

Document Title: Power Shift gearbox, HST-75	Function Group: 421	Information Type: Service Information	Date: 2014/3/21
Profile:			

Power Shift gearbox, HST-75

HST-75

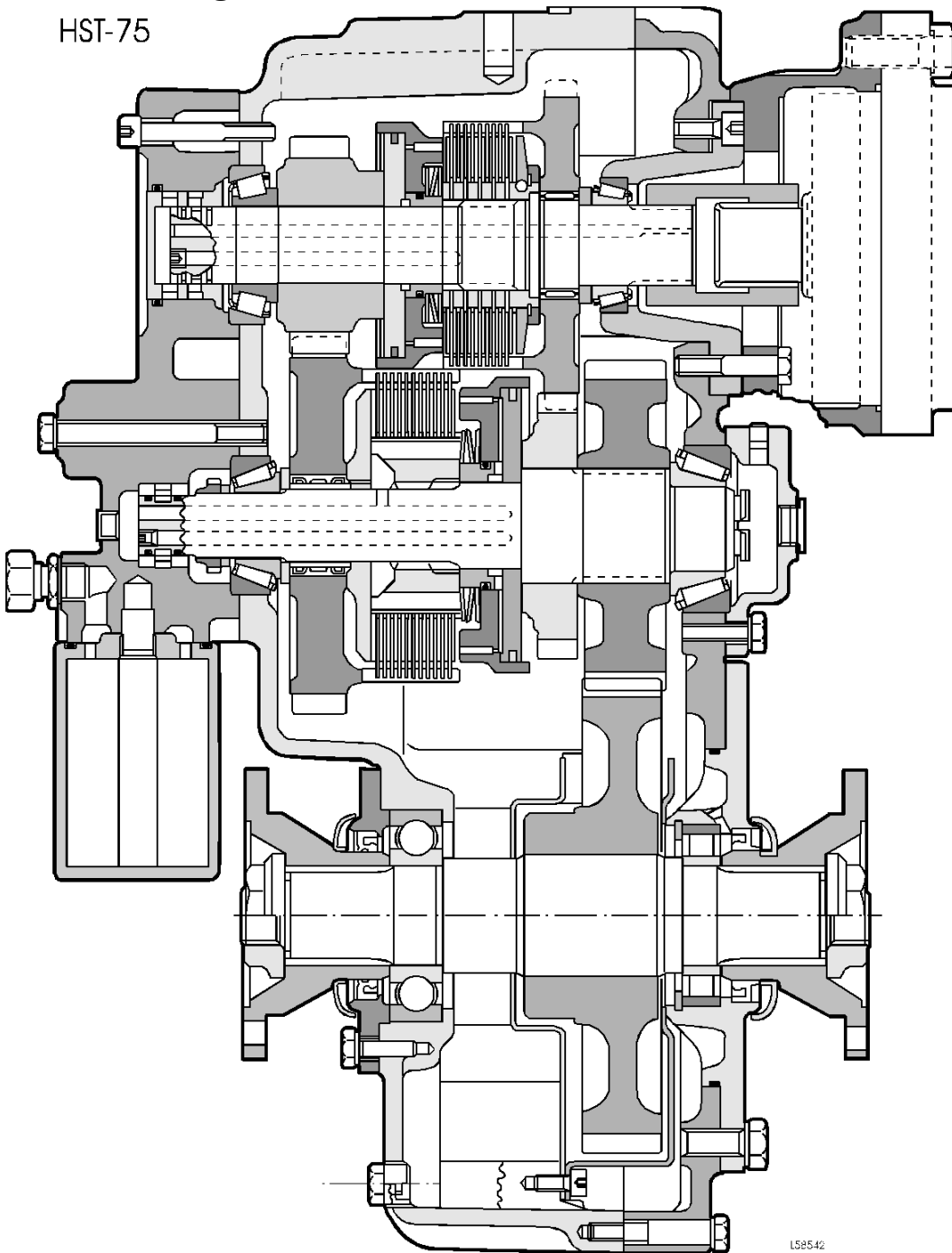
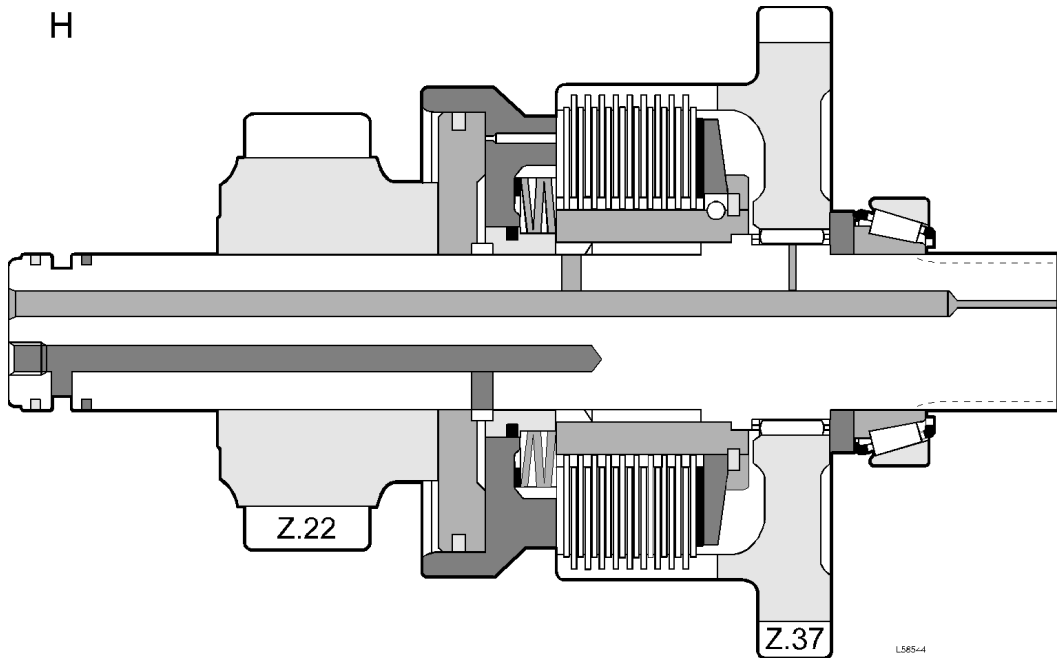


Figure 1

Document Title: Clutch shaft, high gear	Function Group: 421	Information Type: Service Information	Date: 2014/3/21
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Clutch shaft, high gear

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**Figure 1**

Document Title: Clutch shaft, low gear	Function Group: 421	Information Type: Service Information	Date: 2014/3/21
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Clutch shaft, low gear

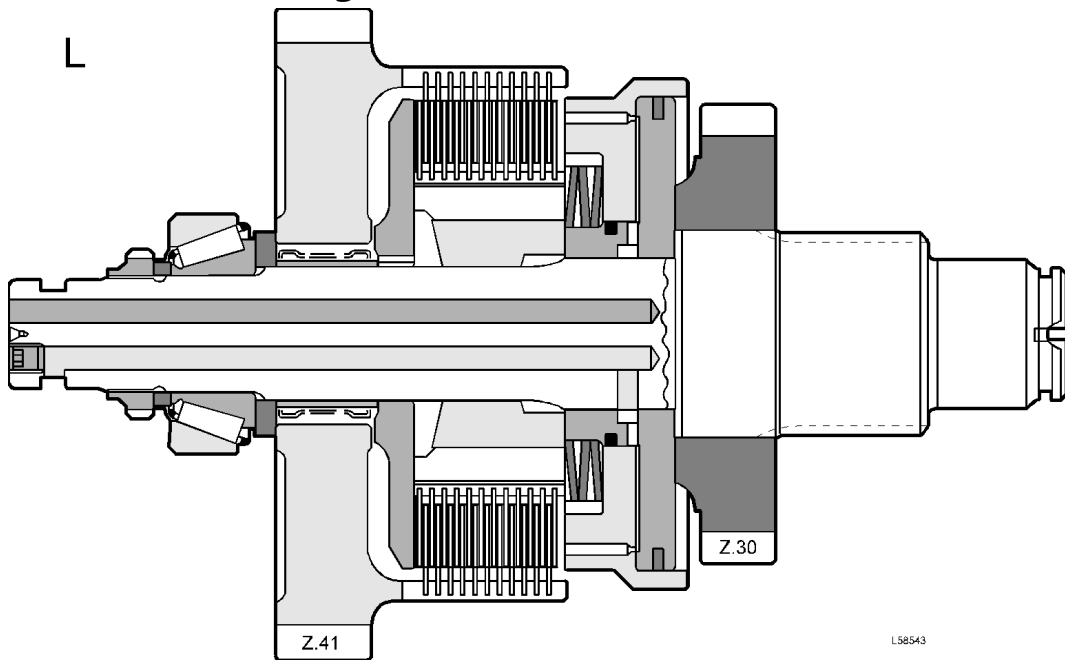


Figure 1

Document Title: Power shift gearbox, checking oil pressure	Function Group: 421	Information Type: Service Information	Date: 2014/3/21
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Power shift gearbox, checking oil pressure

Op nbr 42102

11 666 017 Pressure gauge 0-0.6 MPa (0-87 psi)

11 666 018 Pressure gauge 0-2.5 MPa (0-362 psi)

11 666 037 Hose, 2 pcs

The following applies when checking:	
Temperature:	Normal working temperature[T1] 
Rotational speed:	High idling speed
Clutch pressure, high/low gear:	2.00-2.15 MPa (20-21.5 bar) (290-312 psi)
Lube oil pressure:	0.03-0.05 MPa (0.3-0.5 bar) (4.4-7.3 psi)

[T1]Is reached after transport driving at max. speed for approx. 15 minutes.

Checking, clutch pressure, common pressure checking point

NOTE!

Gear selector valve with one pressure checking point used for both high and low gear, Fig. [Figure 1](#)

1. Remove pressure sensor SE12 and fit a pressure checking point. Connect hose and pressure gauge, see Fig. [Figure 1](#)
2. Move the gear selector control to neutral.
3. Start the engine and read off the pressure gauge at high idling speed.

NOTE!

Check both clutch shafts by shifting between high and low gear.

NOTE!

On machines equipped with Contronic electrical system (ECU) the transmission log should be set to zero after this check, because low oil pressure has been registered when the pressure sensor was been disconnected.

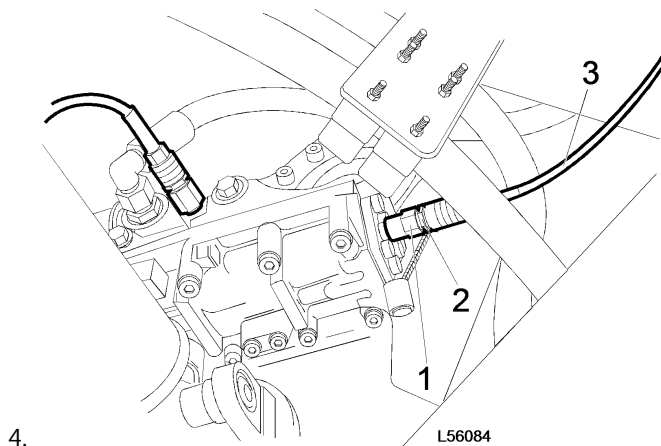


Figure 1

Checking clutch pressure

1. Adapter, (1/4" BSP female. - M10x1 male, part no. 1668067)
2. Pressure checking point, (1/4" BSP male, part no. 930032)
3. Hose 11 666 037 with pressure gauge 11 666 018

NOTE!

Gear selector valve with separate pressure checking points for high and low gear, Fig. [Figure 2](#)

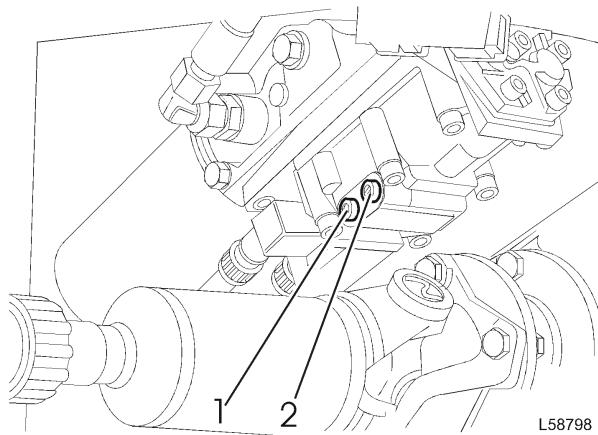
Use two adapters 1/4" BSP female — 10x1 male threads, part no. 1668067 and two pressure outlets 1/4" BSP male threads, part no. 930032.

Checking clutch pressure, separate pressure checking points

5. Remove the plugs, fit the pressure outlets and connect hoses and pressure gauges.
6. Place the selector control in neutral.
7. Start the engine and read off the pressure gauges at high idling speed.
Shift between high and low gear.
Check that no dragging (that is a clutch which does not disengage fully when it should do so) arises when shifting between high and low gear.

NOTE!

On machines equipped with Contronic electronic system (ECU), the transmission log should be set to zero after this check, as low oil pressure has been registered when the pressure sensor was disconnected.



8.

Figure 2
Checking clutch pressure

1. Checking point for clutch pressure, high gear
2. Checking point for clutch pressure, low gear

Checking, lubricating oil pressure

9. Remove the plug and fit an adapter and a pressure checking point. Connect hose and pressure gauge, see Fig. [Figure 3](#)
10. Start the engine and read off the pressure gauge at high idling speed.



11.

Figure 3
Checking lubricating oil pressure

1. Adapter, 2 pcs
(M16x1.5 male - M10x1 female, part no. 949513 and 1/4" BSP female - M10x1 male, part no. 1668067)
2. Pressure checking point (1/4" BSP male, part no. 930032)
3. Hose 11 666 037 with pressure gauge 11 666 017

Document Title: Description	Function Group: 440	Information Type: Service Information	Date: 2014/3/21
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Description

The L50B has a hydrostatic power transmission with a closed circuit.

In simple terms one can describe this as the torque converter being replaced by an hydraulic pump (hydrostatic pump) fitted on the diesel engine and an hydraulic motor (hydrostatic motor) fitted on a dual-range gearbox of the Power Shift type. The power is transmitted via hoses and at an oil pressure exceeding 40 MPa (400 bar) (5800 psi).

In the running text the hydrostatic pump is called the HS-pump and the hydrostatic motor is called the HS-motor.

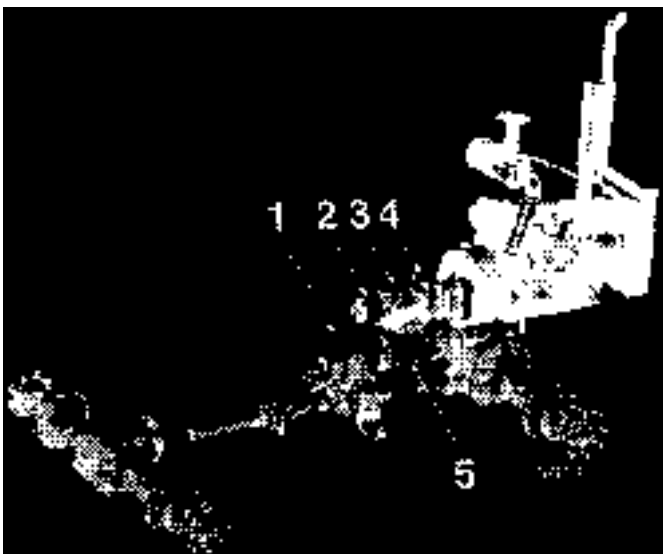


Figure 1

Hydrostatic power transmission

1. Power shift gearbox, HST-75
2. Pump for gearbox
3. Hydraulic oil pump
4. Hydrostatic pump
5. Hydrostatic motor

Advantages with hydrostatic power transmission

- The output from the diesel engine is more efficiently distributed between the drive line and the working hydraulics.
- The entire diesel engine output can be used for accelerating and for achieving a higher propulsion speed when driving uphill.
- The gearbox has only two mechanical ranges, high and low, where each mechanical range includes two hydraulic ranges in the HS-motor.
- With the max. displacement lock in the HS-motor engaged, the machine has very good off-road properties which allows the machine to "climb" over obstacles at a controlled speed.
- Very good hydrostatic engine braking properties which reduces the wear on the ordinary brake system.
- When stalled, the hydrostatic power transmission uses little power, which means that there is always a surplus of engine power for the working hydraulics.
- Low fuel consumption and low sound level.

Hydrostatic pump (HS-pump)

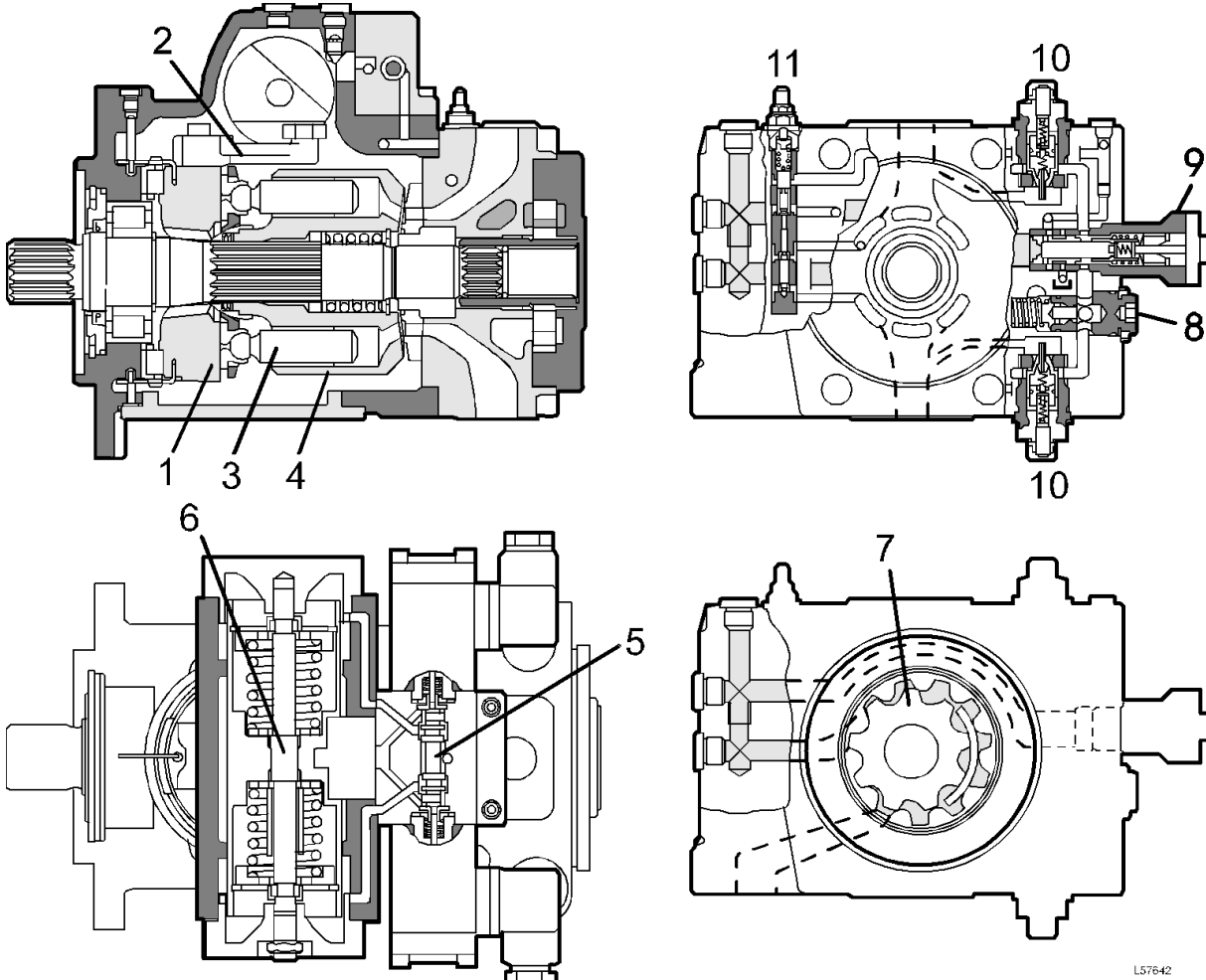
see Fig. [Figure 2](#)

The HS-pump is a nine-cylinder axial piston pump with a variable displacement. The yoke 1 is moveable and can be angled $\pm 15^\circ$ on either side of the neutral position. The yoke 1 is mechanically actuated by a lever 2 which is connected to the control piston 6.

The angle of the yoke determines the stroke of pistons 3. If the angle is increased, the stroke of the pistons will increase. When the yoke is in neutral position, the stroke is zero and consequently the displacement is zero.

If the yoke is angled from one side of the neutral position over to the other, the direction of the oil flow changes. This means that the machine can be operated both forward and rearward while the HS-pump rotates in the same direction.

The forward and rearward drive is operated electrically via the gear selector control. Signals are transmitted through the solenoid valves on the directional valve 5 which controls the oil pressure on control piston 6 which in turn can angle the yoke to a negative or a positive angle.



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Figure 2
Hydrostatic pump

1. Yoke
2. Lever
3. Piston
4. Piston drum
5. Directional valve, electrically controlled via MA82 or MA83
6. Control piston
7. Charge pump
8. Charge-pressure valve
9. Control valve
10. Shock valves with non-return valve function
11. Pressure cut-off valve

HS-pump component parts

See "Hydraulic diagram, hydrostatic drive" [Figure 3](#)

1	HS-pump, axial piston unit .
2	<p>Charge pump, of the crescent type, draws oil from the hydraulic tank which is common to the rest of the hydraulic system. The charge pump makes sure that there is always oil available at charge pressure by control valve 8 and the axial piston unit 1.</p> <p>The charge pressure passes through filter 3, which has a differential pressure sensor 4, which warns if the pressure drop across the filter becomes too great. When the filter is clogged, safety valve 6 opens and the machine cannot be operated.</p> <p>When starting in very cold weather, it may take a few minutes before the machine can be operated as the oil is viscous and must be warmed up before safety valve 6 closes. Sensor 5 warns if the charge-pressure is too low.</p>
7	Charge-pressure valve . Limits the charge pressure to the high-pressure circuit and directs the remaining flow via the pump housing to the HS-motor in order to dissipate heat from the HS-pump and to lubricate and add to the flow of cooling oil in the HS-motor.
8	Control valve , pressure/flow-controlled. Uses part of the flow from the charge pump 2 and directs it at a control pressure proportional to the diesel engine speed via the electrically controlled valve 9 to the control piston 10 . The control pressure is also conducted to and locks the brake defeat valve 19 on the HS-motor.
11	<p>The pressure cut-off valve limits the max. pressure from the HS-pump by draining the control pressure on the control piston 10 to the pump housing, thus reducing the displacement. The HS-pump maintains max. pressure but reduces the displacement which means that the pump requires less torque from the diesel engine while maintaining full pressure.</p> <p>This means that the machine, when stalled, has full pulling power at the same time as the diesel engine is not loaded. The shuttle valve selects the highest pressure regardless of whether the machine is operated forward or rearward.</p>
12	Shock valves with non-return valve functions. One for operating forward and one for operating rearward. The valves conduct high-pressure to the low-pressure side if pressure shocks arise and if the pressure cut-off valve 11 due to the dampening of the pump, is not quick enough in reducing the displacement.
13	<p>Excess pressure valve. Opens if the pressure in the pump housing exceeds approx. 2 bar (29 psi) in order to protect the seals against overloading.</p> <p>This happens when starting a cold machine when the oil is viscous.</p>

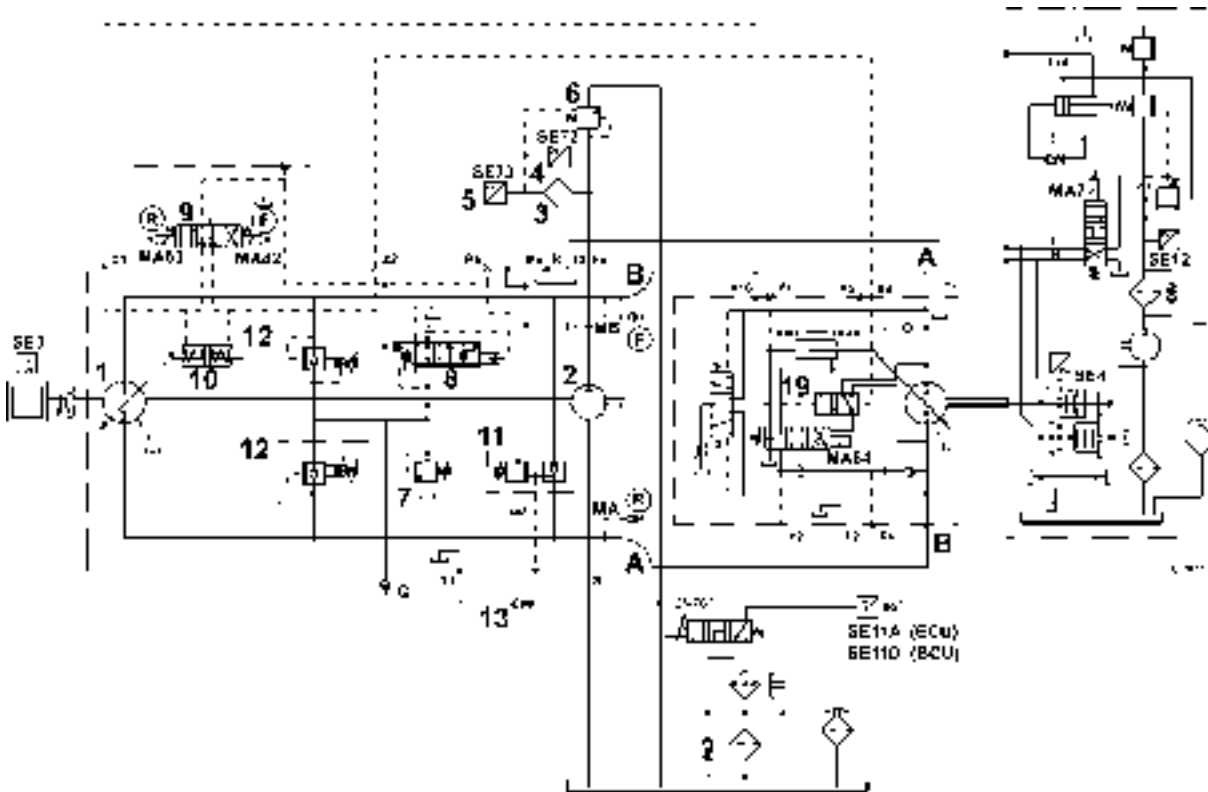


Figure 3
Hydraulic diagram, hydrostatic drive

Hydrostatic motor (HS-motor)

see Fig. [Figure 4](#)

The HS-motor is a nine-cylinder axle piston unit with variable displacement according to the "Bent Axis" principle. It can operate either as a pump or as a motor in a hydraulic system. In the L50B it is used as a motor.

The HS-motor is supplied with oil from the HS-pump. Through high pressure and displacement a conversion to a torque takes place. The magnitude of the output torque depends on the displacement and the pressure in the HS-motor.

Minimum displacement means that a small amount of oil is required to turn the HS-motor one revolution.

Maximum displacement means that the HS-motor "changes" down and requires a large amount of oil to turn the HS-motor one revolution, i.e. the pulling power of the machine increases.

The initial position of the HS-motor is normally always minimum displacement.

The displacement valve 3 is controlled by the high pressure from the HS-pump. When the pressure exceeds 25 MPa (250 bar) (3626 psi), e.g. when the bucket is forced into a gravel bank in order to fill the bucket, the displacement valve 3 opens and the oil pressure actuates control piston 4. The movement of the control piston is transferred mechanically through a pin to the axial piston unit 1 and the displacement increases to maximum.

During for instance off-road operation, one can lock the pump in the max. displacement position by activating solenoid valve MA84 on the displacement valve 3 with switch SW 113. This means that the machine can "climb" over obstacles at a controlled speed.

On machines provided with the Contronic system it is also possible temporarily to lock the HS-motor in the max. displacement position when an increased hydrostatic engine-braking effect is wanted. This is done by activating the spring-return switch SW 105 on the control lever carrier.

NOTE!

Temporary max. displacement locking should be used with caution until the operator has become familiar with the braking properties.

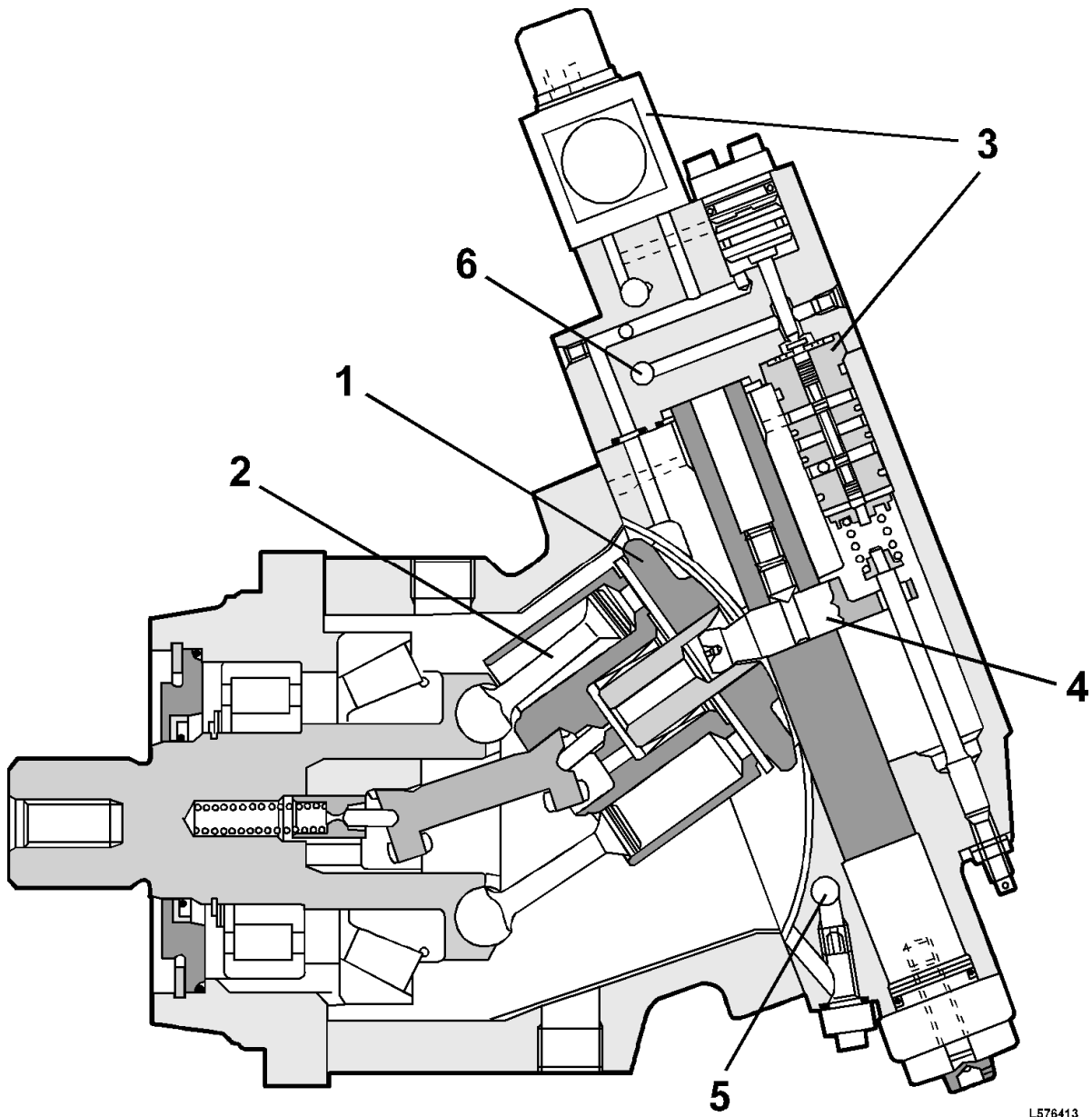


Figure 4
Hydrostatic motor (max.displacement)

1. Movable axial piston unit
2. Piston with piston rings
3. Displacement valve with electrically controlled max. displacement locking via MA84
4. Control piston with pin
5. Flushing valve
6. Brake defeat valve

Hydrostatic motor component parts

Fig. [Figure 5](#)

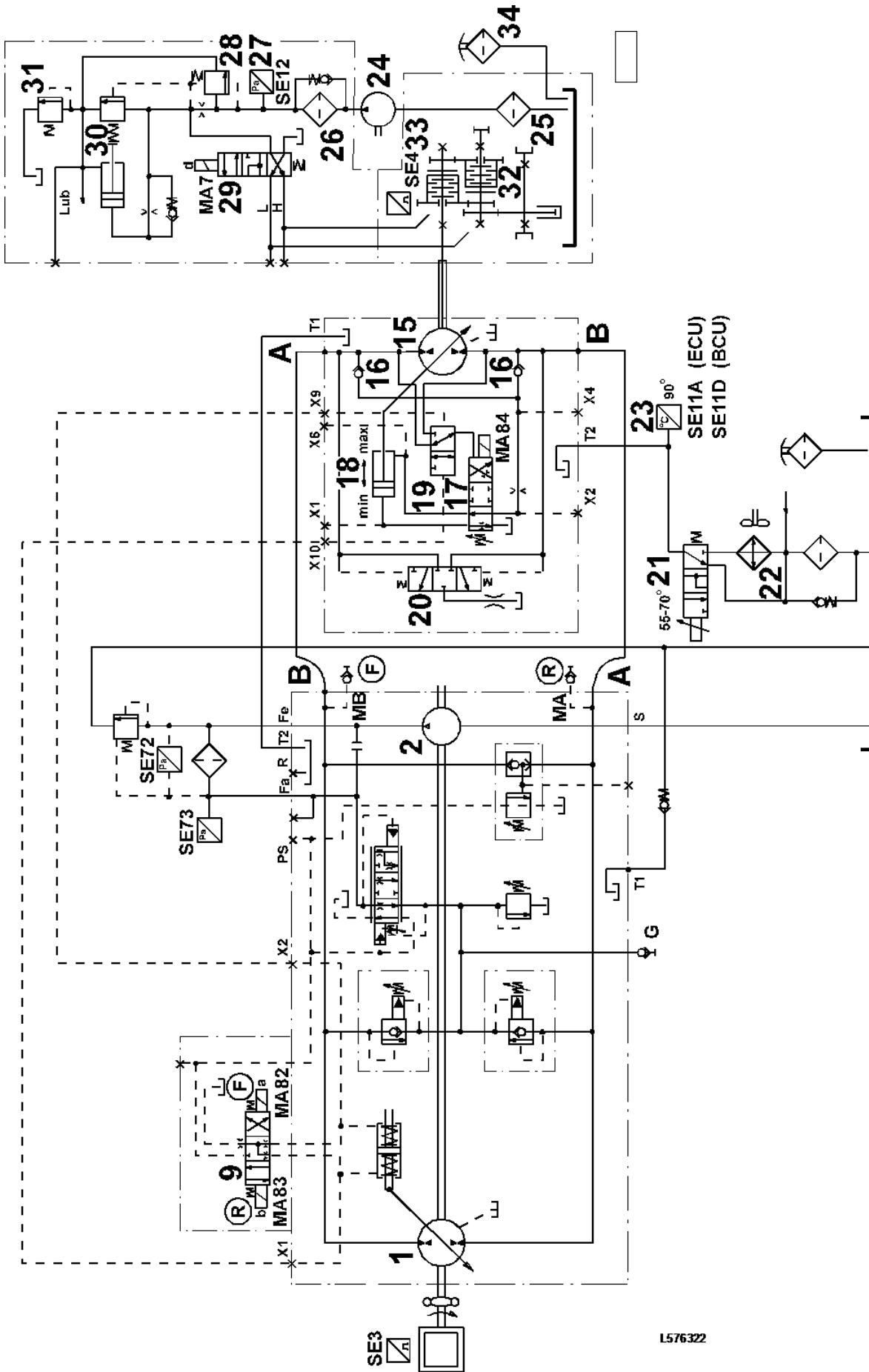
15	HS-motor axial piston unit .
16	Non-return valves . Admits oil from the high-pressure side to the displacement valve 17. The high-pressure side and the low-pressure side change when changing travelling direction. On the low-pressure side there is always oil at charging pressure supplied by the HS-pump charge pump 2.
17	Displacement valve . Controlled by the high pressure from

		the HS-pump and is used for changing from minimum to maximum displacement. Maximum displacement can also be obtained via solenoid valve MA84.
	18	Control piston. Controlled by pressure via the displacement valve 17. It changes the displacement mechanically through a pin which actuates the moveable axial piston unit 15.
	19	Brake defeat valve. Prevents an uncontrollable change of the displacement from minimum to maximum when driving down steep hills, as this would mean a risk of overspeeding the diesel engine. The break defeat valve is actuated by the control pressure from directional valve 9 on the HS-pump.
	20	Flushing valve. 20 Flushing valve. A high-pressure controlled spool which uses oil which has circulated in the high-pressure circuit. After the oil has passed the HS-motor it moves on to the flushing valve in order to dissipate heat from the HS-pump and to cool and lubricate the HS-motor. The oil flows from the HS-motor housing to the thermostat 21 and, depending on the temperature of the oil, continues directly to the tank or through the oil cooler 22 fitted by the engine radiator. The temperature sensor 23 (SE11A or SE11D) warns if the oil temperature is too high.

Power shift gearbox HST-75, component parts

Fig. [Figure 5](#)

	24	Gear pump. Supplies the gearbox with clutch pressure and lubricating oil pressure. The oil is drawn from the sump of the gearbox. The pump is fitted in tandem with the pump for steering, brake, servo and working hydraulics as well as the HS-pump.
	25	Suction strainer. This should be cleaned in connection with changing oil in the gearbox.
	26	Oil filter.
	27	Sensor, SE12. Warns if the clutch pressure is too low.
	28	Flow-limiting valve.
	29	Gear selector valve MA7, High/low gear.
	30	Pressure-control valve for clutch pressure. Consists of a modulator piston and a pressure-limiting valve.
	31	Lubricating-oil valve. 0.03 - 0.05 MPa (0.3 - 0.5 bar) (4.4 - 7.3 psi).
	32	Low gear clutch.
	33	High gear clutch.
	34	Breather filter.



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Figure 5
Hydraulic diagram, hydrostatisk drivning

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Hydraulic diagrams, hydrostatic drive

Neutral position

Neutral position	
Oil temperature:	below 55 °C

The charge pressure is conducted via the non-return valve function of the shock valve 12 in on both sides of the HS-pump 1 and HS-motor 15. There is no flow through the flushing valve 20. At an oil temperature below 55 °C (122 °F) the thermostat 21 directs the oil past the oil cooler 22 and through the filter to the hydraulic oil tank. The high gear clutch 33 is pressurised in the gearbox via the gear selector valve 29.

Hydrostatic system	
Green	= Suction/return, without pressure
Yellow	= Control pressure
Orange	= Charge pressure

Gearbox	
Red	= Clutch pressure
Green	= Suction/return, without pressure
Yellow	= Lubricating oil pressure

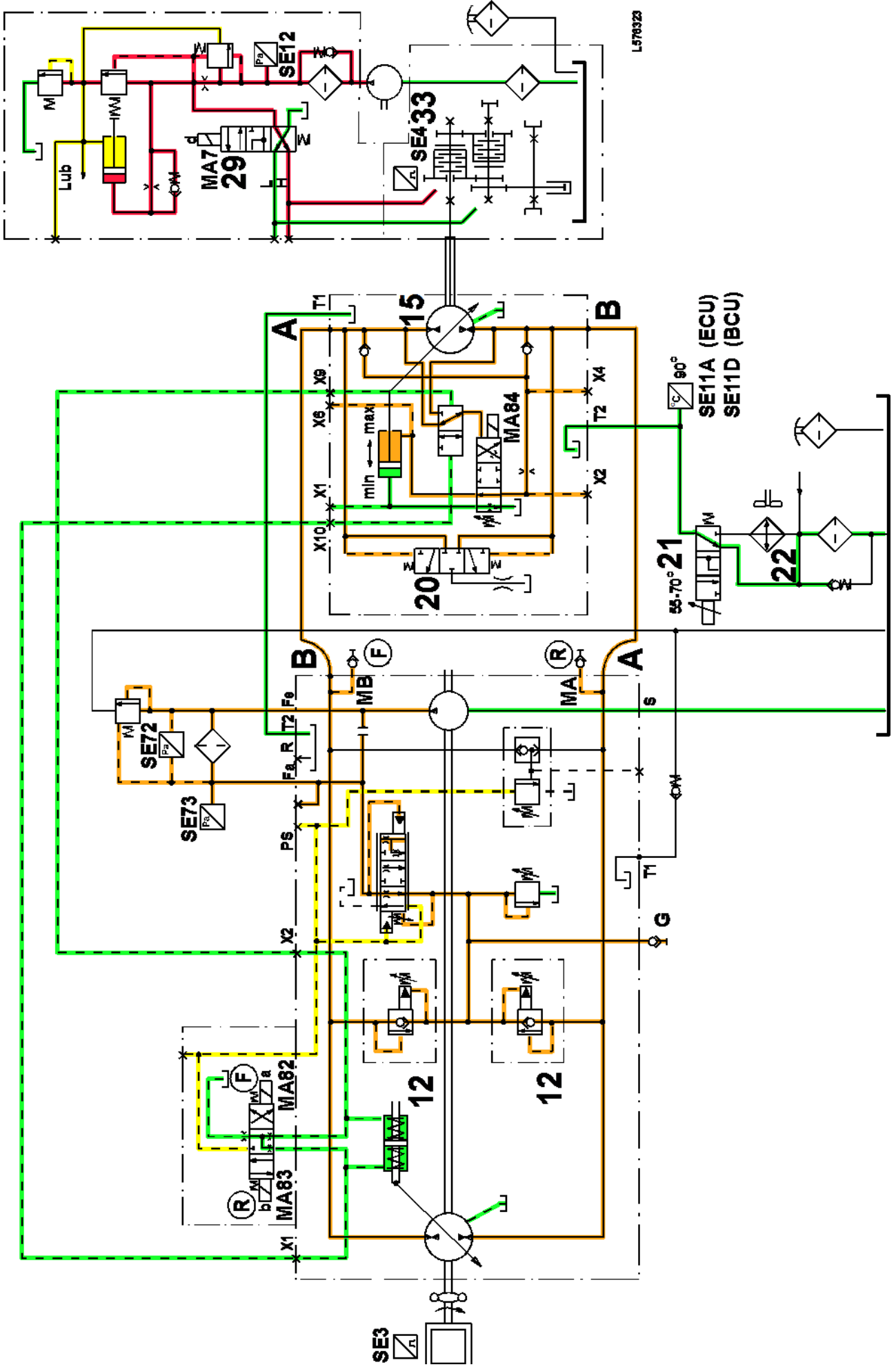


Figure 1

Hydraulic diagram, hydrostatic system

Neutral position

Oil temperature: below 55 °C

Operating forward in high gear

High pressure:	below 25 MPa (250 bar) (3626 psi)
Oil temperature:	60 °C

The charge pressure is directed via the non-return valve function of one of the shock valves 12 in at the low-pressure side and makes sure that the HS-pump 1 is supplied with oil which can be pressurised. The directional valve 9 is activated electrically via the gear selector control. The control pressure exerts a certain pressure on the control piston 10 so that the HS-pump supplies an oil flow proportional to the speed of the diesel engine.

The control pressure is also admitted to and locks the position of the brake defeat valve 19. The high pressure is supplied to the HS-motor 15 where the power is transferred to the gearbox. The high pressure also actuates the flushing valve 20 which opens and cools and lubricates the HS-motor with oil at charge pressure.

As the high pressure is below 25 MPa (250 bar) (3626 psi) the HS-motor is angled to the minimum displacement position. At an oil temperature of 60 °C (140 °F) or less, part of the oil flow is directed by the thermostat 21 through the oil cooler 22 and a part is directed past the oil cooler.

The high gear clutch 33 is pressurised in the gearbox through the gear selector valve 29.

Hydrostatic system	
Red	= High pressure
Green	= Suction/return, without pressure
Yellow	= Control pressure
Orange	= Charge pressure

Gearbox	
Red	= Clutch pressure
Green	= Suction/return, without pressure
Yellow	= Lubricating oil pressure

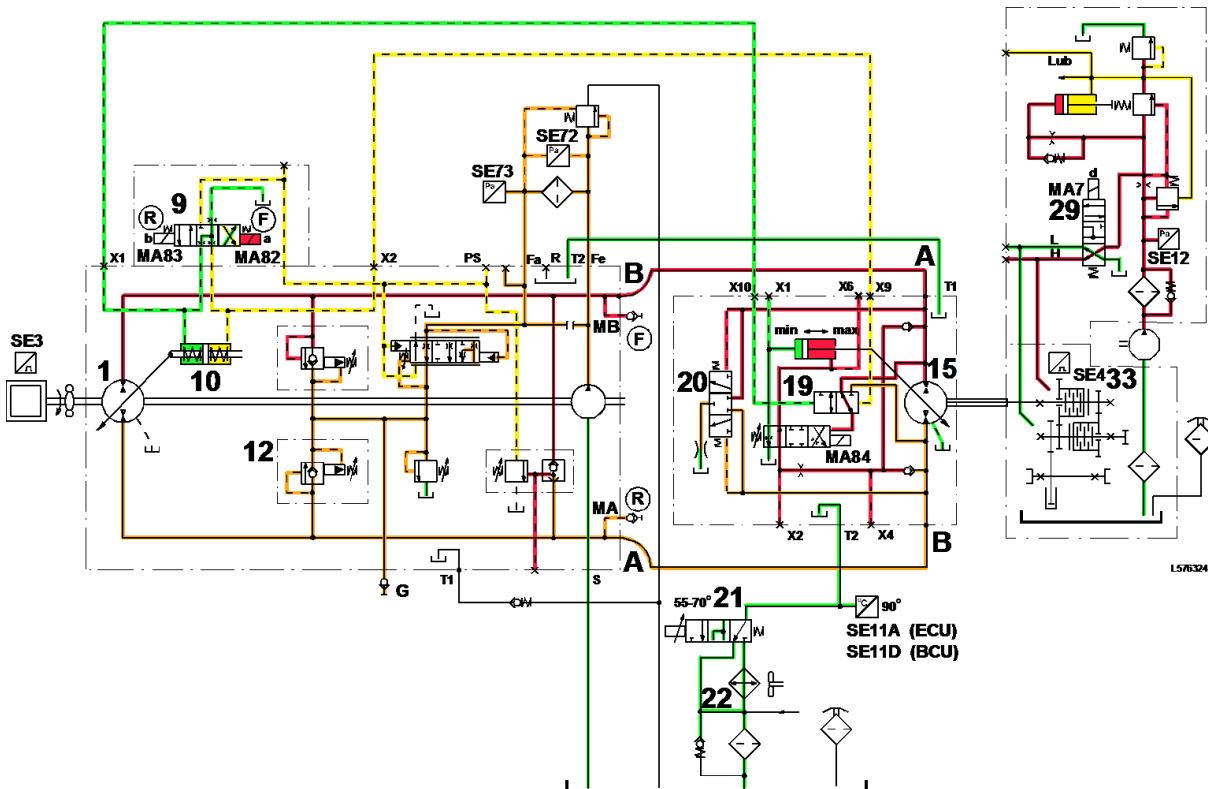


Figure 2

Hydraulic diagram, hydrostatic system

Operating forward in high gear

High pressure: below 25 MPa (250 bar) (3626 psi)

Oil temperature: 60 °C (140 °F)

Operating forward in low gear

High pressure:	above 25 MPa (250 bar) (3626 psi)
Oil temperature:	above 70 °C (158 °F)

The charge pressure passes via the non-return valve function of one of the shock valve 12 in on the low-pressure side and makes sure that the HS-pump 1 is provided with oil which can be pressurised. The directional valve 9 is electrically activated via the gear selector control. The control pressure then acts on the control piston 10 and the HS-pump supplies an oil flow proportional to the speed of the diesel engine.

The control pressure also enters the brake defeat valve 19 and locks it in position. The high pressure is supplied to the HS-motor 15 where the power is transferred to the gearbox. The high pressure also actuates the flushing valve 20 which opens and cools and lubricates the HS-motor at charge pressure.

As the high pressure is above 25 MPa (250 bar) (3626 psi) the displacement valve 17 opens and a smooth change to maximum displacement is achieved via the restrictions. The HS-motor "changes" down.

At an oil temperature of above 70 °C (158 °F) the thermostat 21 directs all oil through the oil cooler 22. The low gear clutch 32 is pressurised in the gearbox because the gear selector valve 29 has been electrically activated either through the handle SW 2B on the gear selector control having been turned to position L or because the kick-down function SW 2C has been activated.

Hydrostatic system	
Red	= High pressure

Green	= Suction/return, without pressure
Yellow	= Control pressure
Orange	= Charge pressure

Gearbox	
Red	= Clutch pressure
Green	= Suction/return, without pressure
Yellow	= Lubricating oil pressure

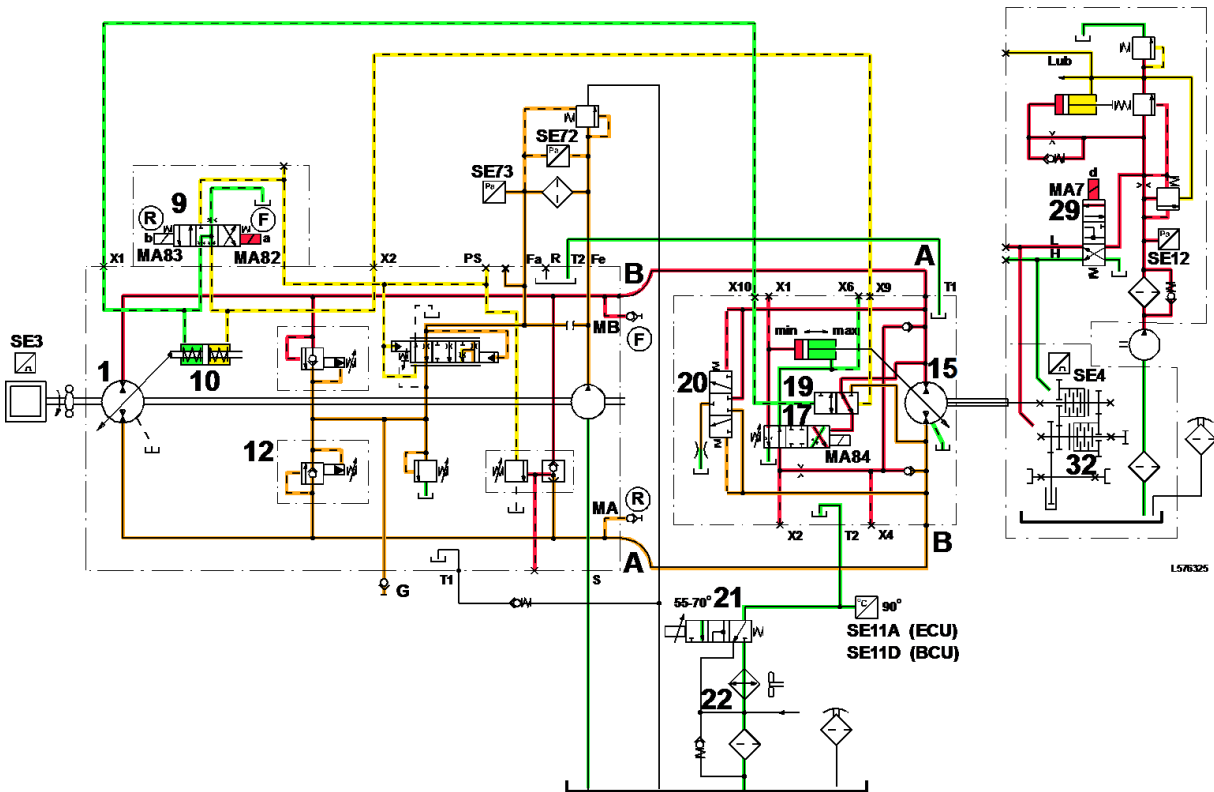


Figure 3

Hydraulic diagram, hydrostatic system

Operating forward in low gear

High pressure: above 25 MPa (250 bar) (3626 psi)

Oil temperature: above 70 °C (158 °F)

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Document Title: Repairing hydrostatic unit	Function Group: 440	Information Type: Service Information	Date: 2014/3/21
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Repairing hydrostatic unit

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When changing or repairing hydrostatic pump and/or hydrostatic motor, note the following:

NOTE!

When changing hydrostatic motor, it is supplied as spare part with a standard 36 mm (1.42 in) long adjusting screw. In order to comply with a maximum travelling speed of 30 km/h (18.6 mph), the fitted adjusting screw must be replaced by one which is 43.2 mm (1.70 in) long. Afterwards fit a new security seal, Fig. [Figure 1](#)

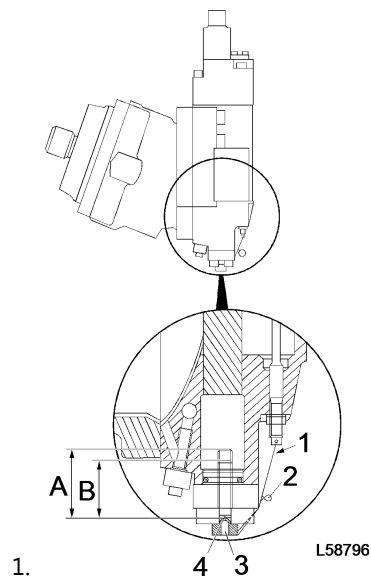
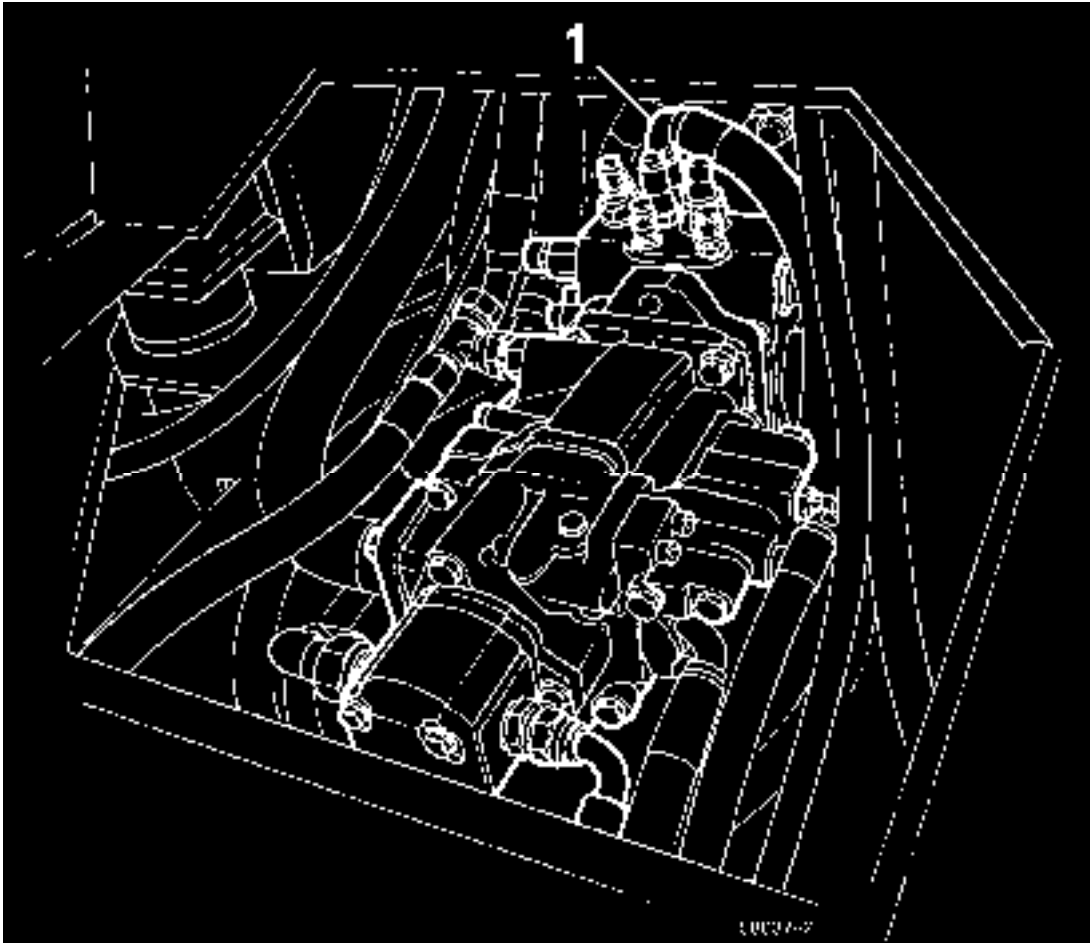


Figure 1
Hydrostatic motor

- A. Adjusting screw 43.2 mm part no. 3794598-7
- B. Adjusting screw 36.0 mm part no. 3796186-9

- 1. Locking wire
- 2. Security seal
- 3. Adjusting screw
- 4. Seal

- 2. Disconnect the line at connection T2 on the hydrostatic pump Fig. [Figure 2](#), fill the pump with oil Fig. [Figure 3](#) and then connect the line.



3.

Figure 2
Hydrostatic pump

1. Connection T2



4.

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Figure 3