

Document Title: Hydraulic description	system, 900	Function Group:	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]				

Hydraulic system, description

See [990 Hydraulic diagram, complete](#).

The hydraulic system consists of five [1] ⓘ respectively six [2] ⓘ hydraulic pumps, piston type pumps with continuously variable displacement. There are two (1) respectively three(2) pumps for the steering and dumping systems, two for fan drive and one ground dependent hydraulic pump on the dropbox. The ground dependent pump delivers oil via a non-return valve to the hydraulic system when the machine is moving forward.

The dumping system is connected in parallel and series with the steering system, and have common hydraulic pumps. However, the steering system has priority over the dumping system to safeguard the steering function at all times. When only dumping, all pumps (except ground dependent pump) provide flow to the dumping system, When steering, a hydraulic pump is connected directly to the steering system, and thus, it is possible to steer and dump at the same time.

Speed control of the fans takes place via a control valve on the pumps, which receives signals from the vehicle electronics. The electronics sense the temperature in the various cooling systems and variably adjusts the fan speed between base speed and max. speed. This is controlled electrically. In case of missing signal from the electronics, the fans are controlled to max. speed. See further in Section 2 and 3.

The dumping system is servo-operated and is controlled with hydraulic oil from the dumping valve. The dump lever has four positions: lower with pressure, lower/float, hold and dump. The lever has fixed positions in lower/float or hold. When the current is cut off or the operator leaves the operator's seat, the lever automatically goes to the hold position. The lever can be locked in the hold position with a lock device.

The dumping valve is a load-sensing 4-way valve. The valve slide has four positions: lower with pressure, lower/float, hold and dump. Operation of the dumping valve can be forced (lower/float position) using an adjusting screw at one end if there is no servo pressure for the dump lever. See [951 Dump body alternative, lowering.](#)

Both hoist cylinders are of single-stage double-acting type.

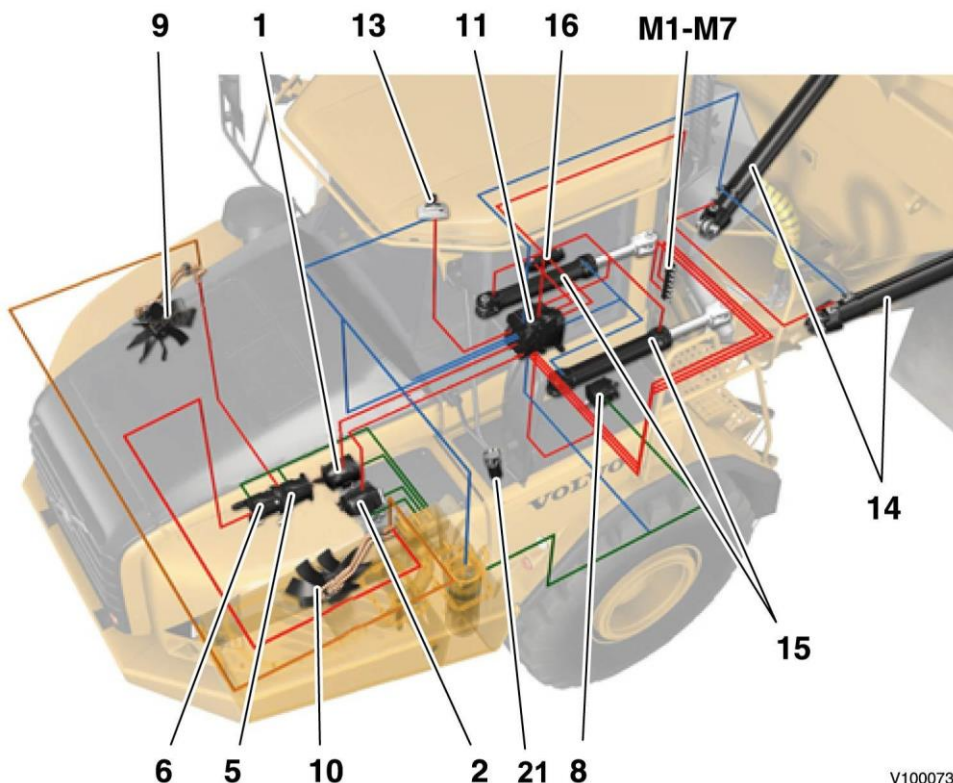


Figure 1
Hydraulic system, overview

The list is according to [990 Hydraulic diagram, complete](#)

1. Hydraulic pump, engine dependent for steering and dumping systems
2. Hydraulic pump, engine dependent for steering and dumping systems
3. –
4. Hydraulic pump, engine dependent for steering and dumping systems
5. Hydraulic pump, engine dependent for intercooler fan motor
6. Hydraulic pump, engine dependent for radiator fan motor
7. –
8. Hydraulic pump, ground dependent for steering
9. Fan motor, intercooler
10. Fan motor radiator
11. Steering and dumping valve
12. –
13. Dump lever
14. Hoist cylinders
15. Steering cylinders
16. Damping cylinder, steering

21. Pressure filter between fan motor and ground dependent pump

M1–M7 Pressure check connections 1–7

[1]Applies to machines from and incl. serial number: EU A25D 11731–, A30D 10369– Brazil A25D 71001–, A30D 70001–

[2]Applies to machines from and incl. serial number: EU A25D –11730, A30D –10368 US A25D –61118, A30D –60093

Document Title: Hydraulic and servo systems, description	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Hydraulic and servo systems, description

Dump lever

The steering and dumping valve includes a pressure reducing valve (R35), see [990 Hydraulic diagram, complete](#). R35 reduces the pressure from the hydraulic pumps to a servo pressure up to the dump lever.

There are two valves in the dump lever, one for dumping and one for lowering. Depending on the position of the dump lever, the position of the valves changes and required servo pressure is delivered out to both ends of the dumping slide, which then changes position.

The dump lever has four positions:

- Lower with pressure
- Lower/float (operating position)
- Hold position
- Dumping position

In lever position "hold", both valves in the dump lever are unaffected.

For more information about the dump lever and its function, see [914 Dump lever, description](#) and [990 Hydraulic pressure, specifications](#).

Document Title: Hydraulic oil, description	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Hydraulic oil, description

The machine is standard-equipped with mineral-based hydraulic oil and bio-oil is available as an option.

The hydraulic oil contains selected additives that give good oxidation stability, good corrosion protection and good lubricating characteristics.

Document Title: Hydraulic oil, storing and handling	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Hydraulic oil, storing and handling

- Hydraulic oil should be stored in tightly sealed tanks or barrels.
- Only containers intended for transport of hydraulic oil may be used for this purpose.
- Hydraulic oil should be stored indoors or in temperature-controlled facilities. If hydraulic oil is stored outdoors, the barrels should be stored horizontally to prevent penetration of water and eradication of barrel markings.
- In order to avoid condensation, oil should not be stored in temperatures above 60 °C (140 °F), or be exposed to intense sunshine or cold temperatures.

Document Title: Hydraulic components, cleanliness when handling	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Hydraulic components, cleanliness when handling

WARNING

Hot hydraulic oil and hydraulic oil under pressure may result in severe personal injuries

NOTICE

It is very important to keep the hydraulic system free from any impurities, as these can cause abnormal wear and may lead to expensive downtime. Greatest possible cleanliness should be maintained during all handling of hydraulic components and hydraulic oil.

NOTE!

A vacuum pump should be used for work on the hydraulic system in order to avoid oil spills.

Document Title: Hydraulic system, repair of hydraulic components in workshop	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Hydraulic system, repair of hydraulic components in workshop

- Always wear clean coveralls and maintain strict personal cleanliness.
- Work with hydraulic components should be performed separate from other work in the shop, in a so-called "clean room". The room should have good ventilation and the floor should be coated with a binding material. Machining, grinding, etc. must not be performed in the "clean room".
- The workplace should be equipped with thoroughly cleaned tools and suitable containers for cleaning hydraulic components.
- Containers used for cleaning hydraulic components must not be used for other cleaning. The containers should be cleaned often and filled with new fluid.
- Clean all components that are going to be handled in the "clean room". Do not use caustic soda solutions or similar, which will result in corrosion.
- Always plan work on the hydraulic system so that it can be completed without long interruptions.
- When cleaning during repairs – use dry and clean compressed air for drying, not rags.
- When work is completed, always plug components with clean plastic plugs of suitable dimensions and package them.
- When cleaning the "clean room" – use methods that do not stir up dust and dirt.

Document Title: Hydraulic components, storage and transport	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Hydraulic components, storage and transport

- All hydraulic components should be stored in plastic bags or plastic foil and they should be plugged. The packaging must not be opened until the component is to be used.
- Service vehicles should be equipped with an interior which facilitates good order and cleanliness.
- Each service vehicle should have a roll of plastic foil, plastic plugs of the most common dimensions and plastic containers for components. Plugs and foil should be of the disposable type, that is, for one-time use only.

Document Title: Pressure build-up, engine-dependent description	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Pressure build-up, engine-dependent pumps, description

The pumps are numbered according to the inputs to the steering and dumping valve.

The engine is running and the machine is parked.

The figures in the text below refer to the [990 Hydraulic diagram, complete](#)

The engine-dependent hydraulic pumps draw hydraulic oil from the hydraulic tank and build up a pressure to the steering and dumping valve **11** (neutral position). The pumps are connected with each other via ducts in the steering and dumping valve. Pump 2 is in contact with the dumping valve spool through the "open centre" of the steering valve spool, but when the steering spool is drawn from its neutral position BV2 prevents the oil flow from pump 2 from going to the dumping function. In this way the steering is prioritised. All oil from pump 2 then goes to the steering. The remaining engine-dependent pumps are in direct connection (past the steering valve spool) to the dumping valve spool and pressure reducing valve R35 for servo pressure to dumping control **13**.

Pressure is built up to the steering and dumping valve and its non-return valves. The pump compensator valve is acted upon through the pump's internal ducts and the pump angles downwards. Stand-by pressure now exists at the valve. The pressure in this phase is approx. **1.6 MPa (16 bar) (230 psi)** and is only determined by the spring force in the compensator valve as no pressure from the steering system to the compensator LS-connection is obtained yet.

In neutral position the steering and dumping valve permits a small controlled oil flow between its connection P2 and the connections A and B to the steering cylinders. An equal oil flow is also permitted between the connections A – B and connection T4 for the tank line. The pressure is built up to the steering cylinders **15**, the damping cylinder **16**, the shock valves CHV1 and CHV2 with anti-cavitation valves and the cross-over valves VV1 and VV2. The steering is stabilised by pressurising the steering cylinders.

Pressure is also built up via the non-return valves BVLS1, BVLS2 and BVLS5 to output C2 and the compensator LS-connection on the engine-dependent pumps. The pressure in the pumps rises to a corresponding degree. At the same time oil is forced out from the steering and dumping valve connections A and B via back-pressure valve (MTRV1) against its spring force of approx. **1.8 MPa (18 bar) (260 psi)** to its connection T4 and is returned to the tank.

Pressure is also built up via BVLS3 and BVLS4 when oil is forced out from the steering and dumping valve connections B1- and A1+.

The neutral position pressure at the outlet for the engine-dependent pumps is **3.5 ±0.5 MPa (35 ±5 bar) (510 ±73 psi)**, which is the total of the LS-pressure (MTRV 1's spring force) **1.8 MPa (18 bar) (260 psi)** and the spring pressure in the compensator valve **1.6 MPa (16 bar) (230 psi)**.

$$P = C + F$$

P = pressure at pump outlet

C = pressure at LS-line

F = spring pressure in the compensator valve

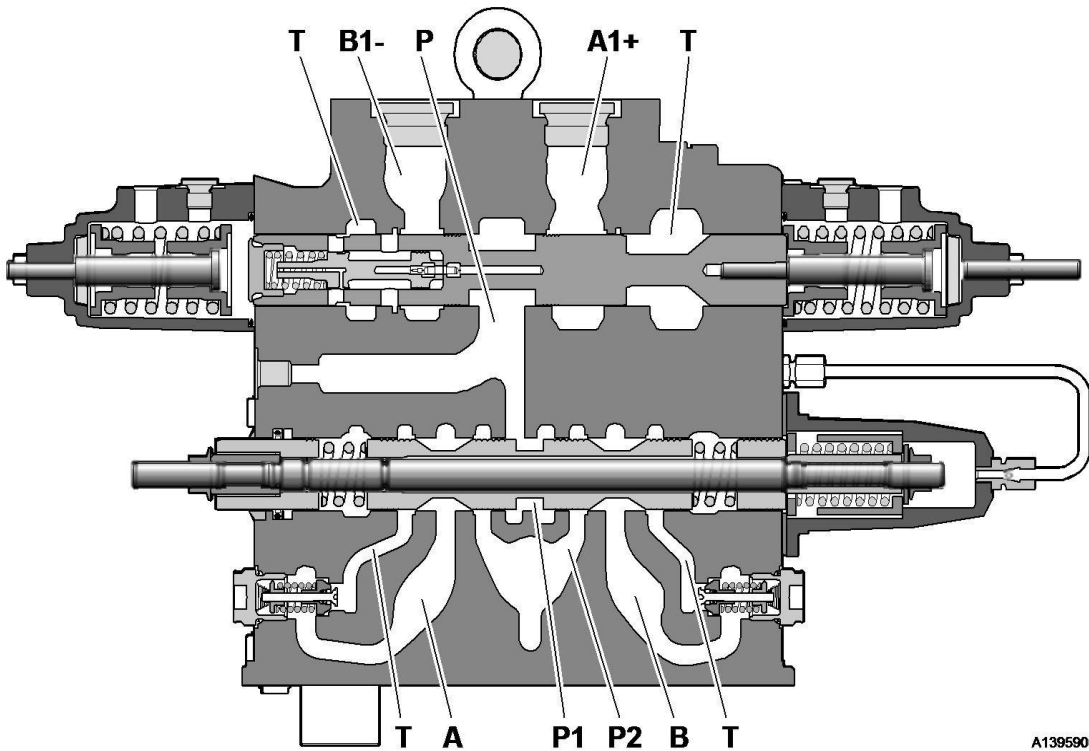


Figure 1
Steering and dumping valve connections

Pos	Description	Pos	Description
A	Connection to the steering cylinders	P	Pressure line
A1+	Connection to the hoist cylinders	P1	Pressure line
B	Connection to the steering cylinders	P2	Pressure line
B1-	Connection to the hoist cylinders	T	Connection to the tank

Pressure build-up, ground-dependent pump 8

The engine is running and the machine moves forwards. The engine-dependent pumps and the ground-dependent pump use common LS-pressure. The operation of the ground-dependent pump 8 is directly connected to the wheels via the drivetrain to the dropbox power take-off. When pump 8 rotates in the correct direction (the machine is driven forwards) pressure is built up to non-return valve BV4 in the steering and dumping valve. The pump's compensator valve is acted upon via internal ducts and the pump angles down as no oil flow arises. The same neutral position pressure now exists at the outlet of all of the pumps.

Steering function, engine-dependent pumps

The steering valve spool is displaced inwards and the connections P1– P4 from the pumps (also pump 8) are now in connection with the steering cylinders via connection A. Pressure is built up in the cylinders' A-connection and the pistons are acted upon on the plus side and minus side respectively. Pressure is built up simultaneously via the cross-over valves VV1 and VV2 to damping cylinder 16 and to the valve spool end face. The valve spool is stabilised. The same pressure is now also in the LS-line to the compensator's LS-connection. The compensator valve is acted upon and adapts the flow of the pumps to existing requirements.

Pressure sensor SE9102 and pressure sensor SE9103, description of operation and checking

Hydraulic pressures are monitored electronically using pressure sensor SE9102 for the engine-dependent pumps and SE9103 for the ground-dependent pump. See also Section 3.

Restrictions C2 and C3 in load signal block 12

If leakage arises on the LS-line between C2 and the engine dependent pumps (indicator light for normal steering system not working lights up) then the LS-pressure to the secondary steering pump (ground-dependent) is maintained to some extent thanks to restriction C2. The secondary steering pump can thus supply the necessary flow to the steering valve.

The opposite applies for C3 if leakage arises on the LS-signal line between C3 and the secondary steering pump.

Load signal block 12

The function of this valve block is to select the highest LS–pressure from the dumping valve or the steering cylinders' A– or B–port to the LS–connection of the hydraulic pumps so that the pumps can angle out and give the requisite flow. There are also two restrictions in the block which drain the system's LS–pressure to the tank.

Anti–cavitation and pressure–limiting valves (shock valves) CHV1 and CHV2

In order to prevent under pressure or excessively high pressure peaks arising in the steering cylinders there are two anti–cavitation and pressure–limiting valves on **30 MPa (300 bar) (4350 psi)** in the steering valve.

Pressure-limiting valve (shock valve) CHV3

Reduces maximum pressure during active lowering to **3.8 MPa (38 bar) (550 psi)**. Prevents the load body from being lowered if for example the load body lock is not removed or prevents undesired pressure build-up in the cylinders if the dumping control is held back in the active lowering position after the cylinders are pushed together.

Non-return valve with back-pressure function, MTRV1

In order to ensure the re-filling of oil in the steering valve and the steering cylinders there is a non-return valve with back-pressure function **1.8 MPa (18 bar) (260 psi)** fitted in the steering and dumping valve. The function of MTRV 1 is also to build up the LS–pressure and the servo pressure.

Non-return valve with back-pressure function, MTRV2

In order to ensure the re-filling of oil in the dumping valve and the hoist cylinders there is a non-return valve with back-pressure function **0.2 MPa (2 bar) (29 psi)** fitted in the steering and dumping valve. MTRV 2.

Non-return valve function in the steering and dumping valve

The function of the non–return valves BV1, BV2, BV3 and BV4 in the steering and dumping valve is to distribute the oil from the hydraulic pumps to the steering valve spool.

See also [990 Hydraulic diagram, complete](#).

Document Title: Troubleshooting tips	Function Group: 900	Information Type: Service Information	Date: 2014/8/21
Profile: ART, A30D [GB]			

Troubleshooting tips

Symptom	Probable cause	Troubleshooting	Action
Noise from engine dependent pumps and foaming oil	Insufficient oil supply.	Check oil level and that correct oil quality is used, no water or impurities in oil.	Fill or change hydraulic oil.
	Clogged breather filter on tank.		Change filter
	Hydraulic pump breakdown		Change pump and clean hydraulic system. See 913 Hydraulic pump, changing
	Hydraulic pump draws air	Check the suction lines and their connections.	Change lines and tighten connections.
Dumping is slow.	Incorrect stand-by pressure at low rpm.	Check pressures in M2.	913 Hydraulic pump, checking and adjusting See standby pressure
	Incorrect max. pressure	Check pressures in M2.	See 913 Hydraulic pump, checking and adjusting max working pressure
	BVLS1 or BVLS2 non-functional	Check max. pressures in M2 when steering right and left. If the pressures are different, probable cause is defect of either BVLS1 or BVLS2	Remove and check BVLS1 and BVLS2. See 912 Steering and dumping valve, removed, reconditioning
Poor or no function of dump lever	Dump slide binding.	Check pressures in M4 and M5	Low or no pressure, see below. At normal pressure, check that the dump slide isn't binding.
	Neutral position pressure too low.	Check pressures in M2 and M7. See 910 Pressure check connections, description	Remove and check MTRV1's function. See 912 Steering and dumping valve, removed, reconditioning
	Servo pressure too low.	Check pressure in M6	Remove and check function and classification of R35. See 912 Steering and dumping valve, removed, reconditioning
	Impurities in system.	Check and clean restriction on the dump lever's P-connection.	See 914 Dump lever, changing

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Hydraulic system, bleeding

Op nbr 91002-3

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Transparent hose of suitable size

Bleed according to the following when work has been performed on the hydraulic pumps' suction side.

CAUTION

Maintain greatest possible cleanliness during all work on the hydraulic system.

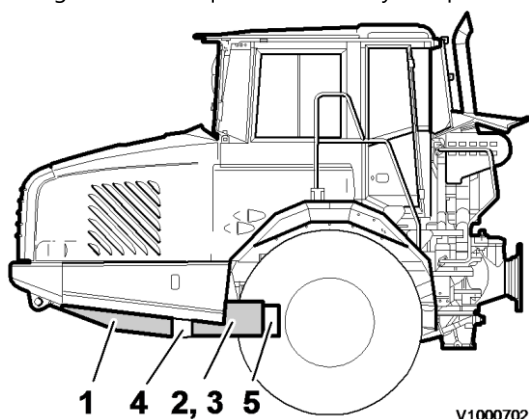
- Wipe off pipe and hose connections and remove any flakes of paint, etc., before disconnecting.
- Plug all pipes, hoses, cylinders, etc., after disconnecting them and never connect an unplugged hose without first flushing it clean with hydraulic oil.

Always fill hydraulic oil through the hydraulic system return oil filter, where the oil is filtered. Always check the level glass on the hydraulic oil tank in connection with an oil change.

WARNING

Risk of burns! Use protective work gloves.

1. Check the oil level, top up with oil if needed.
2. Swing down the required underbody skid plates.



V1000702

Figure 1

1. Front underbody skid plate
2. Rear underbody skid plate, left
3. Rear underbody skid plate, right
4. Front cross member

5. Rear cross member

3. Make sure that the shut-off valve on the hydraulic tank is open.

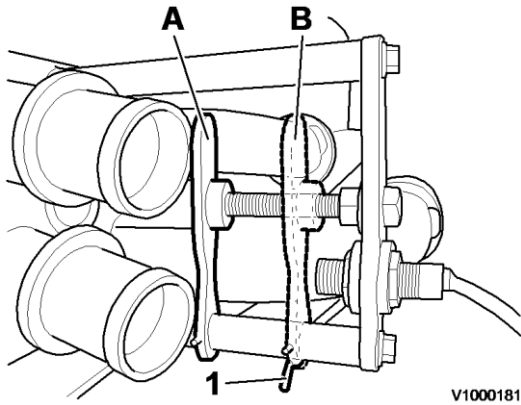


Figure 2
Shut-off valve

A. Closed
B. Open

1. Pin

4. Connect a transparent hose to the air bleeder nipple on the shut-off valve.

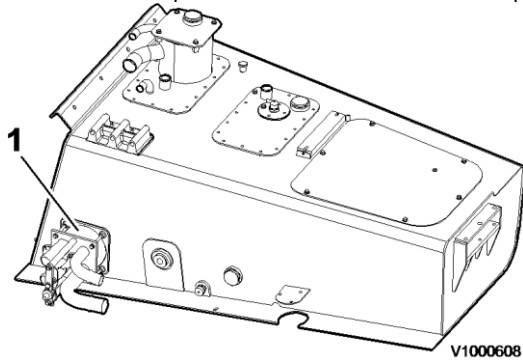


Figure 3
Tank with shut-off valve

1. Air bleeder nipple

5. Open the nipple, close when oil free of air flows in the hose.

6. Bleed air from the five engine dependent pumps, one by one, by connecting a transparent hose to the air bleeder nipple on the suction line to each respective pump. Open the nipple, close when oil free of air flows in the hose.

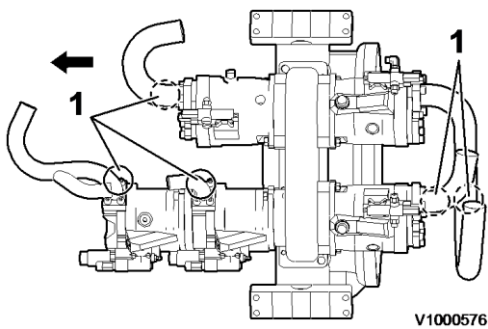


Figure 4
Air bleeder nipples, positions seen from below

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