

MS6000

Submersible motors

Service instructions



Original service instructions.

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2. General information

2.1 Position numbers

Position numbers of motor parts (digits) refer to section [16. Exploded drawing of MS6000](#) and position numbers of service tools (letters) refer to section [5. Service tools](#).

2.2 Before dismantling

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

2.3 Before assembly

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

2.4 During assembly

- Lubricate and tighten screws to the correct torque. See section [4. Tightening torques and lubricants](#).

Warning

Prior to service work, read these service instructions carefully. Installation and 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. Symbols used in this document

**Warning**

If these safety instructions are not observed, it may result in personal injury.

Note

Notes or instructions that make the job easier and ensure safe operation.

3. Identification

3.1 Nameplate

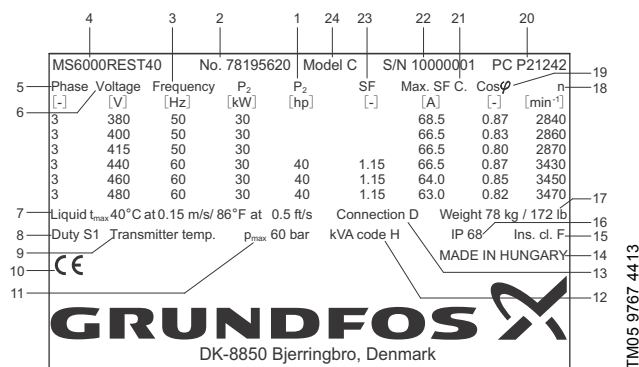


Fig. 1 Nameplate

Pos.	Description
1	Output power in [kW] and [hp]
2	Product number - 78XXXXXX: Product without packaging
3	Frequency
4	Type designation
5	Number of phases
6	Supply voltage
7	Maximum liquid temperature at minimum flow past the motor
8	Motor designed for continuous operation (S1)
9	Built-in Tempcon temperature transmitter
10	CE mark and approvals
11	Maximum operating pressure
12	Locked-rotor current in kVA per hp
13	Connection
14	Country of production
15	Insulation class
16	Enclosure class
17	Net weight in [kg] and [lb]
18	Rated speed min ⁻¹
19	Cos φ
20	Production code
21	Rated current
22	Serial number
23	Service factor
24	Model (C = third generation)

3.2 Frequency converter operation

If the motor has been connected to a frequency converter, the temperature transmitter is damaged. Change the nameplate by striking through "Transmitter temp.". The change must be permanent - use for instance an engraving stylus. See fig. 2.

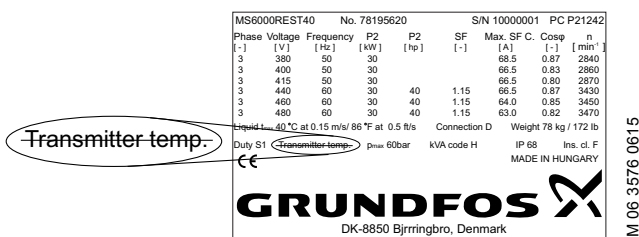


Fig. 2 Nameplate with change

3.3 Product number key

Example		78	19	55	15							
Motor code												
78: MS6000												
Voltage code												
Code	Starting method					Voltage range						
						50 Hz	60 Hz					
10	DOL					3 x 220-230 V	-					
19	DOL					3 x 380-400-415 V	3 x 440-460-480 V					
35	DOL					3 x 380-400-415 V	3 x 440-460-480 V					
28	DOL					-	3 x 208-220-230 V					
30	DOL					-	3 x 208-220-230 V					
33	DOL					-	3 x 380-400 V					
18	DOL					3 x 500-525 V	3 x 575 V					
39	DOL					3 x 500-525 V	3 x 575 V					
60	SD					3 x 220-230 V	-					
63	DOL					3 x 200 V	3 x 200-220 V					
64	DOL					3 x 400 V	3 x 400-440 V					
64	SD					3 x 400 V	3 x 400-440 V					
69	SD					3 x 380-400-415 V	3 x 440-460-480 V					
80	SD					-	3 x 208-220-230 V					
83	SD					-	3 x 380-400-415 V					
08	DOL	3 x 340-380 V	3 x 440 V									
09	DOL	3 x 200 V	3 x 200-220 V									
Configuration code												
Code	Sleeve material					Tempcon	Rubber material	Shaft seal	Radial bearing	Motor liquid	Temperature	Flange extension
45	EN 1.4301					Without	NBR	BBXP	Soft	SML3	T40	Without
50	EN 1.4301					With	NBR	BBXP	Hard	SML3	T40	Without
51	EN 1.4539					With	FKM	BQQV	Hard	SML3	T40	Without
53	EN 1.4301					With	FKM	BQQV	Soft	SML3	T60	Without
55	EN 1.4301					With	NBR	BBXP	Soft	SML3	T40	Without
56	EN 1.4539					With	FKM	BQQV	Soft	SML3	T40	Without
58	EN 1.4301					With	NBR	BBXP	Soft	SML3	T60	Without
59	EN 1.4539					With	FKM	BQQV	Soft	SML3	T60	Without
61	EN 1.4539					With	FKM	BQQV	Hard	SML3	T60	Without
72	EN 1.4301					With	NBR	BQQP	Soft	SML3	T40	With
86	EN 1.4539					With	FKM	BQQV	Soft	DI-Water	T40	Without
Power code												
11	5.5 kW								7.5 hp			
12	7.5 kW								10 hp			
13	9.2 kW								-			
14	11 kW								15 hp			
15	13 kW								-			
16	15 kW								20 hp			
17	18.5 kW								25 hp			
18	22 kW								30 hp			
19	26 kW								-			
20	30 kW	40 hp										

3.4 Type key

Description	MS6000	R	E	S	W	D	F	X	T40	3 x 400/50 460/60	SD	18.5 kW
Motor type												
Material type												
= EN 1.4301												
R = EN 1.4539												
Rubber												
= NBR												
E = FKM												
Shaft seal												
= Ceramic/carbon	BXPFF/NBR											
S = SiC/SiC	Q1Q1VFF/FKM											
Q = SiC/SiC	Q1Q1PFF/NBR											
Radial bearings												
= Ceramic/hard metal												
W = SiC/Tungsten carbide												
Motor liquid												
= SML3												
D = Demineralised water												
H = Glycol 60 vol. % HTF												
Flange extension												
= Without												
F = With												
Tempcon												
= With												
X = Without												
Max. liquid temperature												
T40 = 40 °C												
T60 = 60 °C												
Voltage												
3 x 340-380/50 440/60	=	3 x 340-380 V, 50 Hz							3 x 440 V, 60 Hz			
3 x 200/50 200-220/60	=	3 x 200 V, 50 Hz							3 x 200-220 V, 60 Hz			
3 x 220-230/50	=	3 x 220-230 V, 50 Hz										
3 x 400/50 460/60	=	3 x 380-400-415 V, 50 Hz							3 x 440-460-480 V, 60 Hz			
3 x 400/50 400-440/60	=	3 x 400 V, 50Hz							3 x 400-440 V, 60 Hz			
3 x 690/50	=	3 x 690 V, 50 Hz										
3 x 208-220-230/60	=								3 x 208-220-230 V, 60 Hz			
3 x 380-400/60	=								3 x 380-400 V 60 Hz			
3 x 500/50 575/60	=	3 x 500-525 V, 50 Hz							3 x 575 V, 60 Hz			
3 x 690/60	=								3 x 690 V, 60 Hz			
Method of starting												
= DOL												
SD = SD												
Motor power												
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												

4. Tightening torques and lubricants

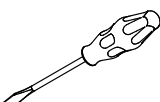
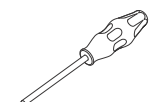
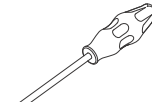
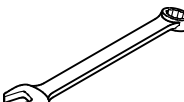
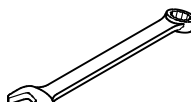
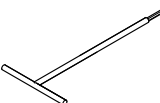
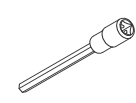
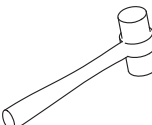
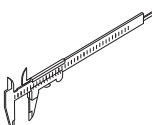
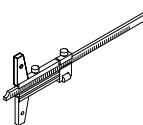
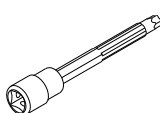
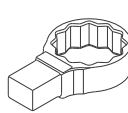
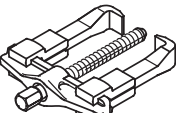
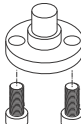
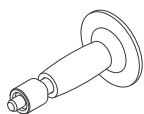
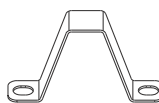
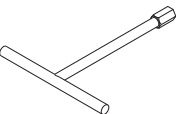
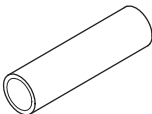
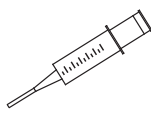
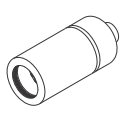
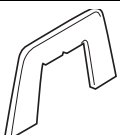
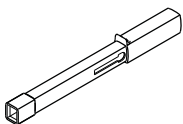
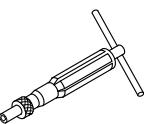
Pos.	Designation	Quantity	Dimensions [mm]	Torque [Nm]	Lubricant
22	Hexagon head screw	4 (8*)	1/2"-20 UNF-2A x 32	70 ± 7 Nm	
22a	Screw with nylon washer	1	M5 x 20	3.5 ± 0.5 Nm	
24	O-ring	1	Ø65 x 2.5	-	Rocol Sapphire Aqua-Sil
41	Hexagon socket head cap screw	4	M10 x 20	46 ± 5 Nm	
45a	Hexagon socket head cap screw	1	M5 x 25	4.5 ± 0.5 Nm	
46	Screw with nylon washer	4	M5 x 25	4.5 ± 0.5 Nm	
48	Screw	4	M5 x 20	4.5 ± 0.5 Nm	
50	Screw with nylon washer	4	M6 x 15 M6 x 16**	4.5 ± 0.5 Nm	
221	Screw with nylon washer	2	M6 x 15 M6 x 16**	4.5 ± 0.5 Nm	
220	Screw	2			-

* Motor with flange extension

** Motor in R-version

Rocol Sapphire Aqua-Sil: product number RM2924 (1 kg).

5. 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		
					

5.1 Standard tools

Pos.	Description	For pos.	Part number
A	Screwdrivers	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	Tee key 8 mm	41	00SV0051
H	Hexagon head driver 8 mm	41	00SV0298
I	Plastic mallet	-	-
J	Slide gauge	-	-
K	Depth gauge	2	-

5.2 Special tools

Pos.	Description	For 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	I, 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

5.3 Torque tools

Pos.	Description	For pos.	Part number
AA	Torque wrench 40-200 Nm		00SV0400
AB	Torque screwdriver 1-6 Nm	22a, 50, 221, 45a, 46, 48	00SV0438
AC	Ratchet insert tool	F	00SV0401

6. Checking of motor/failure analysis

As the reliability of submersible motors is very important, used motors must be checked and then dismantled. By doing this the cause of the fault can be identified, in case the motor has been damaged. Always take care to thoroughly inspect, analyse and document each individual components, both before and during dismantling. Check the following points before dismantling:

- Check the motor for damage, fractures or the like.
- Check that the motor is filled with liquid and has no leaks at the diaphragm or shaft seal.
- Check that the height from the shaft end to the contact face of thread holes is 72.8 ± 0.2 mm.
- Check that 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.
- Check that the motor insulation resistance complies with local regulations. In case of motor repair, however, the resistance must be at least 1 MΩ.
- Submerge the motor cable and the submersible drop cable in water and check that there is no leakage in the cables.
- If the motor is connected to a control unit, type MP204, check the signal from the temperature transmitter of the motor.

- Ohm the motor with the cable mounted on.
- Meg the motor with the cable mounted on.
- Ohm the motor with no cable, directly on the terminals.
- Meg the motor with no cable, directly on the terminals.

7. Dismantling of MS6000

1. Place the motor vertical in a set of jaws, pos. L.
Note: Make sure that the motor is secure in the jaws, and cannot move.
2. Before dismantling the motor, disconnect the motor cable, by slacking and removing the two screws, pos. 221 and the screw, pos. 50, which is holding the earth clamp.
3. Use two screwdrivers to manoeuvre the plug out of its socket, and pull out the plug.
4. Remove the sand shield, pos. 27, from the shaft.
5. Slacken and remove the remaining three screws, pos. 50, holding the shaft seal housing, pos. 32.
6. Use two screwdrivers to tip out the shaft seal housing, pos. 32, see fig. 3.

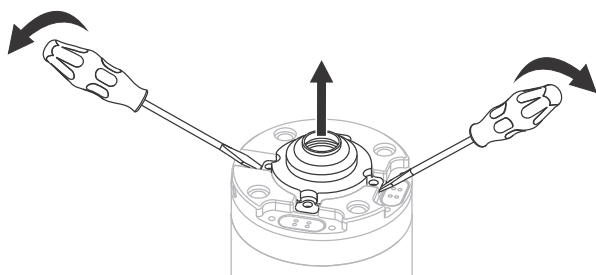


Fig. 3 Removal of shaft seal housing

7. Use two screwdrivers to remove the rotating part of the shaft seal, pos. 34.
8. Remove the washer, pos. 28, from the shaft.
9. Pull up the D-end bearing retainer, pos. 5, using a small screwdriver.
10. Tilt the motor and drain the motor liquid into a bucket.
11. Turn the motor to vertical position with the ND-end facing upwards and remove the four screws, pos. 46, from the bottom cover, pos. 13.
12. Remove the bottom cover including the diaphragm, pos. 12.
13. Slacken and remove the four screws, pos. 48, together with the clamping flange, pos. 7.
14. Press down the shaft adjusting unit, pos. 45, against the thrust bearing to relieve the stress on the retainer spring, pos. 49.
15. Use a small screwdriver to push the retainer spring out of the recess in the stator housing, pos. 1, and pull out the adjusting shaft unit.
16. Remove the stationary part of the thrust bearing, pos. 3, by tilting it out its brackets, pos. 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.
17. Pull out the rotating part of the thrust bearing, pos. 6.
The approach for this depends of the size of the thrust bearing, whether its a 7.5, 27 or 40 kN thrust bearing.
 - **7.5 kN or 27 kN thrust bearing**
 - Turn the motor to horizontal position.
 - Slacken and remove the screws, pos. 41, together with the stop for bearing bracket(s), pos. 42.
 - Carefully pull out the rotor, pos. 2, from the stator housing, and fix it in a vice.
 - Pull out the rotating part of the thrust bearing by using a puller, pos. O, together with a plug, pos. P.
 - Remove the clamping flange, pos. 7a, and radial bearing, pos. 4, from the rotor.

– 40 kN thrust bearing

- Turn the motor to horizontal position.
 - Mount the puller, pos. Q, into the rotation part of the thrust bearing, and fasten it with two screws.
 - Use a hexagon tee key to fasten the two screws in the puller, until the thrust bearing loosens the grip from the conus on the shaft.
 - Remove the puller and the thrust bearing.
 - Slacken and remove the screws, pos. 41, together with the stop for bearing brackets, pos. 42.
 - Carefully pull out the rotor, pos. 2, from the stator housing, and fix it in a vice.
 - Remove the clamping flange, pos. 7a, and the radial bearing, pos. 4, from inside the stator housing.
18. Remove the upthrust ring, pos. 2a, positioned in the D-end of the stator housing. Use a long wooden stick to push out upthrust ring.
Note: The upthrust ring can only be removed by pushing it towards the ND-end.

7.1 Checking of parts

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

The following part should be checked:

Shaft seal

The sliding surface must be intact and smooth

Lower and upper radial bearing

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

Shaft with rotor

The tungsten carbide rings 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 ring must be intact and smooth.

Motor liquid

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

Black motor liquid, then your thrust bearing is damaged

Diaphragm

The diaphragm must be intact with no cracks.

7.2 Replacement of wear parts

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

8. Assembly of MS6000

Assemble the motor when the parts have been cleaned and checked, and the defective parts have been replaced with new ones.

1. Place the stator housing, pos1, vertical in the jaws, pos. L, and tighten.
2. Fit the aligning bracket, pos. T, over the motor head, using two of the threaded holes and the belonging screws, pos 22. Make sure that there is 10 mm gap between the bracket and the motor head. See fig. 4.

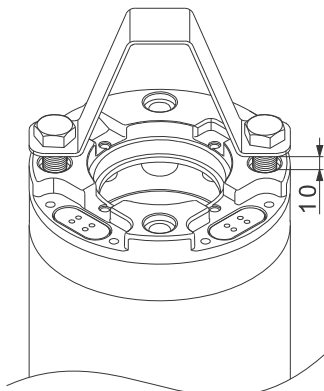


Fig. 4 Aligning bracket on motor head

3. Turn the stator housing to horizontal position.
4. Fit the upthrust ring, pos. 2a, on the D-end of the rotor, pos. 2.
5. Carefully insert the rotor into the stator housing from the ND-end until it stops at the bracket, pos. T.
6. Tighten the two screws, pos. 22, holding the bracket. By doing so, the rotor is being pushed back, but the upthrust ring will stay fixed in the correct position inside the stator housing.
7. Turn the stator housing to vertical position with the ND-end facing up.
8. Insert the radial bearing pos. 4, into the stator housing.
9. Insert the clamping flange, pos. 7a. Make sure that the holes of the clamping flange are aligned with the threaded holes in the stator housing.
10. Insert the stop for bearing bracket(s), pos. 42.
11. Fasten the bracket(s) and clamping flange with the four screws, pos. 41. See section 4. *Tightening torques and lubricants*.
Depending on the size of the thrust bearing, there are different types and numbers of brackets. See figs 5, 6 and 7.

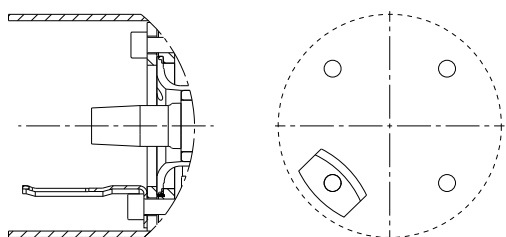


Fig. 5 Bracket for 7.5 kN thrust bearing

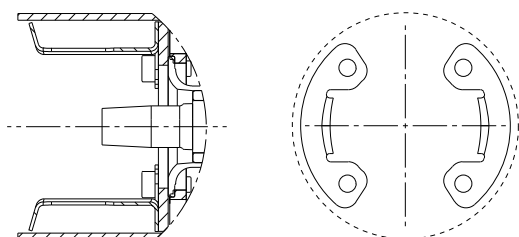


Fig. 6 Brackets for 27 kN thrust bearing

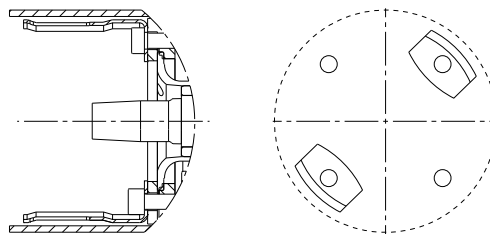


Fig. 7 Brackets for 40 kN thrust bearing

12. Fit the rotating part of the thrust bearing, pos. 6, onto the shaft.
13. Position a space e.g a wooden block between the D-end of the shaft and the bracket, so the shaft is moved a bit back.
14. Use a plastic mallet, pos. I, and a punch, pos. R or S, to fix the rotating part on the conus of the shaft.
Note: It is important that the rotating part is fixed with one hard hit. Failing this, the rotating part may not be knocked all the way home on the conus. Consequently the shaft height will change over time, and the thrust bearing can be damaged.
15. Fit the stationary part of the thrust bearing, pos. 3, into the stop for bearing bracket(s), pos. 42.
Note: As the 40 kN can be difficult to fit, we recommend that you use two screwdrivers to push the bracket to the side and manoeuvre the thrust bearing into place.
16. Loosen the lock screw in the shaft adjustment unit, pos. 45, and fit it into the stator housing.
17. Secure the shaft adjustment unit with a spring retainer, pos. 49.
Note: Before you fit the retainer spring, clean the recess as it is important that the retainer spring has full contact with the bottom of the recess.
18. Insert the clamping flange, pos. 7, into the stator housing.
Note: Make sure that the innermost holes are aligned with the holes in the shaft height adjustment unit.
19. Fasten the clamping flange with four screws, pos. 48, and cross-tighten with the specified torque, using a torque screwdriver, pos. AB. See section 4. *Tightening torques and lubricants*.
20. Press the shaft backwards and turn the stator housing 180 ° in the jaws so the D-end is facing upwards.
21. Remove the bracket, pos. T.
22. Check the shaft height using a depth gauge, pos. K, or a shaft height gauge, pos. Z. The shaft height must be within 72.8 ± 0.2 mm. See fig. 8.
Note: When using the depth gauge, beware that the shaft end is conceal shaped. Make sure that the depth gauge is square on the motor head and shaft end.

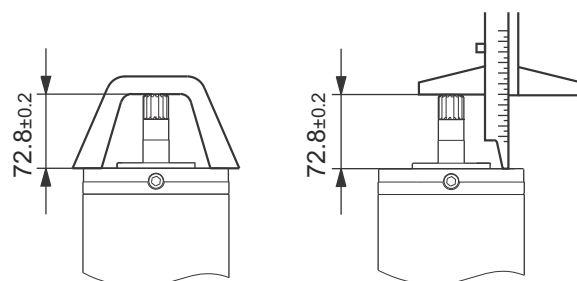


Fig. 8 Checking of shaft height

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23. To adjust the shaft height, attend to the ND-end of the motor. Slacken the lock screw, pos. 45a, in the shaft height adjusting unit, pos. 45, and adjust the height by turning the screw, pos. 45b, by using the shaft height adjustment spanner, pos. U. See fig. 9.

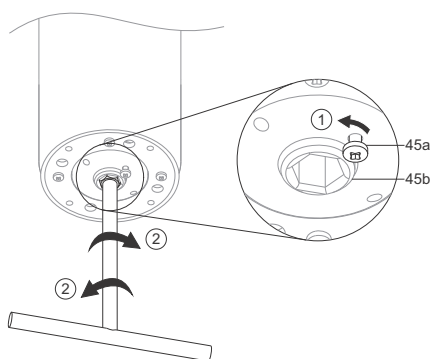


Fig. 9 Adjusting of shaft height

24. When the shaft has been adjusted to the correct height, tighten the lock screw with the specified torque, using the torque screwdriver. See section 4. *Tightening torques and lubricants*.
25. Turn the stator housing to horizontal position.
26. Fit the end cover, pos. 13, and fasten it with the four screws, pos. 46.
Note: Nyltites must be renewed on all screws.
27. Cross-tighten the screws with the specified torque. See section 4. *Tightening torques and lubricants*.
28. Turn the stator housing to vertical position, with the D-end facing upwards.
29. Fill motor liquid into the motor until it has been almost filled.
30. Move the shaft up and down and rotate the shaft to let air escape.
31. Refill the stator housing with motor liquid.
32. Carefully insert the radial bearing, pos. 5, into the stator housing.
Note: It is important that you position the radial bearing so it is not resting on the taps on the upthrust ring, when you mount the shaft seal housing. In such case the upthrust ring will be forced down.
Check that the radial bearing is positioned correctly by turning it with a screwdriver. If the radial bearing is resting on the taps of the upthrust ring, it will drop down when you turn it. See fig. 10.

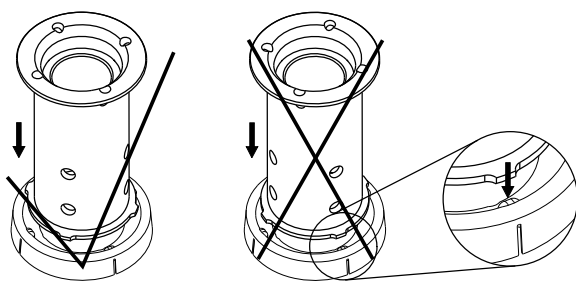


Fig. 10 Positioning of radial bearing

33. Slide the washer, pos. 28, down on the shaft so its positioned in the recess of the radial bearing.
34. Lubricate the rotating part of the shaft sealing, pos. 34, and the shaft with motor liquid.
35. Fit the rotating part of the shaft seal onto the shaft, and press it down using a punch, pos. V.
36. Lubricate the recess inside the shaft seal housing, pos 32.
37. Press the stationary part of the shaft seal into the recess of the shaft seal housing, using a punch, pos. V.
Note: On MS6000R you must press a lip seal, pos. 32a, into the shaft seal before you insert the stationary part of the shaft seal.

38. Fit the shaft seal housing with an O-ring, pos. 24, and lubricate it.
39. Fit the shaft seal housing, pos. 32, into the top of the motor, and press it down into place by using the punch for the shaft seal, pos. V.
40. Fit the four screws, pos. 50, into the shaft seal housing and cross-tighten the shaft seal housing in two steps. First you cross-tighten with half a torque and then with a full torque.
Note: Fit the last screw at the cable plug with the motor cable.
41. Insert the motor cable, pos. 220, into the cable plug.
Note: For proper sealing, Grundfos always recommends that you use a new motor cable
42. Tighten the motor cable with the screws, pos. 220a, and the last screw, pos. 50, for the shaft seal housing.
43. Tighten the screws for the motor cable with the specified torque. See section 4. *Tightening torques and lubricants*.
44. Cross-tighten the screws in the shaft seal housing with the specified torque. See section 4. *Tightening torques and lubricants*.
45. Fit the sand fighter, pos. 27, on the shaft and push it down to the shaft seal housing, pos. 32.
Make sure that the steel ring inside the sand fighter is facing the shaft seal housing.

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9. Dismantling of MS6000F

- Place the motor vertical in a set of jaws, pos. L.
Note: Make sure that the motor is secure in the jaws and cannot move.
- Before dismantling the motor, disconnect the motor cable, by slacking and removing the two screws, pos. 221, and the screw, pos. 25b, holding the earth clamp.
- Use to screwdrivers to manoeuvre the cable out of its socket, and pull out the cable by hand.
- Remove the sand shield, pos. 27, and the spacer pos. 27a, from the shaft.
- Slacken and remove the four screws, pos. 22, and remove the flange extension, pos. 25a.
- Remove the sand shield pos. 27, from the shaft.
- Slacken and remove the remaining four screws, pos. 50, holding the shaft seal housing, pos. 32.
- Use two screwdrivers to tip out the shaft seal housing, pos. 32, see fig. 3.

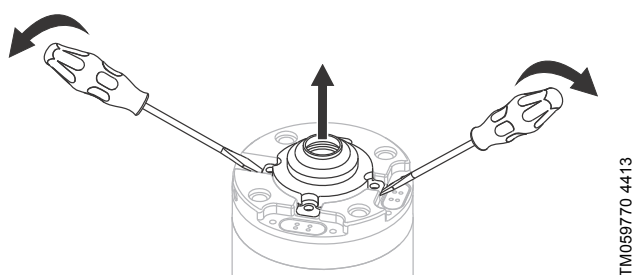


Fig. 11 Removal of shaft seal housing

- Use to screwdrivers to remove the rotating part of the shaft seal, pos. 34.
- Remove the washer, pos. 28, from the shaft.
- Pull up the D-end bearing retainer, pos. 5, using a small screwdriver.
- Tilt the motor and drain the motor liquid into a bucket.
- Turn the motor to vertical position with the ND-end facing upwards and remove the four screws, pos. 46, from the bottom cover, pos. 13.
- Remove the bottom cover including the diaphragm, pos. 12.
- Slacken and remove the four screws, pos. 48, together with the clamping flange, pos. 7.
- Press down the shaft adjusting unit, pos. 45, against the thrust bearing to relieve the stress on the retainer spring, pos. 49.
- Use a small screwdriver to push the retainer spring out of the recess in the stator housing, pos. 1, and pull out the adjusting shaft unit.
- Remove the stationary part of the of the thrust bearing, pos. 3, by tilting it out its brackets, pos. 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.
- Pull of the rotation part of the thrust bearing, pos. 6.
The approach for this depends on the size of the thrust bearing, whether its a 7.5, 27 or 40 kN thrust bearing.

– 7.5 kN or 27 kN thrust bearing

- Turn the motor to horizontal position.
- Slacken and remove the screws, pos. 41, together with the stop for bearing bracket(s), pos. 42.
- Carefully pull out the rotor, pos. 2, from the stator housing, and fix it in a vice.
- Pull of the rotating part of the thrust bearing by using a puller, pos. O, together with a plug, pos. P.
- Remove the clamping flange, pos. 7a, and radial bearing, pos. 4, from the rotor.

– 40 kN thrust bearing

- Turn the motor to horizontal position.
 - Mount the puller, pos. Q, into the rotation part of the thrust bearing, and fasten it with two screws.
 - Use a hexagon tee key to fasten the two screws in the puller, until the thrust bearing loses its grip from the conus on the shaft.
 - Remove the puller and the thrust bearing.
 - Slacken and remove the screws, pos. 41, together with the stop for bearing brackets, pos. 42.
 - Carefully pull out the rotor, pos. 2, from the stator housing, and fix it in a vice.
 - Remove the clamping flange, pos. 7a, and the radial bearing, pos. 4, from inside the stator housing.
20. Remove the upthrust ring, pos. 2a, positioned in the D-end of the stator housing. Use a long wooden stick to push out upthrust ring. **Note:** You can only remove the upthrust ring by pushing it towards the ND-end.

9.1 Checking of parts

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

Check the following parts:

Shaft seal

The sliding surface must be intact and smooth.

Lower and upper radial bearing

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

Shaft with rotor

The tungsten carbide rings 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.

If the motor liquid is black, then your thrust bearing is damaged.

Diaphragm

The diaphragm must be intact with no cracks.

9.2 Replacement of wear parts

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

10. Assembly of MS6000F

Assemble the motor when the parts have been cleaned and checked, and the defective parts have been replaced with new ones.

1. Place the stator housing, pos. 1, vertical in the jaws, pos. L, and tighten.
2. Fit the aligning bracket, pos. T, over the motor head by using two of the threaded holes and the belonging screws, pos. 22. Make sure that there is 10 mm clearance between the bracket and the motor head. See fig. 4.

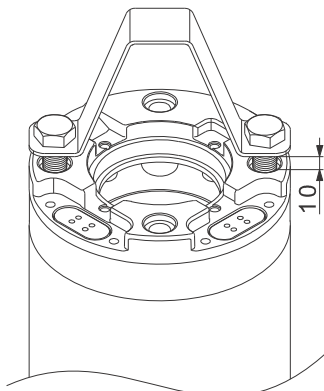


Fig. 12 Aligning bracket on motor head

3. Turn the stator housing in horizontal position.
4. Fit the upthrust ring, pos. 2a, on the D-end of the rotor, pos. 2.
5. Carefully insert the rotor into the stator housing from the ND-end until it stops at the bracket, pos. T.
6. Tighten the two screws, pos. 22, holding the bracket. By doing so, the rotor is being pushed back but the upthrust ring will stay fixed in the correct position inside the stator housing.
7. Turn the stator housing so in vertical position with the ND-end facing upwards.
8. Insert the radial bearing, pos. 4, into the stator housing.
9. Insert the clamping flange, pos. 7a. Make sure that the holes of the clamping flange are aligned with the threaded holes in the stator housing.
10. Insert the stop for bearing bracket(s), pos. 42.
11. Fasten the bracket(s) and clamping flange with the four screws, pos. 41. See section 4. *Tightening torques and lubricants*. Depending on the size of the thrust bearing, there are different types and numbers of brackets. See figs 13, 14 and 15.

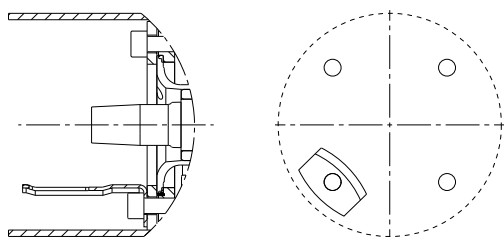


Fig. 13 Bracket for 7.5 kN thrust bearing

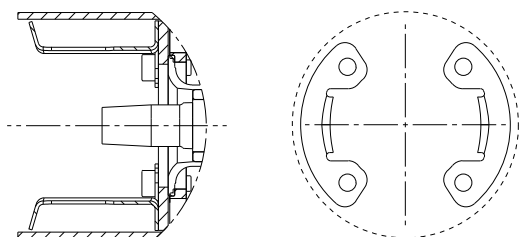


Fig. 14 Brackets for 27 kN thrust bearing

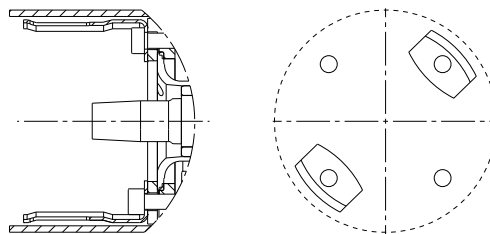


Fig. 15 Brackets for 40 kN thrust bearing

12. Fit the rotating part of the thrust bearing, pos. 6, onto the shaft
13. Position a space e.g a wooden block between the D-end of the shaft and the bracket, pos. T, so the shaft is moved a bit back.
14. Use a plastic mallet, pos. I, and a punch, pos. R or S, to fix the rotating part on the conus of the shaft.
Note: It is important that the rotating part is fixed with one hard hit. Failing this, the rotating part may not be knocked all the way home on the conus. Consequently the shaft height will change over time, and the thrust bearing can be damaged.
15. Fit the stationary part of the thrust bearing, pos. 3, into the stop for bearing bracket(s), pos. 42.
Note: As The 40 kN can be difficult to fit, we recommend that you use two screwdrivers to push the bracket to the sides and manoeuvre the thrust bearing into place.
16. Loosen the lock screw in the shaft adjustment unit, pos. 45, and fit it into the stator housing.
17. Secure the shaft adjustment unit with a spring retainer, pos. 49.
Note: Before you fit the retainer spring is fitted, clean the recess as it is important that the retainer spring has full contact with the bottom of the recess.
18. Insert the clamping flange, pos. 7, into the stator housing.
Note: Make sure that the innermost holes are aligned with the holes in the shaft height adjustment unit.
19. Fasten the clamping flange with four screws, pos. 48, and cross-tighten with the specified torque, using a torque screwdriver, pos. AB. See section 4. *Tightening torques and lubricants*.
20. Press the shaft backwards and turn the stator housing 180 ° in the jaws, so the D-end is facing upwards.
21. Remove the bracket, pos. T.
22. Check the shaft height using a depth gauge, pos. K, or a shaft height gauge, pos. Z. The shaft height must be within 72.8 ± 0.2 mm. See fig. 16.
Note: When using the depth gauge, beware that the shaft end is conceal shaped. Make sure that the depth gauge is square on the motor head and shaft end.

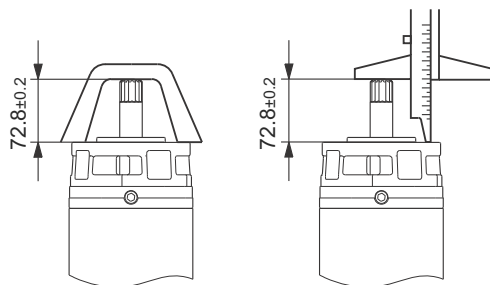
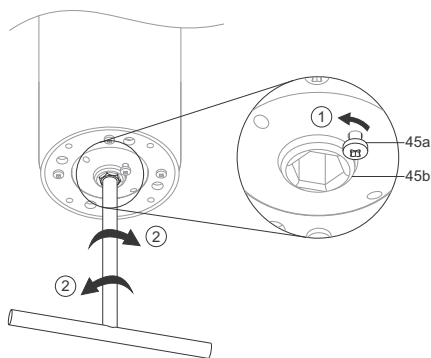


Fig. 16 Checking of shaft height

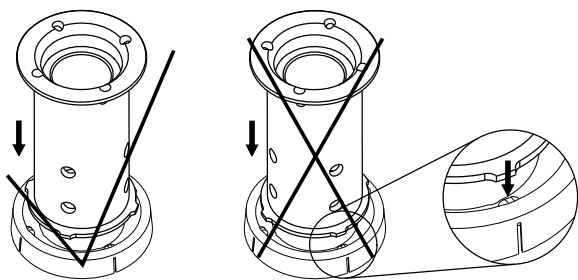
23. To adjust the shaft height, attend to the ND-end of the motor. Slacken the lock screw, pos. 45a, in the shaft height adjusting unit, pos. 45, and adjust the height by turning the screw, pos. 45b, by using the shaft height adjustment spanner, pos. U.



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Fig. 17 Adjusting of shaft height

24. When the shaft has been adjusted to the correct height, tighten the lock screw with the specified torque using a torque screwdriver. See section 4. *Tightening torques and lubricants*.
25. Turn the stator housing to horizontal position.
26. Fit the end cover, pos. 13, and fasten it with the four belonging screws, pos. 46.
- Note:** Nyltites must be renewed on all screws.
27. Cross-tighten the screws with the specified torque. See section 4. *Tightening torques and lubricants*.
28. Turn the stator housing to vertical position, with the D-end facing upwards.
29. Fill motor liquid (SML-3) into the stator housing until it has been filled.
30. Move the shaft up and down and rotate the shaft to let air escape.
31. Refill the stator housing with motor liquid.
32. Carefully insert the radial bearing, pos. 5, into the stator housing.
- Note:** It is important that you position the radial bearing so it is not resting on the taps on the upthrust ring, when you mount the shaft seal housing. In such case the upthrust ring will be forced down. Check that the radial bearing is positioned correctly by turning it with a screwdriver. If the radial bearing is resting on the taps of the upthrust ring, it will drop down when you turn it. See fig. 18.



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Fig. 18 Positioning of radial bearing

33. Slide the washer, pos. 28, down on the shaft, so its positioned in the recess of the radial bearing.
34. Lubricate the rotating part of the shaft sealing, pos. 34, and the shaft with motor liquid.
35. Fit the rotating part of the shaft seal onto the shaft, and press it down using a punch, pos. V.
36. Lubricate the recess inside the shaft seal housing, pos. 32.
37. Press the stationary part of the shaft seal into the recess of the shaft seal housing, using a punch, pos. V.
- Note:** On MS6000R, you must press a lip seal, pos. 32a, into the shaft seal, before you insert the stationary part of the shaft seal.

38. Fit the shaft seal housing with an O-ring, pos. 24, and lubricate it.
39. Fit the shaft seal housing, pos. 32, into the top of the motor and press it down into place by using the punch for shaft seal, pos. V.
40. Fit the four screws, pos. 50, into the shaft seal housing and cross-tighten the shaft seal housing in two steps. First you cross-tighten with half a torque and then with a full torque. See section 4. *Tightening torques and lubricants*.
41. Mount the flange extension, pos. 25a, onto the motor head.
42. Fasten the flange extension with the four screws, pos. 22, including the washers, pos. 21.
43. Cross-tighten the screws using a torque wrench combined with the machined Torx 50 head driver, pos. M, or ring spanner, pos. N. See section 4. *Tightening torques and lubricants*.
44. Insert the motor cable, pos. 220, into the cable plug.
- Note:** For proper sealing, Grundfos always recommends that you use a new motor cable.
45. Tighten the motor cable with the screws, pos. 220a, using a torque screwdriver. See section 4. *Tightening torques and lubricants*.
46. Mount the screw, pos. 25b, that secures the earth plate of the cable plug to the flange extension.
47. Tighten this screw with the specified torque. See section 4. *Tightening torques and lubricants*.
48. Fit the sand fighter, pos. 27, on the shaft and push it down to the shaft seal housing, pos. 32. Make sure that the steel ring inside the sand fighter is facing the shaft seal housing.

11. Filling procedure with a syringe

For a correct filling, evacuate the air inside the motor and replace it with motor liquid.

- Incline the motor approx. 30 °, so that the filling hole is at the highest point of the motor.
- Remove the filling screw, pos. 22a.
- Turn the shaft and inject motor liquid by using a filling syringe, pos. W, until its full.
- Fill the syringe halfway with motor liquid.
- Press the syringe against the filling hole in order to make full contact and good sealing properties.
- Pull back the plunger of the syringe so air is evacuated from inside the motor.
- Press back the plunger to replace the evacuated air with motor liquid.
- Repeat this filling procedure until all air in the motor is evacuated and replaced with motor liquid.
- Refit the filling screw.

12. Final check

- Check that the shaft rotates freely and noiselessly:
 - Use the spline head driver, pos. 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.
- Check the axial clearance:
 - Place the motor in horizontal position. Grab the shaft and move it forwards and backwards. The clearance must be at least 1 mm.

13. Maintenance and service



Warning

If a motor has been used in a liquid which is injurious to health or toxic, the motor will be classified as contaminated.

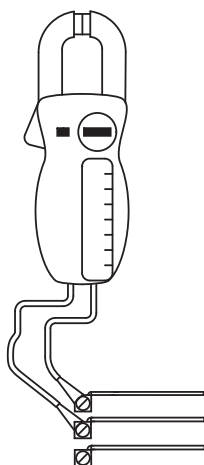
If Grundfos is requested to service a contaminated motor, Grundfos must be contacted with details about the pumped liquid, etc. before the motor is returned for service. Otherwise Grundfos can refuse to accept the motor for service. Possible costs of returning the motor are paid by the customer.

13.1 Fault finding

Fault	Cause	Remedy
1. The motor does not run.	a) No power supply.	Replace the fuses. Check the electrical installation and the submersible drop cable if the new fuses burn too.
	b) The ELCB or the voltage-operated ELCB has tripped out.	Cut in the circuit breaker.
	c) Motor-protective circuit breaker has tripped.	Cut in the motor-protective circuit breaker (takes places automatically or must be done manually). Check the voltage if the motor-protective circuit breaker trips again. If the voltage is okay, see the items e) to h).
	d) Motor-protective circuit breaker/contactator is defective.	Replace the motor-protective circuit breaker/contactator.
	e) Starter device is defective.	Repair/replace the starter device.
	f) The control circuit has cut out or is defective.	Check the electrical installation.
	g) Motor/drop cable is defective.	Repair/replace the motor/drop cable.

14. Checking the motor and cable

1. Supply voltage



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Measure the voltage between the phases by means of a voltmeter. Measure on the terminals where the submersible drop cable is connected.

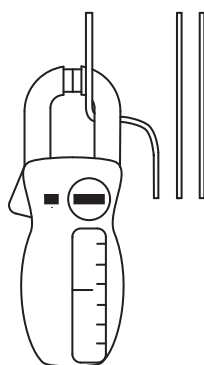
When the motor is loaded, the voltage should be within the required voltage quality for Grundfos MS submersible motors which measured at the motor terminals is - 10 %/+ 6 % of the rated voltage for continuous operation (including variation in the supply voltage and losses in cables).

Check also that there is voltage symmetry in the power supply lines, i.e. 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 has been remedied.

2. Current consumption



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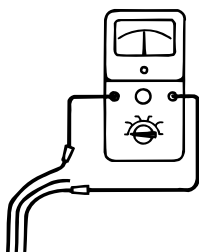
Measure the current of each phase while the pump is operating at a constant discharge pressure (if possible, at the capacity where the motor is most heavily loaded). For maximum operating current, see nameplate.

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, there are the following possible faults:

- The contacts of the motor-protective circuit breaker are burnt.
 - Replace the contacts or the control box for single-phase operation.
- 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.
- The resistance value of the motor windings deviates too much (three-phase).
 - Move the phases in phase order to a more uniform load.
 - If this does not help, see item 3.

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

3. Winding resistance



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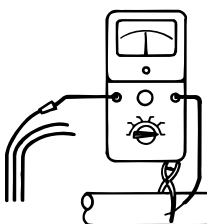
Disconnect the submersible drop cable at the motor-protective circuit breaker. Measure the winding resistance between the conductors of the submersible drop cable.

See section [15. Winding resistances](#).

Note: Include the resistance of the submersible drop cable. See section [15.3 Resistance values for cables](#).

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 motor, motor cable and submersible drop cable separately, and repair/replace defective parts.

4. Insulation resistance



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Disconnect the submersible drop cable at the motor-protective circuit breaker. 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 values in section [14.1 Insulation resistance](#), the motor should be pulled out for motor or cable repair. Local regulations may stipulate other values of insulation resistance.

14.1 Insulation resistance

Note

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.

15. Winding resistances

15.1 MS6000T40

Voltage	Output power		Winding resistance	
	[kW]	[hp]	Between two phases [Ω] DOL	Across one phase [Ω] SD
3 x 220-230 V, 50 Hz	5.5	-	0.760	1.14
	7.5	-	0.560	0.840
	9.2	-	0.445	0.670
	11	-	0.345	0.520
	13	-	0.315	0.470
	15	-	0.255	0.380
	18.5	-	0.208	0.310
	22	-	0.166	0.248
	26	-	-	0.212
	30	-	-	0.174
3 x 340-380 V, 50 Hz	5.5	-	1.86	-
	7.5	-	1.54	-
	9.2	-	1.28	-
	11	-	1.03	-
	13	-	0.825	-
	15	-	0.695	-
	18.5	-	0.555	-
	22	-	0.425	-
	26	-	0.415	-
	30	-	0.315	-
3 x 380-400-415 V, 50 Hz	5.5	-	2.46	3.70
	7.5	-	1.84	2.75
	9.2	-	1.48	2.22
	11	-	1.18	1.76
	13	-	1.00	1.50
	15	-	0.815	1.22
	18.5	-	0.645	0.970
	22	-	0.565	0.850
	26	-	0.465	0.695
	30	-	0.385	0.575
3 x 500-525 V, 50 Hz	5.5	-	3.86	-
	7.5	-	3.00	-
	9.2	-	2.30	-
	11	-	1.86	-
	13	-	1.50	-
	15	-	1.26	-
	18.5	-	1.02	-
	22	-	0.880	-
	26	-	0.735	-
	30	-	0.615	-
3 x 208-220-230 V, 60 Hz	5.5	7.5	0.615	0.925
	7.5	10	0.465	0.695
	9.2	12	0.370	0.555
	11	15	0.285	0.430
	13	18	0.250	0.375
	15	20	0.208	0.310
	18.5	25	0.168	0.250
	22	30	0.136	0.202
	26	35	-	0.172
	30	40	-	0.136

Voltage	Output power		Winding resistance	
	[kW]	[hp]	Between two phases [Ω] DOL	Across one phase [Ω] SD
3 x 440-460-480 V, 60 Hz	5.5	7.5	2.46	3.70
	7.5	10	1.84	2.75
	9.2	12	1.48	2.22
	11	15	1.18	1.76
	13	18	1.00	1.50
	15	20	0.815	1.22
	18.5	25	0.645	0.970
	22	30	0.565	0.850
	26	35	0.465	0.695
	30	40	0.385	0.575
3 x 440 V, 60 Hz	5.5	7.5	1.86	-
	7.5	10	1.54	-
	9.2	12	1.28	-
	11	15	1.03	-
	13	18	0.825	-
	15	20	0.695	-
	18.5	25	0.555	-
	22	30	0.425	-
	26	35	0.415	-
	30	40	0.315	-
3 x 380-400 V, 60 Hz	5.5	7.5	1.62	2.42
	7.5	10	1.22	1.84
	9.2	12	0.945	1.42
	11	15	0.815	1.22
	13	18	0.665	1.00
	15	20	0.595	0.895
	18.5	25	0.430	0.645
	22	30	0.370	0.555
	26	35	0.295	0.445
	30	40	0.265	0.400
3 x 575 V, 60 Hz	5.5	7.5	3.86	-
	7.5	10	3.00	-
	9.2	12	2.30	-
	11	15	1.86	-
	13	18	1.50	-
	15	20	1.26	-
	18.5	25	1.02	-
	22	30	0.880	-
	26	35	0.735	-
	30	40	0.615	-

15.2 MS6000T60

Voltage	Output power		Winding resistance	
	[kW]	[hp]	Between two phases [Ω] DOL	Across one phase [Ω] SD
3 x 380-400-415 V, 50 Hz	5.5	-	1.84	2.75
	7.5	-	1.44	2.16
	9.2	-	1.22	1.82
	11	-	1.06	1.60
	13	-	0.805	1.21
	15	-	0.680	1.02
	18.5	-	0.550	0.825
	22	-	0.475	0.713

Voltage	Output power		Winding resistance	
	[kW]	[hp]	Between two phases [Ω] DOL	Across one phase [Ω] SD
3 x 500-525 V, 50 Hz	5.5	-	2.86	-
	7.5	-	2.34	-
	9.2	-	1.94	-
	11	-	1.64	-
	13	-	1.30	-
	15	-	1.02	-
	18.5	-	0.840	-
	22	-	0.755	-
3 x 200 V, 50Hz	5.5	-	0.485	-
	7.5	-	0.380	-
	9.2	-	0.310	-
	11	-	-	0.380
	13	-	-	0.310
	15	-	-	0.255
	18.5	-	-	0.213
	22	-	-	0.182
3 x 400 V, 50 Hz	5.5	-	1.84	-
	7.5	-	1.44	-
	9.2	-	1.22	-
	11	-	-	1.60
	13	-	-	1.21
	15	-	-	1.02
	18.5	-	-	0.825
	22	-	-	0.713
3 x 440-460-480 V, 60 Hz	5.5	7.5	1.84	2.75
	7.5	10	1.44	2.16
	9.2	12	1.22	1.82
	11	15	1.06	1.60
	13	18	0.805	1.21
	15	20	0.680	1.02
	18.5	25	0.550	0.825
	22	30	0.475	0.713
3 x 575 V, 60 Hz	5.5	7.5	2.86	-
	7.5	10	2.34	-
	9.2	12	1.94	-
	11	15	1.64	-
	13	18	1.30	-
	15	20	1.02	-
	18.5	25	0.840	-
	22	30	0.755	-
3 x 200-220 V, 60 Hz (SF = 1.00)	5.5	7.5	0.485	-
	7.5	10	0.380	-
	9.2	12	0.310	-
	11	15	-	0.380
	13	18	-	0.310
	15	20	-	0.255
	18.5	25	-	0.213
	22	30	-	0.182
3 x 400-440 V, 60 Hz (SF = 1.00)	5.5	7.5	1.84	-
	7.5	10	1.44	-
	9.2	12	1.22	-
	11	15	-	1.60
	13	18	-	1.21
	15	20	-	1.02
	18.5	25	-	0.825
	22	30	-	0.713

15.3 Resistance values for cables

The resistance in the power supply cable depends on the cable diameter.

For further information see the cable dimensioning tool included on the USB-stick delivered with the pump.

15.4 Cable connection

Pos.	Flat cable	Single leads	
	4-wire	3-wire	4-wire
1	Brown	Red	Red
2	Black	Yellow	Yellow
3	Grey	Black	Black
4		-	Green

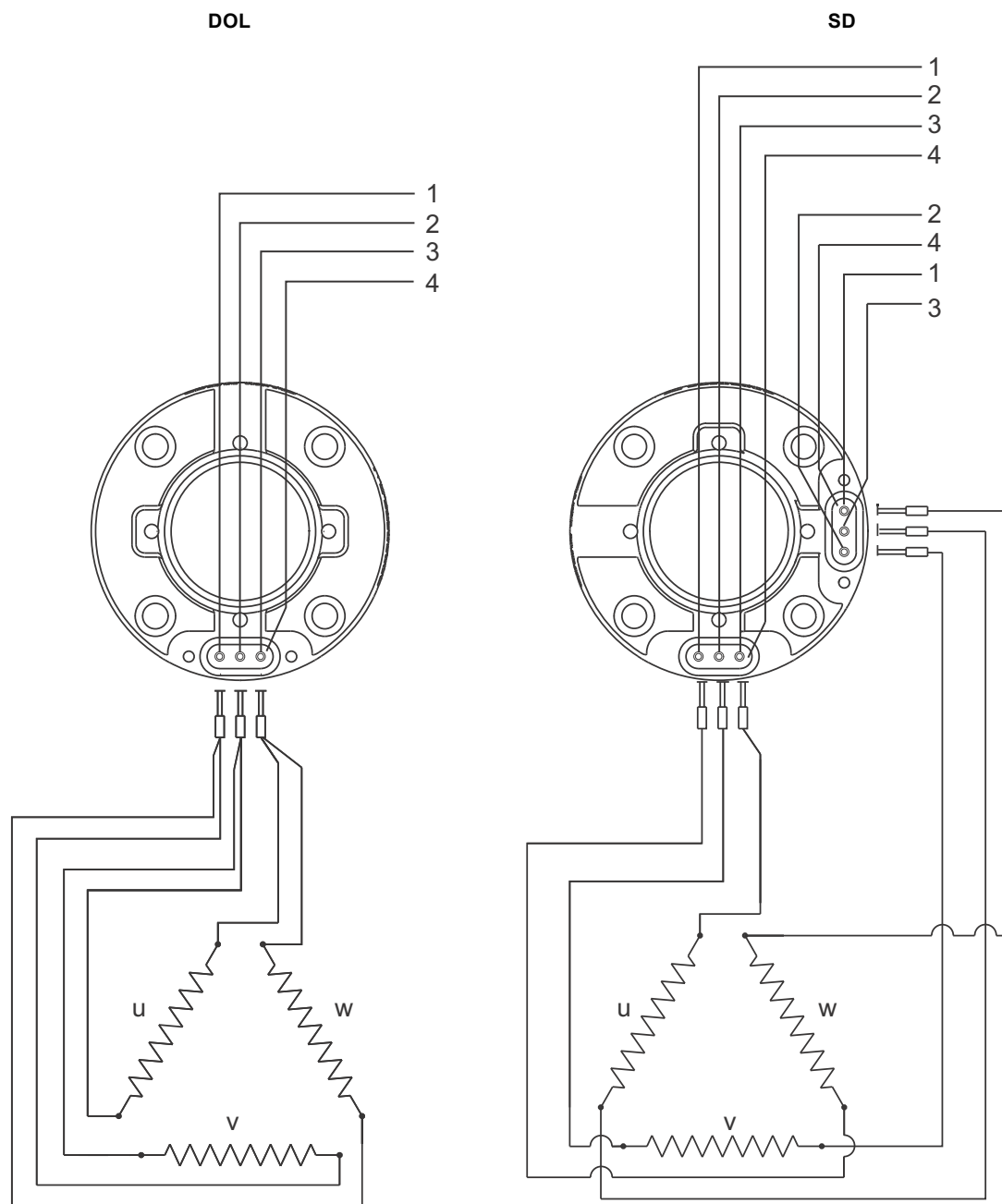


Fig. 19 Wiring diagrams

16. Exploded drawing of MS6000

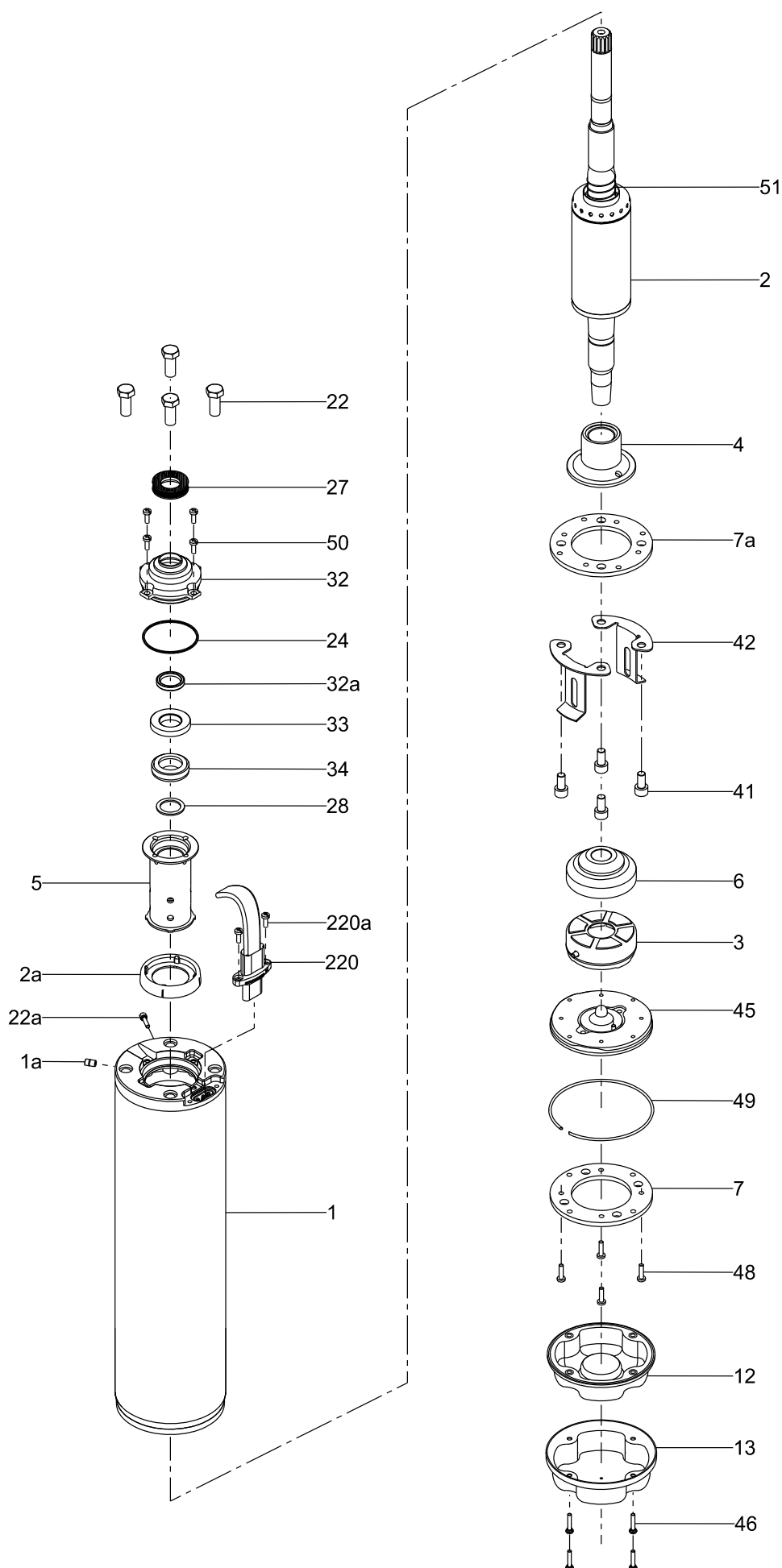


Fig. 20 Exploded view of MS6000 motor

17. Exploded drawing of MS6000F

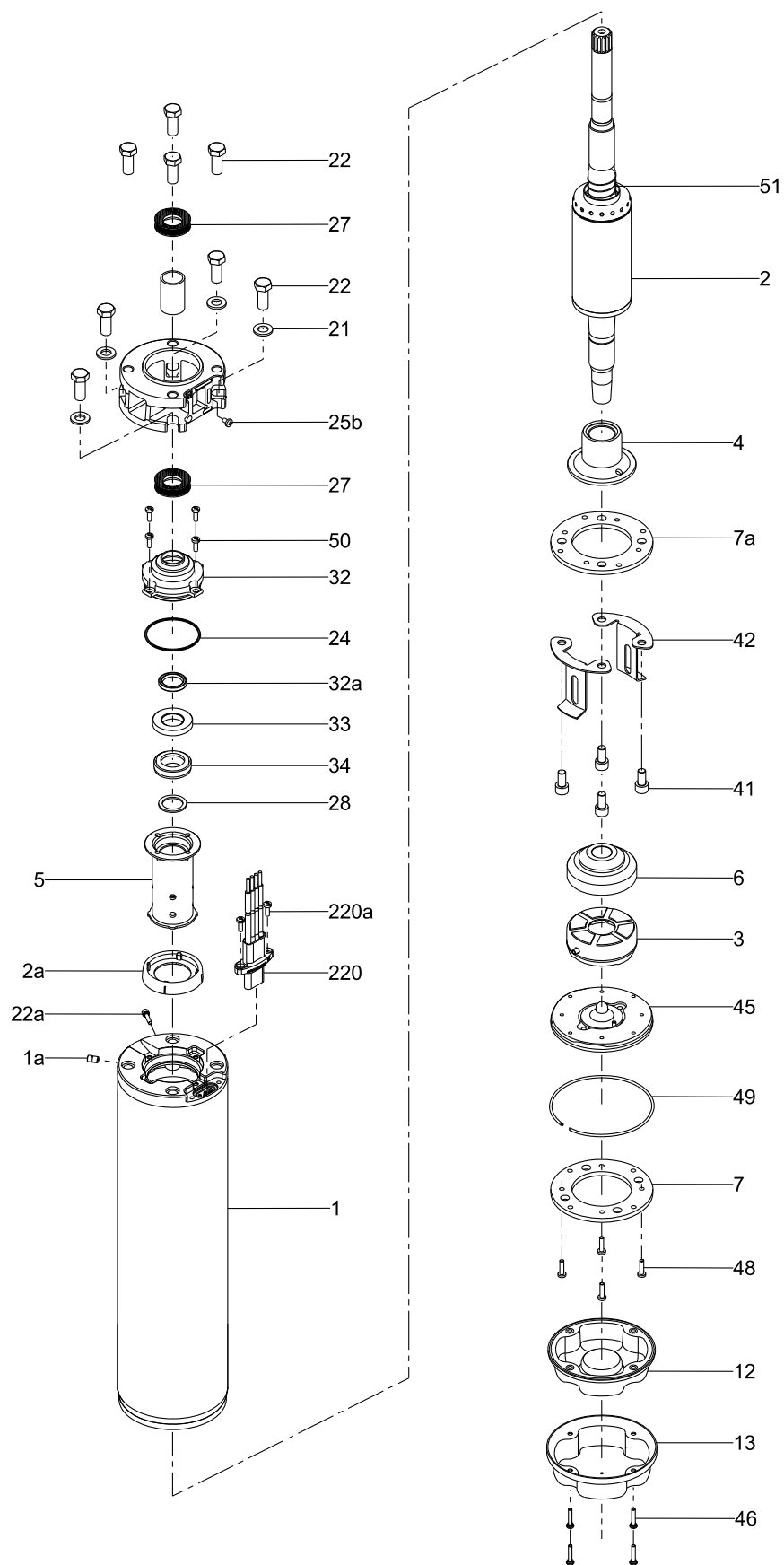


Fig. 21 Exploded view of MS6000F motor

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