## Revision History

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<tr>
<th>Date</th>
<th>Changed</th>
<th>Rev</th>
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<tr>
<td>Mar 2014</td>
<td>Converted to Danfoss layout - DITA CMS</td>
<td>CA</td>
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<tr>
<td>Aug 2011</td>
<td>Drawing</td>
<td>BG</td>
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<tr>
<td>May 2011</td>
<td>Hexagon size</td>
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<tr>
<td>Sep 2010</td>
<td>New back cover</td>
<td>BE</td>
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<td>Jan 2010</td>
<td>Japan location</td>
<td>BD</td>
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<tr>
<td>Dec 2008</td>
<td>Tightening torque changed</td>
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Service Manual Hydrostatic Steering Unit Type OSPB, OSPC and OSPF

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Exploded View and Seal Kit

Exploded View OSPB

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<tr>
<th>Callout</th>
<th>Description</th>
<th>Callout</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dust seal ring</td>
<td>15</td>
<td>O-ring 80,5 • 1,5 mm [3.17 • 0.06 in]</td>
</tr>
<tr>
<td>2</td>
<td>Housing + spool + sleeve</td>
<td>16</td>
<td>Distributor plate</td>
</tr>
<tr>
<td>3</td>
<td>Ball 8.5 mm [0.33 in]</td>
<td>17</td>
<td>Gearwheel</td>
</tr>
<tr>
<td>4</td>
<td>Thread bushing</td>
<td>18</td>
<td>O-ring 75.92 • 1,78 mm [2.99 • 0.07 in]</td>
</tr>
<tr>
<td>5</td>
<td>O-ring with kin-ring or Roto Glyd</td>
<td>19</td>
<td>End cover</td>
</tr>
<tr>
<td>7</td>
<td>Bearing assembly</td>
<td>20</td>
<td>Washer 8.2 • 11,9 • 1.0 mm [0.32 • 0.47 • 0.04 in]</td>
</tr>
<tr>
<td>10</td>
<td>Ring for springs</td>
<td>22</td>
<td>Special screw</td>
</tr>
<tr>
<td>11</td>
<td>Cross pin 6 • 41 mm [0.24 • 1.61 in]</td>
<td>23</td>
<td>Screw</td>
</tr>
<tr>
<td>12</td>
<td>Neutral position springs</td>
<td>24</td>
<td>Name label</td>
</tr>
<tr>
<td>13</td>
<td>Cardan shaft</td>
<td>26</td>
<td>Spacer</td>
</tr>
<tr>
<td>14</td>
<td>Spacer</td>
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<td></td>
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Exploded View and Seal Kit

Exploded View OSPC / OSPF

### Exploded View OSPC / OSPF Callouts

<table>
<thead>
<tr>
<th>Callout</th>
<th>Description</th>
<th>Callout</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dust seal ring</td>
<td>19</td>
<td>End cover</td>
</tr>
<tr>
<td>2</td>
<td>Housing, spool and sleeve. Check valve and the seats for relief and shock valves are locktited.</td>
<td>20</td>
<td>Washer</td>
</tr>
<tr>
<td>3</td>
<td>Ball 8.5 mm [0.33 in]</td>
<td>22</td>
<td>Special screw</td>
</tr>
<tr>
<td>4</td>
<td>Thread bushing</td>
<td>23</td>
<td>Screw</td>
</tr>
<tr>
<td>5</td>
<td>O-ring used with kin-ring (item 6)</td>
<td>24</td>
<td>Name plate</td>
</tr>
<tr>
<td>6</td>
<td>Kin-ring</td>
<td>30</td>
<td>Complete relief valve</td>
</tr>
<tr>
<td>7</td>
<td>Bearing assembly</td>
<td>31</td>
<td>Spring wire</td>
</tr>
<tr>
<td>10</td>
<td>Ring</td>
<td>32</td>
<td>Complete shock valve</td>
</tr>
<tr>
<td>11</td>
<td>Cross pin</td>
<td>33</td>
<td>Ball 3/16 in</td>
</tr>
<tr>
<td>14</td>
<td>Spacer</td>
<td>38</td>
<td>Spring</td>
</tr>
<tr>
<td>13</td>
<td>Cardan shaft</td>
<td>34</td>
<td>Rolled pin</td>
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Exploded View and Seal Kit

### Exploded View OSPC / OSPF Callouts (continued)

<table>
<thead>
<tr>
<th>Callout</th>
<th>Description</th>
<th>Callout</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>Set of springs</td>
<td>36</td>
<td>Bushing</td>
</tr>
<tr>
<td>15</td>
<td>O-ring</td>
<td>35</td>
<td>Ball</td>
</tr>
<tr>
<td>16</td>
<td>Distributor plate</td>
<td>39</td>
<td>Kin ring</td>
</tr>
<tr>
<td>17</td>
<td>Gearwheel set</td>
<td>40</td>
<td>O-ring</td>
</tr>
<tr>
<td>18</td>
<td>O-ring</td>
<td></td>
<td></td>
</tr>
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</table>
Tools

Holding tool
Code number: SJ 150-9000-2

Guide ring
Code number: SJ 150-9000-16

Assembly tool for O-ring and kin-ring / Roto Glyd
Code number: SJ 150-9000-11
Code number: SJ 150N4014-1
Tools

Assembly tool for lip seal
Code number: SJ 150-9000-17

Assembly tool for cardan shaft.
Code number: SJ 150-9000-3

Assembly tool for dust seal.
Code number: SJ 150-9000-22
Tools

Torque wrench 0 - 70 N.m.
13 mm socket spanner.
6.8 and 12 mm sockets.
12 mm screwdriver.
2 mm [0.08 in] screwdriver.
13 mm ring spanner.
6.8 and 12 mm socket spanners.
Plastic hammer.
Tweezers.

The tools are not available from Danfoss
Dismantling

Dismantling steering column from steering unit and place the steering unit in the holding tool.

Screw out the screws in the end cover (6-off plus one special screw).

Remove the end cover, sideways.

Lift the gearwheel set (with spacer if fitted) off the unit. Take out the two O-rings.
Dismantling

Remove the cardan shaft

Remove distributor plate.

Screw out the threaded bush over the check valve.
Dismantling

Remove O-ring

OSP B, OSP B LS, OSP BX LS:
Shake out the check valve ball (Ø 8 mm)

OSP C LS, OSP C LSR:
Shake out the check valve ball and suction valve pins and balls.

On some pins in the OSP C there are two springs (see page 4, pos. 38). Replace this pins prior to the reassembly!

Take care to keep the cross pin in the sleeve and spool horizontal. The pin can be seen through the open end of the spool. Press the spool inwards and the sleeve, ring, bearing races and needle bearing will be pushed out of the housing together.
Dismantling

Take ring, bearing races and needle bearing from sleeve and spool. The outer (thin) bearing race can sometimes “stick” in the housing, therefore check that it has come out.

Press out the cross pin. Use the special screw from the end cover.

Note next point/paragraph!

OSP B CN and OSP C CN

A small mark has been made with a pumice stone on both spool and sleeve close to one of the slots for the neutral position springs (see drawing).

If the mark is not visible, remember to leave a mark of your own on sleeve and spool before the neutral position springs are dismantled.

For OSPF both marks should be placed opposite each other!
Dismantling

Carefully press the spool out of the sleeve.

Press the neutral position springs out of their slots in the spool.
Dismantling

Remove dust seal and O-ring / Kin-ring / Roto Glyd.

Remove plugs from shock valves using a 6 mm hexagon socket spanner.

Remove seal washers (2-off).
Dismantling

Unscrew the setting screws using a 6 mm hexagon socket spanner.

Shake out the two springs and two valve balls into your hand. The valve seats are bonded into the housing and cannot be removed.

The shock valves are now dismantled.

Dismantling the pressure relief valve for OSPC

*Dismantling*

Dismantling the Pressure Relief Valve for OSPC
Dismantling

Screw out the plug using an 8 mm hexagon socket spanner. Remove seal washers.

Unscrew the setting screw using an 6 mm hexagon socket spanner.

Shake out spring and piston. The valve seat is bonded into the housing and cannot be removed.
Dismantling

The pressure relief valve is now dismantled.

**Dismantling the pressure relief valve**

Dismantling OSPC

The steering unit OSPC is now completely dismantled.
Replace this pins prior to the reassembly!

**Cleaning**

Clean all parts carefully in Shellsol K or the like.

**Lubrication**

Before assembly, lubricate all parts with hydraulic oil.

**Inspection and Replacement**

Replace all seals and washers.
Check all parts carefully and make any replacements necessary.
Assembly

Assembling

Place the two flat neutral position springs in the slot.

Place the curved springs between the flat ones and press them into place.

Line up the spring set.
Assembly

Guide the spool into the sleeve. Make sure that spool and sleeve for OSPB LS, OSPBX LS, OSPC LS, OSPC LSR and OSPF are placed correctly in relation to each other (see page 10).

Assemble spool and sleeve

**OSPB LS, OSPBX LS, OSPC LS, OSPC LSR and OSPF**

When assembling spool and sleeve only one of two possible ways of positioning the spring slots is correct. There are three slots in the spool and three holes in the sleeve in the end of the spool/sleeve opposite to the end with spring slots. Place the slots and holes opposite each other so that parts of the holes in the sleeve are visible through the slots in the spool.

**OSPB CN and OSPC CN**

Assemble the spool/sleeve and make sure the marks on spool and sleeve are opposite each other. *Dismantling* for more information.
Assembly

Press the springs together and push the neutral position springs into place in the slave.

Line up the springs and centre them.

Guide the ring down over the sleeve.

The ring should be able to move - free of springs.

Fit the cross pin into the spool/sleeve.
Assembly

Fit bearing races and needle bearings as shown on the drawing next page.

Assembly Pattern for Bearings

**Assembling Pattern for Standard Bearing**

1. Outer bearing race
2. Needle bearing
3. Inner bearing race
4. Spool
5. Sleeve

**Assembly Pattern for Double Bearing**

1. Washer for axial bearing
2. Outer needle bearing
Assembly

3. Outer bearing race
4. Spool
5. Sleeve
6. Inner needlebearing
7. Inner bearing race

The inside chamfer on the inner bearing race must face the inner spool.

Installation Instructions for O-ring / Kin-ring / Roto glyd

Turn the steering unit until the bore is horizontal. Guide the outer part of the assembly tool into the bore for the spool/sleeve.

Grease o-ring and king-ring/roto Glyd with hydraulic oil and place them on the tool.

Hold the outer part of the assembly tool in the bottom of the steering unit housing and guide the inner part of the tool right to the bottom.
Assembly

Press and turn the o-ring/kin-ring into position in the housing.

Draw the inner and outer parts of the assembly tool out of the steering unit bore, leaving the guide from the inner part in the bore.

Installation Instructions for Lip Seal

Lubricate the lip seal with hydraulic oil and place it on the assembly tool.
Assembly

Guide the assembly tool right to the bottom.

Press and turn the lip seal into place in the housing.

With a light turning movement, guide the spool and sleeve into the bore.

Fit the spool set holding the cross pin horizontal.
Assembly

The spool set will push out the assembly tool guide. The o-ring and kin-ring/roto Glyd are now in position.

Turn the steering unit until the bore is vertical again. Put the check valve ball into the hole indicated by the arrow.

Screw the threaded bush lightly into the check valve bore. The top of the bush must lie just below the surface of the housing.
Assembly

Place a ball in the two holes indicated by the arrows.

Place a new pin in the same two holes.

In some cases a spring has to be fitted (see page 4 pos. 38) on the pin before it is placed in the housing.
Assembly

Grease the o-ring with mineral oil approx. viscosity 500 mm²/s [SUS] at 20°C [68 °F].

Place the distributor plate so that the channel holes match the holes in the housing.

Guide the cardan shaft down into the bore so that the slot is parallel with the connection flange.
Assembly

Place the cardan shaft as shown - so that it is held in position by the mounting fork.

Grease the two o-rings with mineral oil approx. viscosity 500 mm²/s [SUS] at 20°C [°F] and place them in the two grooves in the gear rim. Fit the gearwheel and rim on the cardan shaft.

Caution

Fit the gearwheel (rotor) and cardan shaft so that a tooth base in the rotor is positioned in relation to the shaft slot as shown. Turn the gear rim so that the seven trough holes match the holes in the housing.
Assembly

Fit the spacer, if any.

Place the end cover in position.

Fit the special screw with washer and place it in the hole shown.
Assembly

Fit the six screws with washers and insert them. Cross-tighten all the screws and the rolled pin with a torque of \( \tau \pm 6 \) N.m [265.5 \pm 53 lb.in]. The OSPB, OSPB LS and OSPBX LS can now be function tested.

Assembly of the Pressure Relief Valve for OSPC

Fit the piston.

Fit the spring
Assembly

Screw in the setting screw with an 8 mm hexagon socket spanner.
Make the pressure setting on a panel or the vehicle.

Screw plug with dust seal into the housing using an 8 mm hexagon socket spanner.
Tightening torque: 65 +/- 5 N.m. [575.3 +/- 44.2 lbf.in]

Assembly of the Shock Valves for OSPC/OSPC LS/OSPC LSR

Put a ball in the two holes indicated by the arrows.
Assembly

Place springs and valve cones over the two balls. The blue spring applies to setting range 90-180 bar [1305-2610 psi]. The untreated spring applies to setting range 170-260 bar [2465-3770 psi].

Screw in the two setting screws using a 6 mm hexagon socket spanner. Make the pressure setting on a panel or the vehicle.

Screw plug with seal ring into the two shock valves and tighten them with a torque of 30 + 10 N.m [265.5 + 88.5 lbf.in] using a 6 mm hexagon socket spanner.

Steering unit type OSPC, OSPC LS or OSPC LSR is now assembled.
Assembly

Place the dust seal ring in the housing. With the OSPC, OSPC LS and OSPC LSR the dust seal ring must be placed only after the pressure relief valve and shock valves have been fitted.

Fit the dust seal ring in the housing using special tool SJ 150-9000-22 (see page 5) and a plastic hammer.

Press the plastic plugs into the connection ports.

Do not use a hammer!
Maximum Tightening Torque and Hydraulic Connections

<table>
<thead>
<tr>
<th>Screwed connection</th>
<th>With cutting edge</th>
<th>With cooper washer</th>
<th>With aluminium washer</th>
<th>With O-ring</th>
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<tr>
<td>G 1/4</td>
<td>35 [309]</td>
<td>35 [309]</td>
<td>35 [309]</td>
<td>-</td>
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<tr>
<td>G 3/8</td>
<td>70 [619]</td>
<td>45 [398]</td>
<td>50 [442]</td>
<td>-</td>
</tr>
<tr>
<td>G 1/2</td>
<td>100 [885]</td>
<td>55 [486]</td>
<td>80 [708]</td>
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</tr>
<tr>
<td>7/16 -20 UNF</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20 [177]</td>
</tr>
<tr>
<td>3/4 -16 UNF</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>60 [531]</td>
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<tr>
<td>M 12 • 1.5</td>
<td>30 [265]</td>
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<td>65 [575]</td>
<td>80 [708]</td>
<td>60 [531]</td>
</tr>
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