ENGINEERING
TOMORROW

Service Manual

# Steering Valve
## EHPS and EHPS with OLS 320

## Revision history

*Table of revisions*

| Date | Changed | Rev |
|---|---|---|
| July 2016 | Updated EHPS spare parts list | 0102 |
| June 2015 | First version | AA |

## Contents

## Safety Precautions

### Safety precautions

Always consider safety precautions before beginning a service procedure. Protect yourself and others from injury. Take the following general precautions whenever servicing a hydraulic system.

**Warning**

**Unintended Machine Movement**

Unintended movement of the machine or mechanism may cause injury to the technician or bystanders. To prevent unintended movement, secure the machine or disable / disconnect the mechanism while servicing.

**Warning**

**Flammable Cleaning Solvents**

Some cleaning solvents are flammable. To eliminate the risk of fire, do not use cleaning solvents in an area where a source of ignition may be present.

**Warning**

**Fluid under Pressure**

Escaping hydraulic fluid under pressure can have sufficient force to penetrate your skin causing serious injury and/or infection. This fluid may also be hot enough to cause burns. Use caution when dealing with hydraulic fluid under pressure. Relieve pressure in the system before removing hoses, fittings, gauges, or components. Never use your hand or any other body part to check for leaks in a pressurized line. Seek medical attention immediately if you are cut by hydraulic fluid.

**Warning**

**Personal Safety**

Protect yourself from injury. Use proper safety equipment, including safety glasses, at all times.

**Warning**

**Product Safety**

Steering valves are safety components and therefore it is extremely important that the greatest care is taken when servicing these products. There is not much wear on a steering valve and therefore they normally outlast the application they are built into. Therefore the only recommended service work on steering valves is:

- Changing seals and o-rings
- Disassemble, clean, and assemble if contaminated
- Hydraulic testing, including valve setting

## Service Literature

### Symbols Used in Danfoss Literature

-  = Non removable part, use a new part
-  = External hex head
-  = Internal hex head
-  = Lubricate with hydraulic fluid
-  = Inspect for wear or damage
-  = Note correct orientation
-  = Mark orientation for reinstallation
-  = Torque specification
-  = Press in - press fit
-  = Pull out with tool - press fit

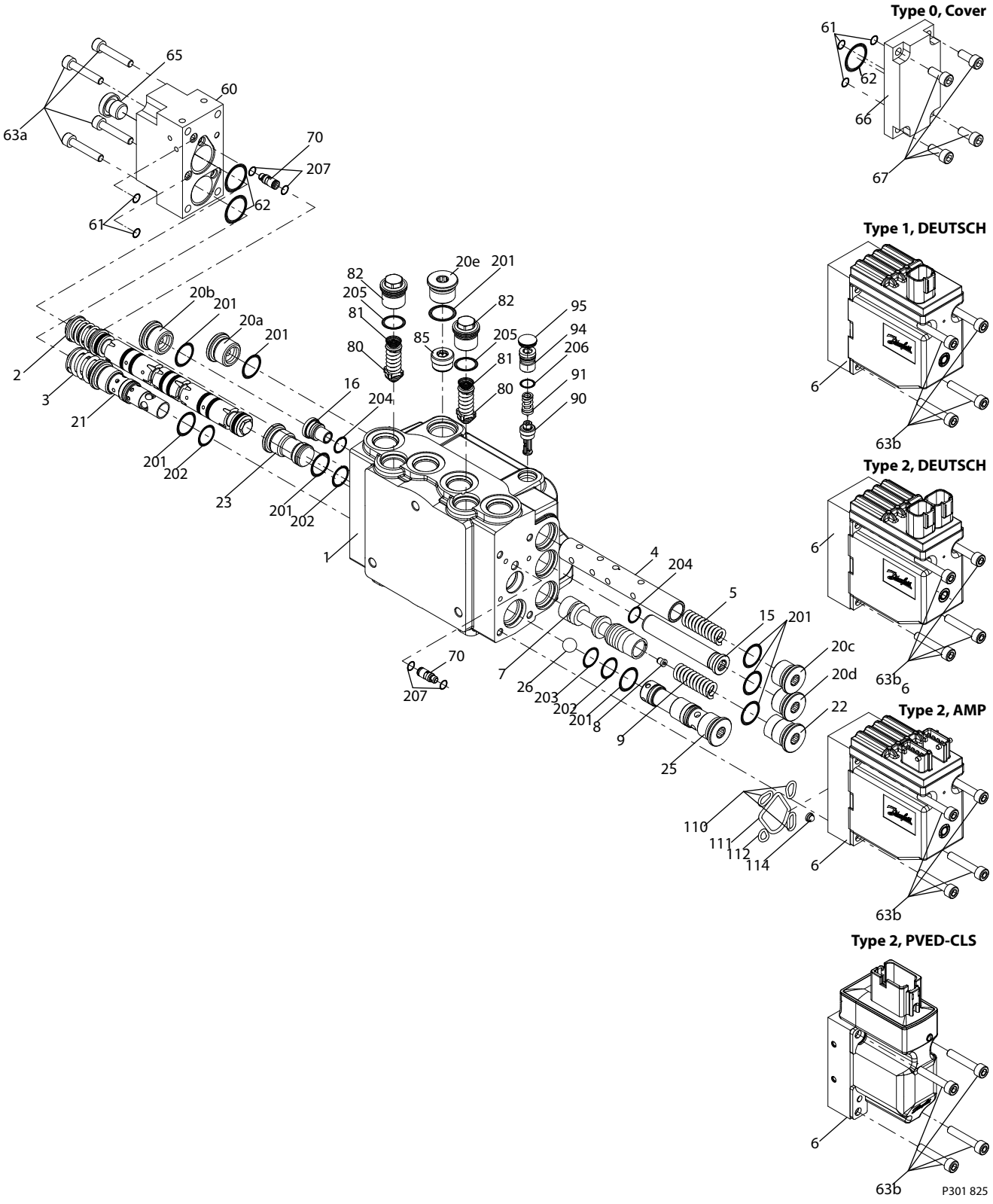
### EHPS versions

This service literature is valid for:

- EHPS type 0: EHPS without PVE actuation module
- EHPS type 1 and 2: EHPS with PVE actuation module
- EHPS with flanged on priority valve module, OLS 320

## Exploded view

### EHPS type 0, 1 and 2 exploded view



## Exploded view

### EHPS spare parts list

*EHPS spare parts*

| EHPS | Number per unit | Item | Tigtening torque |
|---|---|---|---|
| Valve block | 1 | 1 | - |
| Spool with spring, directional | 1 | 2 | - |
| Spool with spring, pilot - OSP | 1 | 3 | - |
| Spool, meetering | 1 | 4 | - |
| Spring | 1 | 5 | - |
| PVE | 1 | 6 | - |
| Spool, priority valve | 1 | 7 | - |
| Orifice, Dynamic | 1 | 8 | 3.5±0.5 Nm |
| Spring | 1 | 9 | - |
| Tube | 1 | 15 | 10±0.5 Nm |
| Plug | 1 | 16 | 10±0.5 Nm |
| Plug | 1 | 20a | 40±3 Nm |
| Plug | 1 | 20b | 40±3 Nm |
| Plug | 1 | 20c | 40±3 Nm |
| Plug | 1 | 20d | 40±3 Nm |
| Plug | 1 | 20e | 40±3 Nm |
| Bushing | 1 | 21 | 40±3 Nm |
| Plug | 1 | 22 | 40±3 Nm |
| Plug | 1 | 23 | 40±3 Nm |
| Plug | 1 | 25 | 20±3 Nm |
| Ball | 1 | 26 | - |
| Cover | 1 | 60 | - |
| O-ring Ø5.0 x Ø1.5 mm | 5 | 61 | - |
| O-ring Ø27.5 x Ø1.5 mm | 3 | 62 | - |
| Screw, M6, l=33 mm | 4 | 63a | 8±0.5 Nm |
| Screw, M6, l=33 mm | 4 | 63b | 8±0.5 Nm |
| Plug w. O-ring | 1 | 65 | - |
| Cover, EHPS type 0 | 1 | 66 | - |
| Screw, M6, l=15 mm, EHPS type 0 | 4 | 67 | 8±0.5 Nm |
| Shuttle valve | 2 | 70 | - |
| Shock valve | 2 | 80 | - |
| Spring, conical | 2 | 81 | - |
| Plug | 2 | 82 | 40±3 Nm |
| Check valve | 1 | 85 | 25±5 Nm |
| Seat for pilot relief valve | 1 | 90 | 20±3 Nm |
| Cone with spring for pilot relief valve | 1 | 91 | - |
| Adjusting screw for pilot relief valve | 1 | 94 | - |
| Plug | 1 | 95 | - |
| O-ring Ø10.0 x Ø2.0 mm | 3 | 110 | - |
| O-ring Ø30.0 x Ø2.5 mm | 1 | 111 | - |
| O-ring Ø8.0 x Ø2.0 mm | 1 | 112 | - |
| Filter | 1 | 114 | - |
| O-ring Ø17.4 x Ø2.1 mm | 9 | 201 | - |

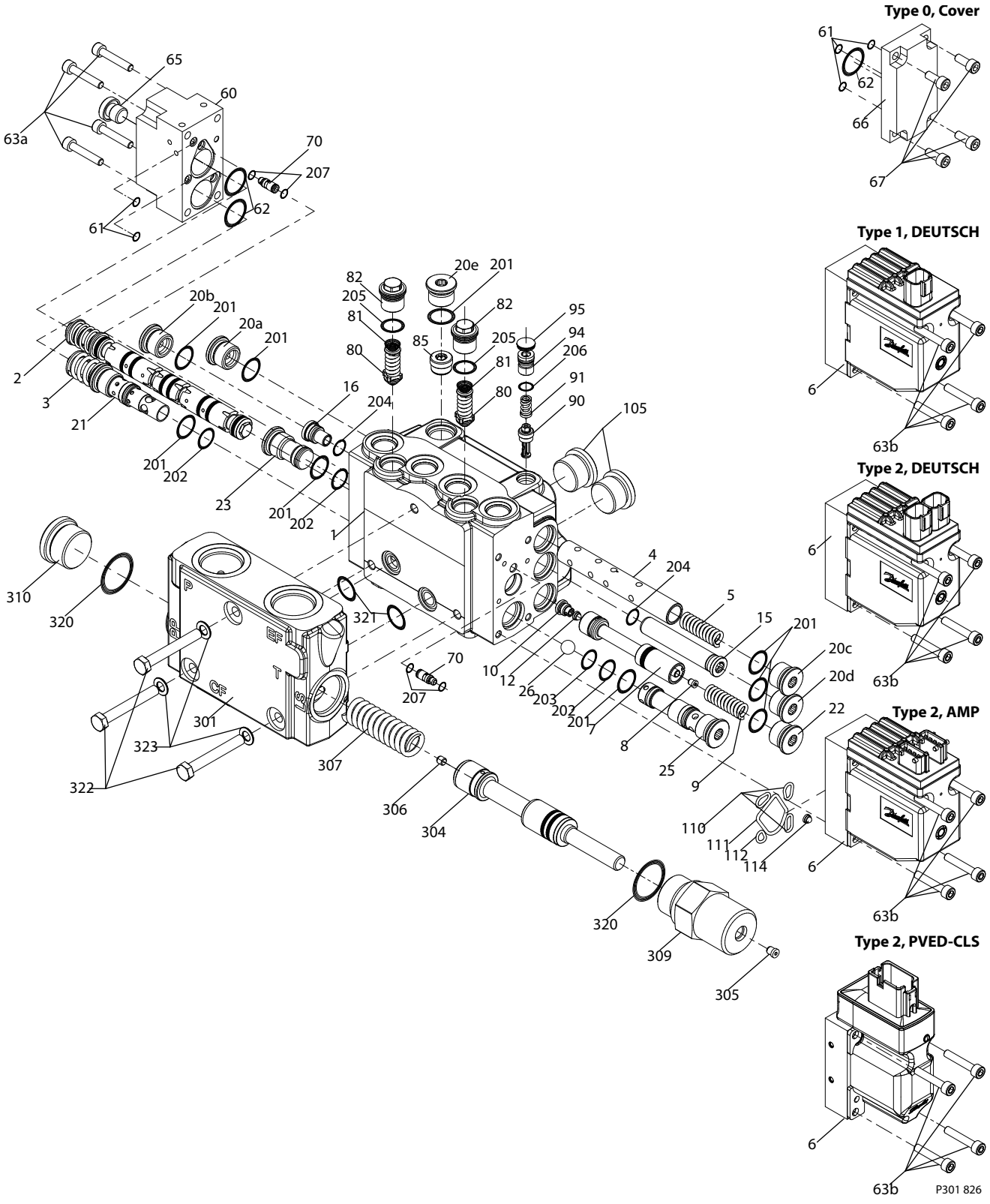
## Exploded view

*EHPS spare parts (continued)*

| EHPS | Number per unit | Item | Tigtening torque |
|---|---|---|---|
| O-ring Ø15.0 x Ø1.5 mm | 3 | 202 | - |
| O-ring Ø14.0 x Ø1.5 mm | 1 | 203 | - |
| O-ring Ø10.0 x Ø2.0 mm | 2 | 204 | - |
| O-ring Ø15.6 x Ø1.78 mm | 2 | 205 | - |
| O-ring Ø9.0 x Ø2.0 mm | 1 | 206 | - |
| O-ring Ø5.0 x Ø1.0 mm | 4 | 207 | - |

## Exploded view

### EHPS with flanged on OLS 320 exploded view



## Exploded view

### EHPS and OLS 320 spare parts list

*EHPS spare parts*

| EHPS | Number per unit | Item | Tigtening torque |
|---|---|---|---|
| Valve block | 1 | 1 | - |
| Spool with spring, directional | 1 | 2 | - |
| Spool with spring, pilot - OSP | 1 | 3 | - |
| Spool, meetering | 1 | 4 | - |
| Spring | 1 | 5 | - |
| PVE | 1 | 6 | - |
| Spool, priority valve | 1 | 7 | - |
| Orifice, Dynamic | 1 | 8 | 3.5±0.5 Nm |
| Spring | 1 | 9 | - |
| Orifice, PP | 1 | 10 | 3.5±0.5 Nm |
| Filter | 1 | 12 | - |
| Tube | 1 | 15 | 10±0.5 Nm |
| Plug | 1 | 16 | 10±0.5 Nm |
| Plug | 1 | 20a | 40±3 Nm |
| Plug | 1 | 20b | 40±3 Nm |
| Plug | 1 | 20c | 40±3 Nm |
| Plug | 1 | 20d | 40±3 Nm |
| Plug | 1 | 20e | 40±3 Nm |
| Bushing | 1 | 21 | 40±3 Nm |
| Plug | 1 | 22 | 40±3 Nm |
| Plug | 1 | 23 | 40±3 Nm |
| Plug | 1 | 25 | 20±3 Nm |
| Ball | 1 | 26 | - |
| Cover | 1 | 60 | - |
| O-ring Ø5.0 x Ø1.5 mm | 5 | 61 | - |
| O-ring Ø27.5 x Ø1.5 mm | 3 | 62 | - |
| Screw, M6, l=33 mm | 4 | 63a | 8±0.5 Nm |
| Screw, M6, l=33 mm | 4 | 63b | 8±0.5 Nm |
| Plug w. O-ring | 1 | 65 | - |
| Cover, EHPS type 0 | 1 | 66 | - |
| Screw, M6, l=15 mm, EHPS type 0 | 4 | 67 | 8±0.5 Nm |
| Shuttle valve | 2 | 70 | - |
| Shock valve | 2 | 80 | - |
| Spring, conical | 2 | 81 | - |
| Plug | 2 | 82 | 40±3 Nm |
| Check valve | 1 | 85 | 25±5 Nm |
| Seat for pilot relief valve | 1 | 90 | 20±3 Nm |
| Cone with spring for pilot relief valve | 1 | 91 | - |
| Adjusting screw for pilot relief valve | 1 | 94 | - |
| Plug | 1 | 95 | - |
| Plug | 2 | 105 | 40±3 Nm |
| O-ring Ø10.0 x Ø2.0 mm | 3 | 110 | - |
| O-ring Ø30.0 x Ø2.5 mm | 1 | 111 | - |

## Exploded view

*EHPS spare parts (continued)*

| EHPS | Number per unit | Item | Tigtening torque |
|---|---|---|---|
| O-ring Ø8.0 x Ø2.0 mm | 1 | 112 | - |
| Filter | 1 | 114 | - |
| O-ring Ø17.4 x Ø2.1 mm | 9 | 201 | - |
| O-ring Ø15.0 x Ø1.5 mm | 3 | 202 | - |
| O-ring Ø14.0 x Ø1.5 mm | 1 | 203 | - |
| O-ring Ø10.0 x Ø2.0 mm | 2 | 204 | - |
| O-ring Ø15.6 x Ø1.78 mm | 2 | 205 | - |
| O-ring Ø9.0 x Ø2.0 mm | 1 | 206 | - |
| O-ring Ø5.0 x Ø1.0 mm | 4 | 207 | - |

*OLS 320 spare parts*

| OLS 320 | Number per unit | Item | Tightening torque |
|---|---|---|---|
| Housing | 1 | 301 | - |
| Spool | 1 | 304 | - |
| Orifice, LS | 1 | 305 | 1±0.1 Nm |
| Orifice, PP | 1 | 306 | 3.5±0.5 Nm |
| Spring | 1 | 307 | - |
| Plug, LS | 1 | 309 | 50±5 Nm |
| Plug. PP | 1 | 310 | 50±5 Nm |
| O-ring Ø29.6 x Ø2.9 mm | 2 | 320 | - |
| O-ring Ø16.0 x Ø2.5 mm | 2 | 321 | - |
| Screw | 3 | 322 | 28±2 Nm |
| Washer | 3 | 323 | - |

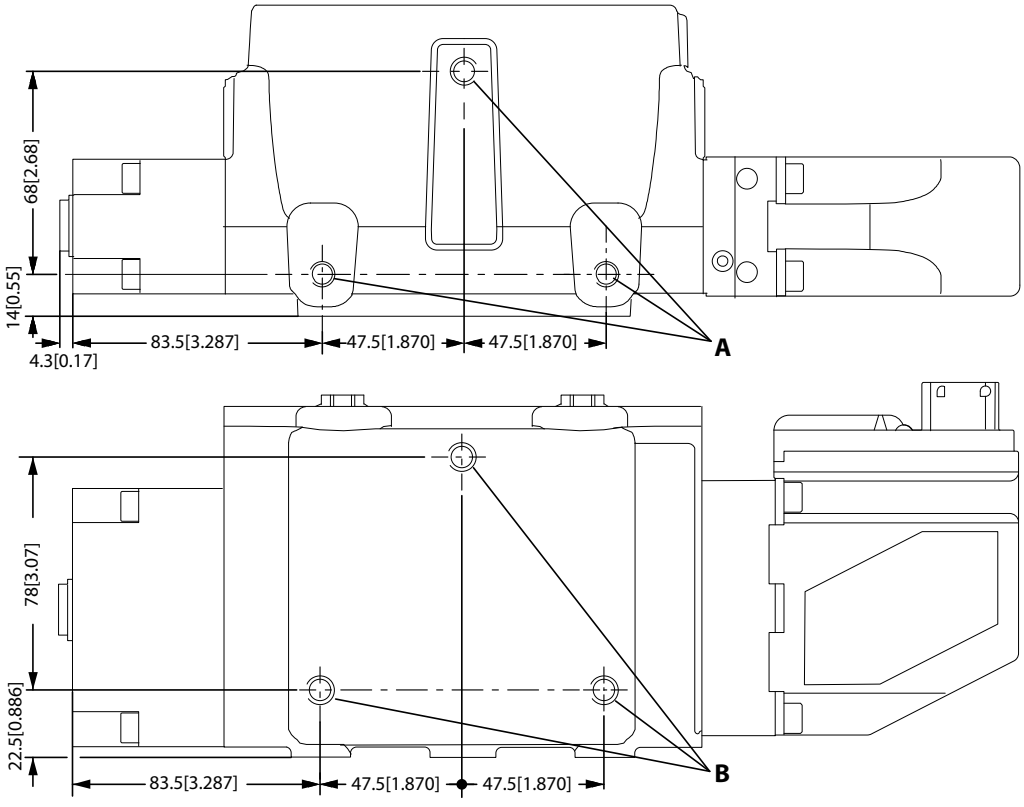
### Seal kits and spare parts for EHPS and OLS 320

| Spare parts list | Code No. | Item |
|---|---|---|
| Seal kit, EHPS | 150H4021 | 61, 62, 201, 202, 203, 204, 205, 206, 207 |
| Seal kit OLS 320 | 152B6200 | 320 |
| Seal kit for block ass. | 11008362 | 321 |
| Seal kit for PVE/cover | 157B4997 | 110, 111, 112, 114 |
| Shuttle valve, 2 pcs | 11007949 | 70 |

## Tools

### Tools for EHPS

Holding tool: It is recommended to use appropriate steel plate with mounting holes 3x Ø 10 mm matching mounting thread holes, A or B on one of the two mounting sides of EHPS.




150H11.11

| | A | B |
|---|---|---|
| All versions | M8 • 1.25, 10 mm [0.39 in] deep | M8 • 1.25, 10 mm [0.39 in] deep |

Torque wrench 0 - 70 Nm.
6 and 13 mm socket spanner.
5, 2x 8, 12 and 14 mm Hex keys.
T50 Torx key
2 mm screwdriver.
13 – 17 – 19 – 36 – 41 mm ring spanner.
Pliers
Inside circlip pliers.
Tweezers

These tools are not available from Danfoss.

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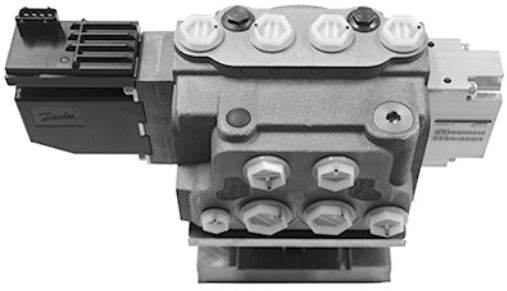
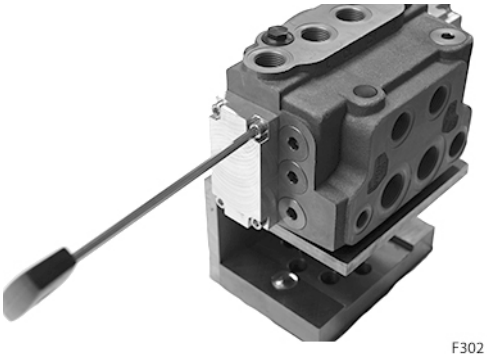
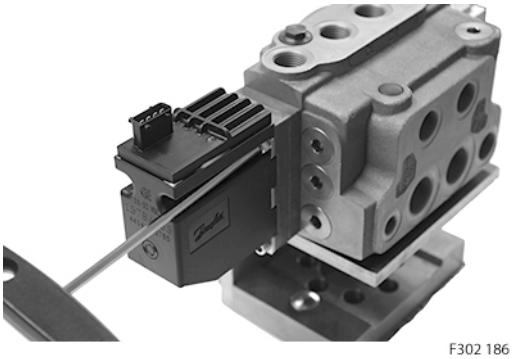
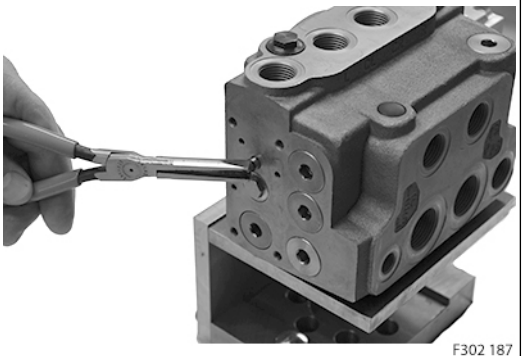
## Disassembly and assembly

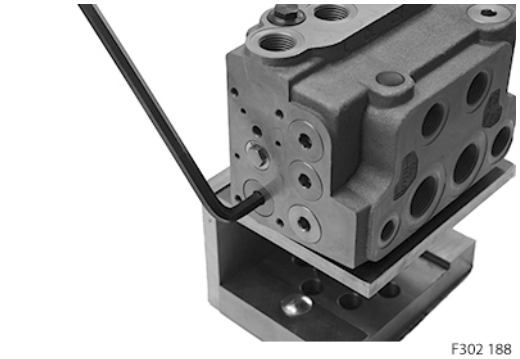
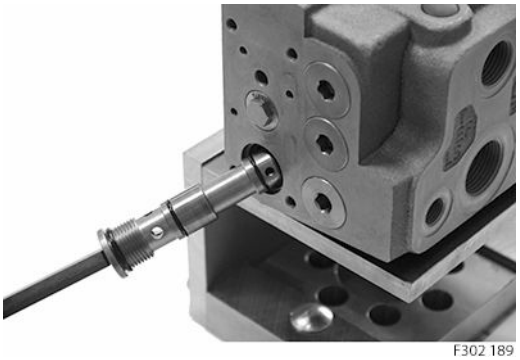
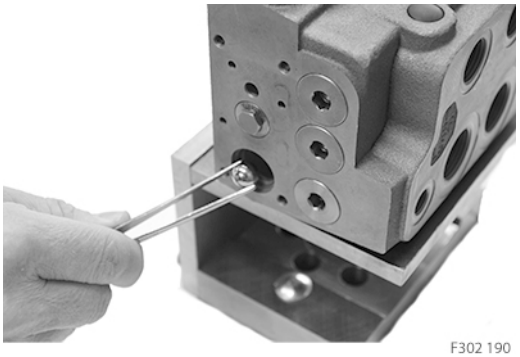
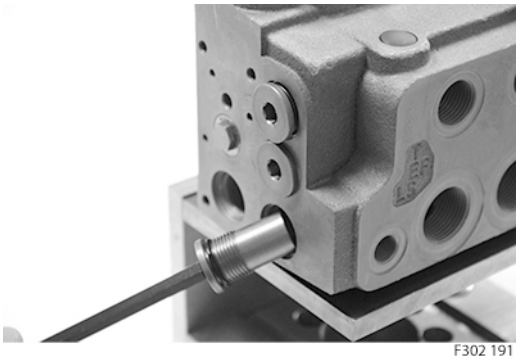
### Disassembly of EHPS

*Disassembly of EHPS*

| | |
|---|---|
| Place the unit on the holding tool. |  F302 184 |
| ***EHPS type 0 (without PVE):***<br>Screw out the 4 screws (67) for cover (66) using a 5 mm Hex key.<br>Remove the cover (66).<br>O-rings (61 and 62) are fitted to cover (66).<br>Shuttle valves (70) are not present in EHPS type 0. |  F302 185 |
| ***EHPS type 1 and type 2:***<br>Screw out the 4 screws (63b) for PVE (6) using a 5 mm Hex key.<br>Remove the PVE (6).<br>O-rings (110, 111 and 112) and filter (114) are fitted to the mounting surface of PVE.<br>Shuttle valve (70) is fitted into the mounting surface of PVE (6) and housing (1), it will stay in one of the 2 elements when removing the PVE from the EHPS housing. |  F302 186<br>  F302 187 |

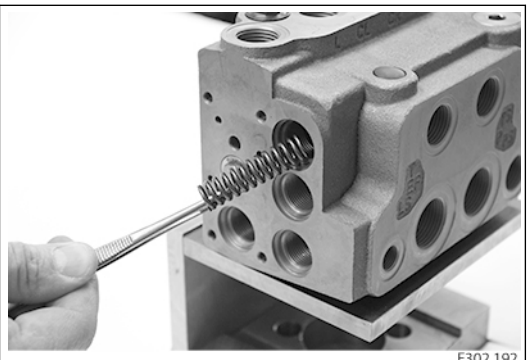
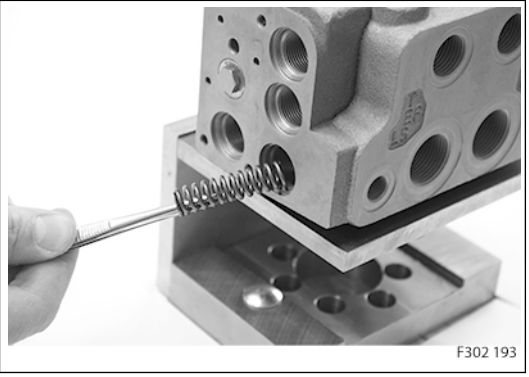
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Screw out the plug (25) using an 8 mm Hex key.<br>O-rings (201, 202 and 203) are fitted to the bushing (21). |  <br>F302 188<br>  <br>F302 189 |
| Remove the ball (26). |  <br>F302 190 |
| Screw out the plugs (20c, 20d and 22) using an 8 mm Hex key.<br>O-rings (201) are fitted to the plugs. |  <br>F302 191 |

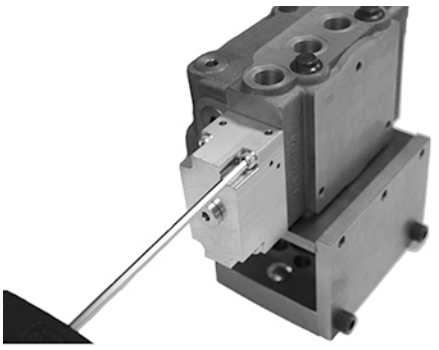
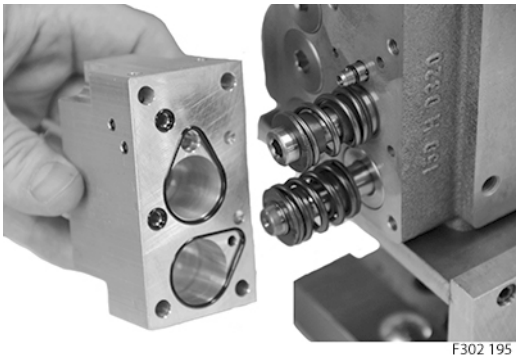
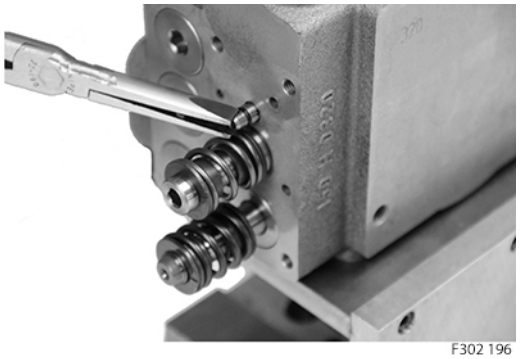
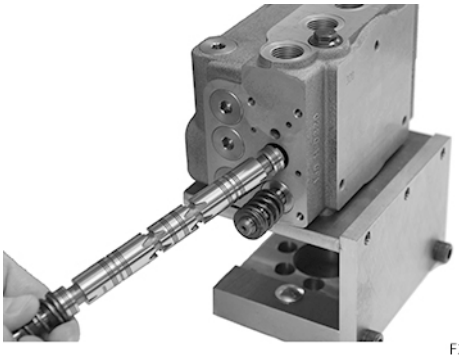
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Remove the spring (5). |  F302 192 |
| Remove the spring (9). |  F302 193 |

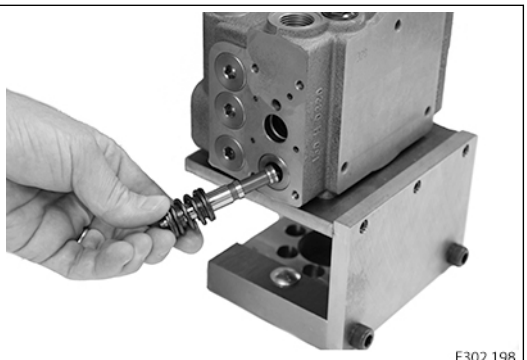
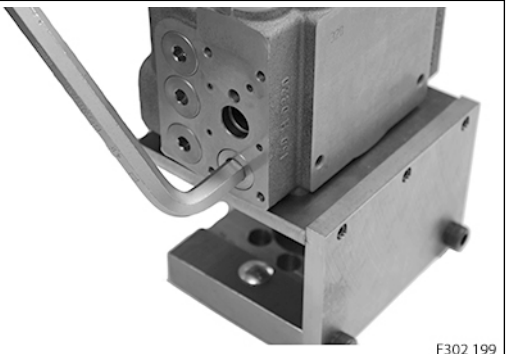
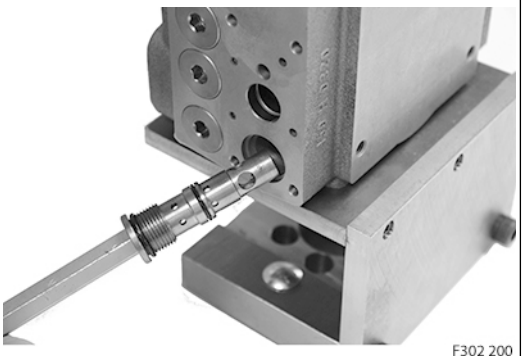
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Screw out the 4 screws (63a) for cover (60) using a 5 mm Hex key.<br>Remove the cover (60).<br>O-rings (61 and 62) are fitted to the mounting surface of cover.<br>***EHPS type 1 and 2***:<br>Shuttle valve (70) is fitted into the mounting surface of cover (60) and housing (1), it will stay in one of the 2 elements when removing the cover from the EHPS housing.<br><br>Plug (65) is fitted to cover (60). It is recommended not to screw out plug (65).<br><br>EHPS type 0 normally has no shuttle valves (70). |  <br>F302 194<br>  <br>F302 195<br>  <br>F302 196 |
| Remove the directional spool with spring (2). |  <br>F302 197 |

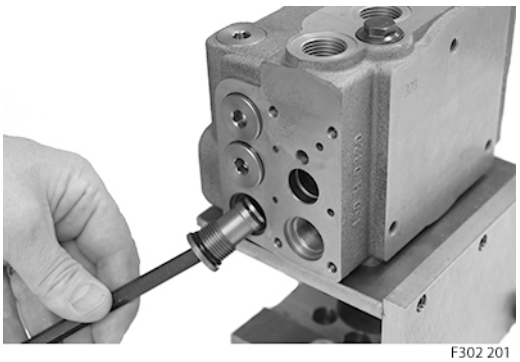
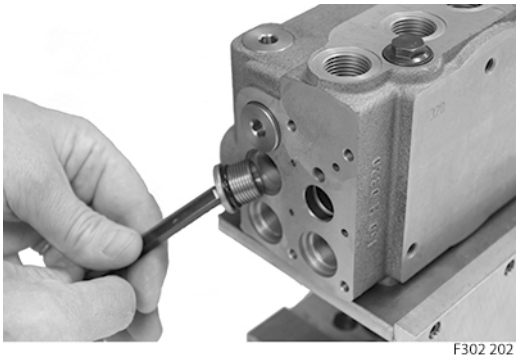
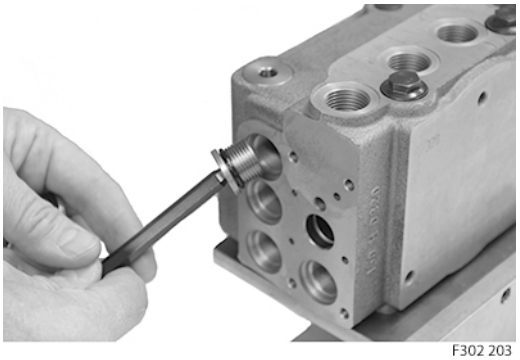
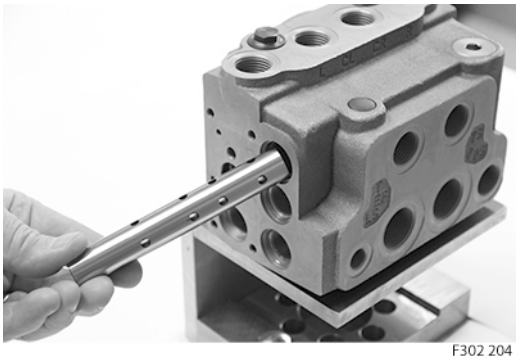
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Remove the pilot spool with spring (3). |  F302 198 |
| Screw out the bushing (21) using a 12 mm Hex key. O-rings (201 and 202) are fitted to the bushing (21). |  F302 199  F302 200 |

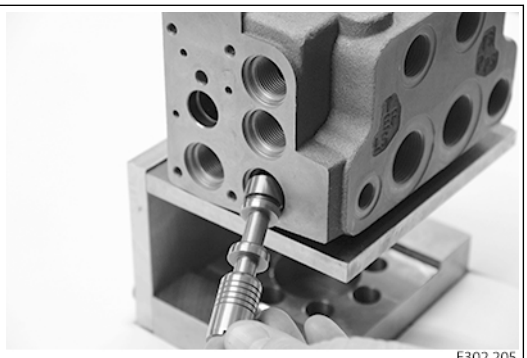
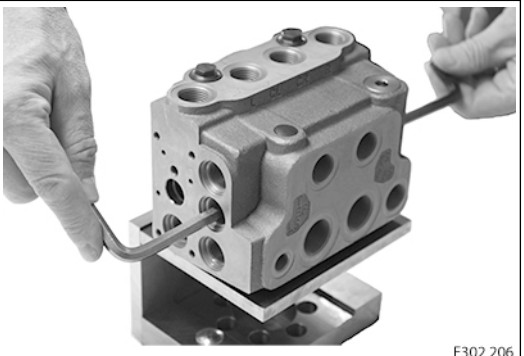
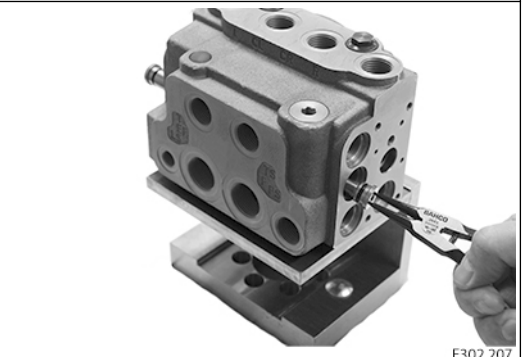
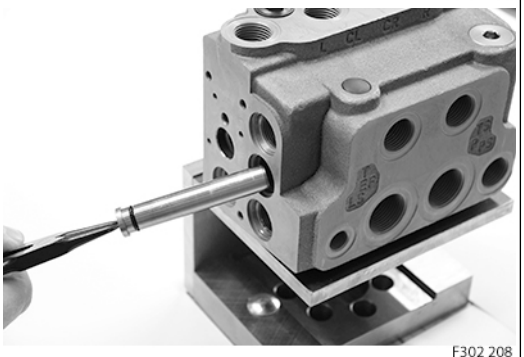
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Screw out the plugs (20a, 20b and 23) using an 8 mm Hex key.<br>O-rings (201) are fitted to the plugs (20a and 20b). O-rings (201 and 202) are fitted to the plug (23). |  <br>F302 201<br>  <br>F302 202<br>  <br>F302 203 |
| From the PVE end (type 1 and 2) or cover (66) end (type 0):<br>Remove the meetering spool (4). |  <br>F302 204 |

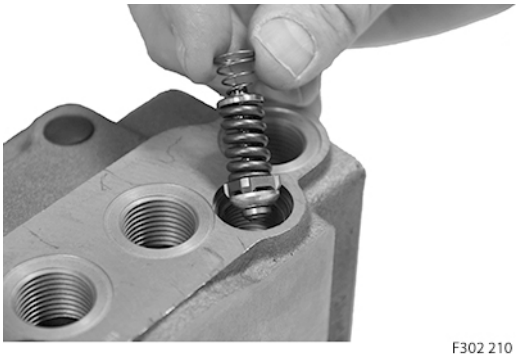
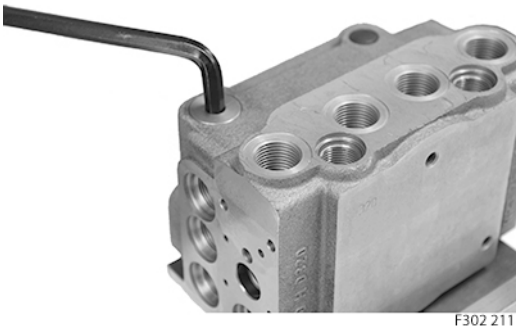
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Remove the priority valve spool (7).<br>Orifice, dynamic (8) is screwed into spool (7). |  <br>F302 205 |
| Screw out the plug (16) of tube (15) using two 8 mm Hex keys: one in plug and one in tube end. |  <br>F302 206 |
| Remove plug (16) and tube (15).<br>O-rings (204) are fitted to the plug (16) and the tube (15). |  <br>F302 207<br>  <br>F302 208 |

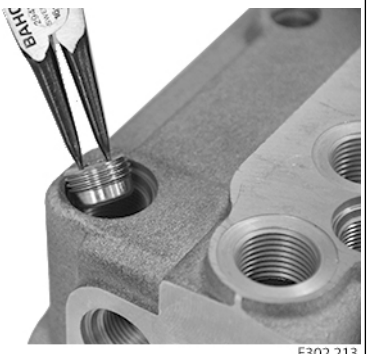
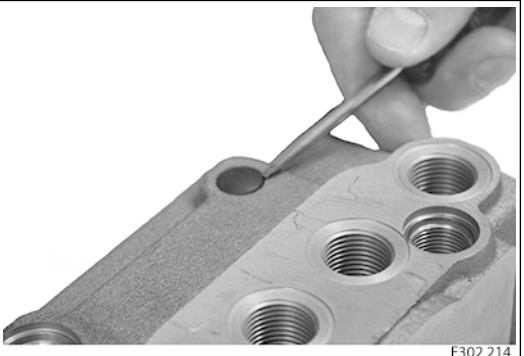
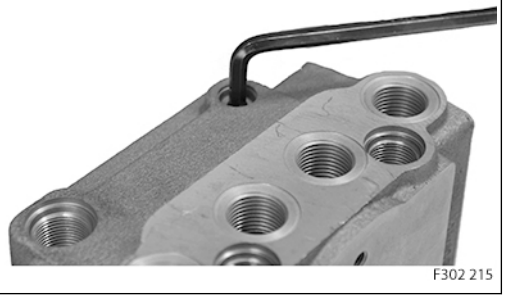
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Screw out the plugs (82) using a 13 mm socket or ring spanner.<br>O-rings (205) are fitted to the plugs (82). |  <br>F302 209 |
| Remove the shock valves (80) with conical springs (81). |  <br>F302 210 |
| Screw out the plug (20e) using an 8 mm Hex key.<br>O-ring (201) is fitted to the plug (20e) |  <br>F302 211 |

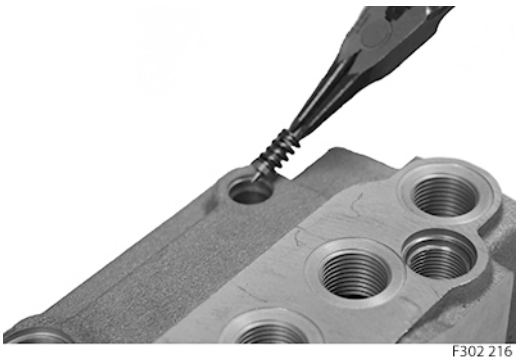
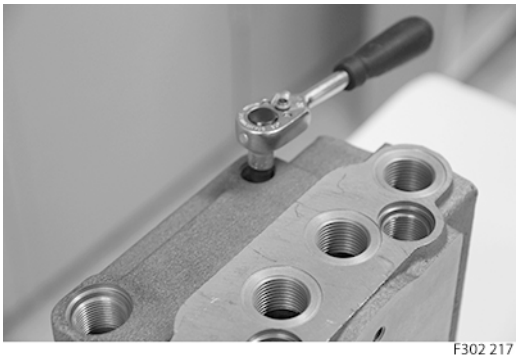
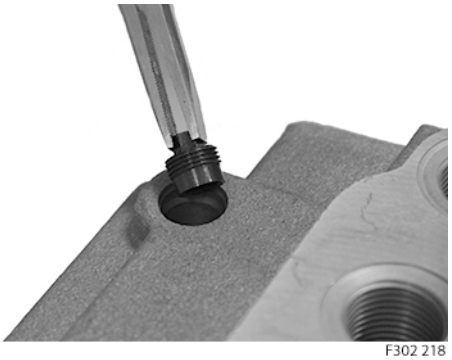
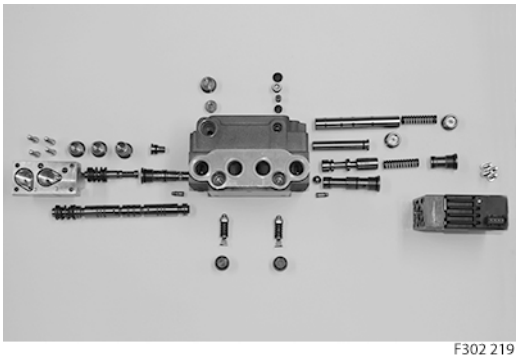
## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Screw out the check valve (85) using an T50 Torx key. |  F302 212<br>  F302 213 |
| Remove plug (95) using a 2 mm screw driver. |  F302 214 |
| Screw out the adjusting screw (94) using an 6 mm Hex key.<br>O-ring (206) is fitted to the screw (94). |  F302 215 |

## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Remove the spring with cone (91). |  F302 216 |
| Screw out the seat (90) using a 6 mm ⬡ socket spanner. |  F302 217  F302 218 |
| Now the EHPS is completely dismantled. |  F302 219 |

**Cleaning:** Clean all parts carefully in Shellsol K or similar cleaner fluid.

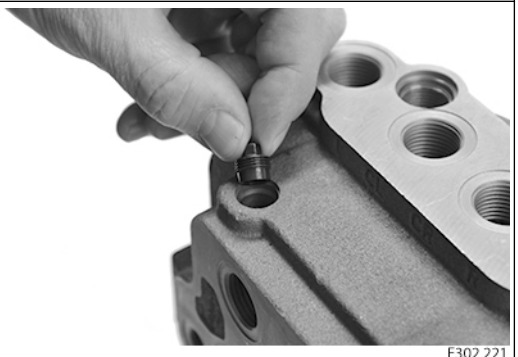
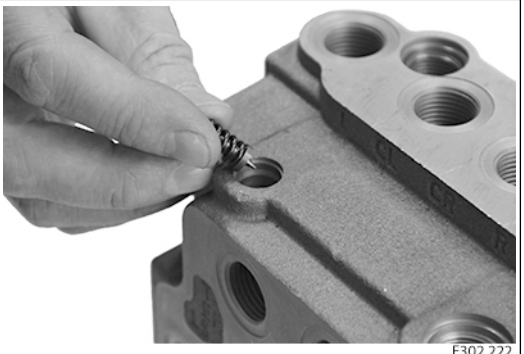
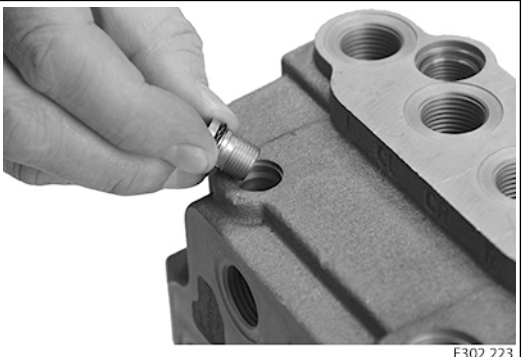
**Inspection and replacement:** Replace all seals and washers.

Check all parts carefully and make any replacements as is necessary.

## Disassembly and assembly

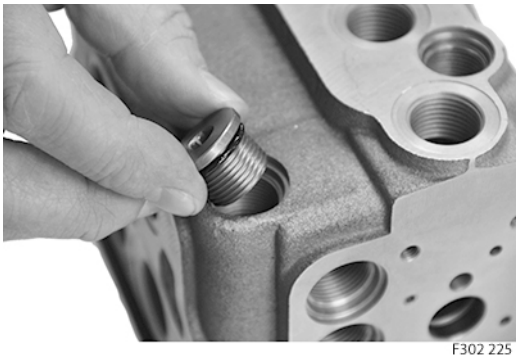
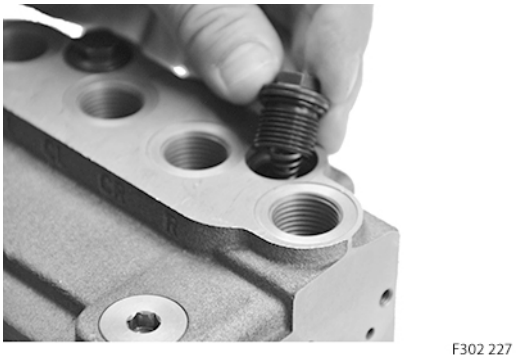
### Assembly of EHPS

*Assembly of EHPS*

| | |
|---|---|
| Place the housing on the holding tool. |  F302 220 |
| Screw in the seat (90) using a 6 mm socket spanner.<br>20 ±3 Nm. |  F302 221 |
| Place the spring with cone (91). |  F302 222 |
| Place O-ring (206) on screw (94).<br>Screw in the adjusting screw (94) using an 6 mm Hex key.<br>After entire assembly of the steering valve, make the pressure setting on a test panel according to valve setting specification, see *Testing of EHPS* on page 39.<br>Insert plastic protection plug (95). |  F302 223 |

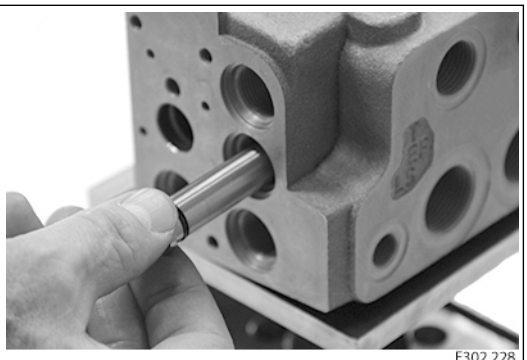
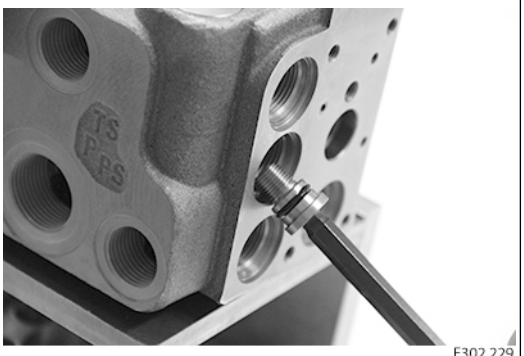
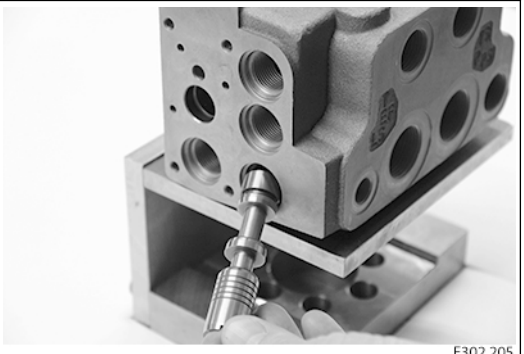
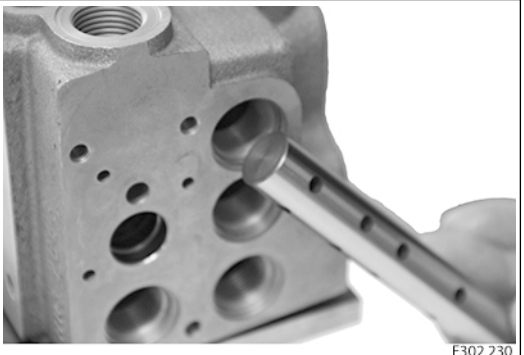
## Disassembly and assembly

*Assembly of EHPS (continued)*

| | |
|---|---|
| Screw in the check valve (85) using an T50 Torx key.<br>25 ±5 Nm. |  <br>F302 224 |
| Place O-ring (201) on to the plug (20e). Screw in the plug (20e) using an 8 mm Hex key.<br>40 +/- 3 Nm. |  <br>F302 225 |
| Insert the shock valves (80) with conical springs (81). |  <br>F302 226 |
| Place O-rings (205) on the plugs (82).<br>Screw in the plugs (82) using a 13 mm socket or ring spanner.<br>40 ±3 Nm. |  <br>F302 227 |

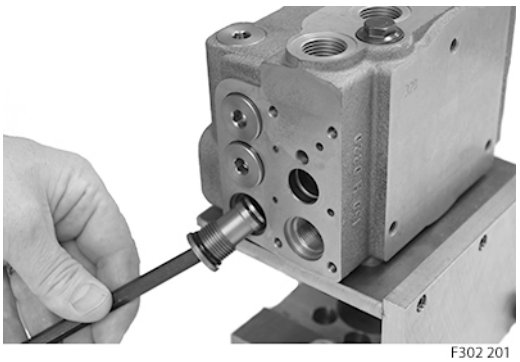
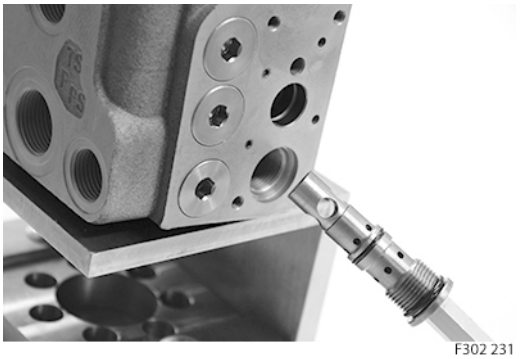
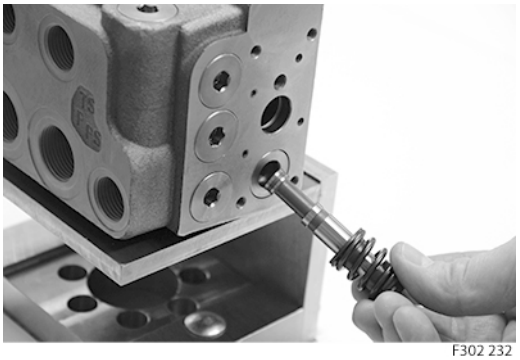
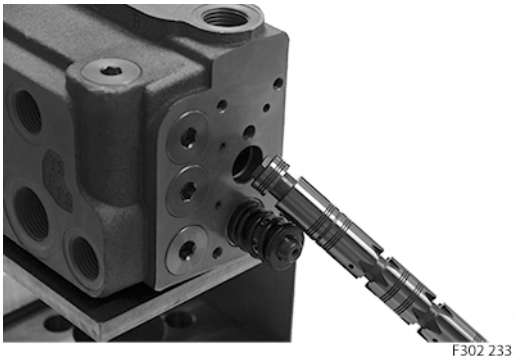
## Disassembly and assembly

*Assembly of EHPS (continued)*

| | |
|---|---|
| Place O-rings (204) on the plug (16) and the tube (15). Insert plug (16) and tube (15) and tighten using two 8 mm Hex keys: one in plug and one in tube end.<br>10 ±0.5 Nm. |  <br>F302 228<br>  <br>F302 229 |
| Assemble priority valve spool (7) with the dynamic orifice (8) using a 3 mm Hex key.<br>3.5 ±0.5 Nm.<br>Insert the priority valve spool (7) with the spring bore pointing outwards. |  <br>F302 205 |
| Insert the meetering spool (4) with the spring bore pointing outwards/flat end pointing inwards. |  <br>F302 230 |

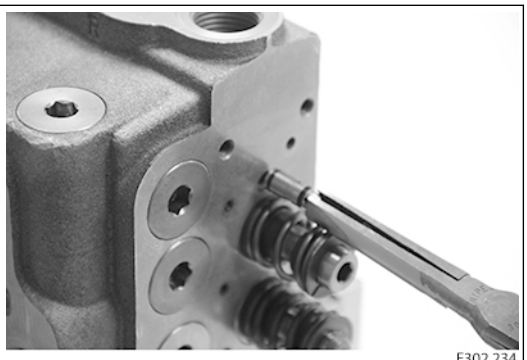
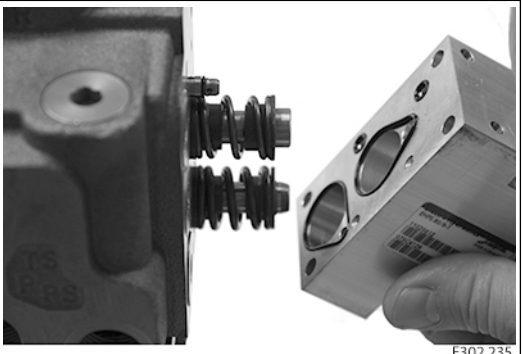
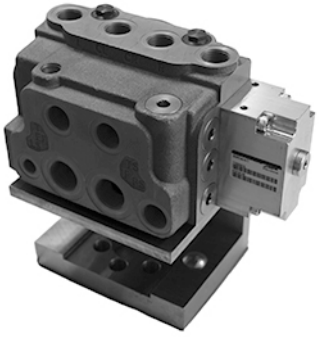
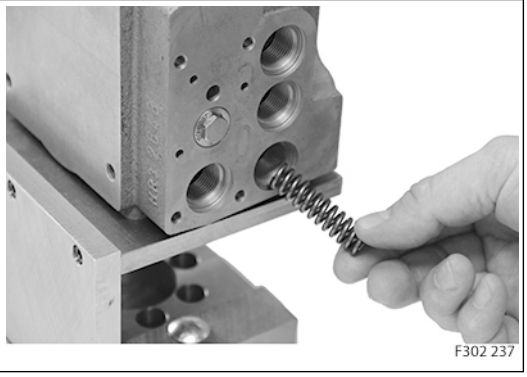
## Disassembly and assembly

*Assembly of EHPS (continued)*

| | |
|---|---|
| From the end cover (60) end:<br>Place O-ring (201) on to the plugs (20a and 20b, the two upper plugs).<br>Place O-rings (201 and 202) on the plug (23, the lower plug).<br>Screw in the plug (20a, 20b and 23) using an 8 mm Hex key.<br>40 ±3 Nm. |  <br>F302 201 |
| Place O-rings (201 and 202) to the bushing (21). Screw in the bushing (21) using a 12 mm Hex key.<br>40 ±3 Nm. |  <br>F302 231 |
| Insert the pilot spool w. spring (3). |  <br>F302 232 |
| Insert the directional spool w. spring (2). |  <br>F302 233 |

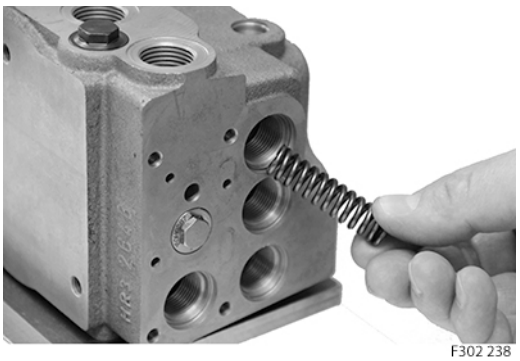
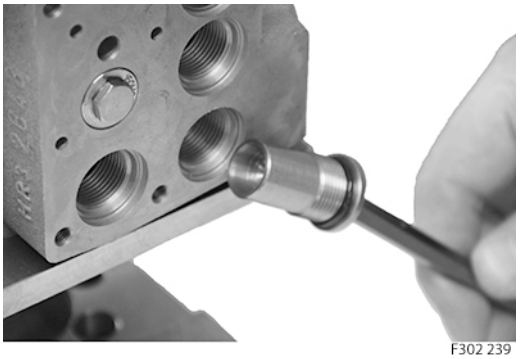
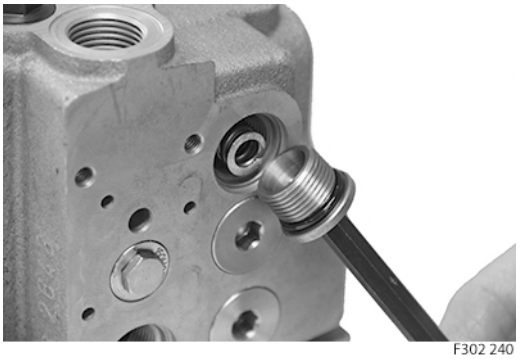
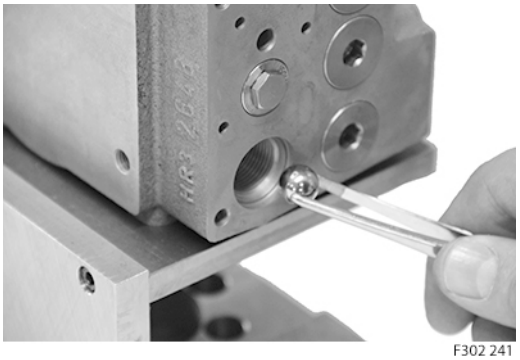
## Disassembly and assembly

*Assembly of EHPS (continued)*

| | |
|---|---|
| If it concerns EHPS type 1 or type 2 it has 2x shuttle valves.<br>Place 2x O-rings (207) on each shuttle valves (70).<br>Insert the shuttle valve (70). |  <br>F302 234 |
| Place O-rings (2x 61 and 2x 62) on the mounting surface of cover (60).<br>Place the cover (60) on housing with the 4 screws (63a) using a 5 mm Hex key.<br>8 ±0.5 Nm. |  <br>F302 235<br>  <br>F302 236 |
| From the PVE end (type 1 and 2) or cover (66) end (type 0):<br>Insert the spring (9) for priority valve. |  <br>F302 237 |

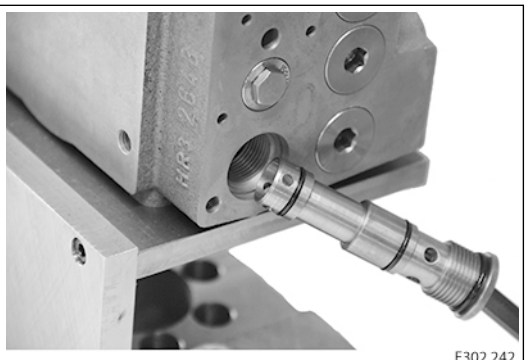
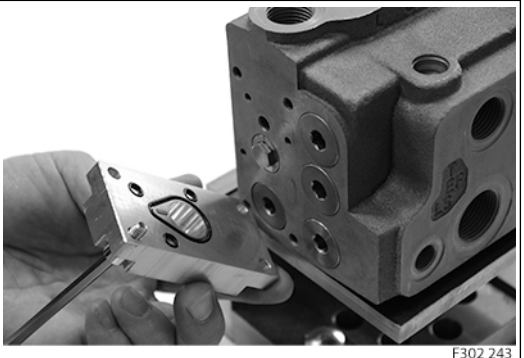
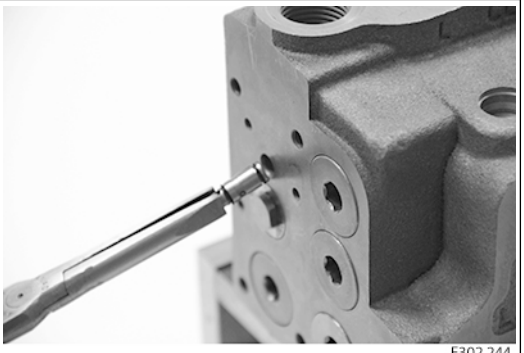
## Disassembly and assembly

*Assembly of EHPS (continued)*

| | |
|---|---|
| Insert the spring (5) for metering valve. |  F302 238 |
| Place O-ring (201) on to the plugs (22, the lower) (20c and 20d, the two upper short plugs).<br>Screw in the plug (20c, 20d and 22) using an 8 mm Hex key.<br>40 ±3 Nm |  F302 239<br>  F302 240 |
| Insert the ball (26). |  F302 241 |

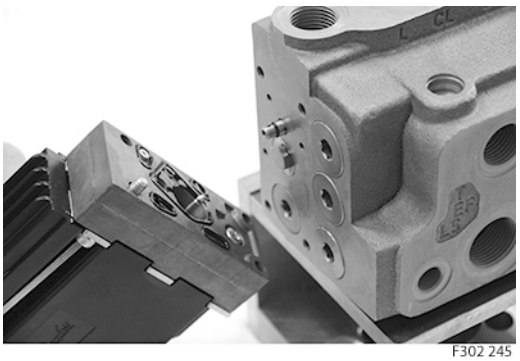
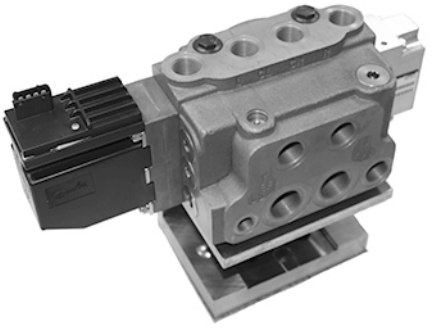
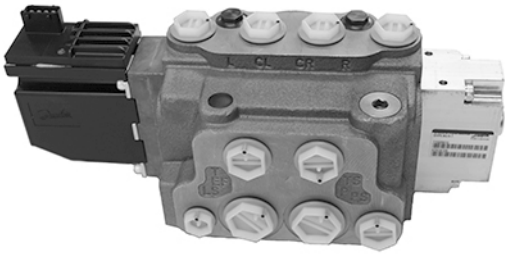
## Disassembly and assembly

*Assembly of EHPS (continued)*

| | |
|---|---|
| Place O-ring (201, 202 and 203) plug (25).<br>Screw in the plug (25) using an 8 mm Hex key.<br>40 ±3 Nm. |  <br>F302 242 |
| ***EHPS type 0 (without PVE):***<br>Place O-rings (1x 62 and 3x 61) on the mounting surface of cover (66).<br>Place the cover (66) on housing with the 4 screws (67) using a 5 mm Hex key.<br>8 ±0.5 Nm. |  <br>F302 243 |
| If it concerns EHPS type 1 or type 2 it has 2x shuttle valves.<br>Place 2x O-rings (207) on each shuttle valves (70).<br>Insert the shuttle valve (70). |  <br>F302 244 |

## Disassembly and assembly

*Assembly of EHPS (continued)*

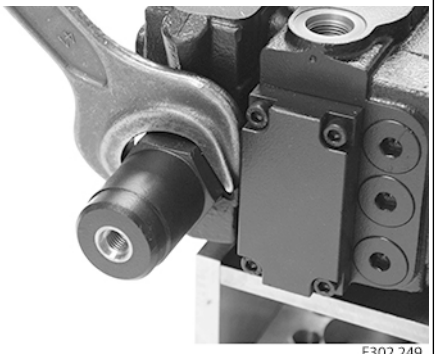
| | |
|---|---|
| EHPS type 1 or 2 (with PVE):<br>Place O-rings (3x 110, 1x 111, 1x 112 and 1x filter 114) on the mounting surface of PVE (6).<br>Place the PVE (6) on housing with the 4 screws (63b) using a 5 mm Hex key.<br>8 ±0.5 Nm |  <br>F302 245<br>  <br>F302 246 |
| Make test and valve setting according to *Testing of EHPS* on page 39. | |
| Screw in the plastic plugs into the connection ports to keep the ports clean during storage and transportation. |  <br>F302 247 |

## Disassembly and assembly

### Disassembly of OLS 320 and priority valve spool of EHPS

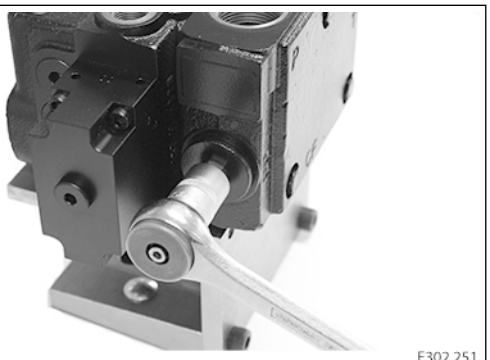
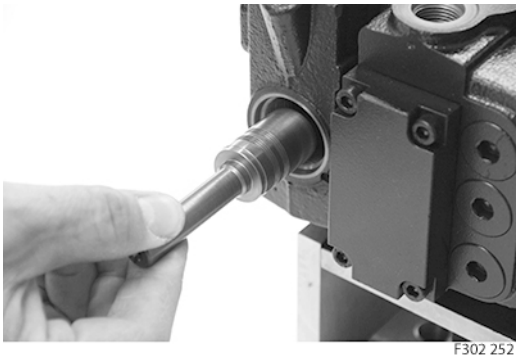
This section only describes the dismantling and assembling of parts, which differs from EHPS type 0, 1 and 2. The item numbers refers to *EHPS with flanged on OLS 320 exploded view* on page 9.

*Disassembly of OLS 320*

| | |
|---|---|
| Place the unit on the holding tool. |  F302 248 |
| Screw out the LS orifice (305) using a 2 mm Hex key, if present.<br>Some versions of LS plug for OLS 320 has integrated LS orifice in the plug (309 as in this case), and some LS plugs are blind plugs. | |
| Screw out the LS plug (309) using a 41 mm socket or ring spanner.<br>O-ring (320) is fitted to the plug (309). |  F302 249 |
| Remove the spring (307). |  F302 250 |

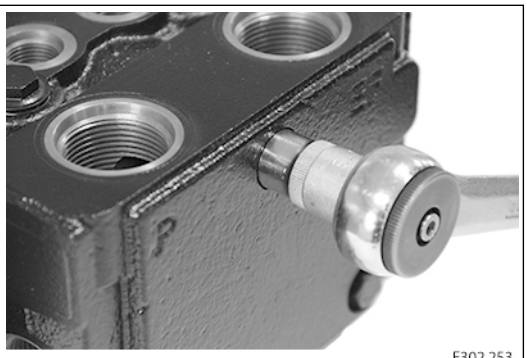
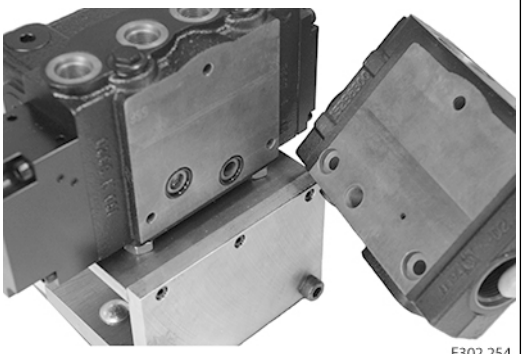
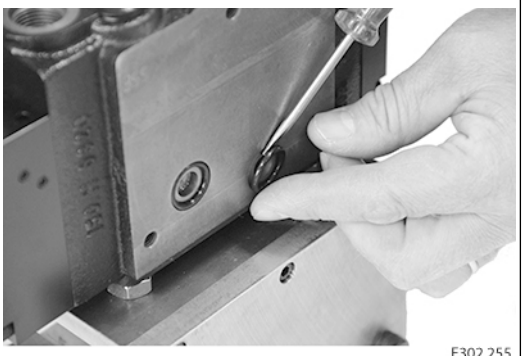
## Disassembly and assembly

*Disassembly of OLS 320 (continued)*

| | |
|---|---|
| Screw out the LS plug (310) using a 14 mm Hex key.<br>O-ring (320) is fitted to the plug (310). |  <br>F302 251 |
| Remove the priority valve spool (304).<br>Orifice, PP (306) is screwed into spool (304). |  <br>F302 252 |

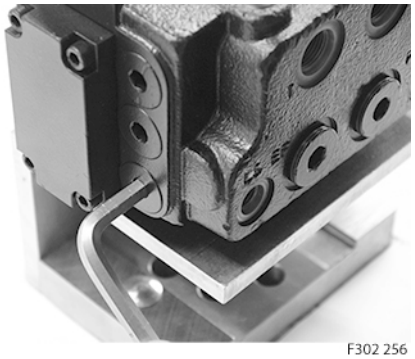
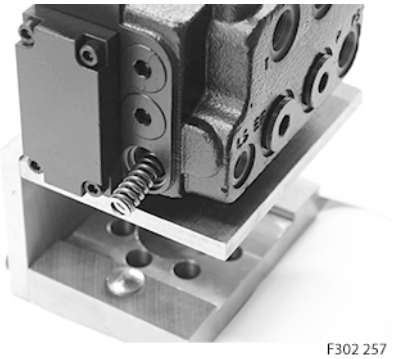
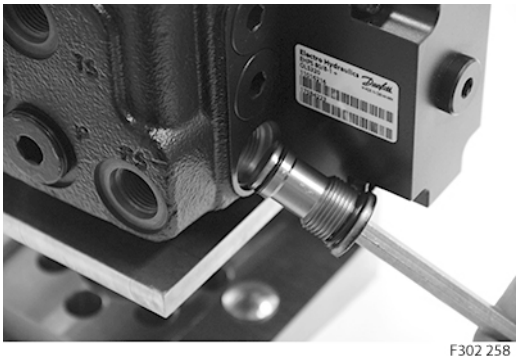
## Disassembly and assembly

*Disassembly of OLS 320 (continued)*

| | |
|---|---|
| Remove the OLS 320 housing (301) from the EHPS by unscrewing the 3 screws (322) using a 13 mm socket or ring spanner.<br>3 washers (323) are fitted to the screws (322).<br>2 O-rings (321) are fitted to the EHPS-housing (1). |  <br>F302 253<br>  <br>F302 254<br>  <br>F302 255 |
| Now the OLS 320 is completely dismantled | |

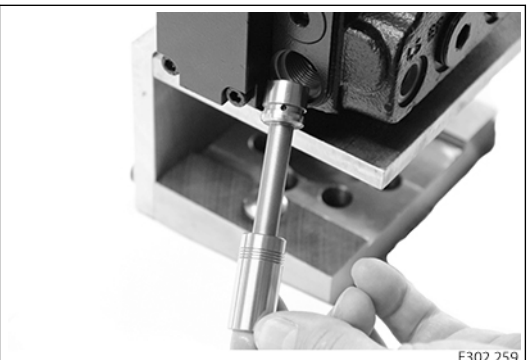
## Disassembly and assembly

*Disassembly of EHPS*

| | |
|---|---|
| Screw out the plug (22) using an 8 mm Hex key.<br>O-ring (201) is fitted to the plug. |  <br>F302 256 |
| Remove the spring (9). |  <br>F302 257 |
| Screw out the plug (23) using an 8 mm Hex key.<br>O-rings (201and 202) are fitted to the plug (23). |  <br>F302 258 |

## Disassembly and assembly

*Disassembly of EHPS (continued)*

| | |
|---|---|
| Remove the priority valve spool (7).<br>Orifice, dynamic (8), orifice, PP (10) and are screwed into spool (7).<br>Filter (12) is fitted into the spool (7). |  <br>F302 259<br>  <br>F302 260 |
| All other EHPS parts are the same for EHPS " stand alone" and for EHPS for OLS 320. | |

**Cleaning:** Clean all parts carefully in Shellsol K or similar cleaner fluid.

**Inspection and replacement** Replace all seals and washers.

Check all parts carefully and make any replacements as is necessary.

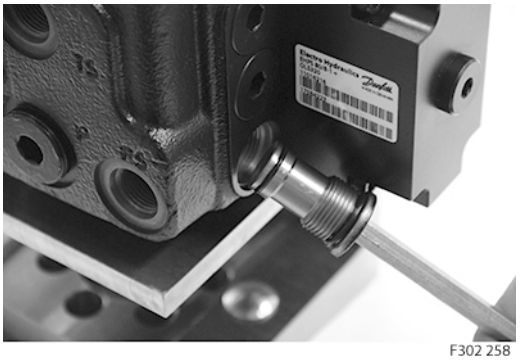
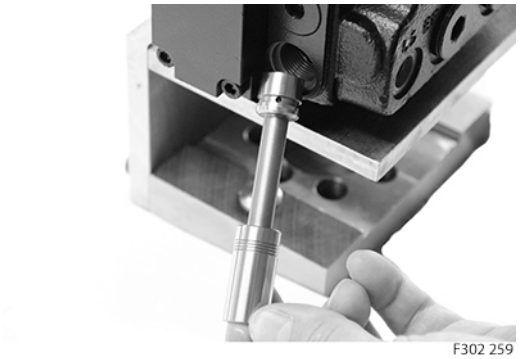
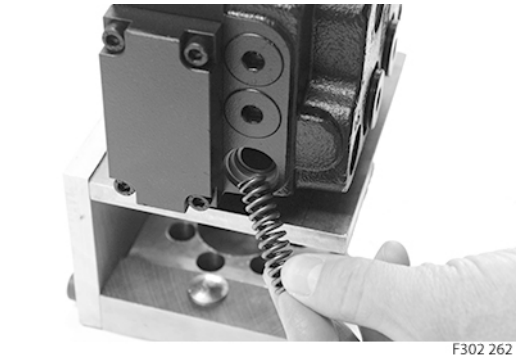
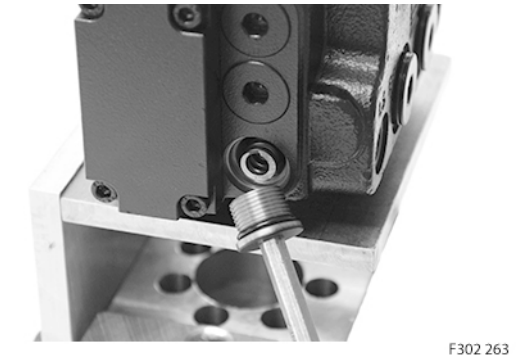
### Assembly of OLS 320 and priority valve spool of EHPS

*Assembly of OLS 320 and priority valve spool of EHPS*

| | |
|---|---|
| Place the EHPS housing on the holding tool. |  <br>F302 261 |
| Assemble all parts for EHPS, see *Assembly of EHPS* on page 23. | |

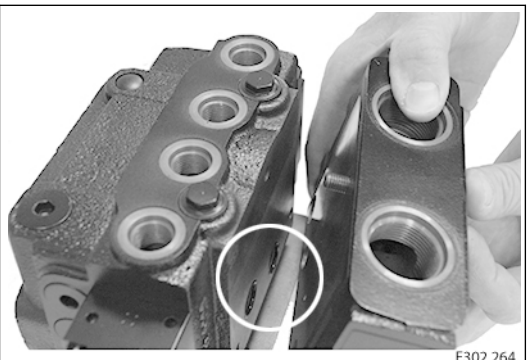
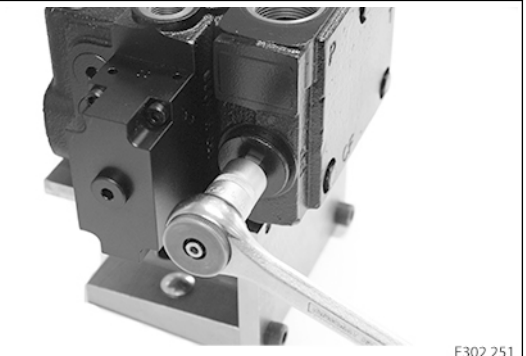
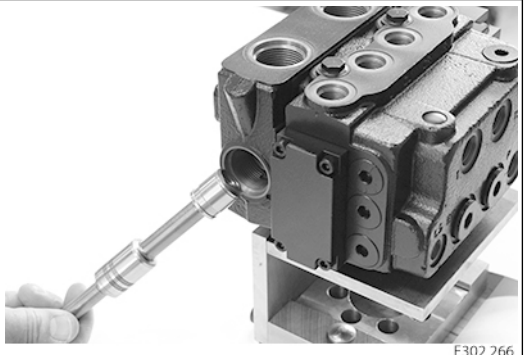
## Disassembly and assembly

*OLS parts for EHPS for OLS 320:*

| | |
|---|---|
| ***From the end cover (60) end:***<br>Place O-rings (201 and 202) on the plug (23, the lower plug).<br>Screw in the plug (23) using an 8 mm Hex key.<br>40 ±3 Nm. |  <br>F302 258 |
| Assemble priority valve spool (7) with:<br>The dynamic orifice (8) using a 3 mm Hex key, 3.5 ±0.5 Nm.<br>The filter (12) to be inserted.<br>The PP orifice (10) using a 4 mm Hex key, 3.5 ±0.5 Nm.<br>From the PVE end (type 1 and 2) or cover (66) end (type 0):<br>Insert the priority valve spool (7) with the spring bore pointing outwards. |  <br>F302 259 |
| Insert the spring (9) for priority valve. |  <br>F302 262 |
| Place O-ring (201) on to the plugs (22, the lower).<br>Screw in the plug (22) using an 8 mm Hex key.<br>40 ±3 Nm |  <br>F302 263 |

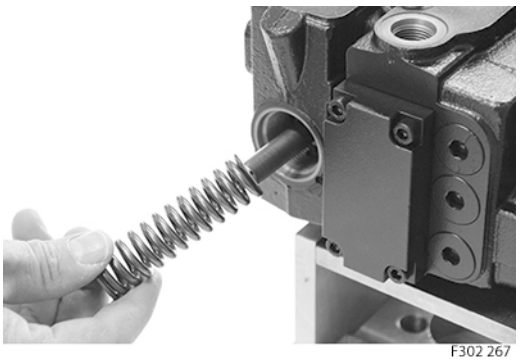
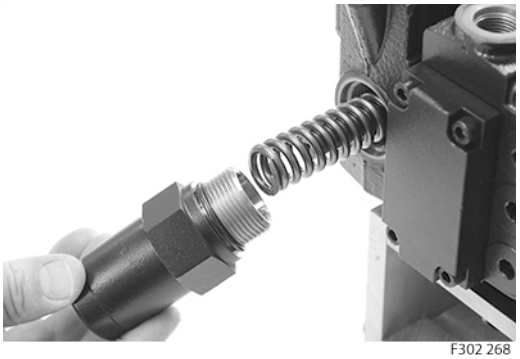
## Disassembly and assembly

*OLS parts for EHPS for OLS 320: (continued)*

| | |
|---|---|
| Flange the OLS 320 housing (301) on the EHPS housing (1):<br>Insert the two O-rings (321) in the EHPS housing (1) indicated in circle Fit the three screws (322) with washers (323) and insert them.<br>Use a 13 mm top wrench, 28 ±2 Nm. |  <br>F302 264<br>  <br>F302 265 |
| Place O-ring (320) on the plug (310).<br>Screw in the plug (320) using a 14 mm Hex key.<br>50 ±5 Nm |  <br>F302 251 |
| Assemble priority valve spool (304) with:<br>The PP orifice (306) using a 3 mm Hex key, 3,5 ±0.5 Nm.<br>Insert the priority valve spool (304) with the spring guide pointing outwards. |  <br>F302 266 |

## Disassembly and assembly

*OLS parts for EHPS for OLS 320: (continued)*

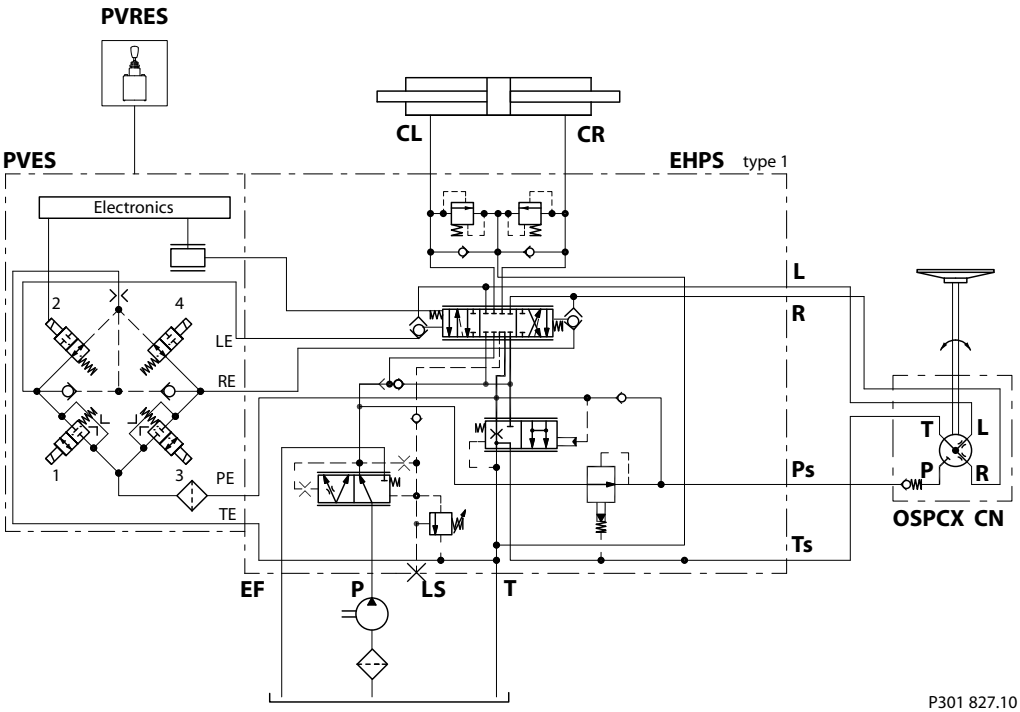
| | |
|---|---|
| Insert the spring (307) for priority valve. |  F302 267 |
| Place O-ring (320) on the plug (309).<br>Screw in the plug (320) using a 41 mm socket spanner, 50 ±5 Nm |  F302 268 |
| If present: Screw in the LS orifice (305) using a 2 mm Hex key, 1 ±0.1 Nm.<br>Some versions of LS plug for OLS 320 integrated LS orifice in the plug (305, as in this case), and some LS plugs are blind plugs. | |
| To make test and valve setting, see *Testing* on page 39. | |
| Screw in the plastic plugs into the connection ports to keep the ports clean during storage and transportation. |  F302 269 |

## Testing

### Testing of EHPS

This section describes minimum tests needed, when the EHPS steering valve has been disassembled and reassembled.

*EHPS type 1 with PVES:*




### Set up for testing the EHPS

Use universal hydraulic work bench with pump capacity:

- 40 l/min and up to 250 bar pressure for relief valve setting and steering test

The hydraulic oil must be with a viscosity of 21 cSt. at 50 ° and with max. degree of contamination according to ISO 4406: 21 / 19 / 16.

1. Connect double rod cylinder to CL and CR ports of EHPS.
2. Connect pilot steering unit OSPCX CN to EHPS: L to L, R to R, P to Ps, T to Ts.
3. Connect T and EF port of EHPS to tank of pump station.
4. With fixed gear pump in pump station: Block LS of EHPS with steel plug. With LS pump in pump station: connect LS of EHPS to LS of pump. Connect P to pump outlet.
5. Connect pressure gages to all ports of EHPS.
6. Connect steering column and steering wheel to the input shaft of the OSPCX steering unit.
7. For EHPS with PVES, PVED CC, PVED CL, after steering wheel test (test with pilot steering unit, type OSPCX CN): Connect voltage supply and signal input for the PVE.

T pressure should not exceed ~5 bar. Max. allowed T pressure is 25 bar.

Pump supply circuit must be adjusted not to exceed 250 bar P-T.

### Steering test using pilot steering unit type OSPCX CN

During the testing no motor effect, disturbing vibrations, noise, sticking or other irregularities must occur.

1. Start the pump, the pump flow is adjusted to approx. 40 l/min and pump pressure control must be set to app. 70 bar.

## Testing

2. Let the supplied oil flow through the EHPS for a few minutes. At the same time the steering wheel is to be rotated a few times in both directions to bleed of air from the unit and the system.
3. Operate the steering wheel by approx. 10 rpm in a smooth manner from end stroke to end stroke of the steering cylinder for at least 5 cycles. Make sure pressure P-T, 70 bar can be achieved, when steering against end stroke. If this is not possible, the adjusting screw of the pilot relief valve (item 94 of exploded view) must be turned clockwise until P-T, 70 bar is achievable.
4. Verify, that steering cylinder does not move, when steering wheel is untouched.

The number of turns i on steering wheel must match this calculation: i ~= V/Vvs where:

- V is stroke volume of steering cylinder, ccm
- Vvs = EHPS steering system displacement, ccm/rev.

> V, stroke volume if cylinder in test rig: 1600 ccm
>
> Vvs, steering system displacement with EHPS 40/5 and OSPCX 50 CN: 400 ccm/rev >
>
> i ~= 1600/400 4 turns lock to lock

This calculation will only match, when pump flow is sufficient for the actual steering speed. Pump flow must be minimum sum of cylinder flow (CQ, flow metered to steering cylnder) and pilot flow (PQ, flow from pilot steering unit).

### Pilot relief valve for EHPS

The pump flow is adjusted to approx. 40 l/min and pump pressure to max 250 bar.

The steering wheel is actuated until the steering cylinder reaches one of its end strokes and the steering wheel is actuated in this cylinder position with steering torque 20 ±5 Nm.

The pilot relief valve (item 94 of exploded view) is set according to specification: Max. steering pressure (P-T), bar, for the code in question.

The setting pressure is the pressure on the P-port minus the T-port of EHPS.

### Neutral positioning test, OSP part for EHPS

After adjusting the pilot relief valve, the steering wheel must be able to go to neutral position by itself no later than ~1 second after the activation of the steering wheel has been stopped.

The steering unit and EHPS is proper in neutral position when the pressure drop (P-T of EHPS) is no higher than 30 bar at pump flow 40 l/min, and there must be no movement of the steering cylinder.

### Steering and neutral positioning test, EH part with EHPS

For EHPS with PVES, PVED CC, PVED CL: Apply battery power and input signal to the PVE: observe that the steering cylinder is moving according to direction of input signal for PVE. Observe that max steering pressure (P-T) from above setting can be reach, when steering cylinder is moved to full end stroke by the PVE. Apply neutral position signal for PVE, observe that cylinder movement stops and that pressure P-T drops to max. 30 bar at pump flow 40 l/min.

### Manual steering with EHPS

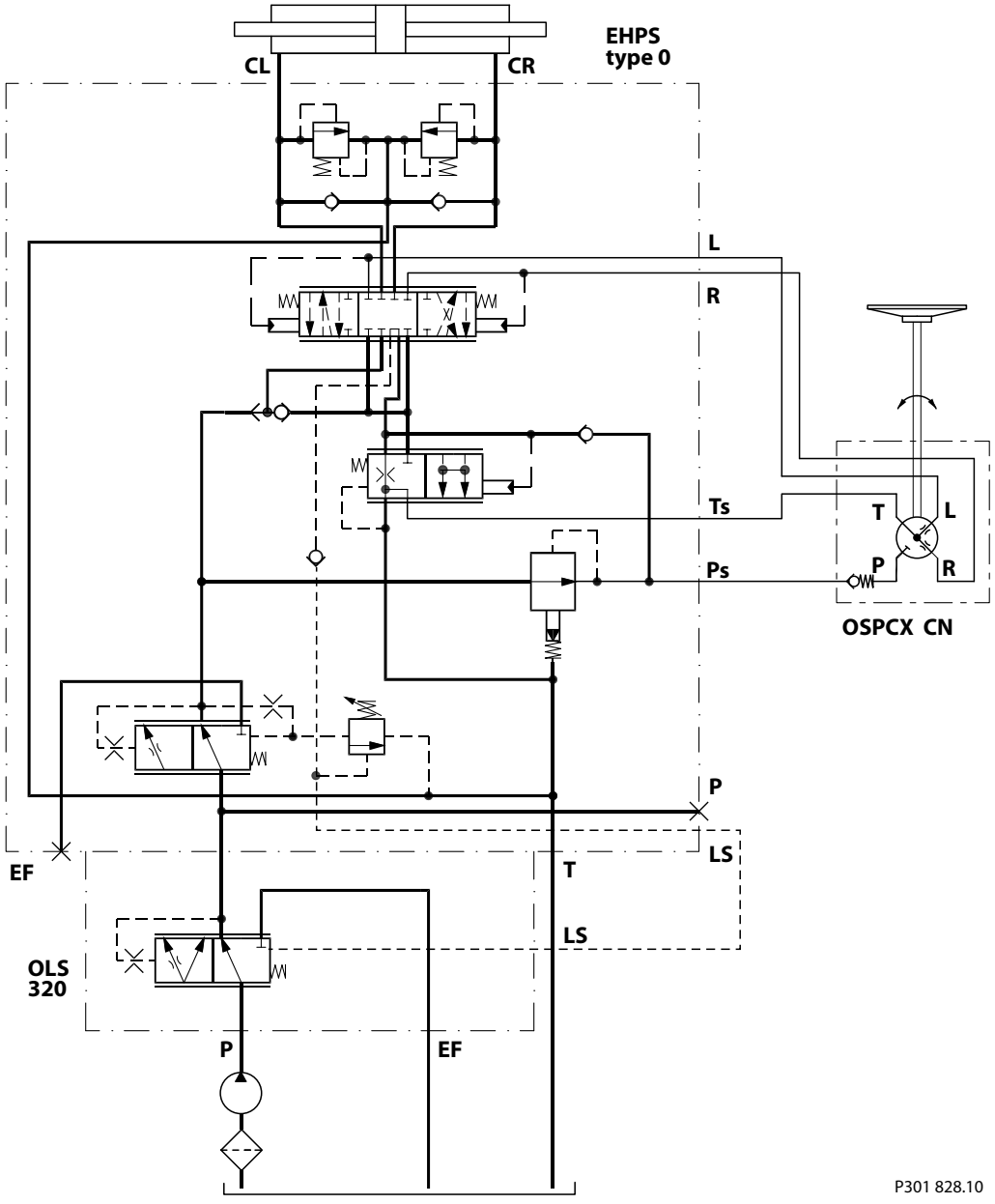
Without pressure on P and T ports, the OSPCX and EHPS must be able to steer in a smooth manner to the right and to the left observed by the cylinder movement. The number of turns on the steering wheel for moving the steering cylinder from lock to lock, must increase in comparison to do this test with normal pump supply.

Without pump supply the number of turns must match cylinder volume/displacement of OSPCX.
Example: Cylinder volume: 1600 ccm, and OSPCX 50 CN > Number of turns must be 1600/50 ~= 32 turns.

## Testing

### Testing of EHPS with OLS 320

*Testing of EHPS with OLS 320*




### Set up for testing the EHPS with OLS 320

Setup and testing for EHPS w. OLS 320 will be the same as for EHPS “stand alone” except:

- P from pump station is connected to P of OLS 320
- EF of OLS 320 to T of pump station
- LS of OLS 320 to LS of EHPS.

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