

*Azura*

## **AZURA® Preparative pump heads** Maintenance instructions



Document no. V6846



**Note:** Please read the corresponding technical documentation for handling and safety reasons.

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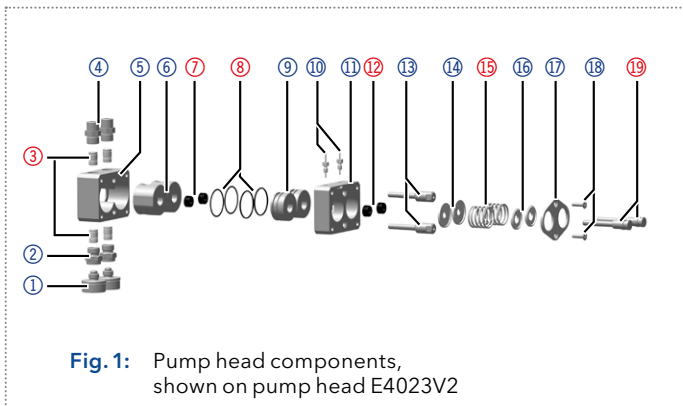
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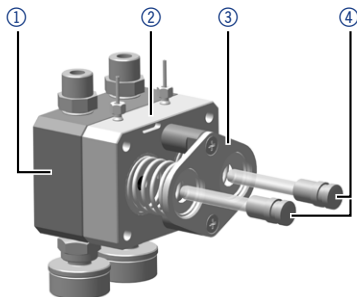
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# 1. Pump head components



## Legend (■ - Wear parts)

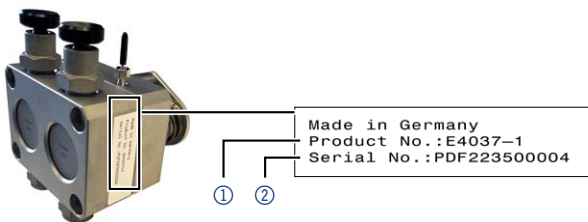
- |  |                                      |
|--|--------------------------------------|
| ① Connector                            | ⑪ Pressure plate (low-pressure side) |
| ② Bushing, inlet side                  | ⑫ Low-pressure seal                  |
| ③ Check valve unit                     | ⑬ Spacing bolt                       |
| ④ Bushing, outlet side                 | ⑭ Washer disc                        |
| ⑤ Pressure plate (high-pressure side)  | ⑮ Compression spring                 |
| ⑥ Inlay                                | ⑯ Pressure ring                      |
| ⑦ High-pressure seal                   | ⑰ Retaining plate                    |
| ⑧ O-ring                               | ⑱ Screw                              |
| ⑨ Seal holder                          | ⑲ Piston rod                         |
| ⑩ Screw fitting of piston backflushing |                                      |



**Fig. 2:** Rear view of a pump head

### Legend

- ① Pressure plate with check valves (high-pressure side)
- ② Pressure plate with connectors for the piston backflushing (low-pressure side)
- ③ Retaining plate
- ④ Piston rod



**Fig. 3:** Pump head with product number ① and serial number ②.

## 2. Required equipment and tools



**Note:** Newer pump heads may not yet be included in this document. Please contact KNAUER directly for corresponding maintenance kits.

### 2.1 Maintenance kits

Order the maintenance kit that matches the order number of your pump head. The maintenance kit includes all required wear parts. The [technical customer support](#) will help you to choose the correct kit.

Pump head (order no.)	Maintenance kit (order no.)
A4029-1	ARH40
A4023V5	ARH41
A4029V2	ARH42
A4021-1	ARH44
A4021V2	ARH45
A4038-1	ARH46
A4022-1	ARH47
A4022V2	ARH48

## 2.2 Tools with order numbers

### Tools with KNAUER order number:

Tool	order no.
Seal toolkit (for 100 ml AZURA® pump heads)	W0112
Seal toolkit (for 250 ml AZURA® pump heads)	W0350
Seal toolkit (for 500 ml AZURA® pump heads)	W0360
Seal toolkit (for 1000 ml AZURA® pump heads)	W0370
Allen wrench, size 4	X0013
Open-end wrench, size ¼"	X0003
Open-end wrench, size 10	X0030
Open-end wrench, size 17	X0004
Bit holder screwdriver	
Bit holder	
Bit Torx 20	
Bit PH2	
Torque wrench basic tool	X0219
Torque wrench plug-in head adapter	X0234
Torque wrench plug-ins	
Open-end wrench, size 17	X0220
Open-end wrench, size 1/4"	X0223
Tweezers	

### 3. Maintenance of the pump head

#### WARNING

##### Chemical burns

Skin damage from aggressive or toxic eluents.

→ Wear protective gloves.

→ Flush the pump head before changing.

---



**Note:** The adjustment/calibration of the flow rate after pump head maintenance can only be performed by the KNAUER company. If you perform the maintenance yourself, flow rate deviations  $> 2\%$  may subsequently occur.

The pump head can be disassembled into individual parts and cleaned. During this procedure all wear parts can be replaced.



---

## 3.1 General procedure

### Process

1. Flush the pump head with a suitable flushing solution e.g. isopropanol.
  2. Switch off the pump.
  3. Remove the pump head from the pump (see chapter see 3.2).
  4. Disassemble the pump head (see chapter see 3.3).
  5. Clean metallic parts (see chapter see 3.3.4).
  6. Exchange the wear parts (see chapter see 3.4).
  7. Reassemble the pump head in the right order (see chapter see 3.4).
  8. Reattach the pump head to the pump (see chapter see 3.5).
  9. Perform a running-in procedure (see chapter see 4).
- 

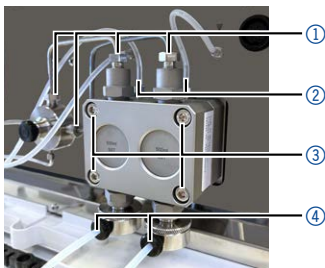
## 3.2 Removing pump head from the pump

### Prerequisites:

- The pump head has been flushed.
- The pump is switched off.

**Process**

1. Loosen the four capillary screw fittings ① (two at the pump head outlet, two at the pressure sensor inlet) to remove the capillaries.
2. Remove tubing ② of the piston backflushing.
3. Remove tubing ④ from the eluent inlets.
4. Using the Allen wrench (size 4), loosen diagonally opposite fastening screws evenly and unscrew the four screws ③.
5. Hold the pump head by hand and remove the screws.
6. Lift off the pump head from the pump.



**Fig. 4:** Removing fittings and tubings

**Result:** The pump head has been removed from the pump.

**Next step:** Disassemble the pump head.

## 3.3 Disassembling the pump head

### Prerequisites:

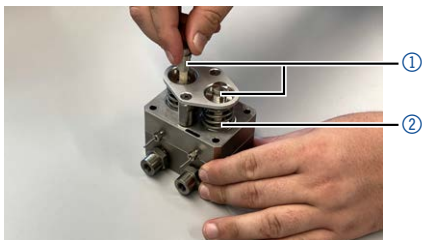
- The pump head is lying on a soft, clean work surface.
- Access to required tools.

### 3.3.1 Separating the pressure plates

#### 3.3.1.1 Removing piston rods and retaining plate

##### Process

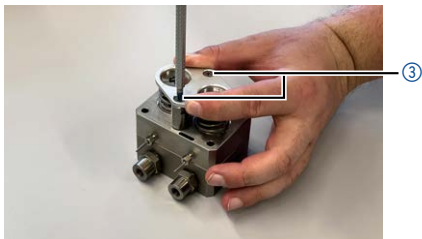
1. By hand or using a suitable tool, e.g. flat pliers, remove the two piston rods ① from the piston guide ② while avoiding jamming. Dispose of the worn piston rods.



**Fig. 5:** Removing the piston rods from the piston guide

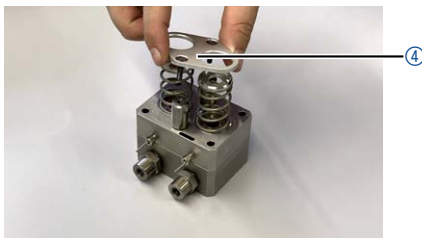
**Process**

- Using the screwdriver (PH2 or TX20, depending on the pump head), loosen the two screws ③ of the retaining plate by turning them alternately by one turn each. Press the retaining plate down to prevent the compression springs from jumping out.



**Fig. 6:** Loosen both cylinder bolts

- Remove the retaining plate ④ .



**Fig. 7:** Removing the retaining plate

### 3.3.1.2 Disassembling piston guide components

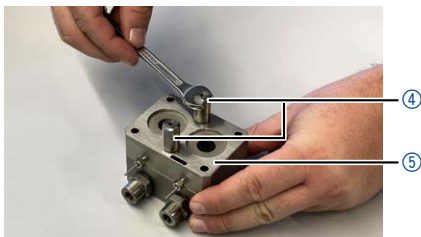
#### Process

1. Remove the two pressure rings ①, the two compression springs ② and the two washer discs ③. Set aside the pressure rings and the washer discs for later reassembly. Dispose of the worn compression springs.



**Fig. 8:** Removing piston guide components

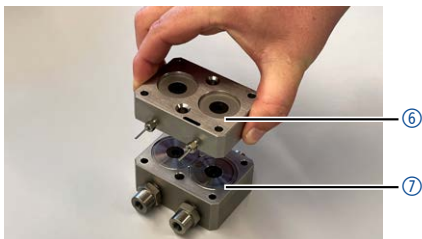
2. Loosen the spacing bolts ④ from the pressure plate ⑤ with an open-end wrench, size 10.



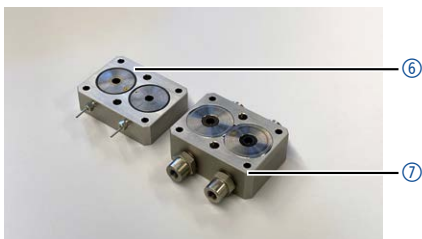
**Fig. 9:** Removing the spacing bolts

**Process**

3. Remove the pressure plate (low-pressure side) ⑥ from the pressure plate (high-pressure side) ⑦ .



**Fig. 10:** Separating pressure plates



**Fig. 11:** Separated pressure plates

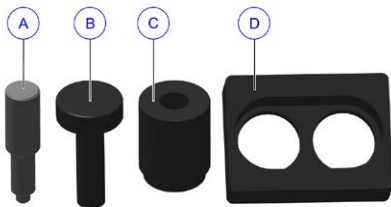
**Result:** The pressure plates are separated.

**Next step:** Disassemble the pressure plate (high-pressure side).

## 3.3.2 Disassembling pressure plate (high-pressure side)

### 3.3.2.1 Removing the seals from the inlays

Tools:



**Fig. 12:** Seal toolkit W0112  
(e. g. for the pump heads E4023V2 and E4023-1)

#### Legend

- A** Extraction tool
- B** Sealing tool
- C** Sealing adapter
- D** Adjusting tool

#### NOTICE

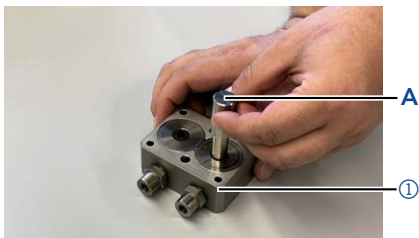
##### **Pump head malfunction**

Seals may be damaged, causing the pump head to malfunction.

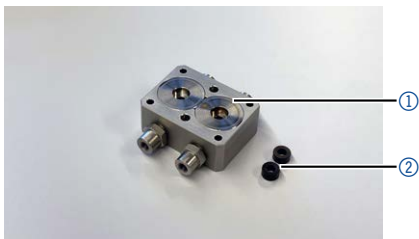
- Use the steel made extraction tool **A** to pull out old seals.
- Use the black plastic made sealing tool **B** in combination with the appropriate adapter **C** to prevent damage to the new seal during insertion.
- Only use original seals.
- Do not reuse old seals.

**Process**

1. Remove the two seals from the pressure plate (high-pressure side) ① by turning the extraction tool **A** into the old seals and pulling them out. Dispose of the worn seals ②.



**Fig. 13:** Removing seals (high-pressure side)



**Fig. 14:** Pressure plate (high-pressure side) and removed seals

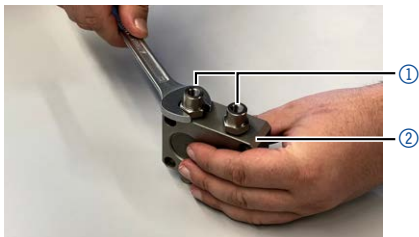
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### 3.3.2.2 Removing bushings, check valves and inlays

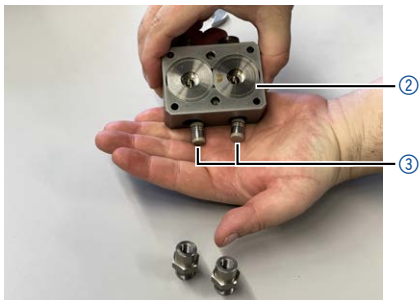
#### Process

1. Remove the two bushings (outlet side) ① on the pressure plate (high-pressure side) ② using the open-end wrench (size 17).



**Fig. 15:** Removing the upper bushings (outlet side)

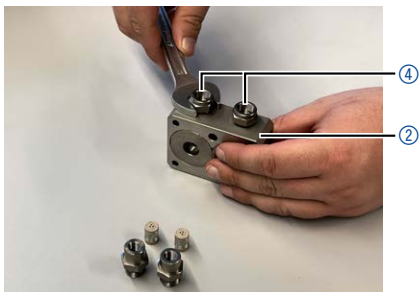
2. Turn the pressure plate (high-pressure side) ② upside down to remove the two check valves ③.



**Fig. 16:** Removing check valves (outlet side)

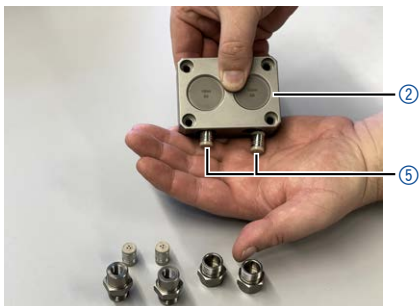
**Process**

3. Remove the two bushings (inlet side) ④ on the pressure plate (high-pressure side) ② using the open-end wrench (size 17).



**Fig. 17:** Removing the lower bushings (inlet side)

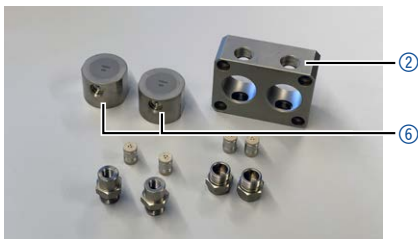
4. Make sure that the inlays do not fall out of the pressure plate (high-pressure side) ② when you turn the pressure plate upside down to remove the two check valves ⑤.



**Fig. 18:** Removing check valves (inlet side)

**Process**

5. Remove the two inlays ⑥ from the pressure plate (high-pressure side) ②.



**Fig. 19:** Disassembled pressure plate (high-pressure side)

**Result:** The pressure plate (high-pressure side) is disassembled.

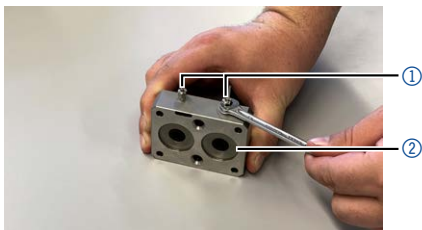
**Next step:** Disassembling pressure plate (low-pressure side).

### 3.3.3 Disassembling pressure plate (low-pressure side)

#### 3.3.3.1 Removing fittings of piston backflushing

##### Process

1. Loosen the fittings of the piston backflushing ① from the pressure plate (low-pressure side) ② with an open-end wrench, size 1/4".

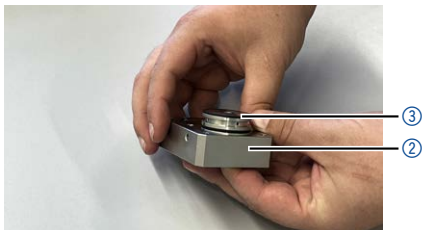


**Fig.20:** Removing the fittings of the piston backflushing

#### 3.3.3.2 Removing seal holders from pressure plate

##### Process

1. Remove the two seal holders ③ from the pressure plate (low-pressure side) ② by pushing them out by hand.



**Fig.21:** Removing the seal holders from the pressure plate

**Process**

2. Use tweezers to remove the two o-rings ④ from each of the two seal holders ③.



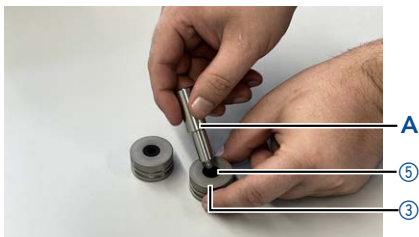
**Fig. 22:** Removing the o-rings from the seal holders



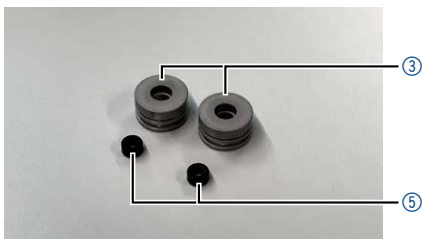
**Fig. 23:** Disassembled pressure plate (low-pressure side)

**Process**

3. Screw the extraction tool **A** into the old seal **⑤** and pull it out of the seal holder **③** (on both seal holders). Dispose of the worn seals.



**Fig. 24:** Removing the seals from the seal holders



**Fig. 25:** Seal holders and removed seals

### 3.3.4 Cleaning metallic parts

Clean all metallic parts **except the pressure plate (low-pressure side)** in the ultrasonic bath. Allow the parts to dry thoroughly afterwards.

#### NOTICE

##### Component defect

The pressure plate (low-pressure side) contains a sensitive RFID chip.

→ Do not clean the pressure plate (low-pressure side) in the ultrasonic bath.

---

Alternatively, the parts can also be cleaned with a cotton swab soaked in ethanol.

**Next step:** Replace the wear parts and reassemble the pump head.

## 3.4 Replacing the wear parts and reassembling the pump head

### Prerequisites:

- The pump head is disassembled.
- The parts of the pump head are lying on a soft, clean work surface.
- Access to wear parts.
- Access to required tools.

### 3.4.1 Assembling pressure plate (high-pressure side)

#### 3.4.1.1 Replacing the check valves

##### Process

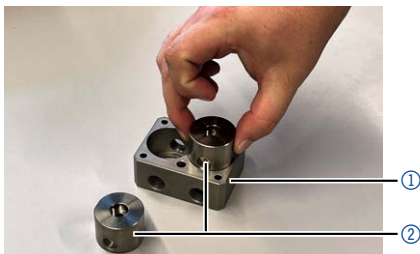
1. Push the two inlays ② into the openings of the pressure plate (high-pressure side) ① without tilting.



**Note:** Inlays must slide in into the pressure plate without the need to apply force otherwise there is a risk of jamming.



**Note:** Pay attention to the correct orientation of the writing on the inlays. The lettering must be visible on the front of the pump head.



**Fig. 26:** Reinserting the inlays

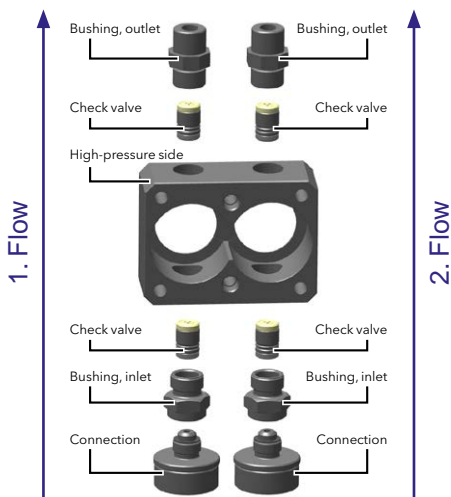
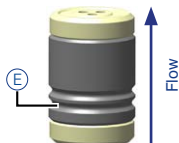


## Process

2. Insert the new check valves into the inlays according to see Fig.27.



**Note:** Ensure that the alignment is correct. The notch **E** on the check valve must point downwards, otherwise the eluent flow will be blocked.




**Fig. 27:** Check valves and fittings of preparative pump head

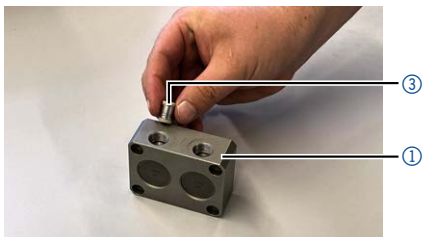


**Note:** The view shows the pressure plate (high-pressure side) from behind.

**Process**

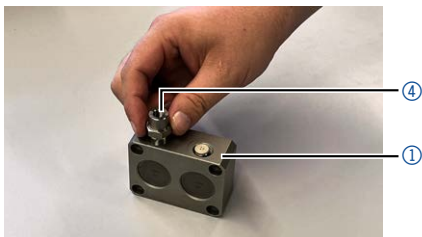
3. Replace the check valves (outlet side) ③ on the pressure plate (high-pressure side) ①.

 **Note:** The sticker with the serial number (if present) is located on the right side when viewed from the front.



**Fig.28:** Inserting the outlet check valves

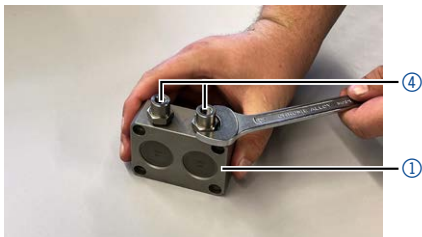
4. Mount the bushings (outlet side) ④ to the pressure plate (high-pressure side) ①.



**Fig.29:** Mounting the bushings (outlet side)

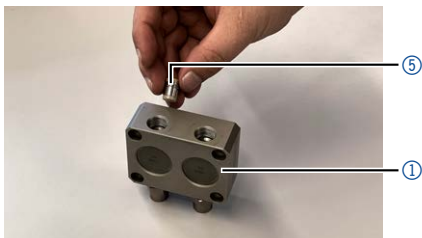
**Process**

5. Use the open-end wrench (size 17) to mount the bushings (outlet side) ④. Tighten the bushings only slightly. The inlays must still be slightly movable when the two pressure plates are joined (see "3.4.3 Reassembling pressure plates and piston guide" on page 35).



**Fig.30:** Slightly tightening of the bushings (outlet side)

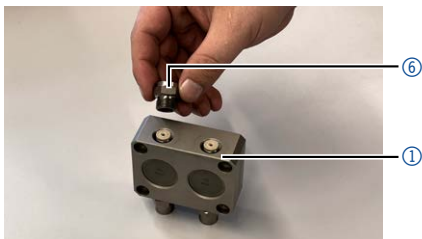
6. Turn around the pressure plate (high-pressure side) ① and replace the check valves (inlet side) ⑤.



**Fig.31:** Inserting the check valves (inlet side)

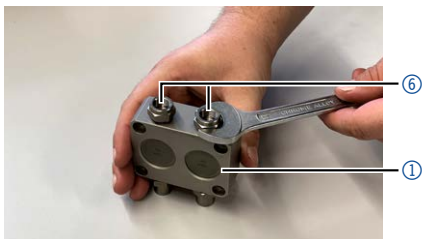
**Process**

7. Mount the bushings (inlet side) ⑥ to the pressure plate (high-pressure side) ①.



**Fig.32:** Mounting the bushings (inlet side)

8. Use the open-end wrench (size 17) to mount the bushings (inlet side) ⑥. Tighten the bushings only slightly. The inlays must still be slightly movable when the two pressure plates are joined (see "3.4.3 Reassembling pressure plates and piston guide" on page 35).



**Fig.33:** Slightly tightening of the bushings (inlet side)

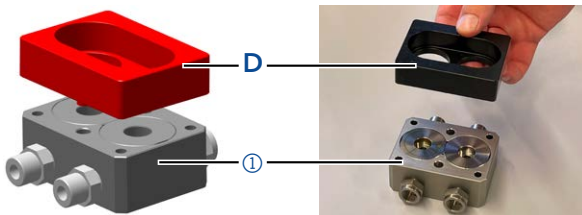
### 3.4.1.2 Replacing the seals in pressure plate (high-pressure side)

An exemplary 100 ml pump head is used to describe how to insert the seals.

**Practical tip:** Place the seals in ethanol or isopropanol for approx. 5 minutes before installation.

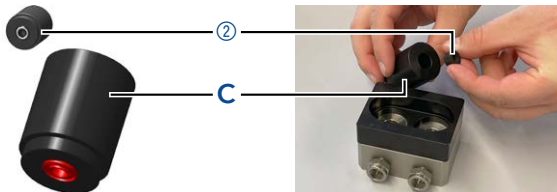
#### Process

1. Insert the adjusting tool **D** into the holes provided for this purpose in the pressure plate (high-pressure side) ①.



**Fig. 34:** Positioning the adjusting tool on the pressure plate

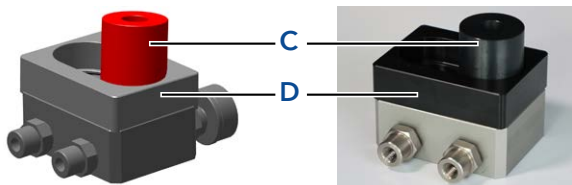
2. Insert the new seal ② into the sealing adapter **C**. Pay attention to the correct direction of the seal. The spring must point downwards.



**Fig. 35:** Inserting the seal in the adapter

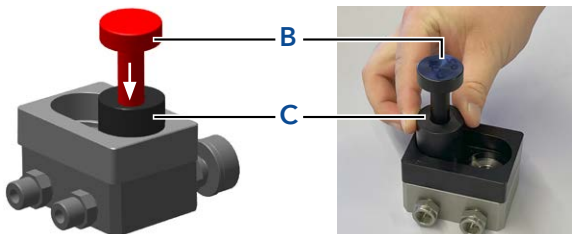
## Process

3. Insert the sealing adapter **C** with seal in the intended opening of the adjusting tool **D**.



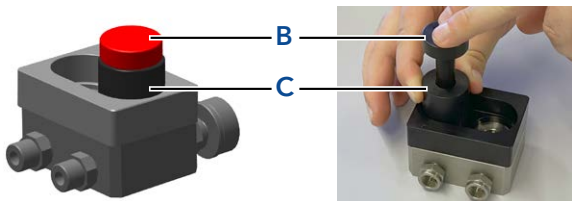
**Fig. 36:** Positioning the sealing adapter in the adjusting tool

4. Insert the sealing tool **B** into the sealing adapter **C**.



**Fig. 37:** Inserting the sealing tool

5. Press the sealing tool **B** down to insert the seal into the inlay.



**Fig. 38:** Pressing the seals into the inlays

---

**Process**

6. Repeat steps 3 and 4 for the second inlay.  
.....
7. Remove the tools **B**, **C** and **D** from the pressure plate.  
.....

**Result:** The pressure plate (high-pressure side) is assembled.

**Next step:** Assembling pressure plate (low-pressure side).

## 3.4.2 Assembling pressure plate (low-pressure side)

### 3.4.2.1 Attaching the o-rings to the seal holders

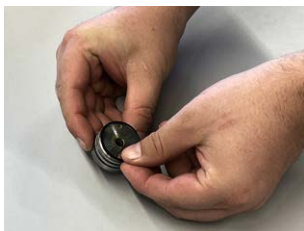
**Practical tip:** Moistening the o-rings with isopropanol supports adhesion.

#### Process

1. Attach to the new o-rings to the seal holders. Place the first o-ring in the narrower of the two ring grooves in the mantle surface of the seal holder.



**Fig. 39:** Attaching the first o-ring to the seal holder



**Fig. 40:** Attaching the second o-ring to the seal holder

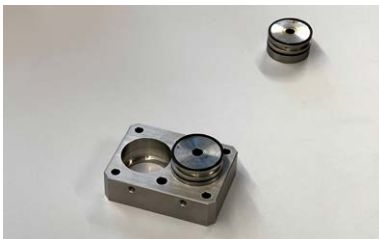


**Note:** You can also attach the second o-ring after you reinserted the seal holders into the pressure plate (low-pressure side), because it can fall out (see next step).



**Process**

2. Reinsert the two seal holders together with the new o-rings into the pressure plate (low-pressure side).



**Fig. 41:** Positioning the seal holder on the pressure plate



**Fig. 42:** Reinserting the seal holder into the pressure plate by hand

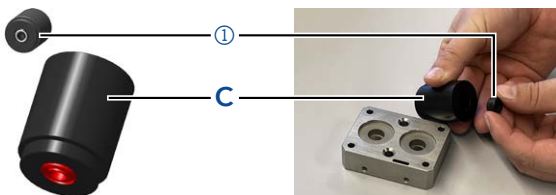
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### 3.4.2.2 Replacing the seals in pressure plate (low-pressure side)

**Practical tip:** Place the seals in ethanol or isopropanol for approx. 5 minutes before installation.

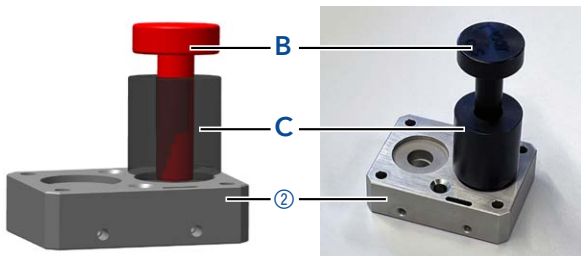
#### Process

1. Insert the new seal ① into the sealing adapter C. Pay attention to the correct direction of the seal. The spring must point downwards.



**Fig.43:** Positioning seal in adapter

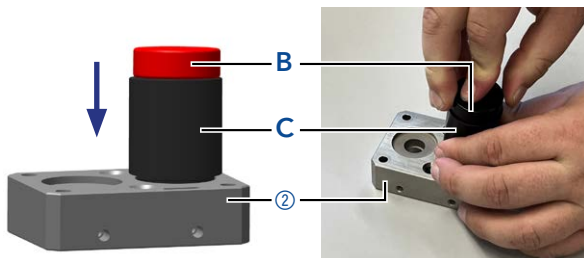
2. Position the sealing adapter C on one of the seal holders in the pressure plate (low-pressure side) ② and insert the sealing tool B into the sealing adapter C.



**Fig.44:** Positioning the sealing adapter on the pressure plate

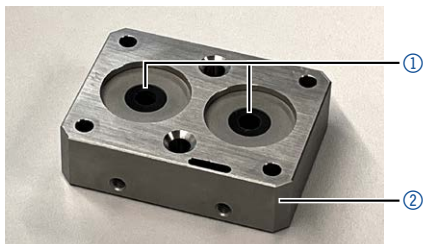
**Process**

3. Press the sealing tool **B** down to insert the new seal into the respective seal holder.



**Fig. 45:** Inserting the seals into the seal holders

4. Repeat the steps 1, 2 and 3 for the second seal holder. Remove the sealing adapter from the pressure plate.

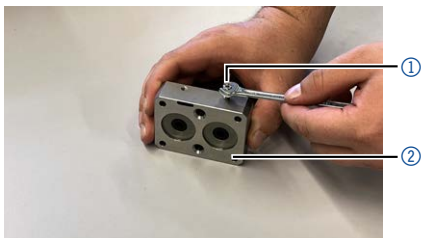


**Fig. 46:** Inserted seals on low-pressure side

### 3.4.2.3 Assembling the fittings of piston backflushing

#### Process

1. Use the open-end wrench (size 1/4") to tighten the fittings of piston backflushing ① on the pressure plate (low-pressure side) ② . Tighten the fittings with a torque of 5 Nm.



**Fig.47:** Tightening the first fitting of piston backflushing

**Result:** The pressure plate (low-pressure side) is assembled.

**Next step:** Reassembling (joining) the two pressure plates and assembling the piston guide.

### 3.4.2.4 Torque values

Use the following torque values to tighten the fittings and capillary connections of the pump head.

Pump head [article no.]	Volume	Bushing inlet/outlet	Capillary connection*	Capillary piston backflushing
E4023-1	100 ml	15 Nm	min. 12 Nm	5 Nm
E4023V2	100 ml	15 Nm	min. 12 Nm	5 Nm
E4023V3	100 ml	27 Nm	min. 12 Nm	5 Nm
E4023V5	100 ml	15 Nm	min. 12 Nm	5 Nm
E4023XA75	100 ml	15 Nm	min. 12 Nm	5 Nm
E4021-1	250 ml	15 Nm	min. 12 Nm	5 Nm
E4021V2	250 ml	15 Nm	min. 12 Nm	5 Nm
E4021XA38	200 ml	15 Nm	min. 12 Nm	5 Nm
E4037-1	500 ml	12 Nm	min. 12 Nm	5 Nm
E4037V2	500 ml	12 Nm	min. 12 Nm	5 Nm
E4037XA38	600 ml	12 Nm	min. 12 Nm	5 Nm
E4022-1	1000 ml	12 Nm	min. 12 Nm	5 Nm
E4022V2	1000 ml	12 Nm	min. 12 Nm	5 Nm
E4022-1XA	1000 ml	12 Nm	min. 12 Nm	5 Nm

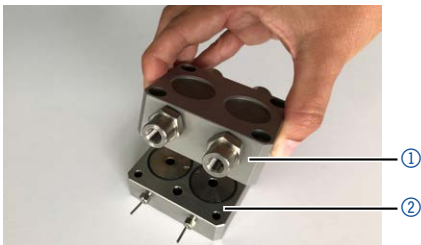
\* For stainless steel capillaries

### 3.4.3 Reassembling pressure plates and piston guide

**Practical tip:** Place the pressure plate (high-pressure side) on the table and place the pressure plate (low-pressure side) on top of it from above. If necessary, press the o-rings into the openings with a finger so that they do not fall out.

#### Process

1. Place the pressure plate (high-pressure side) ① on the pressure plate (low-pressure side) ②. When doing so, make sure that the outlet bushings and the fittings for the piston backflushing point in the same direction and that the o-rings do not slip out of place.

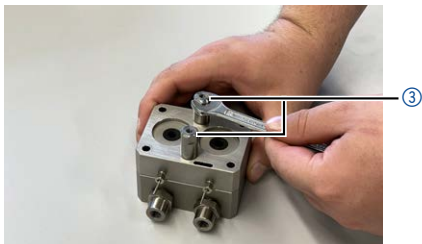


**Fig.48:** Reassembling the pressure plates

2. Hold the two pressure plates together by hand and turn them over. The pressure plate (low-pressure side) must be up so that you can mount the spacing bolts.

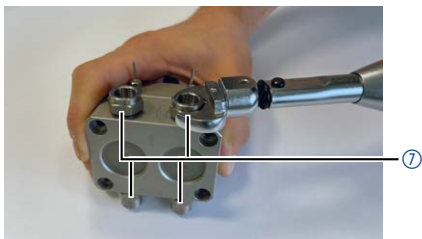
**Process**

3. Use the open-end wrench (size 10) to mount the spacing bolts ③.



**Fig.49:** Mounting the spacing bolts

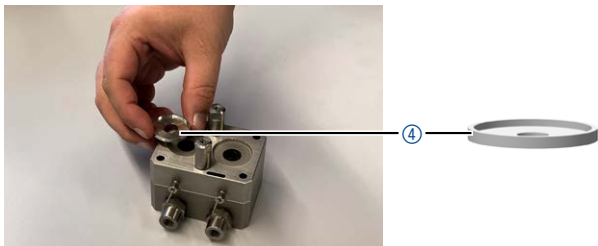
4. Use the open-end torque wrench (size 17) to tighten all bushings ⑦. Note the correct torque value (see table on page 34 for correct torque value).



**Fig.50:** Tightening the bushings (inlet side)

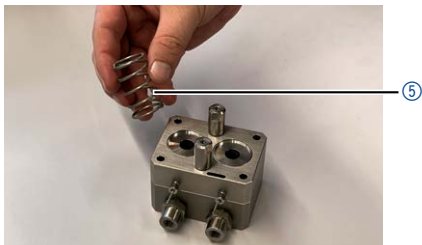
**Process**

5. Insert the washer discs ④ .  
Pay attention to the correct installation direction (see Fig. 51).  
The side with the edge must face up.



**Fig. 51:** Inserting the washer discs

6. Insert the compression springs ⑤ .

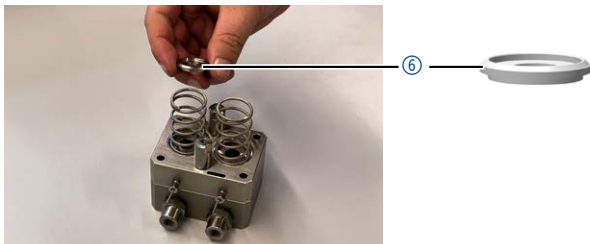


**Fig. 52:** Inserting the compression springs



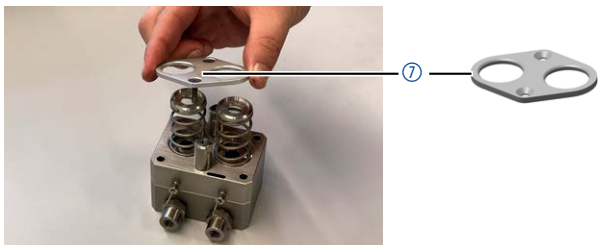
**Process**

7. Insert the pressure rings ⑥ .  
Pay attention to the correct installation direction (see Fig.53).  
The side with the chamfered edge must face up.



**Fig. 53:** Inserting the pressure rings

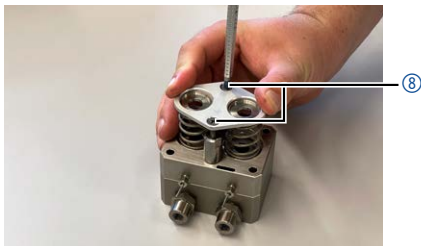
8. Put the retaining plate ⑦ on the pressure rings and compression springs. Pay attention to the correct installation direction (see Fig.54). The retaining plate has counterbore holes for the screws and the chamfered side of the holes must face up.



**Fig. 54:** Replacing the retaining plate

**Process**

9. Press the retaining plate down to prevent the compression springs from jumping out and turn in the screws ⑧ alternately with the screw driver (PH2 or TX20, depending on the pump head). Avoid jamming. Tighten both screws with a torque of 3 Nm.



**Fig. 55:** Screw-on piston guide

**Result:** The pressure plates and the piston guide are reassembled.

**Next step:** Inserting the piston rods.

### 3.4.4 Inserting piston rods

**Practical tip:** Moistening the piston rods with isopropanol supports adhesion.

#### Process

1. Carefully insert the new piston rods ① one after another. Make sure that the piston rods do not tilt.



**Fig. 56:** Inserting the first piston rod



**Fig. 57:** Inserting the second piston rod

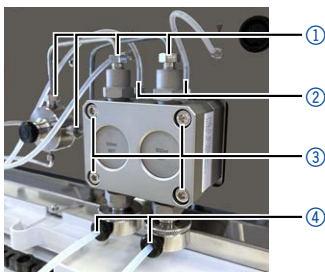
**Result:** The wear parts were replaced and the pump head was reassembled.

**Next step:** Mount the pump head to the pump.

## 3.5 Mounting the pump head to the pump

### Process

1. Hold the pump head by hand. Using the Allen wrench (size 4), turn the four screws ③ alternately by one turn each. Finally tighten the four screws ③.
2. Screw the fittings of the capillaries ① to the pump head outlet bushings and the pressure sensor inlet (finger tight).
3. Connect the tubing of the piston backflushing ②.
4. Connect the tubing ④ to the eluent inlets.
5. Tighten the capillary screw fittings ① at the pump head outlet and at the pressure sensor inlet with a minimum torque of 12 Nm.



**Fig. 58:** Attaching the pump head, the fittings and tubings

**Result:** The pump head is mounted to the pump.

**Next step:** Perform a running-in procedure.

## 4. Running-in procedure

It is mandatory to perform a running-in procedure after a pump head maintenance. For an optimal running-in of the pump head, the pump needs a specific back pressure. This pressure will be produced by a restriction capillary connected after the pressure sensor. Depending on the dimensions of this capillary, different values of the back pressure can be generated.

Refer to the table below for correct running-in parameters. If you have questions contact the KNAUER technical support.

### Prerequisites

- The pump head was installed on the pump.

### Process

1. Choose suitable restriction capillaries and install them on the device.
  2. Connect the pump inlet to the solvent.
  3. Switch on the pump.
  4. Flush the pump.
  5. Start the pump and let it run with the correct running-in parameters (see "4.1 Running-in parameters" on page 43).
  6. After the running-in procedure is completed, the desired solvent can be used.
-

## 4.1 Running-in parameters



**Note:** Using a degasser or a degassed solvent is recommended.

Pump head type	100 ml	250 ml	500 ml	1 000 ml
<b>Article no.</b>	E4023-1 E4023V1 E4023V2 E4023V3 E4023V5	E4021-1 E4021V1 E4021V2	E4037-1 E4037V2	E4022-1 E4022V1 E4022V2
<b>Material*</b>	SSt/Ti	SSt/Ti	SSt/Ti	SSt/Ti
<b>P<sub>max</sub></b> [bar]	400	225	100	75
<b>Backpressure</b>	$\frac{2}{3} - \frac{3}{4}$ of P <sub>max</sub> (valid for all pump head types)			
<b>Flowrate</b> [% of max. flow]	15 - 30%	15 - 30%	15 - 30%	15 - 30%
<b>Running-in time</b> [min]	20	20	20	20
<b>Solvent</b>	EtOH 100%	EtOH:H <sub>2</sub> O 80:20	EtOH:H <sub>2</sub> O 80:20	EtOH:H <sub>2</sub> O 80:20

\* SSt = stainless steel, Ti = titanium



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