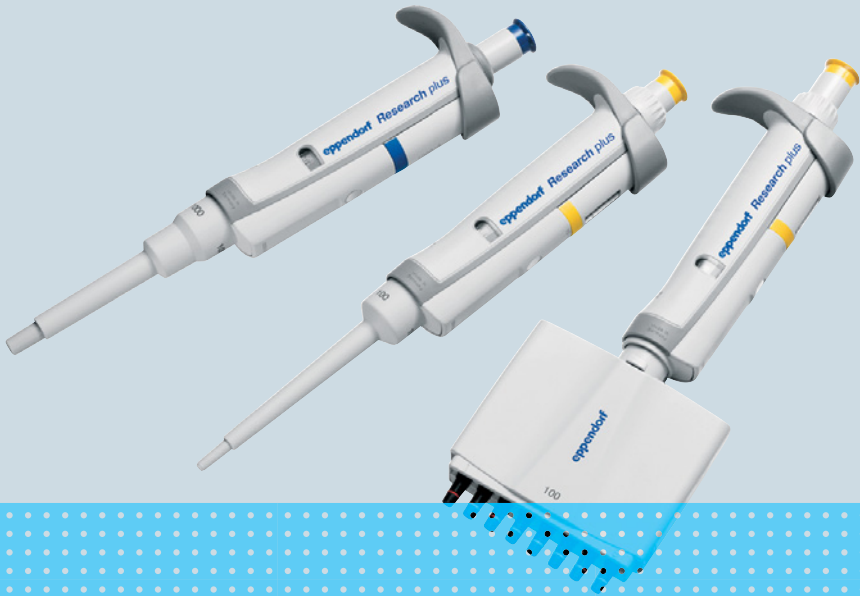


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## Eppendorf Research<sup>®</sup> plus

Operating manual

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**Table of contents**

<b>1</b>	<b>Operating instructions</b>	<b>7</b>
1.1	Using this manual	7
1.2	Danger symbols and danger levels	7
1.2.1	Danger symbols	7
1.2.2	Danger levels	7
1.3	Symbols used	7
1.4	Other applicable documents	8
<b>2</b>	<b>Safety</b>	<b>9</b>
2.1	Intended use	9
2.2	Warnings for intended use	9
<b>3</b>	<b>Product description</b>	<b>11</b>
3.1	Delivery package	11
3.1.1	Accessories – single-channel pipettes	11
3.1.2	Accessories – multi-channel pipettes	11
3.2	Features	11
3.2.1	Pipette models	12
3.3	Product overview	12
3.3.1	Multi-channel lower part with fixed cone spacing	13
3.4	Materials	14
<b>4</b>	<b>Operation</b>	<b>15</b>
4.1	Setting the volume	15
4.1.1	Setting a small volume	15
4.1.2	Setting a large volume	15
4.1.3	Reading the set volume	15
4.2	Attaching the pipette tips	16
4.3	Optimum immersion depths	16
4.4	Forward pipetting	17
4.4.1	Aspirating liquid	17
4.4.2	Dispensing liquid	17
4.4.3	Ejecting the pipette tip	17
4.5	Reverse pipetting	17
4.5.1	Aspirating liquid	17
4.5.2	Dispensing liquid	18
4.5.3	Ejecting the pipette tip	18
4.6	Storing the pipette	18

<b>5</b>	<b>Troubleshooting</b> .....	<b>19</b>
5.1	Error search .....	19
5.1.1	Control button .....	19
5.1.2	Dispensing .....	19
5.1.3	Pipette tip .....	20
5.1.4	Tip cone .....	20
<b>6</b>	<b>Maintenance</b> .....	<b>21</b>
6.1	Service options .....	21
6.2	Disassembling the single-channel pipette $\leq 1000 \mu\text{L}$ .....	21
6.2.1	Removing the lower part .....	21
6.2.2	Disassembling the lower part .....	22
6.3	Disassembling the single-channel pipette $\geq 2.5 \text{ mL}$ .....	23
6.3.1	Removing the lower part .....	23
6.3.2	Disassembling the lower part .....	24
6.4	Assembling the single-channel pipette $\leq 1000 \mu\text{L}$ .....	24
6.5	Assembling the single-channel pipette $\geq 2 \text{ mL}$ .....	24
6.5.1	Assembling the lower part .....	24
6.5.2	Checking the function .....	24
6.6	Replacing the protection filter $\geq 2 \text{ mL}$ .....	25
6.7	Disassembling the multi-channel pipette $\leq 300 \mu\text{L}$ .....	26
6.7.1	Removing the lower part .....	26
6.7.2	Opening the lower part .....	26
6.7.3	Removing the channel .....	26
6.7.4	Assembling the multi-channel lower part .....	27
6.7.5	Checking the function .....	27
6.8	Disassembling the multi-channel lower part $1200 \mu\text{L}$ .....	28
6.8.1	Assembling the multi-channel lower part $1200 \mu\text{L}$ .....	29
6.9	Disassembling the multi-channel lower part – $4.5 \text{ mm}$ cone spacing .....	29
6.9.1	Opening the multi-channel lower part .....	29
6.9.2	Removing pistons .....	29
6.9.3	Removing the cylinder block .....	29
6.10	Assembling the multi-channel lower part – $4.5 \text{ mm}$ cone spacing .....	30
6.10.1	Inserting the cylinder block .....	30
6.10.2	Insert the pistons .....	31
6.10.3	Closing the multi-channel lower part .....	31
6.11	Replacing O-rings – multi-channel lower part .....	32
6.11.1	Removing the O-ring .....	32
6.11.2	Mounting a new O-ring – $100 \mu\text{L}$ and $300 \mu\text{L}$ .....	32
6.11.3	Mounting a new O-ring – $1200 \mu\text{L}$ .....	32
6.12	Adjusting the pipette .....	33
6.13	Cleaning .....	33
6.13.1	Cleaning and disinfecting the pipette .....	33
6.13.2	Cleaning and disinfecting the lower part .....	33
6.13.3	Sterilizing the pipette with UV light .....	34

6.14	Autoclaving the pipette . . . . .	34
6.14.1	Autoclaving . . . . .	34
6.15	Decontamination before shipment . . . . .	35
6.16	Lubricating the piston or cylinder . . . . .	36
6.16.1	Lubricating the piston . . . . .	36
6.16.2	Lubricating the cylinder . . . . .	36
<b>7</b>	<b>Technical data . . . . .</b>	<b>37</b>
7.1	Adjustable sub-steps – single-channel pipettes . . . . .	37
7.2	Adjustable sub-steps – multi-channel pipettes . . . . .	37
7.3	Ambient conditions . . . . .	37
<b>8</b>	<b>Measurement deviations according to Eppendorf SE . . . . .</b>	<b>38</b>
8.1	Single-channel pipettes with fixed volume setting . . . . .	38
8.2	Single-channel pipettes with variable volume setting . . . . .	39
8.3	Multi-channel pipettes with fixed cone spacing . . . . .	40
8.4	Test conditions . . . . .	41
<b>9</b>	<b>Ordering information . . . . .</b>	<b>42</b>
9.1	Single-channel pipettes with fixed volume setting . . . . .	42
9.2	Single-channel pipettes with variable volume setting . . . . .	42
9.3	Multi-channel pipettes with fixed cone spacing . . . . .	43
9.3.1	9 mm cone spacing for 96-well plates . . . . .	43
9.3.2	4.5 mm cone spacing for 384-well plates . . . . .	43
9.4	Spare parts, accessories and pipette tips . . . . .	43

<b>6</b>	<b>Table of contents</b> Eppendorf Research® plus English (EN)
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## 1 Operating instructions






### 1.1 Using this manual

- ▶ Read this operating manual completely before using the device for the first time. Observe the instructions for use of the accessories where applicable.
- ▶ This operating manual is part of the product. Please keep it in a place that is easily accessible.
- ▶ Enclose this operating manual when transferring the device to third parties.
- ▶ The current version of the operating manual for all available languages can be found on our webpage [www.eppendorf.com/manuals](http://www.eppendorf.com/manuals).

### 1.2 Danger symbols and danger levels

#### 1.2.1 Danger symbols


The safety instructions in this manual have the following danger symbols and danger levels:

	<b>Biohazard</b>		<b>Explosive substances</b>
	<b>Toxic substances</b>		<b>Material damage</b>
	<b>Hazard point</b>		

#### 1.2.2 Danger levels

<b>DANGER</b>	<i>Will</i> lead to severe injuries or death.
<b>WARNING</b>	<i>May</i> lead to severe injuries or death.
<b>CAUTION</b>	May lead to light to moderate injuries.
<b>NOTICE</b>	May lead to material damage.

### 1.3 Symbols used

Depiction	Meaning
1. 2.	Actions in the specified order
▶	Actions without a specified order
•	List
<i>Text</i>	Display or software texts
	Additional information

#### **1.4 Other applicable documents**

- Research plus chemical resistance
- Research plus user adjustment
- Research plus factory adjustment
- SOP - Standard operating procedure for manual dispensing systems



## 2 Safety

### 2.1 Intended use

The pipette "Eppendorf Research plus" is a product for general laboratory use intended for transferring liquids in the specified volume range in combination with matching tips. In-vivo applications (in or on the human body) are not allowed. Only users trained according to the manual are allowed to use the pipette "Eppendorf Research plus". All users must read the operating manual carefully and familiarize themselves with the device's mode of operation.

### 2.2 Warnings for intended use

---



**WARNING! Damage to health due to infectious liquids and pathogenic germs.**

- ▶ When handling infectious liquids and pathogenic germs, observe the national regulations, the biosafety level of your laboratory, and the manufacturers' Safety Data Sheets and application notes.
- ▶ Wear your personal protective equipment.
- ▶ For comprehensive regulations about handling germs or biological material of risk group II or higher, please refer to the "Laboratory Biosafety Manual" (source: World Health Organization, Laboratory Biosafety Manual, in the currently valid version).



**WARNING! Damage to health due to toxic, radioactive or aggressive chemicals.**

- ▶ Wear your personal protective equipment.
- ▶ Observe the national regulations for handling these substances.
- ▶ Observe the manufacturer's Safety Data Sheets and application notes.



**CAUTION! Danger to people due to grossly negligent use.**

- ▶ Never point the opening of the device towards yourself or others.
- ▶ Only initiate liquid dispensing if it is safe to do so.
- ▶ For all dispensing tasks, make sure that you are not endangering yourself or anyone else.

**CAUTION! Poor safety due to incorrect accessories and spare parts.**

The use of accessories and spare parts other than those recommended by Eppendorf may impair the safety, functioning and precision of the device. Eppendorf cannot be held liable or accept any liability for damage resulting from the use of accessories and spare parts other than those recommended or from improper use.

- ▶ Only use accessories and original spare parts recommended by Eppendorf.
- 

**NOTICE! Damage to device due to missing pipette tips.**

- ▶ Use the pipette with fitted pipette tips only.

**NOTICE! Carry-over, contamination and incorrect dispensing results due to the incorrect use of pipette tips.**

The pipette tips are for single use only. Prolonged use can have a negative impact on dispensing tasks.

- ▶ Only use the pipette tips once.

**NOTICE! Incorrect dispensing volume with special liquids and due to temperature differences.**

Solutions with physical data very different to that of water or temperature differences between the pipette, pipette tip and liquid may result in incorrect dispensing volumes.

- ▶ Avoid temperature differences between the pipette, pipette tip and liquid.

**NOTICE! Damage to device due to penetration of liquid.**

- ▶ Only immerse the pipette tip in the liquid.
  - ▶ Do not put the pipette down when the pipette tip is filled.
  - ▶ The pipette itself may not come into contact with the liquid.
-

### 3 Product description

#### 3.1 Delivery package

Quantity	Description
1	Research plus
1	Adjustment tool (Allen key with a blue handle)
5	Red adjustment seal
1	Pin (remove the safety plug)
1	Grease for pipettes
1	Operating manual
1	Certificate

#### 3.1.1 Accessories – single-channel pipettes

Quantity	Description
1	Locking ring ( $\leq 1000 \mu\text{L}$ )
10	Protection filter (2.5 mL – 10 mL)
1	Pipette wrench (2.5 mL – 10 mL)

#### 3.1.2 Accessories – multi-channel pipettes

Quantity	Description
1	Multi-channel tool 100/300 (100 $\mu\text{L}$ and 300 $\mu\text{L}$ )
1	Multi-channel tool 1200 (1200 $\mu\text{L}$ )
1	Unlocking tool (1200 $\mu\text{L}$ )
2	Locking clip (8-channel lower part with 10 $\mu\text{L}$ , 100 $\mu\text{L}$ and 300 $\mu\text{L}$ )
3	Locking clip (12-channel lower part with 10 $\mu\text{L}$ , 100 $\mu\text{L}$ and 300 $\mu\text{L}$ )

### 3.2 Features

The Eppendorf Research plus pipette is a piston-stroke pipette for aspirating and dispensing liquids. The pipette operates according to the air cushion principle. A suitable pipette tip must be fitted prior to use. The dispensing and volume setting ring are controlled with the dispensing button. The pipette tips are ejected with the separate ejector. Depending on the model, volumes between 0.1  $\mu\text{L}$  and 10 mL can be dispensed.

**Product description**

Eppendorf Research® plus  
English (EN)

**3.2.1 Pipette models**

Different variants are available:

- Single-channel pipettes with fixed volume setting
- Single-channel pipettes with variable volume setting
- Multi-channel pipettes with 8 or 12 channels with fixed cone spacing and variable volume setting
- Multi-channel pipettes with 16 or 24 channels with fixed cone spacing (4.5 mm) and variable volume setting

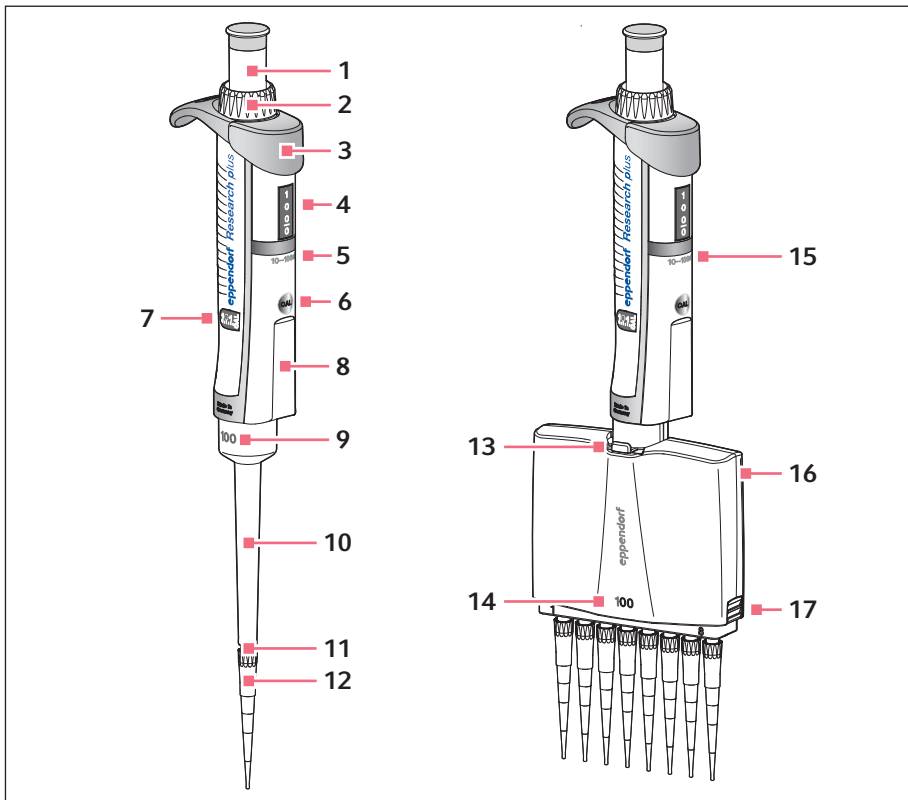
**3.3 Product overview**

Fig. 3-1: Single-channel pipette and multi-channel pipette

- |   |   |    |  |
|---|---|----|--|
| 1 | Dispensing button                             | 10 | Ejector sleeve                               |
| 2 | Volume setting ring                           | 11 | Tip cone                                     |
| 3 | Ejector                                       | 12 | Pipette tip                                  |
| 4 | Volume display                                | 13 | Lever  |
| 5 | Single-channel upper part with nominal volume | 14 | Multi-channel lower part with nominal volume |
| 6 | Adjustment opening                            | 15 | Multi-channel upper part with nominal volume |
| 7 | Adjustment display                            | 16 | Housing lid                                  |
| 8 | Labeling area                                 | 17 | Latch  |
| 9 | Single-channel lower part with nominal volume |    | Opening the lower part                       |

### 3.3.1 Multi-channel lower part with fixed cone spacing

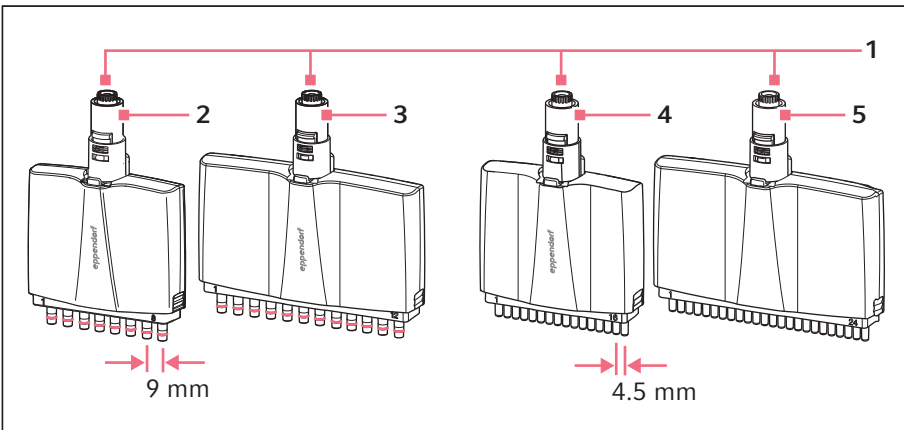


Fig. 3-2: Multi-channel lower parts with fixed cone spacing

- |   |  |   |   |
|---|--|---|---|
| 1 | <b>Mechanical coupling</b>   | 4 | <b>16-channel lower part</b><br>4.5 mm cone spacing for 384-well plates |
| 2 | <b>8-channel lower part</b><br>9 mm cone spacing for 96-well plates  | 5 | <b>24-channel lower part</b><br>4.5 mm cone spacing for 384-well plates |
| 3 | <b>12-channel lower part</b><br>9 mm cone spacing for 96-well plates |   |   |

**Product description**

Eppendorf Research® plus  
English (EN)

**3.4 Materials**

**NOTICE! Aggressive substances may damage components, consumables and accessories.**

- ▶ Check the chemical resistance before using organic solvents or aggressive chemicals.
- ▶ Only use liquids whose vapors do not attack the materials used.

The components of the pipette which can be accessed by the user are made of the following materials:

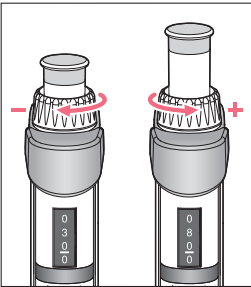
<b>Assembly</b>	<b>Material</b>
External surfaces of the upper part	<ul style="list-style-type: none"> <li>• Improved polypropylene (PP)</li> <li>• Polycarbonate (PC)</li> <li>• Polyetherimide (PEI)</li> <li>• Foil</li> </ul>
Viewing window	<ul style="list-style-type: none"> <li>• Polycarbonate (PC)</li> </ul>
Exterior and interior of lower parts	<ul style="list-style-type: none"> <li>• Improved polypropylene (PP)</li> <li>• Polyvinylidene fluoride (PVDF)</li> <li>• Polyetherimide (PEI)</li> <li>• Polyphenylene sulfide (PPS)</li> <li>• Polyetheretherketone (PEEK)</li> <li>• Polytetrafluoroethylene (PTFE)</li> <li>• Ethylene propylene diene rubber (EPDM)</li> <li>• Silicone</li> <li>• Steel (stainless steel and spring steel)</li> </ul>



You can find information on the resistance to chemicals on our webpage [www.eppendorf.com/manuals](http://www.eppendorf.com/manuals).

**4 Operation**  
**4.1 Setting the volume**  
**4.1.1 Setting a small volume**

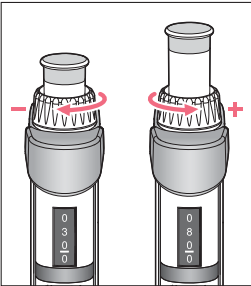
**i** Set the volume from a high to a low value.



1. Turn the volume setting ring clockwise. The set volume is shown on the volume display.

**4.1.2 Setting a large volume**

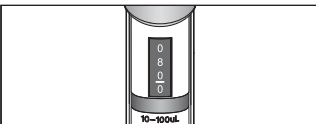
**i** Set the volume from a high to a low value.



1. Turn the volume setting ring counterclockwise. The set volume is shown on the volume display.

**4.1.3 Reading the set volume**

The volume is shown on the volume display. The decimal place is under the hyphen.

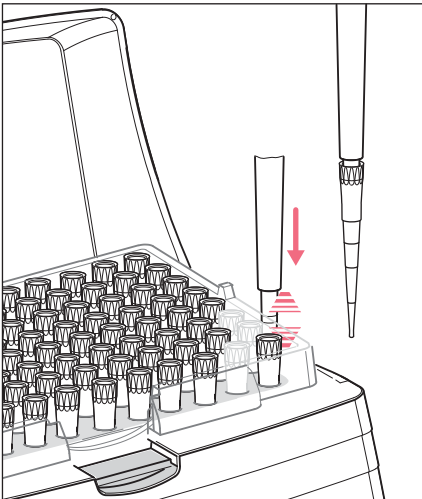


1. Read the volume from top to bottom. Set volume: 80 µL.

## 4.2 Attaching the pipette tips

The pipette tip can be attached by hand or mounted directly from a tip holder (tray) with the pipette.

- i** The pipette tips are single-use items.
- i** The control button and the trays are color-coded. The color marks the pipette size and the volume of the pipette tip (epT.I.P.S.).



1. Insert the tip cone into the pipette tip using light force.

## 4.3 Optimum immersion depths

Volume	Immersion depth
0.1 $\mu\text{L}$ – 1 $\mu\text{L}$	1 mm
1 $\mu\text{L}$ – 100 $\mu\text{L}$	2 mm – 3 mm
100 $\mu\text{L}$ – 1000 $\mu\text{L}$	2 mm – 4 mm
1 mL – 10 mL	3 mm – 5 mm



## 4.4 Forward pipetting

### 4.4.1 Aspirating liquid

Prerequisites

- The pipette tip has been attached.

**i** To ensure maximum precision and accuracy, we recommend initially wetting each new tip by aspirating and dispensing the liquid one to three times.

1. Press down the dispensing button to the first stop.
2. Immerse the pipette tip vertically in the liquid.
3. Maintain the immersion depth and let the dispensing button slide back slowly. Liquid is aspirated into the pipette tip.
4. Wait until the liquid has been aspirated.
5. Remove the pipette tip from the liquid.

**i** If necessary, wipe the pipette tip against the tube inner wall.

### 4.4.2 Dispensing liquid

1. Place the pipette tip on the tube inner wall at a steep angle.
2. Slowly press down the dispensing button to the first stop. The liquid is dispensed.
3. Wait until the flow of liquid stops.
4. Press down the dispensing button to the second stop. The pipette tip is completely emptied.
5. Hold down the dispensing button and wipe the pipette tip on the tube inner wall.

### 4.4.3 Ejecting the pipette tip

- ▶ Press the ejector.  
The pipette tip is ejected.

## 4.5 Reverse pipetting

An additional volume (blow out) is aspirated when performing reverse pipetting. This can improve dispensing results for viscous or foaming liquids. Volume limits may occur when using filter tips.

### 4.5.1 Aspirating liquid

1. Press down the dispensing button to the second stop.
2. Immerse the pipette tip vertically in the liquid.
3. Maintain the immersion depth and let the dispensing button slide back slowly. Liquid is aspirated into the pipette tip.
4. Wait until the liquid has been aspirated.
5. Remove the pipette tip from the liquid.

**i** If necessary, wipe the pipette tip against the tube inner wall.

### **4.5.2 Dispensing liquid**

1. Place the pipette tip on the tube inner wall at a steep angle.
2. Slowly press down the dispensing button to the first stop.  
The liquid is dispensed.
3. Wait until the flow of liquid stops.
4. Hold down the dispensing button and wipe the pipette tip on the tube inner wall.  
Residual liquid remains in the pipette tip.  
During dispensing, the additional volume (blow out) does not belong to the dispensing volume.

### **4.5.3 Ejecting the pipette tip**

1. Press down the dispensing button to the second stop.  
The residual liquid is dispensed.  
The residual liquid can be discarded.
2. Press the ejector.  
The pipette tip is ejected.

### **4.6 Storing the pipette**

The pipette can be stored in a pipette carousel, a wall mount or in horizontal position.

**5 Troubleshooting**  
**5.1 Error search**

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
The adjustment seal has been removed; the adjustment display has been changed.	The pipette has been adjusted for a different liquid.	Adjust the pipette for the liquid used.

**5.1.1 Control button**

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
The control button jams and does not move smoothly.	<ul style="list-style-type: none"> <li>• The piston is contaminated.</li> <li>• The seal is dirty.</li> <li>• The seal is defective.</li> <li>• The pipette is blocked.</li> </ul>	<ul style="list-style-type: none"> <li>▶ Clean the lower part.</li> <li>▶ Replace the protection filter (2.5 mL – 10 mL).</li> </ul>

**5.1.2 Dispensing**

<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Liquid is dripping from the tip and/or the dispensed volume is incorrect.	Pipette tip is loose.	<ul style="list-style-type: none"> <li>▶ Firmly attach the pipette tip</li> <li>▶ Deactivate the spring-loaded action.</li> <li>▶ Use epT.I.P.S. pipette tips.</li> <li>▶ For 2.5 mL, 5 mL and 10 mL ep Dualfilter T.I.P.S. pipette tips, work without a protection filter in the pipette.</li> </ul>
	Liquid with high vapor pressure and/or different density.	Wet the tip several times and adjust the pipette for the liquid used.
	Pipetting was too quick.	Move the control button slowly.
	The tip is withdrawn from the liquid too quickly.	Withdraw the tip slowly and with a time delay (approx. 3 seconds) from the liquid.
	Liquid aspirated with blow out and dispensed with blow out.	Repeat dispensing correctly.
	The piston is contaminated.	Clean and grease the piston.
	The tip cone is damaged.	Replace the lower part or channel.

Problem	Cause	Solution
	The O-rings of the tip cones are damaged.	Replace the O-rings (100 µL, 300 µL and 1200 µL multi-channel).

### 5.1.3 Pipette tip

Problem	Cause	Solution
Pipette tip is loose.	The pipette tip is not compatible.	<ul style="list-style-type: none"> <li>▶ Use epT.I.P.S. pipette tips.</li> <li>▶ Use a suitable size.</li> </ul>
	Higher attachment forces are required.	<ul style="list-style-type: none"> <li>▶ Firmly attach the pipette tip.</li> <li>▶ Deactivate the spring-loaded action.</li> </ul>
Liquid is dripping from the tip and/or the dispensed volume is incorrect.	The piston is damaged.	Replace the piston.

### 5.1.4 Tip cone

Problem	Cause	Solution
No spring-loaded action of the tip cone.	The spring-loaded action is blocked.	<ul style="list-style-type: none"> <li>▶ Remove the locking ring (single-channel).</li> <li>▶ Remove the locking clip (multi-channel).</li> </ul>
	Use of a 2.5 mL, 5 mL, 10 mL or 1200 µL pipette.	The tip cone of these sizes does not have spring-loading action.

To prevent dispensing errors, regularly check the precision and accuracy of the pipette.



The gravimetric test and the conversion of the measured values for the volume are described in the document *“Standard operating procedure for manual dispensing systems”*. The document is available on the webpage [www.eppendorf.com/manuals](http://www.eppendorf.com/manuals).

**6 Maintenance**  
**6.1 Service options**

Eppendorf recommends having your device checked and maintained by trained specialist personnel at regular intervals.

Eppendorf offers you tailor-made service solutions for the preventive maintenance, qualification and calibration of your device. For information, offers and contact options, please visit [www.eppendorf.com/epservices](http://www.eppendorf.com/epservices).

**6.2 Disassembling the single-channel pipette ≤ 1000 µL**

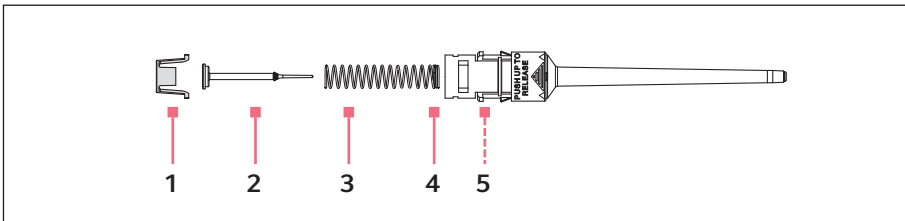
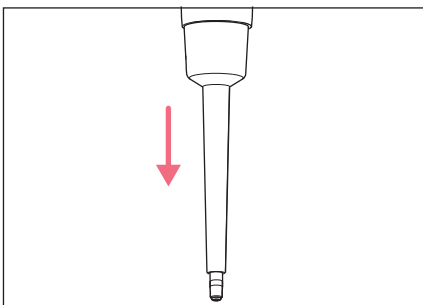


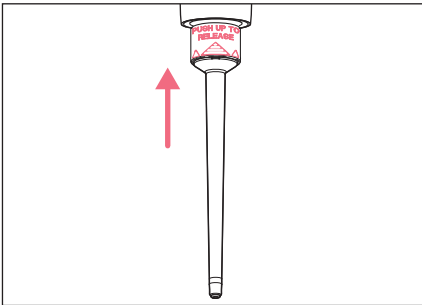
Fig. 6-1: Single-channel lower part ≤ 1000 µL

- |   |   |
|---|---|
| <p><b>1 Piston mount</b></p> <p><b>2 Piston</b></p> <p><b>3 Piston spring</b></p> | <p><b>4 Double coil</b></p> <p><b>5 Cylinder (internal)</b></p> |
|---|---|

**6.2.1 Removing the lower part**



1. Press the dispensing button completely down and hold.
2. Remove the ejector sleeve and release the dispensing button.

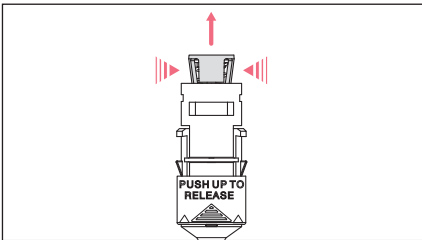


3. Push the ring **PUSH UP TO RELEASE** upward until the lower part is detached.
4. Take out the lower part.

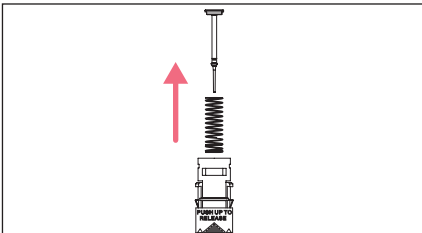
### 6.2.2 Disassembling the lower part

#### Prerequisites

- The ejector sleeve has been removed.
- The lower part has been removed from the upper part.



1. Slightly squeeze the stop pins at the piston mount.
2. Remove the piston mount.



3. Remove the piston spring and the piston.
4. Remove the piston from the piston spring (not possible for pipettes with blue dispensing button).

### 6.3 Disassembling the single-channel pipette $\geq 2.5$ mL

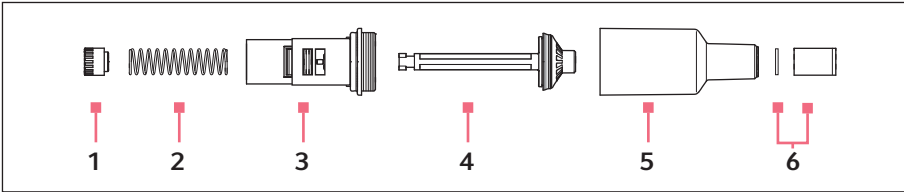
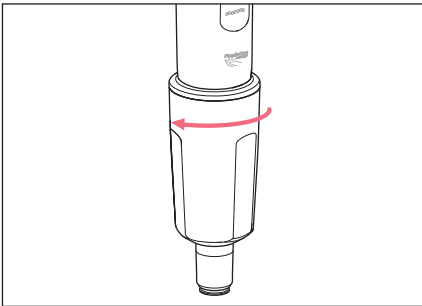


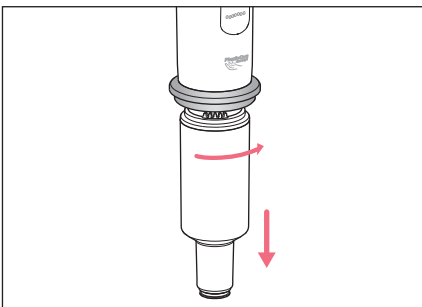
Fig. 6-2: Single-channel lower part  $\geq 2.5$  mL

- |                        |   |
|------------------------|---|
| <b>1</b> Piston mount  | <b>4</b> Piston                               |
| <b>2</b> Piston spring | <b>5</b> Cylinder with tip cone               |
| <b>3</b> Piston guide  | <b>6</b> Filter sleeve with protection filter |

#### 6.3.1 Removing the lower part



1. Unscrew the ejector sleeve.

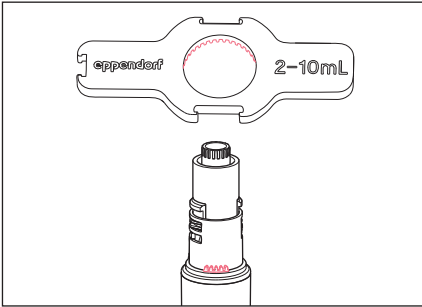


2. Keep the dispensing button fully pressed.
3. Turn the lower part approximately 30° to the right.  
The lower part is released from the upper part.

### 6.3.2 Disassembling the lower part

#### Prerequisites

- The lower part is removed.



1. Fit the pipette wrench onto the lower part.
2. Hold the cylinder and unscrew it from the lower part.

### 6.4 Assembling the single-channel pipette $\leq 1000 \mu\text{L}$

1. Insert the piston spring.



If using piston springs with double coil, this must point down.

2. Carefully insert the piston into the cylinder from the top.
3. Compress the piston spring with piston and hold.
4. Squeeze the stop pins at the piston mount and attach them.
5. Press on the piston from above and check for free movement.  
The piston must be able to move freely without resistance.
6. Insert the lower part into the upper part until it engages.
7. Fit the ejector sleeve.

### 6.5 Assembling the single-channel pipette $\geq 2 \text{ mL}$

#### 6.5.1 Assembling the lower part

1. Insert the piston into the piston guide.
2. Insert the piston spring into the piston guide.
3. Attach the piston mount and press the piston spring into the piston guide.
4. Turn the piston mount by  $90^\circ$  and let it engage.
5. Insert the lower part into the upper part until it engages.
6. Attach and tighten the ejector sleeve.

#### 6.5.2 Checking the function

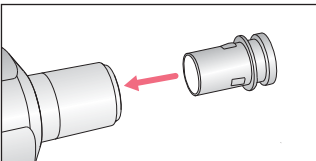
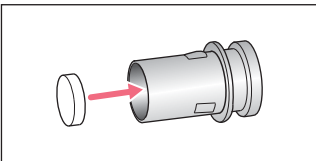
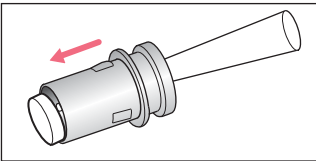
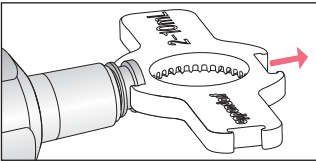
This inspection ensures that the pipette has been assembled correctly.

- ▶ Carry out a gravimetric test of the systematic and random errors.

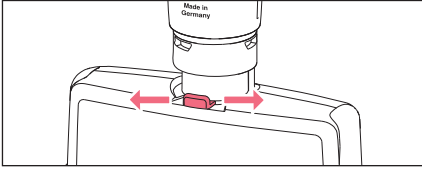


## 6.6 Replacing the protection filter $\geq 2$ mL

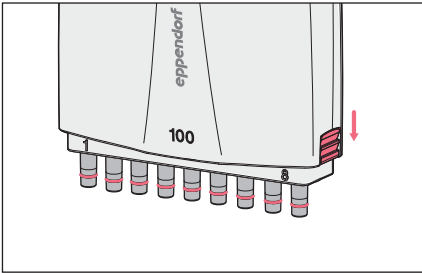
The protection filter in the tip cone must be replaced after every contact with liquids.



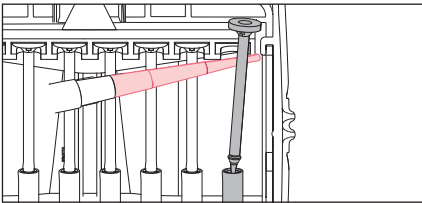
1. Place a pipette wrench with the appropriate opening onto the filter sleeve.
2. Pull out the filter sleeve.
3. Use a pipette tip to push out the filter.
4. Clean the filter sleeve.
5. Insert a new protection filter into the filter sleeve.
6. Insert the filter sleeve in the tip cone.

**6.7 Disassembling the multi-channel pipette  $\leq 300 \mu\text{L}$** **6.7.1 Removing the lower part**

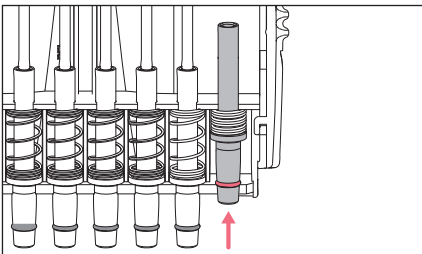
1. Set the volume to the nominal volume.
2. Move the lever to one side and hold. This unlocks the lower part.
3. Remove the lower part.

**6.7.2 Opening the lower part**

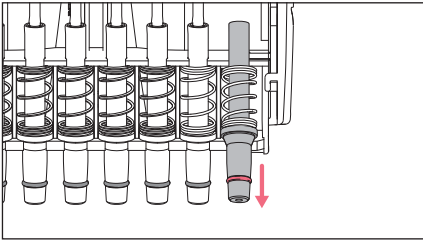
1. Hold the lower part with the lever pointing downward.
2. Push the side latch upward and remove the latch.
3. Remove the cover plate.

**6.7.3 Removing the channel**

1. Carefully release the piston from the upper rail and move it upward to remove.



2. Slightly push the tip cone in and remove it from the lower rail.



3. Decompress the spring and pull the cylinder with the spring out of the center rail.

#### 6.7.3.1 Fitting the channel

1. Insert the spring with the cylinder into the center rail.
2. Compress the spring with the cylinder and insert the cylinder into the lower rail.
3. Insert the piston into the cylinder.
4. Insert the piston into the upper rail.

#### 6.7.4 Assembling the multi-channel lower part

1. Attach the cover plate.
2. Attach the side latches and slide them down.
3. Insert the lower part into the upper part until it engages.

#### 6.7.5 Checking the function

This inspection ensures that the pipette has been assembled correctly.

- ▶ Carry out a gravimetric test of the systematic and random errors.

## 6.8 Disassembling the multi-channel lower part 1200 µL

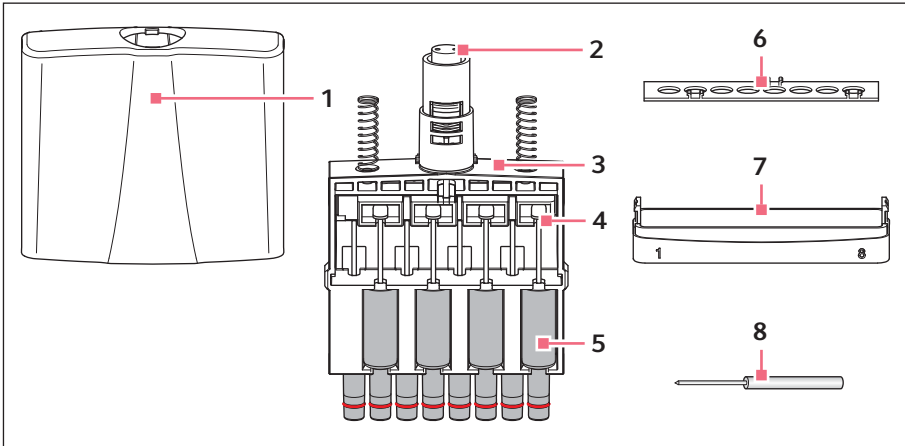


Fig. 6-3: Multi-channel lower part 1200 µL

- |                   |                  |
|-------------------|------------------|
| 1 Housing case    | 5 Fixing strip   |
| 2 Piston actuator | 6 Fixing strip   |
| 3 Inner part      | 7 Bottom panel   |
| 4 Piston          | 8 Unlocking tool |

1. To unlock the lower part, press the ejector and turn the lower part to the left or to the right.  
Detach the lower part from the upper part.

**i** The ejector rail is attached with two hooks to the housing case.

2. To release the hook on the left side, insert the unlocking tool from below into the left bore of the ejector rail.
3. Keep the housing case open.
4. To release the hook on the right side, insert the unlocking tool from below into the right bore of the ejector rail.
5. Remove the ejector rail.
6. Remove the housing case upwards.

**i** The fixing strip is fixed at 3 points. No tool is required for disengaging the connection.

7. Remove the fixing strip.
8. Push the piston mount down.
9. Remove the piston with the cylinder and the O-ring.
10. Remove the piston from the cylinder.
11. Remove the sealing ring from the piston.

### 6.8.1 Assembling the multi-channel lower part 1200 µL

- Attach the housing case in such a way that the toothed rings in the housing case and the toothed rings on the interior part of the housing do not overlap.

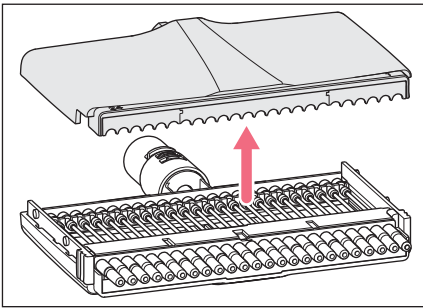
1. Assemble the lower part in reverse order.

### 6.9 Disassembling the multi-channel lower part – 4.5 mm cone spacing

#### 6.9.1 Opening the multi-channel lower part

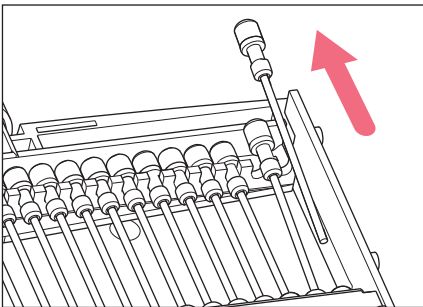
Prerequisites

- The lower part is detached from the pipette upper part.



1. Slide both latches on the sides of the lower part down.
2. Remove the housing lid.

#### 6.9.2 Removing pistons

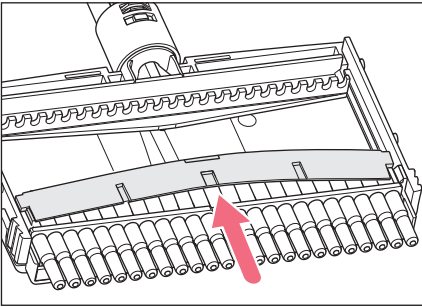


1. Lift the piston out of the piston mount.
2. Pull the piston out of the cylinder.

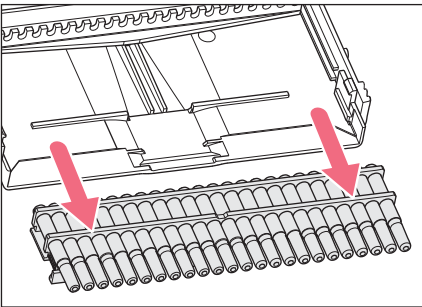
#### 6.9.3 Removing the cylinder block

Prerequisites

- All pistons are removed.



1. Lift the clamping bar at its center and remove it.



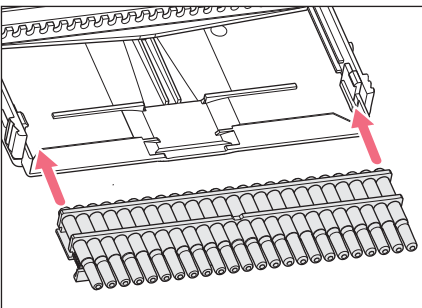
2. Slide the cylinder block straight down and out of the housing case. The lower part can be cleaned.

## 6.10 Assembling the multi-channel lower part – 4.5 mm cone spacing

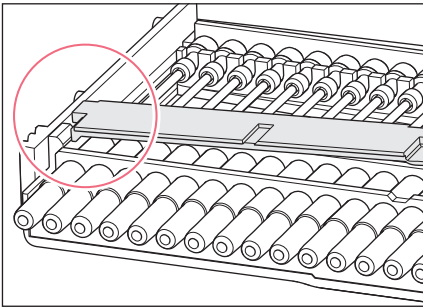
### 6.10.1 Inserting the cylinder block

#### Prerequisites

- All pistons are removed.

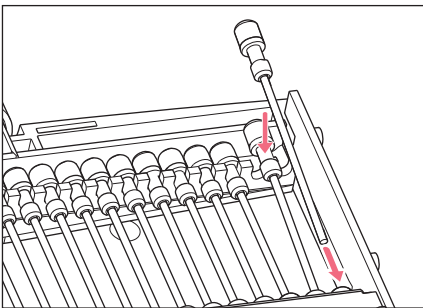


1. Insert the cylinder block straight into the housing case.
2. Slide the cylinder block straight into the housing case. The cylinder block needs to be flush with the edge of the housing case.



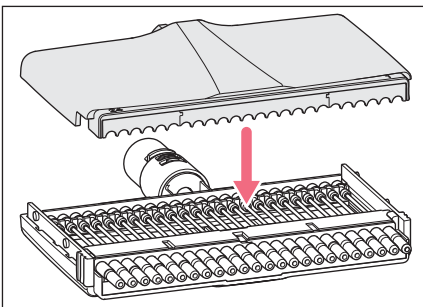
3. Insert the clamping bar on one side into the housing case under the lug.
4. Bend the clamping bar and slide it under the lug on the other side.  
The cylinder block is now fixed.

### 6.10.2 Insert the pistons



1. Slide the piston into the cylinder.
2. Insert the end of the piston into the piston mount.

### 6.10.3 Closing the multi-channel lower part



1. Attach the housing lid.
2. Slide both latches on the sides of the lower part up.

## 6.11 Replacing O-rings – multi-channel lower part

Replace worn or damaged O-rings on multi-channel lower parts.

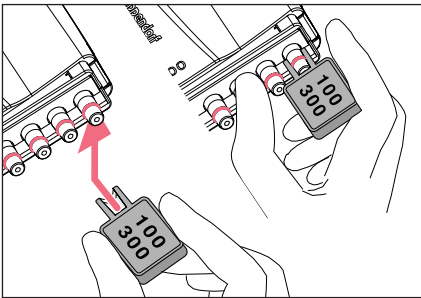
Applies to multi-channel lower parts:

- 100 µL
- 300 µL
- 1200 µL

### 6.11.1 Removing the O-ring

Prerequisites

- O-ring tool (included in the delivery package)



1. Push the opening of the O-ring tool against the tip cone.
2. Supporting the O-ring tool with your thumb, push it against the tip cone. The O-ring is cut at one location.
3. Remove the O-ring tool and O-ring.

### 6.11.2 Mounting a new O-ring – 100 µL and 300 µL

Prerequisites

- Mounting aid


1. Fit the installation aid on the tip cone.
2. Push the O-ring over the installation aid and onto the tip cone. The O-ring must be positioned in the groove in the tip cone.
3. Remove the installation aid
4. Attach the pipette tip and check it is seated correctly. The pipette tip must be firmly seated on the tip cone.

### 6.11.3 Mounting a new O-ring – 1200 µL

1. Push the O-ring onto the tip cone. The O-ring must be positioned in the groove in the tip cone.
2. Attach the pipette tip and check it is seated correctly. The pipette tip must be firmly seated on the tip cone.



## 6.12 Adjusting the pipette

-  The execution of changes to the user adjustment and factory adjustment is described on our website [www.eppendorf.com/manuals](http://www.eppendorf.com/manuals).

## 6.13 Cleaning

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### **NOTICE! Damage to device from unsuitable cleaning agents or sharp or pointed objects.**

Use of unsuitable cleaning agents may damage the device.

- ▶ Do not use corrosive cleaning agents, strong solvents or abrasive polishes.
- ▶ Check the compatibility with the materials used.
- ▶ Please note the information on chemical resistance.
- ▶ Do **not** clean the device with acetone or organic solvents with a similar effect.
- ▶ Do **not** use sharp or pointed objects to clean the device.



### **NOTICE! Damage to device due to penetration of liquid.**

- ▶ Only immerse the pipette tip in the liquid.
  - ▶ Do not put the pipette down when the pipette tip is filled.
  - ▶ The pipette itself may not come into contact with the liquid.
- 


### 6.13.1 Cleaning and disinfecting the pipette


All single and multi-channel lower parts are wear parts. Clean them after contamination, use of aggressive chemicals and/or heavy stress. If the lower parts are worn or damaged, replace these parts.

1. Moisten a cloth with a cleaning agent and a decontamination agent.
2. Remove external contamination.
3. Moisten a new cloth with water.
4. Wipe down the housing.

### 6.13.2 Cleaning and disinfecting the lower part

Prerequisites

- Heavy contamination caused by ingress of liquid must be removed.
  - Lower part has been removed and disassembled.
1. Remove piston grease.
  2. Rinse the lower part with cleaning agent or decontamination agent or let it soak.
-  Observe the contact time recommended by the manufacturer.
3. Thoroughly rinse the lower part with demineralized water.

4. Let it dry.
5. Lubricate the piston or cylinder.
  -  See instructions for use "Grease for pipettes".
6. Assemble the lower part.

### 6.13.3 Sterilizing the pipette with UV light

The pipette can be sterilized with UV light at 254 nm.

## 6.14 Autoclaving the pipette



---





### NOTICE! Damage to device due to incorrect handling.

- ▶ Do not use any additional disinfectants, decontamination agents, or sodium hypochlorite during autoclaving or UV irradiation.
- 

### 6.14.1 Autoclaving

-  Autoclave the filter sleeve and the protection filter separately.
-  The upper part and lower part can be autoclaved in assembled state. The lower part does not have to be disassembled.

#### Prerequisites

- The pipette has been cleaned.
  - Any residual cleaning agent has been removed.
  - The protection filter has been removed.
1. Autoclave the pipette at 121°C and 1 bar overpressure for 20 minutes.
  2. Cool the pipette to ambient temperature and let it dry.
    -  For maximum precision and accuracy, a gravimetric test is recommended after autoclaving.
    -  The piston does **not** need to be greased following autoclaving.

## 6.15 Decontamination before shipment

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**CAUTION! Use of a contaminated device may result in personal injury and damage to the device.**

- ▶ Clean and decontaminate the device in accordance with the cleaning instructions before shipping or storage.
- 

Hazardous substances are:

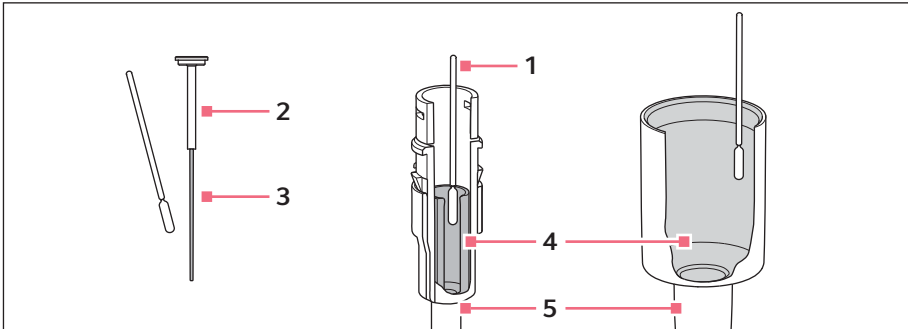
- solutions presenting a hazard to health
  - potentially infectious agents
  - organic solvents and reagents
  - radioactive substances
  - proteins presenting a hazard to health
  - DNA
1. Please note the information in the document "Decontamination certificate for product returns".  
It is available as a PDF document on our website  
[www.eppendorf.com/decontamination](http://www.eppendorf.com/decontamination).
  2. Enter the serial number of the device in the decontamination certificate.
  3. Enclose the completed decontamination certificate for returned goods with the device.
  4. Send the device to Eppendorf SE or an authorized service center.

## 6.16 Lubricating the piston or cylinder

The piston or the cylinder in the lower part of the pipette must be relubricated after cleaning or after decontamination.



The special grease can be ordered as an accessory. The ordering information can be found on our webpage [www.eppendorf.com/manuals](http://www.eppendorf.com/manuals)



1 Cotton swab

2 Piston  
≤ 20 µL

3 Running surface

4 Cylinder

5 Lower part  
> 20 µL

### 6.16.1 Lubricating the piston

Prerequisites

- For volumes ≤ 20 µL.
- Lower part is disassembled.

1. Place a small amount of grease on the cotton swab.
2. Apply a thin film of grease to the running surface of the piston.  
The lower part can now be reassembled.

### 6.16.2 Lubricating the cylinder

Prerequisites

- For volumes > 20 µL.
- Lower part is disassembled.

1. Place a small amount of grease on the cotton swab.
2. Apply a thin film of grease to the inner wall of the piston.  
The lower part can now be reassembled.

## 7 Technical data

### 7.1 Adjustable sub-steps – single-channel pipettes

Model	Increment
0.1 µL – 2.5 µL	0.002 µL
0.5 µL – 10 µL	0.01 µL
2 µL – 20 µL	0.02 µL
10 µL – 100 µL	0.1 µL
20 µL – 200 µL	0.2 µL
30 µL – 300 µL	0.2 µL
100 µL – 1000 µL	1 µL
0.25 mL – 2.5 mL	2 µL
0.5 mL – 5 mL	0.005 mL
1 mL – 10 mL	0.01 mL

### 7.2 Adjustable sub-steps – multi-channel pipettes

Model	Increment
0.5 µL – 10 µL	0.01 µL
1 µL – 20 µL	0.02 µL
5 µL – 100 µL	0.1 µL
10 µL – 100 µL	0.1 µL
30 µL – 300 µL	0.1 µL
120 µL – 1200 µL	1 µL

### 7.3 Ambient conditions

	Temperature range	Relative humidity
Storage without transport package	-5 °C — 45 °C	10 % — 95 %
Operating conditions	5 °C — 40 °C	10 % — 95 %

**8 Measurement deviations according to Eppendorf SE****8.1 Single-channel pipettes with fixed volume setting**

Model	Test tip epT.I.P.S.	Error of measurement			
		systematic		random	
		± %	± µL	± %	± µL
10 µL medium gray	0,1 µL – 20 µL medium gray 40 mm	1,2	0,12	0,6	0,06
20 µL light gray	0,5 µL – 20 µL L light gray 46 mm	0,8	0,16	0,3	0,06
10 µL yellow	2 µL – 200 µL yellow 53 mm	1,2	0,12	0,6	0,06
20 µL yellow		1,0	0,2	0,3	0,06
25 µL yellow		1,0	0,25	0,3	0,08
50 µL yellow		0,7	0,35	0,3	0,15
100 µL yellow		0,6	0,6	0,2	0,2
200 µL yellow		0,6	1,2	0,2	0,4
200 µL blue	50 µL – 1000 µL blue 71 mm	0,6	1,2	0,2	0,4
250 µL blue		0,6	1,5	0,2	0,5
500 µL blue		0,6	3,0	0,2	1,0
1000 µL blue		0,6	6,0	0,2	2,0

## 8.2 Single-channel pipettes with variable volume setting

Model	Test tip epT.I.P.S.	Testing volume	Error of measurement			
			systematic		random	
			± %	± µL	± %	± µL
0,1 µL – 2,5 µL dark gray	0,1 µL – 10 µL dark gray 34 mm	0,1 µL	48	0,048	12	0,012
		0,25 µL	12	0,03	6,0	0,015
		1,25 µL	2,5	0,031	1,5	0,019
		2,5 µL	1,4	0,035	0,7	0,018
0,5 µL – 10 µL medium gray	0,1 µL – 20 µL medium gray 40 mm	0,5 µL	8,0	0,04	5,0	0,025
		1 µL	2,5	0,025	1,8	0,018
		5 µL	1,5	0,075	0,8	0,04
		10 µL	1,0	0,1	0,4	0,04
2 µL – 20 µL light gray	0,5 µL – 20 µL L light gray 46 mm	2 µL	5,0	0,1	1,5	0,03
		10 µL	1,2	0,12	0,6	0,06
		20 µL	1,0	0,2	0,3	0,06
2 µL – 20 µL yellow	2 µL – 200 µL yellow 53 mm	2 µL	5,0	0,1	1,5	0,03
		10 µL	1,2	0,12	0,6	0,06
		20 µL	1,0	0,2	0,3	0,06
10 µL – 100 µL yellow	2 µL – 200 µL yellow 53 mm	10 µL	3,0	0,3	1,0	0,1
		50 µL	1,0	0,5	0,3	0,15
		100 µL	0,8	0,8	0,2	0,2
20 µL – 200 µL yellow	2 µL – 200 µL yellow 53 mm	20 µL	2,5	0,5	0,7	0,14
		100 µL	1,0	1,0	0,3	0,3
		200 µL	0,6	1,2	0,2	0,4
30 µL – 300 µL orange	20 µL – 300 µL orange 55 mm	30 µL	2,5	0,75	0,7	0,21
		150 µL	1,0	1,5	0,3	0,45
		300 µL	0,6	1,8	0,2	0,6
100 µL – 1000 µL blue	50 µL – 1000 µL blue 71 mm	100 µL	3,0	3,0	0,6	0,6
		500 µL	1,0	5,0	0,2	1,0
		1000 µL	0,6	6,0	0,2	2,0
0,25 mL – 2,5 mL red	0,25 mL – 2,5 mL red 115 mm	0,25 mL	4,8	12	1,2	3
		1,25 mL	0,8	10	0,2	2,5
		2,5 mL	0,6	15	0,2	5

Model	Test tip epT.I.P.S.	Testing volume	Error of measurement			
			systematic		random	
			± %	± µL	± %	± µL
0,5 mL – 5 mL violet	0,1 mL – 5 mL violet 120 mm	0,5 mL	2,4	12	0,6	3
		2,5 mL	1,2	30	0,25	6,25
		5,0 mL	0,6	30	0,15	7,5
1 mL – 10 mL turquoise	1 mL – 10 mL turquoise 165 mm	1,0 mL	3,0	30	0,6	6
		5,0 mL	0,8	40	0,2	10
		10,0 mL	0,6	60	0,15	15

### 8.3 Multi-channel pipettes with fixed cone spacing

Model	Test tip epT.I.P.S.	Testing volume	Error of measurement			
			systematic		random	
			± %	± µL	± %	± µL
0,5 µL – 10 µL medium gray 8/12-channel	0,1 µL – 20 µL medium gray 40 mm	0,5 µL	12	0,06	8,0	0,04
		1 µL	8,0	0,08	5,0	0,05
		5 µL	4,0	0,2	2,0	0,1
		10 µL	2,0	0,2	1,0	0,1
1 µL – 20 µL light pink 16/24-channel	1 µL – 20 µL light pink 42 mm	1 µL	12	0,12	8	0,08
		2 µL	8	0,16	5	0,1
		10 µL	4	0,4	2	0,2
		20 µL	2	0,4	1	0,2
5 µL – 100 µL light yellow 16/24-channel	0,5 µL – 100 µL light yellow 53 mm	5 µL	6	0,3	4	0,2
		10 µL	3	0,3	2	0,2
		50 µL	1,2	0,6	0,8	0,4
		100 µL	1	1	0,6	0,6
10 µL – 100 µL yellow 8/12-channel	2 µL – 200 µL yellow 53 mm	10 µL	3,0	0,3	2,0	0,2
		50 µL	1,0	0,5	0,8	0,4
		100 µL	0,8	0,8	0,3	0,3
30 µL – 300 µL orange 8/12-channel	20 µL – 300 µL orange 55 mm	30 µL	3,0	0,9	1,0	0,3
		150 µL	1,0	1,5	0,5	0,75
		300 µL	0,6	1,8	0,3	0,9



Model	Test tip epT.I.P.S.	Testing volume	Error of measurement			
			systematic		random	
			± %	± µL	± %	± µL
120 µL – 1200 µL dark green 8/12-channel	50 µL – 1250 µL L dark green 103 mm	120 µL	6,0	7,2	0,9	1,08
		600 µL	2,7	16,2	0,4	2,4
		1200 µL	1,2	14,4	0,3	3,6

#### 8.4 Test conditions

Test conditions and test analysis in accordance with DIN EN ISO 8655-6:2002-12: Tested using a standardized analytical balance with evaporation protection certified by the national metrological office.

**i** The three largest testing volumes per tip (10 %, 50 %, 100 % of the nominal volume) correspond to the specifications in accordance with DIN EN ISO 8655, Part 2 or Part 5. The test is to be carried out with these three testing volumes for testing of the systematic and random error in compliance with the standard. The smallest adjustable volume serves to provide additional information.

- Number of determinations per volume: 10
- Water according to ISO 3696:1991-06
- Inspection at 20°C – 27°C  
Maximum temperature variation during measurement ±0.5°C
- Dispensing onto the tube inner wall
- Forward pipetting

## 9 Ordering information

### 9.1 Single-channel pipettes with fixed volume setting

Order no. (International)	Order no. (North America)	Description
		<b>Eppendorf Research plus</b> single-channel, fixed
3124 000.016	3124000016	10 µL, medium gray
3124 000.024	3124000024	10 µL, yellow
3124 000.032	3124000032	20 µL, light gray
3124 000.040	3124000040	20 µL, yellow
3124 000.059	3124000059	25 µL, yellow
3124 000.067	3124000067	50 µL, yellow
3124 000.075	3124000075	100 µL, yellow
3124 000.083	3124000083	200 µL, yellow
3124 000.091	3124000091	200 µL, blue
3124 000.105	3124000105	250 µL, blue
3124 000.113	3124000113	500 µL, blue
3124 000.121	3124000121	1000 µL, blue

### 9.2 Single-channel pipettes with variable volume setting

Order no. (International)	Order no. (North America)	Description
		<b>Eppendorf Research plus</b> Single-channel, variable
3123 000.012	3123000012	0.1 – 2.5 µL, dark gray
3123 000.020	3123000020	0.5 – 10 µL, medium gray
3123 000.098	3123000098	2 – 20 µL, light gray
3123 000.039	3123000039	2 – 20 µL, yellow
3123 000.047	3123000047	10 – 100 µL, yellow
3123 000.055	3123000055	20 – 200 µL, yellow
3123 000.101	3123000101	30 – 300 µL, orange
3123 000.063	3123000063	100 – 1000 µL, blue
3123 000.144	3123000144	0.25 – 2.5 mL, red
3123 000.071	3123000071	0.5 – 5 mL, violet
3123 000.080	3123000080	1 – 10 mL, turquoise

### 9.3 Multi-channel pipettes with fixed cone spacing

#### 9.3.1 9 mm cone spacing for 96-well plates

Order no. (International)	Order no. (North America)	Description
3125 000.010	3125000010	<b>Eppendorf Research plus</b> 8-channel 0.5 – 10 µL, medium gray 10 – 100 µL, yellow 30 – 300 µL, orange 120 – 1200 µL, dark green
3125 000.036	3125000036	
3125 000.052	3125000052	
3125 000.214	3125000214	
3125 000.028	3125000028	<b>Eppendorf Research plus</b> 12-channel 0.5 – 10 µL, medium gray 10 – 100 µL, yellow 30 – 300 µL, orange 120 – 1200 µL, dark green
3125 000.044	3125000044	
3125 000.060	3125000060	
3125 000.222	3125000222	

#### 9.3.2 4.5 mm cone spacing for 384-well plates

Order no. (International)	Order no. (North America)	Description
3125 000.079	3125000079	<b>Eppendorf Research plus</b> 16-channel 1 – 20 µL, cone spacing 4,5 mm 5 – 100 µL, cone spacing 4,5 mm
3125 000.095	3125000095	
3125 000.087	3125000087	<b>Eppendorf Research plus</b> 24-channel 1 – 20 µL, cone spacing 4,5 mm 5 – 100 µL, cone spacing 4,5 mm
3125 000.109	3125000109	

### 9.4 Spare parts, accessories and pipette tips



More ordering information can be found on our webpage [www.eppendorf.com](http://www.eppendorf.com).







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