

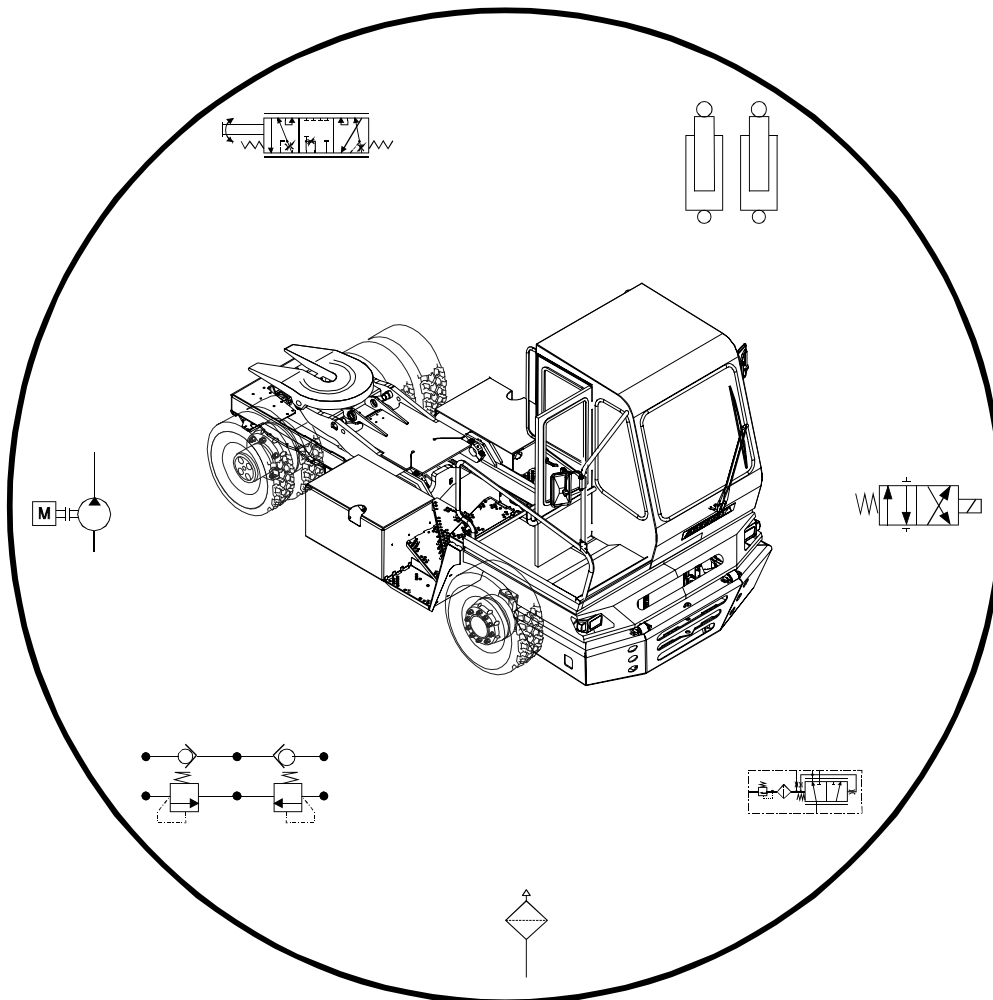


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SERVICE MANUAL

HYDRAULIC SYSTEM

YT xx2 Series



HYDRAULIC SYSTEMS OF TERBERG TERMINAL TRACTORS TYPE YTxx2

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APPENDICES:

Figure 1: Oil pressures and position of the valves during steering and lowering

Figure 2: Oil pressures and position of the valves during lifting

Figure 3: Oil pressures during emergency steering and neutral position of the lift part

Figure 4: Oil pressures during no steering and neutral position of the lift part

1. THE PUMP

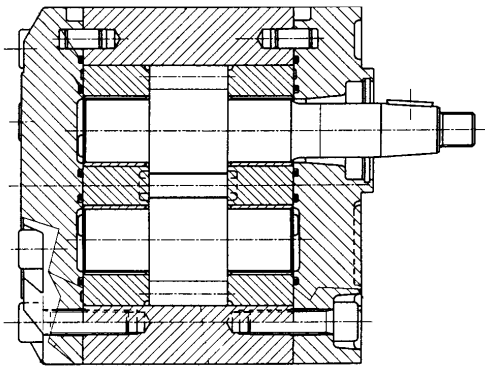
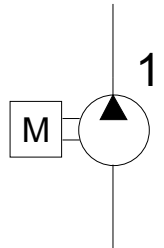
The hydraulic system has got one pump to convert kinetic energy into hydraulic energy (oil flow and oil pressure), which can be used to effect a movement of a hydraulic actuator (a cylinder or a hydraulic motor) of the system. A gear pump is applied for this purpose.

The pumps are free of maintenance, provided that a hydraulic oil is used, according to the specification of section 2.4.

The splines on the outgoing shaft of the pump need to be lubricated with a grease like lithium EP or an equivalent, when assembling the pump.

An exact (detailed) specification of the pump has been added to the parts catalogue.

The pump can be mounted to the engine or the transmission.



2. THE RESERVOIR

2.1 GENERALITY

The oil reservoir has got the following functions:

1. Storage of hydraulic oil.
2. Buffering of the variation of oil quantity in the other hydraulic components.
3. Cooling the hydraulic oil.
4. Separation of the air, carried by the hydraulic oil
5. Separation of pollution

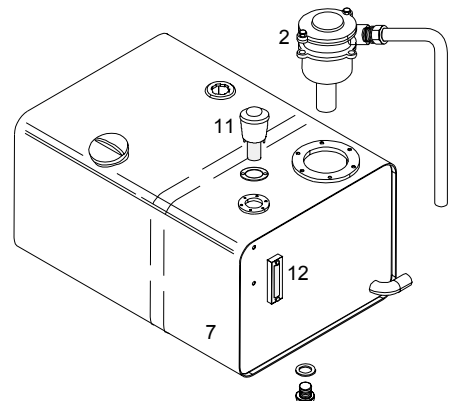
There are two types of oil reservoirs:

- Oil reservoir integrated into the fuel tank
- Separate oil reservoir

See parts manual for capacity of the oil reservoir.

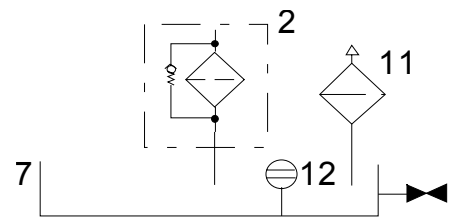
The reservoir is provided with a gauge glass. The oil level must point approximately halfway the gauge glass, when the lift frame has been put into the lowest position.

The oil tank is always assembled on the right hand side of the vehicle and forms a whole, together with the fuel tank. A double-walled partition provides the necessary separation between the two liquid reservoirs. Between the two walls of this partition, there is a drain plug.



By loosening this plug, information can be got whether there is a leak in one of the walls of the partition. Normally, this plug must always remain tight.

The hydraulic reservoir has also got a drain plug. By means of this plug, the hydraulic oil can be drained. There can be checked for water in the hydraulic system, draining a small amount of liquid from the reservoir, by the drain plug.



The reservoir and the accompanying parts are represented in the parts catalogue.

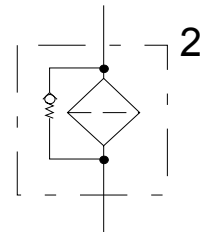
2.2 THE RETURN OIL FILTER

The function of the return oil filter is to remove the insoluble pollution from the hydraulic oil and to store them (temporarily) inside the filter element. Besides, the return filter acts as a filling opening for the hydraulic system. The filter consists of a filter body and an exchangeable filter element.

Return filter classification: $\beta_{10} \geq 75$. (10 μm absolute)

To replace the filter element, it is of great importance to carefully clean the filter and its surroundings, before opening the filter at the top (by loosening the four bolts).

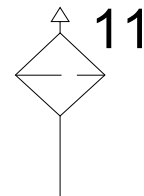
The filter element must be replaced, according to the scheme, represented in the maintenance manual.



The discharge opening of the filter in the tank must be equipped with an extended outlet opening, which is a piece of a hose, attached to the discharge opening of the filter, by a hose clip. This piece of hose prevents the oil from foaming.

2.3 THE BREATHER FILTER / FILLING ACCESS

Air can flow out of or into the reservoir, due to deviations of the temperature- or the oil level, inside the oil reservoir. The breather filter has got the task to trap the dirt particles in the air, penetrating the inside of the filter. By an inefficient filter, dirt can enter, this can cause failures to the hydraulic system.



The breather filter has got a 10 μm , exchangeable filter element. The filter element can be replaced by loosening the top of the filter and subsequently removing the filter element.

The filter element must be replaced according to the scheme, being part of the maintenance manual.

Use the breather filter as access for changing or refilling hydraulic oil.

Remove the breather filter cover and breather filter element. Be sure that the gauze tube is in place to prevent dirt into the hydraulic tank. Clean the filling access and its surroundings, before changing/refilling the oil.

2.4 OIL

Type of oil: Shell Tellus T32 or similar.(See maintenance manual)
Oil purity: ISO 18/13, or preferably according to ISO4406

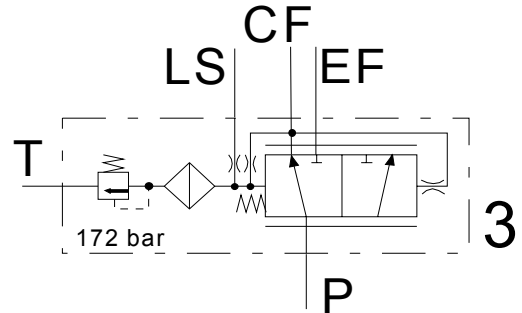
Put the lift frame with the fifth-wheel into the lowest position, before changing the oil.
The oil must be changed according to the scheme represented in the maintenance manual.

3. THE STEERING SYSTEM

3.1 THE PRIORITY VALVE

The priority valve regulates the flow of oil from the pump to the steering and lifting systems as well as to any auxiliary hydraulic systems on the vehicle. The priority valve always gives preference to the steering system. That part of the oil flow that is not needed for steering can be utilised by the lifting system and any other hydraulic systems on the vehicle.

The steering system generates a dynamic load-sensing signal if it requires oil. This dynamic load sensing signal is a hydraulic signal, which puts the priority valve in such a position (through the LS connection of the priority valve), that an exactly sufficient amount of oil will flow to the steering unit through the CF connection of the priority valve. The oil, supplied by the pump but not used by the steering system, flows through the EF-exit of the priority valve to the other hydraulics.



The oil flow to the steering system is independent of the pressure in the steering system. If necessary, all the oil delivered by the pump can flow to the steering system.



If the steering system does not require oil, because, for example, the vehicle is not being steered, the priority valve will then direct the oil flow, via the EF connection, to the other hydraulics. It is also possible that part of the oil flow will go to the steering system and part to the other hydraulics.

The LS connection must be bled on the steering unit side when first fitting and after repair or replacement of the hose between the steering unit and the LS connection of the priority valve.

This valve is to be found in the middle of the chassis underneath the lift frame hinges.

3.2 THE STEERING UNIT

In the steering unit, the rotation of the steering wheel is converted into an oil flow to the steering cylinders, which generate the steering motion. The steering unit delivers a fixed quantity of oil, for each steering rotation, put on the desired pressure by the pump. The quantity of oil depends on the type of steering unit, selected.

There are three types of steering units:

- Steering unit equipped with a dynamic LS signal (standard)
- Dual displacement steering unit equipped with a dynamic LS signal (optional)
- Steering unit without dynamic LS signal. (optional for vehicles without lift frame or any other auxiliary hydraulic systems)

See parts manual for the type of steering unit.

The integrated valves secure a good performance and preserve the steering unit from damage. Hereafter, a list of the available valves follows.

Since this steering unit is a precision element, it is of the utmost importance to guarantee an assembly in a clean environment. Besides, the entering shaft of the steering unit must be assembled, without pre-stress.

Figure 1 (see appendix at the end of this manual) shows how the oil pressure behaves during some steering movements

3.2.1. STEERING UNIT EQUIPPED WITH A DYNAMIC LS SIGNAL.

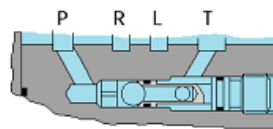
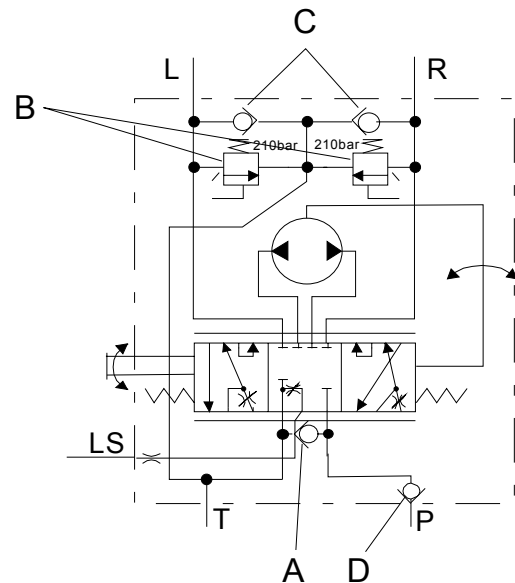
This steering unit is used in a standard YT-series tractor with lift frame. The priority valve regulates the flow of oil from the pump to the steering and lifting systems as well as to any auxiliary hydraulic systems on the vehicle depending of the dynamic load sensing signal of this steering unit (LS).

A- Short circuit valve. This valve is working as a check valve. Its function consists of the supply of the steering unit with oil, in case of an emergency. In principle, it is possible to steer with the pump broken down, because the oil can be sucked through this valve. This valve operates automatically if the pressure in the P connection drops below the T connection.

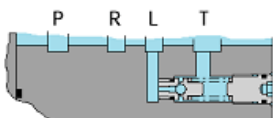
B- Two shock valves for the cylinder connections. These valves protect the steering unit, the cylinders and the hoses between these, against excessive pressures, which can occur whenever the wheels get in touch with big irregularities of the road surface. The valves are pressure relief valves.

C- Two feed-through valves for the cylinders. These valves prevent cavitation at the cylinders. Both valves are non-return valves.

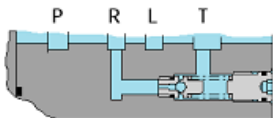
D- An inlet check valve is positioned in the P-connection to attend of a good filled steering unit, also after a long period of time standing still.



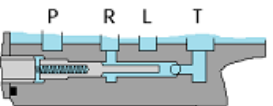
A



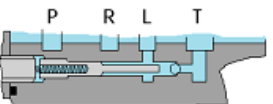
B



B



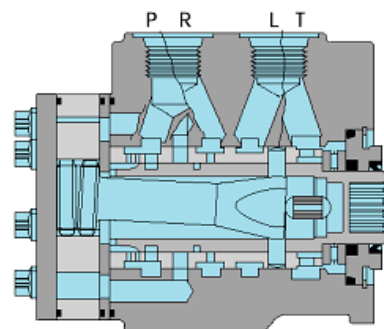
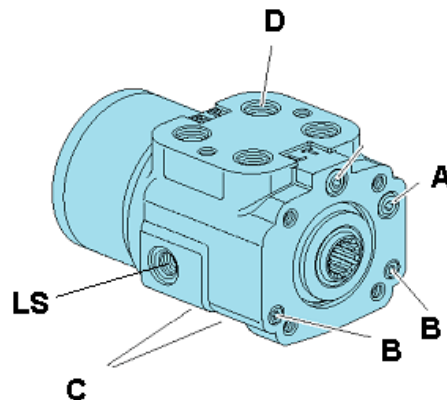
C



C



D

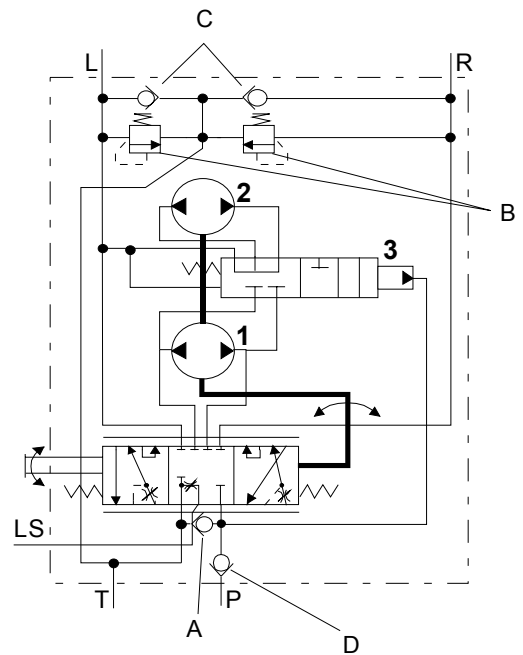
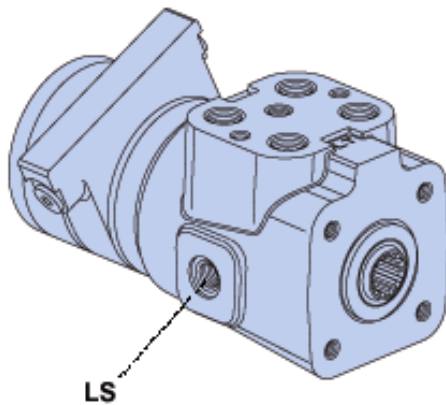


3.2.2. DUAL DISPLACEMENT STEERING UNIT EQUIPPED WITH A DYNAMIC LS SIGNAL

By using two displacements in one unit, a solution is created to manually steer a vehicle in an unpowered mode without the need of a back-up power system.

The dual displacement steering unit uses two rotating valves (manual gerotor 1 and added gerotor 2) and a pressure controlled logic valve (3). The logic valve switches between two displacements, one displacement for manual steering and the total of both displacements for powered operation. The logic valve is spring returned to the smaller manual displacement when inlet pressure falls below 8 bar. Above 8 bar the logic valve connects both gerotors to provide full powered displacement.

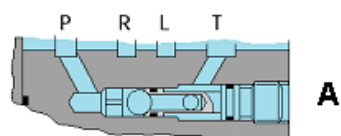
- A- See section 3.2.1
- B- See section 3.2.1
- C- See section 3.2.1
- D- See section 3.2.1



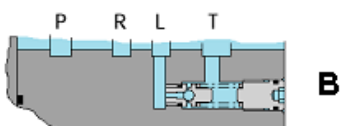
3.2.3. STEERING UNIT WITHOUT DYNAMIC LS SIGNAL.

This steering unit is used in a YT-serie tractor without a lift frame or any auxiliary hydraulic systems. With only the steering system as hydraulic system in the vehicle there is no priority valve needed. Also the dynamic load sensing (LS) is not needed. Therefore this steering unit is not equipped with dynamic load sensing signal.

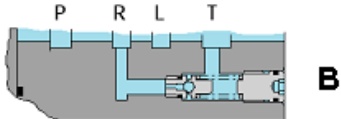
- A- See section 3.2.1
- B- See section 3.2.1
- C- See section 3.2.1
- D- See section 3.2.1
- E- One pressure relief valve is mounted between the pressure line and the return line inside the steering unit. Limits maximum pressure drop across the steering unit protecting the steering circuit



A



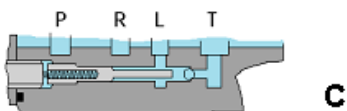
B



B



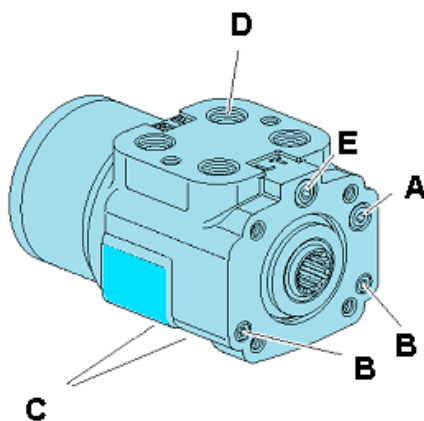
C



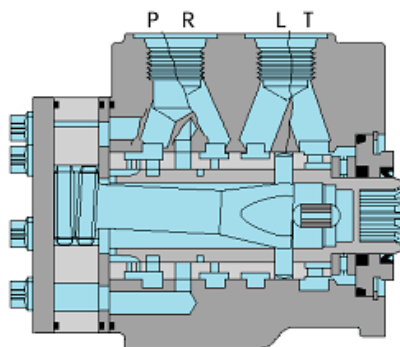
C



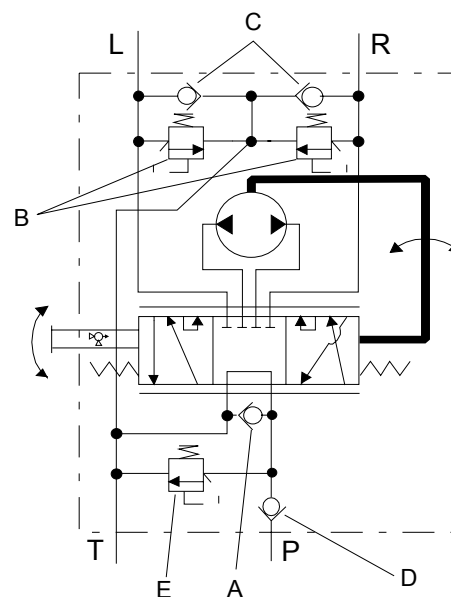
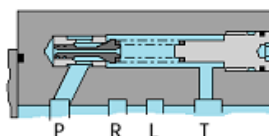
D



C



E

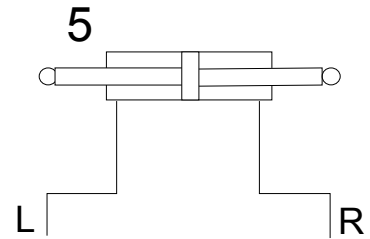


3.3 STEERING CYLINDERS

The steering cylinders convert hydraulic energy into kinetic energy, so the oil flow, controlled by the steering unit, can be converted into a motion of the steering cylinders, which causes the wheels to steer.

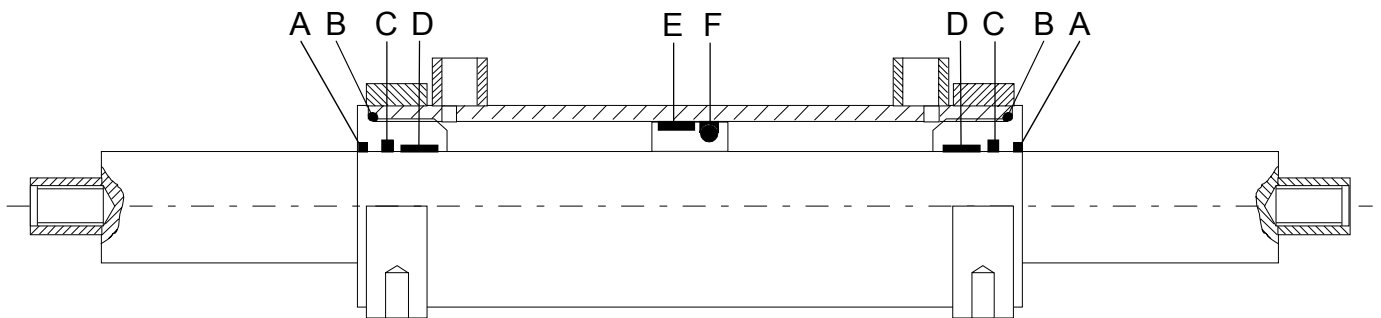
YT types:

The YT types have one steering cylinder on the front axle with a piston diameter of 80 mm and a rod diameter of 55 mm.



It is of great importance that the entire sealing packet of a cylinder is replaced, when the cylinder is leaking. It is not just because of the bad impact on the environment, but there is also a risk that additional dirt will fall on the piston rods in the hydraulic system. This dirt can cause failures.

Steering cylinder below shows the sealings (A, B, C, D, E, F), which are included in the sealing set as described in the parts manual.



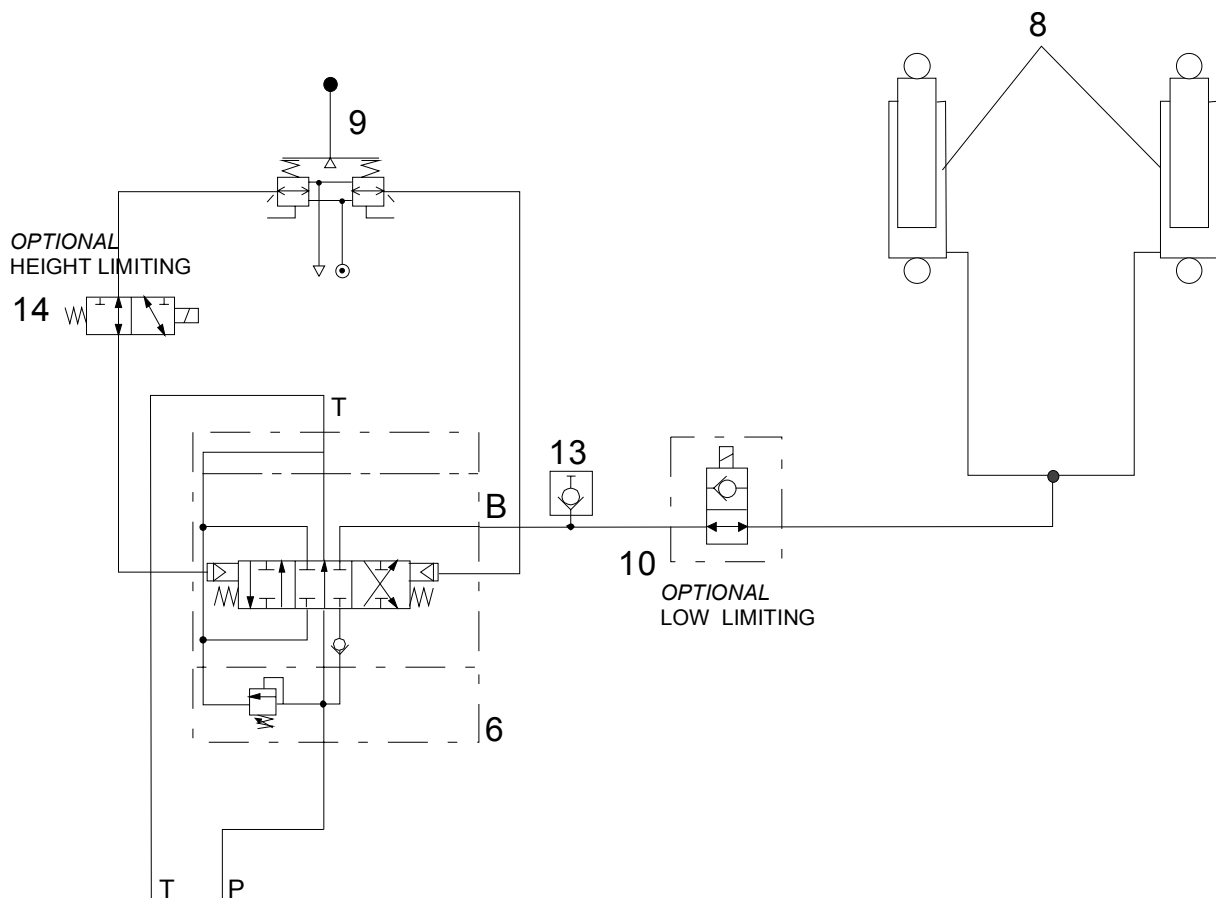
4. THE LIFT FRAME OPERATING HYDRAULICS

This part of the hydraulic system takes care of the lifting and lowering of the lift frame, with the fifth-wheel attached to it. This system consists of two parts:

- 1) Pneumatic part
- 2) Hydraulic part

The pneumatic part consists of a joystick (9) and optional height limiting(14)

The hydraulic part consists of a valve for lifting or lowering (6), pressure measurement point (13), optional low limiting (10) and the lift cylinders (8),



4.1 VALVE FOR LIFTING AND LOWERING

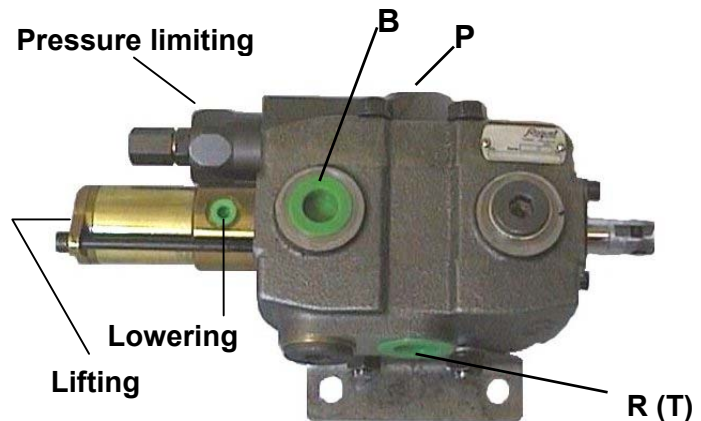
One valve is necessary to lift or lower the lift frame. This valve can be found in the middle of the chassis underneath the lift frame hinges. It is possible to remove some chassis plates, in order to obtain a better accessibility to the valve.

The valve is provided with an 1/4 BSP minimess test connection mP (13), which can measure the pressure in the P connection of the valves block. It is mounted directly on the valve (nearby connection B). This connection can be used, e.g. for the adjustment of the pressure relief valve or for trouble shooting.

The Valve offers the possibility to connect additional hydraulics. Additional valves can be mounted between for application of extra hydraulics.

The main oil flow for the valve comes from the EF connection of the priority valve. The return oil flow of the valves block runs through the R connection to the return oil filter, as described in section 2.2.

Connection B provides the supply and the return oil of the lift cylinders, as described under section 4.2.



4.1.1 PRESSURELESS CIRCULATION PRESSURE RELIEF VALVE

The vehicles are equipped with a fixed pump. This fixed pump always delivers a fixed amount of oil for every rotation, when the diesel motor is running. This oil must be discharged through the filter to the tank, with a minimal resistance.

The middle position of the valve (see scheme belonging to chapter 4) takes care that the oil flows, from the pressure side to the return side of the hydraulic system, with a minimal pressure loss (approx. 7 bar). The pressureless circulation pressure relief valve is in operation when the joy-stick in the cabin is idle

Integrated in this valve is a pressure security valve to protect the hydraulic system

The pressure on the pressure side of the hydraulic system can vary from a few bar till to the preset pressure value of the relief valve.

This valve has been preset on a standard value in the factory (normally on 250 bar), and it is not allowed to change this setting, without written permission of Terberg.

4.1.2 LIFTING

Moving the joystick will activate the valve for lifting or lowering. The joystick operation is proportional. This means that the speed of lifting is proportional controlled with the joystick.

When lifting, the oil pressure is going from the pump through the priority valve and lifting valve to the cylinders.

In unexcited condition, the valve is not really closed, this means that a minimal value of oil is leaking through this valve. This also means that, when the fifth-wheel is heavily loaded, oil is leaking through this valve, so the fifth-wheel can lower very slowly.

In figure 2 (see appendix at the end of this manual) is shown how the oil pressures behave during lifting. Besides, the schematic position of the valves is shown.

4.1.3. HEIGHT LIMITING

As optional a height limiter can be mounted to limit the max. height of the fifth wheel. The height limiter is a pneumatically valve which is electronically actuated. The height limiter can be activated by several electronically detecting or switch commands.

4.1.4. LOWERING

Moving the joystick will activate the valve for lifting or lowering. The joystick operation is proportional. This means that the speed of lowering is proportional controlled with the joystick. However the speed of lowering also depends on the fifth wheel load.

There is NO oil pressure by lowering. The gravity will lower the lift frame.

4.1.5. LOW LIMITING

As optional a low limiter can be mounted to limit the min. height of the fifth wheel. The low limiter is a pneumatically valve which is electronically actuated. The low limiter can be activated by several electronically detecting or switch commands.

4.2 THE LIFT CYLINDERS

In the lift cylinders, hydraulic energy is converted into kinetic energy, so that it is possible to convert the oil flow, from the hydraulic system to the cylinders, into a motion of the fifth wheel.

Two cylinders are assembled with the following specification:

Type: Single operated cylinder (one step)
Effective diameter: 125 mm

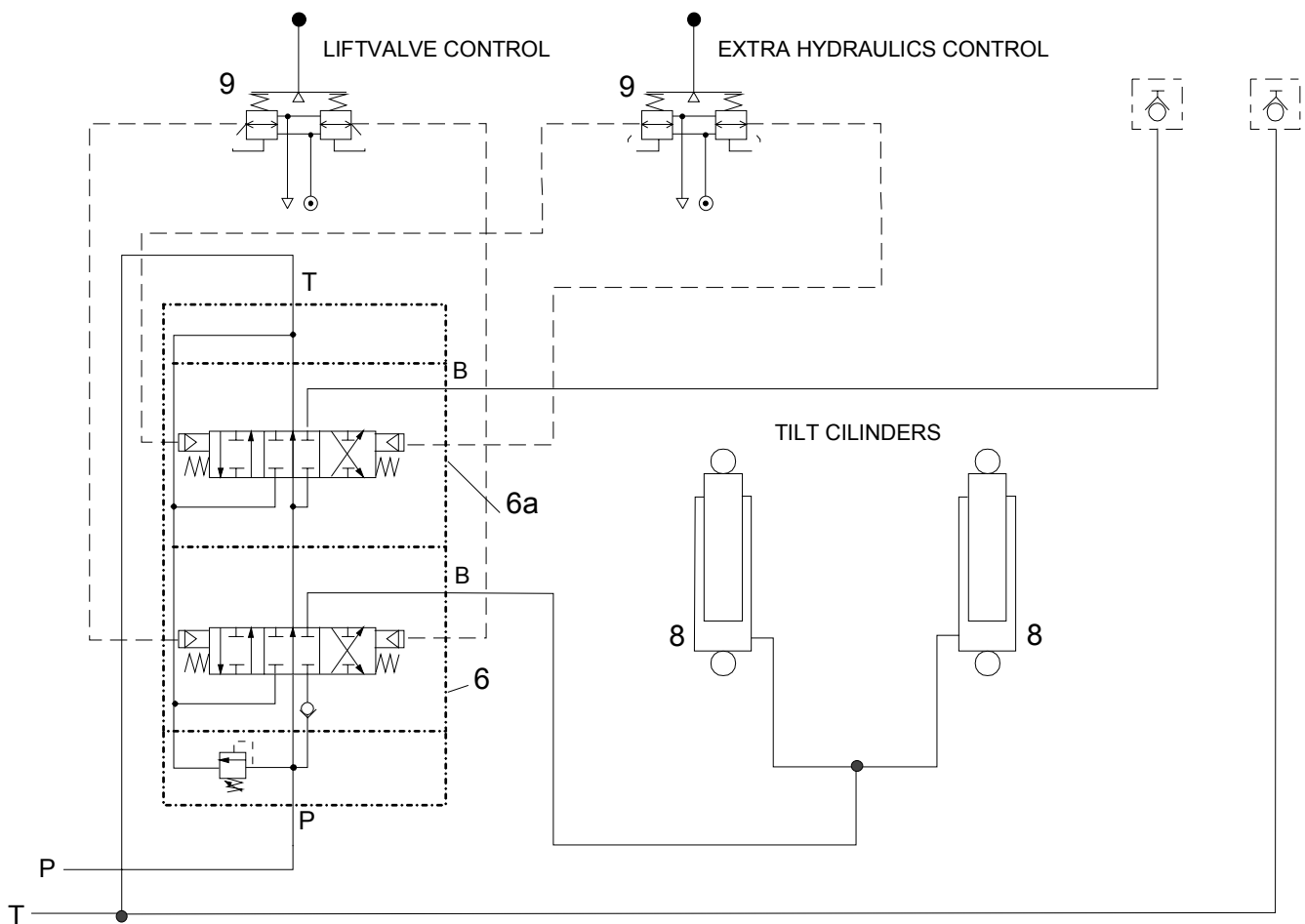
The cylinder is provided with a pivoting bearing with a lubricating nipple on the bottom, as well as on the top. This way, the radial forces on the cylinder will remain small. The bottom is attached to the chassis. The top is attached to the lift frame.

In case of leakage by one of the sealings, the entire sealing packet of the cylinders must be replaced.

Additional information on the lift cylinders is enclosed in the parts catalogue.

4.3 EXTRA HYDRAULIC

It is possible to add an additional section (6a) for activating extra hydraulic applications. See below for an example of extra hydraulic application.



5. HOSES, FLANGES AND NIPPLES

The several hydraulic components, described in the chapters 1 up to and inclusive 4, are connected to each other by hoses, flanges and nipples. Every hose, flange and nipple has been selected, carefully. Only assemble the components indicated by Terberg, if a hose, flange or nipple needs to be replaced. Never use any other type or product.

Take good care, when assembling the hoses, flanges and nipples. Snapped or twisted hoses can affect the functioning of the system. Incorrectly assembled hoses, flanges and nipples can cause leakage. Retighten the new hose by all the available clamping blocks, hose clips etc, after the replacement of a hose.

Take utmost care when assembling the suction hose from the pump to the hydraulic tank. Fasten the hose clips correctly, in order to clamp the hose tight enough on the suction pipe of the pump and the tank. In case, this has not been done in the right way, the pump will suck air and starts to cavitate, so the pump will soon be broken.

The specification of the hoses, flanges and nipples is to be found in the parts catalogue.

Figure 3 (see appendix) shows the entire hydraulic scheme.

6. LIST OF FAILURES

The valve numbers, mentioned in this chapter, refer to the numbers shown in figure 3 (see appendix). Table 6,1 is added on the end of this chapter, in which chapter 6 is summarised. A cause for a possible failure can quickly be found, by using this table. A more extensive description of the possible cause and remedy for a certain failure can be found in chapter 6. Always read the corresponding description in chapter 6, after having been looking for a possible cause in the table.

6.1 THE LIFT FRAME WITH THE FIFTH-WHEEL DOES NOT LIFT

6.1.1 Possible cause:

- a) Valve no. 6 does not switch
- b) Valve no. 9 does not switch
- c) The pump does not generate pressure
- d) The load on the fifth-wheel is too heavy.
- e) The optional height limiting is switch on (Optional)

6.1.2 How to determine the cause:

- a) In the measure point 13, a pressure is measured equal to ± 10 bar. Hereby, the fifth-wheel may not be in the highest position and the joy-stick in the cabin must be set to lifting. In the air tube from valve 9 air pressure is generate when the joystick is moving to lifting. Check the air pressure by releasing the tube. When air is going out the tube, the air pressure is alright.
- b) In the measure point 13, a pressure is measured equal to ± 10 bar. Hereby, the fifth-wheel may not be in the highest position and the joy-stick in the cabin must be set to lifting. In the air tube from valve 9 air pressure is generate when the joystick is moving to lifting. Check the air pressure by releasing the tube. When air is going out the tube, the air pressure is alright.
- c) Set the joystick in the cabin in the position lifting. In the measure point 13, a pressure is measured which is lower than 200 bar (engine running idle), so the present load cannot be lifted. The pump is probably broken, when the vehicle cannot be steered either or when the steering is very tough.
- d) In principle, the lift system is in order, as far as the fifth-wheel can lift in unloaded condition and the pressure on measure point 13 runs to about 210 bar, with the fifth-wheel in the highest position. The load on the fifth-wheel is too heavy, when the fifth-wheel does not lift, under loaded condition.
- e) Lowering the lift frame, if it can lift but not reach the highest position probably the height limiting is switch on (Optional)

6.1.3 Remedy:

- a1) The air cylinder mounted on valve 6 is the problem. Repair or replace the air cylinder.
- a2) The valve 6 is stuck, due to dirt. The dirt must be removed, not only the dirt found in this valve, but also in the rest of the system. Probably, the filter element of the return filter and maybe the breather filter must be replaced. Check the sealings of the valve for damage, when the valve has been assembled again.
- a3) The integrated pressure limiting in valve 6 is damaged. The oil can not generate pressure. Replace valve 6.
- b1) De joystick valve 9 is damaged and must be replace.
- b2) The pressure in the air tank is too low. Start the engine and keep him on a few minutes. If the joystick still doesn't work check the air system.
- c) The pump is out of order and must be replaced.
- d1) The maximum pressure of the system in order to boost the lifting capacity, can only be increased by written permission of Terberg.
- d2) The trailer is overloaded and its load must be lessened.
- e) This is no failure, if the height limiting must be adjust, it can be done in a little margin.

6.2 THE LIFT FRAME WITH THE FIFTH-WHEEL DOES NOT LOWERT

6.2.1 Possible cause:

- a) Valve no. 6 does not switch.
- b) Valve no. 9 does not switch.
- c) The lift frame runs heavily.
- d) One of the pivoting bearing in the cylinders is jammed.

6.2.2 How to determine the cause:

- a) The fifth-wheel may not be in the lowest position and the joy-stick in the cabin must be set to lowering. In the air tube from valve 9 air pressure is generate when the joystick is moving to lowering. Check the air pressure by releasing the tube. When air is going out the tube, the air pressure is alright.
- b) The fifth-wheel may not be in the lowest position and the joy-stick in the cabin must be set to lowering. In the air tube from valve 9 air pressure is generate when the joystick is moving to lowering. Check the air pressure by releasing the tube. When air is going out the tube, the air pressure is alright.
- c) It is possible that the lift frame runs heavily, when cause a, b could not have been determined. The hinges of the lift frame are insufficiently lubricated, when the lift frame will not lower in unloaded condition.
- d) If one of the pivoting bearings of the lift cylinder is not well lubricated, it is likely that the pivoting bearing is jammed. This can be checked, by shuffling the cylinder by hand and so to check if the pivoting bearing can be moved. It must be possible to move the pivoting bearing, without the help of any kind of tool.

6.2.3 Remedy:

- a1) The air cylinder mounted on valve 6 is the problem. Repair or replace the air cylinder.
- a2) The valve 6 is stuck, due to dirt, the dirt must be removed, not only the dirt found in this valve, but also in the rest of the system. Probably, the filter element of the return filter and maybe the breather filter must be replaced. Check the sealings of the valve for damage, when the valve has been assembled again.
- b1) De joystick valve 9 is damaged and must be replace.
- b2) The pressure in the air tank is too low. Start the engine and keep him on a few minutes. If the joystick still doesn't work check the air system.
- c) Lubricate or replace the hinges. Check after lubrication, if the hinge moves smooth enough. If this is the case, the lift frame will lower in unloaded condition.
- d) Remove the dirt from the pivoting bearings and check them for damage. The respective pivoting bearing must be replaced, if it is damaged. Lubricate it, in case it is not damaged and check if it can easily be moved.

6.3 THE VEHICLE CAN NOT BE STEERED

6.3.1 Possible causes:

- a) The pump does not generate any pressure.
- b) The priority valve does not switch
- c) The rotating valve (gerotor) in the steering unit is jammed, due to pollution.

6.3.2 How to determine the cause:

- a) Set the joystick in the cabin in the position lifting and the lift frame in the highest position (the engine must run idle). In the measure point 13, a pressure has been measured which is lower than 200 bar. The pump is probably out of order, as the vehicle cannot be steered well, either.
- b) It is possible to lift and to lower the loaded fifth-wheel. Possibility b and c are the remaining possible causes. Most likely, the priority valve cannot switch.
- c) It is possible to lift and to lower the loaded fifth-wheel. The priority valve has been cleaned and can be switched. Probably, the rotating valve in the steering unit cannot move to each other, due to dirt e.g., as soon as the vehicle cannot be steered.

6.3.3 Remedy:

- a) The pump is out of order and must be replaced.
- b) The priority valve is stuck, due to dirt. The dirt must be removed, not only the dirt found in this valve, but also in the rest of the system. Probably, the filter element of the return filter and maybe the breather filter must be replaced. Check for damage the sealings of the valve, when the valve is assembled again.
- c) The rotating valve is stuck, due to dirt. The dirt must be removed, not only the dirt found in this valve, but also in the rest of the steering unit and the rest of the hydraulic system. Probably, the filter element of the return filter and maybe the breather filter must be replaced. Check for damage the sealings of the valve. It is not allowed to disassemble the steering unit, without any permission of Terberg.

6.4 THE STEERING IS TOUGHER THAN NORMAL

6.4.1 Possible causes:

- a) The mechanism between steering wheel and the entering shaft of the steering unit runs heavily.
- b) The hydraulic hoses have been snapped.
- c) The pump does not function as it should.
- d) The priority valve is polluted.
- e) The bolts in the bottom plate of the steering unit are assembled by a torque which is too high, so the movable part in the steering unit sticks and turns heavily.
- f) The steering unit is polluted.

6.4.2 How to determine the cause:

- a) Disengage the steering unit from the mechanism between the steering wheel and the entering shaft of the steering unit. The cause must be found in the mechanism, if the motion of the steering wheel is now irregular or tough.
- b) Check for snapping of the hoses from the steering system.
- c) Set the joystick in the cabin in the position lifting and the lift frame in the highest position (the engine must run idle). In the measure point 13, a pressure has been measured which is lower than 200 bar. The pump is probably out of order, as the vehicle cannot be steered well, either.
- d) The priority valve has probably become polluted or does not function well, after having determined that a, b and c cannot be the cause.
- e) By the disengagement, as described under a, the steering mechanism runs smoothly and the turning of the steering unit is tough (There can only be steered by using a tool as a lever to turn the steering unit) and if the engine is running. In that case, one of the possible causes is that the bolts of the bottom plate have been tightened by a too high torque. This cause cannot be checked, until it

has been determined that a, c, e and f could not have been the cause of the problem.

- f) The steering unit runs heavy, due to dirt. By disassembling the steering unit there can be determined if dirt is the cause of the heavy way of running. Only disassemble the steering unit with the permission of Terberg and after checking every other possible cause.

6.4.3 Remedy:

- a) Lubricate and adjust the bearing-mounted parts in the mechanism, between steering wheel and the entering shaft of the steering unit.
- b) Remove the snap in the hose. Carefully check the hose for damage. Assemble a new hose, in case it is damaged.
- c) The pump is out of order and must be replaced.
- d) Disassemble the plunger and check the orifices of the valve and the plunger for dirt. Remove the dirt, if it has been located. Check the plunger for damage (scratches). Assemble a new priority valve, if a damage is detected. Assemble the plunger again, in case no damage can be detected.
- e) Loosen the bolts a bit and tighten them subsequently by a torque of 25 Nm. Mind that the bottom plate does not get disassembled. The point is just to tighten the bolts by the correct torque.
- f) Dirt must be removed, not only the dirt found in the steering unit, but also in the rest of the hydraulic system. Probably, the filter element of the return filter, the pressure filter and maybe the breather filter must be replaced. Check the sealings of the steering unit for damage.

6.5 THE STEERING WHEEL SLIPS THROUGH AT THE STOPS OF THE CYLINDERS

The wheels can be steered that far, up to the moment they meet a stop. It is normal, that the steering wheel still can be moved very slowly, while being turned further. If it is possible to turn the steering wheel at normal speed when the wheels meet the stop, the situation can be as follows.

6.5.1 Possible cause:

- a) The pressure regulation of the priority valve or steering unit is incorrect.

6.5.2 How to determine the cause:

- a) Measure the pressure of the pressure line from the pump to the priority valve. The pressure regulation is incorrect, if the pressure exceeds 185 bar, at the moment the wheels meet the stop and it is still possible to steer. In this case the pressure relief valve (see chapter 3.1 or see E chapter 3.2.3) or shock valves (see B chapter 3.2) are damaged / polluted.

6.5.3 Remedy:

- a) Check and clean the pressure relief valve and the shock valves. When the cause is not determined, replace the pressure relief valve or shock valves or complete valve.

6.6 OIL LEVEL IN THE HYDRAULIC TANK IS FREQUENTLY TOO LOW

6.6.1 Possible cause:

- a) The oil has not been refilled, after replacement/ repair of hydraulic components
- b) There is a leakage in the system.

6.6.2 How to determine the cause:

- a+b) Check the hydraulic system for leakage, by checking every component, hoses and lines for leakage. Probably, the oil has not been refilled after maintenance/repair works, if no clear leakage can be detected. The pump can also leak hydraulic oil to the transmission. The transmission oil will contain hydraulic oil, whenever this has happened.

6.6.3 Remedy:

- a) Refill the oil.
- b) Eliminate the leakage by mounting new sealings, if this is the cause of the leakage. In the majority of the cases, this is the cause of the leakage. Some times it happens that a hose loosens by vibration. This leakage can be eliminated, in a simple way by retightening of the respective hose. Refill the oil.

TABLE 6.1 SURVEY ON TROUBLE SHOOTING

Kind of failer	Possible cause	How to determine the cause	Remedy
6.1 Liftframe does not lift.	a) Valve no. 6 does not switch b) Valve no. 9 does not switch c) The pump does not generate pressure d) The load on the fifth-wheel is too heavy. e) The optional height limiting is switch on (Optional)	a) In the measure point 13, a pressure is measured equal to ± 10 bar. Check the air pressure by releasing the tube. b) In the measure point 13, a pressure is measured equal to ± 10 bar. Check the air pressure by releasing the tube. c) In the measure point 13, a pressure is measured which is lower than 200 bar (engine running idle), so the present load cannot be lifted. d) The load on the fifth-wheel is too heavy, when the fifth-wheel does not lift, under loaded condition. e) Lowering the lift frame, if it can lift but not reach the highest position probably the height limiting is switch on (Optional)	- a1) Repair or replace the air cylinder. - a2) The valve 6 is stuck, due to dirt, the dirt must be removed. - a3) The integrated pressure limiting in valve 6 is damaged. - b1) De joystick valve is damaged and must be replace. - b2) The pressure in the air tank is too low. c) The pump is out of order and must be replaced. - d1) The maximum pressure of the system in order to boost the lifting capacity, can only be increased by written permission of Terberg. - d2) The trailer is overloaded and its load must be lessened. e) This is no failure.
6.2 The liftframe with the fifth-wheel does not lowert.	a) Valve no. 6 does not switch. b) Valve no. 9 does not switch. c) The lift frame runs heavily. d) One of the pivoting bearing in the cylinders is jammed.	a) Check the air pressure by releasing the tube. b) Check the air pressure by releasing the tube. c) It is possible that the lift frame runs heavily, when cause a, b could not have been determined. d) If one of the pivoting bearings of the lift cylinder is not well lubricated, it is likely that the pivoting bearing is jammed.	- a1) Repair or replace the air cylinder on valve 6. - a2) The valve 6 is stuck, due to dirt, the dirt must be removed. - b1) De joystick valve is damaged and must be replace. - b2) The pressure in the air tank is too low. c) Lubricate or replace the hinges. d) Remove the dirt from the pivoting bearings and check them for damage.

6.3 The vehicle can not be steered	a) The pump does not generate any pressure. b) The priority valve does not switch c) The rotating valve in the steering unit is jammed, due to pollution.	a) In the measure point 13, a pressure has been measured which is lower than 200 bar. Lift frame in highest position and engine idle. b) It is possible to lift and to lower the loaded fifth-wheel. Possibility b and c are the remaining possible causes. c) It is possible to lift and to lower the loaded fifth-wheel. The priority valve has been cleaned and can be switched. Probably, the rotating valve in the steering unit cannot move to each other, due to dirt e.g., as soon as the vehicle cannot be steered.	(a) The pump is out of order and must be replaced. (b) The valve is stuck, due to dirt, the dirt must be removed. (c) The valve is stuck, due to dirt, the dirt must be removed.
6.4 The steering is tougher than normal	a) The mechanism between steering wheel and the entering shaft of the steering unit runs heavily. b) The hydraulic hoses have been snapped. c) The pump does not function as it should. d) The priority valve is polluted. e) The bolts in the bottom plate of the steering unit are assembled by a torque which is too high. f) The steering unit is polluted.	a) Disengage the steering unit from the mechanism between the steering wheel and the entering shaft of the steering unit. b) Check for snapping of the hoses from the steering system. c) In the measure point 13, a pressure has been measured which is lower than 200 bar. Lift frame in highest position and engine idle. d) The priority valve has probably become polluted or does not function well. e) By the disengagement, as described under a, the steering mechanism runs smoothly and the turning of the steering unit is tough. In that case, one of the possible causes is that the bolts of the bottom plate have been tightened by a too high torque. f) The steering unit runs heavy, due to dirt. By disassembling the steering unit there can be determined if dirt is the cause of the heavy way of running. (Permission of Terberg necessary)	a) Lubricate and adjust the bearing-mounted parts in the mechanism, between steering wheel and the entering shaft of the steering unit. b) Remove the snap in the hose. c) The pump is out of order and must be replaced. d) Disassemble the plunger and check the orifices of the valve and the plunger for dirt. e) Loosen the bolts a bit and tighten them subsequently by a torque of 25 Nm. f) Dirt must be removed.
6.5 The steering wheel slips through at the stops of the cylinders	a) The pressure regulation of the priority valve or steering unit is incorrect.	a) Measure the pressure of the pressure line from the pump to the priority valve. The pressure regulation is incorrect, if the pressure exceeds 185 bar, at the moment the wheels meet the stop and it is still possible to steer.	a) Check and clean the pressure relief valve and the shock valves. When the cause is not determined, replace the pressure relief valve or shock valves or complete valve.

6.6 Oil level in the hydraulic tank is frequently too low	a) The oil has not been refilled, after replacement/ repair of hydraulic components b) There is a leakage in the system.	a+b) Check the hydraulic system for leakage, by checking every component, hoses and lines for leakage. The pump can also leak hydraulic oil to the transmission.	a) Refill the oil by the filling cap of the return filter. b) Eliminate the leakage by mounting new sealings. Refill the oil.
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STEERING

DESCEND

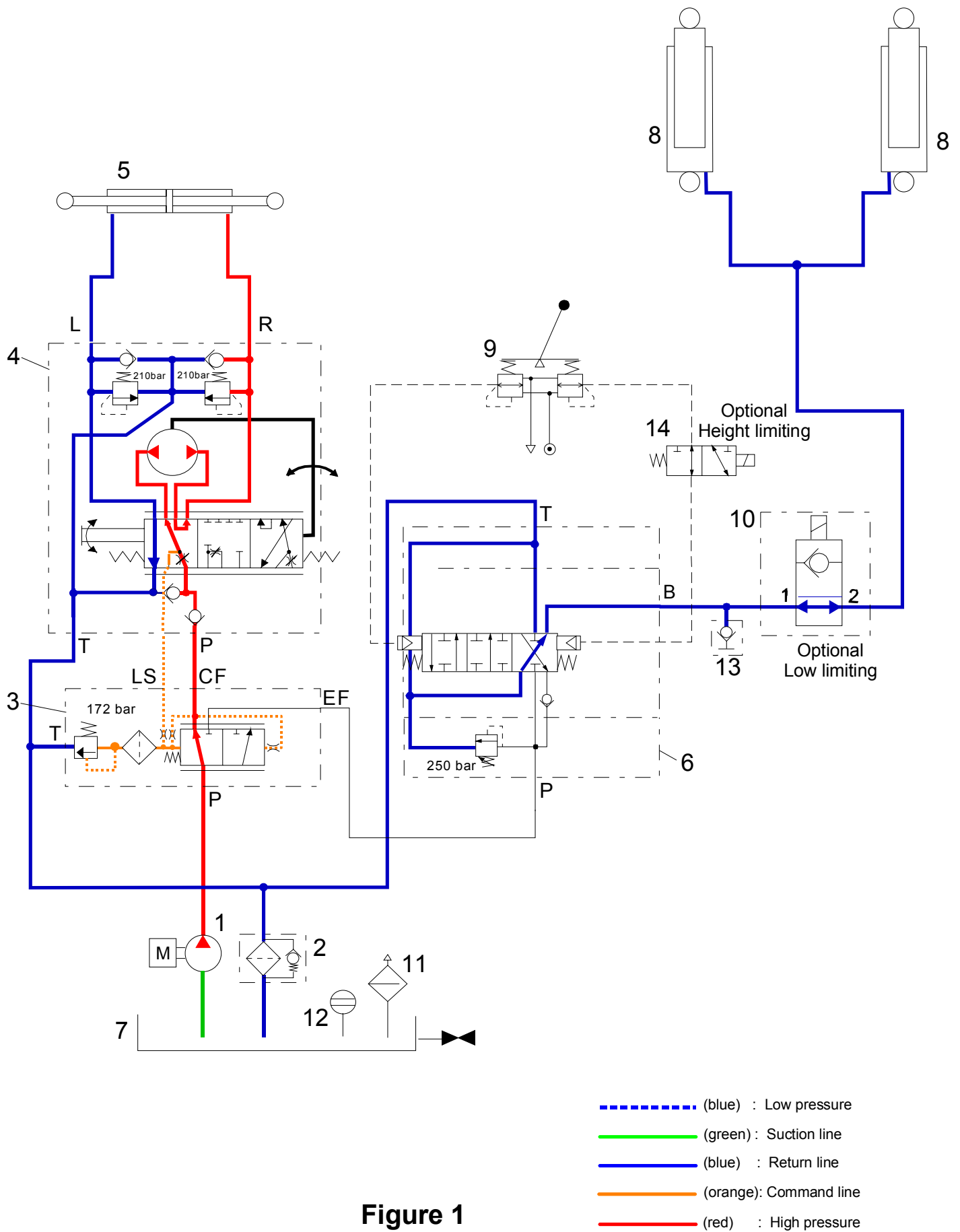


Figure 1

NO STEERING

LIFTING

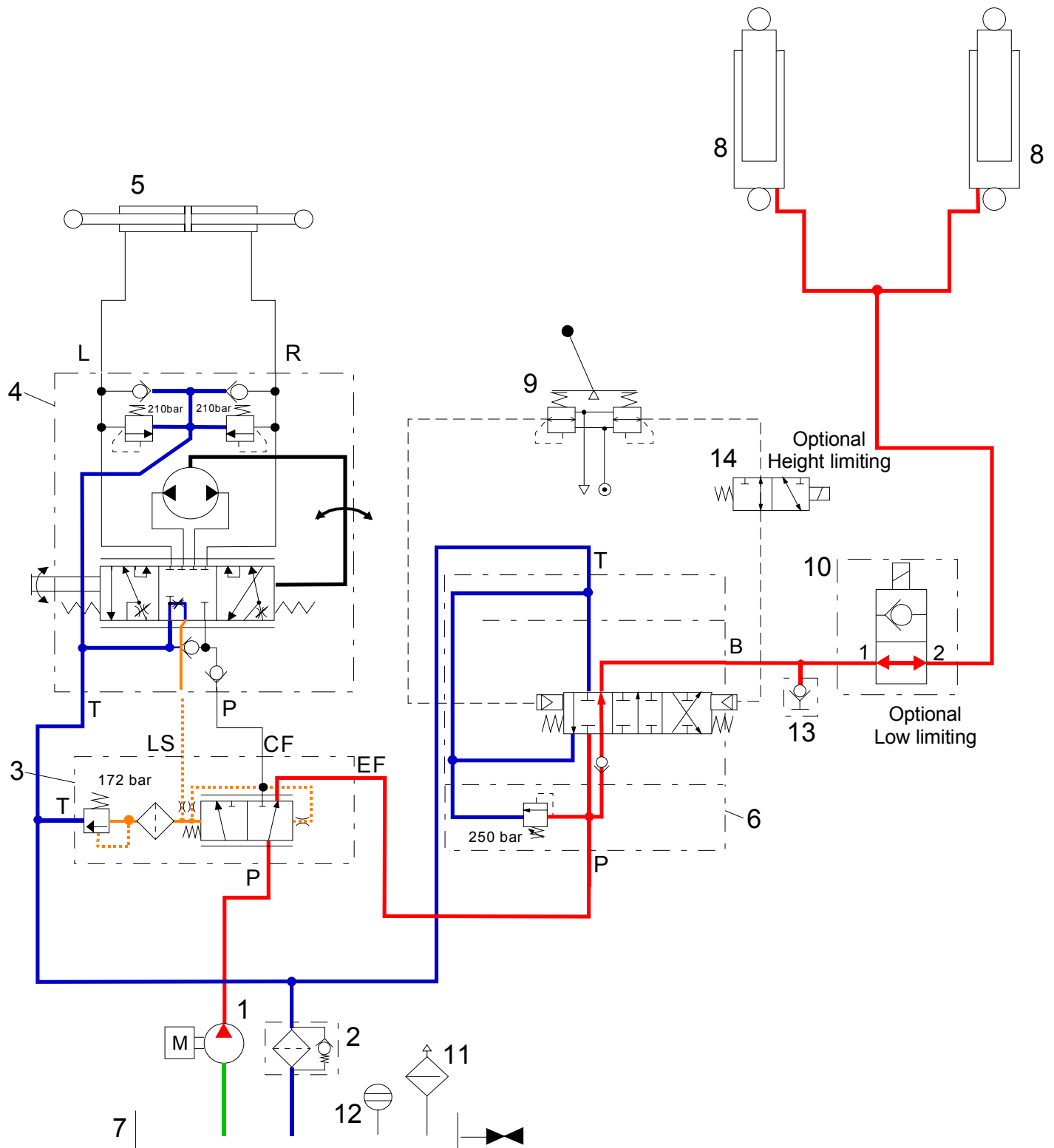


Figure 2

- (blue) : Low pressure
- (green) : Suction line
- (blue) : Return line
- (orange) : Command line
- (red) : High pressure



NO STEERING

NEUTRAL

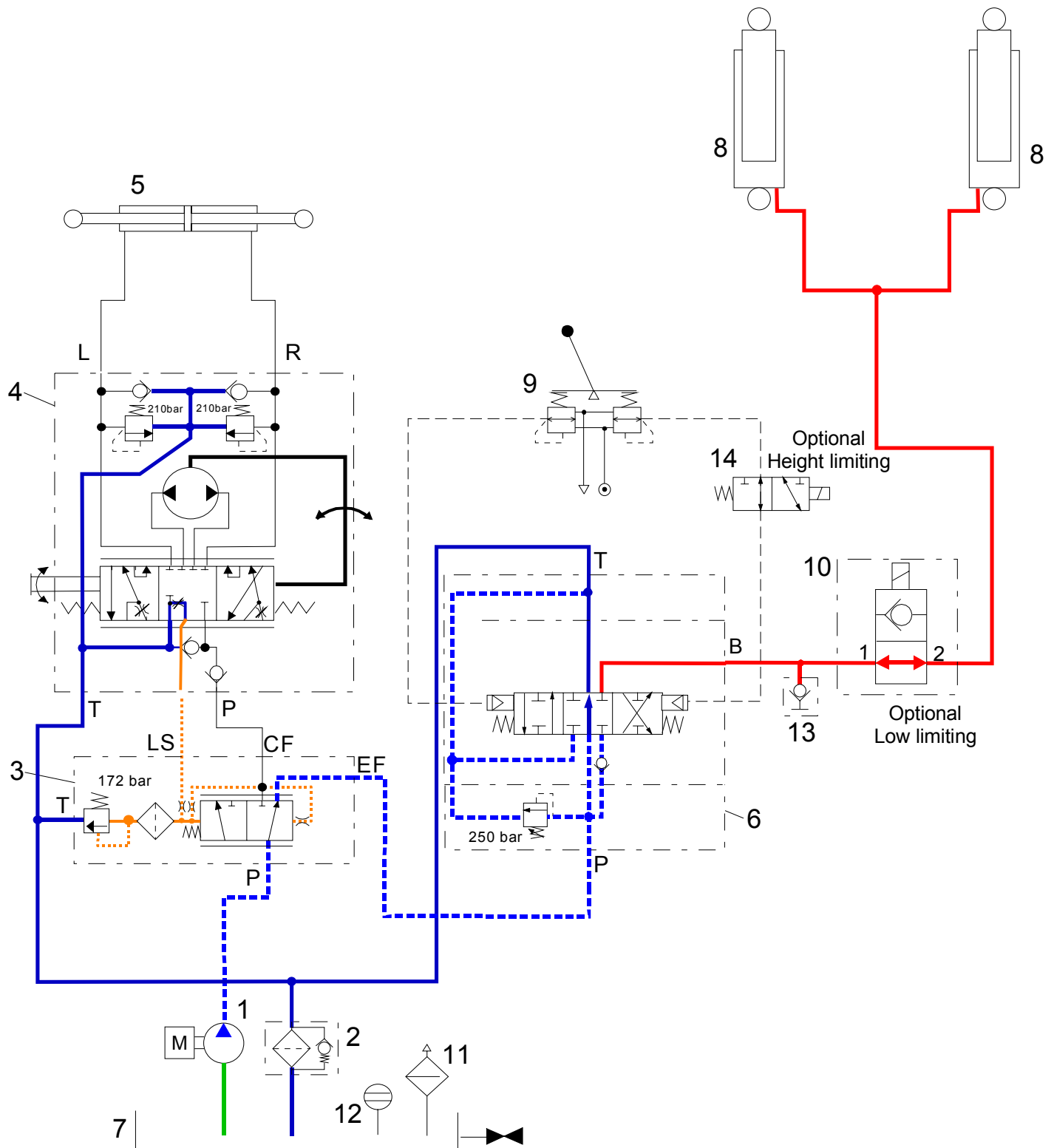


Figure 4

- (blue) : Low pressure
- (green) : Suction line
- (blue) : Return line
- (orange) : Command line
- (red) : High pressure