

Document Title: Steering, description	Function Group: 600	Information Type: Service Information	Date: 2014/3/13
Profile: BHL, BL70B [GB]			

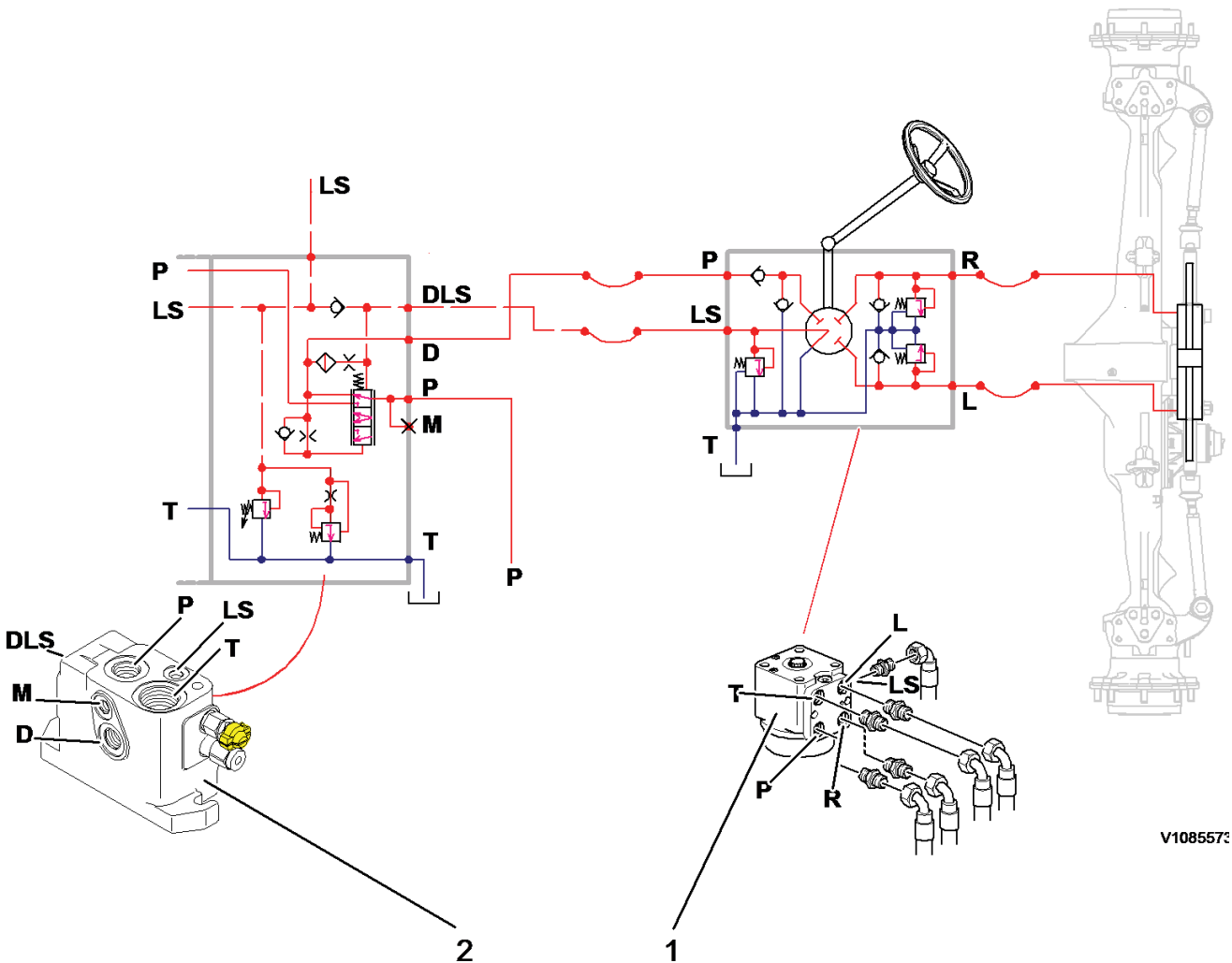
Steering, description

The machine has a hydrostatic steering system that operates one double acting hydraulic steering cylinder. The steering cylinder is located on the front axle.

The hydraulic oil tank is common to hydraulic system and steering system. When the steering is used, the working pump provides oil to the steering system.

The central component of the steering system is the steering valve (ORBITROL). The steering valve is connected to pressure line, tank return line, load-sensing outlet and left and right hoses to the steering cylinder.

The steering valve is connected to the steering wheel via a steering column. When the steering wheel is turned, the steering valve meters an oil volume proportional to the rate of rotation of the steering wheel. This volume of oil is directed to the appropriate side of the steering cylinder, while simultaneously the displaced oil is directed to tank.



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Figure 1
Hydraulic diagram

1	steering valve (ORBITROL)
2	inlet valve MCV (containing the priority valve)

- LS load sensing
- DLS load sensing from steering
- M measuring point steering pressure
- D oil supply steering
- P pressure line
- T tank
- R steering right side
- L steering left side

Steering function 1 (starting the engine)

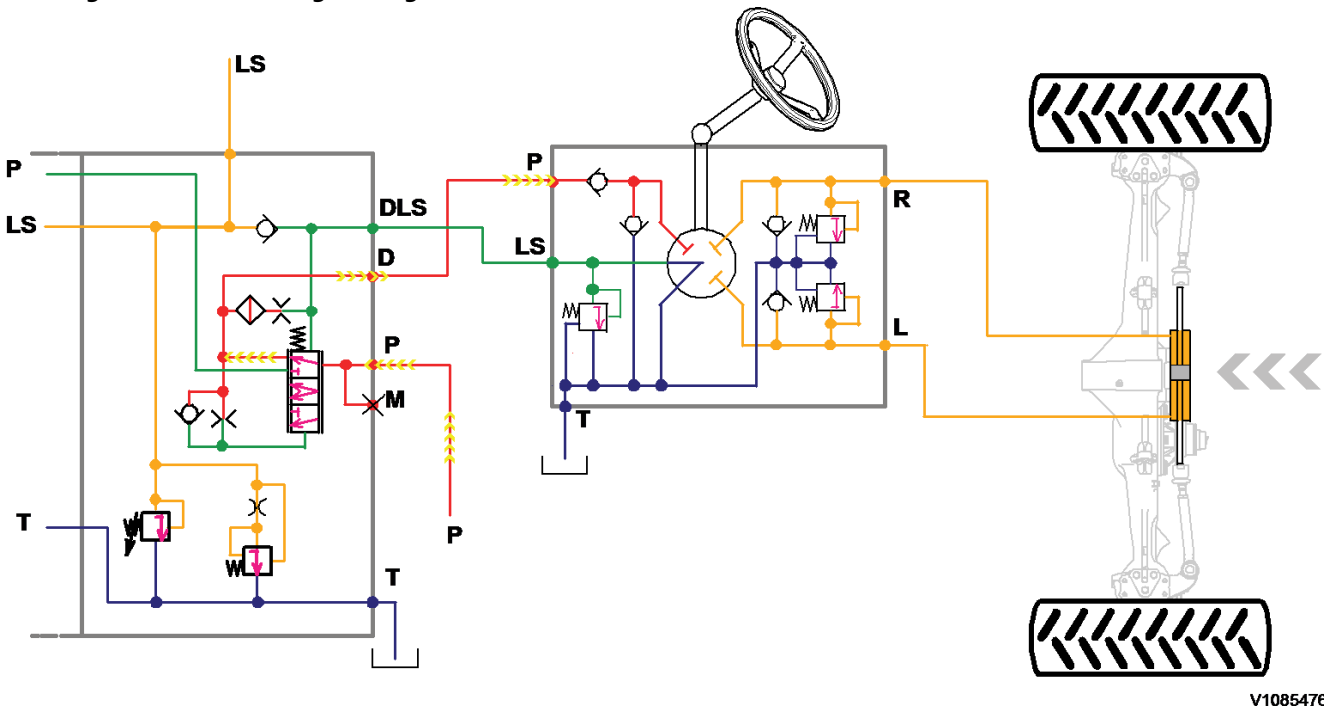
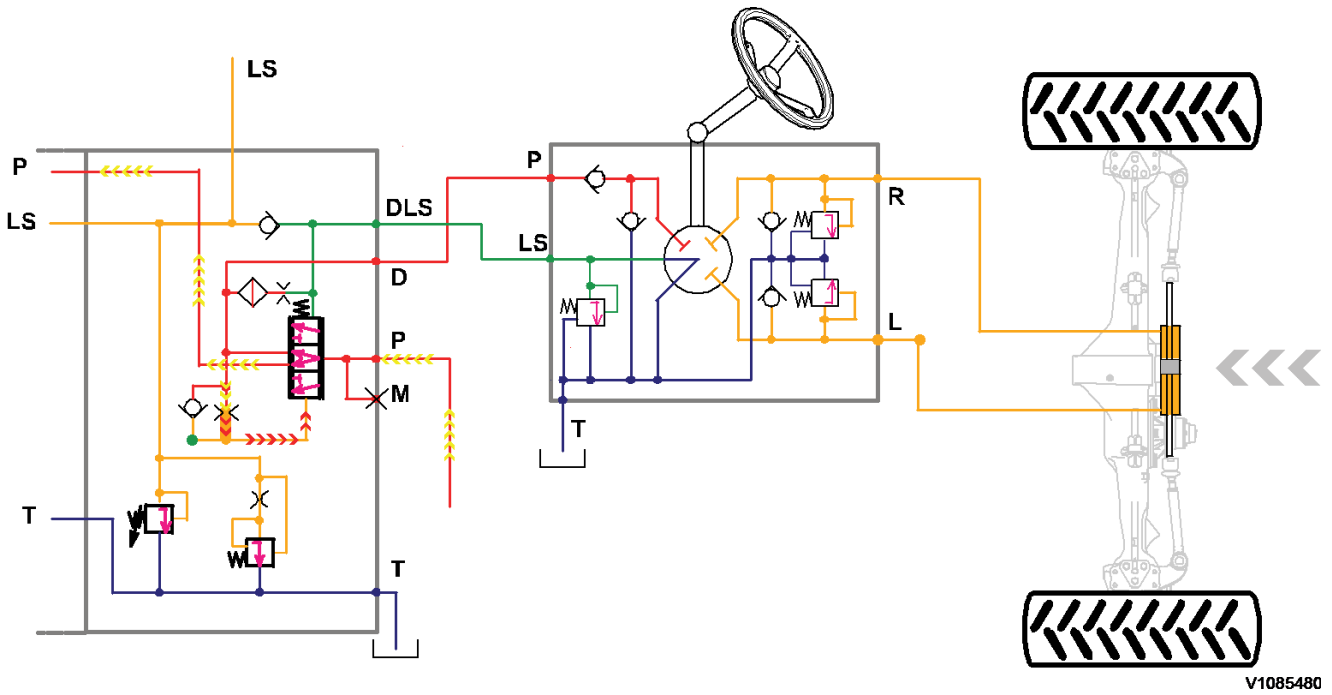


Figure 2
Steering function 1 (starting the engine)

When starting the engine, the priority valve is in neutral position, that means that the valve has been moved downwards by the spring pressure. Oil from the working pump flows into the priority valve. Due to the priority valves neutral position, oil flows only to the steering valve. The connection to all other hydraulic functions is closed.

Steering function 2 (neutral/standby)



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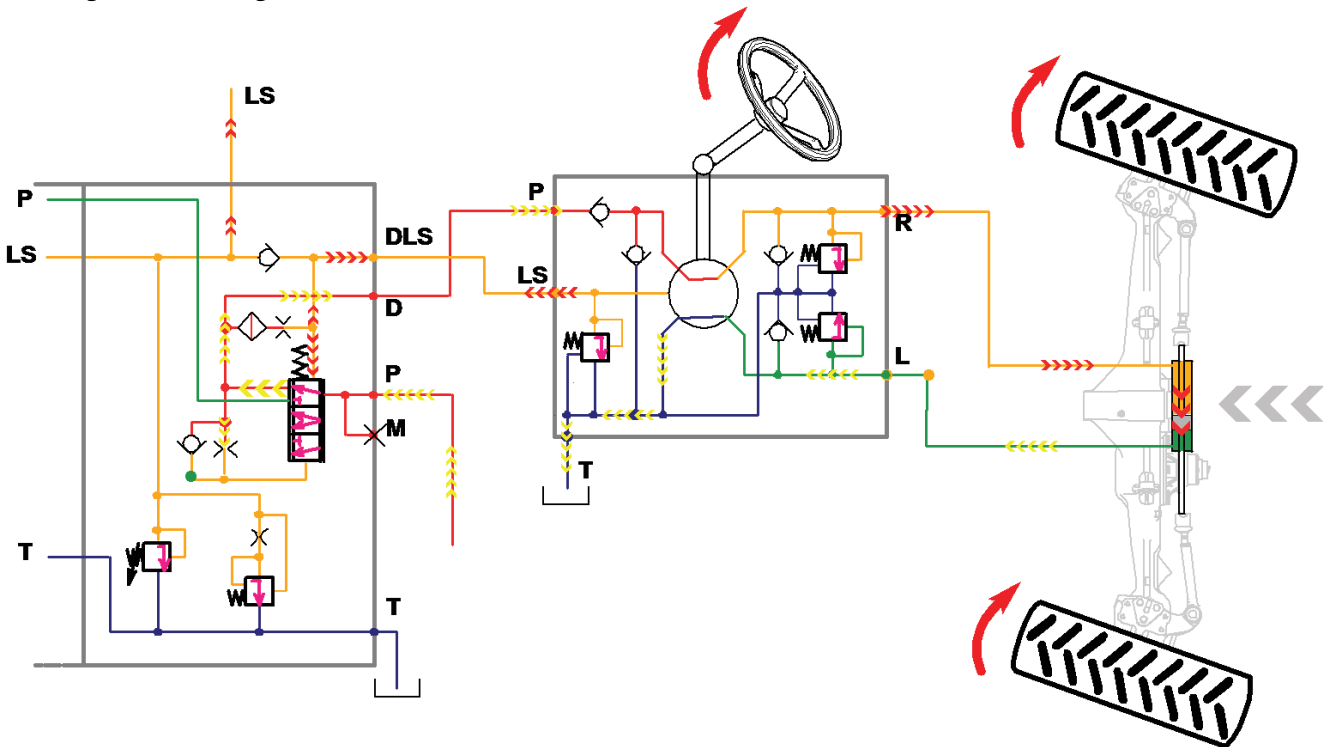
Figure 3
Steering function 2 (neutral/standby)

The working pump continues supplying oil to the steering valve and when the steering is not in use, pressure builds up in the supply line to the steering valve. This stand-by pressure moves the spool of the priority valve against the spring pressure. As the spool moves, it progressively opens the pump flow to the hydraulic system and reduces the flow to the steering system.

Now the steering function and all other hydraulic functions are supplied with oil from the pump.

However, oil will always flow to the steering valve to compensate any leakage within the steering valve. The steering valve's LS connection is open to tank.

Steering function 3 (right turn)



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Figure 4
Steering function 3 (right turn)

When turning the steering wheel, the pressure line P is connected to the corresponding side of the steering cylinder and the connection between LS line and tank is closed.

A LS signal is created through the orifice above the priority valve. The LS signal moves the spool downwards, passes through the LS check valve and from there to the hydraulic pump. Inside the steering valve the connection from the negative side of the piston to tank is established.

Steering function 4 (full lock, right)

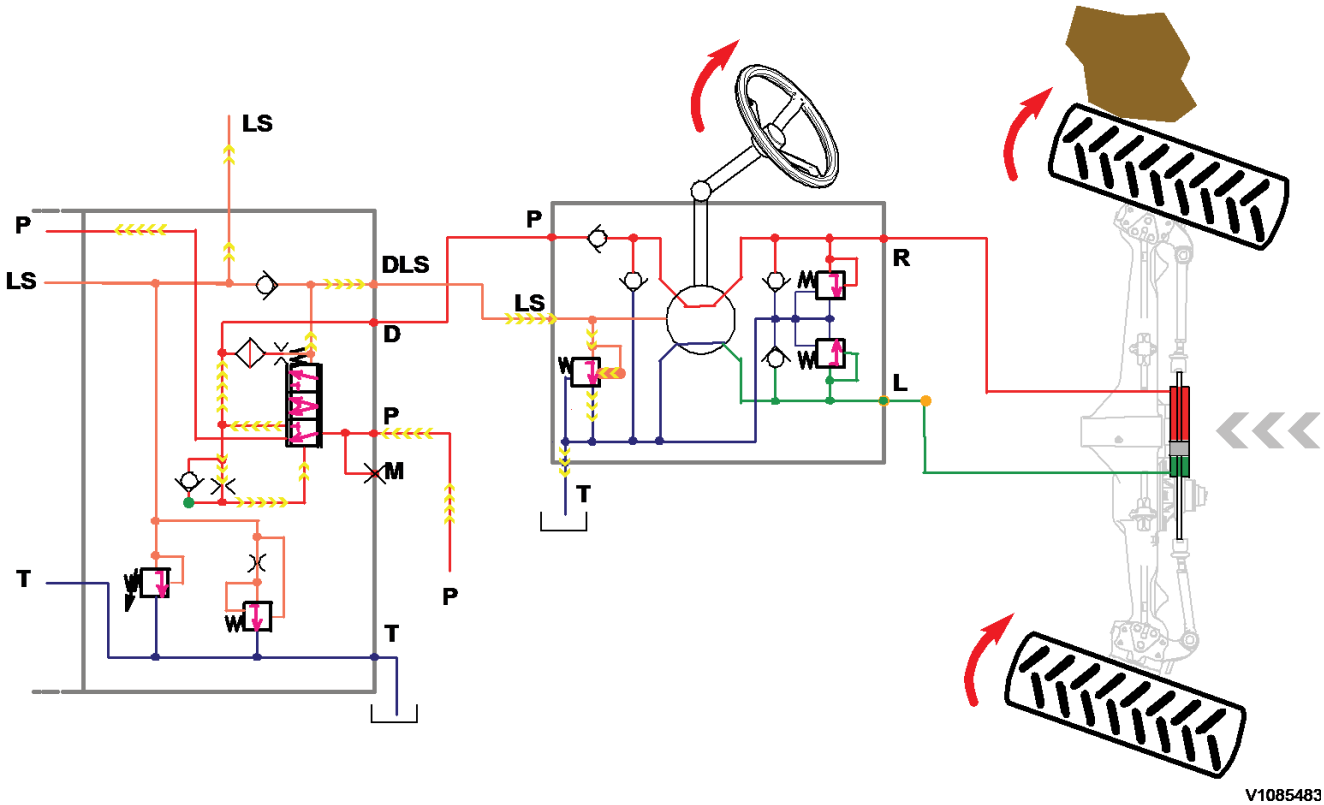
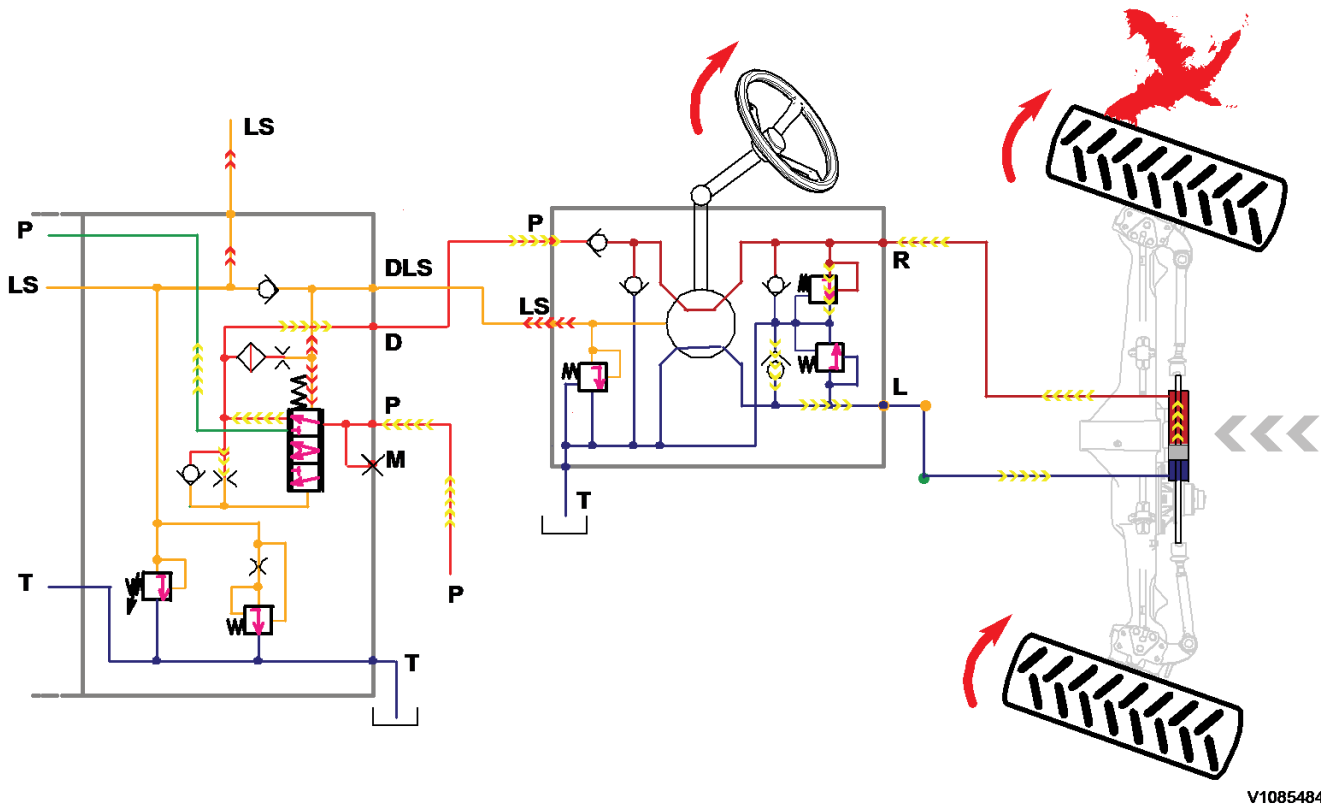


Figure 5
Steering function 4 (full lock, right)

When hitting an obstacle while steering, the LS pressure relief valve inside the ORBITROL opens at a predefined pressure. LS is connected to tank and in the priority valve the pressure on the upper side of the spool decreases. The pressure on the lower side moves the spool upwards and the spool cuts off the supply to the steering valve.

Steering function 5 (shock situation, right)



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Figure 6
Steering function 5 (shock situation, right)

When a shock situation occurs while steering, the corresponding shock valve opens. Additionally the regeneration valve opens to make-up the negative side of the steering cylinder. The check valve in the pressure line prevents the over pressure from entering the whole system

Document Title: Steering, troubleshooting	Function Group: 600	Information Type: Service Information	Date: 2014/3/13
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Steering, troubleshooting

Problem	Cause	Action
No steering or excessive effort required to steer	Incorrect oil level in reservoir	Fill with the correct grade and quantity of oil
	Air in system	Check for loose connections or damaged tubing. Purge system of air
	Pump relief valve faulty	Check system pressure
	Worn pump	Inspect and repair
	Leaking power cylinder	Inspect and repair
	Damaged valve spool	Inspect and replace
	Broken or damaged steering column	Inspect and replace
	Damaged or worn metering element	Inspect and replace
Steering wanders	Excessive play in steering linkage ball joints	Inspect and replace
	Leaking power cylinder	Inspect and repair
	Control valve spool sticking or worn	Inspect and replace
	Damaged or worn metering element	Inspect and replace
Front wheels surge when steering	Leaking power cylinder	Inspect and repair
	Control valve spool sticking	Inspect and repair
	Damaged or worn metering element	Inspect and replace
Noisy pump	Incorrect oil level in reservoir	Fill with the correct grade and quantity of oil
	Air in system	Check for loose connections or damaged tubing. Purge system of oil
	Water in oil	Drain and replace the oil
	Worn pump	Replace pump

Document Title: Steering system, function check	Function Group: 600	Information Type: Service Information	Date: 2014/3/13
Profile: BHL, BL70B [GB]			

Steering system, function check

Op nbr 600-001

After repair work has been completed in any of the system related hydraulic circuit, a function check must be performed as described below:

Preconditions

- Function test must only be done within an area where it cannot cause accidents, neither to people nor to other things.
- Function test must be done on dry horizontal asphalt, dry horizontal concrete or similar horizontal surfaces.
- Machine must not be loaded.
- Door must be closed and fasten seat belt before driving and operating the function.

1. Start the engine and lift the front axle so that the wheels are off the ground and can be turned freely.
2. Operate the steering wheel several times left and right in order to bleed the steering hydraulic circuit after repairs.
NOTE!
During this step do not move the steering cylinder to end positions in order to prevent high pressure.
3. Ensure that the wheels turn left while turning the steering wheel to the left. Check the same operation for the right side. Turn the steering wheel in both directions until the steering cylinder extend completely and the steering cylinder retract completely. The extension as well as the retraction of the steering cylinder must be smooth and regular.
4. Check the steering pressure, see section [645 Steering system working pressure checking](#).
5. Operate the machine in forward direction in 1. gear and check the steering function again.
6. Listen for noise from the hydraulic/steering system.
7. Inspect the steering system for leaks and damaged components.

NOTE!

When operating the machine always observe the valid local traffic and safety regulations and, if necessary, make sure beforehand that the machine is in a condition compatible with these regulations.

Document Title: Steering axle and swivel-joint, description	Function Group: 622	Information Type: Service Information	Date: 2014/3/13
Profile: BHL, BL70B [GB]			

Steering axle and swivel-joint, description

The front axle is the steering axle.

The ball joints are providing the movement of the steering cylinder rod to the swivel-joints. Each swivel-joint pivots on the upper and lower king pins.

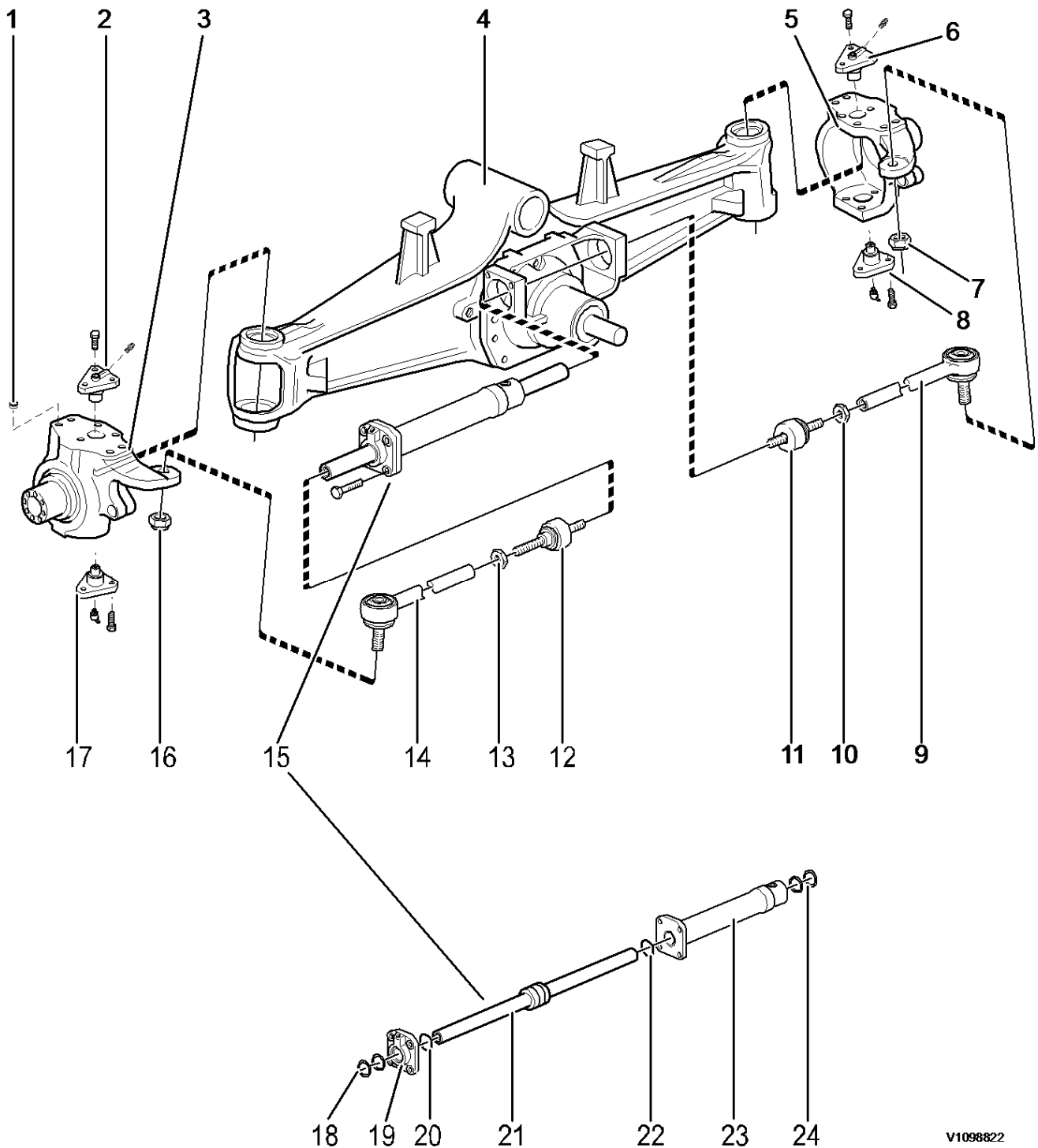


Figure 1
front axle, steering components

Front axle, steering components					
1	plug	9	tie rod	17	lower king pin (with screw and greasing nipple)
2	upper king pin (with screw and greasing nipple)	10	lock nut	18	O-rings
3	swivel housing, left	11	ball joint	19	cylinder head
4	front axle	12	ball joint	20	seal
5	swivel housing, right	13	lock nut	21	cylinder rod
6	upper king pin (with screw and greasing nipple)	14	tie rod	22	seal
7	nut	15	steering cylinder assembly	23	cylinder housing
8	lower king pin (with screw and greasing nipple)	16	nut	24	O-rings

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