

V004540

**Fig 1. Hydraulic Hoses and Lines**

Key	
1	Hydraulic oil cooler
2	Gear pump
3	Cooler return line
4	Steering control unit
5	Hydrostatic unit

### OSPM Function

OSPM is a hydrostatic steering unit which can be used with an add-on steering column, OTPM/OTPM-T or with the steering column integrated with the unit.

The steering unit consists of a rotary valve and a rotary meter.

The steering unit is connected to the steering wheel of the vehicle via a steering column. When the steering wheel is turned, oil is directed from the steering system pump via the rotary valve and rotary meter to the cylinder ports L or R, depending on the direction of turn. The rotary meter meters the oil flow to the steering cylinder in proportion to the angular rotation of the steering wheel.

If the oil supply from the steering system pump fails or is too small, the steering unit is able to work as a manual steering pump.

### OSPN-ON

Open centre steering units have open connection between the pump and the tank when in the neutral position.

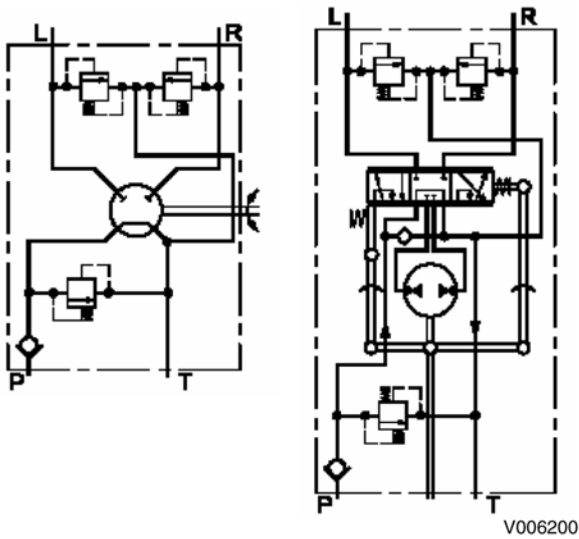


Fig 2.

### Manual Steering Pressure

Under normal operating, where the steering pumps supply an adequate oil flow at the required pressure, the maximum torque on the steering wheel will not exceed 2 Nm (17.7 lbf in).

If the oil flow from the steering system pump fails or is too small, the steering unit functions automatically as a manual steering pump. Manual steering can only be used for a limited control of the vehicle if a sudden drop of pump pressure occurs.

The Pm 50 bar (725 lbf in<sup>2</sup>) shows the manual steering pressure (Pm) for all sizes of Sauer-Danfoss steering units type OSPM at a steering wheel torque of 80 Nm (708 lbf-in). The values apply only if the suction conditions on the steering unit T port are adequate.

### Pressure Relief Valve

The pressure relief valve protects the pump and steering unit against excess pressure and limits the system pressure while steering.

The pressure relief valve in the steering unit will limit the maximum pressure drop from P to T. The pressure relief valve is set at 12 l/min (2.6 gpm) flow.

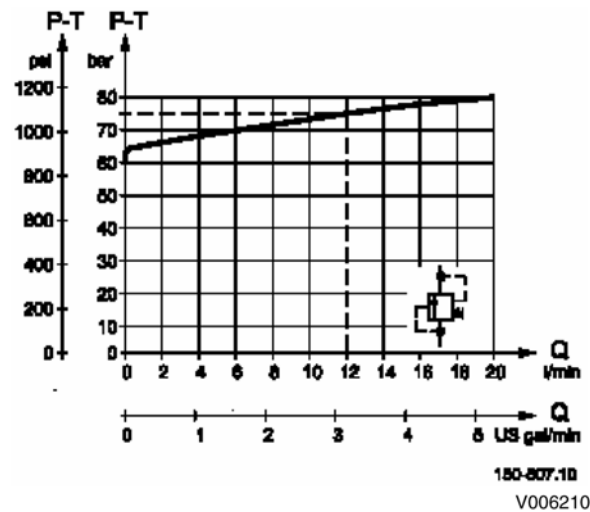


Fig 3.

### Shock Valves

The shock valves protect the steering unit against shocks from external forces on the steering cylinder.

The shock valves in the steering unit limit the max pressure drop from L to T and from R to T. The shock valves are set at 1 l/min (0.22 gpm). They are of the direct type and therefore have a very quick reaction. The setting tolerance is +20 bar (+290 lbf in<sup>2</sup>).

### Check Valve

The check valve protects the operator against kickbacks in the steering wheel. It prevents the oil from flowing back into the pump line during steering under high pressure on the cylinder side. The check valve is mounted in the P-connection of the steering unit.

### Pressure Drop in Neutral

The pressure drop is measured with the steering unit in the neutral position. On the OSPM ON, the pressure drop is measured from P to T. The values are valid at an oil temperature of 50 deg C (122 deg F) and a viscosity of 21 cSt (100 SUS).

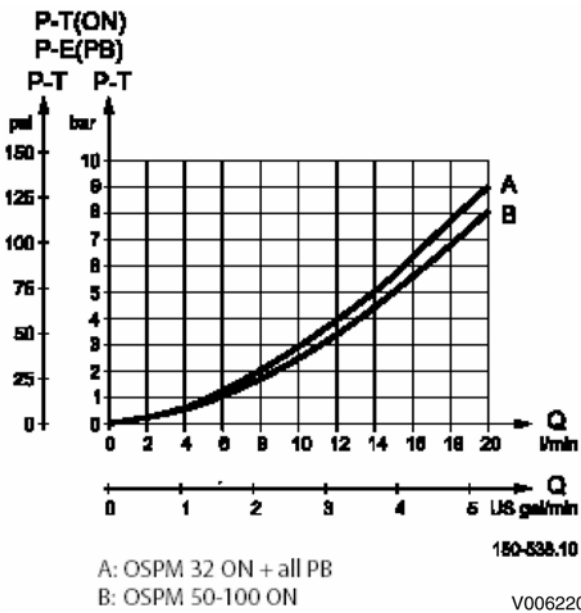


Fig 4.

# Fault Finding

## Power Steering System

**Fault:**

- ⇒ [Table 1. Steering wheel is heavy to turn \(□ H-9\)](#)
- ⇒ [Table 2. Return to neutral is too slow \(□ H-10\)](#)
- ⇒ [Table 3. Free play of steering wheel \(□ H-10\)](#)
- ⇒ [Table 4. Resistance when turning steering wheel \(□ H-11\)](#)
- ⇒ [Table 5. Too much free play in steering \(□ H-11\)](#)
- ⇒ [Table 6. Kick-back of steering wheel \(□ H-11\)](#)
- ⇒ [Table 7. Serious kick-back on each side \(□ H-11\)](#)

**Table 1. Steering wheel is heavy to turn**

Possible Cause	Action
Incorrect assembly between steering column and unit:  Spline of column and unit are assembled too tight.  Spool of unit seized by spline of column.  Poor rotation of column.	Replace column spline.  Check column assembly face and spline length (max length 6.5 mm. (0.26 in))  Replenish or replace oil.
Insufficient pump pressure or fluid volume:  Incorrect pump delivery (Unit volume x 120 rpm x 1.5).  Oil tank fluid low.  Incorrect pump pressure.	Replace pump.  Replenish oil.  Adjust relief valve.
Internal steering valve:  Low pressure setting of relief valve.  Ball-nut stiff.	Adjust fluid to correct level.  Clean or replace.
Machine steering mechanism:  Incorrect operation of link.  Excessive sector gear pre-load.	Clean and replenish oil.  Adjust back lash.
Oil density too high or too cold.	Replace oil.

**Table 2. Return to neutral is too slow**

Possible Cause	Action
<p>Incorrect assembly between steering column and unit:</p> <p style="padding-left: 40px;">Incorrect assembly to centre between column and unit.</p> <p style="padding-left: 40px;">Column assembly face depressing unit bushing.</p>	<p>Release the bolt and re-assemble correctly with the centre.</p> <p>Repair or replace column</p>
<p>Depressed control set (spool and sleeve):</p> <p style="padding-left: 40px;">Excessive fluid volume.</p> <p style="padding-left: 40px;">Excessive pressure.</p> <p style="padding-left: 40px;">Dust.</p>	<p>Adjust fluid to correct level.</p> <p>Adjust pressure.</p> <p>Clean.</p>
<p>High pressure ratio of "T" port (tank port) (Max pressure ratio 20 bar (94.3 lb/in<sup>2</sup>):</p> <p style="padding-left: 40px;">Restricted tank port pipe line.</p> <p style="padding-left: 40px;">Tank port pipe line installed to incorrect connections.</p>	<p>Clean pipe line.</p> <p>Disconnect tank port pipe line and connect to correct connections.</p>

**Table 3. Free play of steering wheel**

Possible Cause	Action
<p>Incorrect tension of centring spring:</p> <p style="padding-left: 40px;">Remove P port pipe line and check left and right turning.</p> <p style="padding-left: 40px;">Damaged or weak spring.</p>	<p>Replace spring</p>
<p>Depressed control set (spool and sleeve):</p> <p style="padding-left: 40px;">Excessive fluid volume and pressure.</p> <p style="padding-left: 40px;">Depressed by foreign material.</p> <p style="padding-left: 40px;">Depressed when assembled with column.</p>	<p>Adjust fluid and pressure to correct level.</p> <p>Clean.</p> <p>Check column and adjust.</p>
<p>Insufficient oil in tank.</p>	<p>Replenish oil.</p>
<p>Worn or damaged steering cylinder.</p>	<p>Replace oil seal and cylinder.</p>
<p>Loose spacer unit.</p>	<p>Assemble spacer parts correctly.</p>