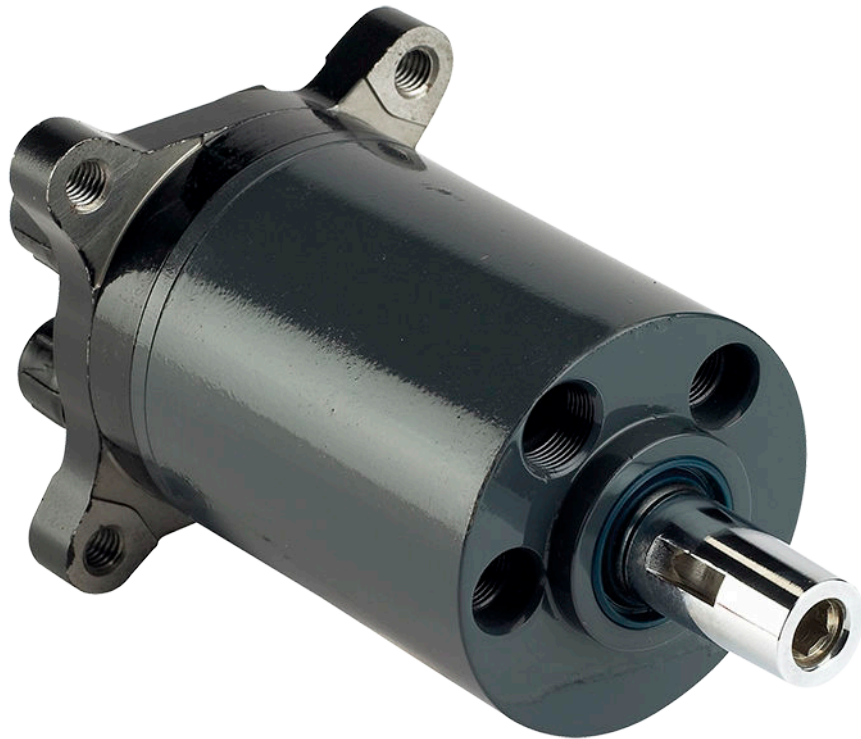


ENGINEERING
TOMORROW



Service Manual

Steering OSPM



Revision history

Table of revisions

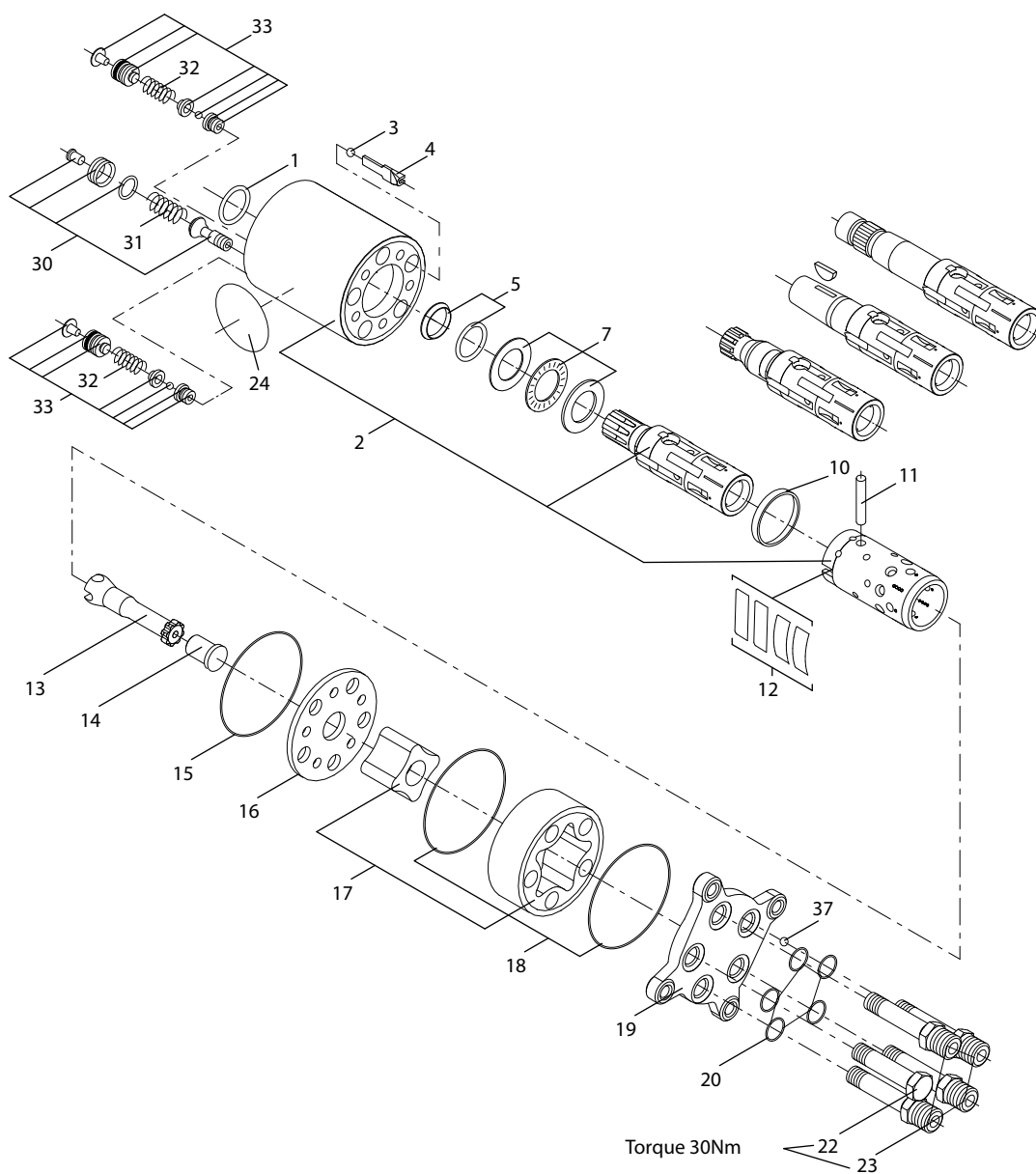
Date	Changed	Rev
October 2019	Minor adjustments throughout, especially reflecting tool numbers	0202
Mar 2014	Converted to Danfoss layout - DITA CMS	BA
Feb 1998	First edition	AA

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Exploded View

Exploded view OSPM



A150-508.10

Part List, OSPM

OSPM main parts list

Item	Spare parts	Dimension	Comments	Number per unit
1	Dust seal ring	26 x 19 x 4		1
2	Housing spool and sleeve			1
3	Ball	ø3/16"		1
4	Ball stop	29	ON with check valve in P-port, item 37	1
		42	PB with check valve in P-port, item 37	1
		34	ON + PB, without check valve in P-port	1
5	Shaft seal	21,9 x 17,5 x 3,1	Integrated column from before 2006	1
		23,4 x 19 x 3		1
7	Bearing			1
10	Rlng			1
11	Cross pin			1
12	Set of springs			1
13	Cardan shaft	63,2	ON units	1
		76,2	PB units	1
14	Spacer (Spacer is only present in OSPM manufactured before 2006)	5,9	32 cm ³	1
		12	50 cm ³	1
		18,9	70 cm ³	1
		22,3	80 cm ³	1
		29,1	100 cm ³	1
15	O-ring	60 x 1,5		1
16	Distributor plate			1
17	Gearwheel set 32 cm ³	11		1
	Gearwheel set 50 cm ³	17,1		1
	Gearwheel set 63 cm ³	21,6		1
	Gearwheel set 70 cm ³	24		1
	Gearwheel set 80 cm ³	27,4		1
	Gearwheel set 100 cm ³	34,2		1
18	O-ring	60 x 1,5		2
19	End cover			1
20	O-ring	10 x 1,5		5
22	Special screw, incl. O-ring	32,1	For OSPM 32 ON	1
		38,2	For OSPM 50 ON	1
		42,7	For OSPM 63 ON	1
		44,9	For OSPM 70 ON	1
		47,6	For OSPM 80 ON	1
		55,3	For OSPM 100 ON	1
23	Special screw, incl. O-ring	32,1	For OSPM 32 ON / PB	4/5
		38,2	For OSPM 50 ON / PB	4/5
		42,7	For OSPM 63 ON / PB	4/5
		44,9	For OSPM 70 ON / PB	4/5
		47,6	For OSPM 80 ON / PB	4/5
		55,3	For OSPM 100 ON / PB	4/5

Part List, OSPM

Item	Spare parts	Dimension	Comments	Number per unit
24	Name plate			1
30	Complete relief valve		(excl. spring)	1
31	Spring for relief valve			
	45-55 bar			1
	54-70 bar			1
	65-85bar			1
	80-100 bar			1

Set of seals 150L4054

Item	Spare parts	Dimension	Comments	Number per unit
1	Dust seal	26 x 19 x 4		1
5	Shaft seal	21,9x 17,5 x 3,1	Integrated column from before 2006	1
		23,4 x 19 x 3		1
15	O-ring	60 x 1,5		1
18	O-ring	60 x 1,5		2
20	O-ring	10 x 1,5		5
30	O-ring	12,4 x 1,78	For relief valve adjusting screw	1

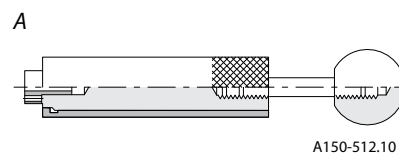
Tightening torque

Item	Nm	lbf·in
22	30 ± 3	265 ± 25
23		

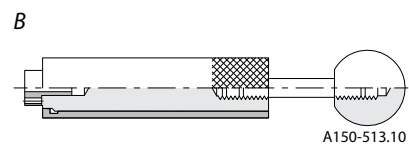
Tools

Tools for OSPM

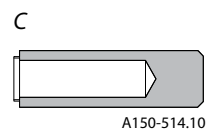
A
Assembly tool for shaft seal $\varnothing 17,5$, code no. code no.
11230556



B
Assembly tool for shaft seal $\varnothing 19,2$, code no. 11230557



C
Assembly tool for dust seal ring, code no. 11230558



D
Ordinary hand tools. Cannot be bought from Danfoss
Socket spanner (5/8 in) Ratchet spanner, 1/2" Torque
wrench: 0-70 Nm (0-7 daNm) Allen keys: 5 & 8 mm a/flats
Small screwdriver, ground sharp. Pincers

E
Lubricants: Vaseline

Dismantling

Dismantling the OSPM

Dismantling

Item	Part to remove	Action
	Column	If there is a steering column on OSPM, place the unit in an appropriate holding tool with steering column upwards. Dismantle the steering column.
30, 31	Pressure relief valve	If there is a pressure relief valve in OSPM, remove the plastic plug from the adjusting screw and unscrew with the 5 mm a/flats Allen key. Remove the spring and use special pliers-lift the valve cone out of the housing.
		Lift OPSM clear of the holding tool, turn it so that the output shaft points downwards and place it in the holding tool again.
22, 23	Spec. screws	Remove the screws with a 16 mm a/flats (5/8") spanner.
19	End cover	Remove end cover sideways.
17, 18	Gear wheel set	Hold a hand under the gearwheel set to keep the gearwheel from falling out. Remove O-rings.
16	Distributor plate	Remove distributor plate.
13	Cardan shaft	Remove cardan shaft.
15	O-ring	Remove O-ring from housing.
3, 4, 37	Balls and ball stop	Shake out check valve ball (not in all units), ball stop and emergency steering ball. Use pincers if necessary.
		Place the OSPM in the tool again with the center line positioned horizontal.
2	Housing/spool/sleeve	Turn the spool set so that the pin in spool and sleeve is horizontal and push it out.
7	Bearing	Remove bearing from shaft end. The outer washer may sometimes adhere to the housing. If the washer does not come out with the shaft, it will come out when shaft seal item 5 is being pressed out.
10	Ring	Remove retaining ring for the neutral position springs.
11	Cross pin	Press the pin out of the spool set. Carefully press the spool out of the sleeve.
12	Spring	Press the neutral position springs out of the spool.
1	Dust seal	Remove the dust seal ring (with a "sharp" screwdriver).
5	Shaft seal	Remove the shaft seal (with a "sharp" screwdriver if necessary).

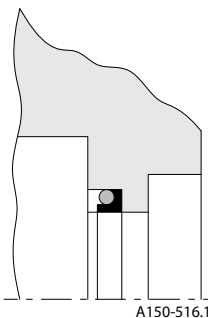

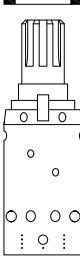
Cleaning, inspection, replacement, and lubrication

- Clean all parts carefully.
- Carefully check all parts and replace imperfect parts, if any.
- Always replace all sealing parts during a repair.
- Before assembly, lubricate all parts with hydraulic oil and grease rubber parts with vaseline.

Assembling

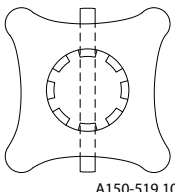
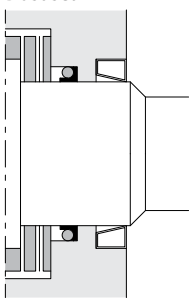
Assembly of the OSPM

Assembly of the OSPM

Item	Part to mount	Action
2	Housing	Place the OSPM housing horizontally in the holding tool.
5	Shaft seal  A150-516.10	With the assembly tool the shaft seal must be inserted into the housing. Note that the small guide piece at the front of the tool must remain in the hole for the output shaft when the tool itself is drawn out of the housing. Note, there are two different tools: Tool 11230557 to be used for any OSPM from 2006 and on, tool 11230556 only for OSPM with shaft for column from before 2006.
2	Spool/sleeve	Guide spool and sleeve together, turn the spools so that the key slots are opposite each other.
12	Springs  A150-517.10	Insert the curved springs between the flat springs and push them into place (see sketch).
10	Spring retaining ring	Center the springs in the spool/sleeve set and guide the ring down over the sleeve. <u>The ring must be able to rotate unimpeded by the springs.</u>
11	Cross pin	Fit the cross pin in the spool set.
7	Thrust bearing  A150-518.10	Fit the thick race, needle cage and thin race. Lubricate the output shaft on the inner spool with Molykote PG plastslip 75, on the surface in contact with the shaft seal.
2	Housing + spool/sleeve	With the housing still horizontal in the holding tool - secure it with one hand. With the other hand take the assembled spool/sleeve set, making sure two fingers hold the cross pin (11) in position. Guide the spool set into the housing with the cross pin (11) horizontal. Be careful with the small guide piece from mounting of the shaft seal. With it is pressed out by the shaft rotary. With housing and spool set remaining in the tool, lift the whole unit into vertical position. The pin in the spool set must now point towards port P in the housing, either at 6 o'clock or 12 o'clock.
3	Ball	Place the emergency steering ball in port P.

Assembling

Assembly of the OSPM (continued)

Item	Part to mount	Action
4	Ball stop	Place the ball stop in port P.
37	Ball	Place the check valve ball (if required) in port P.
15	O-ring	Fit the O-ring in the housing.
16	Distributor plate	Place the distributor plate on the housing. Turn it so that the holes line up.
13	Cardan shaft	Fit the cardan shaft into the inner spool and allow it to engage with the pin.
17	Gear wheel 	All OSPM's made after 2006 has timing securing between cardan shaft and gear wheel: it can only be assembled in correct position. For elder versions: When fitting the gearwheel, it must be oriented correctly so that it engages with the cardan shaft. The cross pin (11) in the spool set must line up with the bottom of the teeth in the star (see sketch).
18	O-ring	Place the O-rings in the grooves on each side of the gearwheel rim.
17	Gear ring	Place the gearwheel rim over the distributor plate so that all holes are in line with each other.
14	Spacer	Place the spacer over the cardan shaft.
19	End cover	Place the cover so that the hole marked "P" lines up with port P in the housing ("6 o'clock" or "12 o'clock").
20, 22, 23	Special screws	Fit screws (with O-rings). Tighten all five screws (cross pattern) with 30 ± 3 Nm (3 daNm). <u>With open center units, the screw with no oil flow connection must be fitted in port E.</u> If the OSPM must be mounted with a pressure relief valve, lift it out of the tool and place it on the four pins with the axle journals upwards
30	Piston	Fit the piston.
31	Spring	Fit the spring.
30	Adjustment	Screw in the adjusting screw.
	Test	Lift OSPM out of the tool and prepare it for testing.
30		The pressure relief valve can be set either on a test panel or in a system with pressure-gauge read-off. Insert plastic plug.
1	Dust seal 	Guide the dust seal rings down over the shaft end and press into place in the housing with assembly tool. 11230558. <u>The dust seal must be fitted after testing so that any leakage from the shaft seal can be detected.</u>

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