ENGINEERING
TOMORROW

Service guide

APP pumps
APP 21 - 38 with Ceramics
Disassembling and assembling

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1. Introduction

This document covers the instructions for disassembling and assembling the axial piston pumps APP 21 - 38 with ceramics.

Tools provided with toolset 180B4654:

- Torque wrench 4-20Nm
- Torque wrench 20-100 Nm
- Lifting eye
- Hex Socket 6 mm, 3/8" - short
- Hex Socket 10 mm, 3/8"
- Hex Socket 24 mm, 3/8"
- Hex Socket 13 mm, 3/8"
- Ringgaffelnøgle 13 mm
- Shaft seal extracter, ø45
- Mandrel for thrust plate
- Press bush, ø45
- Stop for retaining plate
- Screw M8 x 140 RS A4-80 ISO4014
- Screw M8 x 20 CS RS A4-80
- Møtrik 8, 0x6, 5x13,0
- Screw M8 x 70 RS A4-80
- NV24 flush valve tool
- Calibrates for back-up ring

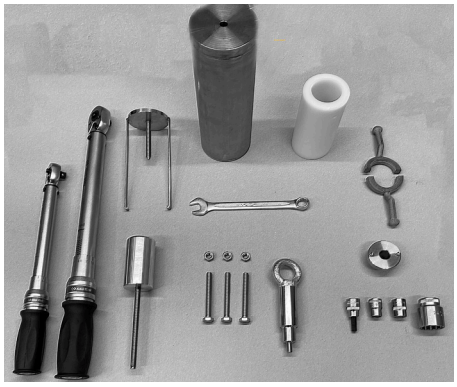
The disassembly instruction shows how to take the product apart. Some parts have their own disassembly section in this document as they are typically not necessary to take apart during inspections. instructions on what to inspect is also indicated in this document.

Important: It is essential that the pump is serviced in conditions of absolute cleanliness.

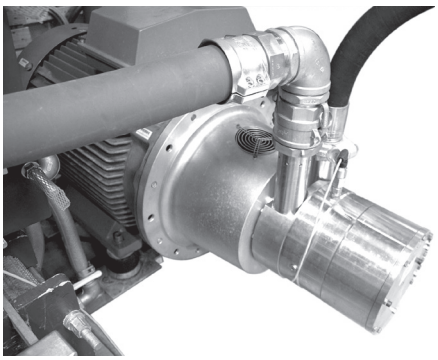
Place the pump on a pallet or other stable surface above the ground. Ensure that the pump cannot roll. It must be possible to place the pump vertically with the shaft pointing downwards. This can be done between two pallets or between two boards on a pallet provided that the distance is minimum 50 mm.

For a better understanding of the pump, please see the exploded view on page 18 and 19.

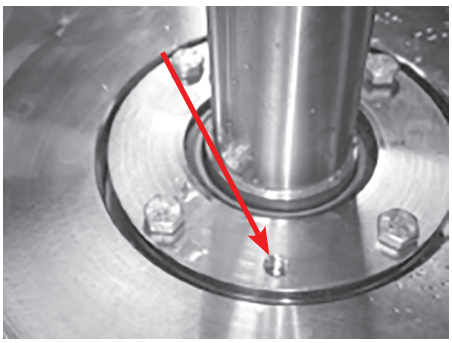
WARNING:
Do not reuse disassembled O-rings or shaft seal as they might be damaged. Always use new O-rings.



2. Disassembling the pump



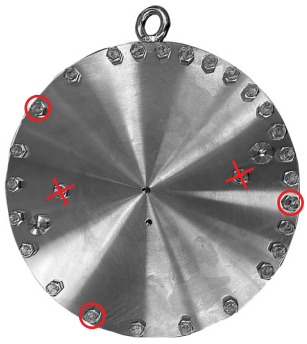
1. Disconnect the pump and motor from the system. Remove non-return valve and connector from the pump.



2. Using a 10 mm socket, unscrew the four bolts from shaft seal flange. If the shaft seal flange is stuck, screw in the two bolts in holes in the flange to remove it.

3. The ceramic ring can normally be inspected without removing it from the cover for shaft-seal. If for some reason it needs to be changed the ceramic ring can be removed by gently pushing it from the back of the sealing ring.

4. Turn pump into vertical position with shaft pointing downwards.



5. Replace the three bolts that is circled in red with the longer bolt and nut from the tool kit. Screw the nut towards the flange.
WARNING:
Do not loosen the two screws that are crossed out as they keep the swash plate in place.

6. Remove all the remaining bolts on the mounting flange.
WARNING:
Do not loosen the two screws that are crossed out as they keep the swash plate in place.

7. Turn each nut one round at the time to make sure that the flange is removed as straight upwards as possible.
When the flange is fully released the three remaining bolt can be removed.

8. Screw the eye bolt in the M8 hole in the middle of the flange. Pull it straight upwards.

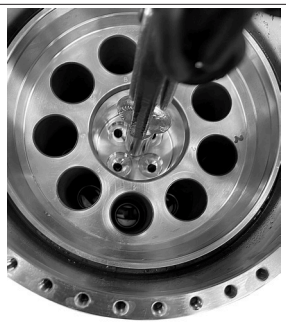
9. Swash plate must be placed so that its surface is not scratched. For further disassembling of swash plate, see page 7.

10. Tilt the retainer plate to horizontal position for easy removal of pistons, if required.
Remove by hand the pistons one by one. Be careful not to scratch the pistons
WARNING: Do not use any tools.

11. Remove the retainer plate and the retainer ball.
Do not loosen the three screws in the retainer plate.

12. Remove the retainer guide, the 4 springs and the spring guide.

13. Mount a 8 mm eye bolt in the cylinder barrel. Before lifting the rotor out. Lift the rotor slightly abover the housing (5-10mm) Use a screwdriver to push the portplate portplate (pos. 91 in the exploded view page 18) down to avoid it from sticking and dropping from the rotor once lifted. Visual inspect that the port plate have dropped through the cylinders.

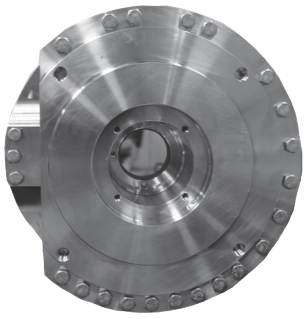


14. Great care must be taken when lifting, as it is a tight fit between the housing bearing and the rotor assembly.
WARNING: If the cylinder barrel is dropped or lowered too fast into housing, the main bearing/shaft bearing might be damaged. It is not replaceable.

15. Place cylinder barrel upside down. For further disassembling of cylinder barrel and valve plate see page 8.

16. Remove the port plate by hand.

17. Remove, by hand, the two pins.
Note: The following operation is only necessary if O-ring on port flange is to be changed.

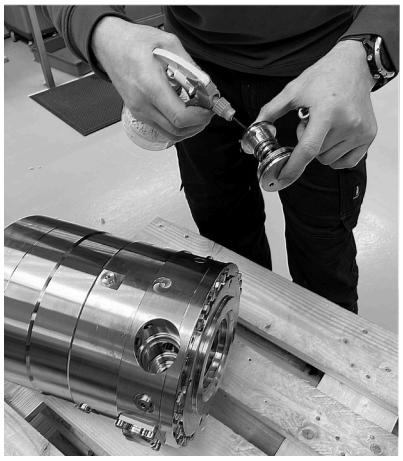


18. Place the pump horizontally.
19. Remove the remaining screws in port flange by using a 13 mm combination wrench. Carefully separate housingand port flange.

20. Ensure that pin is not lost.

3. Flushing valve removal and inspection

1. Start by removing the 3 bolts blocking the acces to the flush valve



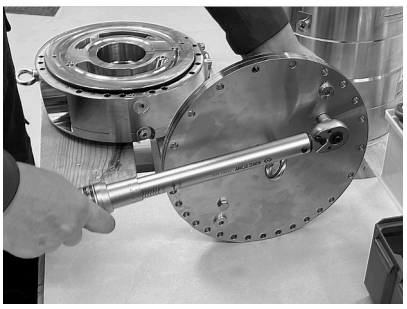
2. Use the flush valve tool to remove the flush valve.

3. There is two seals that can be changed on the flushing valve. One at the cone and one at the cone housing.
   Before installing the flush valve lubricate the valve and housing body with water

4. Tighten the flushing valve according to the torque rating shown in the exploded view.

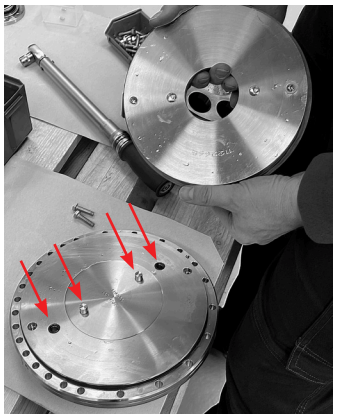
4. Swash plate disassembling and assembling

Note:Do not separate the swash plate from the end flange unless absolutely necesary Inspection of wear surfaces is possible even when assembled.

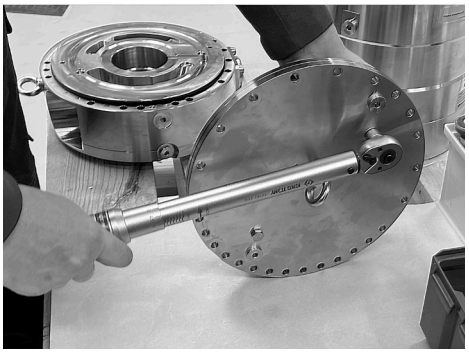


1. Place the end flange and in vertical position and unscrew the two screws that keeps the swash plate in place

2. When the screws are removed the swachplate can be separated from the endflange. make sure to place the swashplate with the ceramic upwards to keep the ceramic surfaces clean.



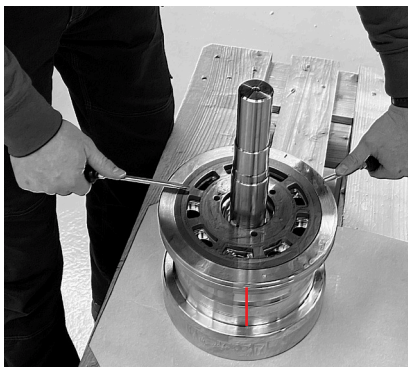
3. When assembling the swashplate and end flange be sure that the two pins and two O-rings are installed.



4. Install the two bolts that keeps the swash plate and end flange together. Tighten according to the torque value in the exploded view.

5. Disassembling and assembling

1. Lubricate the shaft and shaftseal with water and use the shaftseal exstractor to pull of the shaft seal

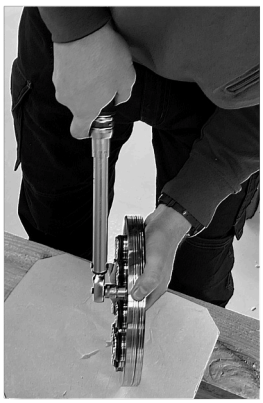


2. Mark the position of the valve plate and carefully use two flat faced screw drivers to remove the valve plate.

3. The portplate consist of a ceramic part and a steel part. The parts can be taken apart by unscrewing the 3 screws holding them together.

4. When the plates are seperated the static seal between the plates can be inspected and replaced if needed

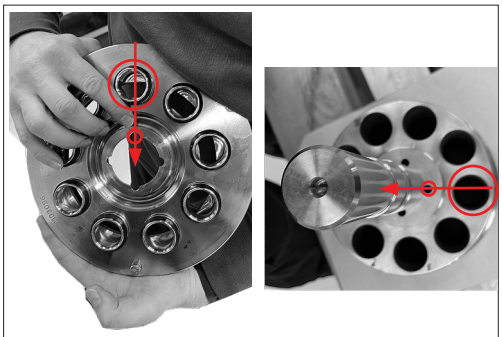
5. When reassembling the plates, make sure the pins in the cover plate are aligned with the pin holes in the valve plate.



6. Install the three screws and wedge lock washers. Tighten according to the torque specified in the exploded view.

7. The seals on the pressure shoes can be removed by hand.

8. If the seals have been replaced they should be set by the set tool for cover seals to ensure correct alignment of the seal.



9. The valve plate must be oriented correct when reinstalled on the cylinder barrel. If you forgot to mark the orientation, you can find the correct orientation by aligning the following holes on the valveplate and cylinder barrel. When installed correct the four flow channels are aligned.

10. Lubricate all orings and cylinders. Use the press bush for valve plate to slowly push the valve plate in place. ensure all O-rings are sliding into the cylinders avoiding to pinch them.

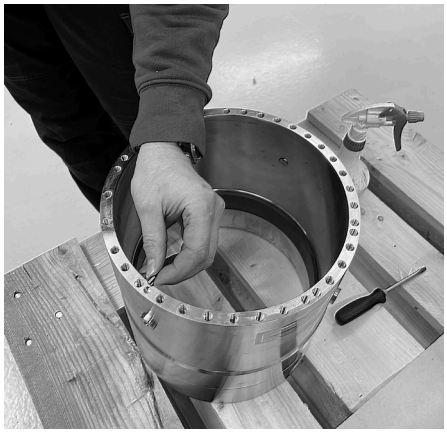
6. Assembling the pump

WARNING:
Do not use silicone when assembling the pump. Do not reuse disassembled O-rings; they might be damaged. Always use new O-rings.

Important:
It is essential that the pump is serviced in conditions of absolute cleanliness. All parts must be absolute clean before mounting.

Note:
Place the pump on a pallet or other stable surface above the ground. Ensure that the pump cannot roll. It must be possible to place the pump vertically with the shaft pointing downwards. This can be done between two pallets or between two boards on a pallet provided that the distance is minimum 50 mm.

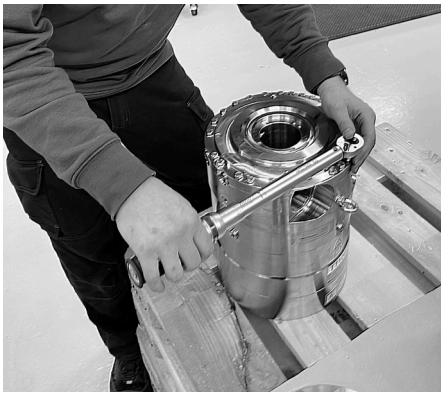
1. Lubrication:
   - To prevent seizing-up, lubricate all threads with PTFE lubrication type.
   - O-rings inside pump may be lubricated only with clean filtered water.
   - O-rings for port flange, mounting flange and flushing valve must be lubricated.
   - It is important to lubricate ALL parts to be assembled with clean filtered water (Especially all PEEK parts).



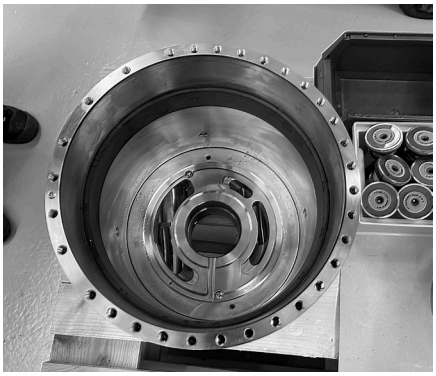
2. Place the housing on a table. The center bearing should be closest to the bottom. install the pin for orientation.

3. Install the the oring for the housing and lubricate it with water.

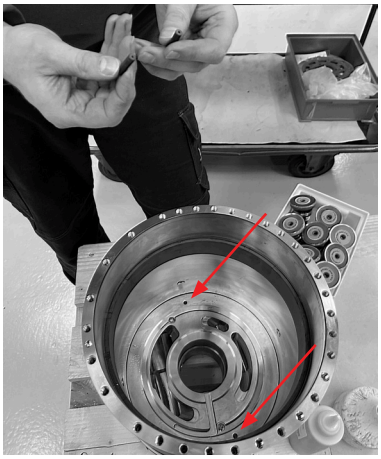
4. Position motor flange by aligning the pin hole over housing guide pin.
5. Gently press downwards. Be careful not to squeeze O-ring. If O-ring is damaged, the pump will leak.



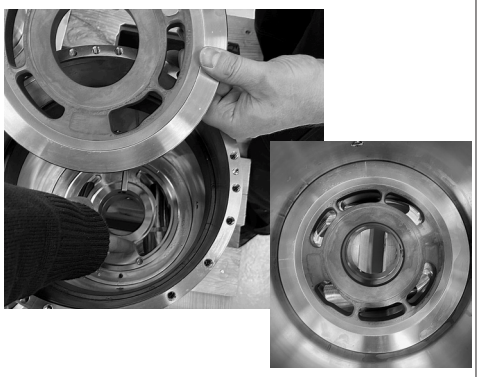
6. Screw in the rest of the screws on port flange. Tighten screws to a torque according to exploded view.



7. Rotate the pump 180 degrees as shown on the picture.



8. Install the two pins in the motor flange. for alignment of the portflange.



9. Ensure port plate is fitted tightly against the bottom.

IMPORTANT: Lubricate port plate with clean filtered fresh water. If valve plate is disassembled from cylinder barrel please see page 11 before continuing.

10. Screw eye bolt in the assembled cylinder barrel.
11. Make sure there is enough free space for the shaft beneath the housing. Gently lower cylinder barrel into housing.

WARNING!
If cylinder barrel is dropped or lowered too fast into housing, main bearing and ceramic valve plate might be damaged. Replacement of mainbearing can only be done at Danfoss, Nordborg.

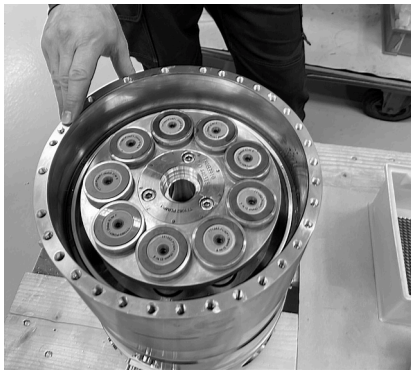
12. Unscrew M8 eye bolt.
13. Place the four springs and spring guide in cylinder barrel. Springs must be positioned in the holes.

14. Retainer guide, retainer ball and retainer plate must be mounted as on this picture.

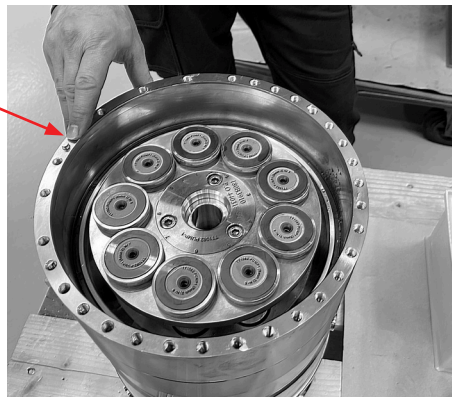
15. Lubricate the cylinder barrel with clean filtered water. Install the Retainer guide in the cylinder barrel and place the complete retainer plate with the ball towards the bearing.
Retainer ball and retainer plate in the cylinder barrel.

16.

Note: If pistons are replaced, place new pistons in clean filtered water for a couple of minutes. Exercise piston shoes to make them "run" smoother.



17. Place pistons in retainer plate and cylinder barrel. When pistons are placed, tilt retainer plate for easier placement of swash plate. If swash plate has been disassembled from mounting flange, see page 7 for assembly of swash plate.



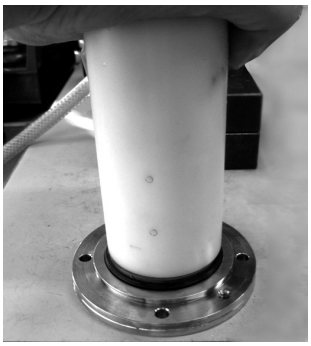
18. Place the pin in the housing and lubricate the piston shoes and swashplate with clean filtered water.

19. Lubricate the O-ring on the end flange. Align the pinhole in the flange with the pin in the housing. Install the three bolts and nuts from the tool kit . Turn each nut one round at a time to ensure mounting flange is mounted as straight downwards as possible. Be careful not to squeeze the O-ring.

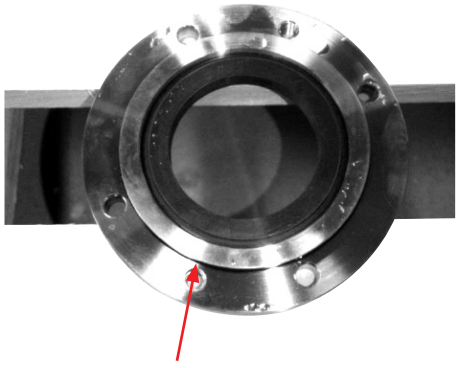
20. Screw in the rest of the bolts and replace the 3 bolts from the toolkit. Cross tighten the screws according to the torque indicated in the exploded view.

21. Rotate the pump - Shaft end upwards. Lubricate the shaft with clean filtered water and install the distance washer and then the shaft seal. Note the ceramic surface have to point upwards.

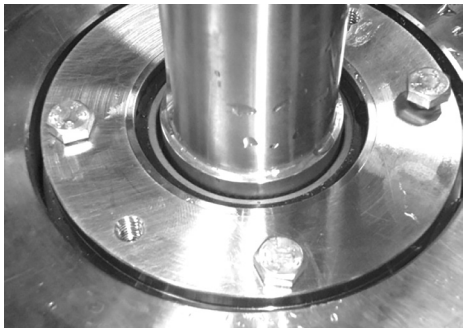
22. Use the shaft seal extractor to push the shaftseal down towards the shoulder of the shaftseal stop



23. If the ceramic ring is exchanged, use the shaft seal tool to press the seal into the cover for shaft seal.
WARNING:
Ensure that the face with rubber seal is positioned against shoulder in shaft seal flange.



24. Remove old O-ring and fit new one on shaft seal flange.



25. Lubricate the shaft seal with clean filtered water. Place the shaft seal cover on the port flange.

7. Changing pistons

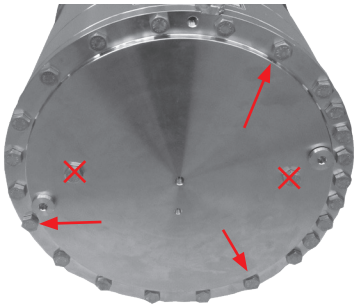
Tools needed are:

13 mm combination wrench
6 mm allen key:

The tools are available from the tool kit 180B4654 the content of the toolkit can be found in page 2.

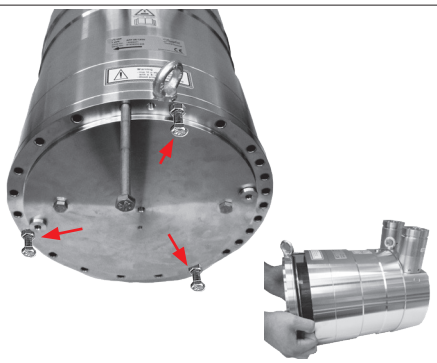
7.1. Disassembling

1. Disconnect the pump from the rest of the system.

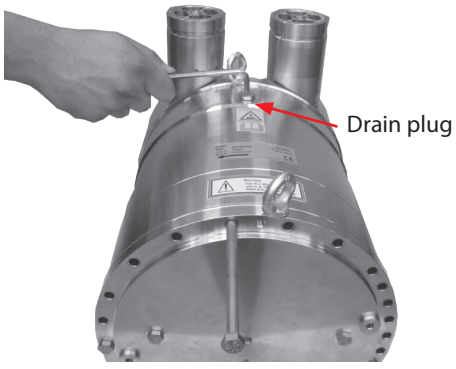


2. Replace the three bolt with the bolt and nuts from the tool kit. Screw the nuts towards the flange to keep it in place while removing the remaining bolts.
Note: There is still water inside the pump.

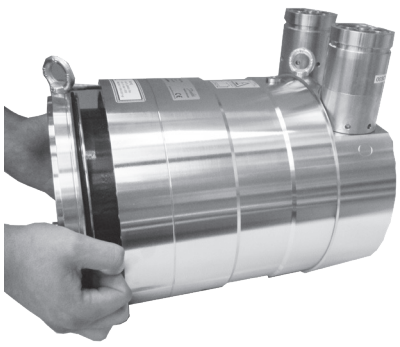
3. Mount the guide bolt in the top hole.



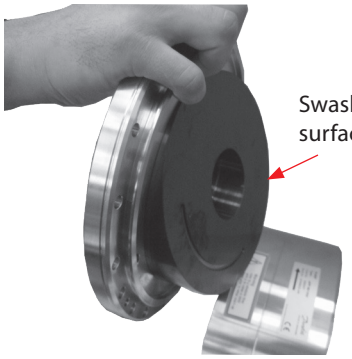
4. Turn each nut a couple of rounds at a time so the flange is removed as straight forward as possible..



5. If the flange does not move forward - loosen the drain plug to empty the pump from water by releasing vacuum.

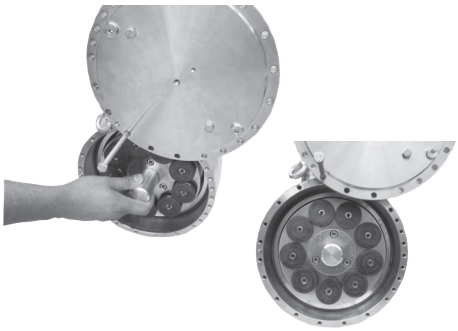


6. Remove the flange when the remaining three screws have been loosened. The guide bolt must remain mounted.

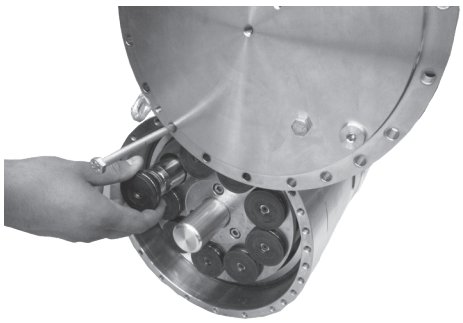


7. Carefully turn the flange and push it backwards to make it rest on the housing surface. Ensure not to scratch the swash plate surface.

8. Adjust the retainer plate to be parrallel to the end flange.

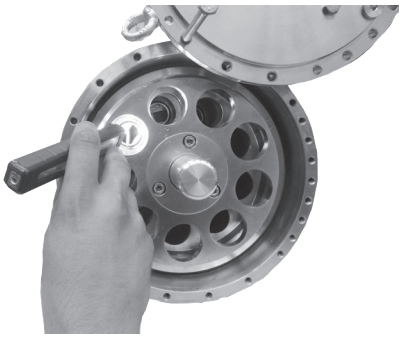


9. Screw the stop for the retainer plate into the centre to keep retainer plate/retainer ball assembly in place.



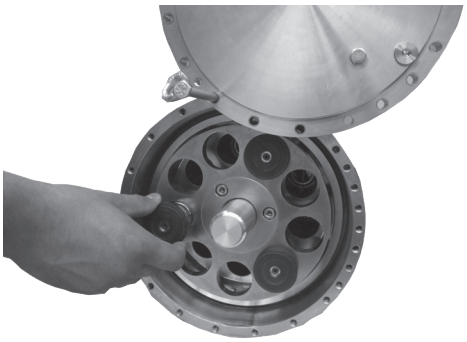
10. Carefully remove the pistons one by one.

11. **Warning:**
Ensure that the piston shoes and the piston surfaces are not damaged during removal. It is recommended to place the pistons upside down on an even and clean base/surface.

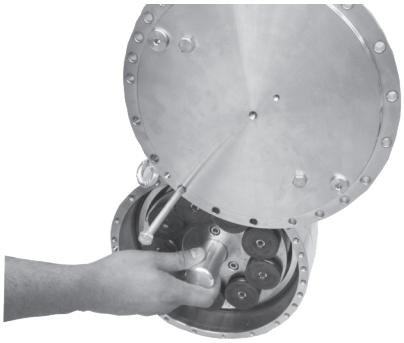


12. Inspect the piston liners.
Replace any worn parts.

7.2. Assembling

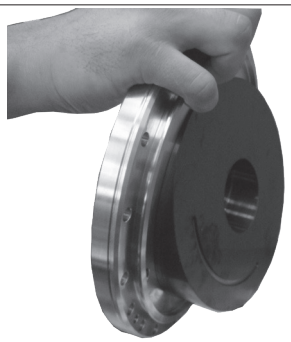


1. Lubricate pistons with clean filtered water. Insert the pistons arbitrarily.

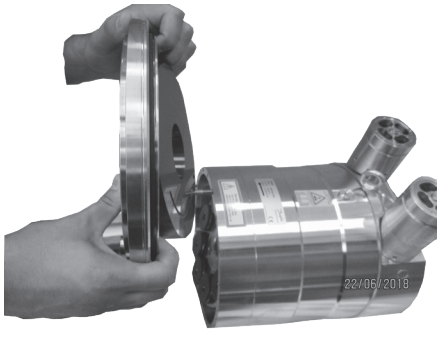


2. Remove the stop for retainer plate.

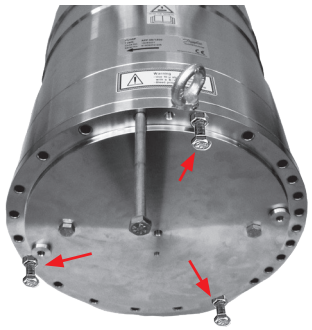
3. Place the retainer plate in an angle corresponding to the orientation of the swash plate.



4. Tilt the flange and replace the flange O-ring.



5. Lubricate the O-ring and pistons with clean filtered water. Turn the flange and gently push it into the housing.



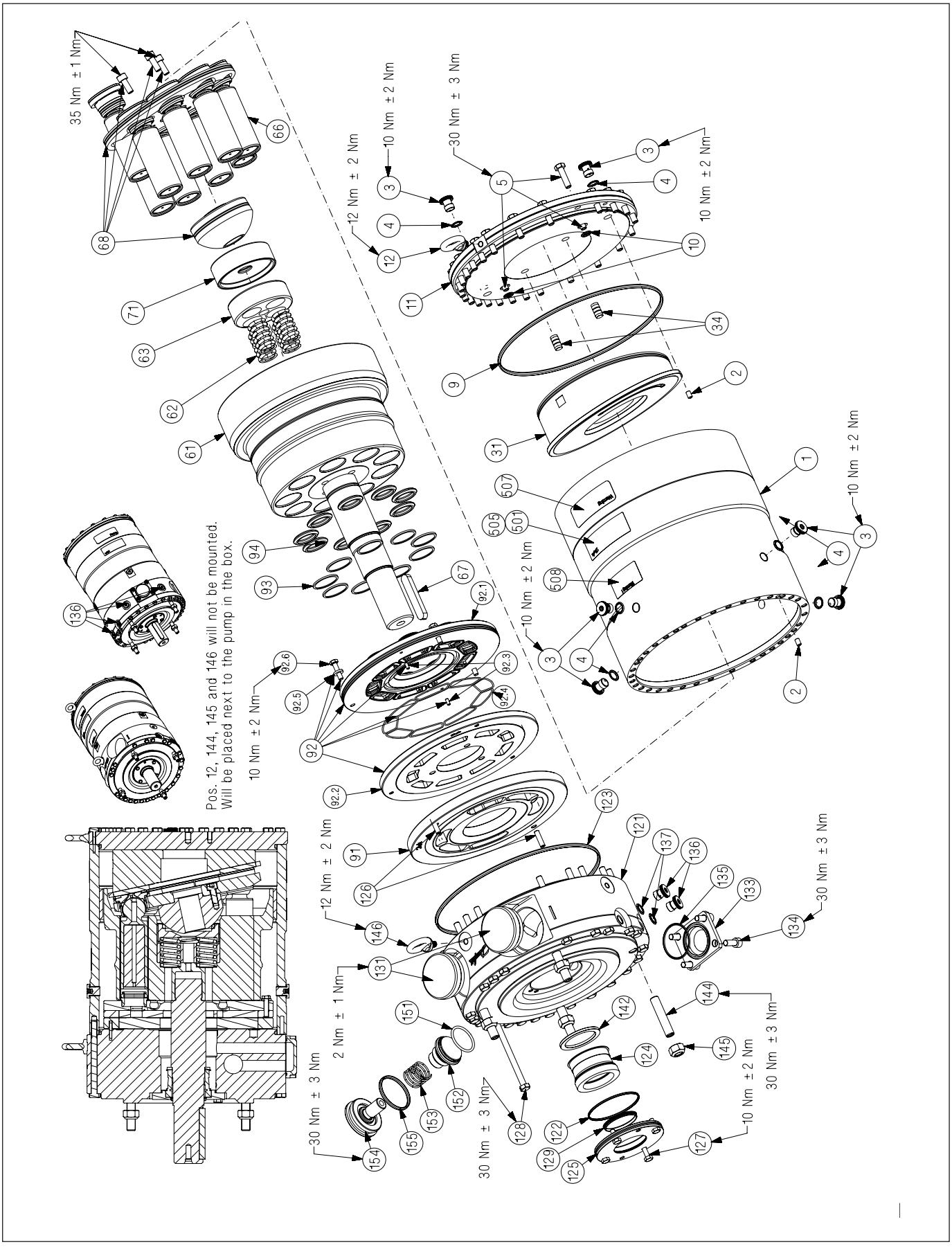
6. Install the three bolts and nuts from the tool kit . Turn each nut one round at a time to ensure mounting flange is mounted as straight downwards as possible. Be careful not to squeeze the O-ring.

7. Remove the guide bolt.
   Install the rest of the bolts and replace the 3 bolts from the toolkit. Cross tighten the screws according to the toque indicated in the exploded view.

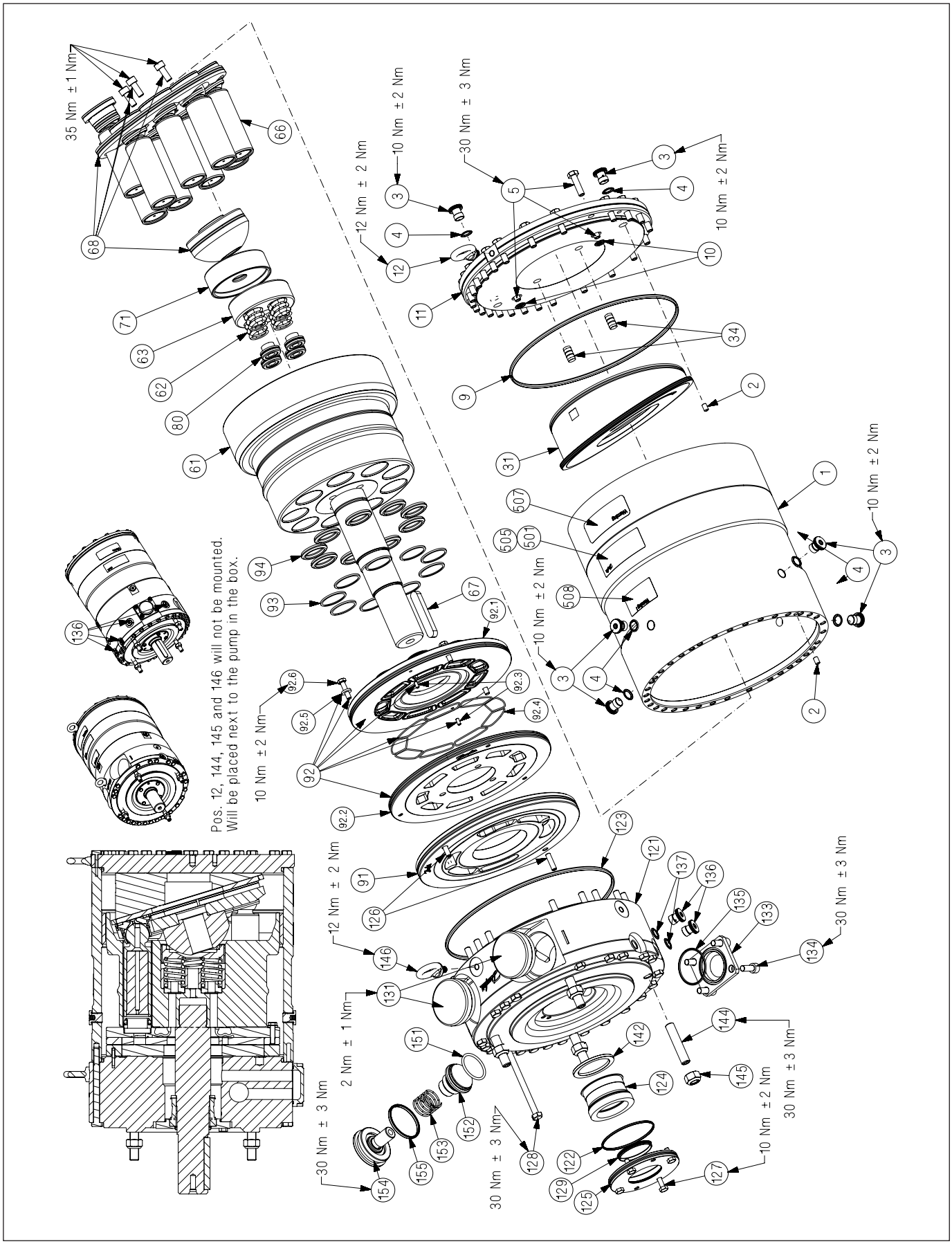
8. Connect the pump to the rest of the system and bleed the pump.

8. Exploded view

Exploded view APP 21-26 with ceramics



8.1. Exploded view APP 30-38 with ceramics



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