

SP 46/60

Model B

Service instructions



Original service instructions.

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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.

2. Identification

2.1 Nameplate

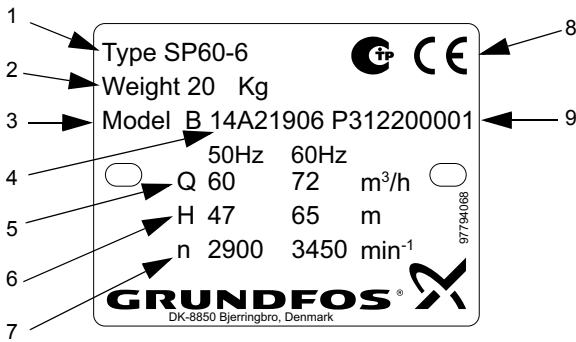


Fig. 1 Nameplate

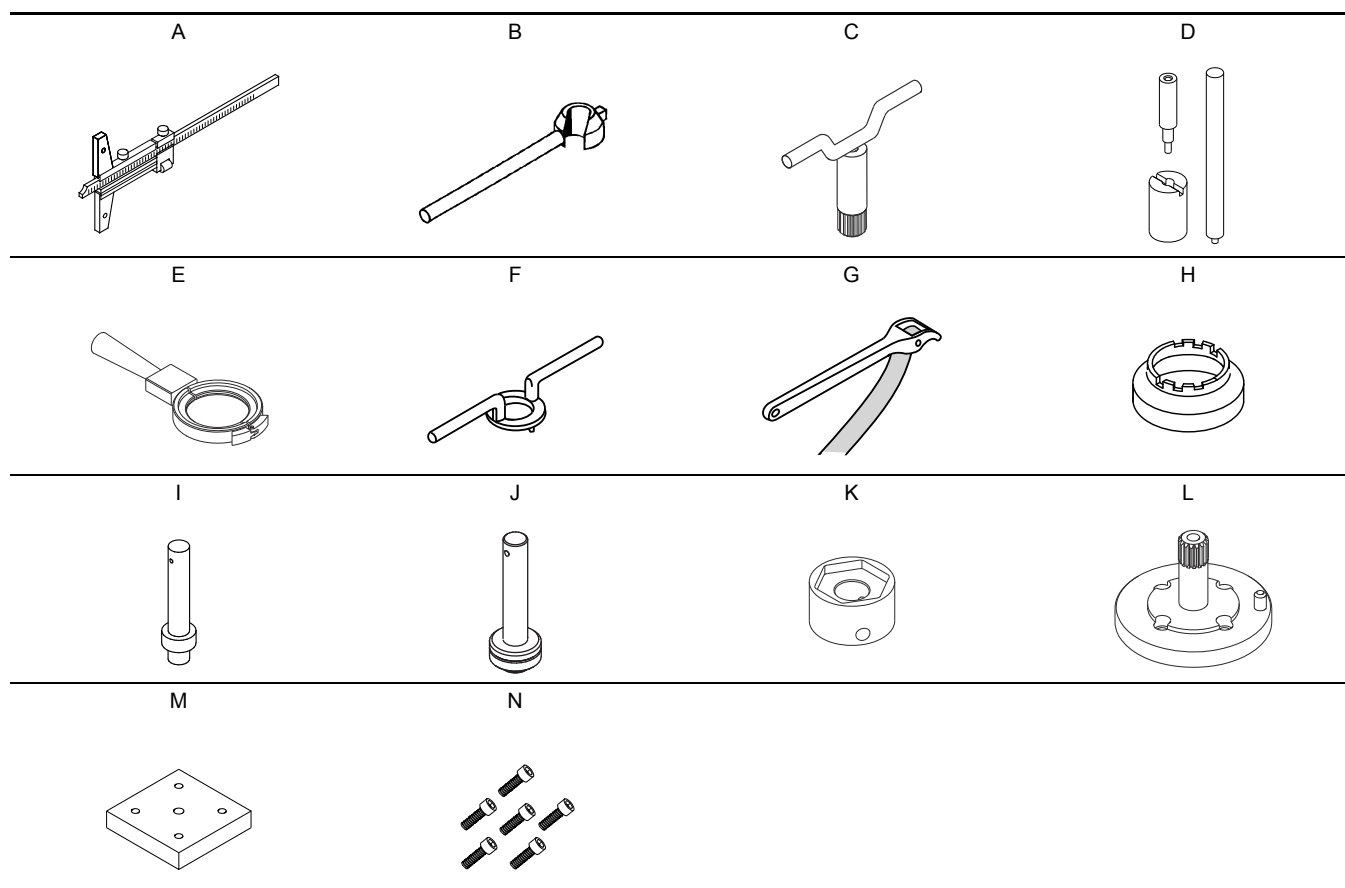
Pos.	Description
1	Type designation
2	Weight
3	Model
4	Material number
5	Rated flow rate
6	Head at rated flow rate
7	Speed
8	CE mark and approvals
9	Production code

2.2 Type key

Example	SP	60	-6	-B	B	N
Type range						
Rated flow rate [m³/h]						
Number of stages						
First reduced-diameter impeller (A, B or C)						
Second reduced-diameter impeller (A, B or C)						
Material:						
	= EN 1.4301					
N	= EN 1.4401					
R	= EN 1.4539					

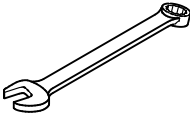
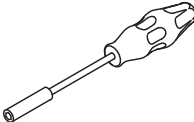
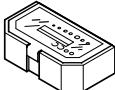
3. Tools

3.1 Special tools



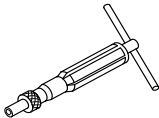
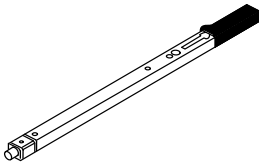
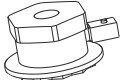
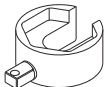
Pos.	Description	For pos.	Motor size	Further information	Part number
A	Depth gauge	14, 14a	4", 6", 8"	Measuring range up to 300 mm	00SV0834
B	Knock-out spanner	11, 11c	4", 6", 8"	Spanner size: 46 mm	00SV0121
C	Spline key	16	4"		00SV0351
			6"		00SV0352
			8"		00SV0353
D	Punch set for guide bearing	142a	4", 6", 8"	Set consisting of support tool, punch and shaft	98163675
E	Spacer tool for fitting of first impeller	14, 14a	4", 6", 8"		00SV2120
F	Special key for fitting of sleeve		4", 6", 8"		00SV0290
G	Band pipe wrench for fitting of sleeve		4", 6", 8"		00SV0853
H	Holder for wear ring	72	4", 6", 8"		00SV0453
I	Punch for bearing	6b	4", 6", 8"		00SV0136
J	Punch for stop ring	8b	4", 6", 8"		00SV0886
K	Spanner for retainer ring tool	W, 203	4", 6", 8"		00SV0874
			4"		97620192
			6"		97620193
L	Adaptor	14, 14a	8"		97620194
			4", 6", 8"		98164171
M	Mounting plate	L	4", 6", 8"		
N	Set of hexagon socket head screws for mounting plate and adaptor	M, L	4", 6", 8"	4 x M8 x 20, 1 x M8 x 75, 1 x M10 x 115, 1 x M10 x 145	98287940

3.2 Standard tools

O	P	Q	R
			

Pos.	Description	For pos.	Motor size	Further information	Part number
O	Hexagon key set	N	4", 6", 8"		97656148
P	Ring spanner			Spanner size: 13 mm	00SV0055
				Spanner size: 17 mm	00SV0056
				Spanner size: 19 mm	00SV0054
Q	Screwdriver for bits	18d	4", 6", 8"		00SV2011
R	Bits kit		4", 6", 8"		00SV2010

3.3 Torque tools

S	T	U	V
			
W	Y		
			

Pos.	Description	For pos.	Motor size	Further information	Part number
S	Torque screwdriver	18d	4", 6", 8"	1-6 Nm	00SV0438
T	Torque wrench	19	4", 6", 8"	20-100 Nm	00SV0269
		203	4", 6", 8"	20-200 Nm	00SV0400
		19	4", 6", 8"	Spanner size: 17 mm	00SV0270
U	Ring spanner for torque wrench	19	4", 6", 8"	Spanner size: 19 mm	00SV0519
		11c	4", 6", 8"		96958354
W	Retainer ring tool for torque wrench	203	4", 6", 8"		97937290
Y	Split cone spanner for torque wrench	13	4", 6", 8"		96958362

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 46/60 service video is available on www.grundfos.com/WebCAPS.

4. Tightening torques and lubricants

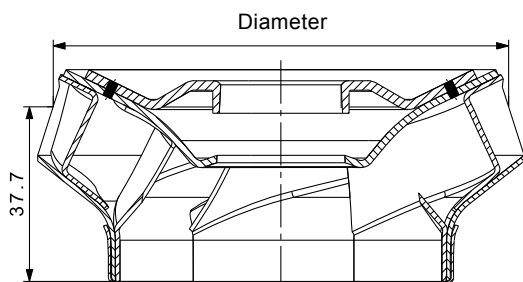
Pos.	Description	Motor size	Quantity	Dimension	Supplementary information	Torque [Nm]	Lubricant
58	Staybolt for motor	8"	4	M16			
58a	Nut for staybolt	8"	4	M16		150	
22	Bolt for flange	8"	4	M12		70	
22	Bolt	6"	4	1/2" UNF		70	
22a	Nut for staybolt	4"	4	M8		18	
19	Nut for strap*	4", 6", 8"	4	M10	First stage	15	O-ring grease
					Second stage	25	
					Third stage	35	
			4	M12	First stage	25	
					Second stage	35	
					Third stage (pump with sleeve)	45	
11	Split cone nut	4", 6", 8"				80	
11c	Nut for stop ring	4", 6", 8"	1			80	
203	Retainer for valve seat	4", 6", 8"	1			150	
18d	Screw for clamp	4", 6", 8"	4			2.5	
68	Neck ring, bottom	4", 6", 8"	1				Soapy water with a concentration of 3 to 5 %

* Tighten the nut in three steps to ensure that the pump is tightened correctly.

5. Reduced impellers

Reduced impellers are categorised as A, B and C. See the table below for impeller dimensions.

Pump type	Diameter [mm]			
	Standard	A	B	C
SP 46	98.3	95.4	86.4	85.0
SP 60	99.1	89.0	85.2	-



TM05 4263 2212

Fig. 2 Sectional view of impeller

If the pump has reduced impellers, they must be positioned as the upper impellers with the smallest diameter closest to the valve casing.

The table below shows examples of how the impellers should be positioned.

Chamber type	SP 60-6 (no reduced impellers)	SP 60-6 A (one reduced impeller)	SP 60-6 AA (two reduced impellers)	SP 60-6 AB (combination)
Top chamber	Std.	A	A	B
Chamber	Std.	Std.	A	A
Chamber	Std.	Std.	Std.	Std.
Chamber	Std.	Std.	Std.	Std.
Chamber	Std.	Std.	Std.	Std.
Bottom chamber	Std.	Std.	Std.	Std.

Std. = standard impeller.

6. Failure analysis

If the pump has to be dismantled for replacement of any part, it is important to 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.

6.1 Before dismantling

1. Disconnect the power supply to the motor.
2. Remove the submersible drop cable from the power supply.
3. Close the isolating valves, if installed, to avoid draining the system.



Warning

When lifting the pump, note the centre of gravity of the pump to prevent it from overturning. This is especially important in the case of long pumps.

- Clean the workplace.
- Sort and clean tools.

7. Dismantling

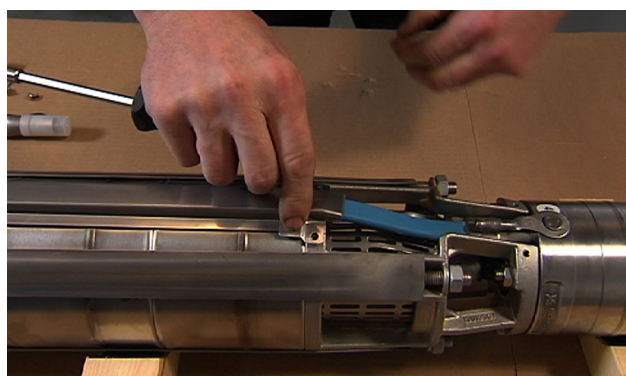
Be systematic when dismantling the pump.

Follow the instructions below.

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

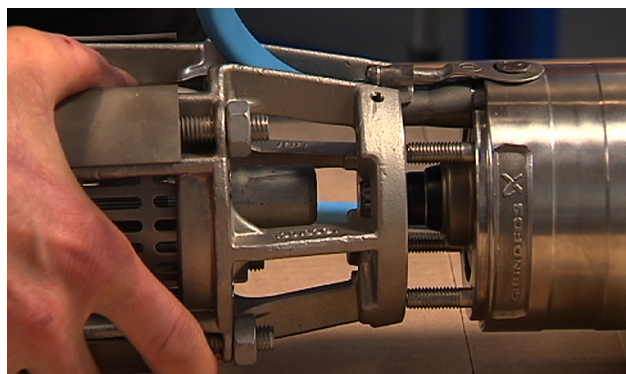
Position numbers of tools (letters) refer to section 3. *Tools*.

7.1 Motor



TM05 4172 2012

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.



TM05 4173 2012

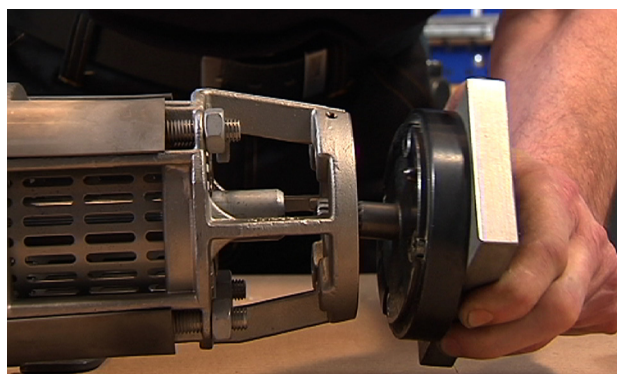
3. Cross-loosen the nuts (pos. 22a) holding the motor.
4. Pull the motor off the pump.

7.2 Straps



TM05 4504 2412

1. Fasten the adaptor (pos. L) to the mounting plate (pos. M) with the hexagon socket head screws (pos. N).



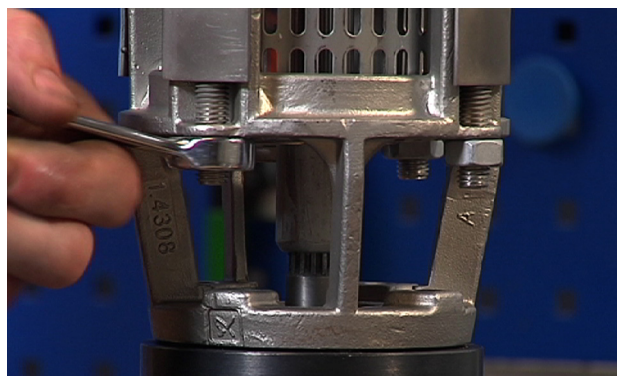
TM05 4174 2012

2. Fasten the adaptor to the chamber stack.
Check that the recess of the adaptor fits into the recess of the suction interconnector (pos. 14/14a).



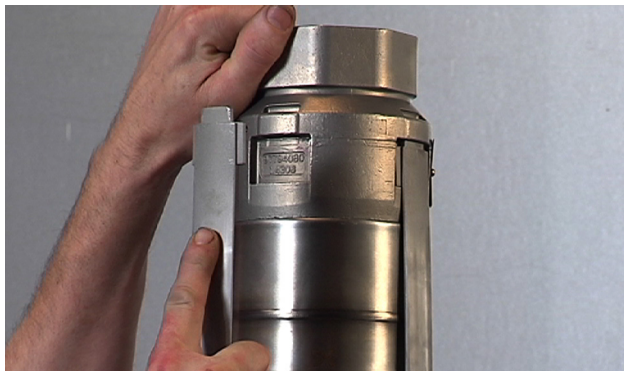
TM05 4175 2012

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



TM05 4176 2012

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



TM05 4177 2012

5. Remove the straps.

7.3 Valve casing



TM05 4178 2012

1. Remove valve casing (pos. 1/1a), valve cup (pos. 2) and top chamber (pos. 4/4a).
In large pump models, the valve casing, valve seat and valve cup are combined in a relieved valve casing (pos. 1a).

7.4 Top chamber and impeller



TM05 4179 2012

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



TM05 4180 2012

2. Turn the knock-out spanner upside down and knock on the nut with a plastic mallet. The split cone (pos. 12) will then loosen its grip on the shaft.
3. Remove impeller (pos. 13) and top chamber (pos. 4/4a).

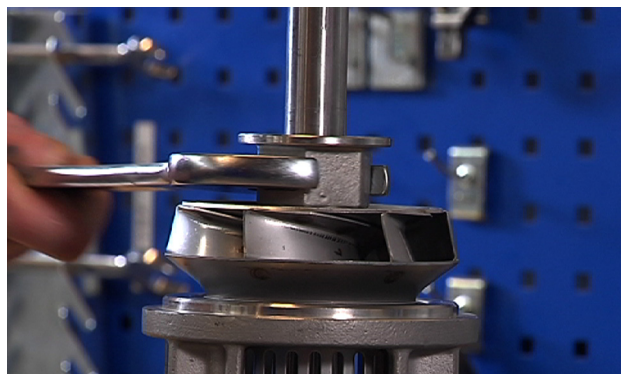
7.5 Chambers



TM05 4181 2012

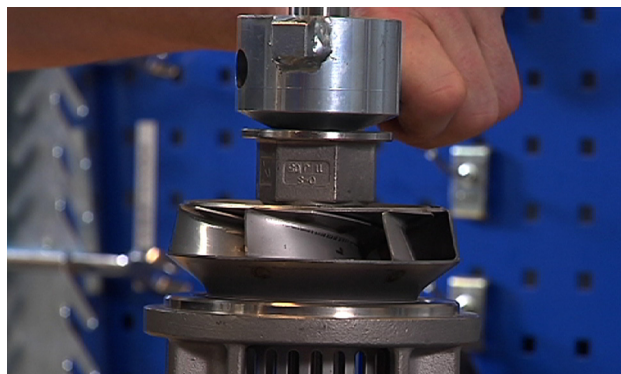
1. Continue the dismantling as described in the previous section until the upthrust disc (pos. 8a) is reached.

7.6 Bottom chamber with upthrust disc



TM05 4182 2012

1. Remove the upthrust disc (pos. 8a) from the shaft.
2. Loosen the nut (pos. 11c) for stop ring with a 38 mm spanner.



TM05 4183 2012

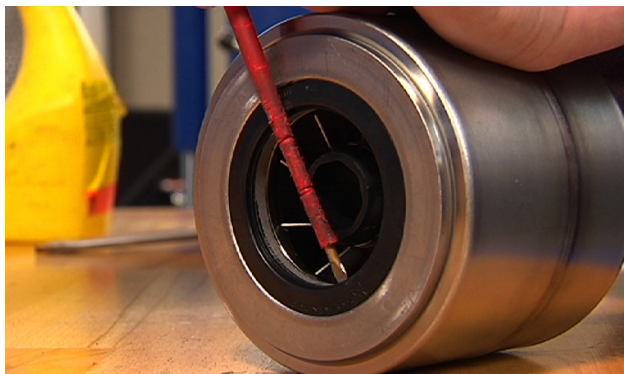
3. Knock on the nut with the knock-out spanner (pos. B). The split cone (pos. 12) will then loosen its grip on the shaft.
4. Remove the bottom impeller (pos. 13).

8. Replacing the wear parts

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

Always replace all parts from a service kit and replace all neck rings and O-rings.

8.1 Valve seat and rubber bearing, top chamber



TM05 4184 2012

1. Press a screwdriver under the valve seat/neck ring (pos. 3/7) and push it out of the recess.



TM05 4185 2012

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



TM05 4186 2012

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



TM05 4187 2012

5. Turn the chamber upside down.
6. Clean the recess where the rubber bearing was fitted.
7. Moisten the recess with soapy water, and press the new rubber bearing home in the recess.



TM05 4188 2012

8. When the neck ring and rubber bearing have been replaced, the text "This side up" on the neck ring must point upwards. The cone of the rubber bearing should point towards the outlet side of the chamber.

8.2 Neck ring and rubber bearing, chambers



TM05 4189 2012

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

8.3 Wear ring, impeller



TM05 4190 2012

1. Remove the wear ring (pos. 72) with the holder (pos. H) and a screwdriver.
Take care not to deform the impeller.



TM05 4191 2012

2. Clean and lubricate the impeller skirt.
3. Carefully press the new wear ring straight down over the impeller skirt with a hydraulic or manual punch press.
4. Check that the wear ring is pressed home and that the impeller is intact.

8.4 Bearing, bottom chamber



TM05 4192 2012

1. Press a screwdriver under the rubber bearing (pos. 8) and pull the bearing out of the recess.



TM05 4193 2012

2. Clean the recess where the rubber bearing was fitted.
3. Moisten the recess with soapy water, and press a new rubber bearing into the recess.

8.5 Valve casing

8.5.1 Standard valve casing



TM05 4194 2012

1. Position the valve casing (pos. 1) upside down on the support tool from the punch set (pos. D).



TM05 4195 2012

2. Centre the guide bearing (pos. 142a) with the hole in the support tool.



TM05 4196 2012

3. Position the punch in the centre of the guide bearing and knock it out with a plastic mallet.



TM05 4197 2012

4. Turn the support tool upside down so that its recess is pointing upwards.
5. Position the valve casing on top of the tool with the outlet pointing upwards.



TM05 4198 2012

6. Fit the new guide bearing on the punch.



TM05 4199 2012

7. Position the new guide bearing in the valve casing.
8. Knock the guide bearing home with a plastic mallet.



TM05 4200 2012

9. Insert the valve cup (pos. 2) into the valve casing.

8.5.2 Relieved valve casing



TM05 4201 2012

1. Fix the relieved valve casing (pos. 1a) upside down in a vice.
2. Fit the retainer ring tool (pos. W) in the retainer ring (pos. 203) for valve seat.



TM05 4202 2012

3. Place the spanner (pos. K) over the retainer ring tool and loosen the retainer ring.
4. Remove the retainer ring and valve cup (pos. 2).



TM05 4203 2012

5. Position the valve casing upside down on the support tool from the punch set (pos. D).



TM05 4204 2012

6. Centre the guide bearing (pos. 142a) with the hole in the support tool.



TM05 4205 2012

7. Position the punch tool in the centre of the guide bearing and knock it out with a plastic mallet.



TM05 4206 2012

8. Turn the support tool upside down so that its recess is pointing upwards.
9. Position the valve casing on top of the support tool with the outlet pointing upwards.



TM05 4207 2012

10. Position the new guide bearing in the valve casing.
11. Knock the guide bearing home with a plastic mallet.



TM05 4210 2012

15. Clean the recess where the O-ring was fitted.
16. Moisten the recess with soapy water, and fit a new O-ring.



TM05 4208 2012

12. Remove the O-ring (pos. 37) from the retainer ring with a screwdriver.



TM05 4211 2012

17. Clean the recess where the valve seat was fitted.
18. Moisten the recess with soapy water, and knock home a new valve seat.



TM05 4209 2012

13. Fix the retainer ring in a vice.
14. Knock out the valve seat (pos. 3) with a punch.



TM05 4212 2012

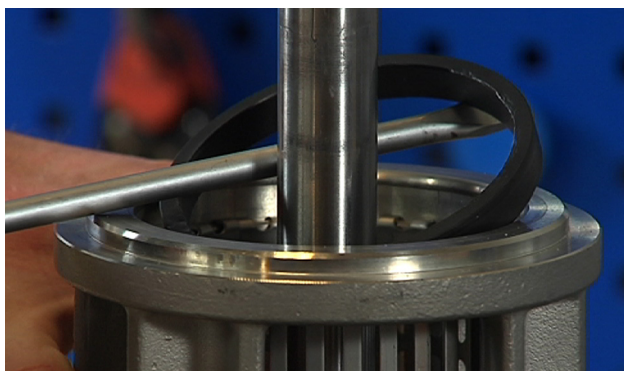
19. Fix the valve casing in a vice.
20. Fit the valve cup and retainer ring in the valve casing.



TM05 4213 2012

21. Tighten the retainer ring with the specified torque.
See section 4. *Tightening torques and lubricants.*

8.6 Suction interconnector



TM05 4214 2012

1. Push the bottom neck ring (pos. 68) out of the recess with a screwdriver.



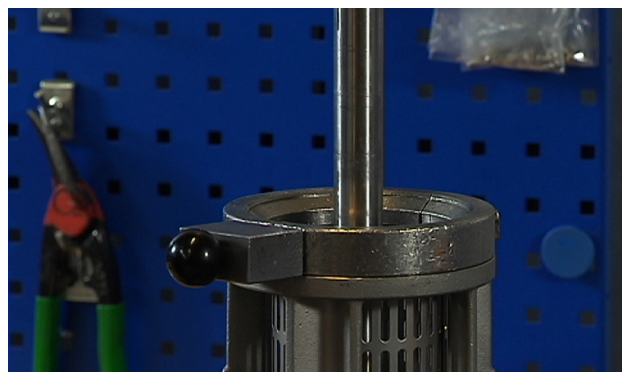
TM05 4215 2012

2. Fit a new neck ring in the recess at the top of the suction interconnector.
3. Knock it into place with a plastic mallet.

9. Pump assembly

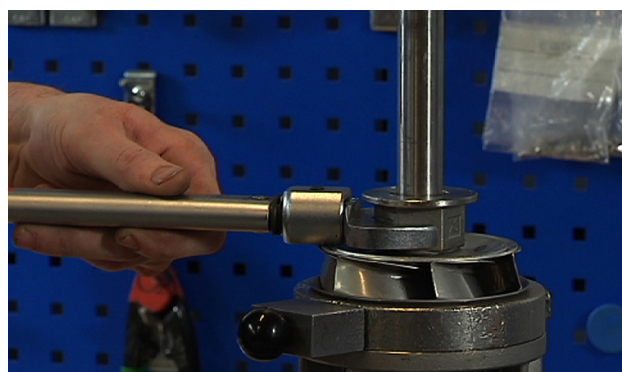
If the pump has reduced impellers, make sure that they are fitted in the correct order. See section 5. *Reduced impellers.*

9.1 Bottom impeller



TM05 4216 2012

1. Fit the spacer tool (pos. E) on top of the suction interconnector (pos. 14/14a).



TM05 4217 2012

2. Fit the bottom impeller (pos. 13) and the belonging nut (pos. 11c).
3. Tighten the nut with the specified torque, using a torque wrench (pos. T) combined with a fork spanner (pos. V). See section 4. *Tightening torques and lubricants.*
4. Remove the spacer tool.

9.2 Bottom chamber with upthrust disc



TM05 4218 2012

1. Fit the upthrust disc (pos. 8a) on top of the bottom impeller.



TM05 4219 2012

2. Fit the bottom chamber (pos. 10) to the suction interconnector (pos. 14/14a).
Make sure that the stop ring (pos. 8b) is fixed inside the bottom chamber before the chamber is fitted.

9.3 Chambers



TM05 4217 2012

1. Fit an impeller (pos. 13) to the bottom chamber (pos. 10).
2. Tighten the split cone nut (pos. 11) with the specified torque, using a torque wrench combined with the split cone spanner (pos. Y). See section 4. *Tightening torques and lubricants*.



TM05 4221 2012

3. Fit a chamber (pos. 9) on top of the just fitted impeller.
4. Repeat this procedure until all impellers and chambers have been fitted.

9.4 Top chamber



TM05 4222 2012

1. If the pump is fitted with reduced impeller(s), see section 5. *Reduced impellers* for details.
Check that the top impeller has the smallest diameter.
2. Fit the top impeller (pos. 13) and tighten the split cone nut (pos. 11) with the specified torque. See section 4. *Tightening torques and lubricants*.
3. Fit the top chamber (pos. 4/4a).

9.5 Valve casing



TM05 4223 2012

1. Fit the valve casing/relieved valve casing (pos. 1/1a) on the top chamber (pos. 4/4a).
2. Position the valve casing so that the threaded holes for the cable guards (pos. 18) are in line with the threaded holes in the suction interconnector (pos. 14/14a).

9.6 Straps



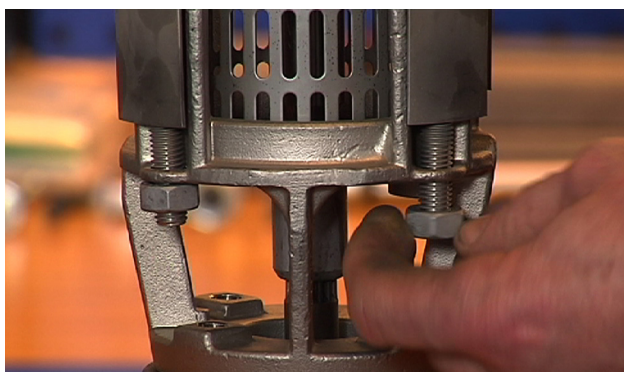
TM05 4224 2012

1. Lubricate the thread of the straps (pos. 17) with O-ring grease and fit them in the suction interconnector (pos. 14/14a).



TM05 4225 2012

2. Fit the strap to the valve casing (pos. 1/1a).

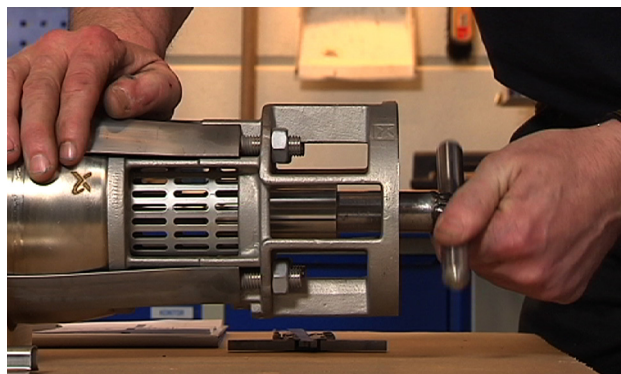


TM05 4226 2012

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

10. Quality control

10.1 Rotating the shaft

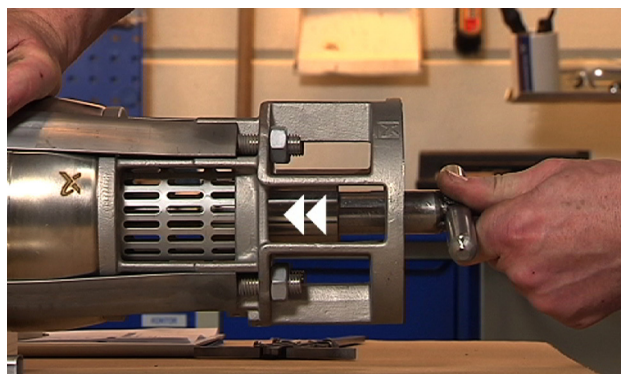


TM05 4228 2012

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

10.2 Checking the pump axial clearance

10.2.1 Axial clearance, shaft in top position



TM05 4229 2012

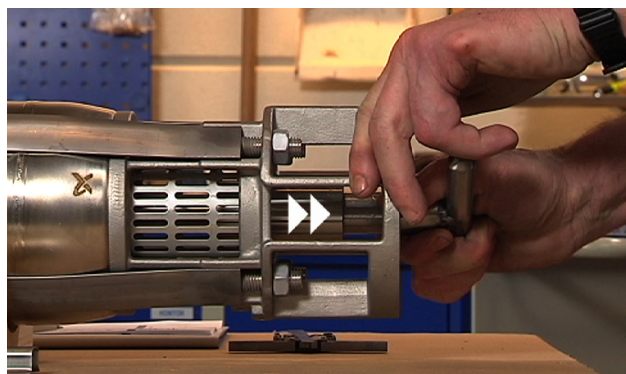
1. Press the shaft home in top position with the spline key (pos. C).



TM05 4230 2012

2. Measure the top axial clearance from the bottom of the coupling to the end of the suction interconnector (pos. 14/14a).
3. Note down the measured axial clearance.

10.2.2 Axial clearance, shaft in bottom position



TM05 4231 2012

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



TM05 4232 2012

2. Measure the bottom axial clearance from the bottom of the coupling to the end of the suction interconnector (pos. 14/14a).
3. Note down the measured axial clearance.

10.2.3 Check list

If there is no clearance (end play) or the measured clearance differs from the values stated below, the assembly has not been made correctly. The pump must therefore be dismantled and reassembled.

Motor size	Axial clearance [mm]	
	Shaft in bottom position	Shaft in top position
4"	35.5 - 36.5	39.0 - 41.5
6"	70.5 - 71.5	74.0 - 76.5
8"	99.5 - 100.5	103.0 - 105.5

10.3 Checking the motor shaft height



TM05 4233 2012

1. Measure the shaft height from the top of the shaft to the motor frame.
2. Note down the measured shaft height.

10.3.1 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
	Mercury	73.00 + 0.03 / - 0.35
8"	Franklin	73.00 + 0.02 / - 0.12
	-	101.00 + 0.60 / - 0.34

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.

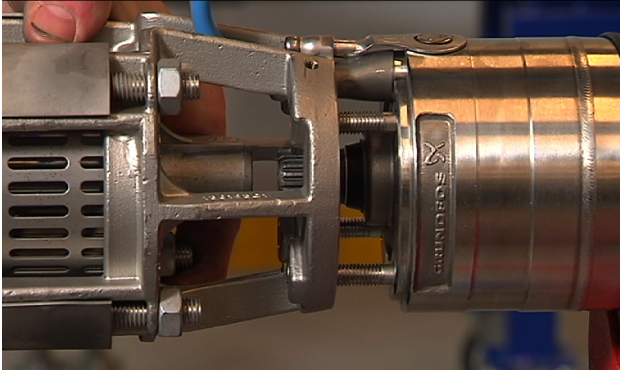
11.2 Insulation resistance

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.

12. Mounting the motor and cable guard

12.1 Mounting the motor



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1. Mount the motor on the chamber stack.
2. Lubricate the motor staybolts (pos. 58) with O-ring grease.
3. Fit the nuts (pos. 22a) on the staybolts.
4. Cross-tighten the nuts in three steps with the specified torque.
See section 4. *Tightening torques and lubricants*.

12.2 Fitting the cable guard



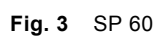
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1. Place the cable along the chamber stack, and position the cable guard (pos. 18) over the cable.



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



13.2 Sectional drawing

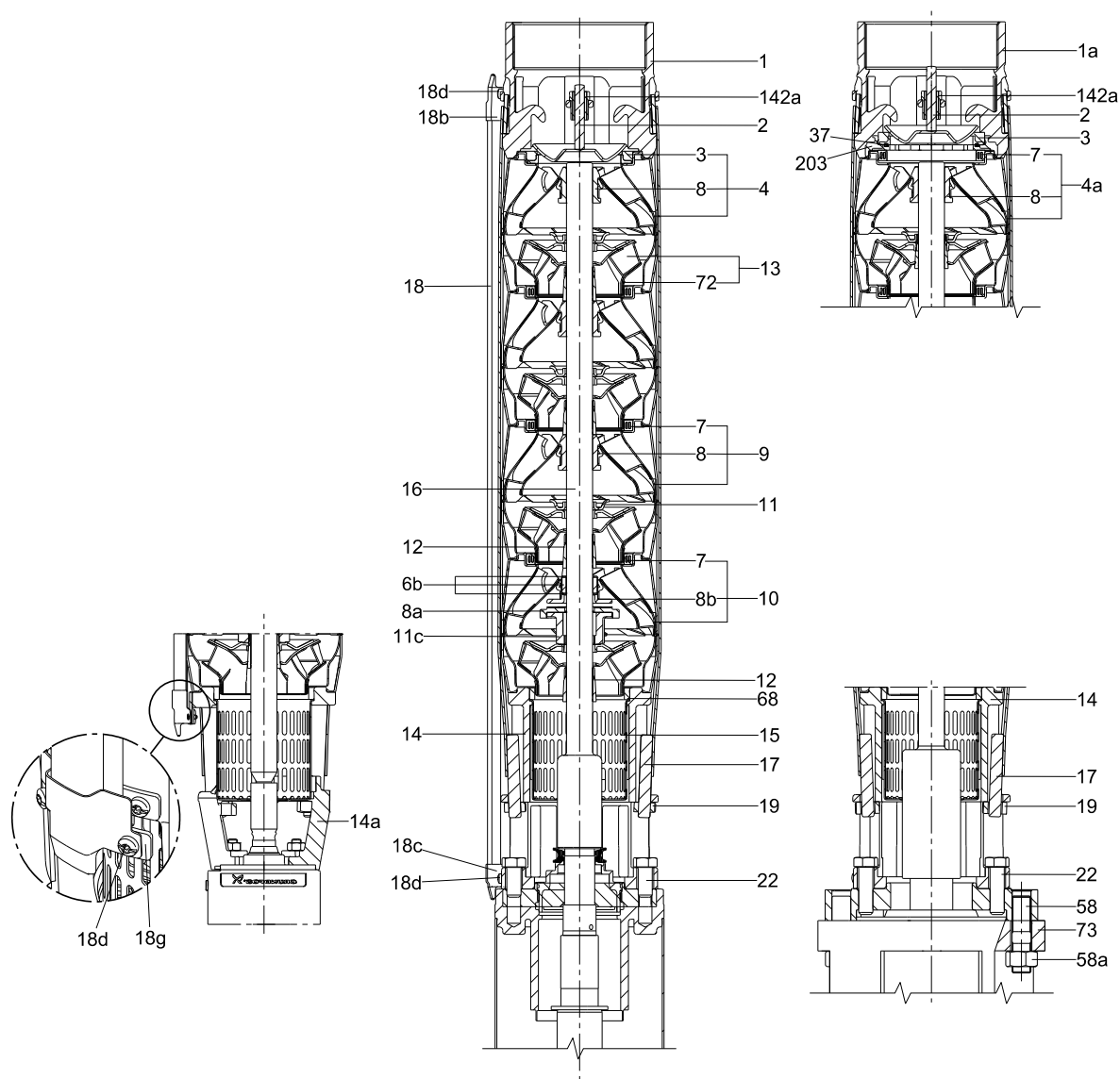


Fig. 4 SP 60

Pos.	Description
1	Standard valve casing
1a	Relieved valve casing
2	Valve cup
3	Valve seat
4	Top chamber, complete (for standard valve casing)
4a	Top chamber, complete (for relieved valve casing)
6b	Bottom bearing set
7	Neck ring
8	Rubber bearing
8a	Upthrust disc
8b	Stop ring
9	Chamber, complete
10	Bottom chamber, complete
11	Split cone nut
11c	Nut for stop ring
12	Split cone
13	Impeller, complete
14	Suction interconnector 6"
14a	Suction interconnector 4"
15	Strainer
16	Shaft

Pos.	Description
17	Strap
18	Cable guard
18b	Clamp, top
18c	Clamp, bottom
18d	Screw
18f	Bracket
18g	Clip
19	Nut
22	Bolt
22a	Nut
37	O-ring
58	Staybolt
58a	Nut
68	Neck ring, bottom
72	Wear ring
73	Connection piece 8"
78	Nameplate
78a	Rivet
142a	Guide bearing
203	Retainer ring

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14. Analysis check list

Component	Problem	Yes/No	Comment
Inspect before dismantling			
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?		
Inspect during dismantling			
Motor	Motor coupling undamaged?		
	Measure shaft height [mm]		
	Can the pump turn freely? (light resistance is expected)		
Pump	Pump coupling undamaged?		
	Measure axial clearance, top position [mm]		
	Measure axial clearance, bottom position [mm]		
	Can it turn freely? (light resistance is expected)		
Valve casing	Wear on valve cup and guide pin?		
Valve casing, relieved	Wear on valve seat and O-ring?		
Top chamber and impeller	Wear on rubber bearing?		
	Are the chamber guide vanes intact?		
	Wear on valve seat or neck ring?		
	Wear on split cone and nut?		
	Wear on impeller wear ring?		
	Are the impeller blades intact?		
	Signs of corrosion, where?		
Intermediate chambers	Wear on rubber bearing?		
	Are the chamber guide vanes intact?		
	Wear on neck ring?		
	Wear on split cone and nut?		
	Wear on impeller wear ring?		
	Are the impeller blades intact?		
	Signs of corrosion, where?		
Bottom chamber	Are the chamber guide vanes intact?		
	Any unexpected wear on neck ring?		
	Are the chamber guide vanes intact?		
	Abnormal wear on stop ring?		
	Are the bearing cups free of dents and wear?		
	Is the upthrust disc intact?		
	Wear on split cone?		
	Wear on nut for stop ring?		
	Wear on impeller wear ring?		
	Are the impeller blades intact?		
	Signs of corrosion, where?		
Suction interconnector	Wear on neck ring?		
	Signs of corrosion, where?		
Shaft	Free of wear, burrs and scratches?		
	Is the shaft straight?		
	Signs of corrosion, where?		

Subject to alterations.

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