

Document Title: <b>Hydraulic system oil contamination</b>	Function Group: <b>440</b>	Information Type: <b>Service Information</b>	Date: <b>2014/3/20</b>
Profile: <b>SSL, MC60B [GB]</b>			

## Hydraulic system oil contamination

### Microscopic Contamination

Microscopic contamination occurs when excessive fine particles of foreign material are in the system oil. These particulates are too small to see or feel.

Examples of contamination problems caused by excessive particulates would include the following:

- cylinder rod seals leak,
- control valve spools do not return to neutral, and/or
- hydraulic circuit has a high operating temperature.

### Sense Contamination

Sense contamination is foreign matter found by sight, touch or smell. This type of contamination can cause a sudden failure of a hydraulic component. Examples of sense contamination are:

- particles of metal or dirt in the system oil,
- air in the system oil,
- system oil dark and thick,
- odor of burned system oil, and/or
- water in the system oil. Water will cause oil to become white in color.

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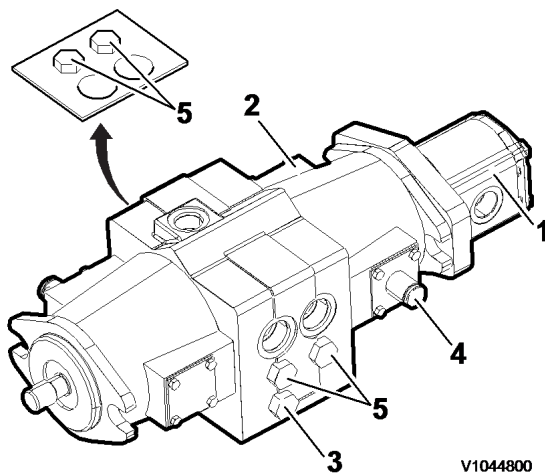
## Hydrostatic transmission, description

### Mechanical controls

#### MC60B, MC70B

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

#### Charge/Implement pump



**Figure 1**

1. Charge/Implement pump
2. Transmission pump
3. Charge relief valve
4. Mechanical pressure control lever
5. Drive relief valve

The charge/implement pump takes oil directly from tank and delivers oil to the main control valve. The return oil from the main control valve goes via filter to the transmission pump. The charge relief valve (R5) reduces the pressure. The charge/implement pump delivers oil to the low pressure side on the drive motor loop. This is to compensate for internal leakage in the loop. There is also a controlled oil leakage from the drive motor to tank to cool and flush the motor clean.

#### Charge pump

##### MC70B, High flow

The charge pump takes oil directly from tank and the charge relief valve (R5) reduces the pressure. The charge pump delivers oil to the low pressure side on the drive motor loop. This is to compensate for internal leakage in the loop. There is also a controlled oil leakage from the drive motor to tank, to cool and flush the motor clean.

#### Charge pressure relief valve

The charge relief valve (R5) reduces the pressure from the charge pump. When the setting pressure is exceeded, the valve opens and oil flushes through the transmission pumps to cool and clean them before the oil goes back to tank.

#### Mechanical displacement control

The transmission pumps utilize a direct mechanical lever to tilt the swashplate for pump displacement/direction control.

**Transmission pump drive relief valve**

The relief valves R1–R4 protect the machine and the hydraulic system. When the setting pressure is exceeded the oil goes from the high pressure side to the low pressure side in the loop.

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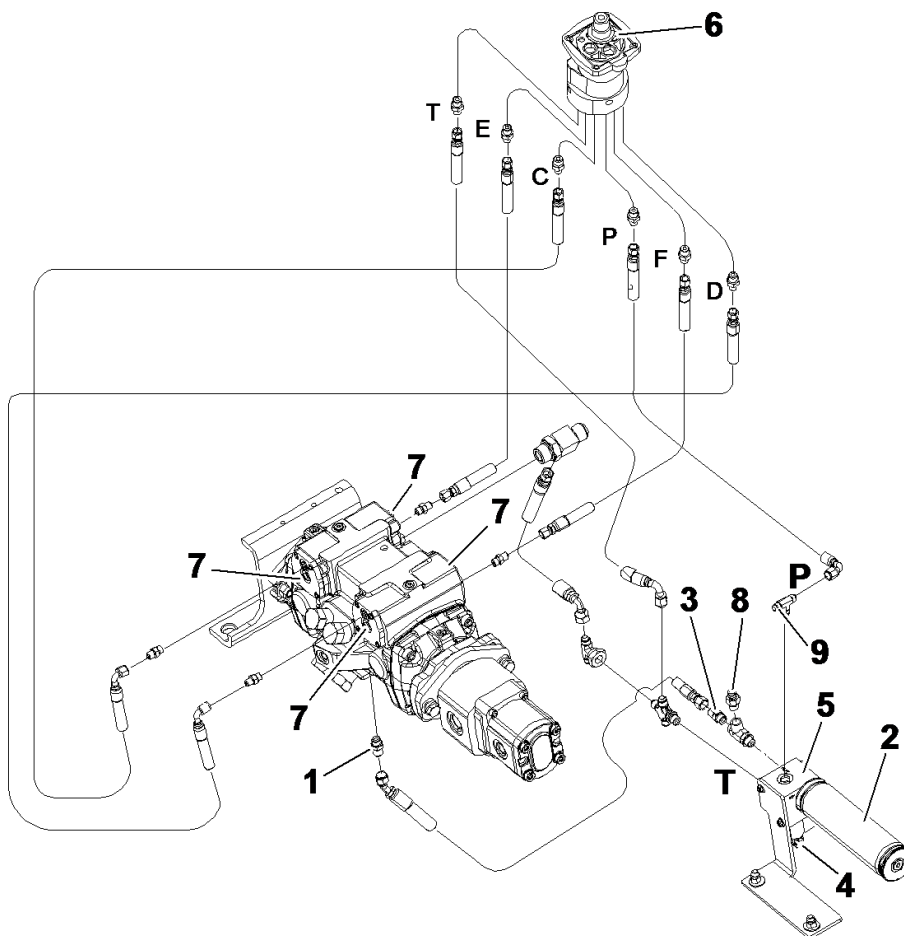
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## Hydrostatic transmission, description

### Pilot controls

#### MC60B, MC70B

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



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**Figure 1**

- |   |               |   |                               |   |                                       |
|---|---------------|---|-------------------------------|---|---------------------------------------|
| 1 | Charge outlet | 4 | MA9113                        | 7 | Connection, servo piston              |
| 2 | Accumulator   | 5 | Accumulator solenoid valve    | 8 | Connection, auxiliary function        |
| 3 | Check valve   | 6 | Hydraulic pilot control valve | 9 | Connection, working hydraulics, lever |

### Charge pump

The charge pump flow does the following things:

- compensate for the internal leakage from the drive motor to tank,
- cool and flush the motor clean and
- supplies the servo in the pilot system

The oil travels from the pump to the hydraulic filter then to the charge relief valve (R5) that limits the pressure. The charge pump delivers oil to the low pressure side of the drive motor loop.

### **Pilot control**

For information about the pilot control, see [914 Servo system description](#).

The oil flows from the charge pump, through a check valve to an accumulator. When MA9113 on the accumulator is activated, the valve opens and servo pressure comes to the joy stick. From the pilot control lever, the servo pressure goes into the transmission pump and affects the servo piston that changes the angle on the swashplate in the transmission pump. On the pilot control servoline, between the check valve and the servo pressure accumulator a line is mounted. This line delivers servo pressure to the auxiliary function on the main control valve. The return line from the auxiliary function is mounted to the pilot control lever return line.

### **Control lever**

The pilot control lever has four spools that are connected to a cross-over valve. When moving one spool in the pilot control lever it affects servo pistons on both sides inside the transmission pump.

For more information regarding the pilot control lever, see [915 Control levers description](#).

### **Accumulator**

The accumulator maintains a stable servo system pressure to get higher response on the pilot control lever.

In event of power loss, the accumulator also supplies enough pressure to the lift and tilt spools in the main control valve to enable the operator to lower the loader arm.

A connection located on the servo line between the check valve and the accumulator connects the servo line to the electrical operated auxiliary valve. This line is also needed to relieve pressure in the auxiliary lines when disconnecting auxiliary attachments.

### **Charge pressure relief valve**

The charge relief valve (R5) reduce the pressure from the charge pump. When the setting pressure is exceeded, the valve opens and oil flushes through the transmission pumps to cool and clean them before the oil goes back to tank.

### **Transmission pump drive relief valve**

The relief valves R1–R4 protects the machine and the hydraulic system. When the setting pressure is exceeded the oil goes from the high pressure side to the low pressure side in the loop.

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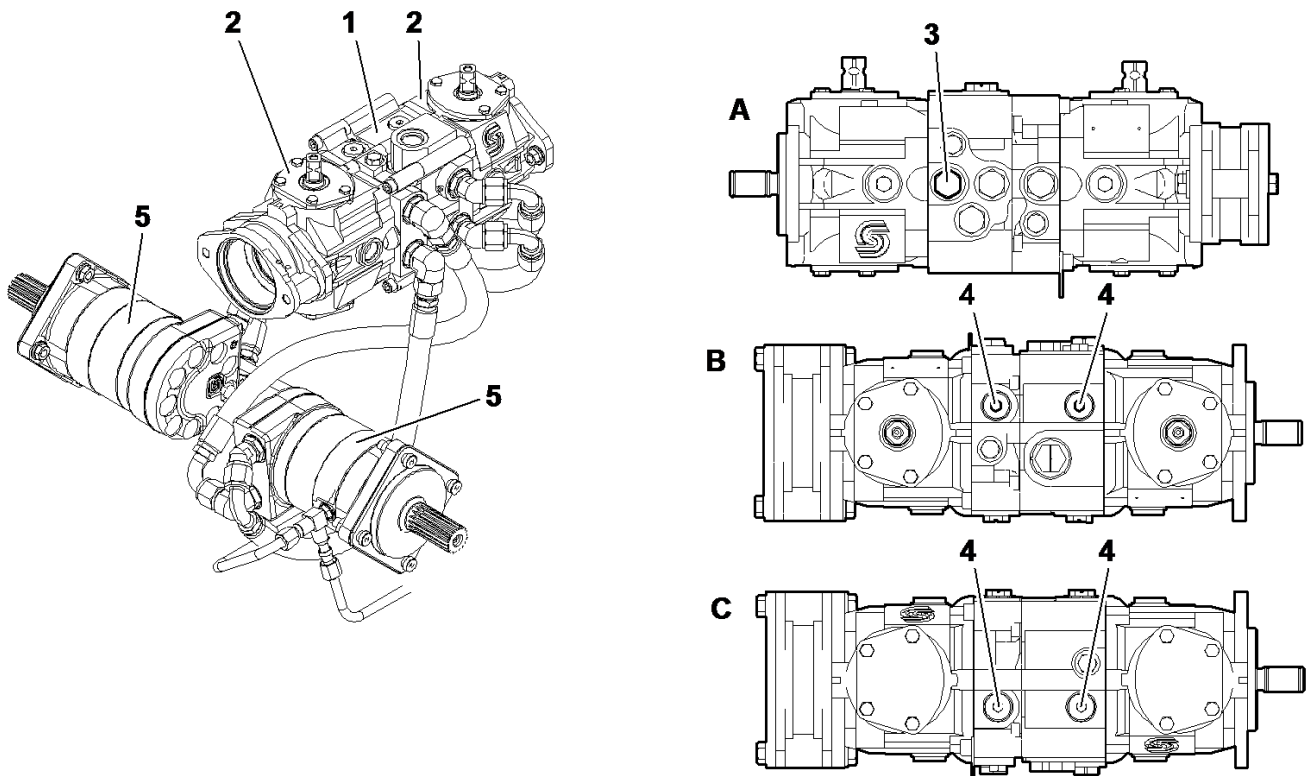
## Hydrostatic transmission, description

### Mechanical controls

Always read descriptions together with an hydraulic diagram, see [990 Hydraulic diagram](#) .

The hydrostatic transmission consists of:

- one integrated gerotor type charge pressure pump
- one double variable displacement transmission pump
- one charge relief valve
- four high pressure drive relief valves
- two hydrostatic drive motors



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**Figure 1**  
**Medium platform shown**

1	Charge pump	A	Transmission pump, right side view
2	Transmission pump	B	Transmission pump, top side view
3	Charge relief valve (R5)	C	Transmission pump, under side view
4	Drive relief valve (R1 — R4)		

**Charge pump**

The charge pump, which is integrated in the transmission pump, takes oil directly from tank and delivers it to the transmission pump. The relief valve (R5) limits the pressure. The charge pump delivers oil to the low pressure side on the drive motor loop to compensate for internal leakage and to cool and flush the motor clean.

**Charge pressure relief valve**

The charge relief valve (R5) reduces the pressure from the charge pump. When the setting pressure is exceeded, the valve opens and oil flushes through the transmission pumps to cool and clean them before the oil goes back to tank.

**NOTE!**

Note The MC110B is equipped with spring applied brakes and they can not be released without hydraulic pressure.

**Transmission pump**

The transmission pumps utilize a direct mechanical lever to tilt the swashplate for pump displacement/direction control. By operating the control levers the pump's displacement varies from full displacement in one direction to full displacement in the opposite direction.

When moving the machine without the engine running, the drive motors work as pumps. This means that the motors can not rotate if the circuits in the hydrostatic pump are closed.

**Transmission pump drive relief valve**

The relief valves R1–R4 protect the machine and the hydraulic system. When the setting pressure is exceeded the oil goes from the high pressure side to the low pressure side in the loop.

**By-pass valve**

In the relief valve unit (R1 — R4) is also a by-pass valve (one for each loop) which enables moving the machine in case of machine failure.

**NOTE!**

The by-pass operation can not be performed on MC110B due to the spring applied brakes that unable rotation of the wheels.

**Drive motor**

Depending on control lever movements, the transmission pump delivers oil to one of the two loops and the motor rotates either forward or reverse.

A valve is located inside the drive motor that is influenced by the high pressure loop. The high pressure moves the valve to open so there can be a controlled oil leakage from the low pressure circuit which cools and flush the drive motor.

For more informations regarding the hydrostatic transmission, see

- [442 Charge pump description](#)
- [442 Transmission pump description](#)
- [441 Drive motor description](#)

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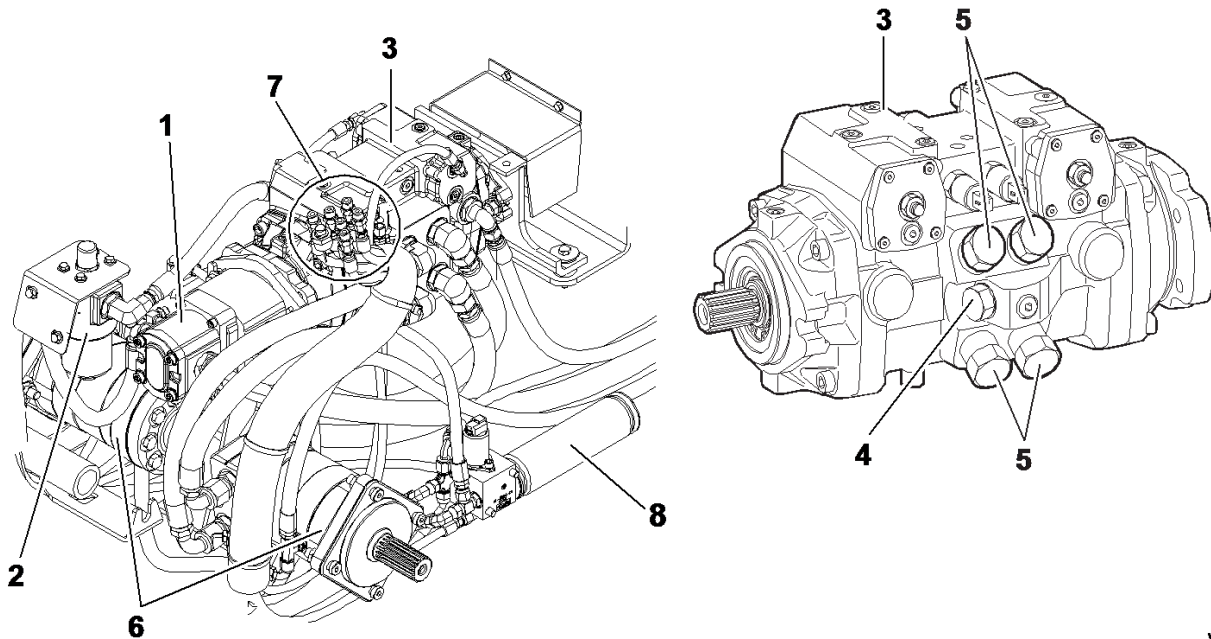
## Hydrostatic transmission, description

### Pilot controls

Always read descriptions together with an hydraulic diagram, see [990 Hydraulic diagram](#) .

The hydrostatic transmission consists of:

- one gear pump for charge pressure
- one charge system filter
- one double variable displacement transmission pump
- one charge relief valve (R5)
- four high pressure relief valve (R1 — R4)
- two hydrostatic drive motors
- one pilot control
- one accumulator to stabilize the servo pressure



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**Figure 1**

- |   |                          |   |                            |
|---|--------------------------|---|----------------------------|
| 1 | Charge pump              | 5 | Drive relief valve (R1–R4) |
| 2 | Charge system filter     | 6 | Drive motor                |
| 3 | Transmission pump        | 7 | Pilot control, connections |
| 4 | Charge relief valve (R5) | 8 | Accumulator, servo system  |

### Charge pump



The charge pump takes oil directly from tank. The oil flows through a hydraulic filter into the transmission pump. A relief valve (R5) limits the pressure. The charge pump delivers oil to the low pressure side on the drive motor loop to compensate for internal leakage and cool and flush the motor clean.

The servo system for the pilot controls (all machines) and the brake system (MC110B) are also supplied by the charge pump system.

#### **Charge relief valve**

The charge relief valve (R5) limits the pressure from the charge pump. When the pressure setting is exceeded, the valve opens and oil flushes through the transmission pumps to cool and clean them before the oil goes back to tank.

#### **Transmission pump drive relief valve**

The relief valves R1–R4 protect the machine and the hydraulic system. When the pressure setting is exceeded the oil goes from the high pressure side to the low pressure side of the loop.

#### **Pilot control**

The charge circuit also provides servo pressure to the pilot controls and the auxiliary circuit.

The oil flows from the charge pump via a check valve to an accumulator and an electrical controlled valve (MA9113). When MA9113 is activated, the valve opens and servo pressure flows to the control lever. From the pilot control lever, the servo pressure goes into the transmission pump and affects the servo piston which changes angle of the swashplate in the transmission pumps. Oil goes out to the four-loop circuit and forward to the drive motors.

Engine speed and movement of the pilot controls determine what rotation and flow will be delivered from the pumps out to the drive motors.

#### **Control lever**

The pilot control lever has four spools that are connected to a cross-over valve. When moving one spool in the pilot control lever it affects servo pistons on both right and left side inside the transmission pump.

#### **Drive motor**

A valve is located inside the drive motor and is influenced by the high pressure loop. The high pressure moves the valve to open so there can be a controlled oil leakage from the low pressure circuit which also cools and flush the drive motor.

#### **Accumulator**

The accumulator maintains a stable servo system pressure to get higher response on the pilot control lever. In event of power loss, the accumulator also supplies enough pressure to the lift and tilt spools in the main control valve to enable the operator to lower the loader arm. A connection located on the servo line between the check valve and the accumulator connects the servo line to the electrical operated auxiliary valve. This line is needed to relieve pressure in the auxiliary lines when disconnecting auxiliary attachments.

For more informations regarding the hydrostatic transmission, see

- [442 Charge pump, description](#)
- [442 Transmission pump, description](#)
- [441 Drive motor, description](#)
- [914 Servo system, description](#)
- [915 Control levers, description](#)

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