

MS6000P

Submersible motors

Service instructions



MS6000P

English (GB)

Service instructions	4
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Original service instructions

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1. General information



Read this document before you start service work on the product. Service work must comply with local regulations and accepted codes of good practice.

Observe the safety instructions in the installation and operating instructions for the product.

1.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.

**DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.

**WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.

**CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

**SIGNAL WORD****Description of the hazard**

Consequence of ignoring the warning

- Action to avoid the hazard.

1.2 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



Observe these instructions for explosion-proof products.



A blue or grey circle with a white graphical symbol indicates that an action must be taken.



A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.



If these instructions are not observed, it may result in malfunction or damage to the equipment.



Tips and advice that make the work easier.

1.3 Position numbers

Position numbers of motor parts (digits) refer to section 16. Exploded drawing of MS6000/MS6000P and section 17. Exploded drawing MS6000/MS6000P (flange extension). Position numbers of service tools (letters) refer to section 4. Service tools.

Related information

[4. Service tools](#)

[16. Exploded drawing of MS6000/MS6000P](#)

[17. Exploded drawing of MS6000/MS6000P \(flange extension\)](#)

1.4 Before dismantling

- Switch off the power supply to the motor.
- Disconnect the power supply cable in accordance with local regulations.

1.5 Before assembly

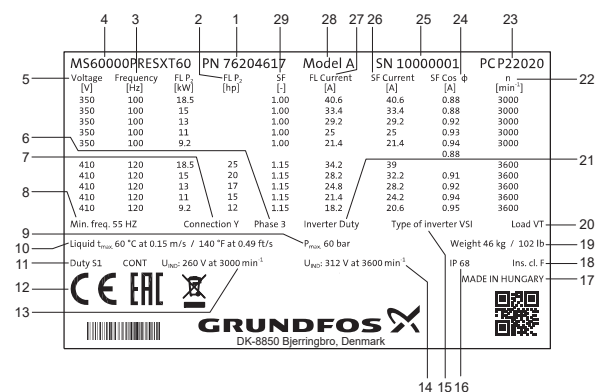
- Clean and check all parts.
- Replace defective parts.
- Order the necessary service kits.
- Always replace O-rings when the motor is serviced.

1.6 During assembly

- Lubricate O-rings and tighten screws to the correct torque. See section Tightening torques and lubricants.

2. Identification

2.1 Nameplate



Pos.	Description
1	Product number - 76XXXXXX: product without packaging
2	Output power in [kW and hp]
3	Frequency
4	Type designation

Pos.	Description
5	Supply voltage
6	Phases
7	Connection
8	Minimum operating frequency
9	Maximum operating pressure
10	Maximum liquid temperature at minimum flow past the motor
11	Motor designed for continuous operation (S1)
12	CE mark and approvals
13	PM back EMF at 100 Hz
14	PM back EMF at 120 Hz
15	Inverter type
16	Enclosure class
17	Country of production
18	Insulation class
19	Net weight in [kg and lb]
20	Load type
21	Inverter duty
22	Rated speed min ⁻¹
23	Production code
24	Power factor cos φ at SF load
25	Serial number
26	Service factor current
27	Full load current
28	Model (A = first generation)
29	Service factor

2.2 Product number key

Example	76		20		46		17	
	Motor code		Voltage code		Configuration code		Power code	
Motor code								
76	MS6000P							
Voltage code	Voltage range							
	100 Hz	120 Hz						
20	3 x 350 V	3 x 410 V						
37	3 x 350 V	3 x 410 V						
Configuration code	Sleeve material	Tempcon	Rubber material	Shaft seal	Radial bearing	Motor liquid	Temperature	Flange extension
46	EN 1.4539	Without	FKM	BQQV	Soft	SML3	T60	Without
62	EN 1.4301	Without	NBR	BQQP	Soft	SML3	T60	With
77	EN 1.4301	Without	NBR	BQQP	Soft	SML3	T60	Without
Power code								
12	7.5 kW	10 hp						
17	18.5 kW	25 hp						
20	30 kW	40 hp						
22	45 kW	60 hp						

2.3 Type key

Example	MS6000P	R	E	S				X	T60	3 x 350/100 410/120	18.5 kW	
Pos.	1	2	3	4	5	6	7	8	9	10	11	
Pos.	Description											
1	Motor type											
P	= MS6000P synchronous motor											
2	Material type											
-	= EN 1.4301											
R	= EN 1.4539											
3	Rubber											
-	= NBR											
E	= FKM											
4	Shaft seal											
-	= Ceramic/carbon							BXPFF/NBR				
S	= SiC/SiC							Q1Q1VFF/FKM				
Q	= SiC/SiC							Q1Q1PFF/NBR				
5	Radial bearings											
-	= Carbon graphite/stainless steel											
W	= SIC/Tungsten carbide											
6	Motor liquid											
-	= SML-3											
D	= Demineralised water											
H	= Glycol 60 vol % HTF											
7	Flange extension											
-	= Without											
F	= With											
8	Tempcon											
X	= Without											
9	Max. liquid temperature											
T60	= 60 °C											
10	Voltage											
3 x 350/100 410/120					= 3 x 350 V/100 Hz - 3 x 410 V/120 Hz							
11	Motor power											
4 kW					5.5 hp							
5.5 kW					7.5 hp							
7.5 kW					10 hp							
9.2 kW					12 hp							
11 kW					15 hp							
13 kW					18 hp							
15 kW					20 hp							
18.5 kW					25 hp							
22 kW					30 hp							
26 kW					35 hp							
30 kW					40 hp							
37 kW					50 hp							
45 kW					60 hp							

The type key cannot be used for ordering as not all combinations are available.

3. Tightening torques and lubricants

Pos.	Designation	Quantity	Dimensions [mm]	Torque [Nm]	Lubricant
22	Hexagon head screw	4 (8*)	1/2"-20 UNF-2A x 32	50 ± 7 Nm	-
22a	Screw with nylon washer	1	M5 x 20	3.5 ± 0.5 Nm	-
24	O-ring	1	Ø65 x 2.5	-	Shell Cassida
32	Shaft seal housing	1	-	-	Shell Cassida
32a	Seal ring	1	-	-	Shell Cassida
33	Shaft seal, stationary part	1	-	-	Shell Cassida
34	Shaft seal, rotating part	1	-	-	Motor liquid
41	Hexagon socket head cap screw	4	M10 x 20	46 ± 5 Nm	-
45a	Hexagon socket head cap screw	1	M5 x 25	4.5 ± 0.5 Nm	-
46	Screw with Nyltite	4	M5 x 25	4.5 ± 0.5 Nm	-
48	Screw	4	M5 x 20	4.5 ± 0.5 Nm	-
50	Screw	4	M6 x 15/M6 x 16**	4.5 ± 0.5 Nm	-
220a	Screw	2	M6 x 15/M6 x 16**	4.5 ± 0.5 Nm	-

* Motor with flange extension

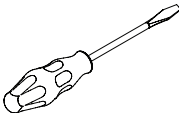
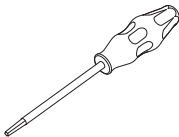
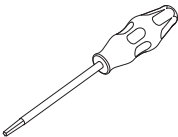
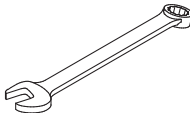
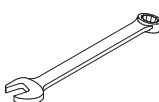
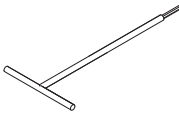
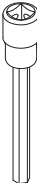
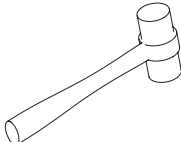
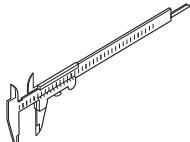
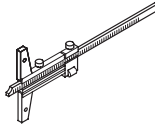
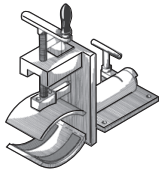
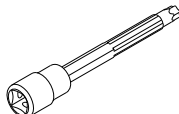
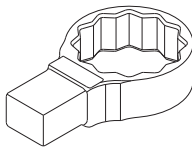
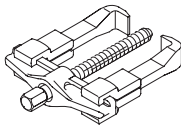
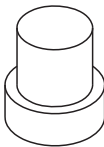
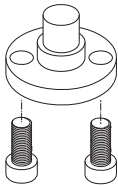
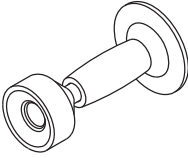
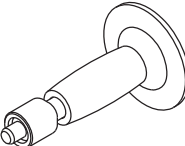
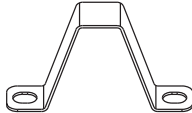
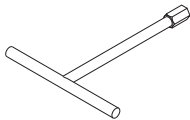
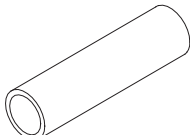
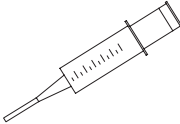
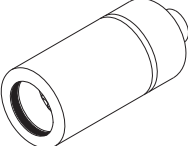
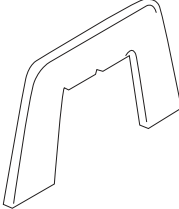
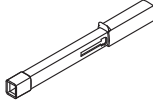
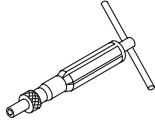
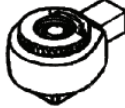
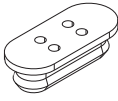
** Motor in R-version

Related information

[7. Assembling MS6000P](#)

[9. Assembling MS6000P \(flange extension\)](#)

4. Service tools

A	B	C	D	E			
							
G	H	I	J	K	L		
							
M	N	O	P	Q	R		
							
S	T	U	V	W	Y		
							
Z	AA	AB	AC	AN			
							
AD							
AE	AF	AG	AH	AI	AJ	AK	AL
							

Related information

[1.3 Position numbers](#)

4.1 Standard tools

Tool	Description	Pos.	Part number
A	Screwdrivers, cross and slot	32, 49	-
B	Torx 20 screwdriver	22a, 50, 221	-
C	Torx 25 screwdriver	45a, 46, 48	-
D	Open-end spanner 17 mm	22	-
E	Open-end spanner 19 mm	22	-
G	Hexagon tee key 8 mm	41	-
H	Hexagon head driver 8 mm	41	-
I	Plastic mallet	-	-
J	Slide gauge	-	-
K	Depth gauge	-	-

4.2 Special tools

Tool	Description	Pos.	Part number
L	Jaws	2	00SV7900
M	Torx 50 head driver (machined)	22	96164206
N	Ring spanner (machined)	22	96164186
O	Puller for rotating thrust bearing 7.5 and 27 kN	6	00SV0335
P	Plug for puller	1, 6	00SV7923
Q	Puller for rotating thrust bearing 40 kN	6	00SV7920
R	Punch for rotating thrust bearing 7.5 kN	6	96164233
S	Punch for rotating thrust bearing 27 and 40 kN	6	96164234
T	Bracket	1	96164181
U	Spanner for shaft height adjustment	45b	00SV7921
V	Punch for shaft seal	33, 34	V7216306
W	Filling syringe	1	00SV8000
X	Vacuum filling device	1	00SV0088
Y	Spline head driver (torque measurement)	2, U	96164190
Z	Shaft height gauge	2	00SV0115
AD	Shaft with rotor alignment tool, consisting of tools AE to AL	2, 5	99917700
AE	Centering flange	-	-
AF	Centering flange	-	-
AG	Shaft extension	-	-
AH	Shaft extension	-	-
AI	Alignment disc	-	-
AJ	Positioning screw, 4 pcs.	-	-
AK	Shaft conical bearing	-	-
AL	Assembly tool	-	-
AN	Cable plug protection cap	-	780418

4.3 Torque tools

Tool	Description	Pos.	Part number
AA	Torque wrench 40-200 Nm	22, 41	-
AB	Torque screwdriver 1-6 Nm	22a, 50, 221, 45a, 46, 48	-
AC	Ratchet insert tool	-	-

4.4 Measuring tools

Description	Part number
Multimeter	-
Megger	-

5. Motor check/fault finding

Used motors must be checked and dismantled. Inspect and document the observations of each component during dismantling. Check the following:

- Check the motor for damage and fractures.
- Check that the motor is filled with liquid and has no leaks at the diaphragm or shaft seal. Place the motor with the filling screw (22a) upwards and remove the screw; turn the shaft end and check the motor liquid level. The motor liquid level must be visible.
- Check that the height from the shaft end to the contact face of thread holes is 72.8 ± 0.2 mm.
- Check that the axial clearance is minimum 1 mm.
- Check that the motor shaft spins freely.
- Check that the plug pins for the cable connection are not defective or burnt.
- Check that the winding resistance is as stated in electrical data. See sections 13. Checking the motor and cable and 13.1 Winding resistance MS6000P.
- Check that the motor insulation resistance complies with local regulations. See section 13.2 Insulation resistance.
- Check the motor cable and the submersible drop cable for visual damage.
- Submerge the motor cable and the submersible drop cable in water and check that there is no leakage in the cables measuring their insulation resistance with a megger.
- Measure the electrical resistance of the motor with the cable mounted on.
- Measure the insulation resistance of the motor with the cable mounted on using a megger.
- Measure the electrical resistance of the motor without cable, directly on the terminals.
- Measure the insulation resistance of the motor without the cable, directly on the terminals using a megger.

Related information

[13. Checking the motor and cable](#)

[13.1 Winding resistance MS6000P](#)

[13.2 Insulation resistance](#)

6. Dismantling MS6000P

DANGER

Magnetic field

Death or serious personal injury



- The rotor dismantled from the motor must never be handled by a person with a pacemaker.

WARNING

Crushing of fingers

Death or serious personal injury



- Keep the surroundings of the dismantled rotor free of magnetic objects, and be careful when placing the rotor on a magnetic surface.

DANGER

Electric shock

Death or serious personal injury

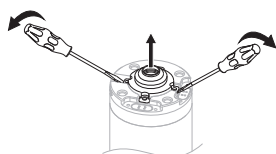


- Before starting any work on the product, make sure that motor cable ends are not live.
- Make sure that the power supply cannot be accidentally switched on.

For further information, see the MS6000P service video.



- Place the motor vertically in a set of jaws (L).
Note: Make sure that the motor is secure in the jaws and it cannot move.
- Before dismantling the motor, disconnect the motor cable by slacking and removing the two screws (220a) and the screw (50) holding the earth clamp.
- Use two screwdrivers to manoeuvre the plug (220) out of its socket, then pull out the plug.
- Insert cable plug protection cap (AN).
- Remove the sand shield (27) from the shaft.
- Slacken and remove the remaining three screws (50) holding the shaft seal housing (32).
- Use two screwdrivers to tip out the shaft seal housing (32). See the figure below.



- Remove the rotating part of the shaft seal (34).
- Remove the washer (28) from the shaft.
- Tilt the motor and drain the motor liquid into a bucket.
- Turn the motor to vertical position with the NDE facing upwards and loosen the four screws (46) holding the bottom cover (13).
- Remove the bottom cover including the diaphragm (12).
- Turn the motor to horizontal position.
- Slacken and remove the four screws (48) together with the clamping flange (7).
- Press down the shaft adjusting unit (45) against the thrust bearing to relieve the stress on the retainer spring (49).
- Use a small screwdriver to push the retainer spring out of the recess in the stator housing (1) and pull out the shaft adjusting unit.
- Slacken and remove the screws (41).

- Remove the stationary part of the thrust bearing (3) by tilting it out of its brackets (42).

Note: To remove the 40 kN thrust bearing, it may be necessary to use two screwdrivers to force the stationary part of the thrust bearing out of its brackets.

- Pull off the rotating part of the thrust bearing (6). The approach depends on the size of the thrust bearing.

7.5 kN or 27 kN thrust bearing

- Pull off the rotating part of the thrust bearing (6) by using a puller (O) together with a plug (P).
- Remove the plug (P).

40 kN thrust bearing

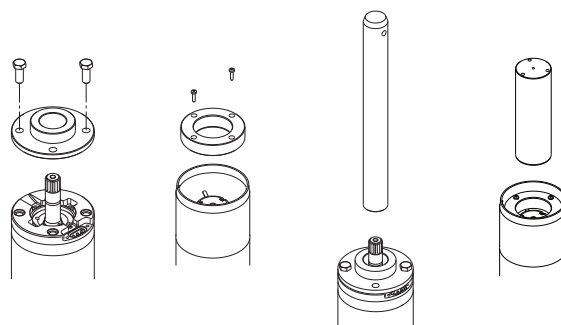
- Mount the puller (Q) into the rotating part of the thrust bearing (6) and fasten it with its two screws.
- Use a hexagon tee key (G) to fasten the two screws in the puller until the rotating part of the thrust bearing loses the grip from the conus on the shaft.
- Remove the puller and the rotating part of the thrust bearing.

- Remove the stop for bearing bracket(s) (42).

- Remove the clamping flange (7a) and the NDE radial bearing (4) from the stator housing.

- Push the rotor slightly towards the DE in order to loosen the DE bearing retainer. Pull out the DE radial bearing (5) with a small screwdriver.

- Mount centering tool AE and shaft extension tool AH in the motor DE. Mount centering tool AF and shaft extension tool AG on the motor NDE. Use the screws of the motor. See the figure below.



- Carefully push out the rotor (2) from the stator housing, and place it in a clean place without any loose metal parts or burrs.

Note: It is a permanent magnet rotor!

- Remove centering tools AE and AF.

- Remove the upthrust ring (2a) positioned in the DE of the stator housing (1). Use a long wooden stick to push out the upthrust ring.

Note: The upthrust ring can only be removed by pushing it out from the DE towards the NDE.

6.1 Component check

Before assembling the motor, clean and check all parts for damage and wear. All rubber parts must be soft, flexible and intact.

The following components should be checked:

Shaft seal

The sliding surface must be intact and smooth.

NDE and DE radial bearing

The bearings must be intact, smooth and without visible wear.

Shaft with rotor

The radial bearing surfaces (sliding surfaces) on the shaft must be intact, smooth and without visible wear.

Thrust bearing

The thrust bearing must be intact and the sliding surfaces must be intact and smooth.

Upthrust ring

The ring must be intact and smooth.

Motor liquid

The motor liquid must be clean and clear when the shaft seal housing is removed.

Black motor liquid may indicate damaged bearing components.

Diaphragm

The diaphragm must be soft, flexible and intact without cracks.

6.2 Replacement of the wear parts

Always replace defective parts with wear part kits. See the recommended kits and spare parts in the MS Service Kit Catalogue.

Related information

- [MS Service Kit Catalogue](#)

7. Assembling MS6000P

Assemble the motor after the parts are cleaned and checked, and the defective parts are replaced with new ones.

DANGER

Magnetic field

Death or serious personal injury

- The rotor dismantled from the motor must never be handled by a person with a pacemaker.

WARNING

Crushing of fingers

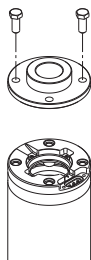
Death or serious personal injury

- Keep the surroundings of the dismantled rotor free of magnetic objects, and be careful when placing the rotor on a magnetic surface.

For further information, see MS6000P service video.



1. Place the stator housing (1) vertically in the jaws (L) with DE upwards and tighten.
2. Mount centering tool AE in the stator housing.

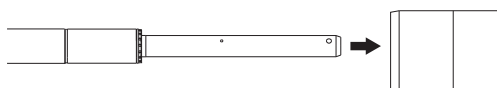


3. Rotate the stator housing (1) 180° and tighten the jaws (L).
4. Insert the upthrust ring (2a) into the stator housing (1) and push it into place with shaft extension tool AG.
5. Mount centering tool AF in the stator housing.

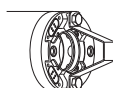


6. Turn the stator housing to horizontal position.
7. Fit the shaft extension tools AG and AH to the rotor and carefully insert the rotor into the stator housing from the NDE.

Note: Pay attention to the magnetic forces when inserting the shaft with the rotor into the stator housing.



8. Remove the shaft extension tools AG and AH and the centering tools AE and AF.
9. Fit the aligning bracket (T) over the motor head using two of the threaded holes and the belonging screws (22). Push the rotor towards the DE so it touches the bracket.



10. Turn the stator housing to vertical position with the NDE facing up.

11. Insert the NDE radial bearing (4) into the stator housing and push it in place with the shaft extension tool AG, if necessary.

12. Insert alignment disc (AI) and fasten it with the 4 positioning screws (AJ).



13. Use the shaft conical bearing (AK) to align the radial bearing NDE (4).

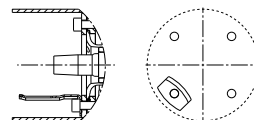


14. Remove the alignment disc (AI) and the 4 positioning screws (AJ).

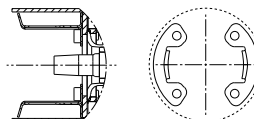
15. Insert the clamping flange (7a). Make sure that the holes of the clamping flange are aligned with the threaded holes in the stator housing (1).

16. Insert the rotation stop for bearing bracket(s) (42).

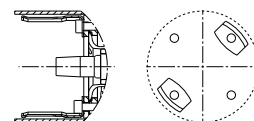
17. Fasten the bracket(s) and clamping flange with the four screws (41). Use the torque wrench (AA) and the wrench (AC). See section 3. Tightening torques and lubricants. Depending on the size of the thrust bearing, there are different types and numbers of brackets.



Bracket for 7.5 kN thrust bearing



Brackets for 27 kN thrust bearing



Brackets for 40 kN thrust bearing

18. Fit the rotating part of the thrust bearing (6) onto the shaft.

19. Use a plastic mallet (I) and a punch (R or S), according to the size of the thrust bearing to fix the rotating part on the conus of the shaft.

Note: The rotating part must be put into the correct position with one hit, otherwise, the shaft height may change over time resulting in damage to the thrust bearing.

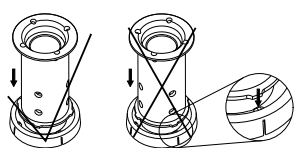
20. Fit the stationary part of the thrust bearing (3) into the stop for bearing bracket(s) (42).

Note: As the 40 kN may be difficult to fit, use two screwdrivers to push the bracket to the sides and manoeuvre the thrust bearing into the correct position.

21. Fit the shaft adjustment unit (45) into the stator housing.

22. Secure the shaft adjustment unit with a retainer spring (49).
Note: Before fitting the retainer spring, clean the recess to ensure the retainer spring is in contact with the bottom of the recess.
23. Insert the clamping flange (7) into the stator housing.
Note: Align the innermost holes with the holes in the shaft adjustment unit (45).
24. Fasten the clamping flange with four screws (48) and cross-tighten with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.
25. Loosen the lock screw (45a) and the shaft adjustment screw (45b) to have adjustment space (too low shaft height).
26. Turn the stator housing 180° in the jaws, so the DE is facing upwards.
27. Remove the bracket (T).

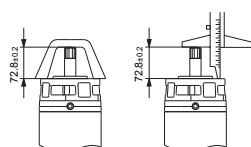
28. Carefully insert the radial bearing (5) into the stator housing.
Note: Position the radial bearing so it is not resting on the taps of the upthrust ring when the shaft seal housing is mounted. If the radial bearing is in the correct position, it drops down when turned with a screwdriver.



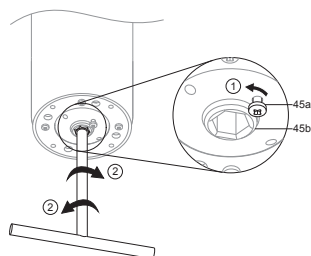
29. Make sure that the radial bearing is centered in the stator housing. Position assembly tool AL over the shaft and on the top of the stator housing. Use a plastic mallet (I) and a punch (V) to drive the assembly tool AL against the mounting face for the shaft seal housing.



30. Remove assembly tool AL from the shaft.
31. Check the shaft height using a depth gauge (K), or a shaft height gauge (Z). The shaft height must be within 72.8 ± 0.2 mm. See the figure below.
Note: Make sure that the depth gauge is square between the shaft end and the motor flange.



32. To adjust the shaft height, attend to the NDE of the motor and adjust the height by turning the screw (45b) with the shaft height adjustment spanner (U).



33. When the shaft is adjusted to the correct height, tighten the lock screw (45a) with the specified torque using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.
34. Turn the stator housing to horizontal position.

35. Fit the diaphragm (12) and the end cover (13). Fasten them with the four screws (46).

Note: Nylon washers must be renewed on all screws.

36. Cross-tighten the screws with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.
37. Turn the stator housing to vertical position, with the DE facing upwards.
38. Use the spline head driver (Y) to check that the shaft rotates freely.
39. Fill motor liquid (SML-3) into the stator housing until it is full.
40. Move the shaft up and down and rotate the shaft to let air escape.
41. Refill the stator housing with motor liquid, if necessary.
42. Slide the washer (28) down on the shaft, so it is positioned in the recess of the radial bearing.
43. Lubricate the rotating part of the shaft seal (34) and the shaft with motor liquid.
44. Fit the rotating part of the shaft seal onto the shaft and press it down using the punch (V).
45. Lubricate the recess inside the shaft seal housing (32) and the outer surface of the stationary part of the shaft seal (33). See section 3. Tightening torques and lubricants.
46. Press the stationary part of the shaft seal (33) into the recess of the shaft seal housing, using the punch (V).
Note: On the MS6000 R version, press a lip seal (32a) into the shaft seal housing before inserting the stationary part of the shaft seal.
47. Fit the shaft seal housing with an O-ring (24) and lubricate it. See section 3. Tightening torques and lubricants
48. Fit the shaft seal housing (32) into the top of the motor and press it down into place by using the punch for shaft seal (V).
49. Fit the four screws (50) into the shaft seal housing and cross-tighten them in two steps. First, cross-tighten with a screwdriver and then with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.
50. Top up the motor liquid, see section 10. Filling procedure with a syringe.
51. Fit the sand shield (27) on the shaft and push it down to the shaft seal housing (32). Make sure that the steel ring inside the sand fighter is facing the shaft seal housing.
52. Remove the cable plug protection cap (AN).
53. Remove one screw (50) to fit the motor cable earth connection.
54. Insert the motor cable plug (220) into the cable socket.
Note: For proper sealing, always use a new motor cable.
55. Tighten the motor cable plug with the screws (220a) and the last screw (50) on the shaft seal housing.
56. Tighten the screws for the motor cable (220a) with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.
57. Cross-tighten the screws in the shaft seal housing (50) with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.
58. Perform a final check, see section 11. Final check.

Related information

[3. Tightening torques and lubricants](#)

[10. Filling procedure with a syringe](#)

[11. Final check](#)

8. Dismantling MS6000P (flange extension)

DANGER

Magnetic field

Death or serious personal injury



- The rotor dismantled from the motor must never be handled by a person with a pacemaker.

WARNING

Crushing of fingers

Death or serious personal injury



- Keep the surroundings of the dismantled rotor free of magnetic objects, and be careful when placing the rotor on a magnetic surface.

DANGER

Electric shock

Death or serious personal injury

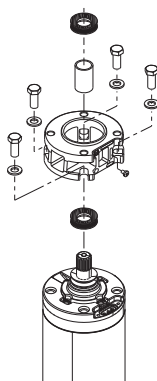


- Before starting any work on the product, make sure that motor cable ends are not live.
- Make sure that the power supply cannot be accidentally switched on.

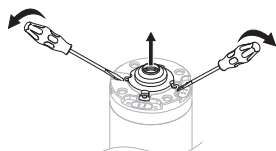
1. Place the motor vertically in a set of jaws (L).

Note: Make sure that the motor is secured in the jaws and it cannot move.

2. Before dismantling the motor, disconnect the motor cable by slacking and removing the two screws (220a) and the screw (25b) holding the earth clamp.
3. Use two screwdrivers to manoeuvre the plug (220) out of its socket, then pull out the plug.
4. Insert cable plug protection cap (AN).
5. Remove the sand shield (27) and the spacer (27a) from the shaft.
6. Slacken and remove the four screws (22), and remove the flange extension (25a).
7. Remove the sand shield (27) from the shaft.



8. Slacken and remove the four screws (50) holding the shaft seal housing (32).
9. Use two screwdrivers to tip out the shaft seal housing (32).



10. Remove the rotating part of the shaft seal (34).
11. Remove the washer (28) from the shaft.
12. Tilt the motor and drain the motor liquid into a bucket.
13. Turn the motor to vertical position with the NDE facing upwards and loosen the four screws (46) holding the bottom cover (13).
14. Remove the bottom cover including the diaphragm (12).
15. Turn the motor to horizontal position.

16. Slacken and remove the four screws (48) together with the clamping flange (7).

17. Press down the shaft adjusting unit (45) against the thrust bearing to relieve the stress on the retainer spring (49).

18. Use a small screwdriver to push the retainer spring out of the recess in the stator housing (1) and pull out the shaft adjusting unit.

19. Slacken and remove the screws (41).

20. Remove the stationary part of the thrust bearing (3) by tilting it out of its brackets (42).

Note: To remove the 40 kN thrust bearing it may be necessary to use two screwdrivers to force the thrust bearing out of its brackets.

21. Pull off the rotating part of the thrust bearing (6). The approach depends on the size of the thrust bearing.

27 kN thrust bearing

- a. Pull off the rotating part of the thrust bearing (6) by using a puller (O) together with a plug (P).
- b. Remove the plug (P).

40 kN thrust bearing

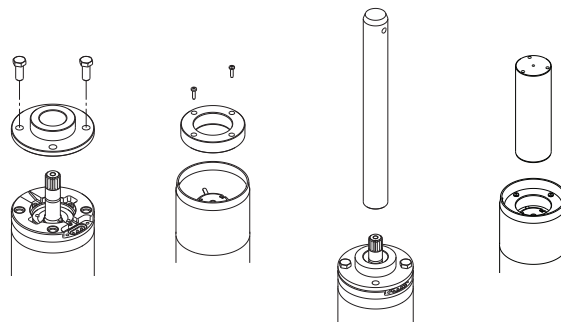
- a. Mount the puller (Q) into the rotating part of the thrust bearing (6) and fasten it with its two screws.
- b. Use a hexagon tee key (G) to fasten the two screws in the puller until the rotating part of the thrust bearing loses the grip from the conus on the shaft.
- c. Remove the puller and the rotating part of the thrust bearing.

22. Remove the stop for bearing bracket(s) (42).

23. Remove the clamping flange (7a) and the NDE radial bearing (4) from the stator housing.

24. Push the rotor slightly towards the DE in order to loosen the DE bearing retainer. Pull out the DE radial bearing (5) with a small screwdriver.

25. Mount centering tool AE and shaft extension tool AH in the motor DE. Mount centering tool AF and shaft extension tool AG on the motor NDE. Use the screws of the motor.



26. Carefully push out the rotor (2) from the stator housing, and place it in a clean place without any loose metal parts or burrs.

Note: It is a permanent magnet rotor!

27. Remove centering tools AE and AF.

28. Remove the upthrust ring (2a) positioned in the DE of the stator housing (1). Use a long wooden stick to push out the upthrust ring.

Note: The upthrust ring can only be removed by pushing it out from the DE towards the NDE.

8.1 Component check

Before assembling the motor, clean and check all parts for damage and wear. All rubber parts must be soft, flexible and intact.

The following components should be checked:

Shaft seal

The sliding surface must be intact and smooth.

NDE and DE radial bearing

The bearings must be intact, smooth and without visible wear.

Shaft with rotor

The radial bearing surfaces on the shaft must be intact, and the sliding surface must be intact, smooth and without visible wear.

Thrust bearing

The thrust bearing must be intact and the sliding surface must be intact and smooth.

Upthrust ring

The upthrust ring must be intact and smooth.

Motor liquid

The motor liquid must be clean. Clear the motor when the shaft seal housing is removed.

Black motor liquid may indicate damaged bearing components.

Diaphragm

The diaphragm must be intact without cracks.

8.2 Replacement of the wear parts

Always replace defective parts with wear part kits. See the recommended kits and spare parts in the MS Service Kit Catalogue.

Related information

- [MS Service Kit Catalogue](#)

9. Assembling MS6000P (flange extension)

Assemble the motor after the parts are cleaned and checked, and the defective parts are replaced with new ones.

DANGER

Magnetic field

Death or serious personal injury

- The rotor dismantled from the motor must never be handled by a person with a pacemaker.

WARNING

Crushing of fingers

Death or serious personal injury

- Keep the surroundings of the dismantled rotor free of magnetic objects, and be careful when placing the rotor on a magnetic surface.

1. Place the stator housing (1) vertically in the jaws (L) with DE upwards and tighten it.
2. Mount centering tool AE in the stator housing.

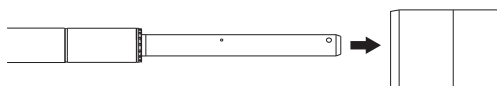


3. Rotate the stator housing (1) 180° and tighten the jaws (L).
4. Insert the upthrust ring (2a) into the stator housing (1) and push it into place with shaft extension tool AG.
5. Mount centering tool AF in the stator housing.

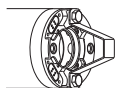


6. Turn the stator housing to horizontal position.
7. Fit shaft extensions tools AG and AH to the rotor, and carefully insert the rotor into the stator housing from the NDE.

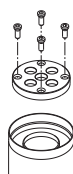
Note: Pay attention to the magnetic forces when inserting the shaft with the rotor into the stator housing.



8. Remove shaft extension tools AG and AH and the centering tools AE and AF.
9. Fit the aligning bracket (T), over the motor head, using two of the threaded holes and the belonging screws (22). Push the rotor towards the DE so it touches the bracket.



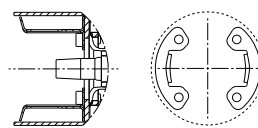
10. Turn the stator housing to vertical position with the NDE facing up.
11. Insert the radial bearing NDE (4) into the stator housing and push it in place with the shaft extension tool AG, if necessary.
12. Insert alignment disc (AI) and fasten it with the 4 positioning screws (AJ).



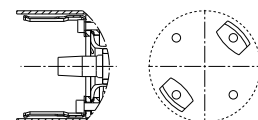
13. Use the shaft conical bearing (AK) to align the radial bearing NDE (4).



14. Remove the alignment disc (AI) and the 4 positioning screws (AJ).
15. Insert the clamping flange (7a). Make sure that the holes of the clamping flange are aligned with the threaded holes in the stator housing (1).
16. Insert the rotation stop for bearing bracket(s) (42).
17. Fasten the bracket(s) and clamping flange with the four screws (41). Use the torque wrench (AA) and the wrench (AC). See section 3. Tightening torques and lubricants. Depending on the size of the thrust bearing, there are different types and numbers of brackets.

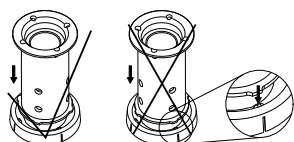


Brackets for 27 kN thrust bearing



Brackets for 40 kN thrust bearing

18. Fit the rotating part of the thrust bearing (6) onto the shaft.
19. Use a plastic mallet (I), and a punch (R or S) according to the size of the thrust bearing to fix the rotating part on the conus of the shaft.
Note: The rotating part must be put into the correct position with one hit, otherwise, the shaft height may change over time resulting in damage to the thrust bearing.
20. Fit the stationary part of the thrust bearing (3) into the stop for bearing bracket(s) (42).
Note: As the 40 kN may be difficult to fit, use two screwdrivers to push the bracket to the sides and manoeuvre the thrust bearing into the correct position.
21. Fit the shaft adjustment unit (45) into the stator housing.
22. Secure the shaft adjustment unit with a spring retainer (49).
Note: Before fitting the retainer spring, clean the recess to ensure the retainer spring is in contact with the bottom of the recess.
23. Insert the clamping flange (7) into the stator housing.
Note: Make sure that the innermost holes are aligned with the holes in the shaft height adjustment unit (45).
24. Fasten the clamping flange with four screws (48) and cross-tighten with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.
25. Loosen the lock screw (45a) and the shaft adjustment screw (45b) to have adjustment space (too low shaft height).
26. Turn the stator housing 180° in the jaws, so the DE is facing upwards.
27. Remove the bracket (T).
28. Carefully insert the radial bearing (5) into the stator housing.
Note: Position the radial bearing so it is not resting on the taps of the upthrust ring when the shaft seal housing is mounted. If the radial bearing is in the correct position, it drops down when turned with a screwdriver.



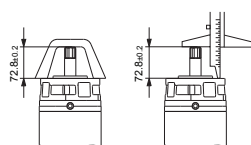
29. Make sure the radial bearing is centered in the stator housing. Position assembly tool AL over the shaft and on the top of the stator housing. Use a plastic mallet (I) and a punch (V) to drive the assembly tool AL against the mounting face for the shaft seal housing.



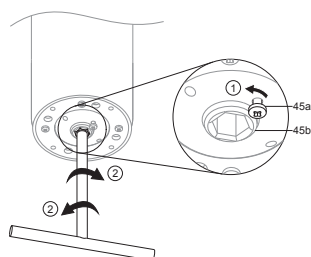
30. Remove assembly tool AL from the shaft.

31. Check the shaft height using a depth gauge (K) or a shaft height gauge (Z). The shaft height must be within 72.8 ± 0.2 mm. See the figure below.

Note: Make sure that the depth gauge is square between the shaft end and the motor flange.



32. To adjust the shaft height, attend to the NDE of the motor and adjust the height by turning the screw (45b) with the shaft height adjustment spanner (U).



33. When the shaft is adjusted to the correct height, tighten the lock screw with the specified torque using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.

34. Turn the stator housing to horizontal position.

35. Fit the diaphragm (12) and the end cover (13). Fasten them with the four belonging screws (46).

Note: Nylon washers must be renewed on all screws

36. Cross-tighten the screws with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.

37. Turn the stator housing to vertical position, with the DE facing upwards.

38. Use the spline head driver (Y) to check that the shaft rotates freely.

39. Fill motor liquid (SML-3) into the stator housing until it is full.

40. Move the shaft up and down and rotate the shaft to let air escape.

41. Refill the stator housing with motor liquid, if necessary.

42. Slide the washer (28) down on the shaft, so it is positioned in the recess of the radial bearing.

43. Lubricate the rotating part of the shaft seal (34) and the shaft with motor liquid.

44. Fit the rotating part of the shaft seal onto the shaft and press it down using a punch (V).

45. Lubricate the recess inside the shaft seal housing (32) and the outer surface of the stationary part of the shaft seal (33). See section 3. Tightening torques and lubricants.

46. Press the stationary part of the shaft seal (33) into the recess of the shaft seal housing, using the punch (V).

Note: On the MS6000 R version, press a lip seal (32a) into the shaft seal housing before inserting the stationary part of the shaft seal.

47. Fit the shaft seal housing with an O-ring (24) and lubricate it. See section 3. Tightening torques and lubricants.

48. Fit the shaft seal housing (32) into the top of the motor and press it down into place by using the punch for shaft seal (V).

49. Fit the four screws (50) into the shaft seal housing and cross-tighten them in two steps. First, cross-tighten with a screwdriver and then with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.

50. Top up the motor liquid, see section 10. Filling procedure with a syringe.

51. Fit the sand shield (27) on the shaft and push it down to the shaft seal housing (32). Make sure that the steel ring inside the sand fighter is facing the shaft seal housing.

52. Mount the flange extension (25a) onto the motor head.

53. Fasten the flange extension with the four screws (22) including the washers (21).

54. Cross-tighten the screws using a torque wrench combined with the machined Torx 50 head driver (M) or ring spanner (N). See section 3. Tightening torques and lubricants.

55. Fit the spacer for the sand shield (27a) on the shaft and push it down until touching the sand shield (27) from step 51.

56. Fit the sand shield (27) on the top of the spacer for the sand shield (27a).

57. Remove the cable plug protection cap (AN).

58. Insert the motor cable plug (220) into the cable socket.

Note: For proper sealing, always use a new motor cable.

59. Tighten the screws for the motor cable (220a) with the specified torque, using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.

60. Mount the screw (25b) that secures the earth plate of the cable plug to the flange extension.

61. Tighten this screw with the specified torque using a torque screwdriver (AB). See section 3. Tightening torques and lubricants.

62. Perform a final check, see section 11. Final check.

Related information

3. Tightening torques and lubricants

10. Filling procedure with a syringe

11. Final check

10. Filling procedure with a syringe

For a correct filling, evacuate the air inside the motor and replace it with motor liquid. Verify that the cable plug protection cap (AN) is correctly placed on the cable socket.

1. Incline the motor approximately 30°, so that the filling hole is at the highest point of the motor.
2. Remove the filling screw (22a).
3. Turn the shaft and inject motor liquid by using a filling syringe (W) until its full.
4. Fill the syringe halfway with motor liquid.
5. Press the syringe against the filling hole in order to make full contact and good sealing properties.
6. Pull back the plunger of the syringe so air is evacuated from inside the motor.
7. Press back the plunger to replace air with motor liquid.
8. Repeat this filling procedure until all air in the motor is completely evacuated and replaced with motor liquid.
9. Refit the filling screw.

Note: Nylon washer must be renewed.

Note: Motor liquid must not reach the plug hole. Use air gun to clean the surface before removing the cable plug protection cap (AN).

Related information

[7. Assembling MS6000P](#)

[9. Assembling MS6000P \(flange extension\)](#)

11. Final check

1. Check that the shaft rotates freely and quietly:
 - Use the spline head driver (Y) combined with a torque screwdriver to check the torque for rotating the shaft. Rotate the shaft slowly with at least one revolution without exceeding 2.5 Nm.
2. Check the axial clearance:
 - Place the motor in horizontal position. Grab the shaft and move it forwards and backwards. The clearance must be 1 to 2 mm.

Related information

[7. Assembling MS6000P](#)

[9. Assembling MS6000P \(flange extension\)](#)

12. Maintenance and service



WARNING
Toxic material
Death or serious personal injury

- If a motor is used in a liquid that is contagious or toxic, the motor is classified as contaminated.

Before returning the product for service, contact Grundfos with details about the pumped liquid. Otherwise, Grundfos can deny servicing the product. Any application for service must include details about the pumped liquid. Possible costs of returning the motor are to be paid by the customer.

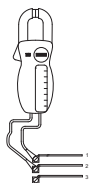
12.1 Fault finding the product

12.1.1 The motor does not run

Cause	Remedy
No power supply.	Replace the fuses. Check the electrical installation and the submersible drop cable if the new fuses burn as well.
The ELCB or the voltage-operated ELCB is tripped out.	Cut in the circuit breaker.
VFD is defective.	Repair/replace the VFD.
The control circuit in the VFD cut out or is defective.	Check the electrical installation.
Motor/drop cable is defective.	Repair/replace the motor/drop cable.

13. Checking the motor and cable

1. Supply voltage



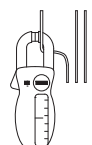
Measure the voltage between the phases with a voltmeter. Measure on the terminals on the output side of the sine wave filter where the submersible drop cable is connected.

When the motor is loaded, the voltage should be within the required voltage quality. For Grundfos MS submersible motors, that are measured at the motor terminals, it is - 10 %/+ 6 % of the rated voltage for continuous operation (including variation in the supply voltage and losses in cables).

Make sure that there is voltage symmetry in the power supply lines, such as the same difference of voltage between the individual phases.

Large variations in voltage may cause the motor to burn. Large variations in voltage indicate poor power supply and the motor must be stopped until the defect is eliminated.

2. Current consumption



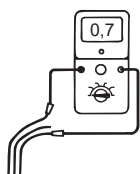
Measure the current of each phase while the pump is operating at a constant discharge pressure (if possible, at the capacity where the motor is most heavily loaded). For the maximum operating current, see the nameplate. Measure on the terminals on the output side of the sine wave filter where the submersible drop cable is connected.

On three-phase motors, the difference between the current in the phase with the highest current consumption and the current in the phase with the lowest current consumption must not exceed 5 %. If so, or if the current exceeds the maximum operating current, the following faults may exist:

- Poor connection of conductors, possibly in the cable joint.
 - See item 3.
- Too high or too low supply voltage.
 - See item 1.
- The motor windings are short-circuited or partly disjointed.
 - See item 3.
- Damaged pump is causing the motor to be overloaded.
 - Pull out the pump for overhaul.

Items 3 and 4: Measurement is not necessary when the supply voltage and current consumption are normal.

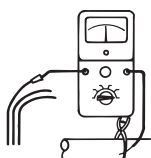
3. Winding resistance



Disconnect the submersible drop cable at the sine wave filter. Measure the winding resistance between the conductors of the submersible drop cable. See section Winding resistance MS6000P.

For three-phase motors, the difference between the highest and lowest winding resistance must not exceed 10 %. If the deviation is higher, pull out the motor. Measure the motor, the motor cable and the submersible drop cable separately, and repair/replace defective parts.

4. Insulation resistance



Disconnect the submersible drop cable at the sine wave filter. Measure the insulation resistance from each phase to earth (frame). Make sure that the earth connection is made carefully.

If the insulation resistance deviates from the given values in section 13.2 Insulation resistance, the motor should be pulled out for motor or cable repair. Local regulations may stipulate other values of insulation resistance.

Related information

5. Motor check/fault finding

13.1 Winding resistance MS6000P

13.2 Insulation resistance

13.1 Winding resistance MS6000P

Voltage	Output power		Winding resistance line to line
	[kW]	[hp]	[Ω]
3 x 350 V, 100 Hz 3 x 410 V, 120 Hz	4.0	5.5	0.980
	5.5	7.5	
	7.5	10	
	9.2	12	
	11	15	0.385
	13	18	
	15	20	
	18.5	25	
	22	30	0.238
	26	35	
	30	40	
	37	50	
	45	-	0.137

Related information

5. [Motor check/fault finding](#)

13. [Checking the motor and cable](#)

13.2 Insulation resistance



The insulation resistance must be measured in accordance with local regulations.

The table shows suggested values of insulation resistance and the test voltage in relation to the rated voltage of the motor.

Rated voltage:	≤ 500 [V]	> 500 [V]
Condition of motor and cable	[MΩ]	[MΩ]
New motor (without submersible drop cable)	≥ 200	≥ 200
Used motor which can be reinstalled in well	≥ 10	≥ 10
New motor in well	≥ 20	≥ 20
Motor in good condition in well	≥ 0.5	≥ 1
Damaged insulation	< 0.5	< 1

If the rated motor voltage is ≤ 500 V, the insulation resistance must be measured at a test voltage of 500 VDC.

If the rated motor voltage is > 500 V, the insulation resistance must be measured at a test voltage of 1000 VDC.

Related information

5. [Motor check/fault finding](#)

13. [Checking the motor and cable](#)

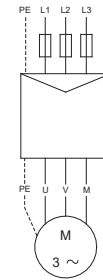
14. Motor connection

All MS6000P synchronous motors are designed for direct-on-line starting.

14.1 MS6000P motors with single-cable connection

MS6000P motors up to 30kW are supplied with single cabling per phase.

Mains	Cable/connection
PE	PE (yellow and green)
L1	U (brown)
L2	V (black)
L3	W (grey)

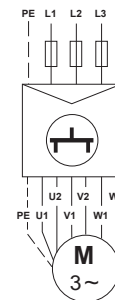


MS6000P motors with single-cable connection

14.2 MS6000P motors with double-cable connection

MS6000P motors of 37 and 45 kW are supplied with double cabling per phase.

	Connection	Colour
PE	PE	Yellow and green
L1	U1+U2	Brown
L2	V1+V2	Black
L3	W1+W2	Grey



Applicable to Grundfos MS6000P 37 kW and 45 kW

15. Parts list

Pos.	Description	Quantity	Wear part	Service kit ¹				
				Seal kit	End cover	Thrust bearing	Radial bearing	Screw
1	Stator housing	1						
1a	Valve	1	x	x				
2	Shaft with rotor	1						
2a	Upthrust ring	1	x	x				
3	Stationary part of thrust bearing	1	x			x		
4	Radial bearing NDE	1	x				x	
5	Radial bearing DE	1	x				x	
6	Rotating part of thrust bearing	1	x			x		
7	Clamping flange	1				x		
7a	Clamping flange	1						
12	Diaphragm	1	x	x	x			
13	Bottom cover	1	x		x			
21	Washer	4 ²						
22	Screw	4(8 ²)						x
22a	Filling screw with Nyltite	1	x	x				
24	O-ring	1	x	x				
25a	Flange extension ²	1						
25b	Earth screw ²	1						
27	Sand shield	1(2 ²)	x	x				
27a	Spacer for sand shield ²	1						
28	Washer	1						
32	Shaft seal housing	1	x	x				
32a	Lip seal ³	1	x	x				
33	Stationary seal ring	1	x	x				
34	Rotating seal ring	1	x	x				
41	Screw	4				x		
42	Rotation stop for bearing	1				x		
45	Shaft adjustment unit	1				x		
45a	Lock screw	1						
45b	Shaft adjustment screw	1						
46	Screw with Nyltite	4	x	x	x			
48	Screw	4				x		
49	Retainer spring	1				x		
50	Screw	4	x	x	x			
51	Compression spring	1						
220	Motor cable plug	1						
220a	Screw for cable plug	2						

¹ Refer to the MS Service Kit Catalogue for part number information.

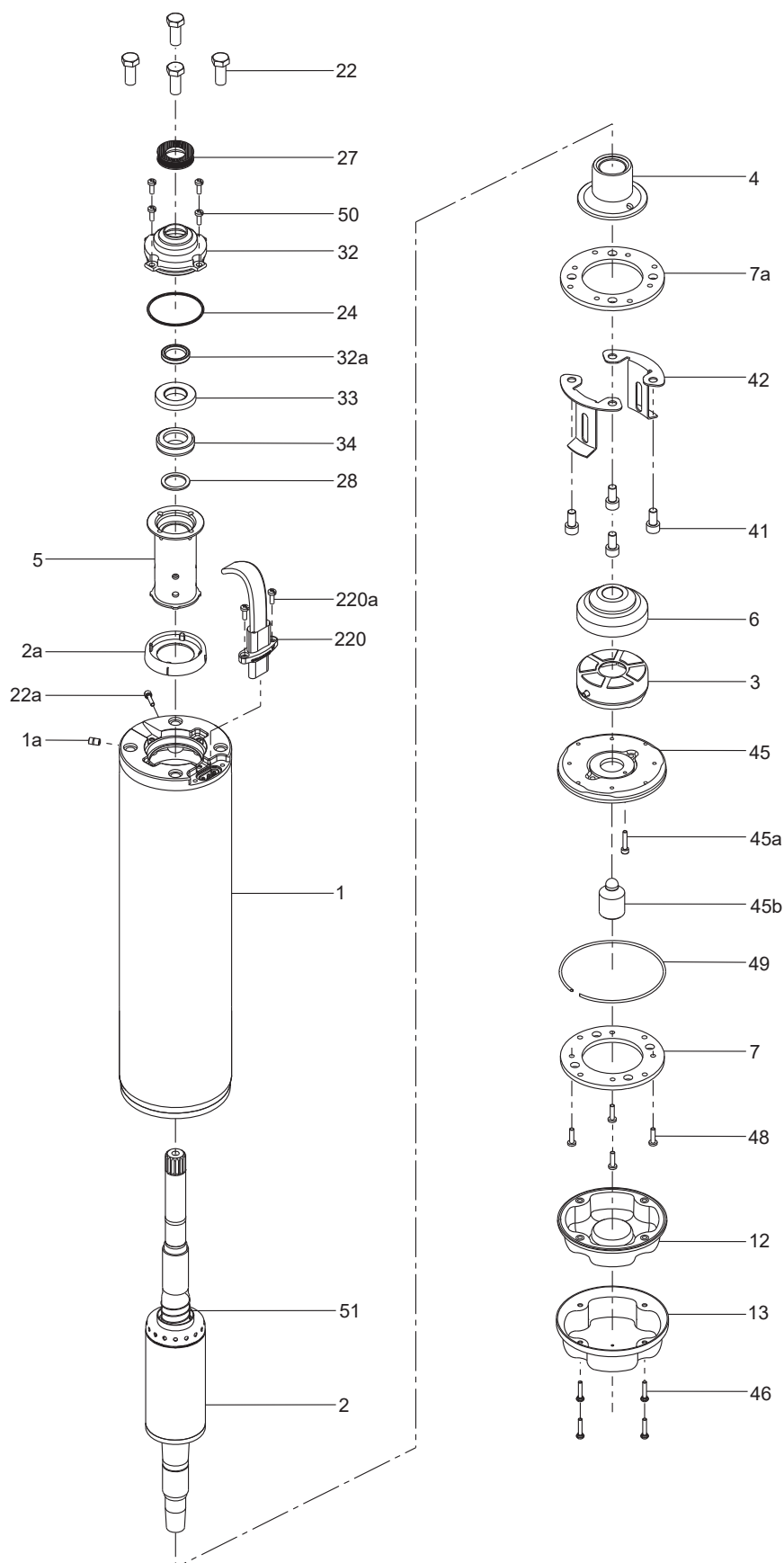
² Motor with flange extension

³ Motor in R-version

Related information

- [MS Service Kit Catalogue](#)

16. Exploded drawing of MS6000/MS6000P

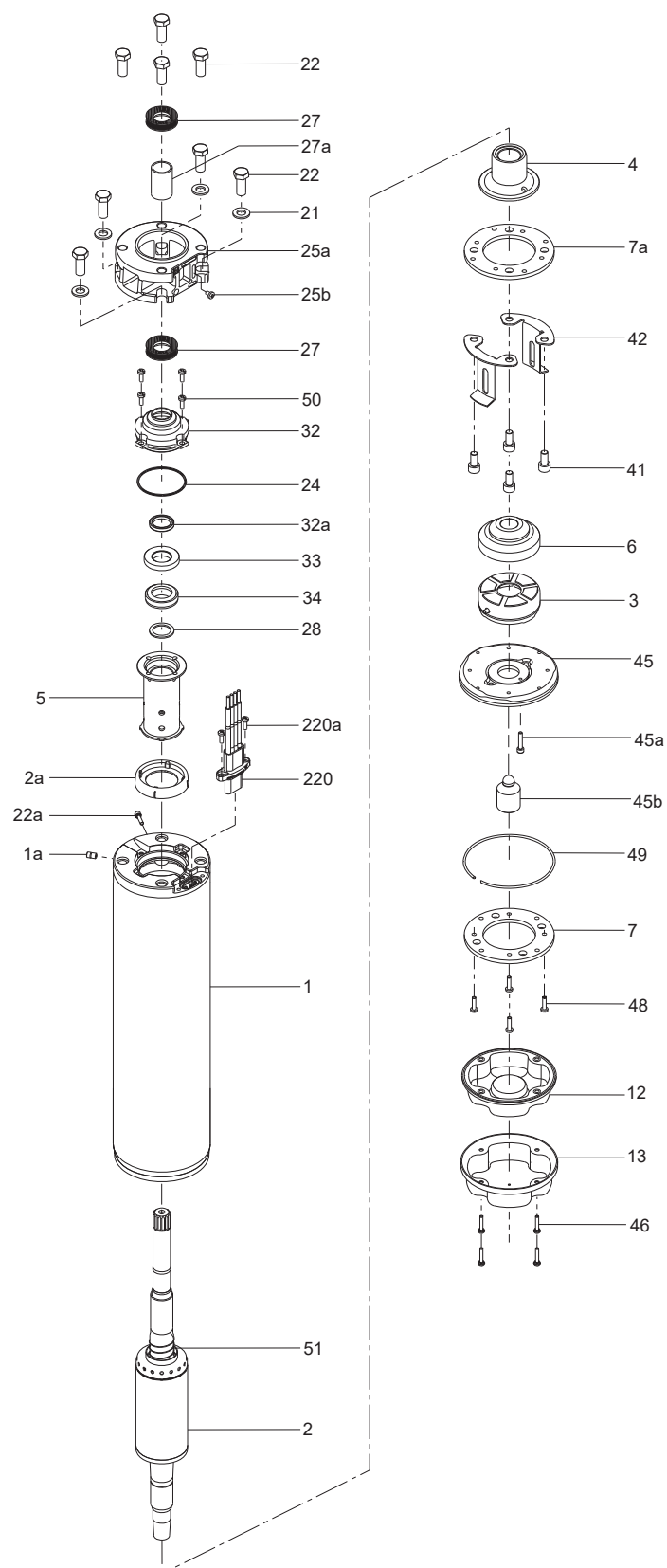


Exploded view of MS6000/MS6000P motor

Related information

[1.3 Position numbers](#)

17. Exploded drawing of MS6000/MS6000P (flange extension)



Exploded view of MS6000/MS6000P (flange extension) motor

Related information

1.3 Position numbers

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