

ENGINEERING TOMORROW

Service Manual

Steering Valve OSPE







Revision history

Table of revisions

Date	Changed	Rev
August 2022	Changed document number from 'L1506577' to 'AX152986482698' and updated service parts list	0201
August 2015	Codenumber changed	0001
February 2015	First edition	AA



Contents

Safety Precautions		
	Safety precautions	4
Service Literature		
	Symbols used in Literature	5
	OSPE versions	5
Exploded View and Se	eal Kit	
•	OSPE exploded view	6
	OSPE parts list	7
Tools		
	Tools for OSPE	
Dismantling		
	Dismantling OSPE	
Assembly		
	Assembling OSPE	
Test and valve setting	g of OSPE	
	Set up for testing	
	Set up OSPE with integrated priority valve	
	Set up OSPE without integrated priority valve	
	Steering test	
	Pilot relief valve	
	Neutral positioning test, OSP part	
	Neutral positioning test, EH part	
	Manual steering	
	Shock valves	
	OSPE LSRM	
	OSPE LS (non reaction/non reaction versions)	
	Check for external leakage	
Tightening Torques		
	Tightening torques for connections OPSE	46



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.

A 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.

A 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.

A 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 Literature

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

• 🔊

The symbols above appear in the illustrations and text of this manual. They are intended to communicate helpful information at the point where it is most useful to the reader. In most instances, the appearance of the symbol itself denotes its meaning. The legend above defines each symbol and explains its purpose.

OSPE versions

This service literature is valid for:

- All OSPEs with single stage gear set
- All OSPED with dual gear set; however, only for V2/OSPED for the gear set end

If the OSPED in question is in "old" or "V2/new" design can be traced by the product code:

- OSPEDs with product code number higher than 11113069 are all in "new" design
- OSPEDs with product code lower than 11113069 are all in "old" design

For further explanations between OSPED in "old" and "new" design, see Product Information Bulletin ST2014-0139.

Service literature HN.21.ZA.52 is valid for gear set end of OSPED in "old" version.



OSPE exploded view





OSPE parts list

OSPE	Number per unit	ltem	Tightening torque
Spool/Sleeve set	1	1	-
Housing	1	3	-
Screw	1	4	1.5 ±0.3 N·m
Ball for emergency steering Ø8.5 mm	1	5	-
O-ring Ø79.4 x Ø2.0 mm	1	6	-
Shaft seal	1	7	-
Dust seal ring	1	9	-
Cross pin	1	12	-
Cardan shaft	1	13	-
Set of springs	1	14	-
Ring	1	16	-
Bearing assembly	1	18	-
Gear set	1	30	-
Short screw (OSPED)	1	27	30 ±6 N⋅m
Screws (OSPED)	6	31	30 ±6 N⋅m
Screws (OSPE)	7	31	30 ±6 N⋅m
Valve plate	1	34	-
Washers	7	35	-
End cover	1	36	-
O-ring Ø79.4 x Ø2.0 mm (OSPED)	6	39	-
O-ring Ø79.4 x Ø2.0 mm (OSPE)	2	39	-
O-ring Ø9.0 x Ø1.5 mm	2	40	-
O-ring Ø6.0 x Ø1.5 mm	2	41	-
Balls for shock valves Ø4.8 mm	2	61	-
Spring with thrust pad for shock valves	2	62	-
Valves seats	2	63	5.5 ±0.5 N·m
Adjusting screws for shock valves	2	64	-
Pins	2	80	3 ±0.5 N⋅m
Balls for suction valves Ø4.8 mm	2	81	-
Screw	1	85	1.5 ±0.3 N⋅m
Spring	1	86	-
Valve cone for P check	1	87	-
Plug	1	93	-
Pilot relief valve cartridge	1	95	20 ±3 N·m
Gear set	1	115	-
Valve plate	1	116	-
Valve plate	1	117	-
Cardan shaft	1	120	-
Valve housing assembly	1	122	-
Spool, EH steering	1	202	-
Spool priority valve	1	203	-
PVE	1	204	-
Plug	1	205	45 ±5 N⋅m



OSPE parts list (continued)

OSPE	Number per unit	ltem	Tightening torque
Plug	1	207	45 ±5 N·m
Plugs	2	209	45 ±5 N·m
Spring	1	213	-
Cone pilot supply	1	214	-
Spool pilot supply	1	215	-
Plug	1	216	30 ±3 N·m
Check valve, LS	1	221	3.5 ±0.5 N⋅m
Orifice, LS	1	222	3.5 ±0.5 N⋅m
Spool PVFC	1	224	-
Plug	1	225	15 ±2 N·m
Orifice PP	1	230	3.5 ±0.5 N⋅m
Spring	1	231	-
Orifice, dynamic	1	232	1 ±0.1 N⋅m
Screws	4	233	8 ±1 N·m
Spring	1	241	-
Spool reaction/EH L&R cut off	1	242	-
Plug	1	243	45 ±5 N·m
Cartridge spool, pilot dump	1	246	15 ±2 N·m
Coil	1	247	-
Nut	1	248	5 ±1 N·m
O-ring Ø10.0 x Ø1.5 mm	1	249	-
Plug	1	253	20 ±3 N·m
Plug	1	254	20 ±3 N·m
Lock ring	1	300	-
O-ring Ø7.5 x Ø1.5 mm	1	301	-
O-ring Ø11.0 x Ø2.0 mm	1	302	-
Backup ring	1	303	-
O-ring Ø8.0 x Ø1.5 mm	1	304	-
Filter	1	305	-
O-ring Ø23.3 x Ø2.4 mm	1	310	-
O-ring Ø17.8 x Ø2.1 mm	2	311	-
O-ring Ø17.4 x Ø2.1 mm	2	312	-
O-ring Ø15.0 x Ø1.5 mm	1	313	-
O-ring Ø11.0 x Ø2.0 mm	1	314	-
O-ring Ø10.0 x Ø2.0 mm	3	320	-
O-ring Ø30.0 x Ø2.5 mm	1	321	-
O-ring Ø8.0 x Ø2.0 mm	1	322	-
Filter	1	323	-
O-ring ø7.65 x ø1.78 mm	1	330	-
O-ring ø9.25 x ø1.78 mm	1	331	-
O-ring ø13.5 x ø2.08 mm	1	332	-



OSPE spare parts

Spare parts list	Code number	Item
Coil, DEUTSCH: D08 12V DE 322113	11084688	247
Coil, AMP: D08 12V AJE 321930	11084690	247
Spare part bag containing: Cartridge spool for pilot dump, Nut and O-ring	11085713	246, 248, 249
Seal kit OSPE steering unit part	150N4041	6, 7, 9, 35, 39, 40, 41
Seal kit OSPE EH part	11160415	93, 225, 310, 311, 312, 313, 314
Seal kit pilot relief valve cartridge	155L6870	300, 301, 302, 303, 304, 305
Seal kit PVE ¹	157B4997	320, 321, 322, 323
Seal kit cartridge spool for pilot dump	120433	330, 331, 332

¹ PVE seal kits may contain extra parts not applicable to some PVEs

OSPE seal kit

Spare parts list	Code number	Containing seal kits, codes
Seal kit KIT OSPE complete ¹	11160838	150N4041, 11160415, 155L6870, 157B4997, 120433

EH main spools

Spare parts list	Code number	Item
12 l/min	11275591	202
20 l/min	11278328	202
30 l/min	11275043	202
40 l/min	11238915	202
50 l/min	11277978	202

PVED-CLS

Spare parts list	Code number	Item
Firmware version 1.95 ²	11181365	204
Firmware version 2.01 ²	11217600	204

² PVED-CLS firmware version can be manually changed once received



Tools

Tools for OSPE





Tools

Tools (continued)

Assembly tool for shaft seal, O-ring/Roto Glyd type: Code number: 11092408.

This tool has been modified by January 2015. The upper end of outer tube has knurled surface on 25 mm from top only (was 35 mm). Tool with 35 mm knurled surface can be modified by grinding off 10 mm of the knurled surface.



Tool for removing/assembling pilot relief valve cartridge: Code number: 155L6494

Torque wrench 0 - 70 Nm. 13 - 17 - 19 and 32 mm socket spanner. 2 - 2.75 - 3 - 4 - 5 - 6 and 8 mm Hex key. 12 mm screwdriver. 2 mm screwdriver. 13 - 17 - 19 - 7/8 inch mm ring spanner. Inside circlip pliers Plastic hammer. Tweezers. These tools are not available from Danfoss.





Dismantling OSPE

Dismantling OSPE

Place the unit in the holding tool on steering column end.	F302 079
Screw out the 4 screws for the PVE (233) using a 5 mm Hex key. Remove the PVE (204). O-rings (320, 321, 322) and filter (323) are fitted to the mounting surface of PVE.	F302 080
Screw out the plug (243) using a 17 mm socket or ring spanner. O-ring (312) is fitted on plug (243).	F302 081
Remove the spring (241).	F302 082



Dismantling OSPE (continued)	
Remove the EH L&R cut off spool (242).	F32 083
Screw out the plug (207). If the OSPE is with priority valve integrated: Use a 17 mm socket or ring spanner. O-ring (312) is fitted on plug (207). If the OSPE is without priority valve integrated: Use a 8 mm Hex key. This plug is fitted with O-ring (312) and (313).	F302 084
Remove the spring (231).	F302 085
Remove the priority valve spool (203). Orifices (230) and (232) are screwed into spool (203).	F302 086



















Dismantling OSPE (continued) Screw out the LS check valve (221) using a 3 mm Hex key. This check valve is not present in all OSPE's. F301 103 Screw out the plugs (253) and (254) using a 6 mm Hex key. These plugs not present in all OSPE's. F302 104 OSPED: Remove the screws (1x27 and 6x31) with washers (35) using a 13 mm Socket or ring spanner. OSPE: Has 7 identical screws (7x 31). F302 105 Remove the end cover (36), sideways. F302 106



Districting OST E (continued)	
OSPED: Lift the gearwheel set (115) off the unit. Remove the two O-rings (39).	F302 107
OSPED: Remove the distributor plate (117).	F302 108
OSPED: Remove valve housing assembly (122). Remove the two O-rings (39). Do not dismantle the entire valve (122).	F302 109
OSPED: Remove the distributor plate (116).	F302 110



	-
OSPED: Remove the cardan shaft (120).	F302 111
Lift the gearwheel set (30) off the unit. Remove the two O-rings (39).	F302 112
Remove the cardan shaft (13).	F302 113
Remove the distributor plate (34) from the housing.	F302 114



-	
Remove the O-ring (6) from housing.	F302 115
Screw out threaded bushing/ball stop (4) from housing using a 12 mm screw driver and remove bushing from housing.	F302 116
Screw out the screw (85) using a 12 mm screw driver. Spring (86) and valve cone (87) will be attached to the screw (85).	F302 117
	F32118



Screw out the pin bolts (80) using a 4 mm Hex key. F302 119 Screw out the plug (216) using a 6 mm Hex key. O-ring 314 is fitted on plug (216). F302 120 Remove plug (216) and spool (215). F302 121 F302 122







Press the spool (1) inwards (from the steering column end) and the sleeve (1), ring (16), neutral position springs (14) and bearing assembly (18) will be pushed out of the housing together.	F302 127
Take the bearing races with needle bearing (18) and the ring (16) off from the spool and sleeve set (1). The outer bearing (18) race can sometimes "stick" in the housing, therefore check that it has come out.	F302 128
Press out the cross pin (12).	E302.120
Carefully press the spool out of the sleeve.	
	F302 130



Press the neutral position springs (14) out of the slot of the spool.	
	F301 808
Remove dust seal (9) and shaft seal (Roto Glyd) (7) carefully with a screw driver or similar tool.	
	F302 131
The steering unit OSPED is now completely dismantled	
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.	



Assembling OSPE

Assembling OSPE Place the two flat neutral position springs (from item 14) in the slot of the spool (from item 1). Place the curved springs between the flat ones and press them into place. F301 810 Configuration of spring set (14). There can be different numbers of curved springs depending on configuration of spring set. There can be 2, 4 or 6 curved springs. 150-386.10 **OSPEF:** Spool and sleeve must be positioned correctly relatively to each other. Small marks are present on both spool and sleeve close to one of the slots for the spring set. 8 0 0 0 0 С 0 150-412.10 Guide the spool into the sleeve (1). If the spool and sleeve has marks as shown above, these must be placed on same side. Make sure the neutral position springs (14) are placed into the slot. F302 133











Press and turn the shaft seal (7) into position in the housing.	F302 138
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.	FIO 136
With a light turning movement, guide the spool and	
sleeve into the bore. Fit the spool set holding the cross pin (12) horizontal.	F302 139
The spool set will push out the assembly tool guide. The shaft seal (7) is now installed.	
	F302 140
Place the steering valve housing (3) on the holding tool	



Put the check valve ball (5) into the hole indicated by the circle.	F32 141
Screw in the screw (4) using a 12 mm screw driver.	F302 142
Assemble spring (86) and cone (87 on screw (85). Place the assembly in the hole indicated by the circle. Screw in the screw (85) using a 12 mm screw driver.	F302 143
Put the suction valve balls (81) into the holes indicated by the circles.	F32144



Screw in the pin bolts (80) using a 4 mm \bigcirc Hex key. 3 ±0.5 Nm.	F302 145
	1502115
Place the spool (224) in the hole indicated by the circle.	F302 146
Screw in the plug (225) using a 5 mm Hex key.	F302 147







	Assembling OSFE (continued)
F30 152	Insert the O-ring (6) in the grove on the housing.
	Place the distributor plate (34).
F302 153	OSPED: the small ø4 mm hole of the plate (34) must be placed above the ø3 mm hole in the housing The radial channel groove of the plate (34) must be facing the housing side.
and the second sec	Guide the cardan shaft (13) down into the bore so that
F302113	the slot is parallel with the connection flange for P, I, L and R ports and lines up with the cross pin (12).
	Place the 2 O-rings (39) in the two groves in the gear rim.
	Fit the gearwheel with rim (30) on the cardan shaft (13). Place the gear wheel side with all the deeper splines facing downwards. Only this side will fit on the cardan shaft due to all gear sets used in OSPE have timing securing: splines of gear wheel and cardan shaft can only be assembled with correct timing.
	Place the 2 O-rings (39) in the two groves in the gear rim. Fit the gearwheel with rim (30) on the cardan shaft (13). Place the gear wheel side with all the deeper splines facing downwards. Only this side will fit on the cardan shaft due to all gear sets used in OSPE have timing securing: splines of gear wheel and cardan shaft can only be assembled with correct timing.



OSPED: Place and rotate the cardan shaft (120) with the big diameter end until it moves in gear with gear wheel of gear set (30).	F32 111
OSPED: Place the middle distributor plate (116) so that the channel holes match the holes in the gear set.	F32110
OSPED: Place the 2 O-rings (39) in the two groves in the valve housing assembly (122). Place the valve housing assembly so that the one and only M8 thread whole points upwards and direction port face for P, T, L and R connections.	F302 173
Make sure that channel holes of the valve housing assembly (122) match the holes in the distributor plate (116).	F31 827







The OSPE can now be function tested manually: it must be possible to rotate input shaft with torque < 3.5 Nm [31 lbf•in].	
Place the dust seal ring (9) in the housing.	F302156
Fit the dust seal ring (9) in the housing using special tool for dust seal assembly (see page 7) and a plastic hammer.	F302 157
Place O-ring (41) on the shock valve seats (63). Screw in	
the seats (63) using a 2.75 mm \bigcirc Hex key into the cavities indicated by the circles. \bigcirc 6 ± 1 Nm. [53.1 ± 8.85 lbf•in].	F302 158
Place one ball (61) in each of the shock valve cavities.	F302 159











Assembling OSPE (continued)	
Screw in the plugs (253) and (254) using a 6 mm Hex key. 20 ±3 Nm. These plugs not present in all OSPE's.	F30 104
Place O-rings (330, 331, 332) on cartridge spool (246). Screw in the cartridge spool (246) using a 7/8 inch ring spanner. 15 ± 2 Nm.	Гадарана (1990) Тарарана (1990) Тарарана (1990) Тарарана (1990)
OSPE with priority valve: Assemble spool (203) with the PP orifice (230) using a 3 mm \bigcirc Hex key. \bigcirc 3.5 ±0.5 Nm. And with dynamic orifice (232) using a 2 mm \bigcirc Hex key. \bigcirc 1 ±0.1 Nm. Insert the priority valve spool (203) with the spring bore pointing outwards.	F302 165
OSPE with priority valve: Insert the spring (231). Dimension of this spring depends on specification of priority valve.	F32 166







Check proper movement of EH spool (202): press on spool end, the spool must be able to be moved downwards 4 mm with force < 100N, and it must be able to return to starting position by help of the neutral spring package integrated in the spool end facing plug (205).	F302 170
Place O-rings (320, 321, 322) and filter (323) on PVE (204). Place the PVE (204) on OSPE housing as illustrated and screw in the 4 screws for the PVE (233) using a 5 mm Hex key. 8 ±1 Nm.	F302 080
Place coil 247 on cartridge for pilot dump (246). Place O- ring (249) and nut (248) on cartridge for pilot dump (246). Screw in the nut (248) using a 19 mm socket spanner 5 ± 1 Nm.	F302 171
Make test and valve setting according to description, see <i>Steering test</i> on page 43.	
Screw in the plastic plugs into the connection ports to keep the ports clean during storage and transportation.	
	F302 172



Test and valve setting of OSPE

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

OSPEDC LSRM with integrated priority valve:



Set up for testing

A universal hydraulic work bench is required for this setup. The work bench must support the following pump capacity.



Test and valve setting of OSPE

- 25 l/min and up to 210 bar pressure for relief valve setting and steering test
- 3 l/min and up to 280 bar pressure for shock valve setting

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

Set up OSPE with integrated priority valve

- 1. Connect double rod cylinder to L and R ports of OSPE.
- 2. Connect pressure gauges to all ports of OSPE.
- 3. Connect steering column and steering wheel to the input shaft of the OSPE.
- **4.** If OSPE with PVES, PVED CC, or PVED CL, connect battery power cables with on/off switch to the coil of control valve for mode select (247).

Voltage must meet the specification for the code.

For OSPE with PVED CLS, the coil (247) is controlled by the PVED CLS.

- 5. Connect voltage supply and signal input for the PVE.
- 6. Connect P port to pump supply.
- 7. Block LS port with steel plug.
- 8. Connect T and EF ports separately to tank of pump station.

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

The pump supply circuit should not exceed 210 bar P-T.

9. Screw the adjusting screws of shock valves to block. Screw clockwise as much as possible to a torque < 5 Nm to ensure the shock valves do not open during steering test or setting of pilot relief valve.

Set up OSPE without integrated priority valve

- 1. Connect double rod cylinder to L and R ports of OSPE.
- 2. Connect pressure gauges to all ports of OSPE.
- 3. Connect steering column and steering wheel to the input shaft of the OSPE.
- If OSPE with PVES, PVED CC, or PVED CL, connect battery power cables with on/off switch to the coil
 of control valve for mode select (247).

Voltage must meet the specification for the code.

For OSPE with PVED CLS, the coil (247) is controlled by the PVED CLS.

- 5. Connect voltage supply and signal input for the PVE.
- 6. Connect an external priority valve between P of pump station and P of OSPE.

Use Danfoss priority valve OLS 80 code 152B8269, or other OLS 80 with same orifice and spring specification.

Dynamic orifice: Ø1.0 mm LS orifice: Ø1.2 mm Spring: 7 bar

- 7. Connect LS port of OSPE with LS port of OLS.
- 8. Connect T port of OSPE to tank.
- **9.** Screw the adjusting screws of shock valves to block.

Screw clockwise as much as possible to a torque < 5 Nm to ensure the shock valves do not open during steering test or setting of pilot relief valve.

Steering test

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. 25 l/min and pump pressure control must be set to app. 70 bar.
- **2.** Let the supplied oil flow through the steering unit 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 95 of exploded view) must be turned clockwise until P-T, 70 bar is achievable.

Pilot relief valve

The pump flow is adjusted to approx. 25 l/min and pressure to max 210 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 25 ± 5 Nm.

The pilot relief valve (item 95 of exploded view) is set according to specification: Maximum 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 OSPE.

Neutral positioning test, OSP part

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 is in neutral position when the pressure drop (P-T) is no higher than 18 bar.

Neutral positioning test, EH part

For OSPE with PVES, PVED CC, PVED CL: Apply battery power to the coil (item 247 on exploded view). Apply battery power and input signal to the PVE: observe that the steering cylinder is moving according to direction of input signal for PVE. Apply neutral position signal for PVE, observe that cylinder movement stops and that pressure LS-T drops to max. 10 bar.

For OSPE with PVED CLS: The coil (item 247 of exploded view) is controlled by the PVED CLS.

Manual steering

Without pressure on P and T ports, the unit must be able to steer in a smooth manner to the right and to the left observed by the cylinder movement.

For OSPED: 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/emergency steer displacement of OSPED. Example: Cylinder volume: 600 ccm, and OSPED 60/185 LSRM > Number of turns must be $600/60 \sim = 10$ turns.

Shock valves

Remove pump supply to P port of OSPE and plug the P-port. Remove the steering cylinder connection. T must still be connected to tank of pump station.

OSPE LSRM

L and R ports are connected through the spool/sleeve set in neutral, steering wheel must be untouched during setting of shock valves:



Test and valve setting of OSPE

- 1. Plug the L- port and apply pump pressure to the R-port. The shock valves are to be set at an oil flow of 3 l/min. The supply must be limited to max 280 bar on the pump station.
- 2. Screw one of the shock valves (item 64) outwards until pressure is reduced to the lower specified value + 15-20 bar and flows comes out of the T-port (e.g. 235-240 bar of specified value 220-240 bar)
- **3.** Screw the other shock valve (item 64) outwards until pressure is reduced to the lower specified value + 0-5 bar and check that flow out of T-port continues (e.g. 220-225 bar of specified value 220-240 bar).

OSPE LS (non reaction/non reaction versions)

The shock valves are to be set at an oil flow of 3 l/min applied to one of the servo ports L and R at a time. The supply must be limited to maximum 280 bar on the pump station.

Adjust the pressure (R-T/L-T) by adjusting screws of shock valves (item 64) to the specified value for the shock valve setting for the code in question.

Check for external leakage

After testing of the former items, the steering column (wheel) and port connections are removed. P, L, R, EF and LS ports are to be plugged and oil pressure of 20 bar is supplied to the T port for approx. 3 minutes: No leakage must be found in any assemblies or at the input shaft for the steering column.



Tightening Torques

Tightening torques for connections OPSE

Tightening Torques for Connections OSPD V2

Connections	Maximum tightening torque Nm [lbf.in]			
	With cutting edge	With copper washer	With alum. Washer	O-ring
M12 • 1.5	30 [265]	20 [177]	30 [265]	25 [221]
M18 • 1.5	80 [708]	55 [486]	70 [619]	50 [442]
M22 • 1.5	100 [885]	65 [575]	80 [708]	60 [531]





Products we offer:

- Cartridge valves
- DCV directional control valves
- Electric converters
- Electric machines
- Electric motors
- Gear motors
- Gear pumps
- Hydraulic integrated circuits (HICs)
- Hydrostatic motors
- Hydrostatic pumps
- Orbital motors
- PLUS+1[®] controllers
- PLUS+1[®] displays
- PLUS+1[®] joysticks and pedals
- PLUS+1[®] operator interfaces
- PLUS+1[®] sensors
- PLUS+1[®] software
- PLUS+1[®] software services, support and training
- Position controls and sensors
- PVG proportional valves
- Steering components and systems
- Telematics

Hydro-Gear

www.hydro-gear.com

Daikin-Sauer-Danfoss

www.daikin-sauer-danfoss.com

Danfoss Power Solutions is a global manufacturer and supplier of high-quality hydraulic and electric components. We specialize in providing state-of-the-art technology and solutions that excel in the harsh operating conditions of the mobile off-highway market as well as the marine sector. Building on our extensive applications expertise, we work closely with you to ensure exceptional performance for a broad range of applications. We help you and other customers around the world speed up system development, reduce costs and bring vehicles and vessels to market faster.

Danfoss Power Solutions – your strongest partner in mobile hydraulics and mobile electrification.

Go to www.danfoss.com for further product information.

We offer you expert worldwide support for ensuring the best possible solutions for outstanding performance. And with an extensive network of Global Service Partners, we also provide you with comprehensive global service for all of our components.

Local address:

Danfoss Power Solutions (US) Company 2800 East 13th Street Ames, IA 50010, USA Phone: +1 515 239 6000 Danfoss Power Solutions GmbH & Co. OHG Krokamp 35 D-24539 Neumünster, Germany Phone: +49 4321 871 0 Danfoss Power Solutions ApS Nordborgvej 81 DK-6430 Nordborg, Denmark Phone: +45 7488 2222 Danfoss Power Solutions Trading (Shanghai) Co., Ltd. Building #22, No. 1000 Jin Hai Rd Jin Qiao, Pudong New District Shanghai, China 201206 Phone: +86 21 2080 6201

Danfoss can accept no responsibility for possible errors in catalogues, brochures and other printed material. Danfoss reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specifications already agreed. All trademarks in this material are property of the respective companies. Danfoss and the Danfoss logotype are trademarks of Danfoss A/S. All rights reserved.