

# SP 7/9/11/14

Service instructions



## Original service instructions.

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## 1. Symbols used in this document

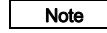


## Warning

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



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



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

## 2. Identification

## 2.1 Nameplate

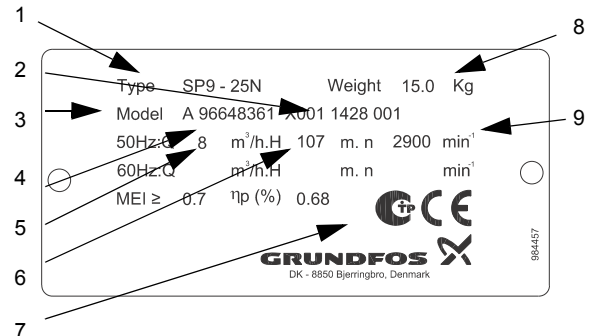


Fig. 1 Nameplate

Pos.	Description
1	Type designation
2	Production code
3	Model
4	Material number
5	Rated flow rate
6	Head at rated flow rate
7	CE mark and approvals
8	Weight
9	Speed

TM06 1782 3214



## 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.

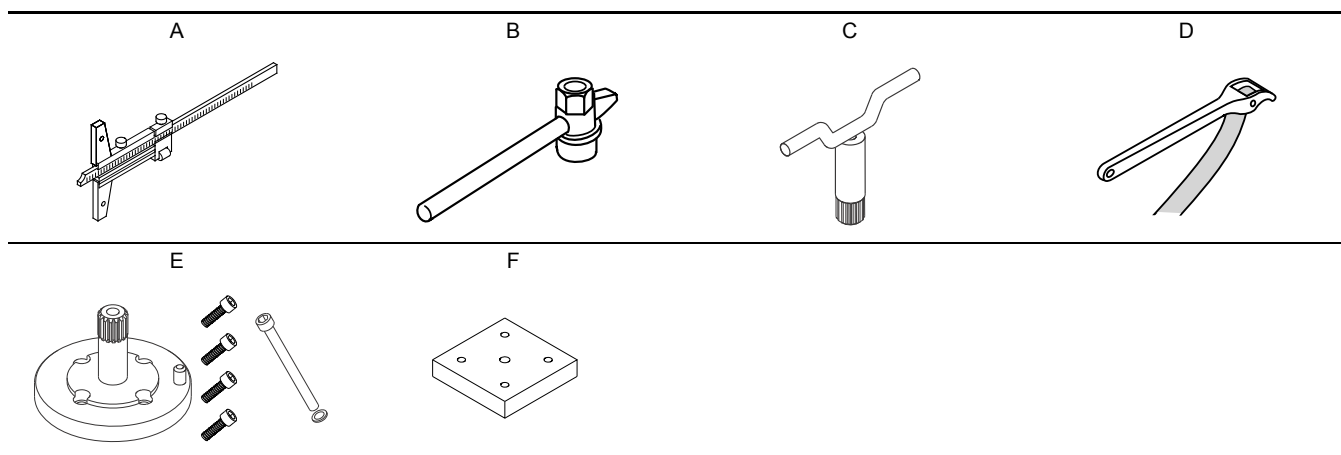
Observe the safety instructions in the installation and operating instructions for the product.

## 2.2 Type key

<b>Example of pump</b>	<b>SP9</b>	<b>- 9</b>	<b>C</b>	<b>L</b>	<b>Rp4</b>	<b>6"</b>		<b>50/60</b>	<b>SD</b>	
<b>Example of pump with motor</b>	<b>SP9</b>	<b>- 10</b>	<b>AA</b>	<b>N</b>	<b>Rp6</b>	<b>8"</b>	<b>3 x 380-415</b>	<b>50</b>	<b>SD</b>	<b>92 kW</b>
Type range (SPXA, SP)										
Number of impellers										
Reduced impellers (A, B, C max. 2)										
Stainless-steel parts of material										
= EN 1.4301										
N = EN 1.4401										
R = EN 1.4539										
Rubber parts of material										
SP1A - SP5A	SP9 - SP14	SP17 - SP215								
= NBR	= LSR/NBR/TPU	= NBR								
E = FKM	E = FKM	E = FKM								
		L = LSR/NBR								
Connection										
Rp thread (PpX)										
R thread (RX)										
NPT thread (XNPT)										
Grundfos flange (GrX)										
Inlet motor size										
Voltage [V]										
Frequency [Hz]										
Starting method										
S = DOL										
D = SD										
Motor power [kW]										

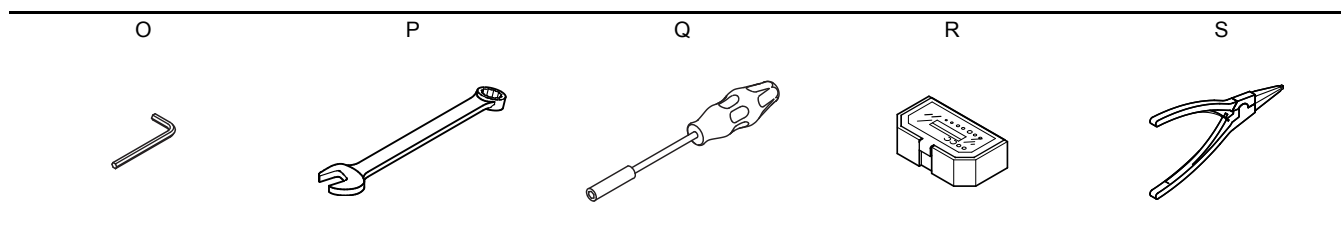
### 3. Tools

#### 3.1 Special tools



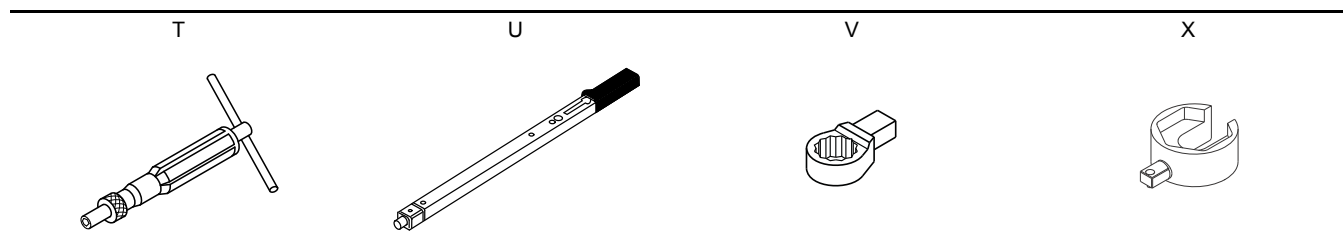
Pos.	Description	For pos.	Motor size	Further information	Part number
A	Depth gauge	14, 14a	4", 6"	Measuring range up to 300 mm	00SV0834
B	Knock-out spanner	11	4", 6"	Shaft diameter: 12.7 mm	00SV0187
				Shaft diameter: 16 mm	00SV0217
C	Spline key	16	4"		00SV0351
			6"		00SV0352
D	Band pipe wrench for fitting of sleeve		4", 6", 8"		00SV0853
E	Adaptor	14, 14a, 73	4"	Including 4 x M8 x 20.1 x M8 x 75	98148060
			6"	Including 4 x M8 x 20.1 x M8 x 115	97620193
F	Mounting plate		4", 6"		98164171

#### 3.2 Standard tools



Pos.	Description	For pos.	Motor size	Further information	Part number
O	Hexagon key set	N	4", 6"		97656148
P	Ring spanner			Spanner size: 13 mm	00SV0055
Q	Screwdriver for bits	18d	4", 6"		00SV2011
R	Bits kit		4", 6"		00SV2010
S	Locking-ring pliers		4", 6"	40-100 mm, J3	0V022474

### 3.3 Torque tools



Pos.	Description	For pos.	Motor size	Further information	Part number
T	Torque screwdriver	18d	4", 6"	1-6 Nm	00SV0438
U	Torque wrench	11	4", 6"	4-20 Nm	00SV0292
		19, 22	4", 6"	20-100 Nm	00SV0269
V	Ring spanner for torque wrench	19	4", 6"	Spanner size: 13 mm	00SV0513
X	Split cone spanner for torch wrench	11	4", 6"	∅12.7 mm, size 22 mm	98772885
			4", 6"	∅16 mm, size 27 mm	98772890

### 3.4 Service video

As an additional tool and supplement to these service instructions, we offer a service video which shows the following procedures:

- dismantling
- replacement of wear parts
- pump assembly
- quality control.

The SP service video is available on [www.product-selection.grundfos.com/](http://www.product-selection.grundfos.com/) or [www.youtube.com/user/Grundfosvideo](http://www.youtube.com/user/Grundfosvideo).

### 4. Tightening torques and lubricants

Pos.	Description	Motor size	Quantity	Dimension	Supplementary information	Torque [Nm]	Lubricant
58	Bolt for motor	6"	4	1/2" UNF		50	
58a	Nut for motor staybolt	4"	4	M8		18	
19	Nut for strap	4", 6"	4	M8	First step	10	00RM6117
					Second step	18	
11	Split cone nut	4", 6"		∅12.7 mm	size: 22 mm key	20	00RM6117
				∅16 mm	size: 27 mm key	30	
18d	Screw for clamp	4", 6"	4	M4		2.5	
7	Neck ring	4", 6"	1				Soapy water with a concentration of 3 to 5 %
8/6	Bearings	4", 6"					
105	Eyebolt*	6"	2				00RM6117
-	Nut for eyebolt*	6"	2	M8		18	
-	Hexagon head screw*	6"	12	M8		18	00RM6117
-	Sleeve/flange thread*	6"					00RM6117

\* Only for sleeve versions.

## 5. Before dismantling

### 5.1 Failure analysis

If the pump has to be dismantled for replacement of any part, it is important that you identify the cause of the fault, especially if the pump has been damaged. Always take care to thoroughly inspect, analyse and document each individual component, both before and during dismantling.

Use the check list in section 14. *Analysis check list* as a guide for inspection of the components.

## 6. Dismantling

Be systematic when dismantling the pump.

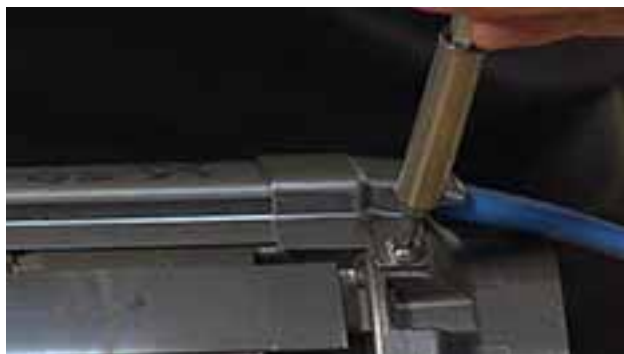
Follow the instructions below.

Have the 14. *Analysis check list* next to you during dismantling.

Position numbers of pump components (digits) refer to section 13. *Drawings*.

Position numbers of tools (letters) refer to section 3. *Tools*.

### 6.1 Motor



TM06 3064 4014

1. Remove screws (pos. 18d) and then remove top and bottom cable guard clamps (pos. 18b/18c).
2. Remove cable guard (pos. 18).  
Do not remove the motor cable from the motor, unless required. The sealing might be damaged. Check the condition of the cable.



TM06 3065 4014

3. Cross-loosen bolts/nuts (pos. 22/22a) holding the 4"/6" motor.
4. Pull the motor off the pump.

### 6.2 Pump



TM05 4504 2412

1. Fasten adaptor (pos. E) to mounting plate (pos. F) with the hexagon socket head cap screws.
2. Fasten the adaptor to the chamber stack by use of the hexagon socket head cap screw and tighten with 20 Nm. Check that the recess of the adaptor fits into the recess of suction interconnector (pos. 14).



TM06 3066 4014

3. Fix the mounting plate with chamber stack in a vice.



TM06 3067 4014

4. Cross-loosen and remove nuts (pos. 19) from straps (pos. 17).



TM06 3068 4014

5. Remove the nameplate supported by straps (pos. 17).
6. Remove straps (pos. 17).

### 6.3 Valve casing



TM06 3070 4014

1. Remove valve casing (pos. 1).

### 6.4 Top chamber and impeller



TM06 3071 4014

1. Loosen split cone nut (pos. 11) with knock-out spanner (pos. B).



TM06 3072 4014

2. Turn the knock-out spanner upside down and knock on the nut with a plastic mallet. Split cone (pos. 12) will then loosen its grip on the shaft.
3. Remove impeller (pos. 13) and top chamber (pos. 9).

### 6.5 Chambers



TM06 3073 4014

1. Continue the dismantling as described in the previous section until you reach upthrust bearing (pos. 6).

### 6.6 Bottom chamber with upthrust bearing



TM06 3074 4014

1. Remove upthrust bearing (pos. 6) from the shaft.
  2. Remove the last impeller as described in the previous section.
- Note:** On SP 7, sleeve versions (start stage 50 Hz 56 stages, 60 Hz 40 stages. End stage 50 Hz 88, 60 Hz 73) there are two upthrust bearings placed on the first and second stage.



TM06 3075 4014

3. Remove the retainer for neck ring



TM06 3076 0414

4. Result

## 7. Replacing the wear parts

When replacing wear parts of the pump, clean and check all parts.

Always replace all wear parts from the recommended service kit.

**Note:** The service kit can contain more parts than the pump needs.

### 7.1 Replace bearings and seal rings

#### 7.1.1 Remove bearings and neck rings



TM06 3079 4014

1. Press a screwdriver between seat and neck ring (pos. 9/7) and push it out of the recess.



TM06 3078 4014

2. Press out rubber bearing (pos. 8) on the back of the chamber with a screwdriver.

#### 7.1.2 Mount new bearing and neck rings

1. Clean the recess where the valve seat/neck ring was fitted.
2. Moisten the valve seat/neck ring with soapy water and press it home in the recess. See section 3. *Tools*.



TM06 3080 4014

3. When the neck ring and rubber bearing have been replaced, the lip on the neck ring must point upwards.



TM06 3076 0414

4. Replace all neck rings and rubber bearings in the chambers as described above.

#### 7.1.3 Disassembling of valve casing



TM06 3081 0414

1. Position the valve casing (pos. 1) upside down.



TM06 3082 0414

2. Use locking-ring pliers (pos. S) to remove lock ring.



TM06 3083 0414

3. Remove valve retainer (pos. 3a), and remove valve seat (pos. 3).
4. Check the condition of valve cup (pos. 2), and valve guide (pos. 2). Verify that no deformation has happened.



### 7.1.4 Assembling the valve casing



TM06 3084 0414

1. Place valve cup (pos. 2) and valve guide (pos. 70) into the valve case.
2. Verify that the valve guide is seated correctly into the valve case.



TM06 3085 0414

3. Replace valve seat (pos. 3) and place the valve retainer into the valve case and verify that the components are seated correctly.



TM06 3086 0414

4. Insert the locking ring with locking-ring pliers (pos. S)
5. Verify that the locking ring is seated correctly.
6. Check that the valve cone is moving freely.

## 8. Pump assembly

### 8.1 Suction interconnector



TM06 3066 4014

1. Fasten the adaptor to the shaft by use of the hexagon socket head cap screw and tighten with 20 Nm. Be sure that movement is not possible between shaft and adaptor.



TM06 3087 0414

2. Place the retainer for the neck ring on the suction interconnector.



TM06 3088 0414

3. Mount the bottom impeller.



TM06 3089 0414

4. Tighten split cone nut. (pos. 11) using a torch wrench together with split cone spanner (pos. X). See section 4. *Tightening torques and lubricants.*

## 8.2 Bottom chamber with upthrust bearing



TM06 3090 0414

1. Mount upthrust bearing (pos. 6) on top of the bottom impeller.



TM06 3091 0414

2. Mount bottom chamber (pos. 9) on suction interconnector (pos. 14).

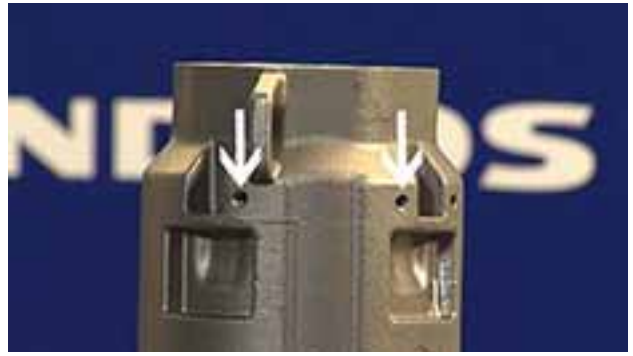
## 8.3 Chambers



TM06 3092 0414

1. Mount the following chamber (pos. 9) on top of the bottom chamber. Repeat this procedure until all impellers and chambers have been fitted.

## 8.4 Valve casing



TM06 3093 0414

1. Mount valve casing (pos. 1) on the top chamber.



TM06 3094 0414

2. Position the valve casing so that the threaded holes for cable guards (pos. 18) are in line with the threaded holes in suction interconnector (pos. 14/14a).

## 8.5 Straps



TM06 3095 0414

1. Lubricate the thread of straps (pos. 17) with 00RM6117 - grease and mount them in the valve casing and suction interconnector (pos. 14/14a).



TM06 3096 0414



TM06 3097 0414

2. Mount the nameplate between two straps before tightening the straps.



TM06 3098 0414

3. Mount nuts (pos. 19) and cross-tighten them in two steps with the specified torque. See section 4. *Tightening torques and lubricants*.

## 9. Quality control

### 9.1 Rotating the shaft

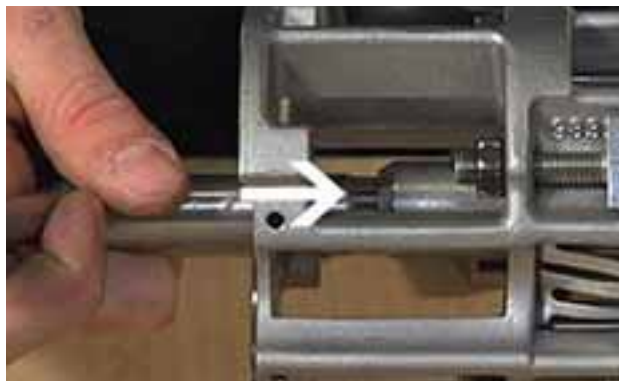


TM06 3099 0414

1. Position the pump so that it is easy to turn the shaft.
2. Insert spline key (pos. C) into the shaft spline.
3. Give the spline key two turns clockwise and counter-clockwise. You must be able to turn the shaft in both directions with little force only.

## 9.2 Checking the pump axial clearance

### 9.2.1 Axial clearance, shaft in top position



TM06 3100 0414

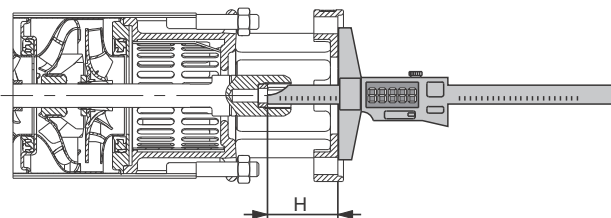
1. Press the shaft to top position with spline key (pos. C).



TM06 3101 0414

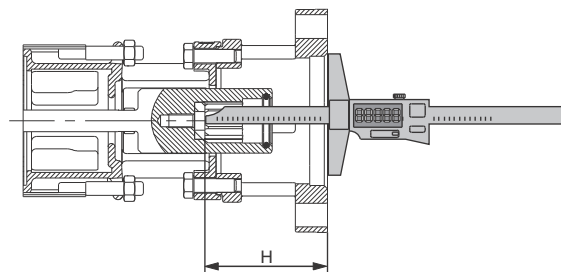
2. Using depth gauge (pos. A), measure the top axial clearance from the bottom of the coupling to the end of suction interconnector (pos. 14).
3. Note down the measured axial clearance.

**Note:** When measuring the axial clearance on 4" pumps, the reference point is the recess of the suction interconnector and not the edge. See figs 2 and 3.



TM06 2871 1114

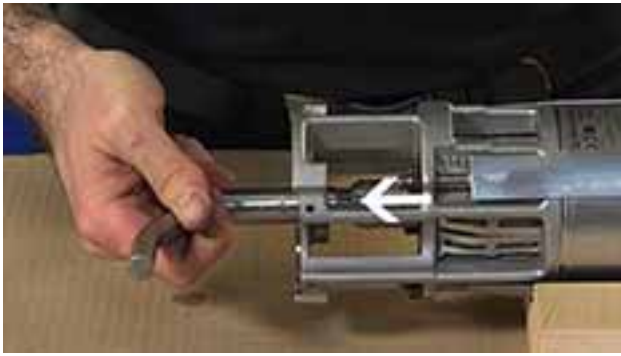
Fig. 2 Measuring axial clearance of 4" pump



TM06 2870 1114

Fig. 3 Measuring axial clearance of 6" pump

9.2.2 Axial clearance, shaft in bottom position



TM06 3102 0414

1. Turn the shaft with spline key (pos. C) while pulling the shaft into bottom position.



TM06 3101 0414

2. Using depth gauge (pos. A), measure the bottom axial clearance from the bottom of the coupling to the end of the suction interconnector (pos. 14).
3. Note down the measured axial clearance.

9.2.3 Check list

If there is no clearance (end play) or the measured clearance differs from the values stated below, the assembly is not correct. Therefore, you must dismantle and reassemble the pump.

Motor size	Axial clearance [mm]	
	Shaft in bottom position	Shaft in top position
4"	Max. 37.15	Min. 38.7
6"	Max. 71.8	Min. 73.4

Note: Maximum clearance 5 mm.

10. Motor

10.1 Check motor cooling liquid

The submersible motors are factory-filled with a special FDA-approved, non-toxic liquid which is frost-proof down to -20 °C.

**Note** Check the level of the liquid in the motor and refill the motor, if required. Use tap water.

**Caution** If frost protection is required, a special Grundfos liquid must be used to refill the motor. Otherwise, tap water may be used for refilling.

Refilling of liquid is described below.

10.1.1 Grundfos MS 402 and MS 4000 submersible motors

The filling hole for motor liquid is placed in the following positions:

**MS 402:** in the bottom of the motor.

**MS 4000:** in the top of the motor.

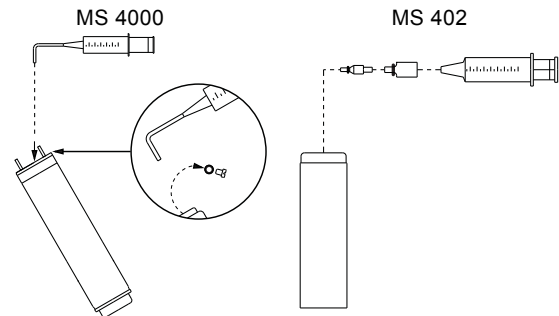
1. Position the submersible motor as shown in fig. 4. The filling screw must be at the highest point of the motor.
2. Remove the screw from the filling hole.
3. Inject liquid into the motor with the filling syringe (fig. 4) until the liquid runs back out of the filling hole.
4. Replace the screw in the filling hole and tighten securely before changing the position of the motor.

Torques:

**MS 402:** 2.0 Nm.

**MS 4000:** 3.0 Nm.

The submersible motor is now ready for installation.



TM03 8128 0507

Fig. 4 Motor position during filling - MS 4000 and MS 402

### 10.1.2 Grundfos MS 6000 submersible motors

- If the motor is delivered from stock, the liquid level must be checked before the motor is installed. See fig. 5.
- In the case of service, the liquid level must be checked. See fig. 5.

#### Filling procedure:

The filling hole for motor liquid is placed at the top of the motor.

1. Position the submersible motor as shown in fig. 5. The filling screw must be at the highest point of the motor.
2. Remove the screw from the filling hole.
3. Inject liquid into the motor with the filling syringe (fig. 5) until the liquid runs back out of the filling hole.
4. Replace the screw in the filling hole and tighten securely before changing the position of the motor.

Torque: 3.0 Nm.

The submersible motor is now ready for installation.

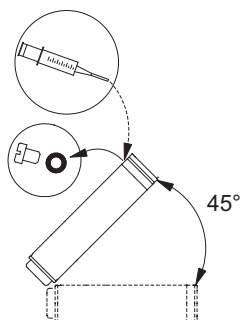


Fig. 5 Motor position during filling - MS 6000

### 10.1.3 Grundfos MMS6, MMS 8000, MMS 10000 and MMS 12000 submersible motors

#### Filling procedure:

Place the motor at a 45° angle with the top of the motor upwards. See fig. 6.

1. Unscrew the plug (A) and place a funnel in the hole.
2. Pour tap water into the motor until the motor liquid inside the motor starts running out of plug (A).

**Caution** Do not use motor liquid that contains oil.

3. Remove the funnel and refit plug (A).

**Caution** Before fitting the motor to a pump after a long period of storage, lubricate the shaft seal by adding a few drops of water and turning the shaft.

The submersible motor is now ready for assembly with the pump and ready for installation.

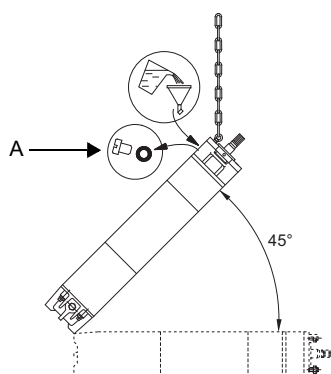


Fig. 6 Motor position during filling - MMS

## 10.2 Checking the motor shaft height



1. Using the depth gauge (pos. A), measure the shaft height from the top of the shaft to the motor frame.
2. Note down the measured shaft height.

### 10.2.1 Check list

If the measured shaft height differs from the value stated below, adjust the axial bearing in the motor.

Motor size	Motor type	Tolerated shaft height [mm]
4"	Grundfos	38.15 + 0.15 / - 0.15
	Franklin	38.18 + 0.12 / - 0.12
6"	Grundfos	73.00 + 0.00 / - 0.4
	Franklin	73.00 + 0.02 / - 0.12

## 11. Checking the motor

### 11.1 Winding resistance

1. Disconnect the power supply to the motor.
2. Remove the submersible drop cable from the power supply.
3. Measure the winding resistance between the leads of the drop cable.

For three-phase motors, the deviation between the highest and the lowest value should not exceed 10 %. If the deviation is higher, pull out the motor. Measure motor, motor cable and drop cable separately, and repair or replace defective parts.

**Note:** On single-phase, 3-wire motors, the operating winding will assume the lowest resistance value.

### 11.2 Insulation resistance

1. Disconnect the power supply to the motor.
2. Remove the submersible drop cable from the power supply.
3. Measure the insulation resistance from each phase to earth (frame). Make sure that the earth connection is made carefully.

If the insulation resistance is lower than 0.5 MΩ, the motor should be pulled out for motor or cable repair. Local regulations may specify other values for the insulation resistance.

For further instructions, see the service instructions for MS/MMS.

TM03 8129 0507

TM03 2065 3605

## 12. Mounting the motor

### 12.1 Mounting the motor



TM06 3104 4014

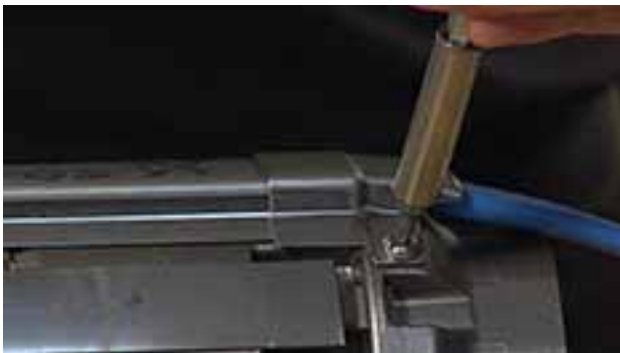
4. Mount the motor on the suction interconnector.
5. Mount bolts/nuts (pos. 22/22a).
6. Cross-tighten bolts/nuts (pos. 22/22a) according to the table on page 5.

### 12.2 Fitting the cable guard



TM06 3105 4014

1. Place the cable along the chamber stack, and position cable guard (pos. 18) over the cable.



TM06 3064 4014

2. Mount clamps (pos. 18b/18c) at the top and bottom of the chamber stack.
3. Mount screws (pos. 18d) in the top and bottom clamps. Tighten the screws with the specified torque, using a torque screwdriver (pos. T). See section 4. [Tightening torques and lubricants](#).

### 13. Drawings

#### 13.1 Exploded view

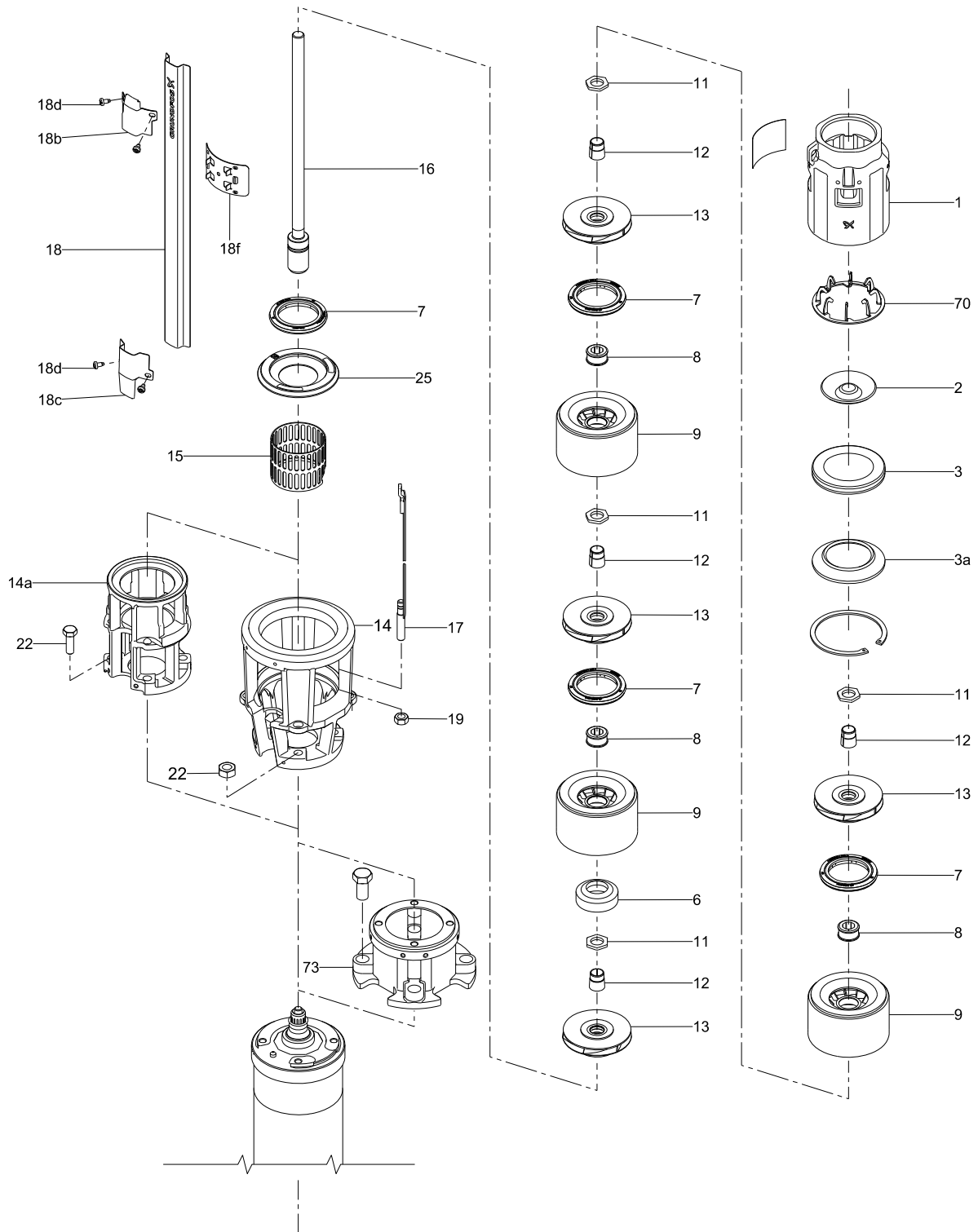


Fig. 7 SP7, SP9, SP11, SP14

13.2 Exploded view (with sleeve)

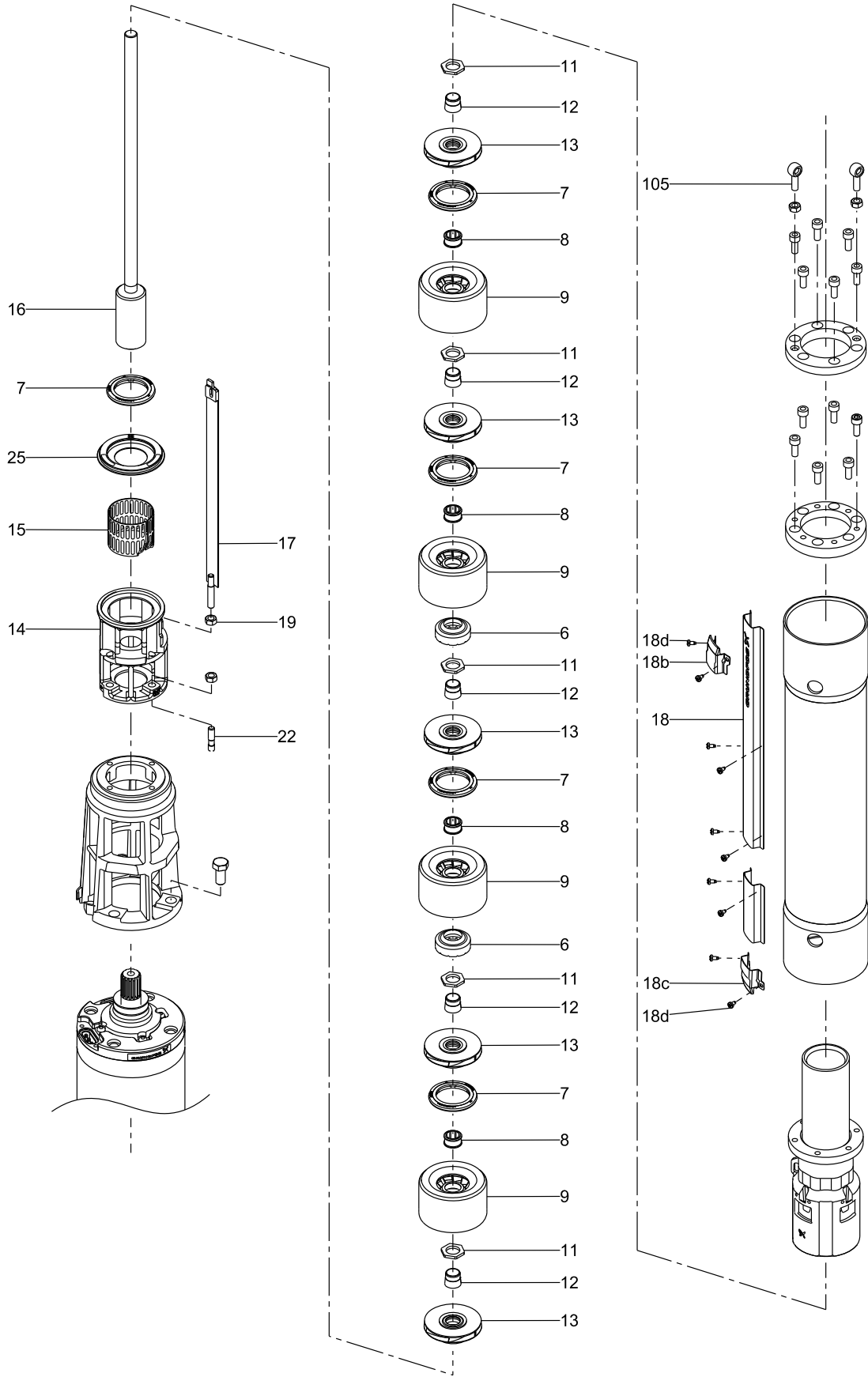


Fig. 8 SP7, SP9, with sleeve



13.3 Sectional drawing

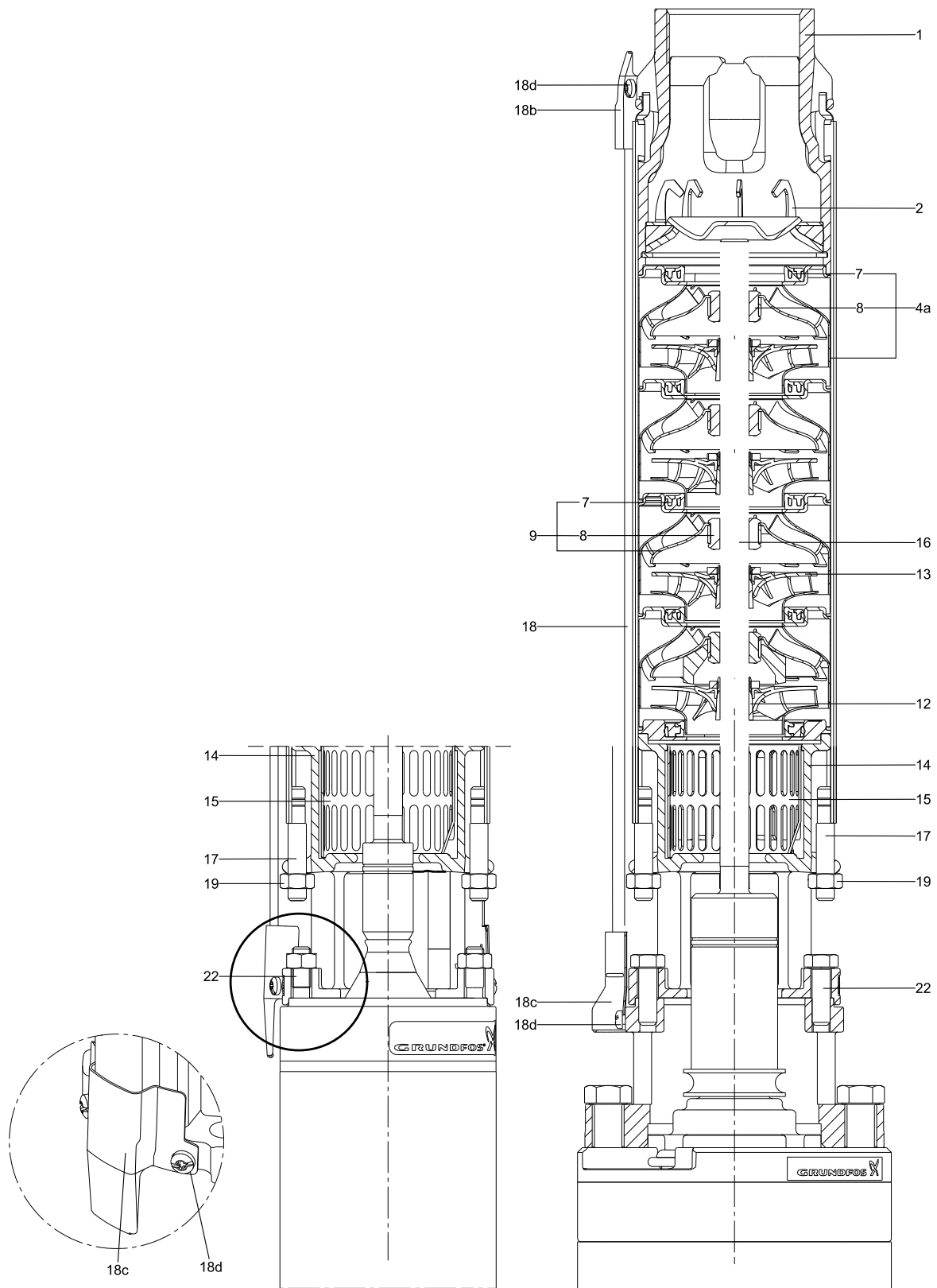


Fig. 9 SP 9

TM06 1773 2014

Pos.	Description
1	Standard valve casing
2	Valve cup
3	Valve seat
3a	Valve retainer
6	Upthrust bearing
7	Neck ring
8	Rubber bearing
9	Chamber, complete
11	Split cone nut
12	Split cone
13	Impeller, complete
14	Suction interconnector 6"
14a	Suction interconnector 4"
15	Strainer

Pos.	Description
16	Shaft
17	Strap
18	Cable guard
18b	Clamp, top
18c	Clamp, bottom
18d	Screw
18f	Bracket
19	Nut for staybolt
22	Bolt/stay bolt
22a	Nut
68	Neck ring, bottom
70	Valve guide
72	Wear ring
73	Connection piece 8"

## 14. Analysis check list

Component	Problem	Yes/No	Comment
<b>Inspect before dismantling</b>			
Motor	Any dents in motor?		
	Damaged motor cable?		
	Cable plug intact?		
	Damaged motor/submersible drop cable joint?		
	Damaged submersible drop cable?		
	Signs of corrosion, where?		
Pump	Broken or damaged strainer?		
	Non-return valve functional?		
	Any loose straps?		
	Any dents, in pump?		
	Signs of corrosion, where?		
<b>Inspect during dismantling</b>			
Motor	Motor shaft undamaged?		
	Measure shaft height [mm]		
	Does it turn freely? (a light resistance is expected)		
Pump	Pump coupling undamaged?		
	Measure axial clearance, top position [mm]		
	Measure axial clearance, bottom position [mm]		
	Does it turn freely? (a light resistance is expected)		
Straps	Are the straps intact?		
	Check weldings, threads, and that strap lengths are equal?		
Valve casing	Wear on valve cup?		
	Wear on valve seat?		
Chambers, impellers, and upthrust bearing	Wear on rubber bearing?		
	Are the chamber guide vanes intact?		
	Wear on neck ring?		
	Wear on split cone and nut?		
	Wear on impeller?		
	Are the impeller blades intact?		
	Signs of corrosion, where?		
Suction interconnector and retainer for neck ring	Is the upthrust bearing intact?		
	Wear on neck ring?		
	Is retainer for neck ring intact?		
	Signs of corrosion, where?		
Shaft	Is suction interconnector and strainer intact?		
	Free of wear, burrs and scratches?		
	Is shaft coupling intact?		
	Is the shaft straight?		
	Signs of corrosion, where?		

Subject to alterations.



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