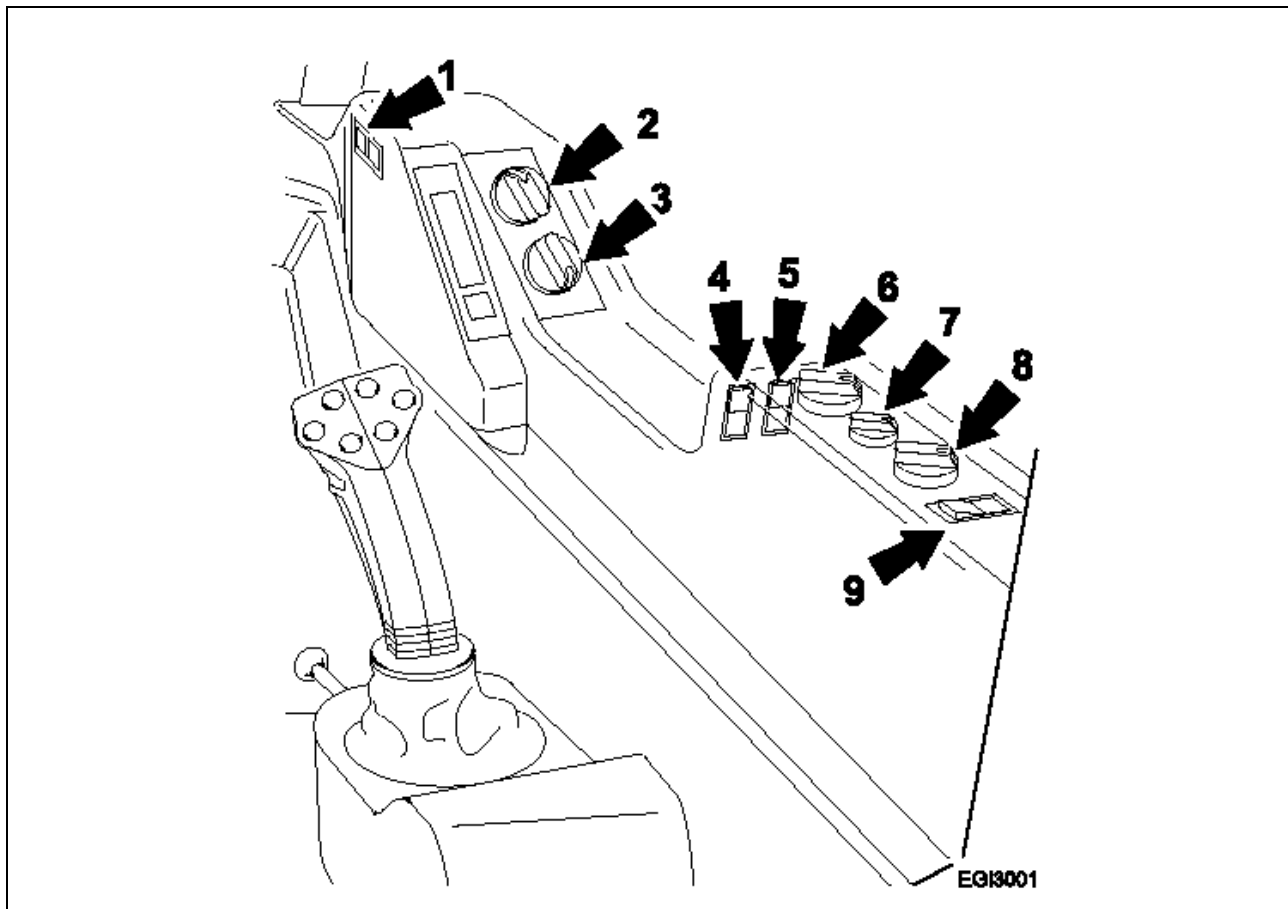
- 10. Oil pressure:**
This illuminates when the gearbox oil pressure drops below the normal pressure. The light may come on when the engine is started, but should go out once the engine is running.
The machine must NOT be operated when the light is illuminated.
- 11. Gearbox oil temperature:**
Do NOT operate the machine when the gearbox oil temperature light is illuminated.
- 12. Charge indicator:**
This light may stay illuminated for a few seconds after the machine has been started, but should then go out. If the light does not go out then there could be a problem with either the alternator or the charging system.
Do NOT operate the machine with this light illuminated.
- 13. Hydraulic filter blocked:**
This is illuminated when the hydraulic filter is not filtering the oil due to the fact that it is blocked through dirt.
Note:
When the engine is started in cold conditions (i.e. under 0°C), the lamp may be illuminated. Operate the machine for a few minutes at a reduced rate.
With the machine warm, NEVER operate the machine with the light illuminated.
- 14. Headlamp:**
This is illuminated when the headlamps are switched.
- 15. Indicator:**
This flashes when the right hand indicator is flashing.
- 16. Indicator – for the trailer**
- 17. Lights display (option):**
This is illuminated when the lights have been switched on.
- 18. Front working lights display (option):**
This is illuminated when the front working lights have been switched on.
- 19. Rear working lights display (option):**
This is illuminated when the rear working lights have been switched on

1.2 Switches on the instrument panel



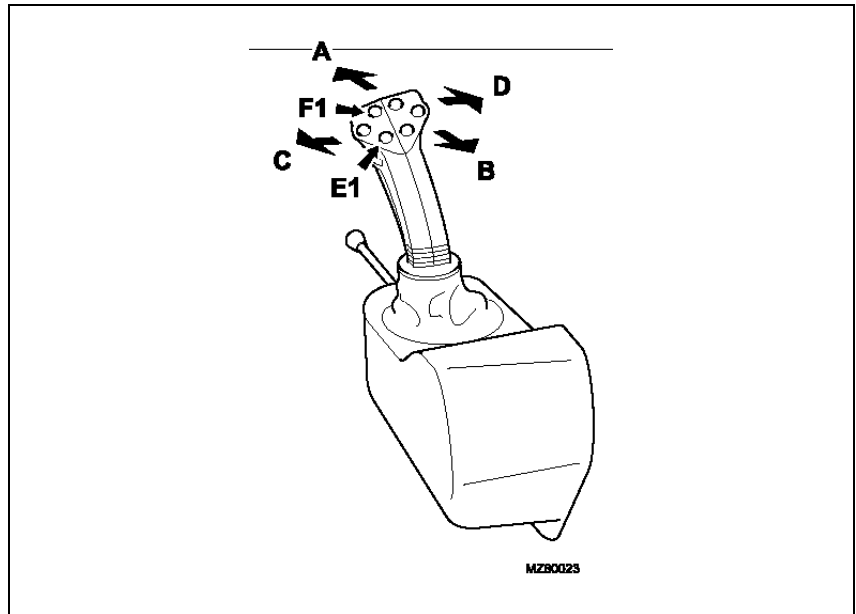
1. **Switch: high beam and head lights.**
The high beam and head lights are controlled from the multifunction switch.
2. **Switch: Beacon rocker switch.**
Press in order to switch on the beacons.
3. **Switch: Fog lights.**
By pressing this when the side lights are on, will switch on the fog lights.
4. **Switch: Hazard lights.**
When this switch is switched ON, then the hazard lights will operate. The indicator lights on the instrument panel will also flash.
5. **Switch: Front working lights** (option).
Press in order to switch on the front working lights. The light will only be illuminated when the side lights have been switched on.
6. **Switch: Rear working lights** (Optional).
Press in order to switch on the rear work lights. The working lights will only come on when the side lights are switched on.
7. **Switch: Side working lights** (Optional).
Press in order to switch on the side work lights.
8. **Warning light: Servo steering** (Optional).
This is illuminated when the pressure in the servo steering drops too low. Stop and find fault.
Note:
This lamp illuminates each time the machine is started.
9. **Warning light: Brake operation.**
This shows when the pressure in the brake system is too low. Stop and determine the fault.
10. **Switch: Outer limit lighting** (Optional).
Press in order to switch on the outer limit work lights.
11. **Switch: Ignition**

1.3 Components on the side console



1. **Wheel position lights**
2. **Lock for joystick control**
3. **Steering mode switch**
4. **Aggressive / progressive switch**
5. **Rear wash / wipe switch**
6. **Heating fan control switch (3 position).**
This switch regulates the speed of the heating fan as soon as the ignition switch is on position 1
7. **Air conditioning switch on - off**
8. **Heating temperature switch**
Turn the switch clockwise in order to switch the heating ON.
Turn the switch anticlockwise in order to switch the heating OFF.
Note:
Before the air conditioning is switched on, please ensure that the heating has been switched off.
9. **Switch for the change over valve (additional hydraulics)**

1.4 Telescopic arm and carriage control



Telescopic arm raise and lower

- A** Forwards = Telescopic arm lower
- B** Backwards = Telescopic arm raise

Carriage tipping

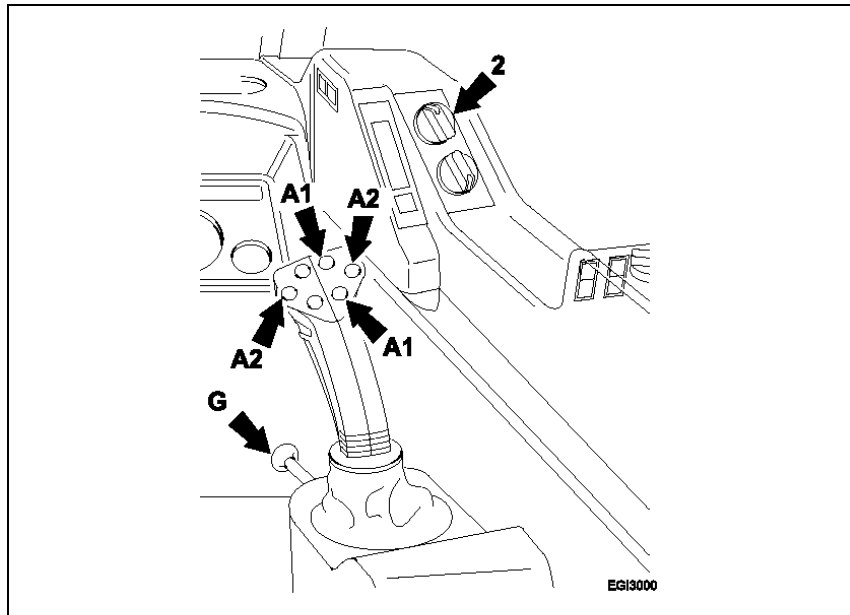
- C** To the left, tilt back
 - D** To the right, tilt forwards
- By operating the unit diagonally, then both the telescopic arm and the carriage can be operated.

Telescopic arm retraction / extension

Used in conjunction with the joysticks with the roller switch.

- E1** upwards, the telescopic arm extends
- F1** backwards, the telescopic arm retracts.

1.5 Operating components for the front attachment



Operating components for the front attachment

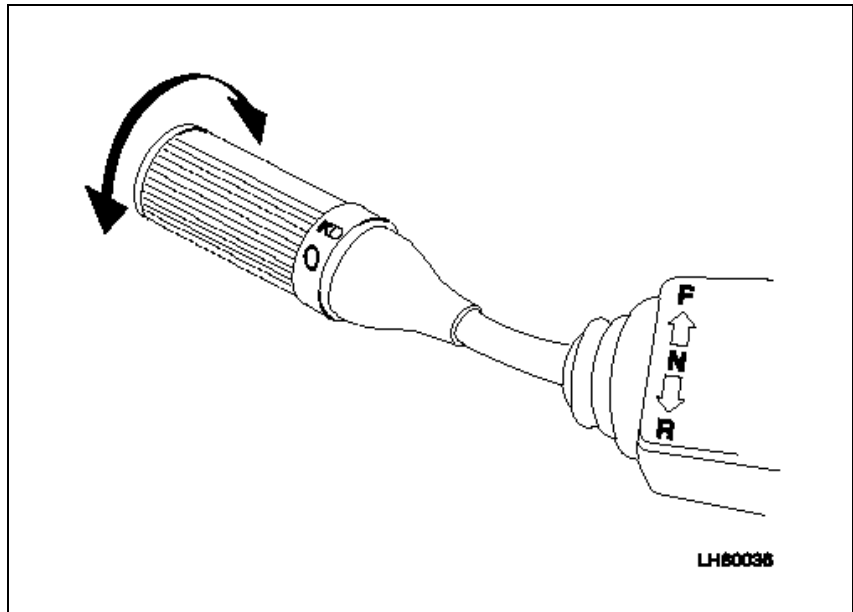
As standard, the machine is fitted with the additional hydraulics for the extra control of a front attachment when fitted. As option, another control unit can be fitted.

Joystick heads

- (A1) Head for the standard unit – green
 - (A2) Head for the optional front attachment – red
- Lever G – carriage tilt control.
This blocks the carriage tilt control in order to help safe working on platforms.
In order to operate, **press lever (G) in** and at the same time gently operate the joystick until the lock is in place.

2.0 Driving the machine

2.1 Speed switch



The speed switch on the FNR lever will switch between 0 to 8 km/h and depending on the country, 0 to 20 km/h, 0 to 25 km/h or 0 to 32 km/h. The switch can be operated when the machine is running. By switching it to the * position will give it the higher speeds, and by switching it to the **KD** position then the machine will switch to the lower speeds. The speed range 0 to 8 km/h is used in conjunction with the aggressive / progressive switch (Rambo / Bambi) for difficult work.

Selecting the travel Forwards:

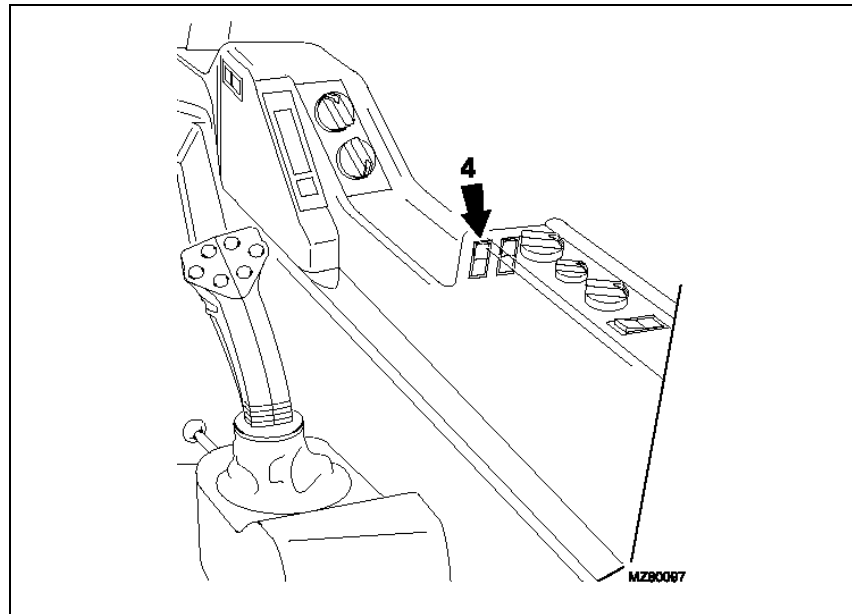
Turn the handle to the lowest **KD** speed.

- a** Start the engine and run on idle
- b** To make the machine move forwards, lift the lever and push towards the front.
- c** Slacken off the parking brake
- d** Accelerate

Changing the direction

- a** Lower the engine speed
- b** Stop the machine on the foot brakes
- c** Move the lever from the forwards position to the back position in order to swap from forwards to reverse.
- d** Release the brakes
- e** Accelerate

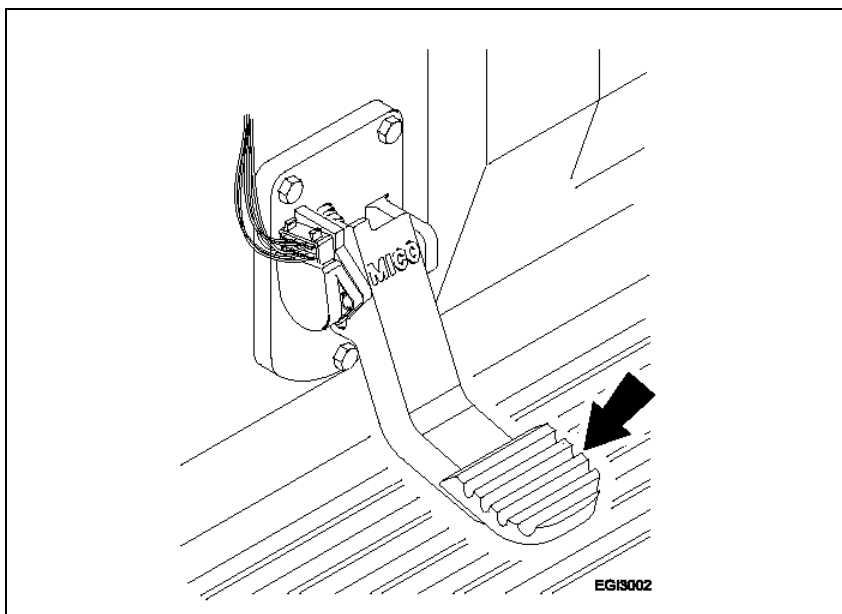
2.2 Aggressive / progressive switch (Rambo / Bambi)



Using the aggressive / progressive switch **(4)** on the side console, one can switch between two available starts or working power settings. When the switch is pressed downwards, then power is normal and normal manoeuvrability with maximum setting for the attachments. When the switch is pressed upwards then the machine will be switched to the higher speeds and normal settings for the attachments. Both settings can be used irrespectively of the speed selected and with the machine being driven.

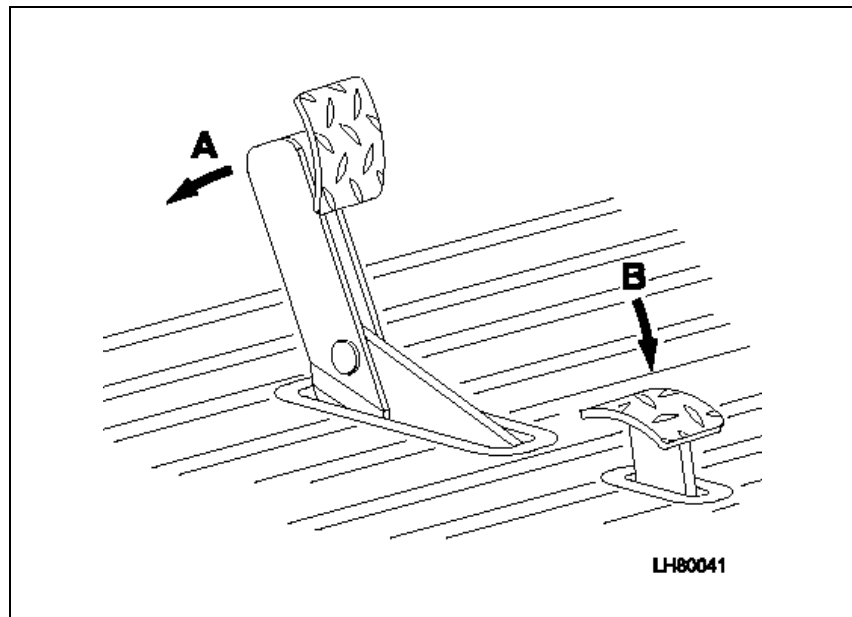
The aggressive / progressive switch can be used when the machine is with its transport or working limits.

2.3 Brakes



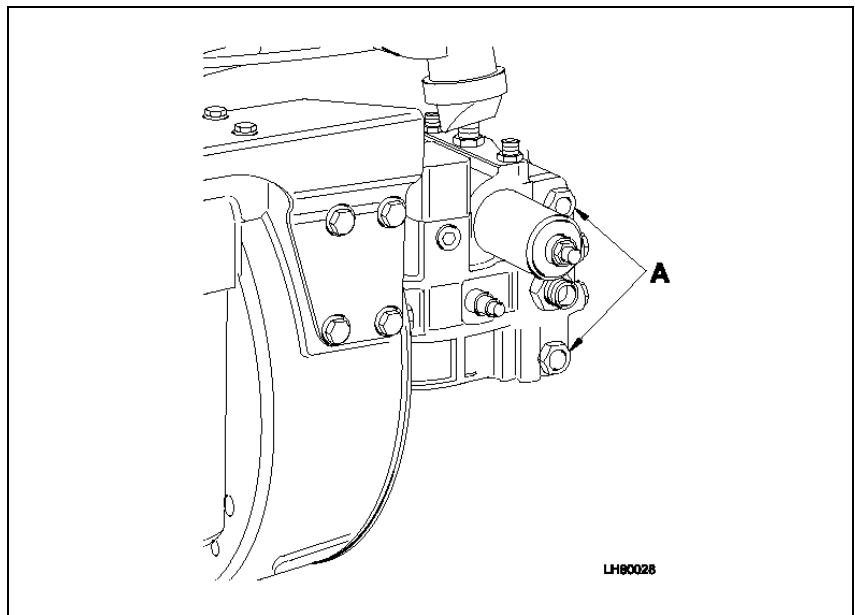
The machine is fitted with a servo braking system and a mechanical parking brake system, that operates the disc brakes on the front axle. The brake pedal operates the servo braking system as normal, except operates the gearbox proportionally. This allows the machine to "creep" forwards or to be held in a particular position, even when the engine is at full speed.

2.4 Parking brake



Stop accelerating and brake. The FNR drive lever in the neutral position. When travelling slowly or on level ground, the machine will automatically slow down without the need for the brakes to be applied. With the machine stationary, apply the brakes. For this push lever **(A)** forwards until it locks in the ratchet. To release press lever **(B)** down. When the brakes have been applied, the gearbox will automatically be disengaged. Before driving off, release the brakes.

3.0 Towing the machine



Should a problem occur with the engine and / or the hydraulics, then the machine will automatically come to a standstill via the hydrostatic. The servo system of the machine will for a limited time remain active for the emergency use.

The parking brake is mechanically operated and remains operated on the front axle.

In order to move the machine a short way in order to make it safe:

Open the engine cover and look for the yellow plastic caps **(A)**.

Clean the area around the plastic caps, then remove them. Turn the hex By-pass screw three turns anticlockwise.

In order to tow the machine, carry out the above, disconnect the drive shafts and raise the front axle.

CAUTION! Never drive the machine faster than 8 km/h as the servo for the steering and the braking will not be operational and these functions will be limited. This will only allow the machine to be moved in an emergency. If towed for too long or too fast then damage will occur to the gearbox pump and motor.

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1.0 Operation of load indicator

The load indicator can be found in the cab of the machine. Using an LED display, the load on the forks can be monitored.

A green LED shows that the system is switched on.

The 2nd LED (red) shows that the machine is 50% loaded. Each LED after that approx equates to 6.5%

From 50% loading to 100%, there are a total of 9 LEDs (red).

When 100% loading is achieved, then the LEDs flash and an additional buzzer is sounded.

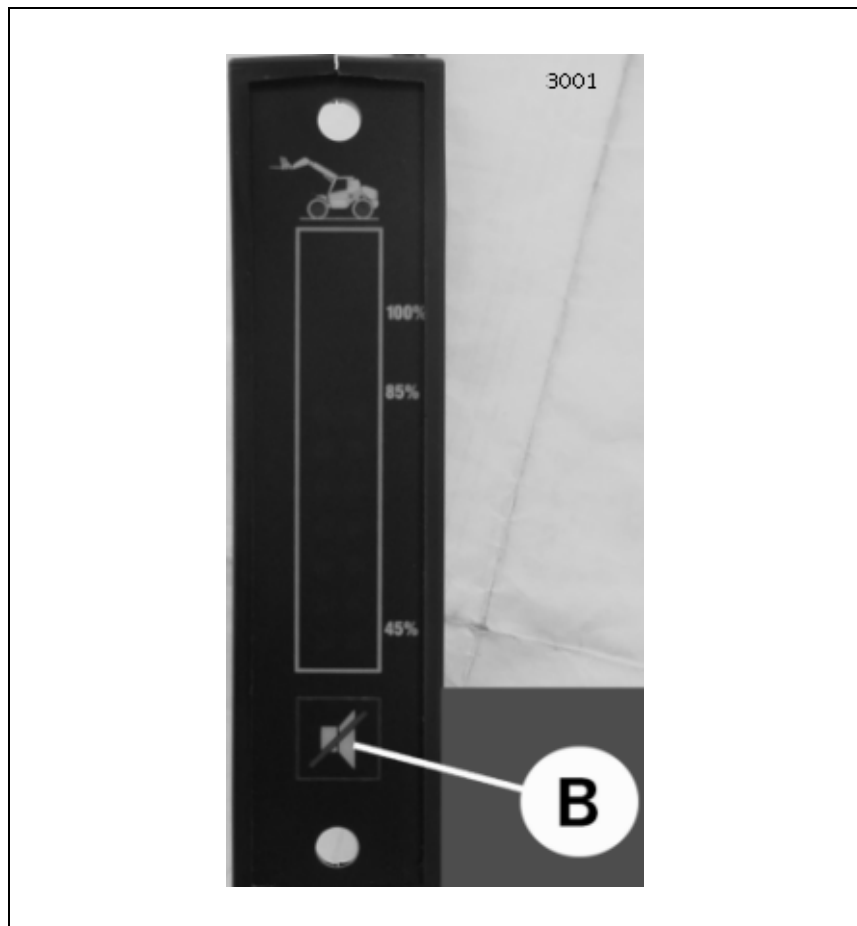
Should the top LED (red) illuminate, then the machine is loaded to 110%.

For the indicator to work, there is a load cell that supplies the signal and is mounted on the rear axle.

The resistance of the load cell changes when pressure or tension is applied to the rear axle.

Using the "B" button, the load indicator needs to be checked on a daily basis. The load indicator is OK if, when pressing the button, all the LEDs flash and the warning buzzer can be heard.

Load indicator



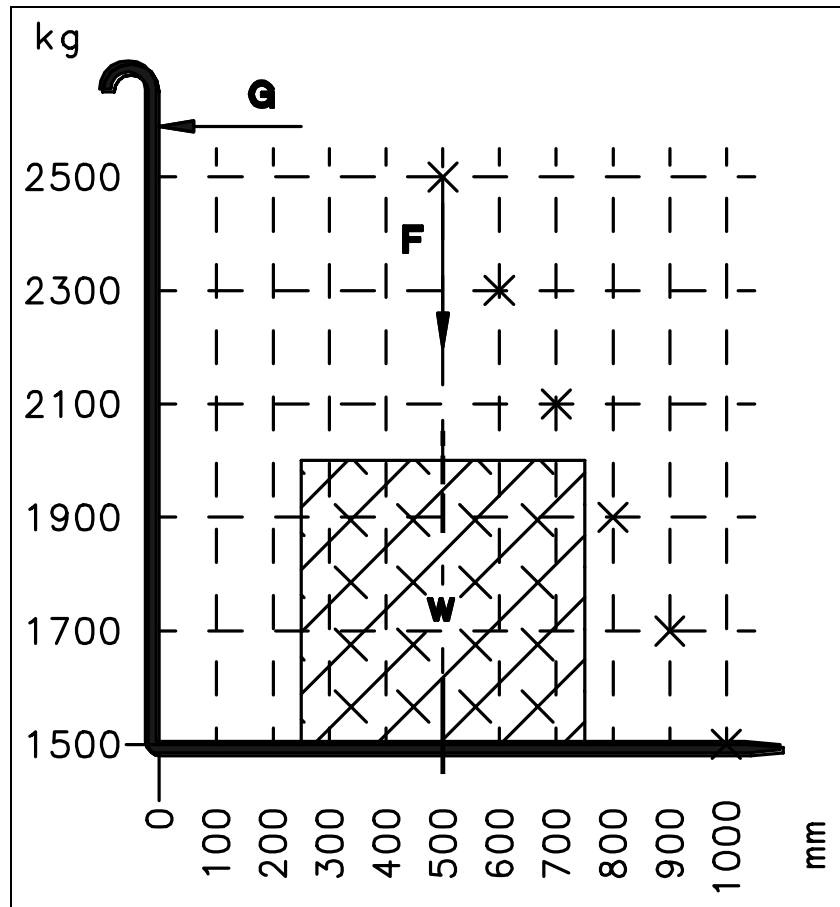
B This button is to test the load indicator and to mute the warning buzzer.

The button "B" has two uses.

2.0 Adjusting the load indicator

2.1 Load diagram

Using the standard forks (125kg) so that the load centre is 500 mm from the rear of the forks.



CAUTION

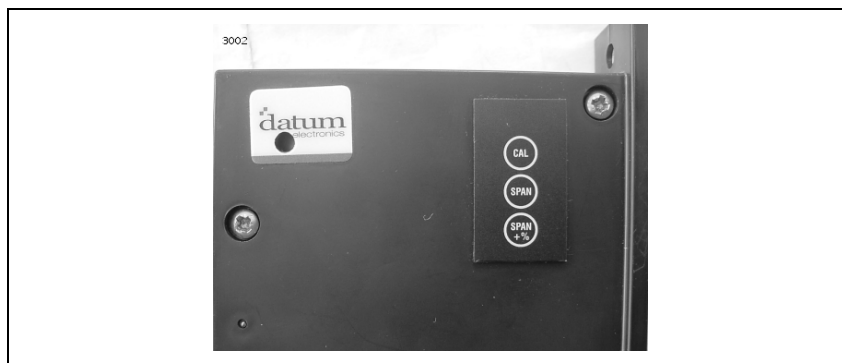
Standard forks must be used when lifting a load (W), in order to calculate the load centre (F) at 500 mm from the rear of the forks (G). Should the load (W) on the forks have a load centre (F) greater than 500 mm from the rear of the forks (G), then for every 100 mm the total weight must be reduced by 200 kg.

Example:

Given a nominal weight of 2500 kg and a load centre of 800 mm, the calibration weight minus the fork weight of 125 kg must only be 1775 kg ($2500 \text{ kg} - 125 \text{ kg} - 600 \text{ kg} = 1775 \text{ kg}$).

2.2 Calibration

Side view of a removed load indicator



The side on the load indicator shows the calibration button.

The SPAN+% button is not used.

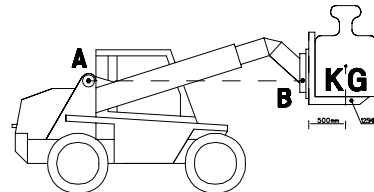


Procedure

1. Drive the machine for approx. 15 min (So axle reaches operational temperature)
2. Stop the machine
 - a. On straight and level ground
 - b. With the wheels straight
 - c. With the parking brake off
 - d. With the boom in the road travel position
 - e. With the boom fully retracted
 - f. Without forks or front attachment
3. Remove the load indicator and start the engine.

Carrying out the calibration

The SPAN+% button is not used.

	Procedure	Reaction
1	Using a screwdriver, momentarily press the CAL button	The lower green and the second red light should now flash quickly. The flashing shows that the unit is now in calibration mode. Should they not flash, then momentarily press the CAL button again.
2	Without a load on the boom, wait approx 15 seconds and then momentarily press the "B" button on the front	The lower green LED is illuminated for a second constantly and the buzzer is sounded momentarily. The zero point for the unloaded condition is now set. The lower green and the second red LED from the top now flash.
3	Load the boom with the test weight. Using the standard forks, position the load so that the load centre is 500 mm from the rear of the forks. Observe the load diagram	<i>The calibration can be carried out with either the boom being extended or retracted.</i> With the boom retracted: C40 = calibration weight 2200 kg C50 = calibration weight 2500 kg With the boom extended: C40 = calibration weight 750 kg C50 = calibration weight 1000 kg
4	Stop the machine	4a on straight and level ground 4b with the wheels straight 4c with the parking brake off 4d with boom at point A and angle point B at the same height. 
5	After approx 15 seconds of the machine standing still press the SPAN button momentarily.	The second red LED from the top illuminates for a second and the buzzer sounds for a moment. The 100% load is now set. The lower green and the second red LED from the top flash again.
7	Momentarily press the CAL button	The calibration mode has been left. All the LEDs flash and the buzzer tone pulses.
8	Switch the engine and the ignition off	Wait 10 seconds
9	Start the engine	All the LEDs flash and the buzzer sounds intermittently.
10	Without a load on the boom, wait approx. 15 seconds. Switch the engine off, ignition on. Test the function by pressing the button "B"	Now all the LEDs must flash and the buzzer sounds intermittently.

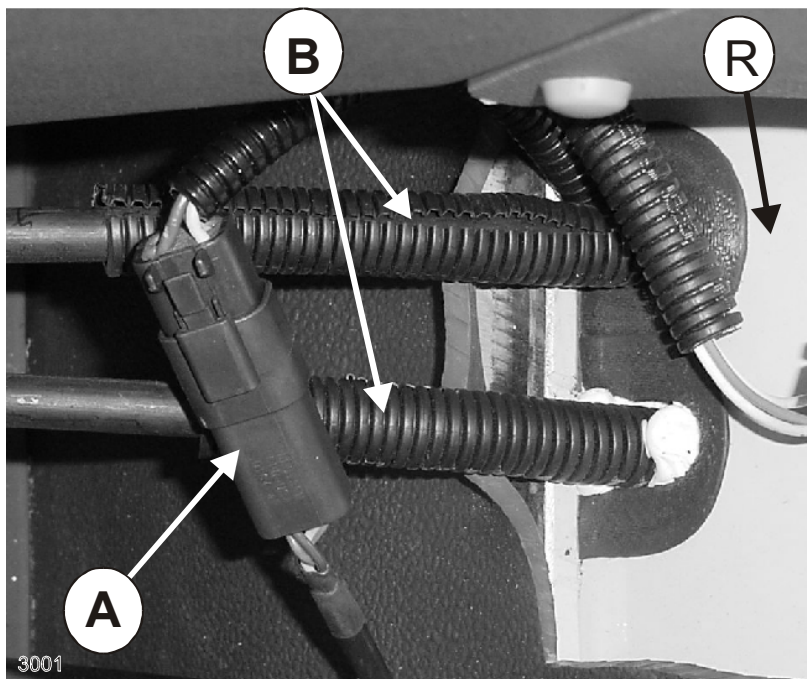
3.0 Load signal test

3.1 Operational test of the load indicator

1. - Switch on the ignition
- Switch the road travel switch on, and the bottom green light should come on to show that there is power.
2. - Press button "B"
- Now all the LED should flash and buzzer must be heard

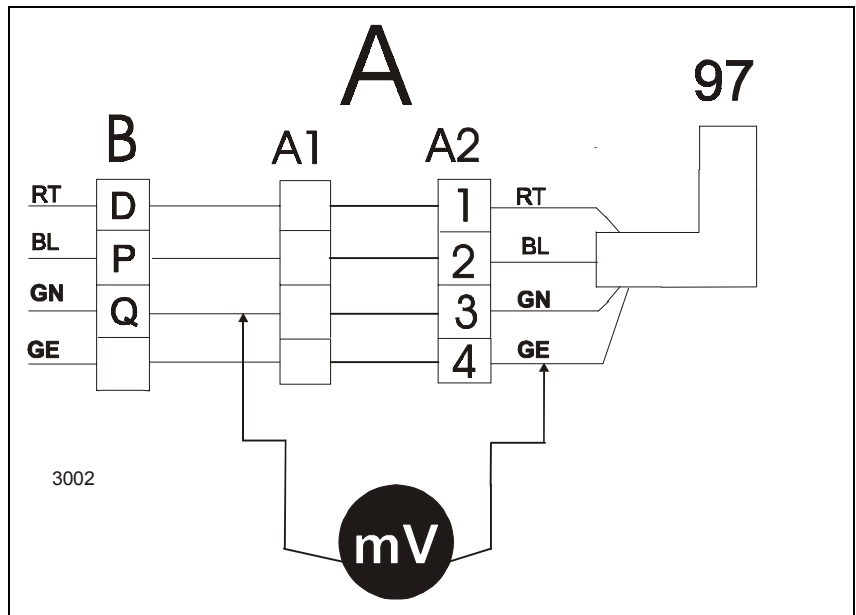
3.2 Operation

1. Drive the machine for approx 15 min (So that the axle reaches the operating temperature)
2. Stop the machine:
 - 2a On straight and level ground
 - 2b With the wheels straight
 - 2c With the parking brake released.
 - 2d With the boom point **A** and the swivel point **B** at the same height
 - 2e With the boom fully retracted
 - 2f Without forks or front attachment fitted
 - 2g Connector A released.



- A Connector A
B Bowden cable
R Cab rear wall

The connector A connects the load sensor to the load indicator.



A Connector A
97 Load sensor

3. The reading must be taken between pins 3 + 4 (connector A)

Cable colour **Green** = + Signal voltage

Cable colour **Yellow** = - Signal voltage

The reading can be obtained by using the test probes (part number 365 747.0) without having to damage the cables.

4. With the test probes connected set the multimeter to mV
5. Switch on the ignition and the main hydraulic switch
6. Carry out the tests

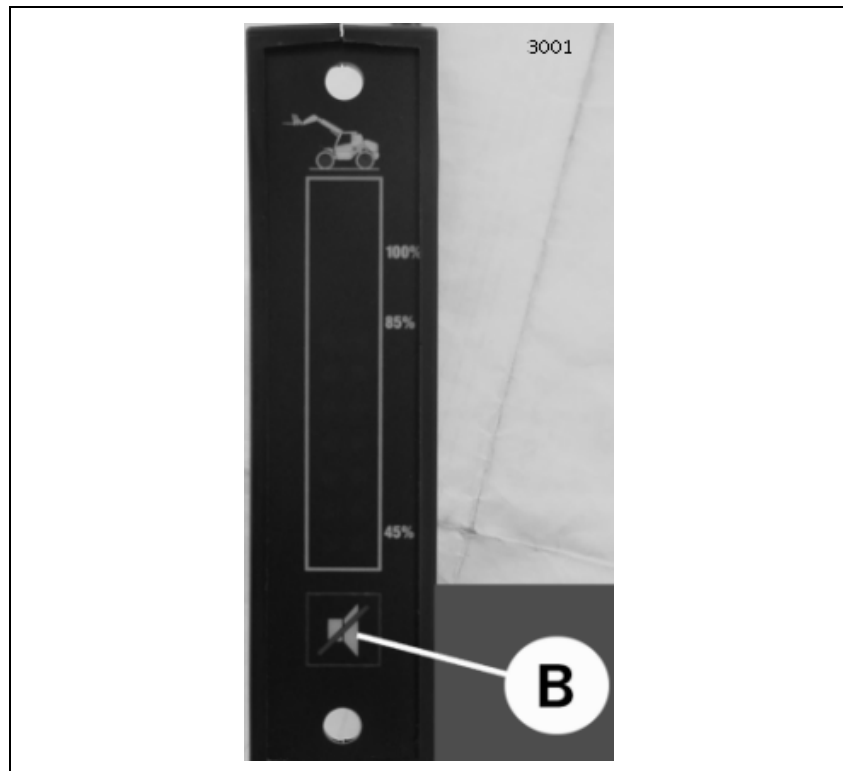
A) Note the readings when the machine is not loaded

B) With maximum permissible weight (test weight) the reading should be approx. **1,8..2,3 mV** less than the reading obtained in a).

NOTE! The reading can indicate a negative value.

4.0 Fault diagnostics

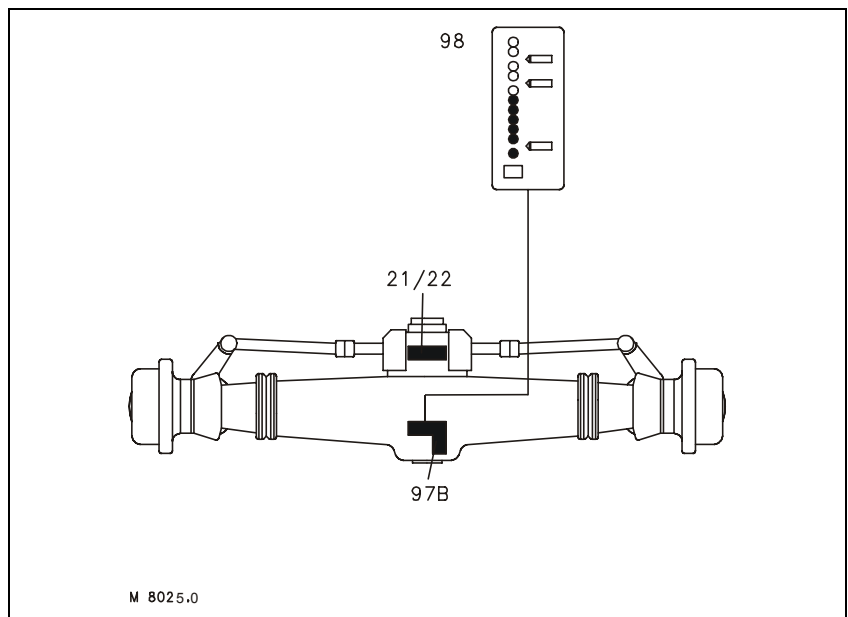
4.1 Load indicator



Problem	Cause	Help
Even though the ignition is switched on, no LEDs are illuminated	Power supply voltage broken	1. Check the fuses 2. Check the cable connection 3. Replace the load indicator and calibrate
LED's 2,3,4,5,6 and 7 flash slowly	Internal fault with the load indicator	Replace the load indicator and calibrate
LED's 4 and 5 are permanently illuminated and LED 1 flashes quickly	The signal for the load indicator is well over the 100% reading	1. Refit a new load sensor and recalibrate the load indicator 2. Fit a new load sensor and recalibrate the load indicator
LED's 2 and 11 flash slowly and LED 1 flashes quickly.	No load sensor signal	1. Check the wiring connection to the load sensor 2. Replace the load sensor and recalibrate

5.0 Load sensor signal (fitted to the rear axle)

5.1 Position



Pos.	Description	Comment
21/22	Steering position switch	The steering position switch is the sensor for the wheel position warning. Fitted to the steering ram. Colour code blue = own magnetic field Colour code yellow = Controlled by a magnetic field in the steering ram.
97B	Load sensor	The Targo series of machines have the set unit part number 318 029.0
98	Load indicator	In the cab

5.2 Fitting

Applies for all types

1. Drive the machine for approx. 15 min (So axle reaches operational temperature)
2. Stop the machine
 - a) On straight level ground
 - b) With the wheels straight
 - c) With the parking brake released
 - d) With the boom in the road travel position
 - e) With the boom fully retracted
 - f) Without forks or a front attachment.
3. Clean the surface to which the sensor fixes to (metal blank)
4. Fit the sensor

General tip: Apply loctite 638 to the surface to which the sensor fits too.

CAUTION!

Do not allow the loctite on the threads or enter the holes.

5. Tighten the bolts.

Use 3 off M8 x 20 bolts tightened to 25 Nm
6. Leave the machine at least 2 hrs without moving it in order to allow the glue to dry.
7. Carry out the calibration of the load indicator.

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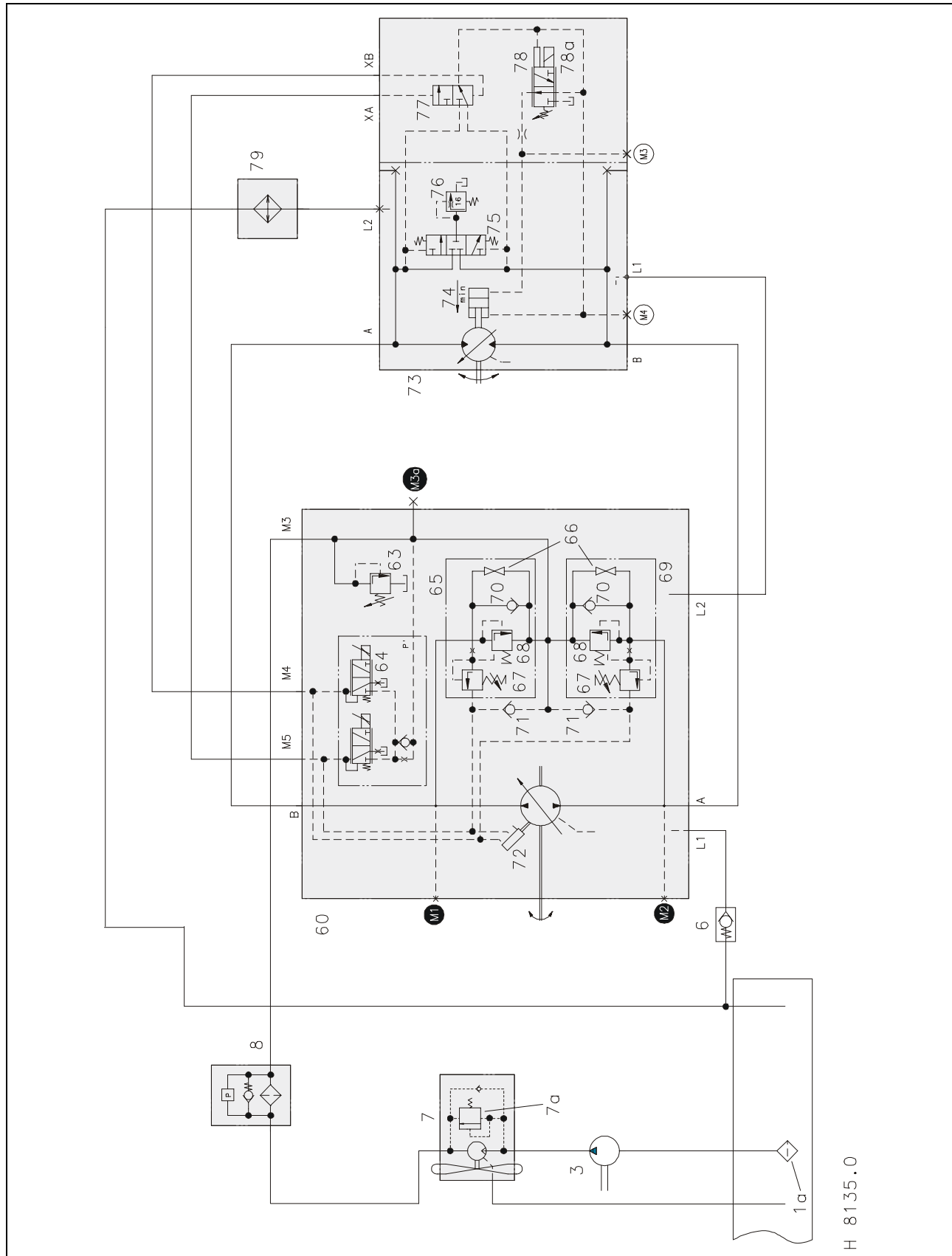
1.0 Technical data

	C 40	C 50
Ground drive	Hydrostatics	Hydrostatics
Type	Sauer	Sauer
Charge pump, external	max. 19 l/min	max. 19 l/min
Charge pump, type	Ultra	Ultra
Charge pressure	30 bar	30 bar
Pump (hydrostatic)	Sauer 90R75 NFPE	Sauer 90R75 NFPE
Pump power	max. 75 ccm	max. 75 ccm
Max. housing pressure	3 bar	3 bar
Max. housing pressure at cold start	5 bar	5 bar
Weight of pump (hydrostatic)	49 kg	49 kg
Motor (hydrostatic)	Sauer 51D 110	Sauer 51D 111
Capacity	36 - 110 ccm	36 - 110 ccm
Max. speed	3950 rpm	3950 rpm
Max. housing pressure	3 bar	3 bar
Max. housing pressure at cold start	5 bar	5 bar
Operating pressure (hydrostatic)	10 - 480 bar	10 - 480 bar
Operating temperature (note oil viscosity)	- 40°C to 104°C	- 40°C to 104°C
Hydraulic filter	10 µm	10 µm
Oil filling quantity (hydraulics, complete)	80 litres	80 litres
Weight motor (hydrostatic)	44 kg	44 kg
Standard speed	20 km/h	20 km/h
Optional speed	25 km/h	25 km/h
Optional speed	30 km/h	30 km/h

Notes

2.0 Hydrostatics

2.1 Circuit diagram, Targo C Hydrostat



Item	Designation	Note
1a	Suction sieve	In tank
3	Pump	max. 19 l/min
6	One way valve	The valve is located in the leakage oil circuit (3 bar)
7	Hydraulic motor fan	13 cm ³
7a	Pressure relief valve	160 bar
8	Hydraulic filter	Pressure filter with 3.5 bar bypass
60	Pump (hydrostatic)	Series 90R75 NFPE
61	Not available	
63	Charge pressure, pressure relief valve	30 bar
64	Servo valve	With solenoid valves (PWM)
65	Multifunction valve	
66	Bypass function	Used for example when towing the vehicle
67	Pressure relief valve	480 ± 10 bar
68	Overpressure, pressure relief valve	530 ± 10 bar (shock function)
69	Multifunction valve	
70	Purging	Purges the oil that the purge pressure relief valve has released.
71	One way valve	Separation of charge pressure and position pressure
72	Servo ram	Swashes the swash plate in the pump
73	Motor (hydrostatic)	Series 51D 110
74	Adjusting unit from motor	
75	Purge valve	
76	Purge pressure relief valve	Opens at about 16 bar
77	Travel directional valve	
78	Constant pressure regulator	
78a	Solenoid valve	Speed range of 0-8 km/h or 0-20 (32) km/h possible
M1	Test port	High pressure 480 ± 10 bar Reverse
M2	Test port	High pressure 480± 10 bar Forwards
M3a	Test port	Charge pressure
M3	Test port	Position pressure, ram rod side The position pressure works on the adjusting unit from the motor 51
M4	Test port	Position pressure, ram rod side The position pressure works on the adjusting unit from the motor 51

Function description

E-MV= Solenoid valve

The ground drive unit consists of the following modules and control elements:

1. Pump: Type 90 R 75 NFPE (Non-feedback proportional electric = No mechanical feedback)
2. Motor: Type 51 D 110 – 1
3. Hydrostatic module (SUSMIC)
4. Road travel switch on the ground speed control lever, forwards/reverse.
5. Rotary switch on the ground speed control lever (2 stages = 8 km/h or 20 (32) km /h)
6. Operating mode switch (progressive/aggressive)
7. Speed sensor mounted on the flywheel
8. Sensor on inch pedal (brake pedal) (no adjustment required)
9. Servo valve with 2 proportional valves fed by the (Susmic) module.

Pump:

Top line: B = High pressure, reverse

Bottom line: A = High pressure, forwards

Forwards: M4 = Position pressure

Reverse: M5 = Position pressure

- In the neutral position the hydraulic motor remains in the position:
Minimum capacity = Fast starting
- If the inch pedal is actuated to its full extent both proportional valves are supplied with about 1 Amp by the servo valve (64), this causes the pump to swash back.

The functional description refers to forwards travel – and used in reverse applies to reverse travel.

The oil in pump (3) drives the axial fan of the diesel engine and flows through the filter (8) via M3 into the pump and via the one way valve (70) into the two high pressure lines.

In this way the oil is also available at the proportional valves (64).

Through the pressure rise the pressure relief valve (63) opens at a charge pressure of 30 bar.

The main quantity of the excess charge oil flows via L2 to L1 into the hydraulic motor and through L2 via the oil cooler (79) back into the tank. The remaining excess charge oil is returned to the tank via L2 and the one way valve (6).

When the ground speed control lever is operated 12 V is switched to the SUSMIC unit.

During idle state the Targo does not start travelling.

If the speed of the diesel engine is increased a SIGNAL is sent from the speed sensor to the SUSMIC and the Targo starts to move.

The SUSMIC sends a PWM signal (Pulse Width Modulation) to the "Forwards" proportional valve, which is mounted on the servo valve (64).

- At idle state approx. 0.2 Amps
- At full speed approx. 1.5 Amps, max. $\pm 10\%$
- At about 0.45 Amps the Targo starts to move
- Measuring devices: Multimeter, D.C. measuring (A)

The "Forwards" proportional valve opens and allows the applied charge pressure - as the position pressure - to operate via M4 and XB on the travel directional valve (77). See circuit diagram: Position as drawn.

The same position pressure is applied to the servo adjustment (72) of the pump.

The pump swashes and the machine starts to travel.

The "Forwards" high pressure actuates the purge valve (75). Similarly the "Forwards" high pressure also flows via the travel directional valve (77) and the constant pressure regulator (78) to both sides of the adjusting unit (74). Adjusting unit (74) swashes the motor to a small swash angle.

If the high pressure rises to over 180 bar, then the constant pressure regulator (78) connects the rod surface side of the adjusting unit (74) to the tank.

In this way the hydraulic motor is returned to a large capacity. The Targo operates more slowly but it now has a greater torque available.

If the high pressure climbs above about 480 bar, the adjustable pressure relief valve (67) in the multifunction valve (69) opens. The pressure is then applied directly to the servo-ram (72) and correspondingly the pump swashes back.

The speed of the Targo is reduced.

Special features of the hydrostatics

During forwards travel it is possible to actuate the speed range switch on the ground speed control lever. This causes current to pass to the solenoid valve (78a) and the rod surface is connected to the tank by the adjusting unit (74). In this way the hydraulic motor swashes over to max. capacity. The Targo operates more slowly but it now has a greater torque available.

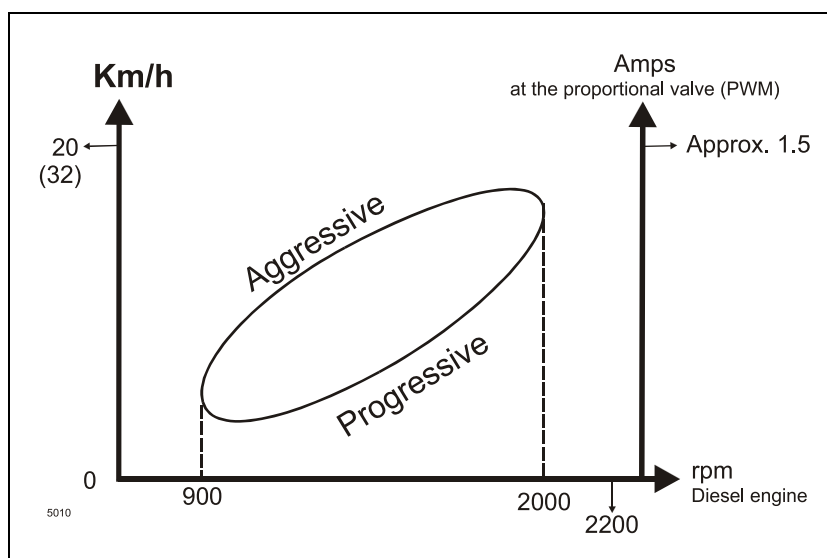
- KD position = 8 km/h stage, 12V applied to the solenoid valve (78a).
- position = 20 (32) km/h stage, no voltage (V) at the solenoid valve (78a).

This description can also be used for reverse travel.
Another switch: Mode switch (W102) offers 2 options

2 differently programmed characteristic diagrams can be activated from the SUSMIC via this switch.

These two operating modes (characteristic diagrams) are called:

- Mode 1 aggressive (Rambo) = Operating range
- Mode 2 progressive (Bambi) = Transport range



It should be noted that the difference in travel behaviour only takes place in the speed range of about 900 to 2000 rpm. Outside this range the two characteristic diagrams are identical, as a result of which the machine eventually achieves its final speed.

Notes

Designations

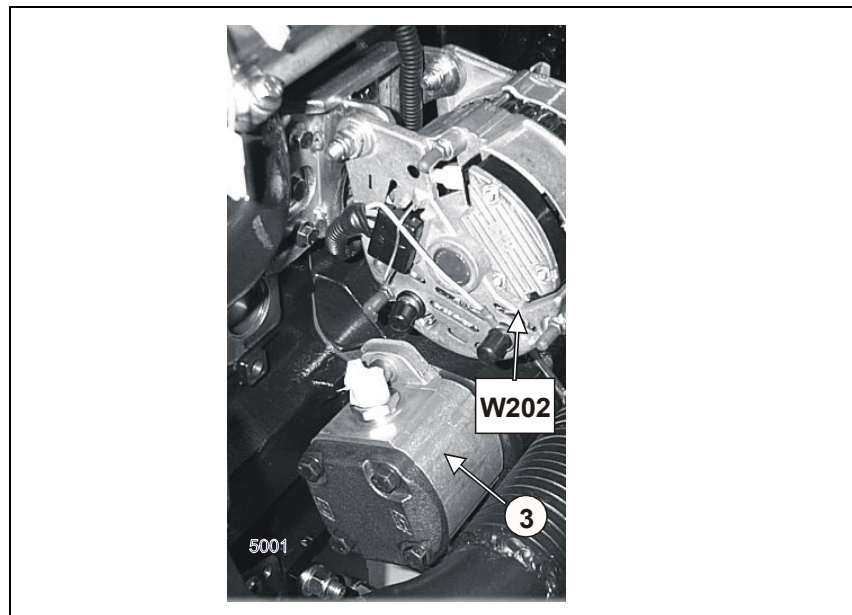
- 1 – Oil tank
- 124 – Oil cooler
- 144 – Connection, steering hydraulic return line
- 201 – Charge pump
- 202 – Filter cartridge
- 205 – Charge pressure relief valve
- 206 – Pilot pressure valve
- 211 – Multi function valve, reverse
- 212 – Multi function valve, forwards
- 213 – Servo valve
- 216 – Servo ram
- 217 – Axial rod adjusting pump
- 220 – Axial rod constant motor
- 221 – Change over valve
- 222 – Purge valve

- S – Charge pressure circuit
- H – High pressure circuit
- R – Purging return line
- Z – Position pressure channel

The closed circuit

The main connections of the pump are connected to the main engine connections by hydraulic lines. In the closed circuit the hydraulic fluid flowing back from the engine does not flow into the storage tank but instead it always flows back to the pump. Each of the two sides can be subjected to high pressure. The flow direction and speed of the fluid (and hence the speed and turning direction of the motor output shaft) depends on the position of the pump's swash plate. The high pressure is determined by the machine load.

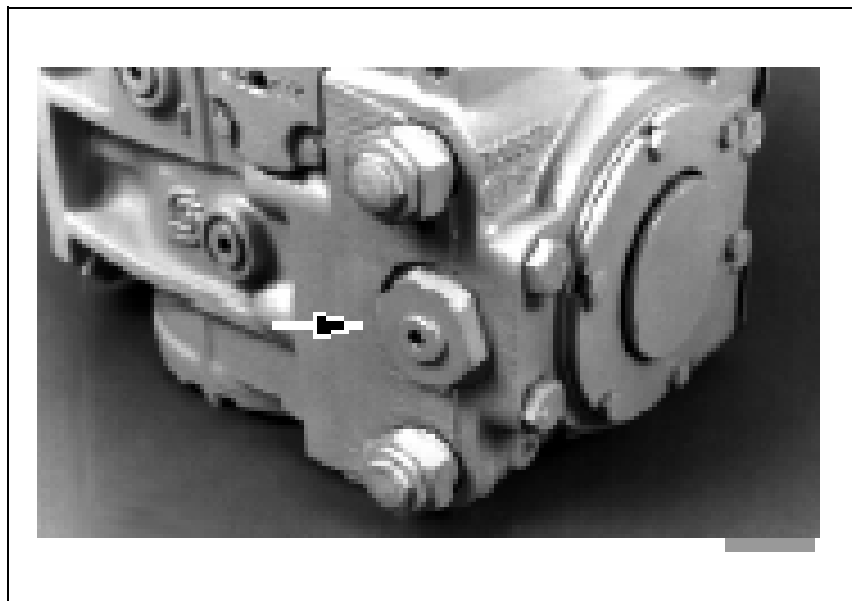
2.3 Charge pump



Item	Designation	Note
3	Charge pump	The pump is positioned beneath the alternator
W202	Alternator	

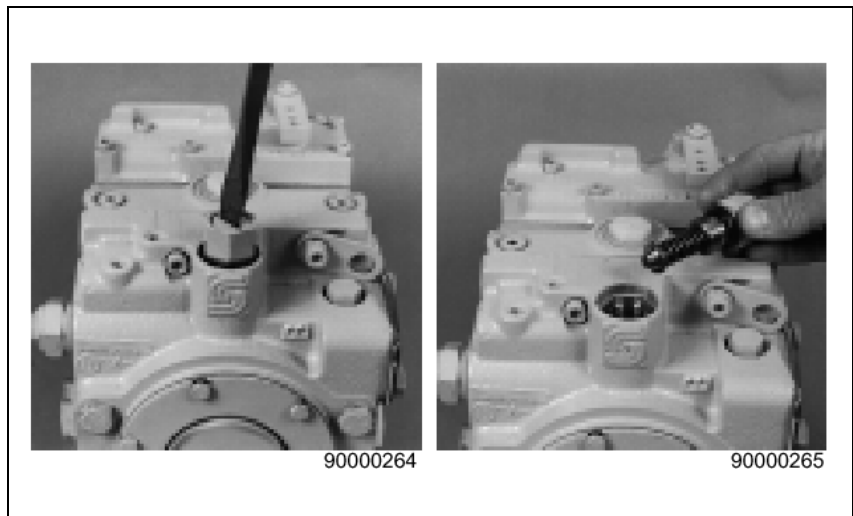
After starting the diesel engine the charge pump (3) is driven. The max. supplied quantity is 19 l/min. The charge pump delivers the oil to the fan motor (7), the hydraulic filter (8) and the hydrostatic pump (60).

Charge



The charge oil is delivered via the hydraulic filter (8) to the connection (see arrow) on the hydrostatic pump (60).

2.4 Charge pressure relief valve

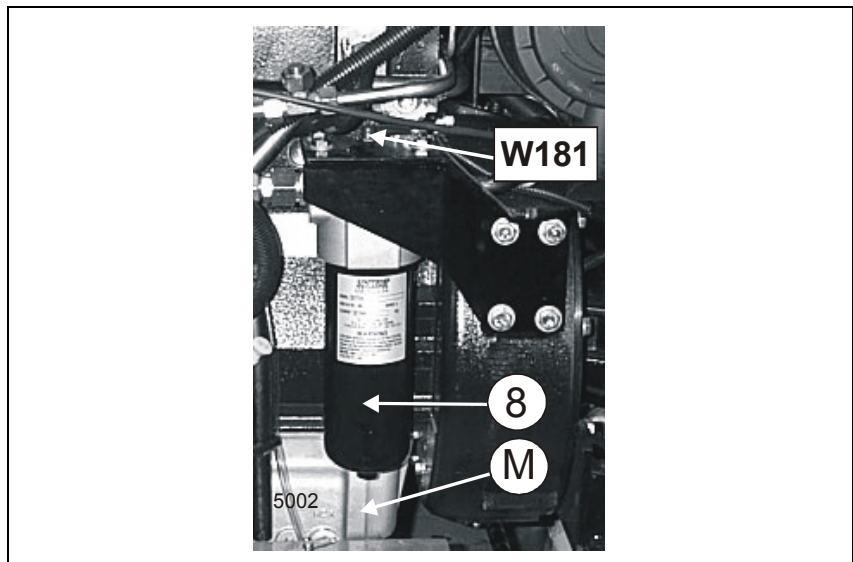


The charge pressure relief valve has the task of holding the charge pressure at a value of 30 bar.

A conical valve reduces the charge pressure if this value is exceeded. This nominal value is measured against the housing pressure and set while at a speed of 1500 rpm. This nominal setting assumes that the pump is on neutral operation (zero flow); the forwards or reverse charge pressure is somewhat lower. The setting of the charge pressure relief valve is specified by the type plate on the pump. The charge pressure relief valve is adjusted by means of a set screw.

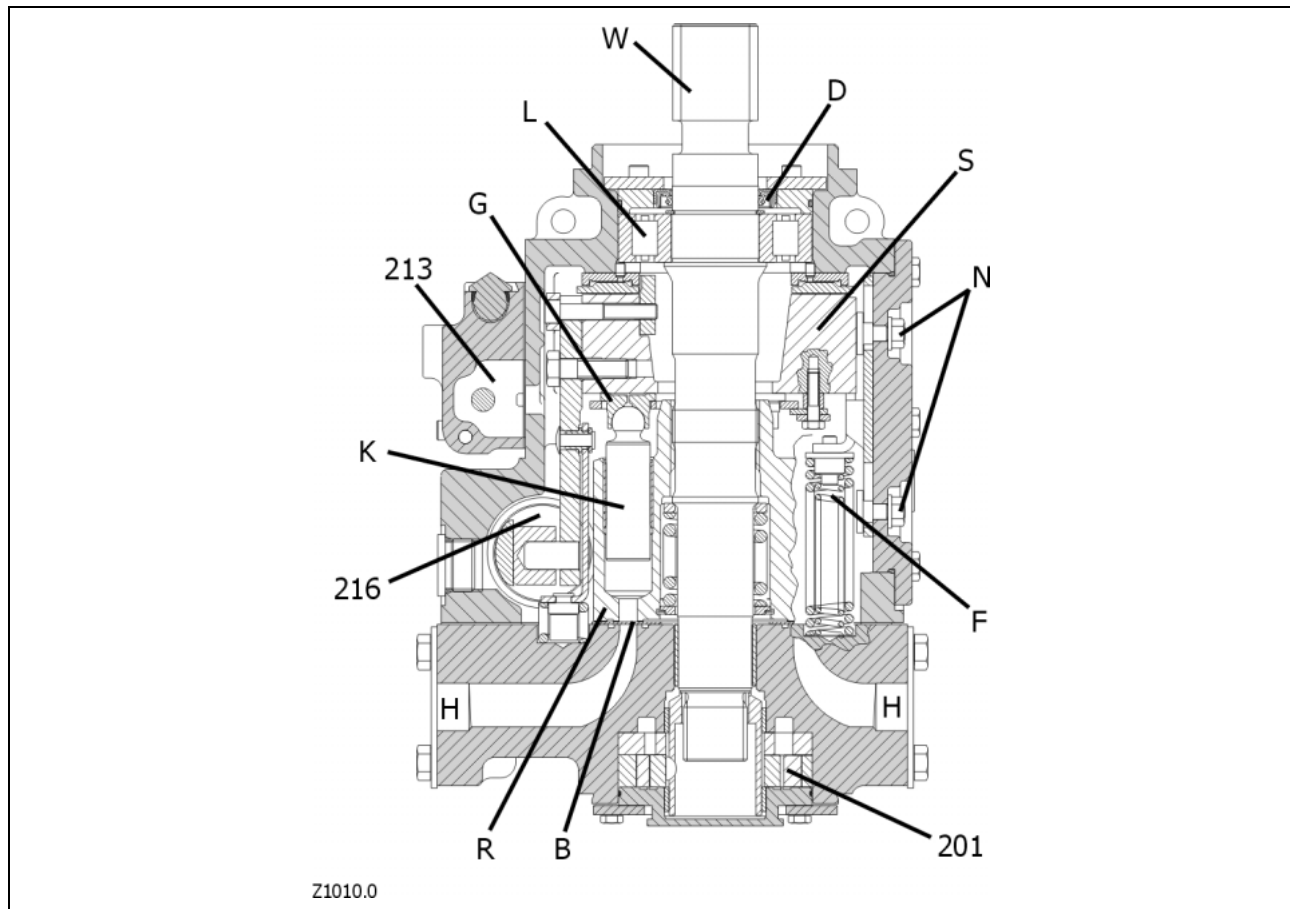
On this set screw one turn corresponds to **about 3.5 bar**.

2.5 Hydraulic filter



- 8 Hydraulic filter
- M Oil sump motor
- W181 Switch (hydraulic filter) ΔP 3.45 bar

3.0 Sauer Pumpe 90R NFPE



Description

- 201 – Charge pump not present - External charge pump
- 213 – Servo valve
- 216 – Servo ram
- B – Control base
- D – Shaft seal ring
- F – Return spring
- G – Slide
- H – High pressure
- K – Rod
- L – Bearing
- N – Adjustment of mechanical neutral position
- R – Cylindrical rotor
- S – Swash plate
- W – Drive shaft

Function description

As soon as the diesel engine is started the cylindrical rotor (R) is driven with the new rods (K), which are arranged radially around the drive shaft (W), together with the charge pump (201). The rods (K) are thereby forced with the slides (G) onto the swash plate (S) by the charge pressure which is applied to both sides of the high pressure circuit (H).

The servo-cylinder (216) is controlled by the servo ram (213) so that this swashes out the swash plate (S) according to the direction of travel and the travel speed. During this procedure the rods (K) carry out an axial movement which leads to the oil being forced out of the filled cylinder space.

Once the whole oil quantity has been forced out of the cylinder space the surrounding rods (K) are forced back by the charge pressure against the falling incline of the swash plate (S) on the low pressure side.

The cylinder spaces in the rotor (R) are successively filled on the inclined side of the swash plate (S) (low pressure) and this oil quantity is then displaced to the rising side (high pressure).

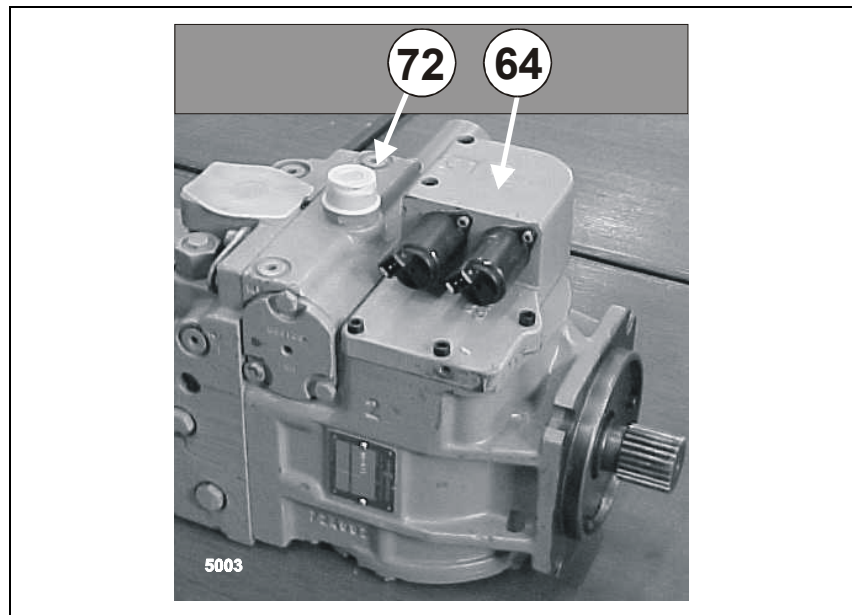
According to the direction of travel, the swash plate (S) is then moved in one or the other direction so that also the high pressure and low pressure exchange sides. The ground travel speed is dependent on the volumetric flow of oil and on the swash angle of the swash plate (S).

The Susmic module acquires the speed of the diesel engine with the speed sensor. With this the module then controls the solenoid valve (PWM – Pulse Width Modulation) at a clocked voltage of 100 Hz and approx. 50% PWM. The solenoid valve thus controlled applies a position pressure to the servo ram via the servo valve depending on the PWM signal.

The control base (B) separates the low pressure side from the high pressure side in the pump unit. For sealing purposes the cylindrical rotor (R) is simply pressed against the control base (B) by a pressure spring.

The accurate return of the swash plate to the neutral position is done by the pressure springs (F), whereby the alignment of the mechanical neutral position is done by means of the eccentric screws (N).

3.1 Servo valve

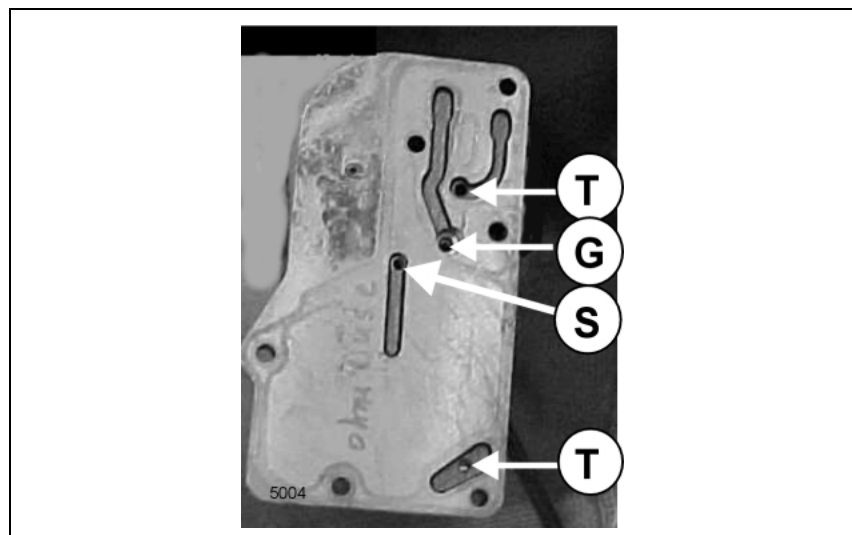


64 Servo valve with solenoid valves (PWM)

72 Servo ram

The solenoid valve (PWM), mounted on the servo valve (64) generates a position pressure. This position pressure is transferred internally to servo ram (72) and constant pressure regulator (77). The solenoid valve is powered by the Susmic module.

Bottom of servo valve



T Position pressure

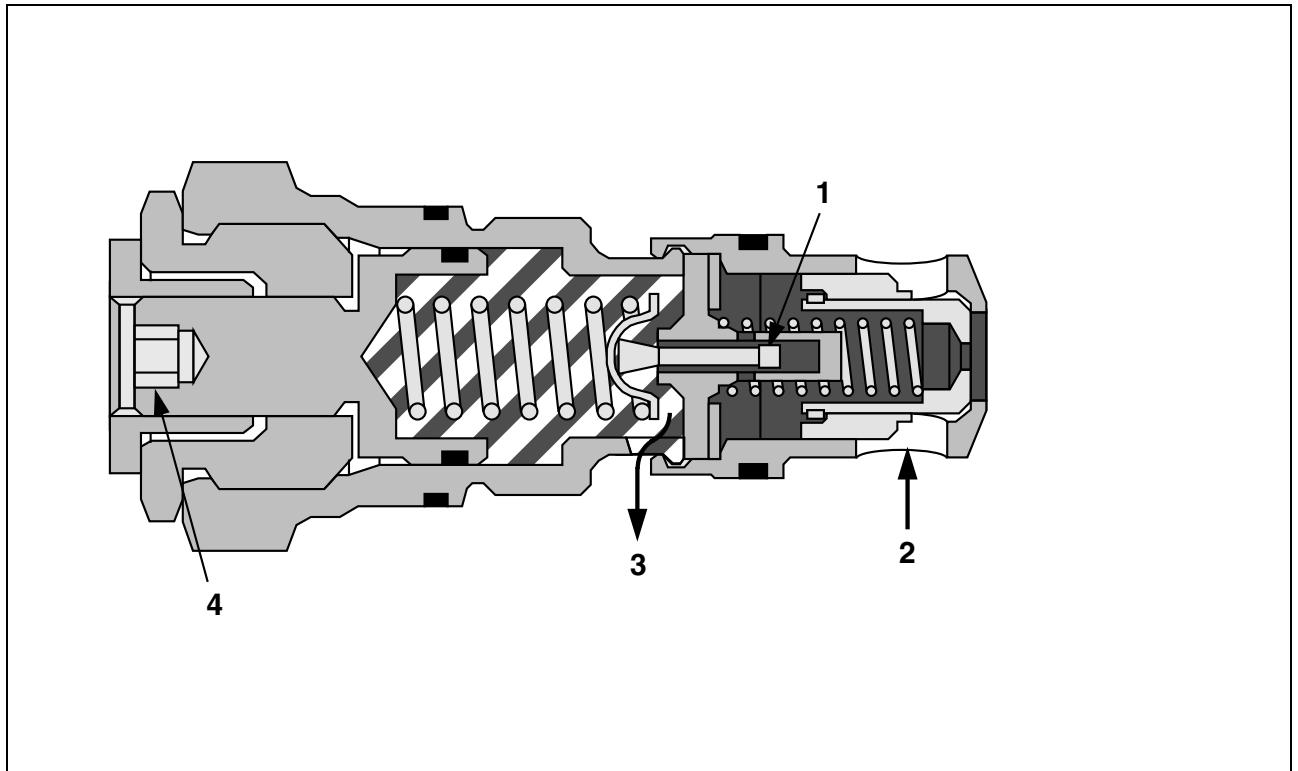
S Charge pressure

G Connection with the housing

Sieves are provided in some of the drilling holes for T, G and S.

3.2 Multi function valves

Function of pressure relief



- 1 Pressure relief valve
- 2 Charge pressure
- 3 Outlet to servo-rod
- 4 Set screw for pressure relief valve

The pump contains a multi function valve for each side of the drive circuit.

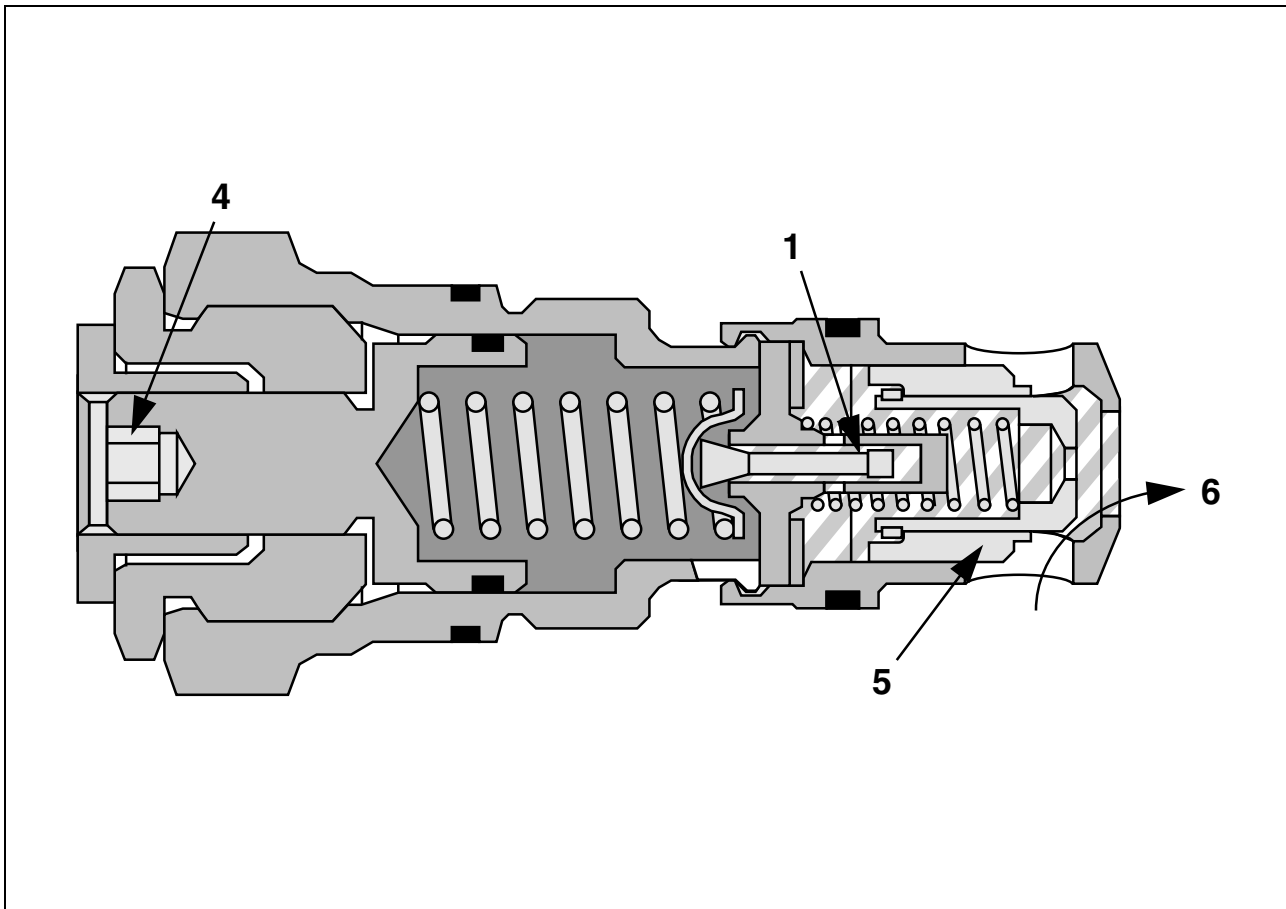
Each multi function valve acts as a purge valve, pressure relief valve and over pressure valve, according to which side of the closed circuit it is operating on.

Function

On the high pressure side of the circuit the multi function valve acts as a pressure relief valve to regulate back the steering pump if the pressure reaches the maximum set value for the valve.

If the max. pressure is approx. $48,000 \pm 1,000$ kPa (480 ± 10 bar), the pressure relief valve (1) lifts from its seat against the compressive force of the spring. This displacement results in the pressurized oil being fed via the outlet (3) to the servo-rod, to regulate back the pump. The pressure relief valve (1) can be set with set screw (4).

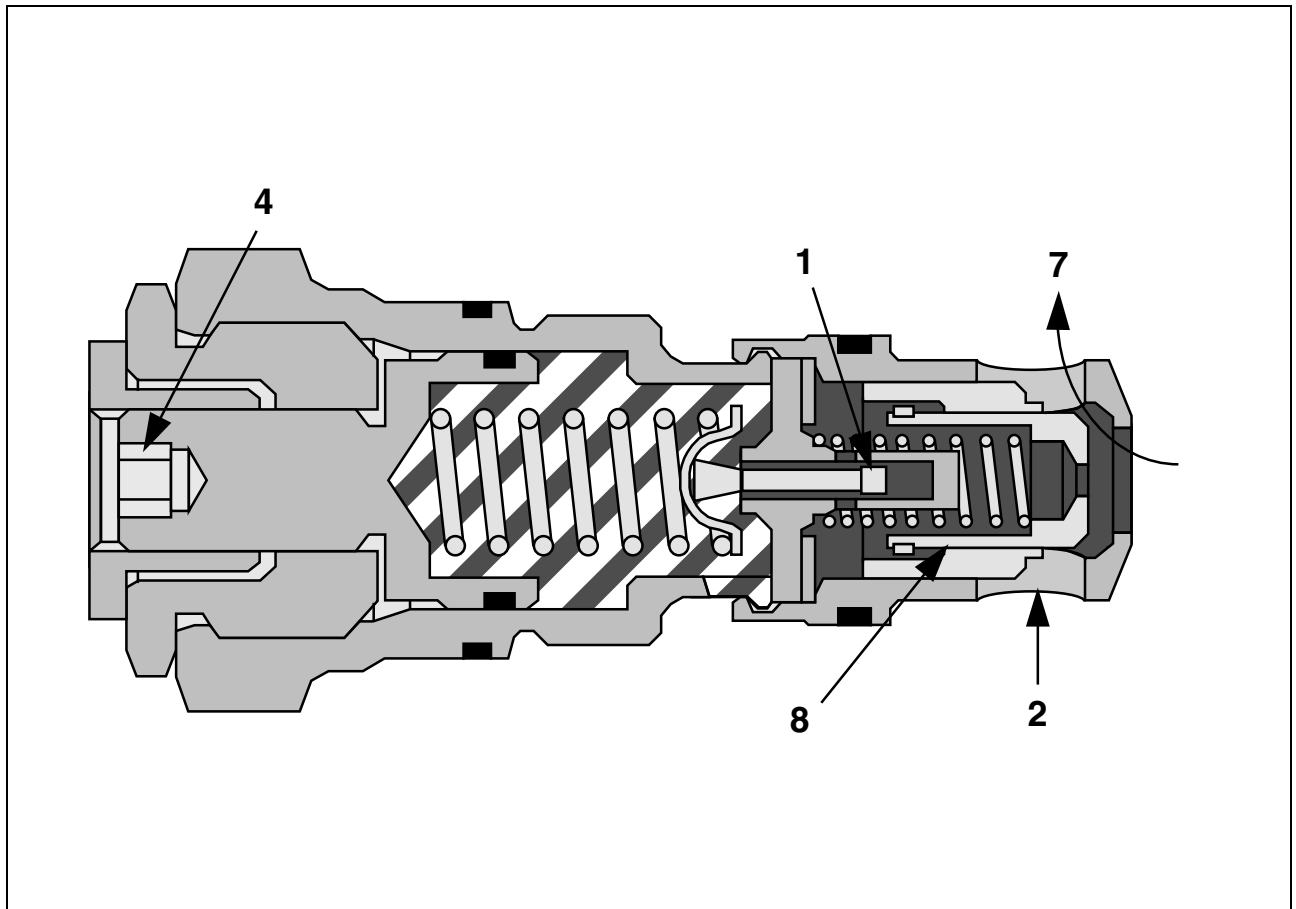
After loosening the lock nut on the multi function valve the pressure setting can be corrected. On this set screw one turn corresponds to **about 93 bar**.

Function of purging

- 1 Pressure relief valve
- 4 Set screw for pressure relief valve
- 5 Purge valve
- 6 To the low pressure side

Function

On the low pressure side of the circuit the multi function valve acts as purge. If the pressure in the circuit falls below the set value of the charge pressure, the charge pressure displaces the purge valve (5) to the left against the spring force, which causes the charge oil to flow into the circuit and leakage losses can thus be compensated. Leakage losses are caused by normal leaks in the pump components and through the purge valve in the steering motor.

Function of over pressure

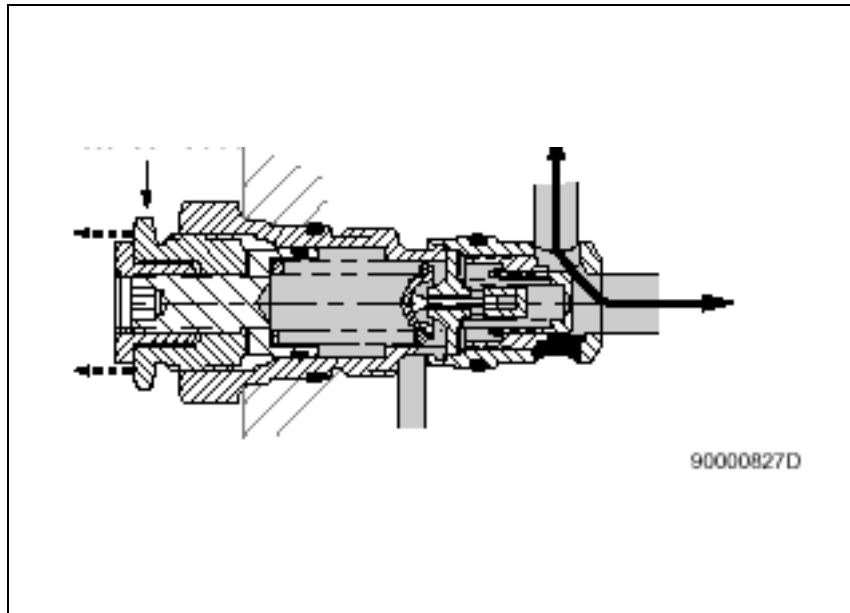
- 1 Pressure relief valve
- 2 Charge pressure
- 4 Set screw for pressure relief valve
- 7 To charge circuit
- 8 Over pressure valve

Function

On the high pressure side of the circuit the multi function valve also acts as an over pressure valve to protect the system from high pressure peaks. High pressure peaks can occur where great external forces affect the ground drive.

The high pressure displaces the pressure relief valve (1) from its seating against the spring force, which results in a pressure drop in the spring chamber. The high pressure overcomes the spring force and displaces the over pressure valve (8) to the left, after which the high pressure oil can flow through the charge circuit into the low pressure side of the circuit (return).

The over pressure valve (8) opens if the high pressure side of the closed circuit rises above the set value of approx. 53,000 kPa (530 bar).

By-pass function

The by-pass function is included in the multifunction valves and can be manually actuated if the vehicle has to be moved without the pump operating. When working on the by-pass valves switch off the drive and make sure that the high pressure circuit has no pressure. The by-pass valves must be open on both multi function valves to maintain the by-pass function.

Setting the by-pass function on the multifunction valve.

Place an open-ended wrench on the middle-sized hexagon on the multifunction valve and another open-ended wrench on the large hexagon to prevent the valve body from turning.

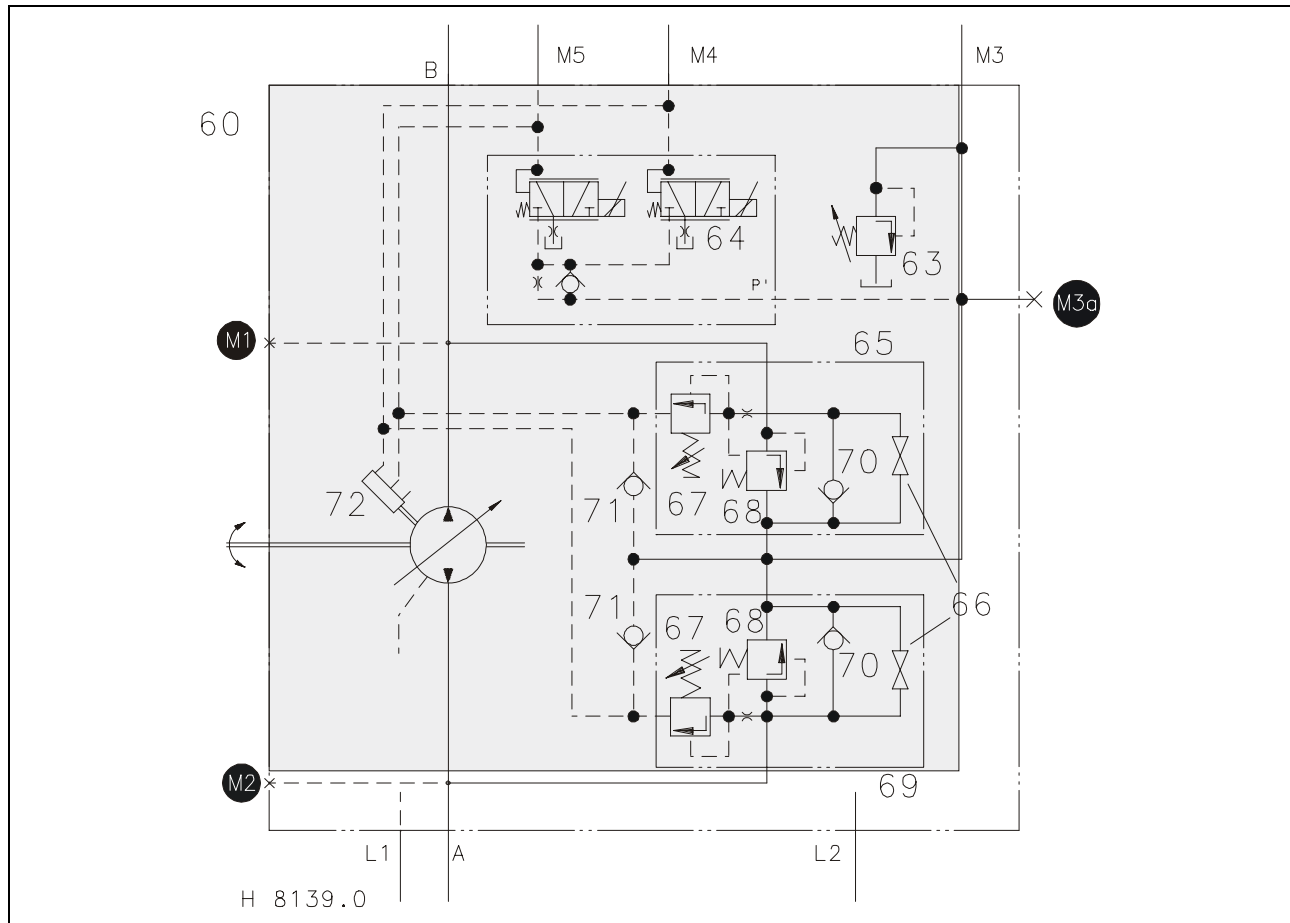
Now turn the middle hexagon three turns anticlockwise to open the by-pass valve.

Do not turn it more than 3 1/2 turns since otherwise pressure liquid will escape.

Notes

4.0 Test ports, pump 90

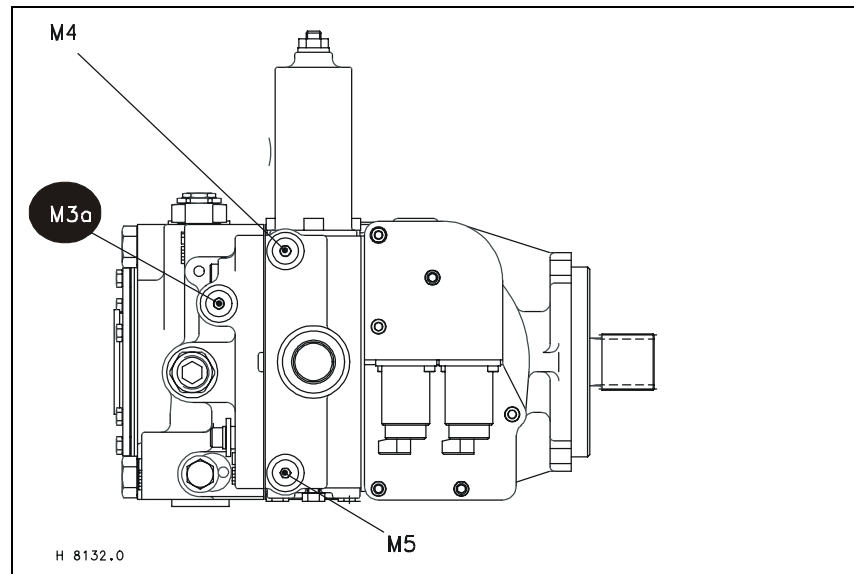
Circuit diagram, pump



Item	Designation	Note
60	Pump (hydrostatic)	Series 90R75 NFPE
63	Charge pressure, pressure relief valve	30 bar
64	Servo valve	With solenoid valves (PWM)
65	Multi function valve	
66	Bypass function	For example when towing the vehicle
67	Pressure relief valve	approx. 480 ± 10 bar
68	Over pressure, pressure relief valve	530 ± 10 bar (shock function)
69	Multi function valve	
70	Purging	Purges the oil that the purge pressure relief valve has released.
71	One way valve	Separation of charge pressure and position pressure
M1	Test port	High pressure 480 ± 10 bar Reverse
M2	Test port	High pressure 480 ± 10 bar Forwards
M3a	Test port	Charge pressure

Note: For measurements and settings the upper idling speed of the diesel engine and an operating temperature for the hydraulic oil of about 60°C are necessary.

4.1 Charge pressure

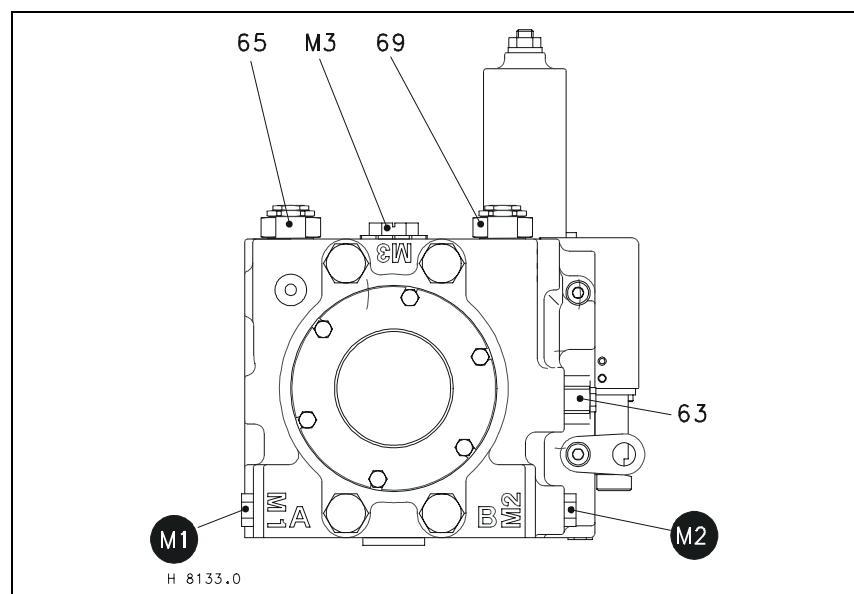


- M3a** Test port, charge pressure
M4 Connection, position pressure (forwards)
M5 Connection, position pressure (reverse)

Measurement

- Apply parking brake
- Heat system to an operating temperature of **approx. 60°**
- Put ground speed control lever into neutral position
- Set diesel engine to its upper idling speed
- Measurement charge pressure (M3a) **30 ± 2.5 bar**

4.2 High pressure



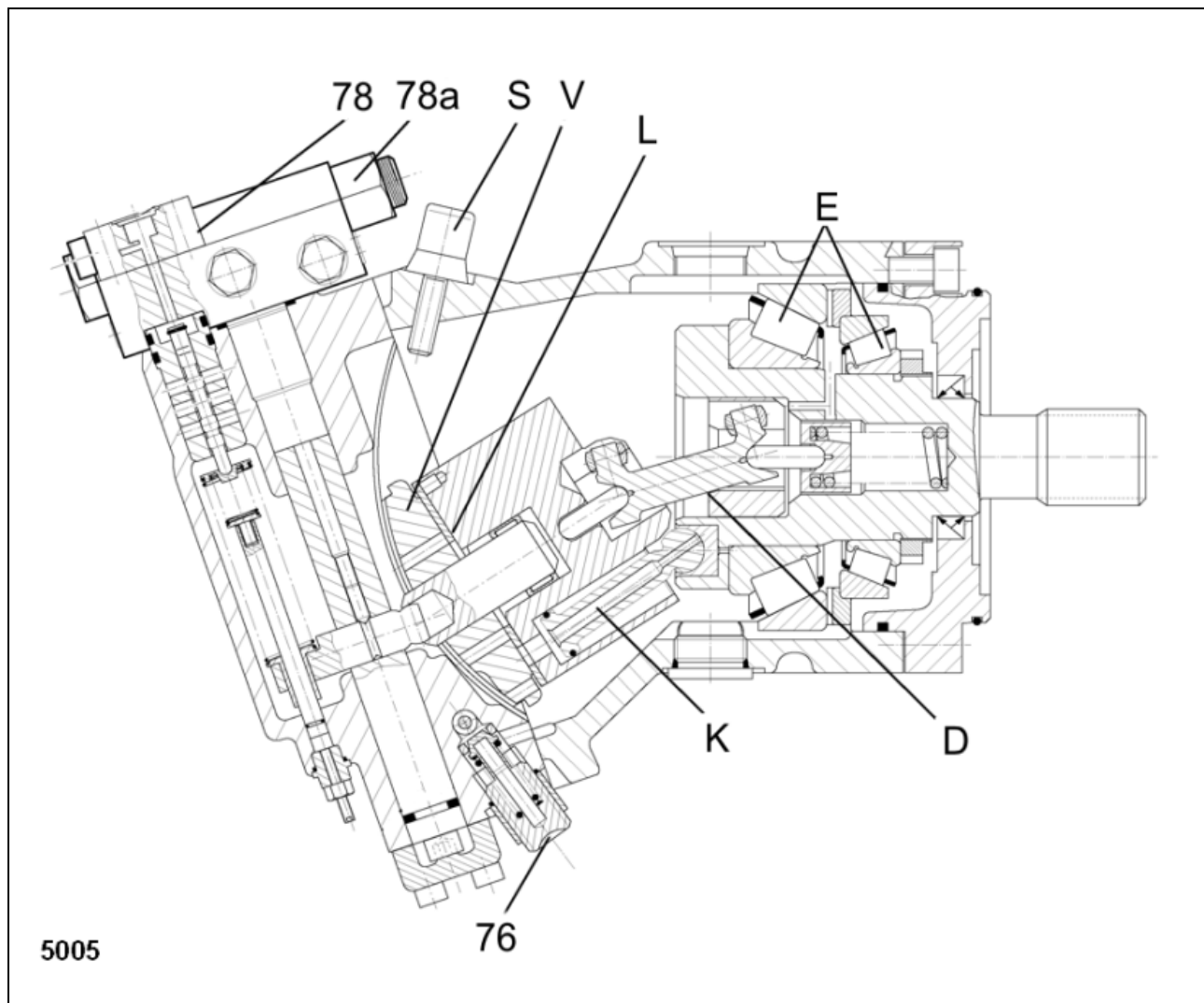
- M 1** Test port, high pressure reverse
M 2 Test port, high pressure forwards
M 3 Connection charge pressure
63 Charge pressure relief valve (set screw)
65 Multi function valve
69 Multi function valve

Measurement

- **Forwards**
- Apply parking brake
- Jack up the machine
- Withdraw connector from potentiometer on the inch pedal (brake pedal)
- Release parking brake
- Clear any personnel from the hazard area
- Connect manometers to both high pressure sides (M1, M2)
- Heat system to an operating temperature of **approx. 60°**
- Set diesel engine to its upper idling speed
- Measure charge pressure: **30 ± 3 bar** (M3)
- Difference in charge pressure on both sides: **max. 7 bar** (M1 and M2)
- Release parking brake
- Set diesel engine to upper idling speed
- Carry out this procedure for max. 15 seconds
- Set ground speed control lever to forwards position
- Press brake pedal until its maximum operating position has been reached
- Constantly monitor the manometers
- The high pressure M2 should increase to about 480 bar
- Low pressure measurement M1: **min. 14**

- **Reverse**
- Apply parking brake
- Jack up the machine
- Withdraw connector from potentiometer on the inch pedal (brake pedal)
- Clear any personnel from the hazard area
- Connect manometers to both high pressure sides (M1, M2)
- Heat system to an operating temperature of **approx. 60°**
- Set diesel engine to its upper idling speed
- Measure charge pressure: **30 ± 3 bar** (M3)
- Difference in charge pressure on both sides: **max. 7 bar** (M1 and M2)
- Release parking brake
- Set diesel engine to upper idling speed
- Carry out this procedure for max. 15 seconds
- Set ground speed control lever to reverse position
- Press brake pedal until its maximum operating position has been reached
- Constantly monitor the manometers
- The high pressure M1 should increase to about 480 bar
- Low pressure measurement M2: **min. 14 bar**

5.0 Sauer Motor 51



- 76 Purge pressure relief valve
- 78 Constant pressure regulator
- 78a Solenoid valve - select speed range 0-8 km/h or 0-20 (32) km/h
- S Setting of swash angle - the minimum capacity can be set (protective cap)
- V Valve segment
- L Bearing plate
- E Taper roller bearing
- D Synchronization joint
- K Rod

Series 51 hydraulic actuating motors operate with spherical rods and rod rings. The angle between the cylinder block and the output shaft can be adjusted between 32° and 6°, which provides a ratio of maximum to minimum capacity of 5 to 1.

At the maximum capacity the motor achieves its maximum output torque with minimum speed under the respective pressure and volumetric flow ratios.

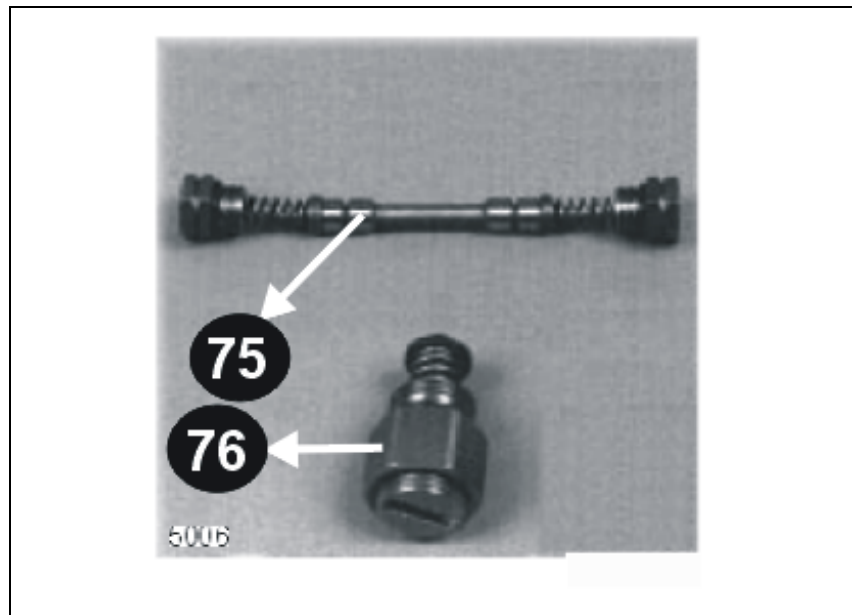
At the minimum capacity and the same input conditions the output speed increases 5-fold, whilst the output torque reduces to one fifth (1/5) of the value of the maximum capacity.

The capacity is changed by an adjusting unit which is linked to the valve segment.

For altering the adjusting unit and the capacity various different hydraulic and electro-hydraulic adjusters can be mounted on the end housing of the motor. The oil pressure for the adjustment of the motor can be provided either internally in the motor or externally. When the combined effect of a control pressure (or a control force) from the external adjuster and the internal spring force is applied to the valve rod, the position pressure oil is switched such that the adjusting unit is moved and the capacity of the motor is changed.

A synchronization shaft with spherical rolls ensures the synchronism of the rotation of the output shaft and the cylinder block. The spherical heads of each piston run in pilot bearings which are pressed in the output shaft. No other parts are used to link the pistons with the output shaft. The output shaft is supported by two taper roller bearings.

5.1 Purge valve



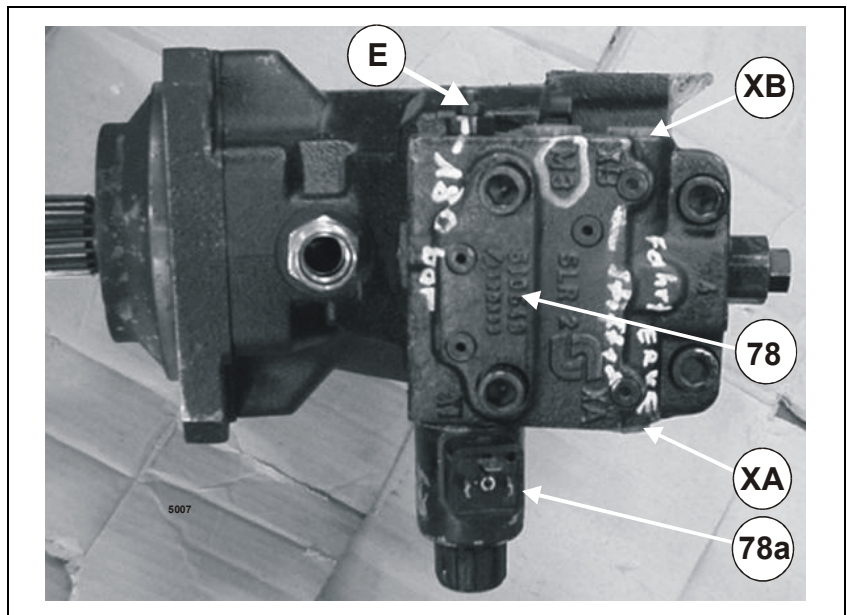
75 Purge valve

76 Purge pressure relief valve

Series 51 motors include as standard an integrated purge valve. Circuit purging is carried out in the closed circuit in order to cool the high pressure circuit or to remove contamination from the circuit. Series 51 motors with an integrated purge valve are also equipped with a purge pressure relief valve. The pressure setting of the purge pressure relief valve also influences the function of the circuit purging. A higher setting of the purge pressure relief valve reduces the purging flow and during operation of the closed circuit allows the flow to increase via the charge pressure relief valve of the pump. A lower setting of the purge pressure relief valve allows the purging flow to increase and can lead to an increase of the motor housing pressure.

The correct combination of charge pressure and purge pressure settings ensures the correct function of the circuit purging system. This combination is specially set by the manufacturer for the respective vehicle. The correct charge pressure must remain intact under all operating conditions so as to ensure the adjusting properties of the pump in the closed circuit.

5.2 Constant pressure regulator



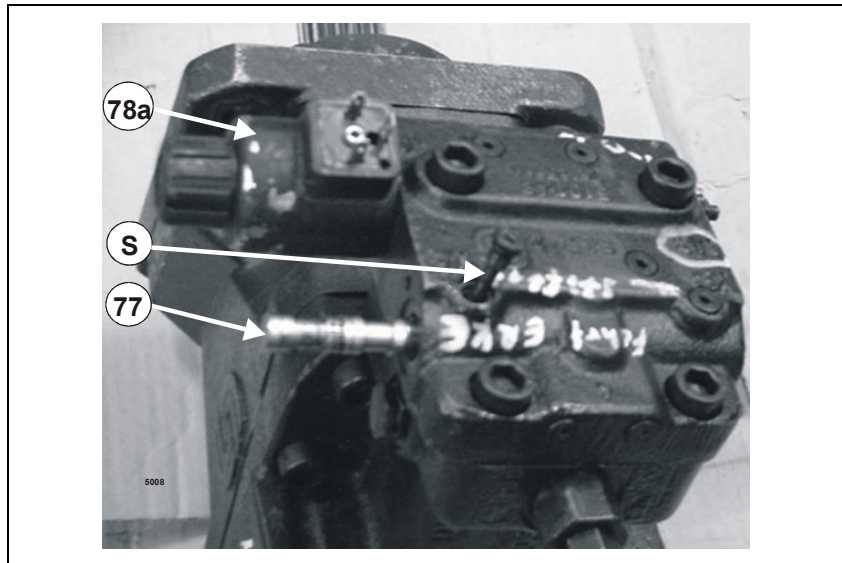
- 78 Constant pressure regulator
- 78a Solenoid valve
- XA Connection, position pressure (reverse)
- XB Connection, position pressure (forwards)
- E Control pressure setting (set screw 180 bar)

This controller (78) regulates the constant pressure system in the multi function block module for the motor capacity depending on the high pressure. As long as the high pressure remains below the control pressure setting (E) (180 bar), the adjusting unit is maintained in the position for minimum motor capacity. If the high pressure exceeds the pressure setting, the effect of the high pressure on the adjusting unit causes the motor capacity to increase.

At the constant pressure regulator an increase in the high pressure (via the set pressure) leads to an increase in the motor capacity and thereby an increase in the motor output torque and a corresponding reduction in the speed of the motor shaft.

Additionally an solenoid valve (78a) is mounted on the constant pressure regulator. If 12 Volts is applied to the solenoid valve the motor remains at max. capacity. In this way the lower speed range (8 km/h) is made possible.

5.3 Travel directional valve



77 Travel directional valve

78a Solenoid valve

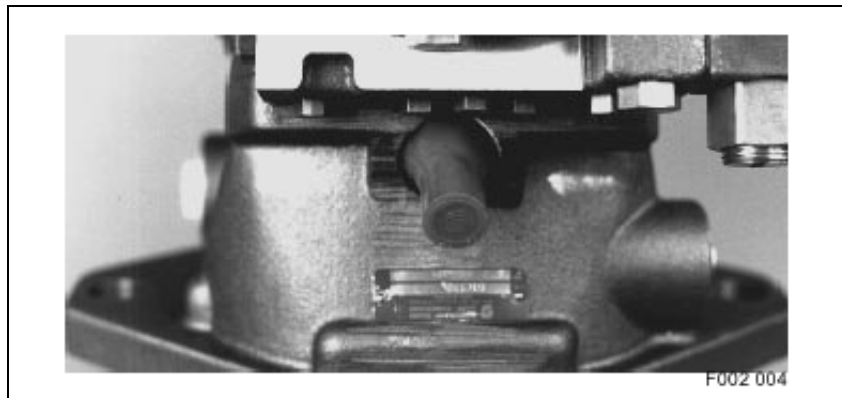
S Stud bolt

Attention: If the travel directional valve (77) has to be removed it is first necessary to unscrew the stud bolt (S).

The travel directional valve (77) is integrated into the constant pressure regulator (78) and is actuated by the respective position pressure. The travel directional valve is a change over valve which provides the respectively-delivered high pressure for the constant pressure regulator (78). The higher high pressure side is always linked to the constant pressure regulator (78) and the adjusting unit (74).

5.4 Setting of swash angle

Settings in discussion
with CLAAS Customer
Services



Swash angle setting (minimum capacity limiter with protective cap)

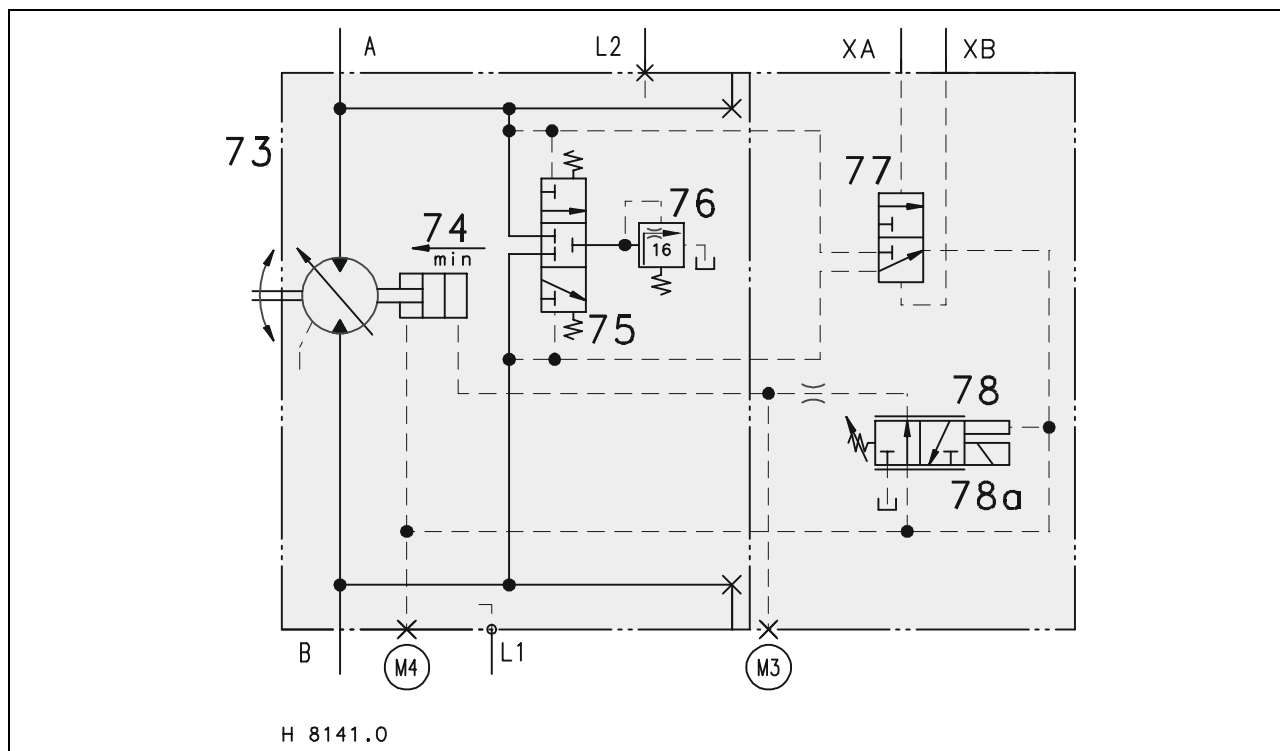
For 20 km/h = 18.4 mm thread length

For 32 km/h = 28.9 mm thread length

All Series 51 motors are fitted with mechanical capacity limiters. The minimum capacity of the motor can be limited within the standard range by means of a set screw on the housing.

6.0 Test ports, motor 51

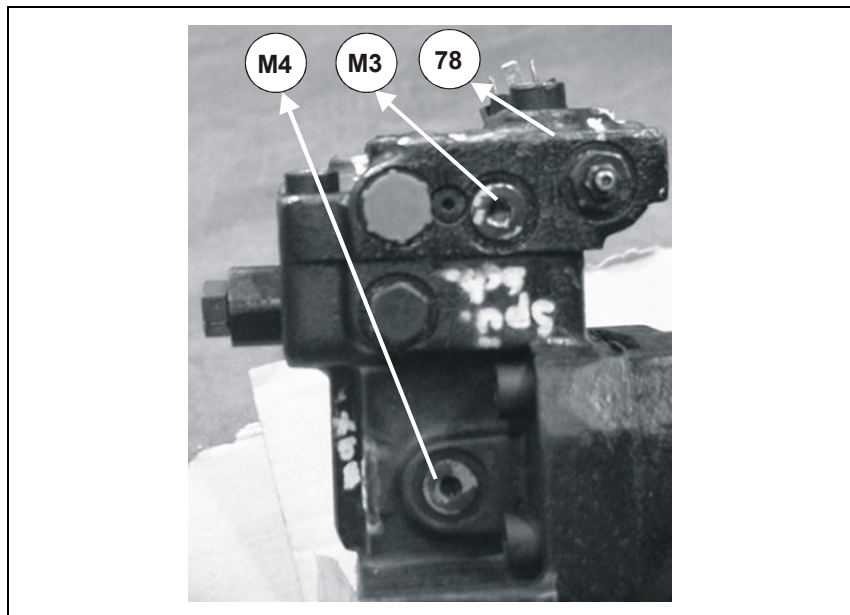
Circuit diagram, motor



Item	Designation	Note
73	Motor (hydrostatic)	Series 51D 110
74	Adjusting unit from motor	
75	Purge valve	
76	Purge pressure relief valve	Opens at about 16 bar
77	Travel directional valve	
78	Constant pressure regulator	
M3	Test port	Position pressure, ram side The position pressure works on the adjusting unit from the motor 51
M4	Test port	Position pressure, rod side The position pressure works on the adjusting unit from the motor 51

Note: For measurements and settings the upper idling speed of the diesel engine and an operating temperature for the hydraulic oil of about 60°C are necessary.

6.1 Checking the constant pressure regulator



Item	Designation	Note
M3	Position pressure, ram side	The position pressure works on the adjusting unit from the motor 51
M4	Position pressure, rod side	The position pressure works on the adjusting unit from the motor 51
78	Constant pressure regulator	Version with solenoid valve and set to 180 bar

E-MV= Solenoid valve

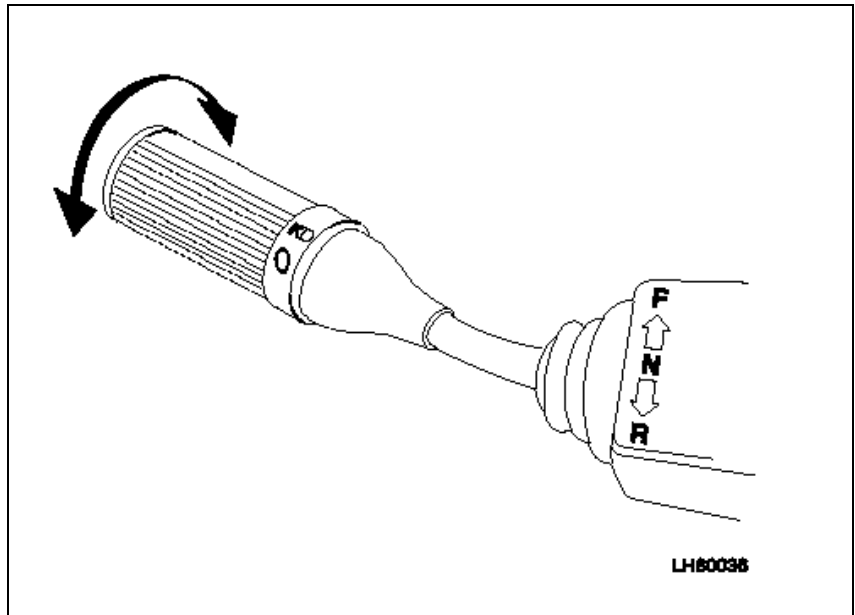
Measurement

- Apply parking brake
- Jack up the machine
- Withdraw connector from potentiometer on the inch pedal (brake pedal)
- Clear any personnel from the hazard area
- Connect manometer to test port M3
- Heat system to an operating temperature of **approx. 60°**
- Release parking brake
- Fully actuate brake
- Set ground speed control lever to "Forwards" position
- Set motor speed slowly up to nominal speed
- Manometer M3 should be carefully monitored during this procedure
- During the increase in speed manometer M3 should briefly display a max. pressure of 180 - 200 bar and then fall back to a pressure of 0 bar.
- Set ground speed control lever to "Neutral" position

Note: In the event of a repeat of this measurement procedure the ground speed control lever will beforehand have to be returned to the "Neutral" position.

6.2 Checking the speed range 0 - 8 km/h

Speed range switch



Measurement

- Apply parking brake
- Jack up the machine
- Clear any personnel from the hazard area
- Connect manometer to test ports M3 and M4
- Heat system to an operating temperature of **approx. 60°**
- Withdraw connector from potentiometer on the inch pedal (brake pedal)
- Release parking brake
- Set rotary switch on the ground speed control lever to the position "KD" (see graphics)
- Carry out this procedure for max. 15 seconds
- Actuate brake slowly
- Set ground speed control lever to "Forwards" position
- Set motor speed slowly up to nominal speed
- Manometer M3 and M4 should be carefully monitored during this procedure
- Manometer M3 should display 0 bar when the motor speed is set to nominal speed.
- Manometer M4 should display up to the max. high pressure (approx. 480 bar)

Notes

7.0 Hydrostatic module (SUSMIC)



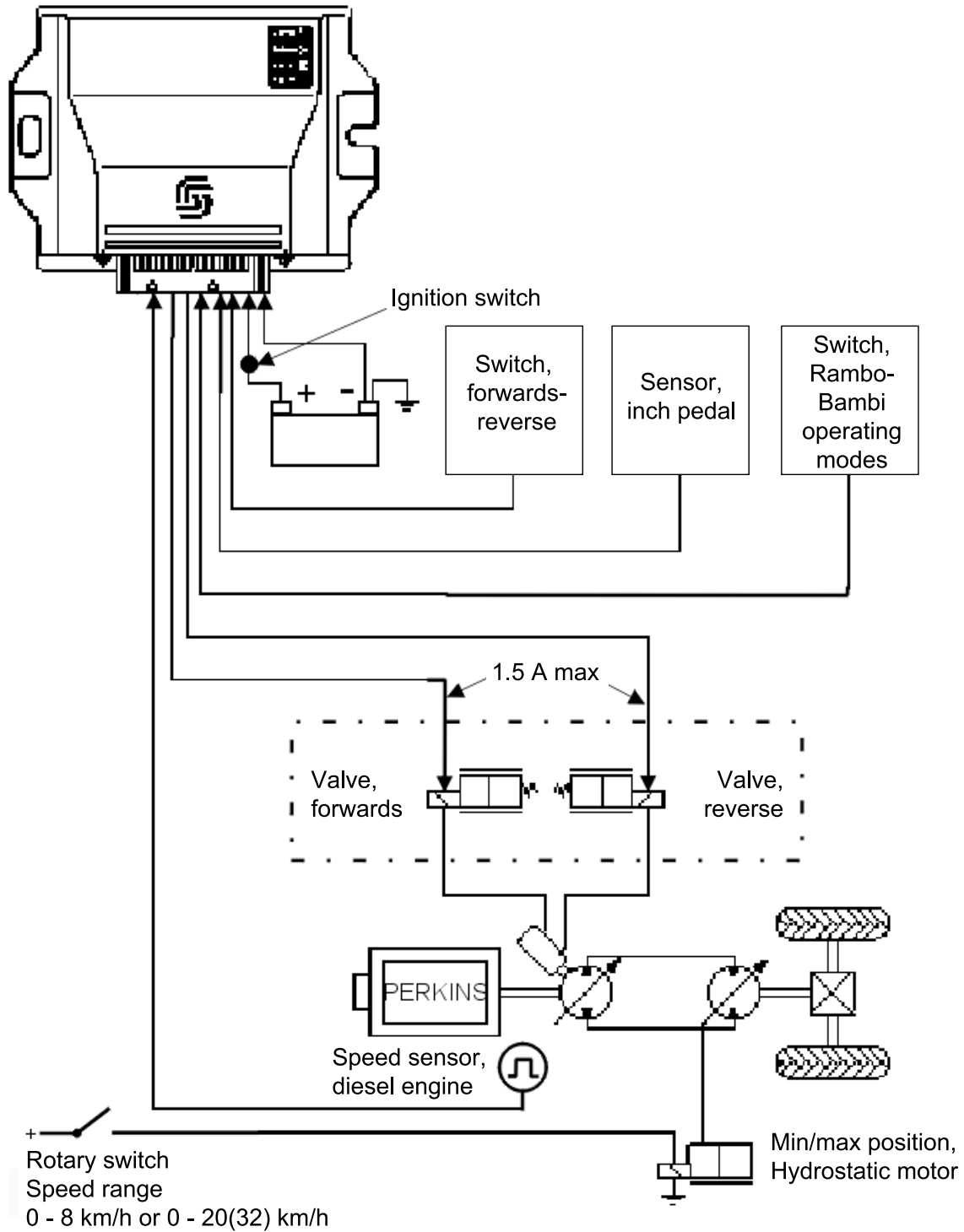
The SAUER-DANFOSS NFPE (Non-Feedback Proportional Electric) System for Automotive Applications combines the future-oriented technology of the Off Highway Digital Electronic Control with SAUER-DANFOSS's proven axial piston pump technology. This application either uses the NFPE pump only, the two-position motor or proportional controlled motor. The Susmic module combines control performance with the flexibility of a future-oriented control scheme. The controller converts engine speed to an automotive drive signal to control the non-feedback proportional axial piston pump. In addition, the Susmic supplies a speed dependent on/off control for a two position controlled motor and an electric proportional control for a bent axis motor.

Two important features of the Susmic system are the integral park brake control and the integral motor control which provides an automatic shift of the two-position and proportional motor. With this control the HST motor always starts at maximum displacement.

7.1 Circuit diagram, module

SUSMIC

Type S1X Ident-Nr.: 513893



5020

7.2 Hydrostatic module strategies (Susmic)

To influence the driving behaviour of the machine, the operator can control the transmission in 6 ways:

1. Speed-Sensor (Accelerator pedal)
 2. Brake pedal (inch pedal)
 3. Direction control lever
 4. Speed limiter twist grip
 5. Progressive/Aggressive mode switch
 6. Parking brake
-
1. The accelerator pedal function is straight forward. The further the pedal is pushed down, the faster the machine wants to go.
 2. The brake pedal is a so-called 'inching pedal'. This entails a potentiometer on the pedal that measures the position of the pedal which is transmitted to the Hydrostatic electronic control unit (Susmic). The Susmic will deswash the Hydrostatic pump, i.e. the transmission is slowly put back into neutral. For the first part of the brake pedal travel there is no actual braking on the axles as yet. The next step is an overlap period where both the pump is being deswashed further and the brakes are starting to be applied. The last phase on the pedal is where the pump is put in neutral and the brakes are applied fully. This set up ensures that the engine rpm can be high to give full hydraulic flow while the machine moves forward slowly rather than at full speed. It further prevents the brakes having to work against the transmission.
 3. The direction control lever controls the direction of movement, i.e. the lever moved forward, machine moves forward. Lever moves backwards, machine moves in reverse. For safety reasons, to take the lever out of neutral, it has to be lifted up before it can be moved forward or backward.
 4. The speed limiter is the twist grip fitted to the direction control lever and controls the Hydrostatic motor. The speed limiter limits the maximum speed (independent from the individual country road regulatory maximum speeds) to 8 km/h. This is a useful feature when the machine is operating in confined spaces. While the operator still has got full engine rpm available for fast hydraulic operations, the machine will only reach a maximum speed of 8 km/h without the operator having to apply the inching pedal.

5. The Aggressive / Progressive mode switch (alternatively called Rambo / Bambi switch) changes the characteristics of the Hydrostatic pump and therefore transmission behaviour.

Characteristics of the Progressive mode:

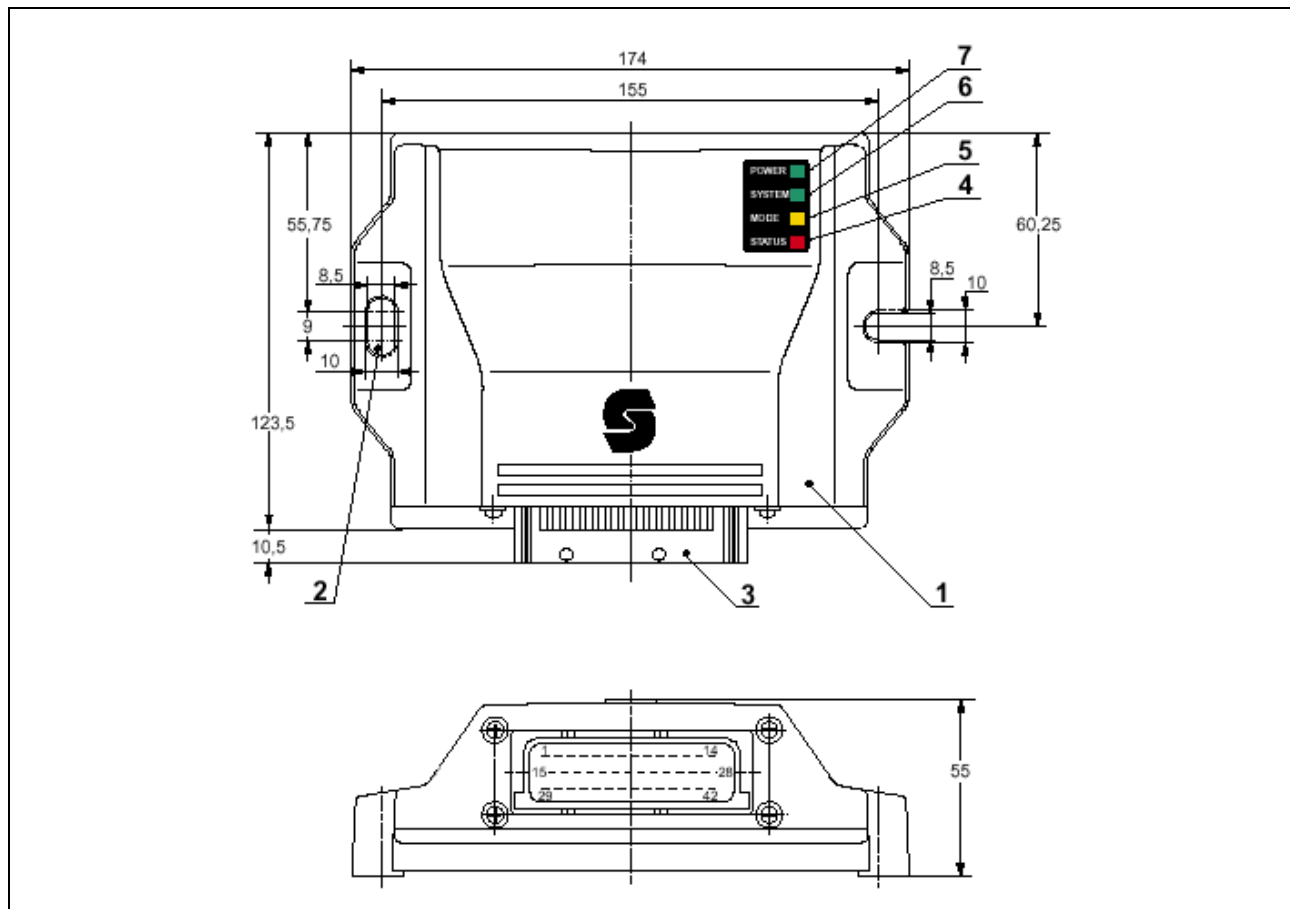
- Good resolution at low-medium engine speeds, i.e. for a large movement of the accelerator pedal there is a small increase in vehicle speed, allowing accurate control over the machine (e.g. placement work).
- Good anti-stall at medium-high engine speeds, i.e. for a small drop in engine speed there is a large speed reduction and increase in tractive effort, i.e. the engine does not stall when the machine movement is blocked (e.g. heavy duty rehandling).

Characteristics of the Aggressive mode:

- A sharp speed increase with a small amount of accelerator pedal movement gives a quick accelerating machine with a very responsive behaviour (e.g. rehandling and rapid shuttling work). It has to be noted that the difference in driving behaviour is different only in the range of approximately 900 to 2000 engine rpm. Outside that range the two characteristics are identical and consequently the machine will reach the same final speed.
6. When applying the parking brake, the Hydrostatic pump is put into neutral and therefore the transmission is in neutral. This to prevent the machine burning the brake discs.

Notes

7.3 Diagnosis



1 Modul SUSMIC S1X Ident. no. 51893

2 Mounting slots

3 AMP connector

4 Diagnostic LED red (STATUS) Error check
Lights up if an error is detected.

5 Diagnostic LED yellow (MODE) Software check
LED flashing slow if the program is running fine.
LED flashing fast if no program is loaded.
No flashing if in setup mode.

6 Diagnostic LED green (SYSTEM) 5VDC internal
Lights up if 5V DC internal is O.K.

7 Diagnostic LED green (POWER) Battery after ignition switch
Lights up if the battery voltage is connected after ignition.

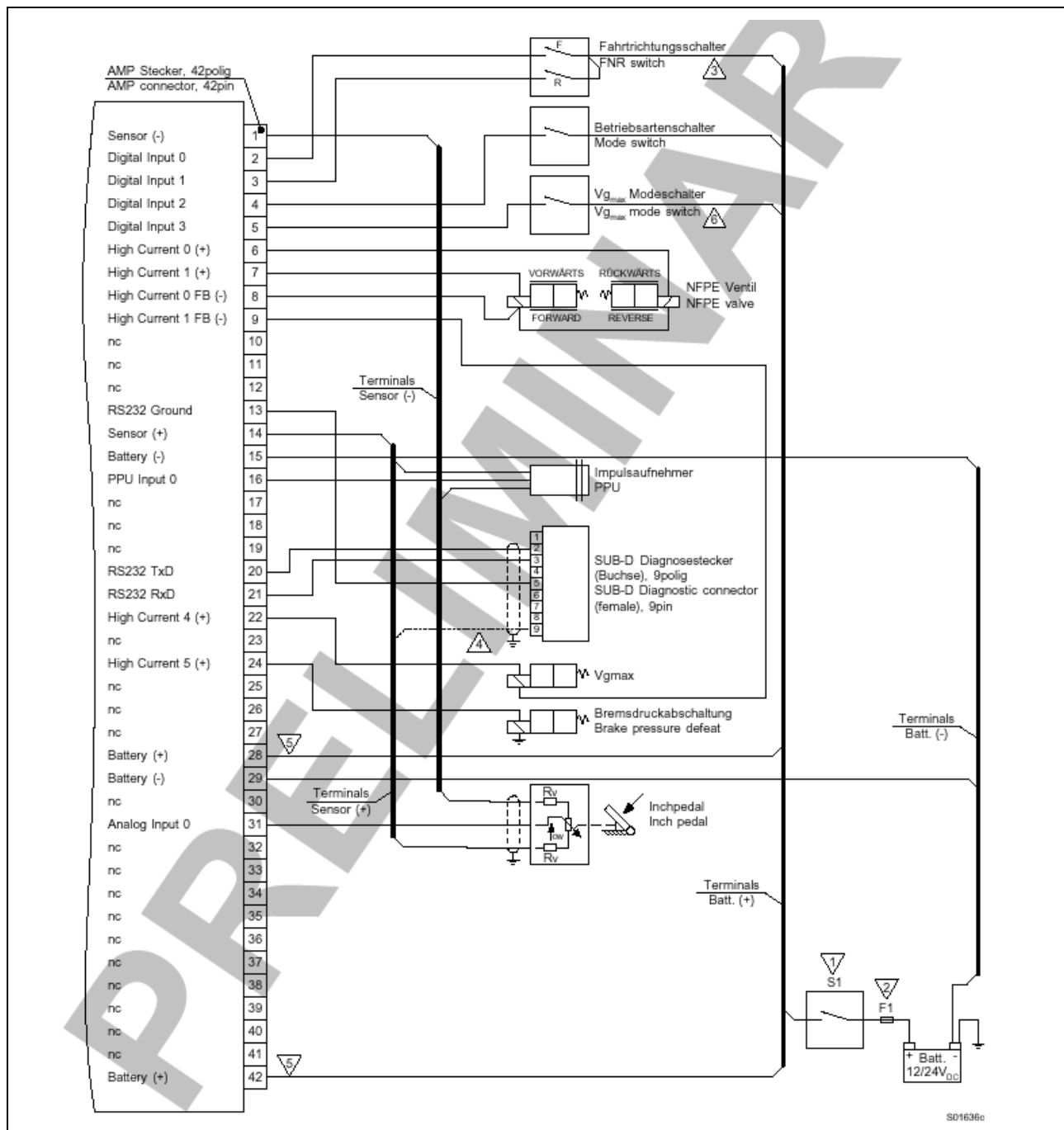
7.4 Error table (Susmic)

Error code (red LED)	Error location / error cause	Possible remedy
İ%İ	Potentiometer on brake pedal (inch pedal) Supply power (5V) outside tolerance range	Check wiring Renew Susmic
--İ%	Potentiometer on brake pedal (inch pedal) Signal voltage incorrect	Check wiring Check potentiometer / renew if necessary
İ%-İ	Speed sensor (diesel engine) No speed signal during start	Check wiring Check sensor and renew if necessary
-İ-İ	Solenoid valve (PWM) W105+106 Short circuit Broken cable	Check wiring Check solenoid valves and renew if necessary
İ--İ	Travel direction switch (F, N, R ground speed control lever) Short circuit between switches F and R	Check wiring
---İ	Speed sensor (diesel engine) W107 Speed signal interrupted	Check wiring Check sensor and renew if necessary
--İ-	Incorrect hardware	Renew Susmic
----	Default parameter Parameter not set	Renew Susmic

Legend

-	Long lit-up time of red LED
İ	Short lit-up time of red LED
----	Red LED permanently lit up
F	Forwards
R	Reverse
Solenoid valve	Solenoid valve

7.5 Pin assignment (Susmic)



Note

- Operating mode switch not provided
- Brake pressure cut-out not provided
- Vg max = Solenoid valve (78a) mounted on the hydrostatic motor
- Pulse sensor or shown as speed sensor.

Contents

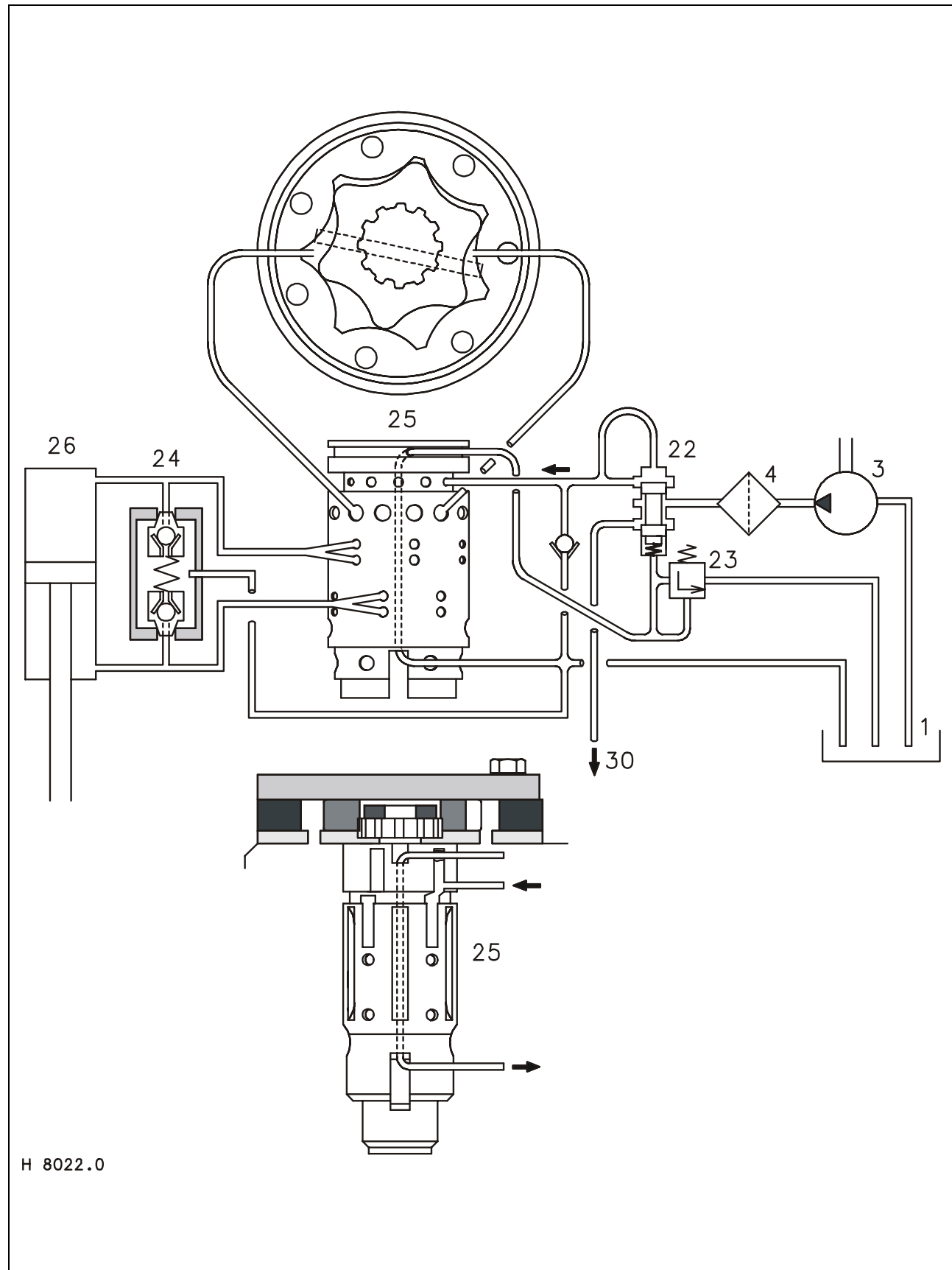
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1.1 Components

1	Tank
1a	Sieve in tank
2	Pump max 80 l/min
9	Priority – charge valve
10	Priority valve
11	Pressure relief valve >175 bar
12	Charge valve
13	Filter
14	Filter
17	Foot brake valve
24	Danfoss OSPF steering unit
25	Rotary plate valve
26	Shock valves 225-245 bar
27	4/3 way steering mode solenoid valve
28	Pressure relief valve 175 bar
29	One way valve
30	Rear steering ram
31	Front steering ram
32	Working hydraulics control valve
56	Hydraulic brake for trailer
62	Oil pressure switch, steering pressure (optional)
M5	Steering test port
M6	Charge pressure test port
M7	Working pressure test port

2.0 Steering operation

2.1 Neutral



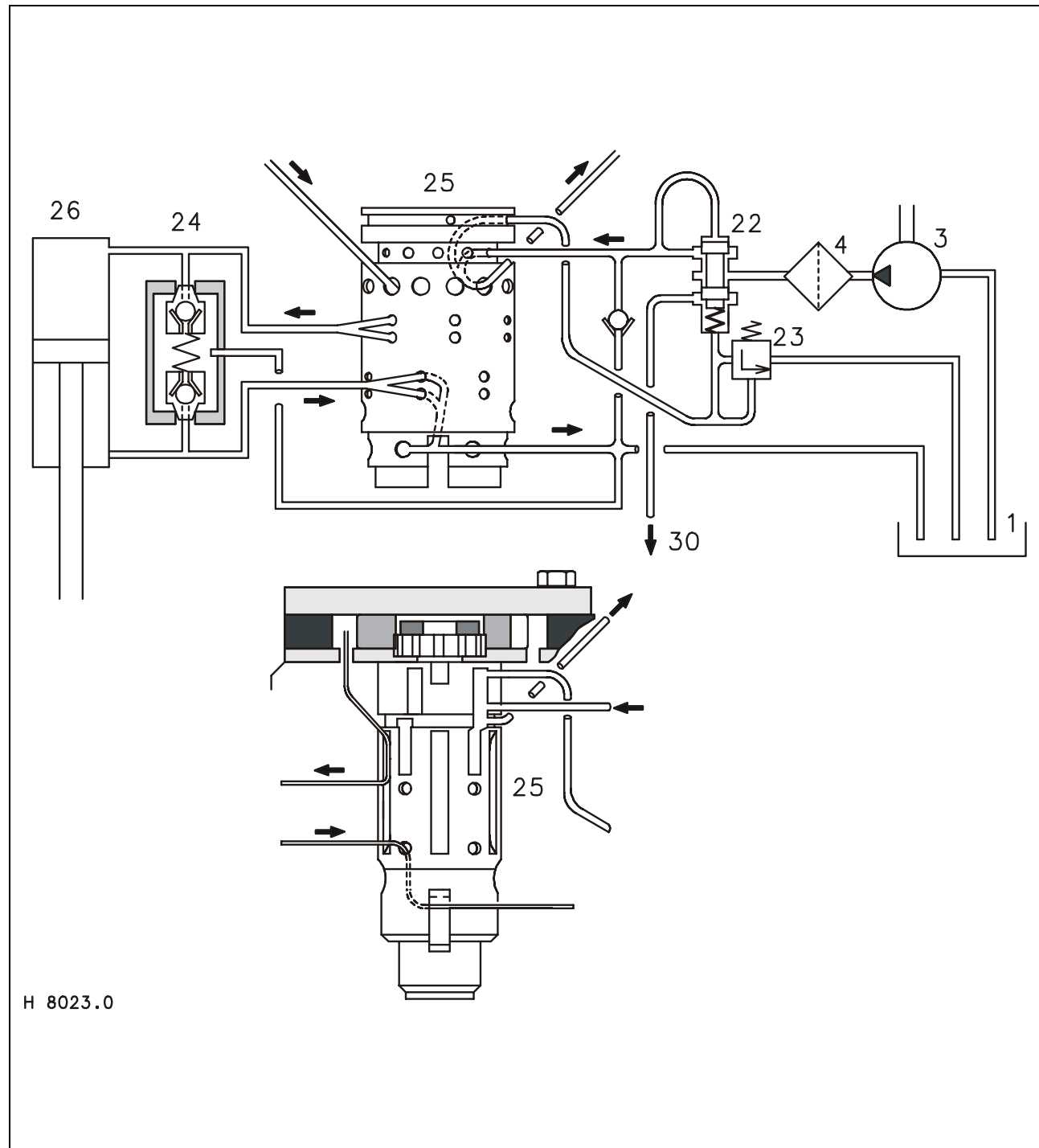
Key	01	Hydraulic tank
	03	Pump
	04	Pressure filter
	22	Priority valve
	23	Pressure relief valve
	24	Shock valve
	25	Rotary plate valve
	26	Steering ram

Operation

In the neutral position, the pressure is dumped to tank 1 via the spring area of the priority valve 22 and the rotary valve 25 and the supply from the pump 3 is locked.

The build up of back pressure builds up against the spool of the priority valve 22 against the spring which allows the oil flow for the working hydraulics 30.

2.2 Steering



Key

- | | |
|----|-----------------------|
| 01 | Hydraulic tank |
| 03 | Pump |
| 04 | Pressure filter |
| 22 | Priority valve |
| 23 | Pressure relief valve |
| 24 | Shock valve |
| 25 | Rotary valve |
| 26 | Steering ram |

Operation

By turning the wheel, back pressure on the spool in the priority valve 22 is momentarily connected together and the control line to the spring area of the priority valve 22 and the back pressure side of the rotary valve 25 are connected. The spring in the priority valve 22 and the change in pressure in the steering, moves the spool into one position which distributes the required oil to the steering

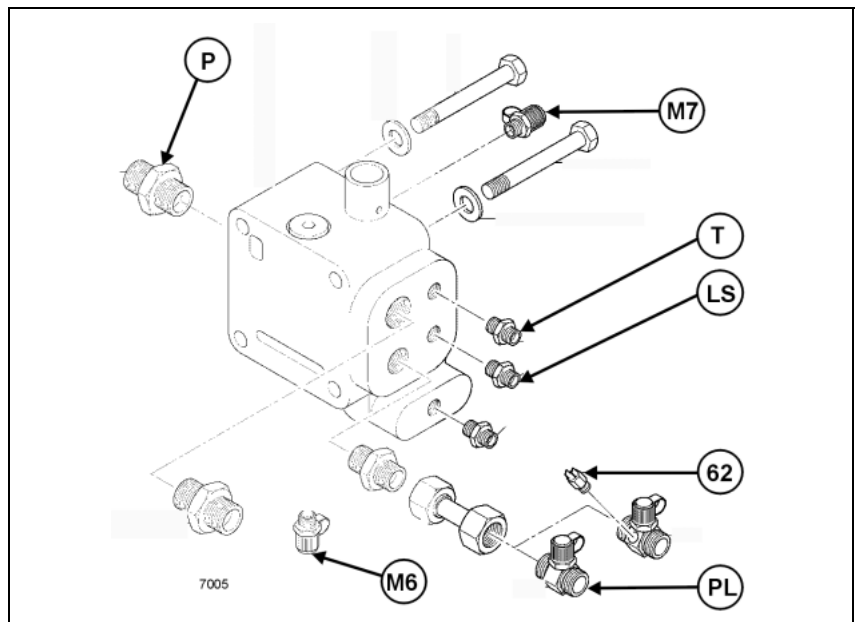
Over pressure

Should the pressure exceed 175 bar, then the pressure relief valve 23 is opened which dumps oil from the spring area of the priority valve 22 back to tank 1.

The higher pressure on the opposite side operates the spool against the spring, so the oil flow is redirected to the working hydraulics 30.

3.0 Priority – charge valve

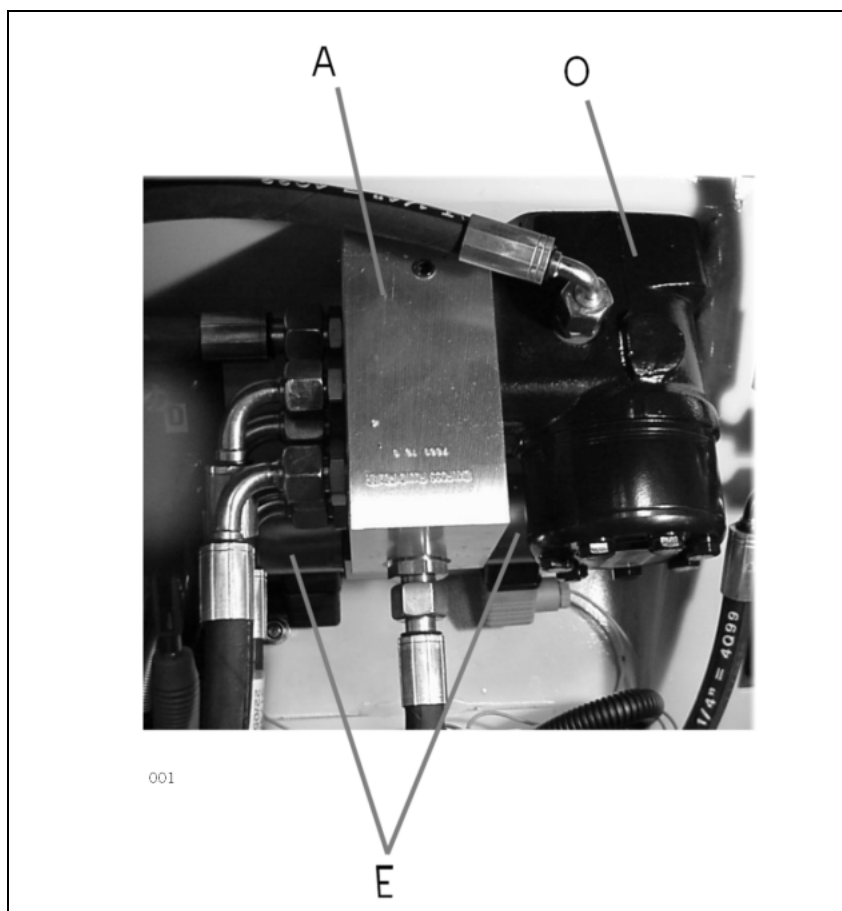
3.1 Structure



PL	Supply to the Orbitrol
62	Steering oil pressure switch (10 bar)
LS	LS line from the Orbitrol
T	Tank connection
M7	Working pressure (Max. 240 bar)
P	Supply from the pump (2) max. 80 l/min
M6	Charge pressure test port (Accumulator pressure)

The pump supplies oil to the priority charge valve so that firstly the priority steering and brakes are supplied.

4.0 Steering unit



- O Steering unit OSPF250
- A Adaptor
- E Steering mode valve

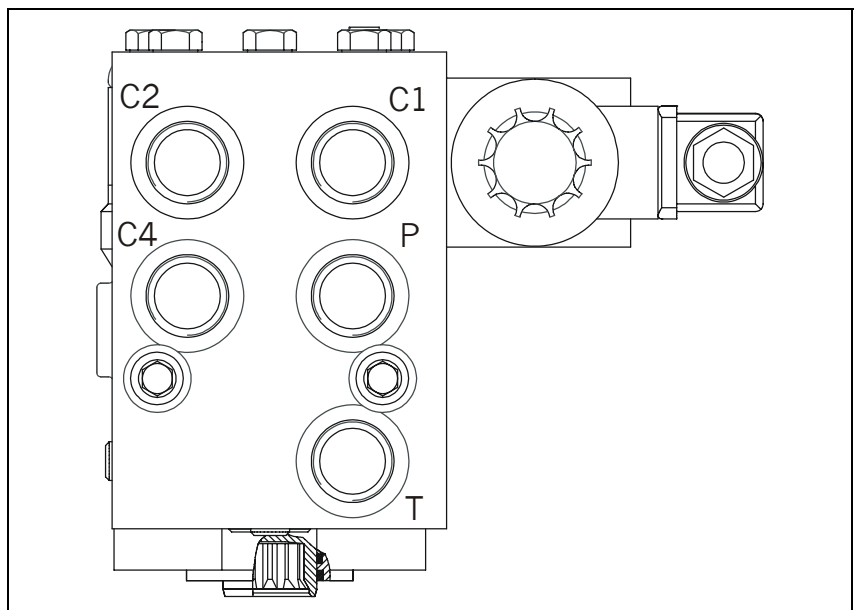
The components (O, A, E) can be found on the floor area directly next to the brake valve kicker plate.

The connection from steering to the wheels is done by the steering orbital.

The hydraulic lines for the steering is done via the adaptor.

The steering valve enables the different steering modes.

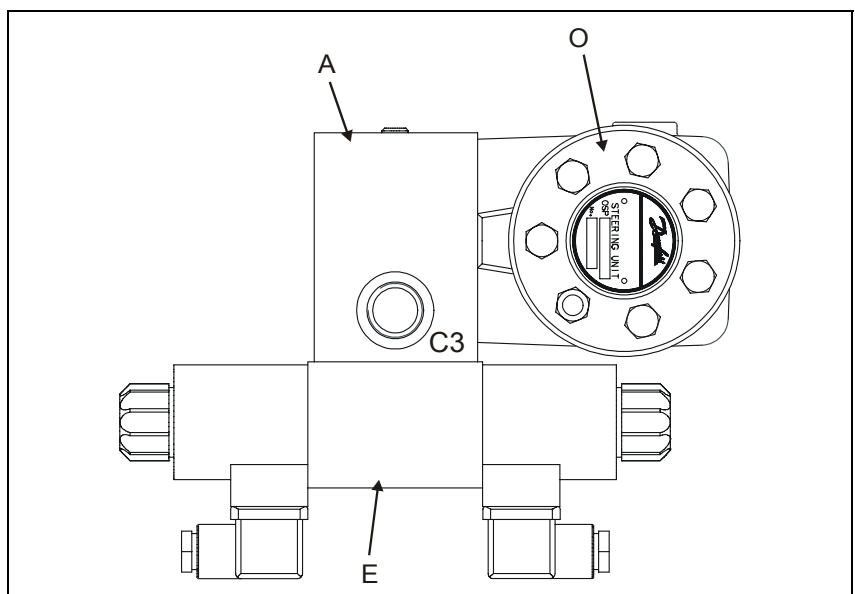
4.1 Adaptor connection



002

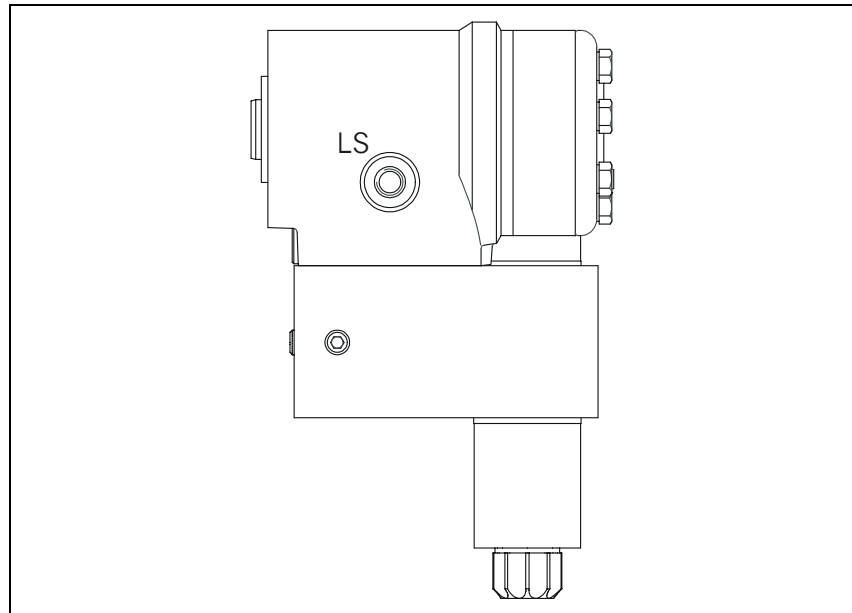
- C1 Steering ram rear axle
- C2 Steering ram rear axle
- C4 Steering ram front axle
- P Pump
- T Tank

The P connection from the LS pump is via the priority charge valve.



003

- C3 Steering ram front axle
- O Steering orbital OSPF250
- A Adaptor
- E Steering mode valve

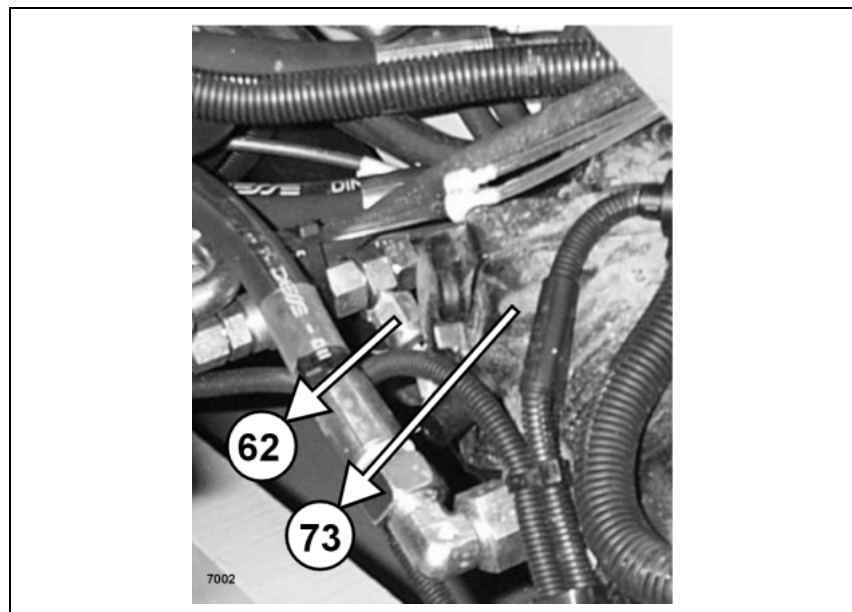


004

LS connection

The LS connection is from the orbitrol (OSPF 250) to the priority charge valve.

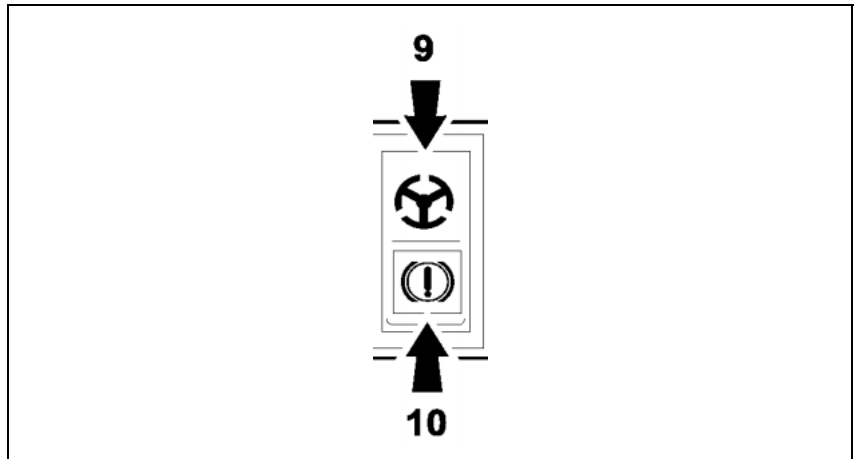
4.2 Steering pressure monitoring (Optional)



62 Oil pressure steering switch (10bar)

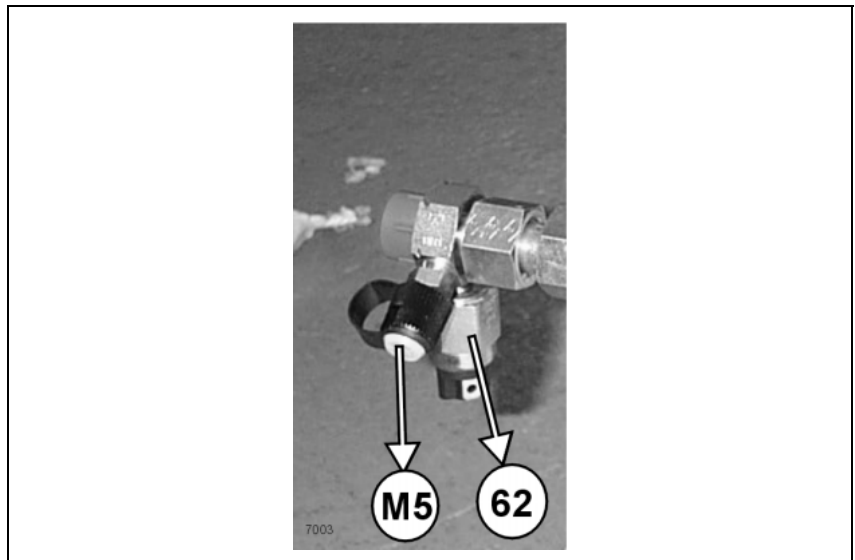
73 Sauer motor 51

Should the system pressure of the steering drop below 10 bar, then the steering oil pressure switch (62) sends a signal to the warning light (9) in the cab.

Warning light

- 9 Warning light steering pressure
10 Warning light brake pressure

Should the system pressure of the steering drop below the required amount, then the steering oil pressure switch (L) sends a signal to the warning light (9) in the cab.

4.3 Steering measurement table

7005

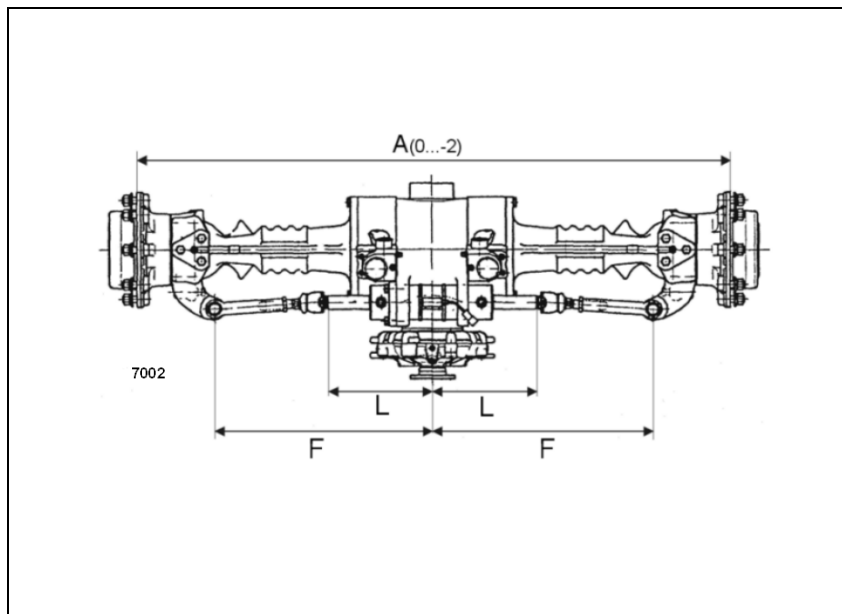
- M 5 Steering test port
62 Steering oil pressure switch (10bar) (optional)

Pressure readings

Return = 20^{+7} bar
System pressure = 170^{+15} bar
Shock valve = 230 ± 15 bar

NOTE! The readings are taken with the engine at full speed and the oil at working temperature of approx. 60°C.

5.0 Axle

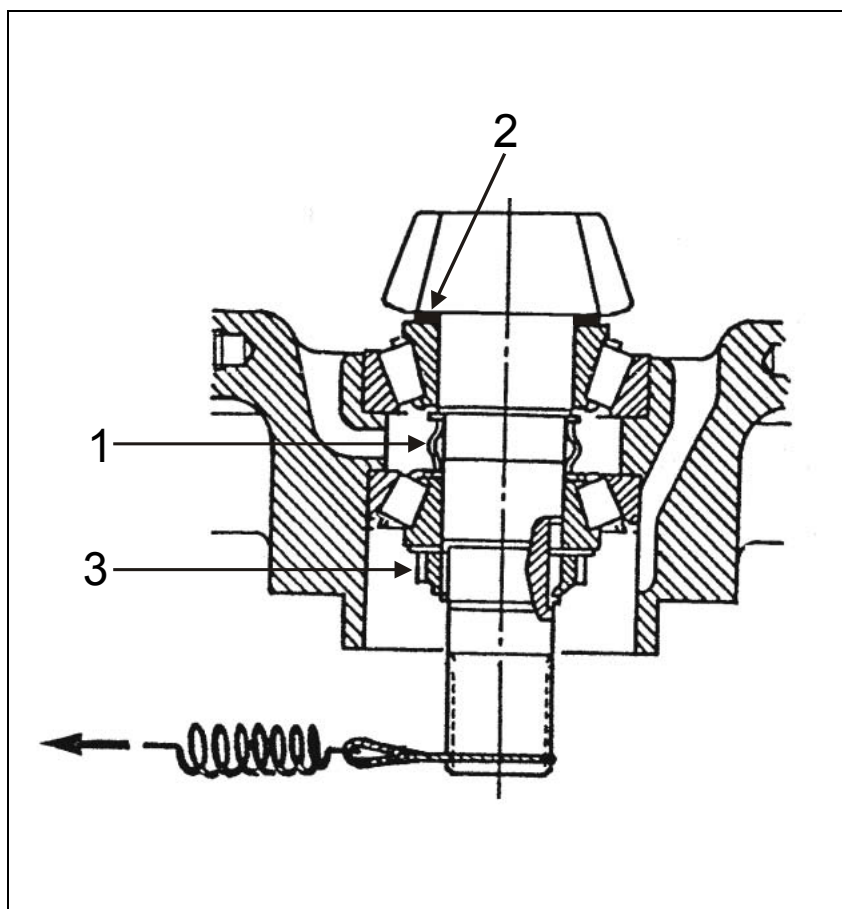


7002

The tracking with the front axle is 0 - 2 mm
The tracking with the rear axle is 0 mm

5.1 Adjustment notes on the bevel gear shaft

This note is not available in the workshop manual.



Ran-038

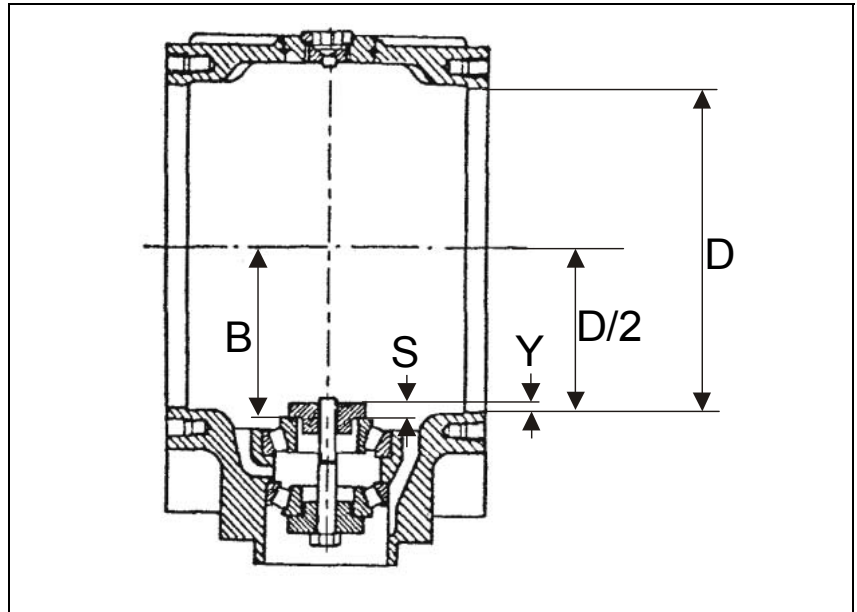
- | | |
|-----------------|--|
| 1 Dirt bush | always renew |
| 2 Thrust washer | |
| 3 Nut | Determines the pretension of the roller bearings to the correct rolling torque of the shaft: |

Rolling torque of the shaft without the crown wheel: 92 ... 138 N

Rolling torque with the crown wheel and adjusted correctly: 115,7 ... 173,6 N.

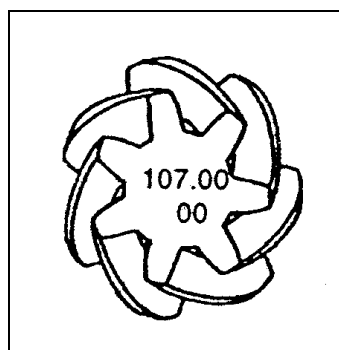
Gear tooth play 0,18 ... 0,25 mm

Determining the thrust washer (2)



Ran-039

1. Determine the dimension: $B = D/2 - Y + S$
2. Determine the thrust washer required: Read off the crown wheel speed and deduct from B



ran-040

e.g crown wheel: 107,00 = 1.07mm

The max allowed washer thickness must not exceed ± 0.1 mm compared to the determined washer thickness.

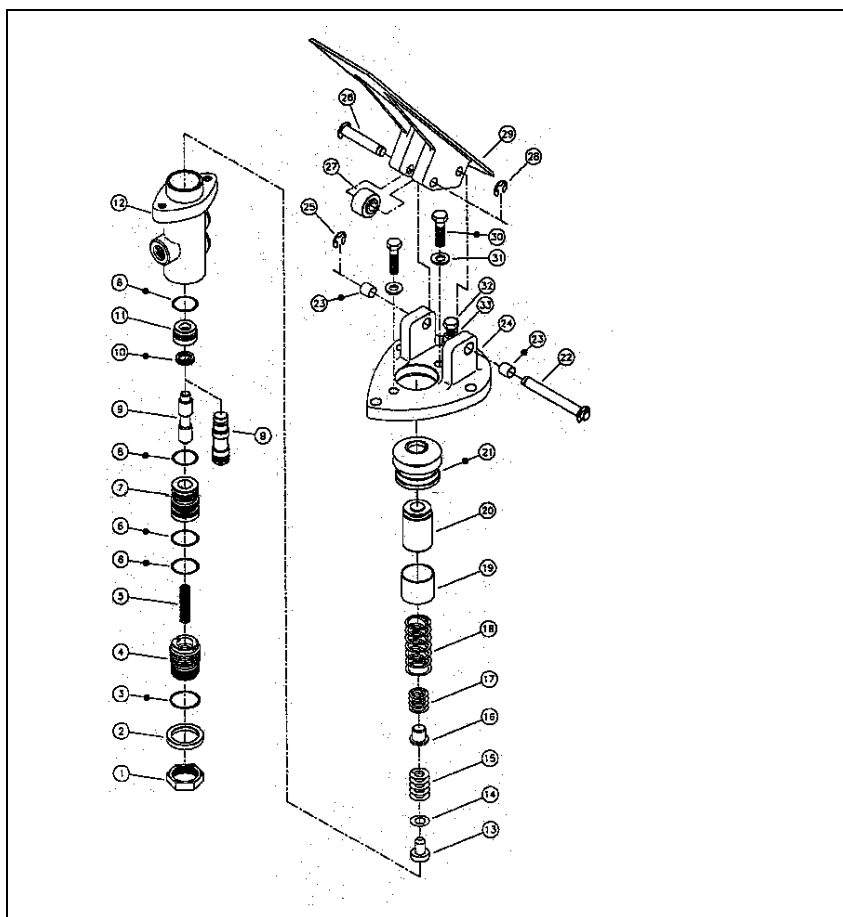
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1.0 Service brake

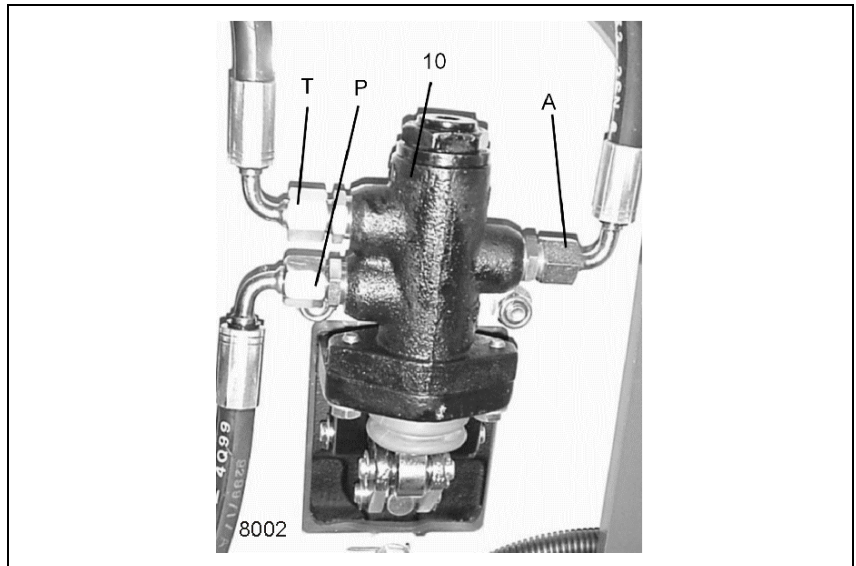
The brakes are hydraulically operated and are either single circuit or dual circuit. The supply for the hydraulic pressurisation is from the pump.

1.1 Kicker plate brake valve



Those components marked with a point are available in the repair kit (316 893.0)

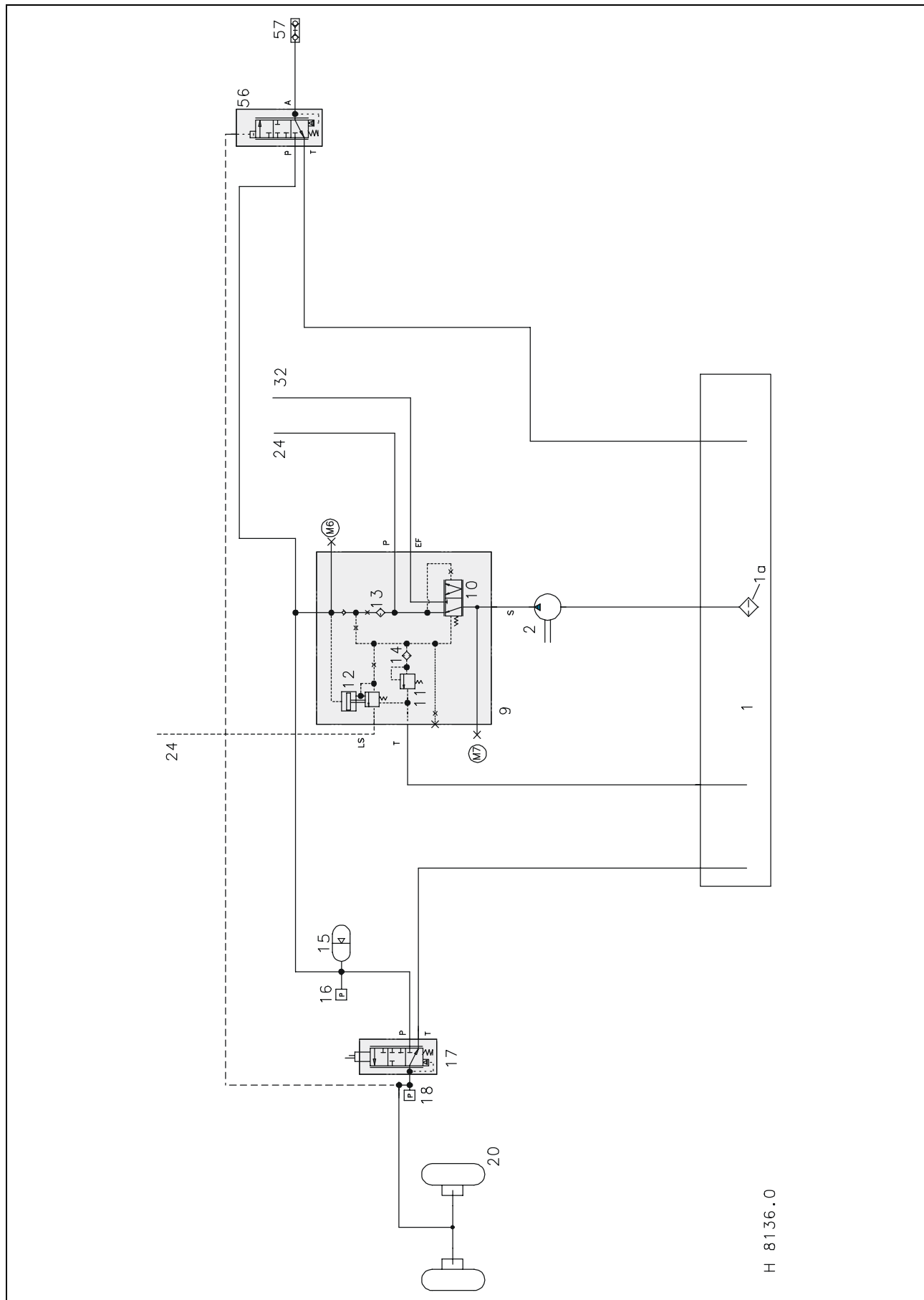
1.2 Kicker plate brake valve for single braking system



- 10 Kicker plate brake valve
- P Connection to pump (pressure)
- T Connection to tank (return)
- A Connection to the brake rams

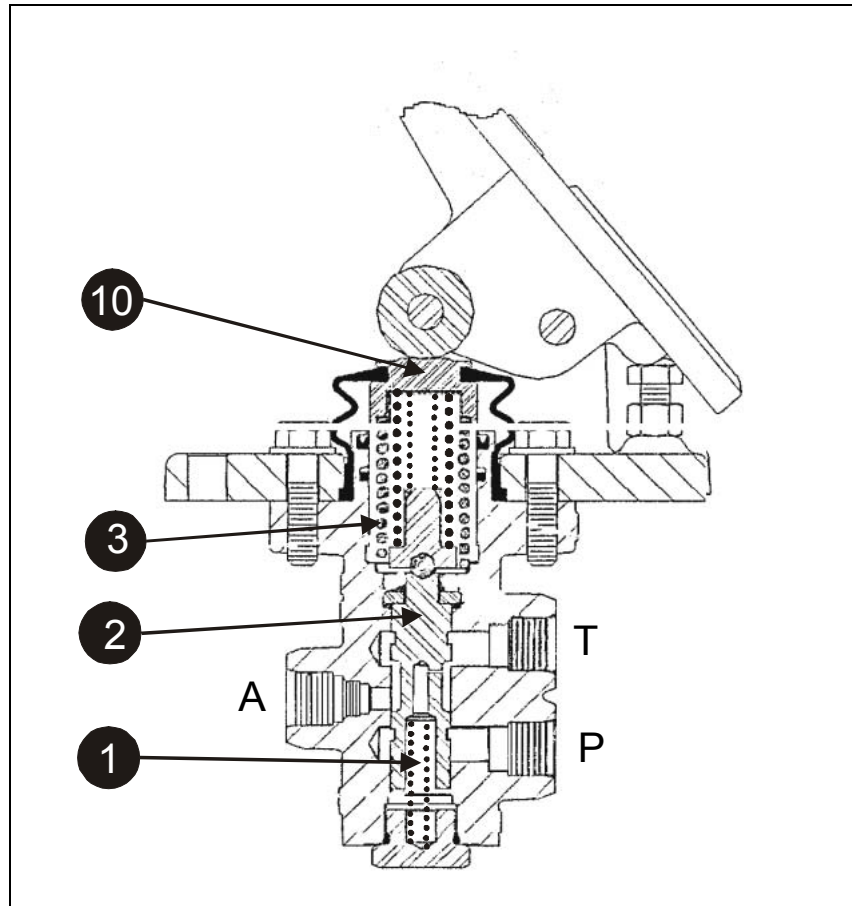
The kicker plate brake valve can be found in the foot area next to the orbital.

The pump connections (P) are connected via the priority charge valve from the pump.



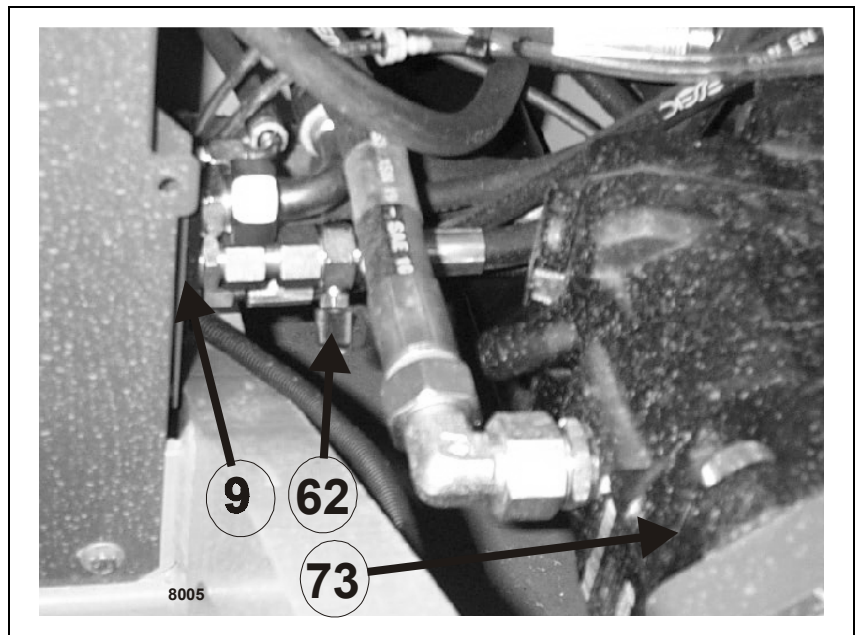
Pos.	Description	Comments
1	Hydraulic tank	
1a	Suction sieve	In the tank
2	Pump	max. 80 l/min
9	Priority charge valve	
10	Priority valve	Brakes and steering have priority to the working hydraulics
11	Pressure relief valve	Opening pressure > 175 bar
12	Charge valve	Should the pressure drop to below 128 bar, then the charge valve is activated and charges the accumulator
13	Filter	
14	Filter	
17	Kicker plate brake valve	Single braking system
24	Steering unit	Danfoss OSPF 250
25	Rotary plate	4/3 way valve
26	Shock valves	225 – 245 bar
27	4/3 way valve	Enables the steering modes
28	Steering pressure relief valve	175 bar
29	One way valve	Fitted in the P line of the steering
30	Steering ram	Rear axle
31	Steering ram	Front axle
32	Control unit (working hydraulics)	
62	Oil pressure switch (optional)	Steering pressure (10 bar pressure point)
M5	Test port	Steering pressure
M6	Test port	Working pressure
M7	Test port	Accumulator (brakes)

1.3 Structure



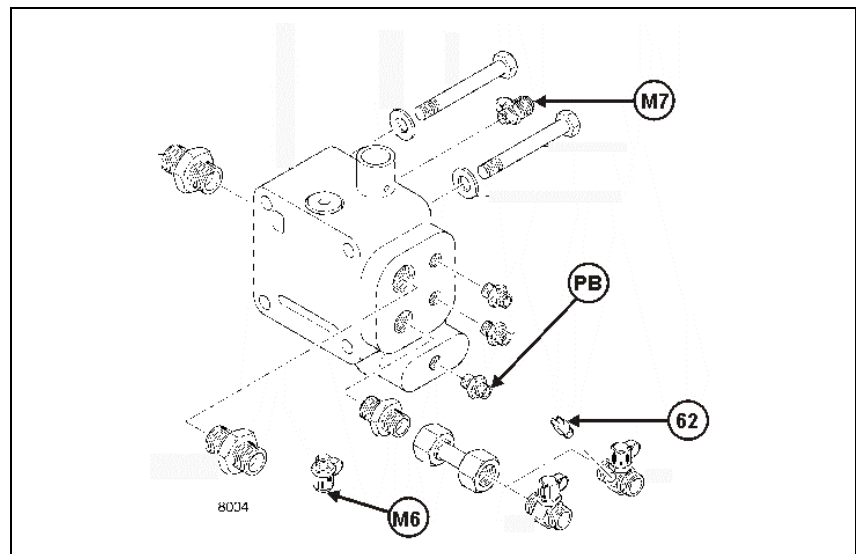
Pos.	Description	Comments
1	Spring control spool	
2	Control spool	Is held by its spring (1) in the neutral position. Therefore: - The pressure connection (P) is closed. - The connection to the brakes (A) and the tank (T) is joined. When braking the control spool is operated downwards: - The connection (A) is made to the connection (T). - Via the control edge, the connection from (P) to (A) is opened. On this control edge the brake pressure is regulated. Less force on the pedal = less movement of the control spool = less opening of the control edge = less brake pressure. The brake pressure is via a small hole in the control spool spring (1). With the operating pressure (from top) and the brake pressure (from below), the spool is regulated.
3	Return spring	Pushes the ram (10) against the brake pedal.
10	Ram	Operates from the brake pedal against the return spring (3)
A	Connection	To the wheel brake ram for the brakes Max brake pressure = 44 bar
P	Connection	Here sits the system pressure (128..159 bar) from the charge valve.
T	Connection	Working hydraulics tank

1.4 Priority and charge valve



- 9 Priority and charge valve
- 62 Oil pressure steering switch (10 bar)
- 73 Sauer motor 51

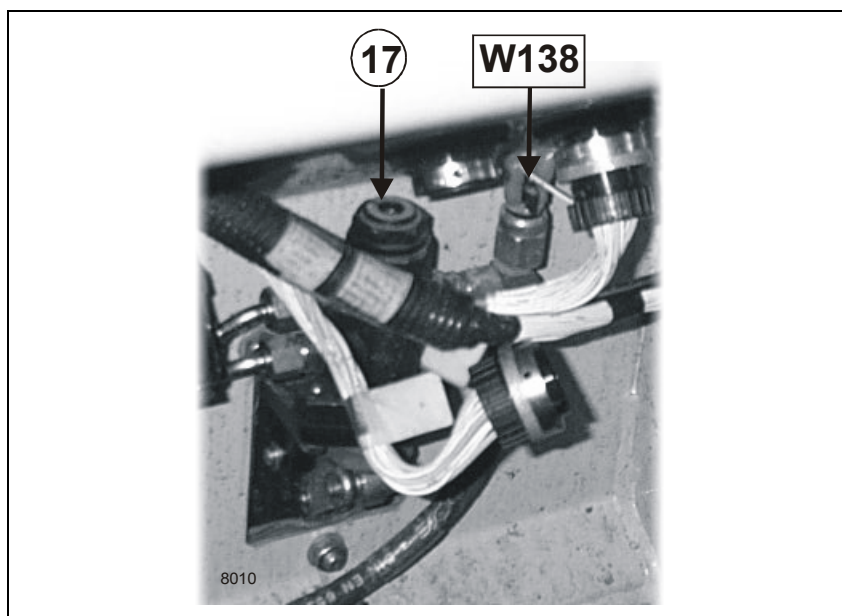
When the accumulator is charged, the actual charge pressure is registered with the priority charge valve (9).
 If the charge is sufficient, then the priority charge valve switches the supply to the working hydraulics.
 The max. accumulator pressure is approx. 160 bar.



- PB Supply to the kicker plate brake valve
- 62 Oil pressure steering switch (10 bar)
- M6 Charge pressure test port (accumulator)
- M7 Working pressure (Max. 240 bar)

The priority charge valve is supplied directly from the pump.

1.5 Pressure switch for the brake lights



- W138 Pressure switch for the brake lights
17 Kicker plate brake valve

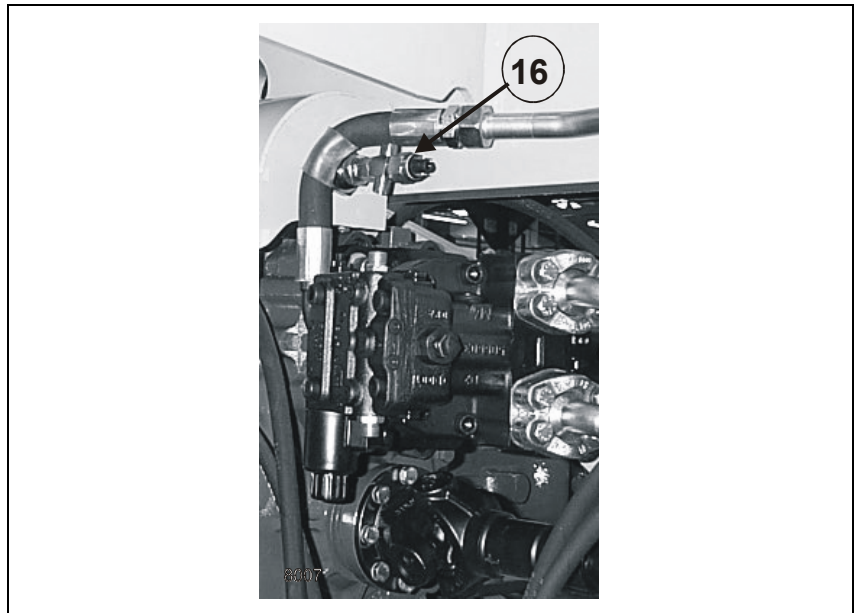
The oil pressure switch (W138) activates the brake lights. The switch is fitted in the line to the wheel brake cylinder. The minimum pressure of response of the switch amounts to approx. 5 bar.

1.6 Accumulator



- 15 Accumulator pre-tensioned to 41 bar

The accumulator is positioned on the front left hand side of the chassis. With the single braking system, only the accumulator with the oil pressure switch is available.

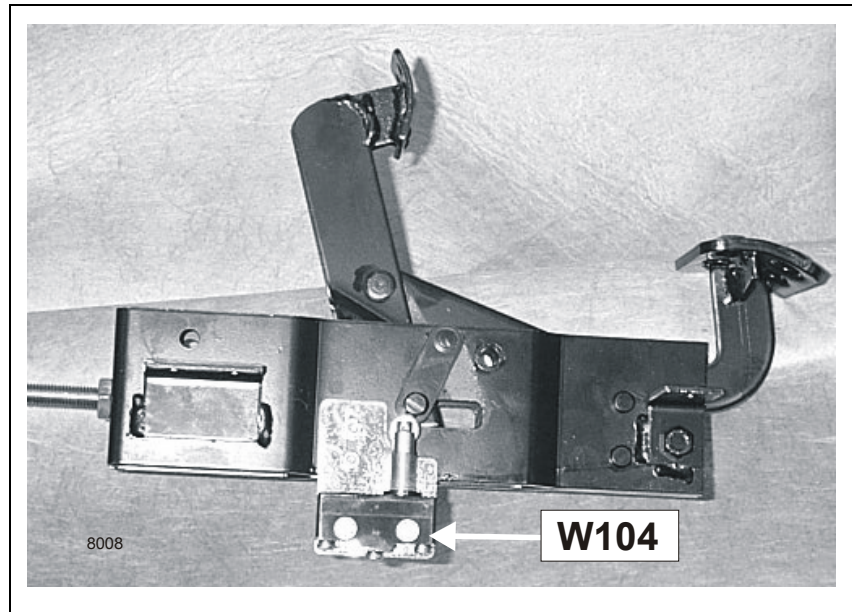
Oil pressure switch

16 Oil pressure switch 116 bar

Should the charge pressure drop below 116 bar, then the oil pressure switch (16) is activated. In the cab the warning light (left on the instrument unit) is illuminated. This signals that the actual charge pressure for further braking is insufficient.

2.0 Parking brake

2.1 Switch for the parking brake

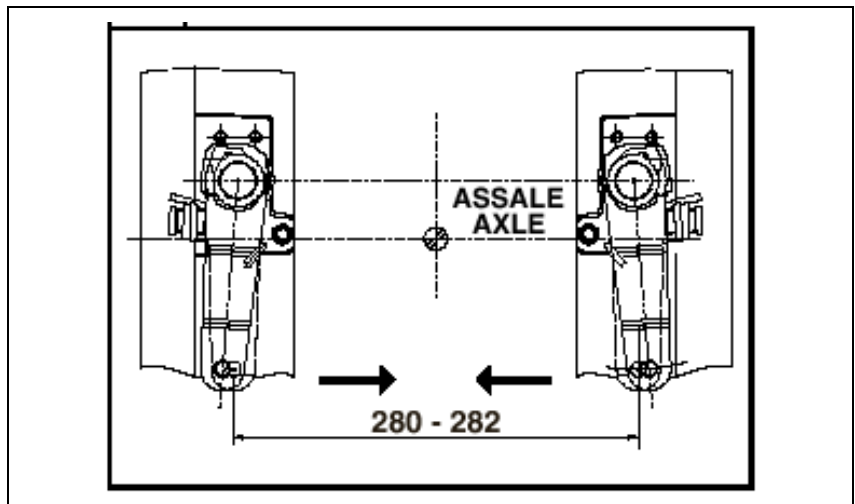


W 104 Parking brake switch

When the parking brake is operated, the switch (W104) is activated, whose signal is displayed on the CLAAS display. The signal is also sent to the hydrostatic module (Susmic W100) which in turn swashes the hydrostatic pump back.

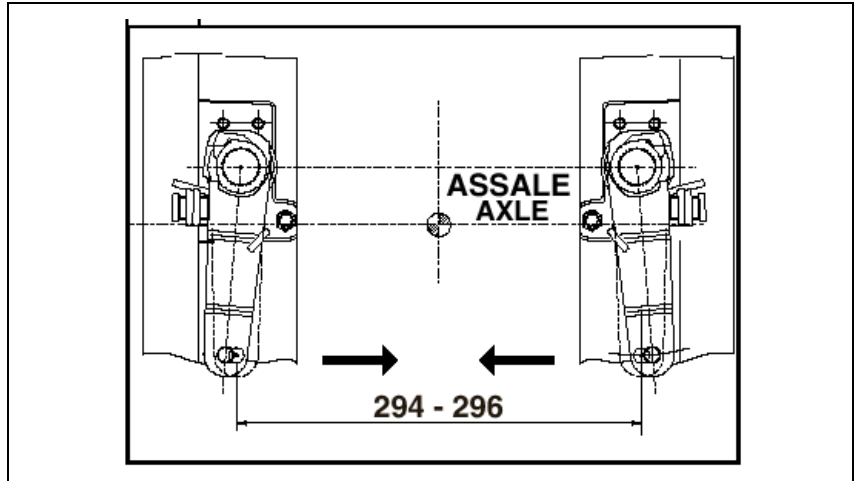
2.2 Adjusting the parking brake

Operation



- Attach the Bowden cable to both levers on the front axle. Note that the return springs on the levers should be removed.
- Operate both levers with 5 daN and hold in that position.
- Measure the distance between the centre of the holes at the end of the levers and check that they fall within the tolerance:
280 ... 282 mm
- Should this not be the case then correct the position of the levers: Lift the levers from the shaft, and refit on a new spline.
- Check the adjustment and adjust until the measurements are correct.

Check



- Attach the Bowden cable to both levers on the front axle. Note that the return springs on the levers should be removed.
- Do not operate the levers, leave in the slack position.
- Measure the distance between the centre of the holes at the end of the levers and check that they fall within the tolerance:
294 ... 296 mm
- Should this not be the case, then carry out the adjustment until the tolerance is within **280 282 mm**

2.3 Adjusting the Bowden cable

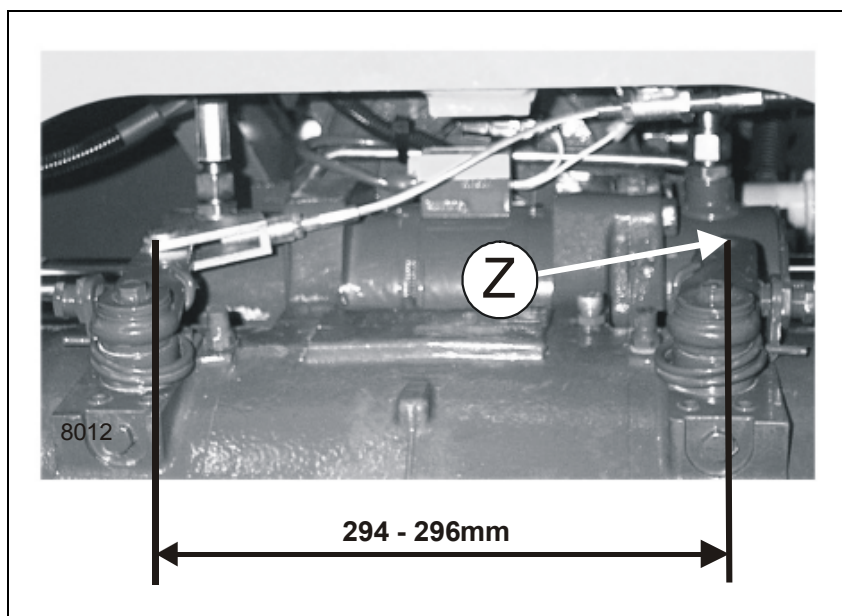
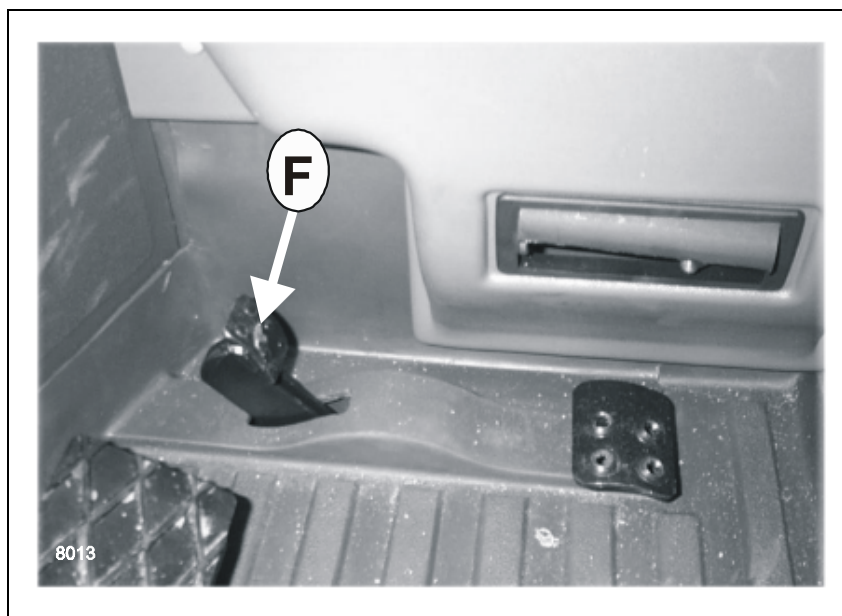
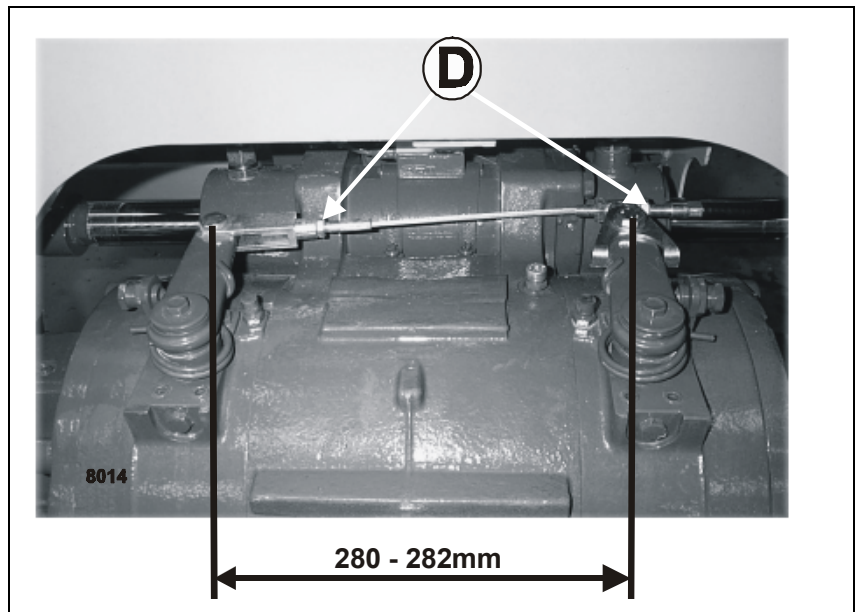


Diagram: front axle from the front

- Attach the Bowden cable to the lever (Z).
- Do not operate the lever (Z)
- Measure the distance between the centre of the holes at the end of the levers and check that they fall within the tolerance:
294 ... 296 mm



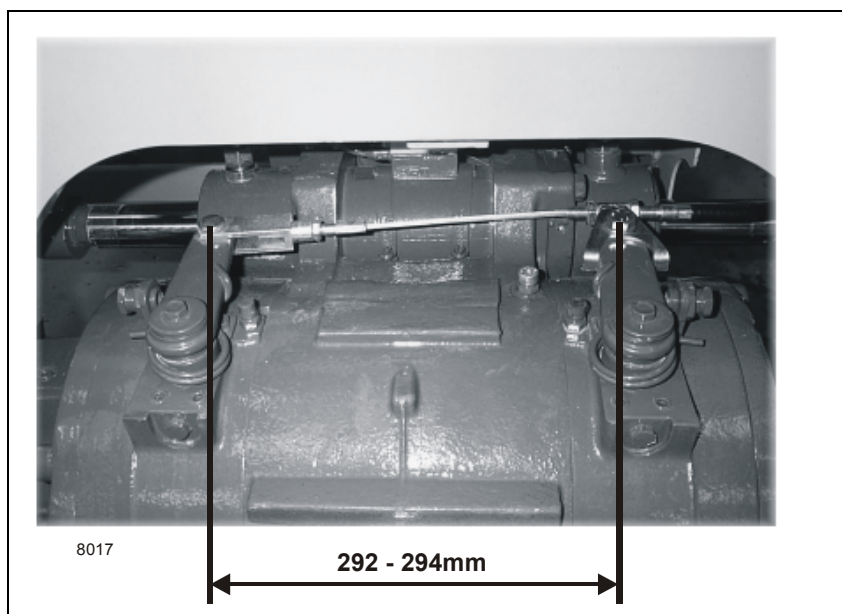
- Attach the Bowden cable
- Apply the parking brake (F), until the ratchet has gone on the forth notch (4 clicks).
- Take a measurement on the front axle (see next diagram).



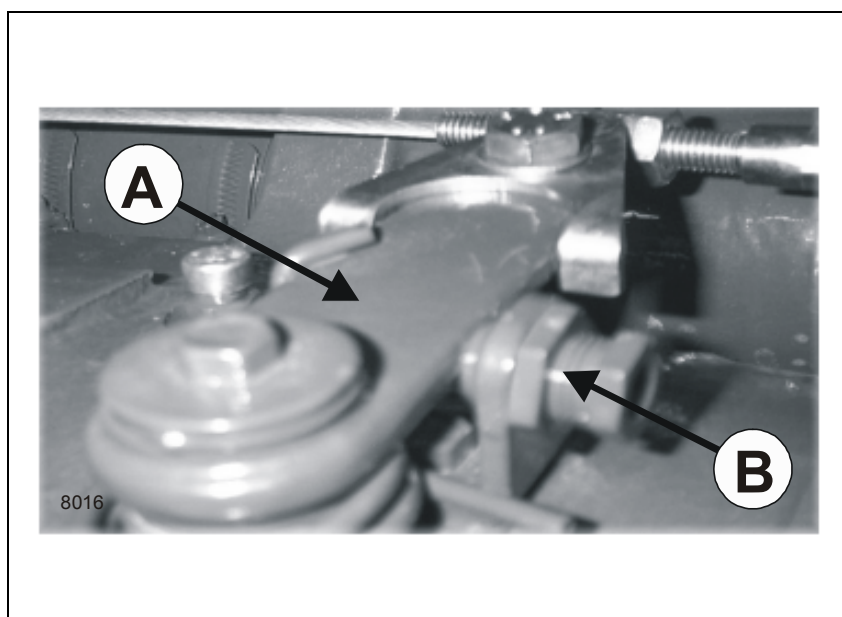
- Measure the distance between the centre of the holes at the end of the levers and check that they fall within the tolerance:
280 ... 282 mm
- Should this not be the case, so the measurement possibilities over the adjustment possibilities (D) need to be carried out.



- Block up the front axle
- Slacken off the parking brake
- The front wheels must be capable of being turned by hand (see diagram)



- parking brake has been released
- Measure the distance between the centre of the holes at the end of the levers and check that they fall within the tolerance:
292 ... 294 mm

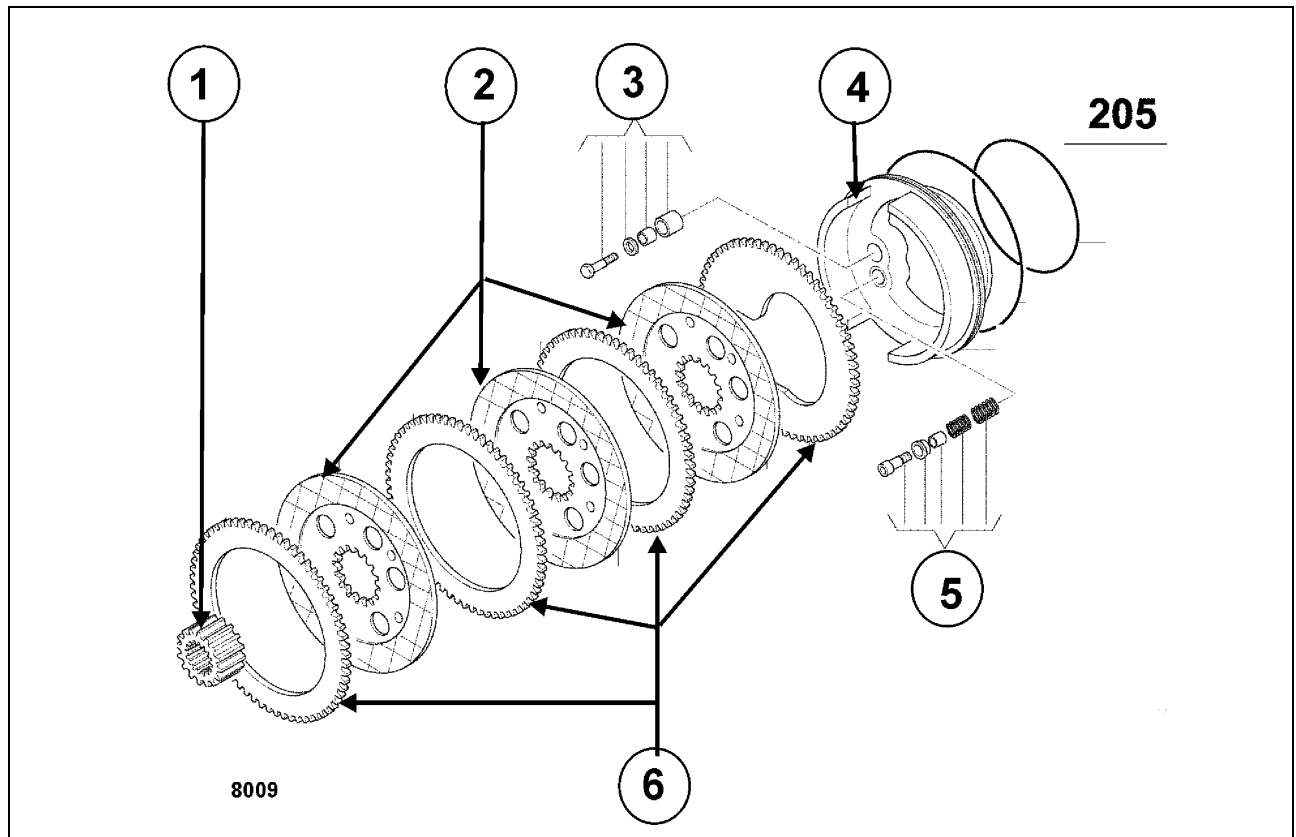


With the parking brake released, and a measurement of **292...294 mm**, then the following checks need to be carried out:

Between the lever (A) and the limit stop (B) there should be some free air. The free air should be on the left and the right hand side.

3.0 Front axle brakes

3.1 Brake discs



Pos.	Description	Comments
1	Gear	Splined to the inner shaft
2	Brake disc	Brake discs are splined to the inner shaft
3	Guide pin	Brings the brake ram (4) into position
4	Brake ram	Brake ram is operated by the kicker plate brake valve
5	Adjuster	Automatically adjusts the brake ram (4)
6	Outer discs	Splined to the hub

When the brakes are applied, the pressure forces the brake ram (4), the outer discs and the brake discs together. The axle travel of the brake ram (4) is dependant on the brake pedal valve and is related to the pressure exerted.

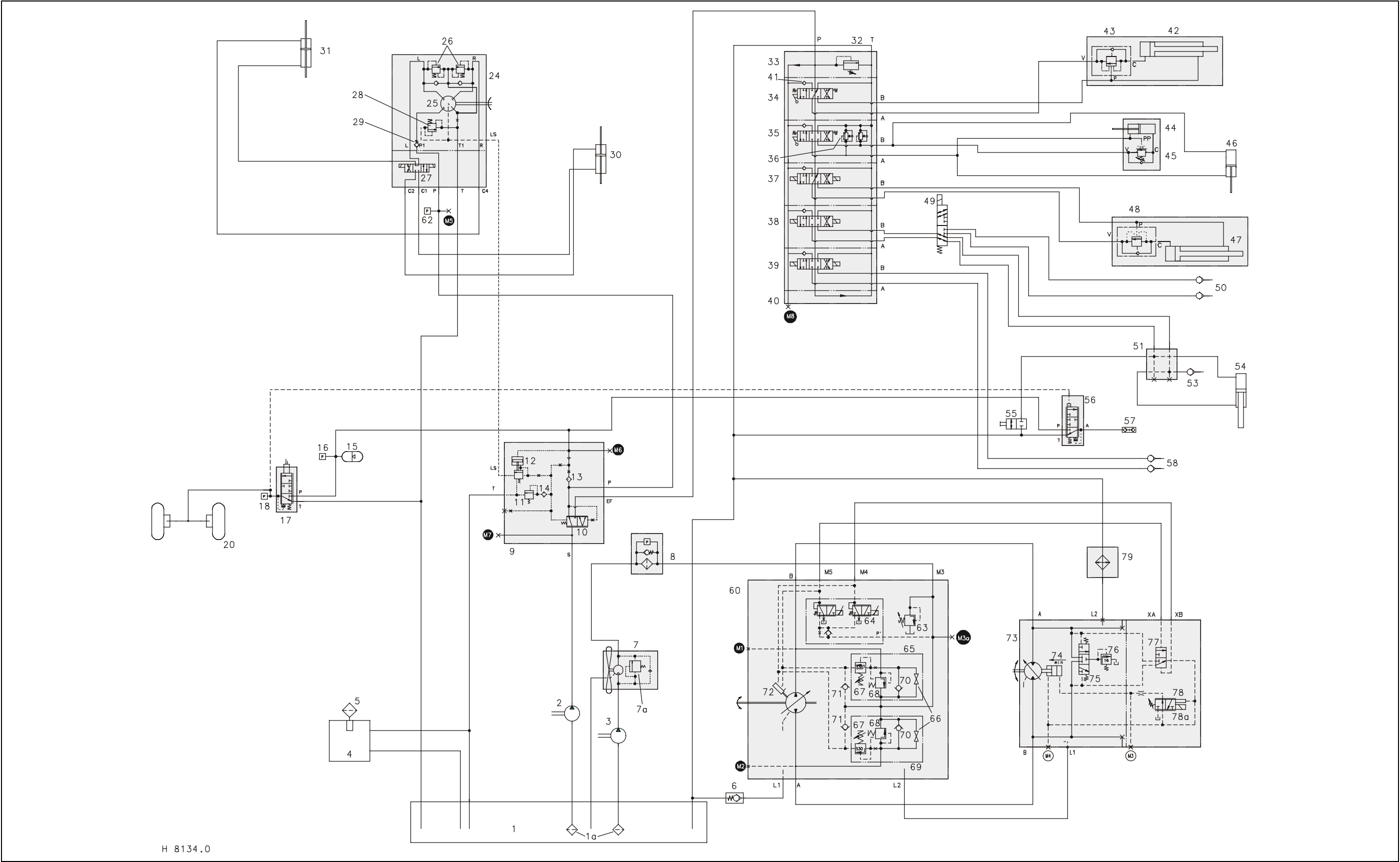
For the parking brake, the same outer discs and the brake discs are used. A shaft is fitted down through the brake ram from the top to the bottom. On this shaft is an eccentric tube fitted. When the parking brake is applied, then the shaft is twisted and the eccentric tube is turned. This then causes the outer discs (6) to be forced against the brake discs (2). This is also dependant on force.

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1.0 Hydraulic system

1.1 Hydraulic circuit diagram



Pos	Description	Comments
1	Hydraulic tank	
1a	Suction sieve	In the tank
2	Pump	Max 80 l/min, supply to main circuit
3	Pump	Max. 19 l/min, supply to next circuit
4	Hydraulic tank (additional)	
5	Tank breather	
6	One way valve	Opening pressure 3 bar, the valve sits in the leakage circuit
7	Motor breather	13 m ³ , drives the fan
7a	Pressure relief valve	Opening pressure 160 bar
8	Hydraulic filter	Pressure filter with 3.5 bar by-pass
9	Priority and charge valve	
10	Priority valve	Brakes and steering have a supply from the working hydraulics
11	Pressure relief valve	Opening pressure > 175 bar
12	Charge valve	Should the charge pressure drop below 128 bar, then the charge valve recharges the accumulator.
13	Filter	
14	Filter	
15	Accumulator	Pre-tensioned to 41 bar
16	Oil pressure switch	Should the pressure drop below 116 bar, then the switch is activated and switches on the warning display in the cab
17	Foot brake valve	Single braking circuit
18	Oil pressure switch	At 5 bar the brake lights are switched
19	Not used	
20	Front axle	Carraro Type 26.16 M
21	Not used	
22	Not used	
23	Not used	

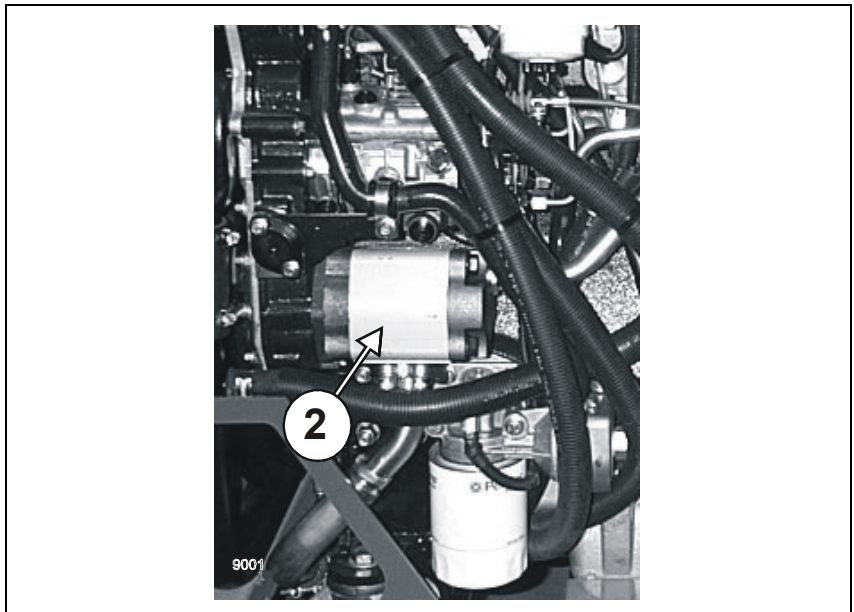
Pos	Description	Comments
24	Steering unit	Danfoss OSPF 250
25	Rotary valve	4/3 way valve
26	Shock valves	225 - 245 bar
27	4/3 way valve	Required for steering modes
28	Steering PRV	Opens at 175 bar
29	One way valve	Fitted to the P line of the steering
30	Steering ram	Rear axle
31	Steering ram	Front axle
32	Control unit (working hydraulics)	
33	Base plate with PRV	Opens at 240 bar
34	4/3 way valve	Boom raise and lower
35	4/3 way valve	Front attachment tilt
36	Shock valve for tilt	Tilt forward 210 bar and back 125 bar
37	4/3 way valve	Boom extension / retraction
38	4/3 way valve	Hydraulic additional function (front and rear quick coupling or hitch)
39	4/3 way valve	Addition
40	End plate	
41	One way valve	
42	Ram	Boom raise and lower
43	Load hold valve	
44	Ram	Tilt
45	Load hold valve	
46	Compensating ram	Hold the carriage level
47	Ram	Boom extension / retraction
48	Load hold valve	
49	Change over valve	Switches between the front or rear quick couplings and the hitch

Pos	Description	Comments
50	Front quick release coupling	
51	Distribution block	Distributes to hitch and rear quick release couplings
52	Not used	
53	Rear quick release coupling	Tipping the trailer
54	Hitch	Optional
55	2/2 way valve	Manually operated, controls the P line from the control unit (38) to the tank.
56	3/3 way valve	The valve controls the pressure to the trailer brakes (hydraulic brakes)
57	Quick release coupling	Hydraulic trailer braking
58	Front quick release coupling	
59	Not used	
60	Pump (Hydrostatic)	Series 90R75 NFPE
61	Not used	
62	Oil pressure switch (Option)	If below 10 bar, the warning light "steering pressure" is illuminated
63	Charge pressure PRV	Opens at 30 bar
64	Servo valve	With solenoid valve (PWM)
65	Multi function valve	
66	Bypass function	Used when towing the machine
67	Pressure relief valve	480 ±10 bar
68	Over pressure PRV	520 ±10 bar (shock operation)
69	Multi function valve	
70	Purging	Purges the oil that the purge pressure relief valve has released
71	One way valve	Separates the charge pressure and the position pressure
72	Servo ram	Swashes the swash plate in the pump
73	Motor (hydrostatic)	Series 51D110

Pos	Description	Comments
74	Adjusting unit from motor	
75	Purge valve	
76	Purge pressure relief valve	Opens at approx. 16 bar
77	Travel directional valve	
78	Constant pressure regulator	
79	Oil cooler	Cools the circuit (motor (7) and hydrostatic)
M1	Test port	High pressure 480 ±10 bar Reverse
M2	Test port	High pressure 480 ±10 bar Forwards
M3a	Test port	Charge pressure
M3	Test port	Position pressure, ram side. The position pressure works on the control unit from the motor 51.
M4	Test port	Position pressure, rod side. The position pressure works on the control unit from the motor 51.
M5	Test port	Steering pressure
M6	Test port	Working pressure
M7	Test port	Charge pressure (Brakes)
M8	Test port (to machine No)	Working pressure

2.0 Working hydraulics

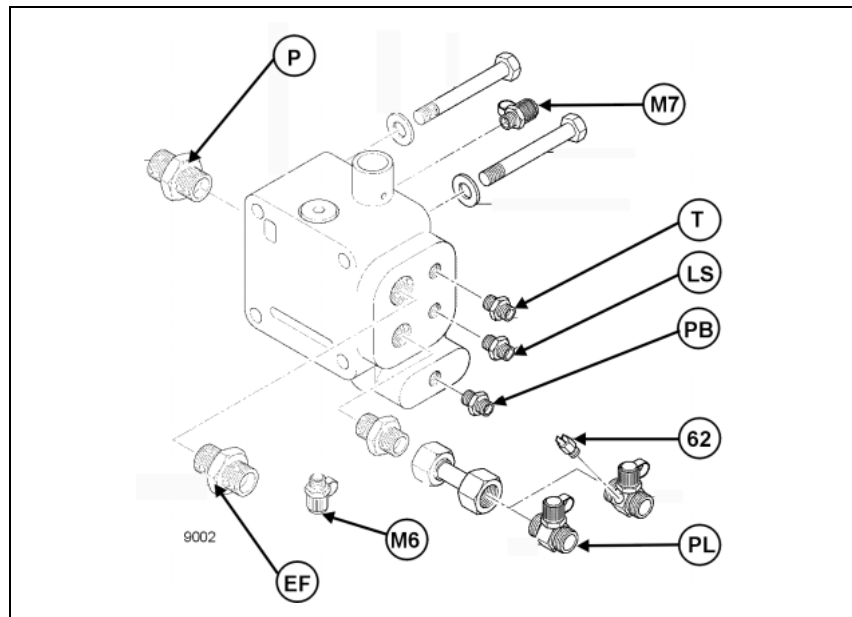
2.1 Pump



2 Pump 80 l/min

The pump is a constant pump, that supplies the steering, brakes and the working hydraulics.

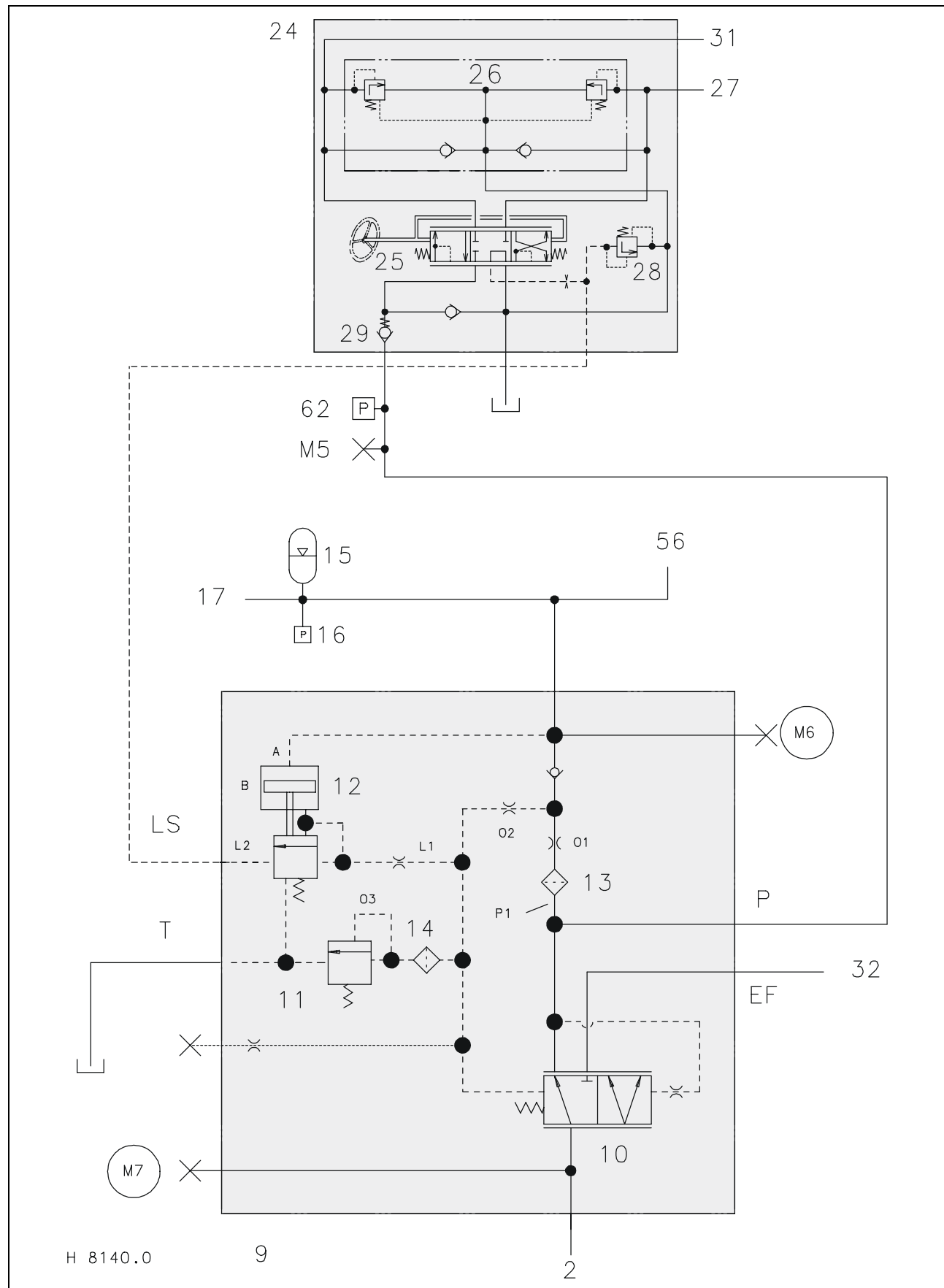
2.2 Priority and charge valve



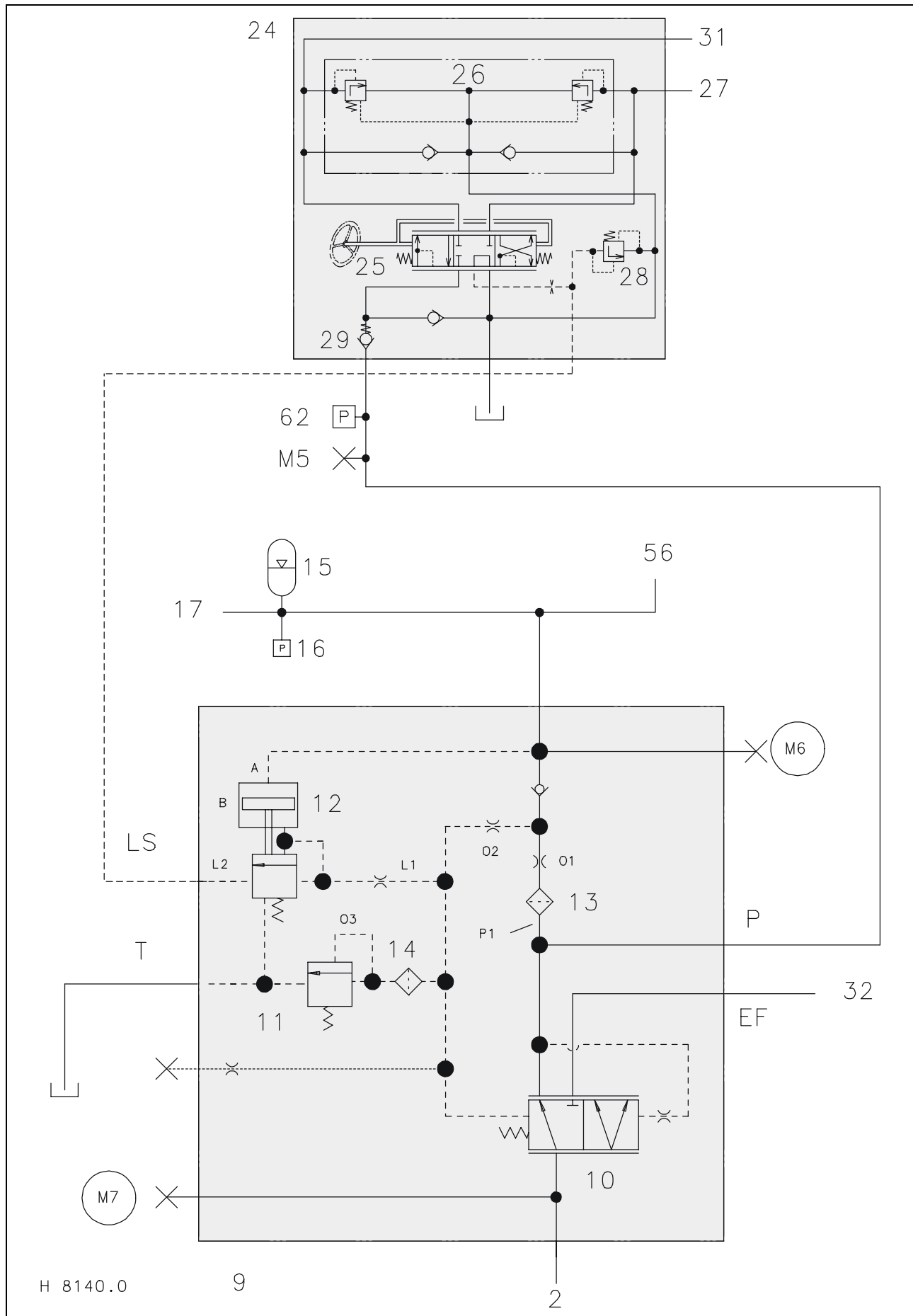
M7	Test port working pressure (max. 240 bar)
T	Tank connection
LS	Load sensing from the Orbitrol
PB	Supply to the kicker plate brake valve
62	Steering oil pressure switch (10 bar)
PL	Supply to the Orbitrol (OSPF250)
M6	Charge pressure (accumulator) test port
P	Supply from the pump (2) max. 80 l/min
EF	Supply to the control unit (working hydraulics)

Notes

Circuit diagram



Pos	Description	Comments
2	Pump	Max 80 l/min, supply to main circuit
9	Priority and charge valve	
10	Priority valve	Brakes and steering have priority to the working hydraulics
11	Pressure relief valve	Opening pressure 175 bar
12	Charge valve	Should the charge pressure drop below 128 bar, then the charge valve recharges the accumulator
13	Filter	
14	Filter	
15	Accumulator	Pre-tensioned to 41 bar
16	Oil pressure switch	Should the pressure drop below 116 bar, then the switch is activated and switches on the warning display in the cab
17	Foot brake valve	Single braking circuit
24	Steering unit	Danfoss OSPF 250
25	Rotary valve	4/3 way valve
26	Shock valves	225 - 245 bar
27	4/3 way valve	Required for steering modes
28	Steering PRV	Opening pressure 175 bar
29	One way valve	Fitted to the P line of the steering
31	Steering ram	Front axle
32	Control unit (working hydraulics)	
56	3/3 way valve	The valve controls the pressure to the trailer brakes (hydraulic brakes)
62	Oil pressure switch (Option)	If below 10 bar, the warning light "steering pressure" is illuminated
M5	Test port	Steering pressure
M6	Test port	Working pressure
M7	Test port	Charge pressure (Brakes)



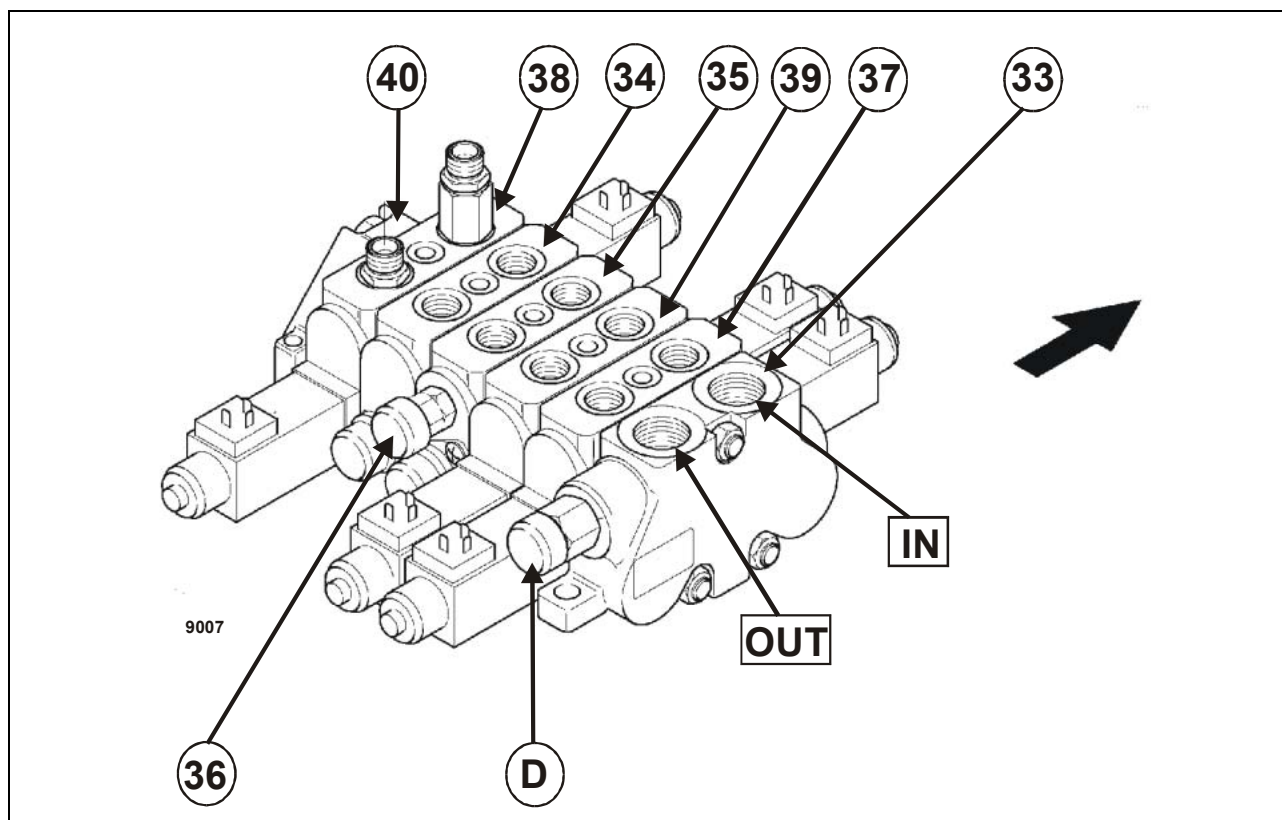
Function description**Charge the accumulator and the steering in the neutral position**

- Start the engine, and the pump (2) starts to operate.
- Priority valve (10) is in the drawn position.
- The oil flows to P and P1
- Accumulator is charged.
- The charge valve (12) stays in this position (charged), there is no control signal from the orbitrol to tank (position closed)
- The charge pressure goes via the restrictor (O2) to the left hand side of the priority valve (10)
- Before the restrictor (O1) there is a higher pressure than behind it = Charge supply
- This higher pressure stands on the right hand side of the priority valve (10)
- Should the pressure on the right hand side of the priority valve (10) be greater than that pressure plus the spring on the left hand side of the priority valve (10), then the priority valve moves towards the left.
- In this position, the flow travels to the working hydraulics (32)
- Should the charge pressure equal the accumulator pressure of approx. 150 bar, then in this situation the charge valve (12) is open and the control signal (LS) is transmitted to the steering unit (24).
- Accumulator is charged
- Up to this point the pressure on the ram side (B) is the same as that on the rod side (B).
- Due to the surface area differential of the ram side and the ram rod side, the charge valve (12) is held in this position (Position open).
- So the ram (control signal A) holds the charge valve in the open position.
- The control signal on the left hand side of the priority valve (10) goes through the charge valve (12) via the Orbitrol to the tank and is dumped (steering still in the neutral position)
- Due to this, the side of the left hand priority valve (10) has a lower pressure.
- This causes the valve (10) to stay in one position, the brakes (17), steering (24) and the working hydraulics (32).
- When the charge pressure reaches a set point (approx 130 bar) then the valve (12) closes.
- Now the control signal A (ram side) has a lower pressure.
- The sequence repeats.

Accumulator full and steering

- Due to the additional oil quantity to the Orbitrol, the priority valve (10) goes in the drawn position.
- The charge valve (12) goes into the open position, so that L1 and L2 are connected.
- By operating the steering, the Orbitrol send the pressure via the charge valve (12) to the right hand side of the valve (10).
- This pressure is protected by the pressure relief valve (11).
- The pressure relief valve (11) (>175 bar) should be set higher than the pressure relief valve in the Orbitrol.
- Should the pressure (LS) from the Orbitrol be higher than the charge pressure (brakes), then the accumulator is charged more.

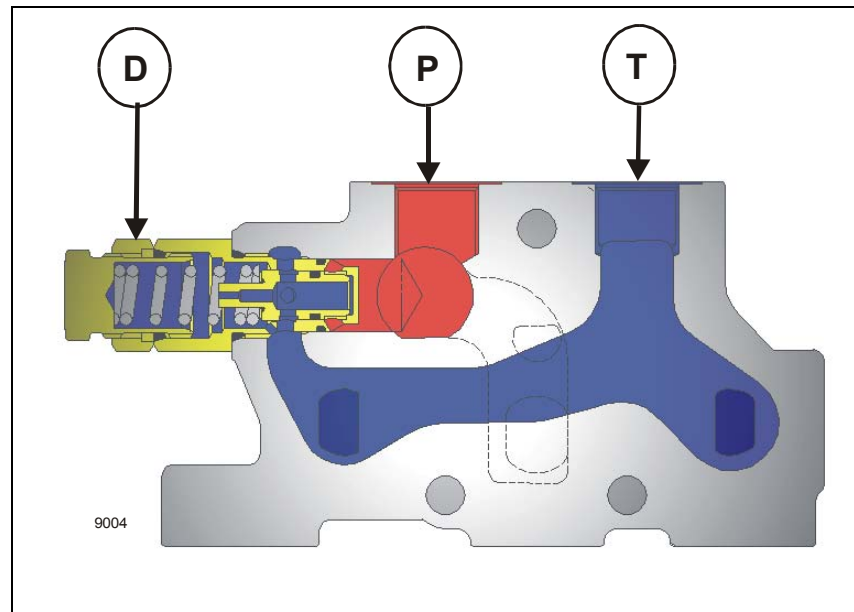
2.3 Working hydraulics control units



Pos	Description	Comments
33	Base plate with PRV	
34	4/3 way valve	Boom raise and lower
35	4/3 way valve	Front attachment tilt
36	Shock valve for tilt	Tilt forward 210 bar and back 125 bar
37	4/3 way valve	Boom extension / retraction
38	4/3 way valve	Hydraulic additional functions (front and rear quick coupling or hitch)
39	4/3 way valve	Additional units
40	End plate	
D	Pressure relief valve	Set to 240 bar

The control unit is fitted to the chassis behind the cab.

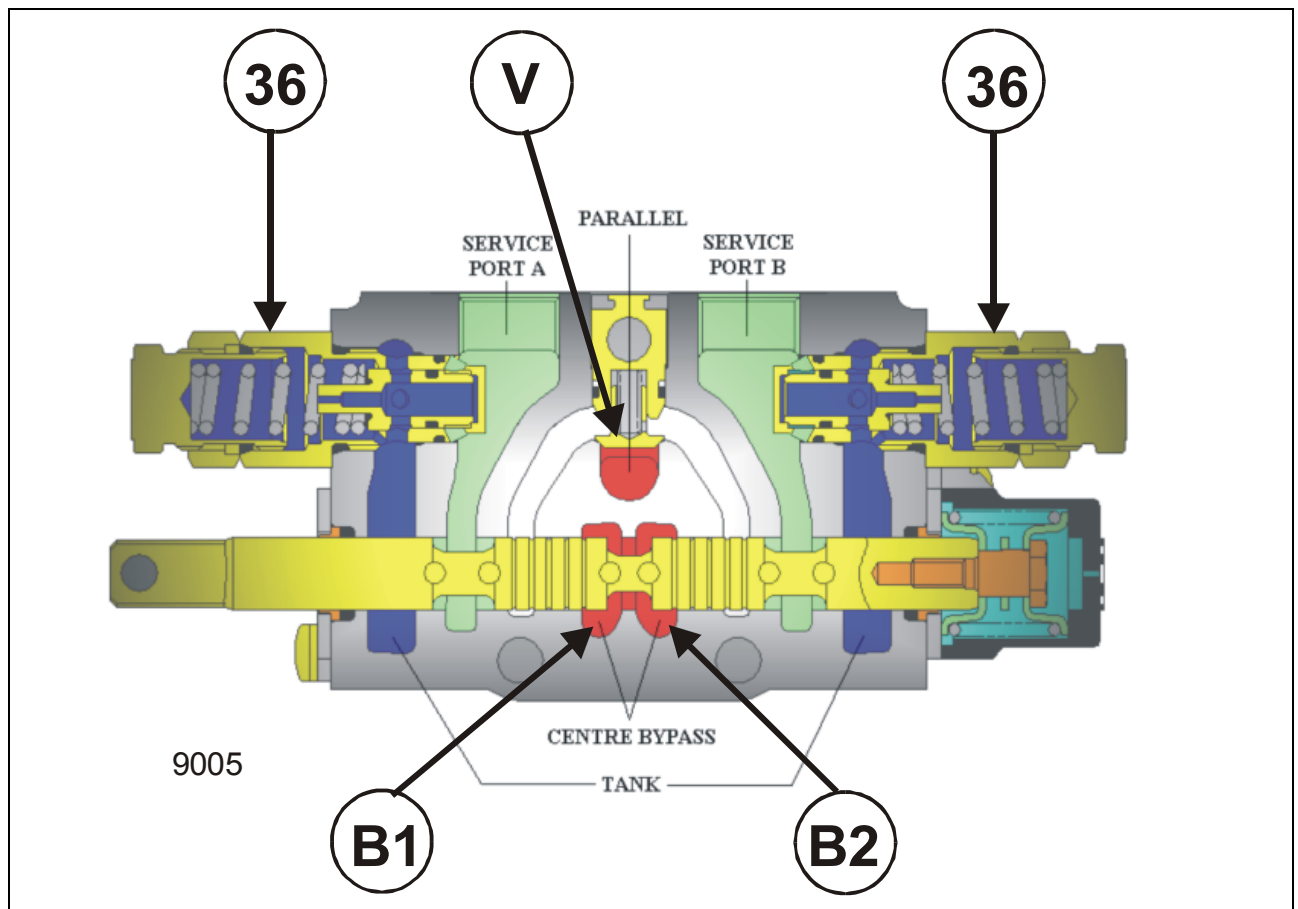
2.4 Base plate



- D Pressure relief valve set to 240 bar
- P P- connection from the priority and the charge valve supply
- T Tank connection

The pump pumps oil via the priority valve and the charge valve to the connection P (base plate). Should the pressure increase to above 240 bar, then the pressure relief valve opens and dumps the oil to tank.

2.5 Control unit



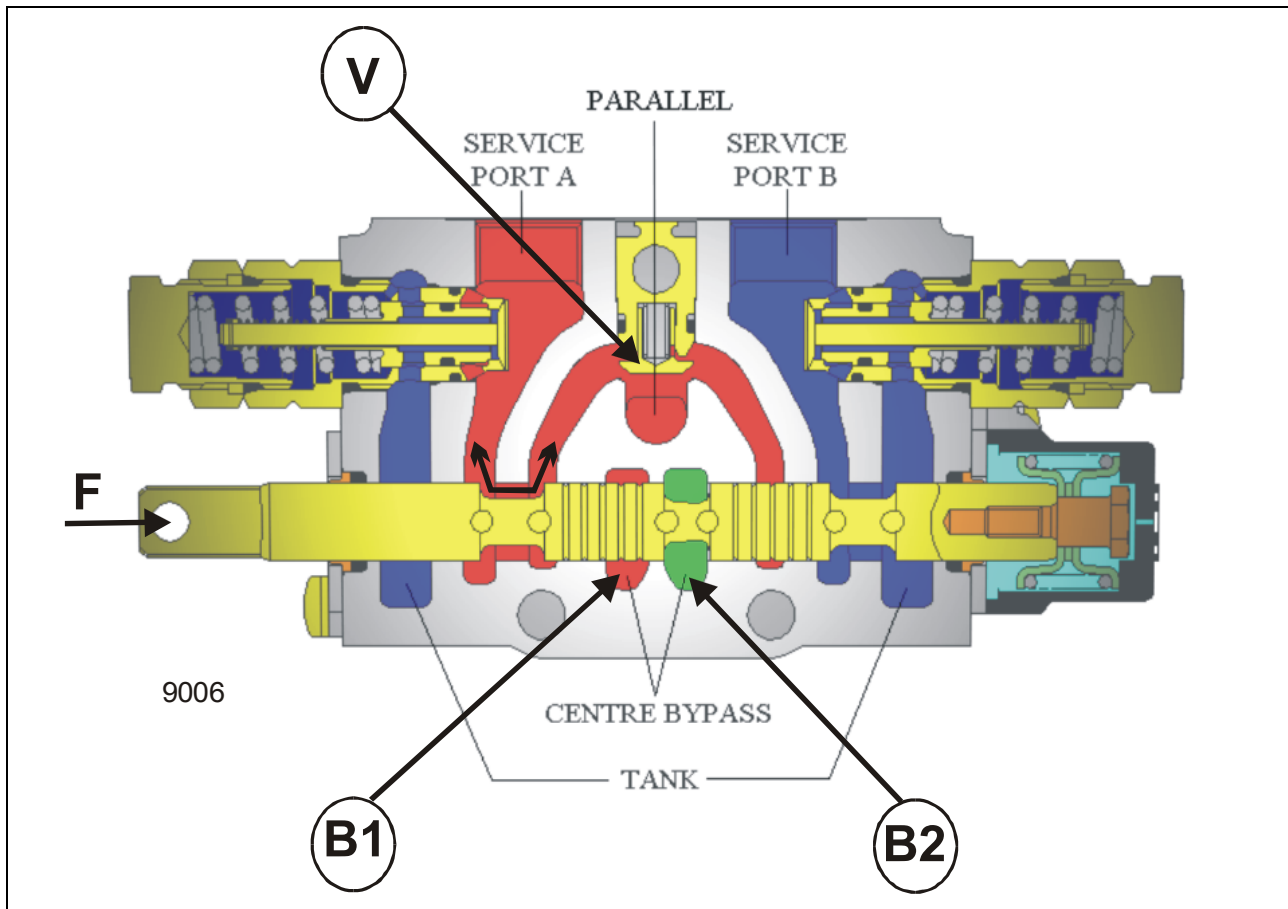
Pos	Description	Comments
36	Shock valve (control unit 35 only)	Tilt forward 210 bar and back 125 bar
V	Valve	Under the valve is a hole that connects the P connection.
B1	Drilling	Has an internal connection to the P Connection
B2	Drilling	Is connected to the tank

The control units (34 to 38) are identical. The control unit (35) is fitted with a shock valve. Additionally both control valves can be operated in two different ways:
Either with a Bowden cable or with an electric solenoid valves.

Neutral position

The drilling under the valve (V) and the drilling (B1) are connected to the P-connection of the base plate internally.
Due to connection of B1 and B2 together, the oil from the pump flows to tank.

2.6 Spool operated

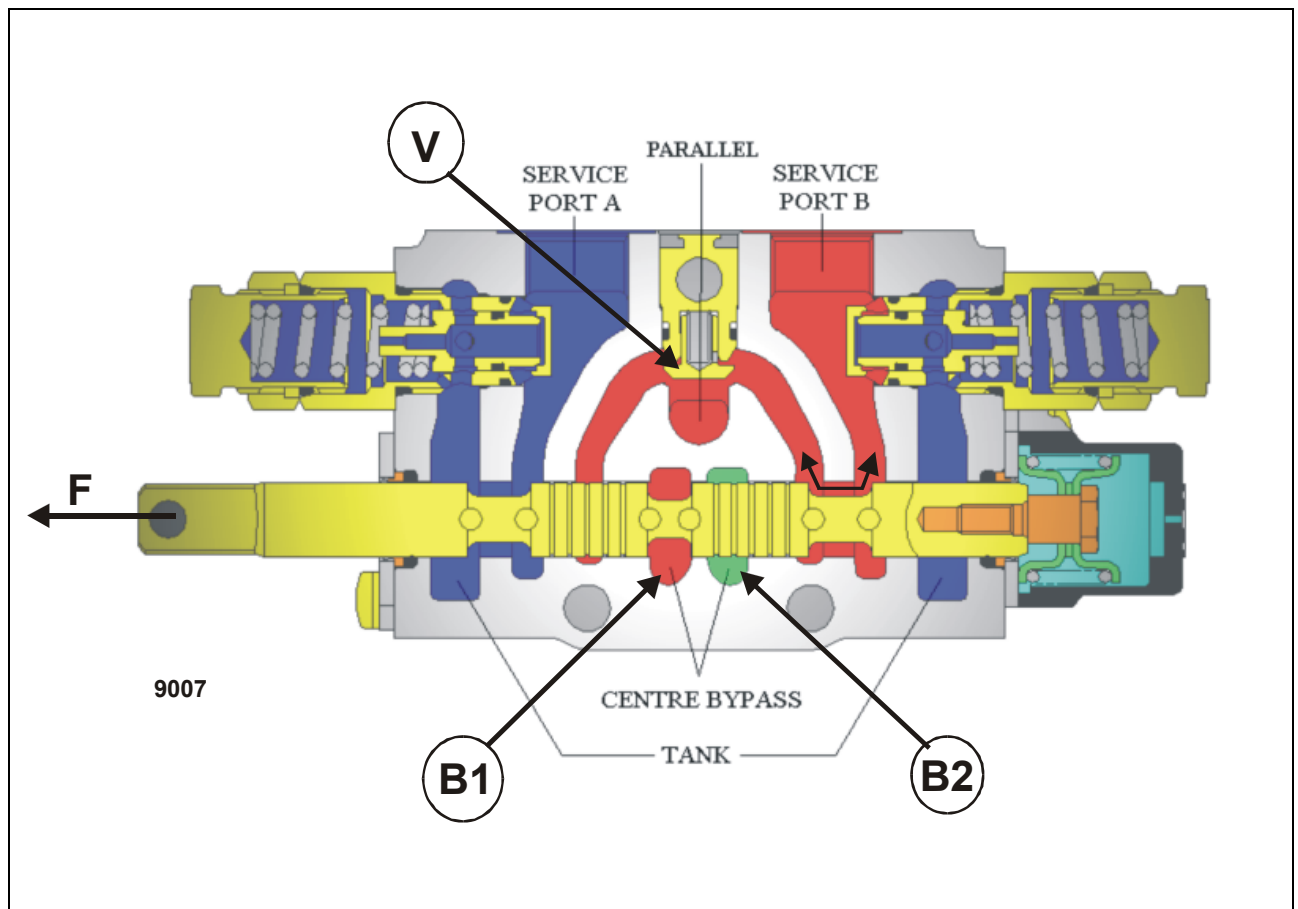


Pos	Description	Comments
V	Valve	Under the valve is a hole that connects the P connection.
B1	Drilling	Has an internal connection to the P connection
B2	Drilling	Is connected to the tank
F	Operating force	

Operated to the right

Due to the movement of the spool, the connection between B1 and B2 is broken. The pressure increases and pushes the valve (V) upwards. The oil is distributed to the left and to the right. Due to the position of the control spool, the left control edge is open to the connection A and the right hand control edge is closed to the connection B. The oil flows over the connection A to the relevant working pressure function.

2.7 Spool operated

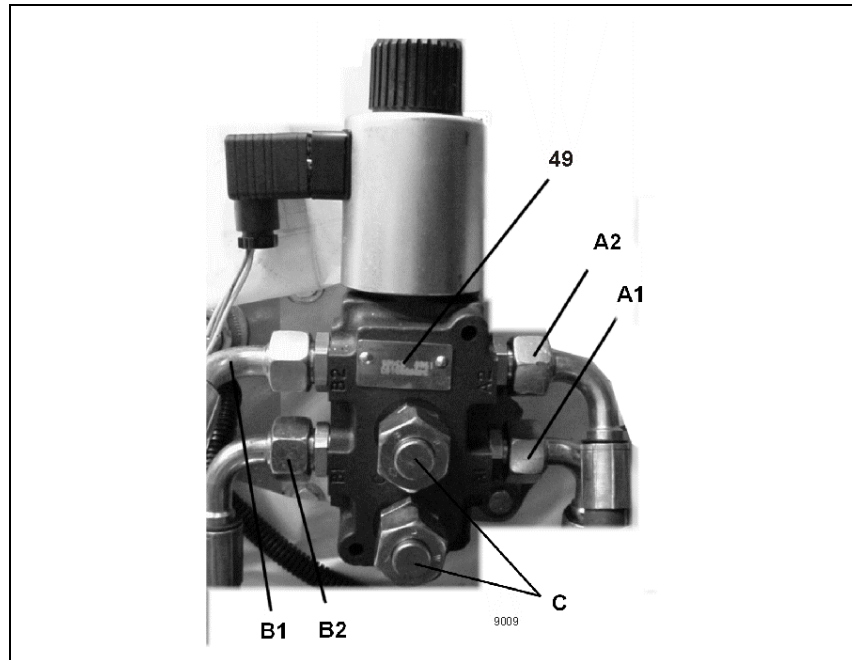


Pos	Description	Comments
V	Valve	Under the valve is a hole that connects the P connection.
B1	Drilling	Has an internal connection to the P connection
B2	Drilling	Is connected to the tank
F	Operating force	

Operated to the left

Due to the movement of the spool, the connection between B1 and B2 is broken. The pressure increases and pushes the valve (V) upwards. The oil is distributed to the left and to the right. Due to the position of the control spool, the left control edge is closed to the connection A and the right hand control edge is open to the connection B. The oil flows over the connection A to the relevant working pressure function.

2.8 Change over valve

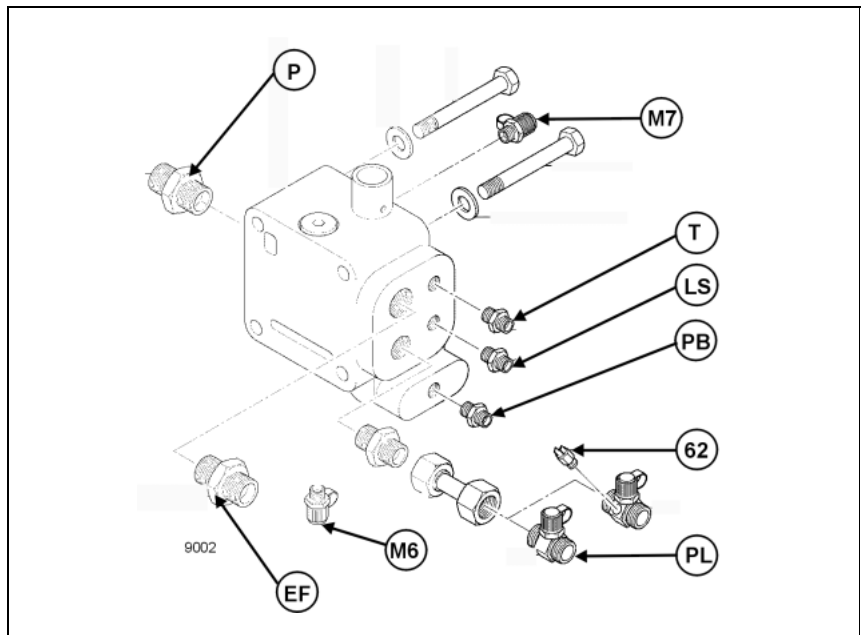


- 46 Change over valve, front and rear quick release couplings
- A1 From control unit 38
- A2 From control unit 38
- B1 Front quick release coupling
- B2 Front quick release coupling
- C Rear quick release coupling and hitch

The change over valve is operated via a "Change over" rocker switch, and switches between the front quick release couplings or the rear quick release couplings and the hitch.

2.9 Working pressure test port

On priority and charge valve

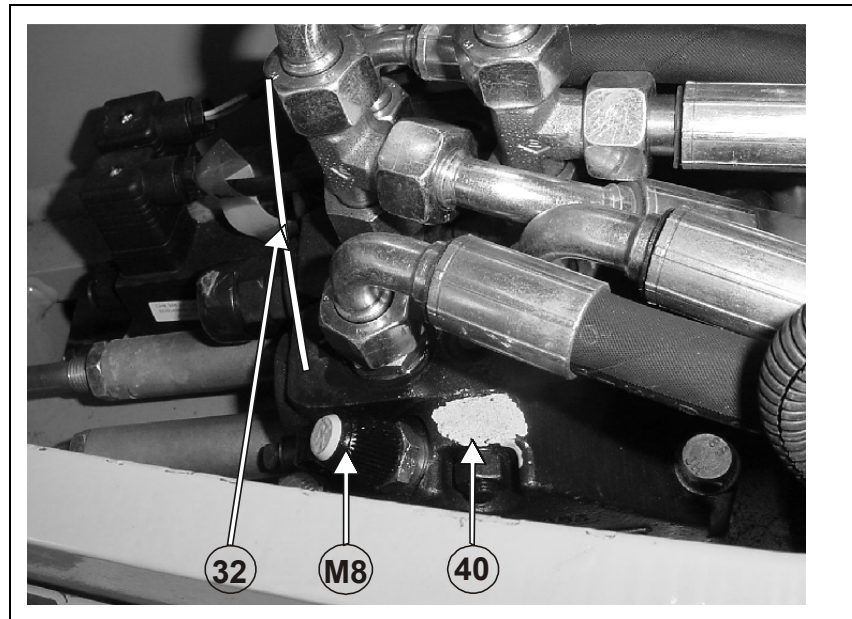


M7	Working pressure test port (max. 240 bar)
T	Tank connection
LS	LS connection from the Orbitrol
PB	Supply from the kicker plate brake valve
62	Steering oil pressure switch (10 bar)
PL	Supply to Orbitrol (OSPF250)
M6	Charge pressure test port (accumulator)
P	Supply from the pump (2) max. 80 l/min
EF	Supply to the control units (working hydraulics)

Measurements

- Apply the parking brake
- Warm the system up to an operating temperature **of approx. 60°C**
- Connect a test gauge to the M 7 test port
- Move the drive lever to the neutral position.
- Set the engine speed to maximum no-load speed
- Operate a hydraulic function (i.e. boom retraction)
- The pressure should reach 240 bar max.

On the control unit
(to machine number)



- | | |
|----|-------------------------------------|
| 32 | Control unit (working hydraulics) |
| 40 | End plate |
| M8 | Test connection (to machine number) |

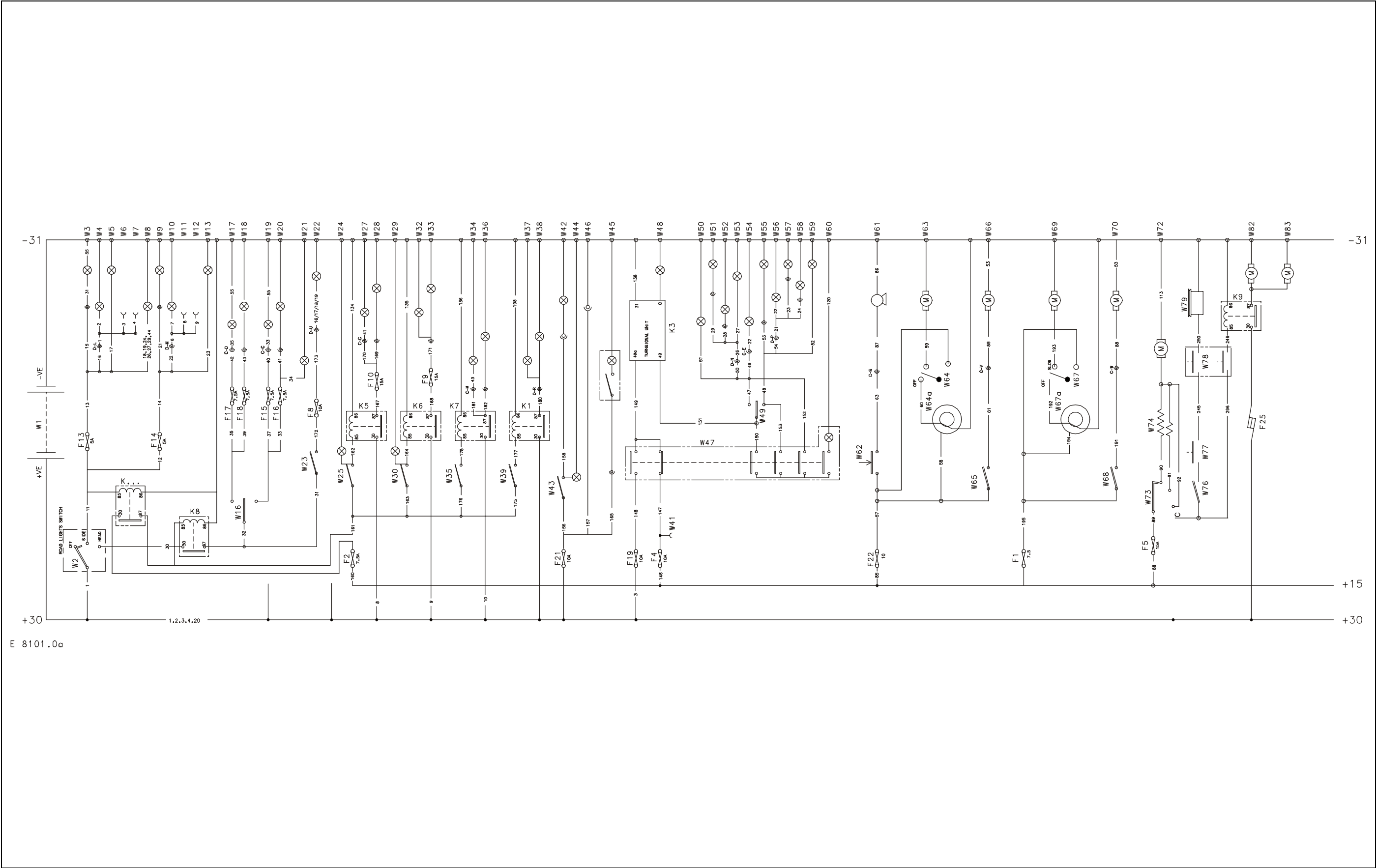
Measurements

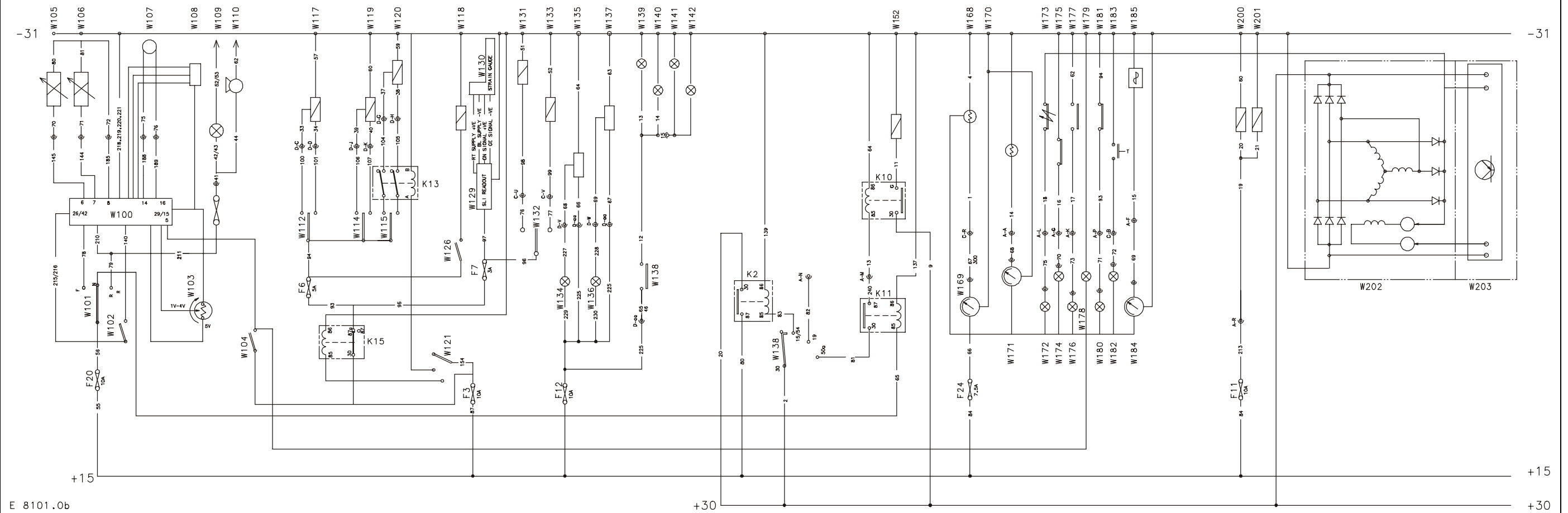
- Apply the parking brake
- Warm the system up to the operating temperature **of 60°C**
- Connect a test gauge to the M 8 test port
- Move the drive lever to the neutral position
- Set the engine speed to maximum no-load
- Operate a hydraulic function (e. g. boom retraction)
- The pressure should reach 240 bar

Contents

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1.0 Circuit diagram TARGO C





Notes

2.0 Legends

2.1 Circuit legends

Pos	Description	Comments
W 1	Battery	
W 2	Light switch	Switch:- Side and head lamps
W 3	Front right side light	
W 4	Rear right side light	
W 5	Instrument illumination	Lighting switch (left hand instrument console and CLAAS display)
W 6	Pin 58R (7 pin connector)	Trailer (optional)
W 7	Pin 58R (7 pin connector)	On boom (optional)
W 8	Light switch	Switch mounted on the side Console
W 9	Front left side light	
W 10	Rear left side light	
W 11	Pin 58L (7 pin connector)	Trailer (optional)
W 12	Pin 58L (7 pin connector)	On boom (optional)
W 13	Lighting of switches	The switch is on the left hand instrument console
W 14	Not available	
W 15	Not available	
W 16	Switch for high beam/head lights	Integrated in the multi-function switch
W 17	Right hand head lights	
W 18	Left hand head lights	
W 19	Right hand high beam	
W 20	Left hand high beam	
W 21	Control light (high beam)	Claas display

Pos	Description	Comments
W 22	Fog light	
W 23	Fog light switch	
W 24	Control light (front working lights)	CLAAS display
W 25	Switch (working lights)	
W 26	Not used	
W 27	Front working lights	
W 28	Front working lights	
W 29	Control light (rear working lights)	CLAAS display
W 30	Switch (rear working lights)	Switch in instrument console lhs
W 31	Not used	
W 32	Rear working lights	
W 33	Rear working lights	
W 34	Side working lights	
W 35	Switch (side working lights)	Switch in instrument console lhs
W 36	Side working lights	
W 37	Working lights (boom)	
W 38	Working lights (boom)	
W 39	Switch (working lights boom)	Switch in instrument console lhs
W 40	Not used	
W 41	Not used	
W 42	Connector (beacons)	Fitted on the rear cab wall
W 43	Switch (beacons)	
W 44	Control light (beacons)	Control light in switch
W 45	Switch and inner lighting	Switch on the inner lighting
W 46	Connector (internal)	Cab and fitted in the side console
W 47	Switch (hazard lights)	

Pos	Description	Comments
W 48	Control light (trailer indicators)	CLAAS display
W 49	Switch (indicators)	Integrated in the multifunction switch
W 50	Control light (RHS indicator)	CLAAS display
W 51	Pin R (7 pin connector)	Fitted to the boom (optional)
W 52	Pin R (7 pin connector)	trailer (optional)
W 53	RHS indicator (rear)	
W 54	RHS indicator (front)	
W 55	LHS Indicator (front)	
W 56	LHS Indicator (rear)	
W 57	Pin L (7 pin connector)	trailer (option)
W 58	Pin L (7 pin connector)	Fitted to boom (option)
W 59	Control light (LHS indicators)	CLAAS display
W 60	Control light (hazard lights)	Control light in switch
W 61	Horn	
W 62	Horn switch	Integrated in the multifunction switch
W 63	Front windscreen wiper motor	
W 64	Switch for the front windscreen wiper motor	Integrated in the multifunction switch
W64a	Switch End position of the wiper motor	Switch in motor
W 65	Switch (front windscreen wiper motor)	Integrated in the multifunction switch
W 66	Front windscreen motor	
W 67	Switch (front windscreen wiper motor)	Fitted to side console
W 67a	Switch End position of the rear wiper motor	Switch in motor
W 68	Switch (rear windscreen wiper motor)	
W 69	Rear windscreen wiper motor	
W 70	Rear washer motor	

Pos	Description	Comments
W 71	Not used	
W 72	Cab fan motor	3 speeds
W 73	Switch (cab fan)	In side console
W 74	resistance (cab fan motor)	resister in cab fan motor
W 75	Not used	
W 76	Switch (air conditioning)	In side console
W 77	Thermostat (air conditioning)	Thermostat near condenser
W 78	Pressure safety switch (Trinary)	Monitors pressure in the high pressure circuit
W 79	Compressor (air conditioning)	
W 80	Not used	
W 81	Not used	
W 82	Axial fan, condenser (air conditioning)	behind the cab roof
W 83	Axial fan, condenser (air conditioning)	behind the cab roof
W 84.....W95	Not used	
W95	Not used	
W 96	Not used	
W 97	Not used	
W 98	Not used	
W 99	Not used	
W 100	Hydrostat module (Susmic-Sauer)	On the steering column
W 101	Switch, travel direction (F,N,R drive lever)	
W 102	Mode switch, aggressive / progressive (Rambo/Bambi)	On side console. Switches between the speed ranges of aggressive and progressive
W 103	Inch pedal potentiometer	Inch pedal = brake pedal
W 104	Switch (parking brake)	Position, parking brake pedal

Pos	Description	Comments
W 105	Solenoid valve reverse	Position, hydraulic pump
W 106	Solenoid valve forward	Position, hydraulic pump
W 107	Speed sensor	Position, flywheel (diesel motor)
W 108	Diagnostic connector (Hydrostat module Susmic)	
W 109	Reversing light	
W 110	Reversing horn	
W 111	Not used	
W 112	Boom extend / retract control	Joystick
W 113	Not used	
W 114	Switch for front / rear or hitch couplings	Joystick
W 115	Switch, hydraulic attachments	Joystick (optional)
W 116	Not used	
W 117	Valve, boom extend/retract	Solenoid valve
W 118	Not used	
W 119	Valve, front and rear couplings or hitch	Solenoid valve
W 120	Valve, additional hydraulics	Solenoid valve
W 121	Road travel switch	Rotary switch positioned in the side console.
W 122....W 125	Not used	
W 126	Switch, activating the change over valve	In side console
W 127	Change over valve	Switches from the front quick release couplings to the rear or the hitch
W 128	Not used	
W 129	Load indicator	
W 130	Load indicator sensor	Fitted to rear axle
W 131	Solenoid valve (steering mode front axle)	Near orbitrol
W 132	Rotary switch (steering mode)	In side console

Pos	Description	Comments
W 133	Solenoid valve (steering mode rear axle)	Fitted near orbital
W 134	Wheel position display (front axle)	Wheels straight = light on
W 135	Wheel position sensor (front axle)	Fitted to steering axle
W 136	Wheel position display (rear axle)	Wheels straight = light on
W 137	Steering position sensor	Fitted to steering ram
W 138	Oil pressure switch (brake lights)	Fitted in the brake ram line (front axle)
W 139	Brake lights (right)	
W 140	Brake lights (left)	
W 141	Pin 54 (7 pin connector)	Right hand trailer brakes
W 142	Pin 54 (7 pin connector)	Left-hand trailer brakes
W 143....W 149	Not used	
W 150	Ignition key	
W 151	Not used	
W 152	Starter motor	
W153.....W167	Not used	
W 168	Sensor (fuel tank)	Fitted in fuel tank
W 169	Fuel gauge	CLAAS display
W 170	Sensor (coolant temperature)	Engine
W 171	Display (coolant temperature)	CLAAS display
W 172	Control light (battery charging)	CLAAS display
W 173	Regulator (alternator)	Fitted to alternator
W 174	Control light (engine oil pressure)	CLAAS display
W 175	Oil pressure switch (engine)	
W 176	Control light (air filter)	CLAAS display
W 177	Switch (air filter)	Positioned near air filter
W 178	Control light (parking brake)	CLAAS display

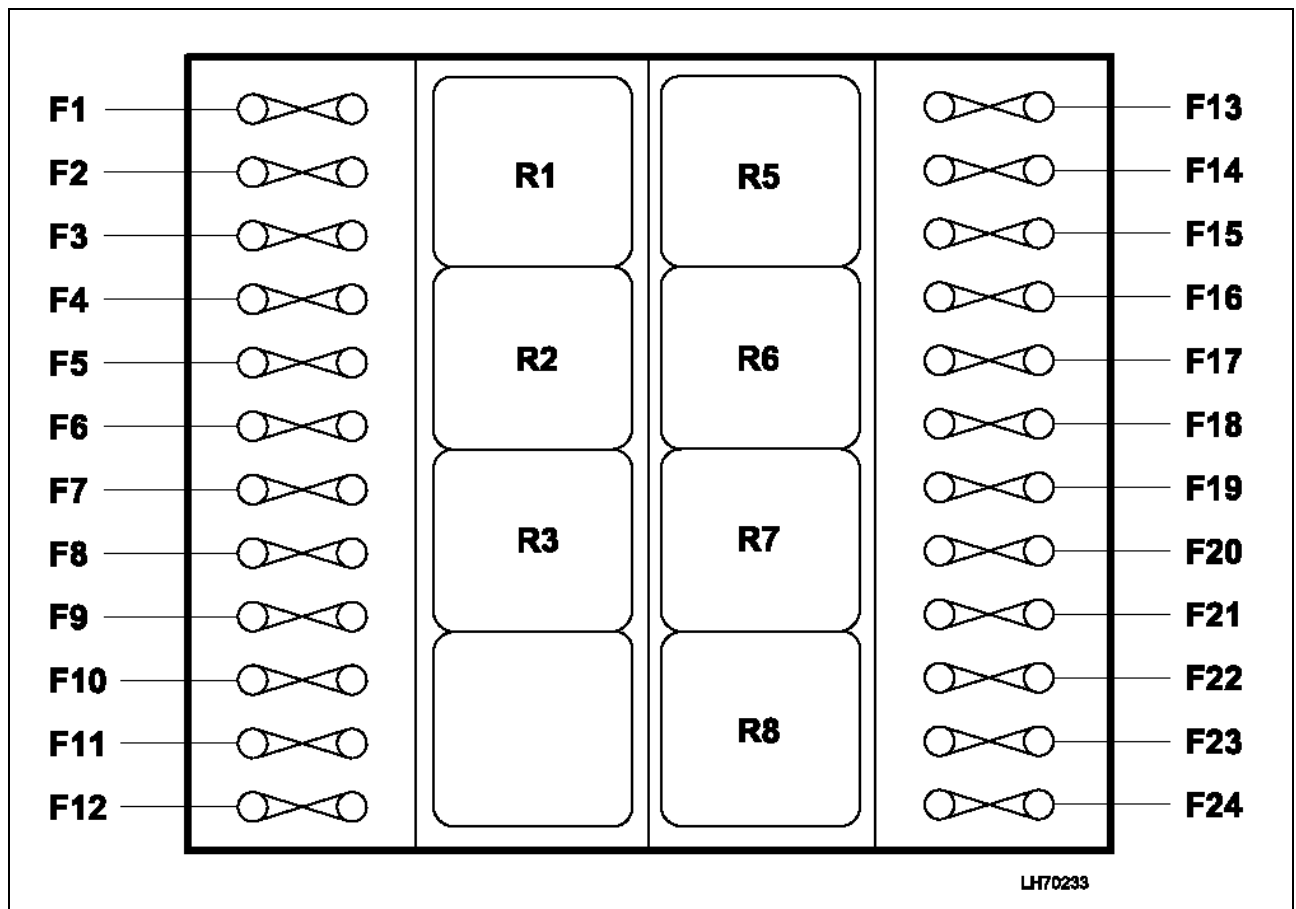
Pos	Description	Comments
W 179	Not used	
W 180	Control light (hydraulic filter)	CLAAS display
W 181	Switch (hydraulic filter)	Fitted to hydraulic filter
W 182	Control light (gearbox temp)	CLAAS display
W 183	Switch (gearbox temp)	Screwed into gearbox
W 184	Display (speed, km/h)	CLAAS display
W 185	Signal from alternator (speed display)	Fitted to W (alternator)
W 186....W 199	Not used	
W 200	Solenoid (engine)	Positioned near the fuel pump
W 201	Fuel adjustment	Fitted in the pump. Active until the temp reaches 47 °C
W 202	Alternator	
W 203	Regulator	

2.2 Legend fuses

Pos	Fuse	Comments
F 1	Front and rear windscreen wiper and wash	7.5 Amp.
F 2	Working lights (front, rear, side boom)	K16 \ K8 individually protected 7.5 Amp
F 3	Road travel switch (hydraulic)	10 Amp.
F 4	Indicators \ radio	K12 \ K15 \ K13 individually protected 10 Amp.
F 5	Cab fan	15 Amp.
F 6	Solenoid valve control unit	5 Amp
F 7	Load indicator \ load sensor \ steering Solenoid	3 Amp.
F 8	Fog lights	10 Amp.
F 9	Rear working lights	15 Amp.
F 10	Front working lights	15 Amp.
F 11	Engine stop solenoid	10 Amp.
F 12	Brake lights	10 Amp.
F 13	RHS side lights	5 Amp.
F 14	LHS side lights	5 Amp.
F 15	RHS high beam / high beam display (CLAAS display)	7.5 Amp.
F 16	LHS high beam	7.5 Amp.
F 17	RHS head lights	7.5 Amp.
F 18	LHS head lights	7.5 Amp.
F 19	Hazard lights	10 Amp.
F 20	Hydrostatic module (Susmic \ switch travel direction (FNR lever) \ switch Aggressive / progressive	10 Amp.
F 21	Beacons \ inner lighting \ socket (cab)	10 Amp.
F 22	Horn \ front washers	15 Amp.

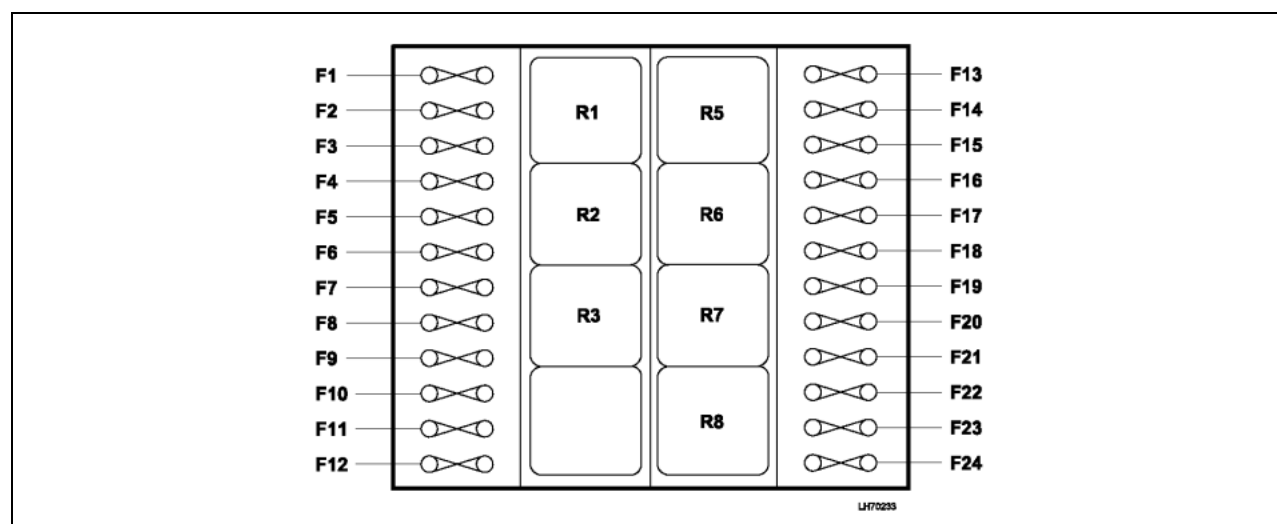
Pos	Fuse	Comments
F 23	Headlight flashers	10 Amp.
F 24	Indicators/warning lights on Claas display	7.5 Amp.
F 25	Thermo fuse (red press switch)	Positioned behind cab roof (air conditioning)

E-MV = Solenoid valve



2.3 Legend relays

Pos	Relay	Comments
K 1	Boom work lights	
K 2	Ignition +15	
K 3	Indicator relay	
K 4	Not used	
K 5	Front work lights	
K 6	Rear work lights	
K 7	Side work lights	
K 8	Main lights	
K 9	Air conditioning	Positioned over the condenser (behind cab roof)
K 10	Starting relay	Positioned near the battery isolator switch
K 11	Starting lock (control lever in the neutral position)	Separate, near fuse box
K 12	Not used	
K 13	Front and rear quick release couplings or hitch	Separate, behind load indicator
K 14	Not used	
K 15	Hydraulic (road travel switch), load indicator and steering	Separate, behind load indicator
K 16	Working lights (front, rear, side and boom)	Separate, near fuse box



The relays are shown in the diagram, abbreviated with the letter R.

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15.0 Maintenance

Maintenance section page

Warning lights / displays carry out regardless

15.1 Maintenance plan

Maintenance	Section	Page in ops book
Warning "light" check system (only qualified mechanics)	Brakes	
Warning light: clean air filter	Air filter	
Warning light, (yellow) Change the hydraulic filter	Hydraulic system	
As required		
Replace primer and if necessary inner air filter	Air filter	3.20
Replace / Clear: Secondary and if necessary outer air filter	Air filter	3.20
Clear : Air pre filter	Air filter	3.20
Every 10 operating hours or daily		
Check: oil level	Engine oil	3.11
Check: coolant	Coolant system	3.14
Check: oil and water cooler	Cooling system	3.13
Check: Fuel tank	Fuel system	3.17
Check: Air pre filter	Air filter	3.20
Check: hydraulic oil level	hydraulic system	3.24
Check: hydraulic filter	hydraulic system	3.25
Check: Wheel nuts (C40)	Wheels / tyres	3.7
Check: Wheel nuts (C50)	Wheels / tyres	3.8
Check: Secondary and outer	Air filter	3.20

Check the operation of the parking brake and if necessary adjust.

Check: Brake pedal travel

Check the operation of the brakes. If the travel of the brake is too short then the machine will stop abruptly, If its long or the brakes are not responsive enough then have them adjusted.

Every 20 operating hours

Grease: Axle pins	Grease point	3.6
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Grease: Middle axle bolts rear axle	Grease point	3.6
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Grease: Middle axle bolts rear axle	Grease point	3.6
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Grease: Blank metal and rotary shafts	Grease point	3.6
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Empty: Fuel pre filter	Fuel system	3.18
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Every the first 50 operating hours

Check: Idle speed (only qualified personnel, see engine hand book)

Check: Drive shaft fixings	Gearbox	3.23
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After the first 100 operating hours

Change: Hydraulic filter	Hydraulic system	3.25
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After 50 operating hours or weekly

Clean: Hydraulic tank and breather filter	Hydraulic system	3.26
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Check: Tyre pressure and tyre condition (C40)	Tyres	3.7
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Check: Tyre pressure and tyre condition (C50 Front wheels)	Tyres	3.8
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Check: Tyre pressure and tyre condition (C50 rear wheels)	Tyres	3.9
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Check: Battery level	Battery	3.27
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Check: Oil level in the front and rear axle	Axle	3.22
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Every 500 operating hours

Check all the bolts and nuts are tight, in particular in relation to the drive train and steering.

Check: belt tension	Engine	3.21
Change: Engine oil and filter	Engine and filter	3.11
Check: Fuel and fuel filter	Fuel system	3.18
Change: Hydraulic filter	Hydraulic system	3.25
Check: Idle speed	Engine	3.21
Replace: Air filter outer element	Air filter	3.20
Replace: Cab filter	cab	3.29

Every 1000 operating hours

Check: Fuel – injectors	Engine	3.21
Check: valve clearance	Engine	3.21
Clean: Alternator fan	Engine	3.21
Check: Coolant quality	Cooling system	3.15
Replace: Oil in front and rear axles	Axle	3.22
Replace: oil in transfer gearbox and the wheel hubs	Axle	3.22
Replace: the air filter element	Air filter	3.20
Check: coolant quality	Cooling system	3.16
Check: Cooling pipes	Cooling system	3.16
Clean: Oil cooler and water cooler	Cooling system	3.16

Every 1500 operating hours

Replace: hydraulic oil	Hydraulic	3.26
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Every 2000 operating hours

Check: Coolant pipes	Cooling system	3.16
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Check: brakes, braking system to be checked by the local agent.

Additional maintenance

frequently especially the cleaning of the cooling system and the greasing of the machine.

For storage

system.

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