

Eppendorf Research® Series 2100 fix · adjustable · multi

Instruction Manual · Mode d'emploi · Manual de Instrucciones

eppendorf

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Fig. 1 Research Series 2100 – adjustable / fix

Single-Channel / Monocanal

Research adjustable:

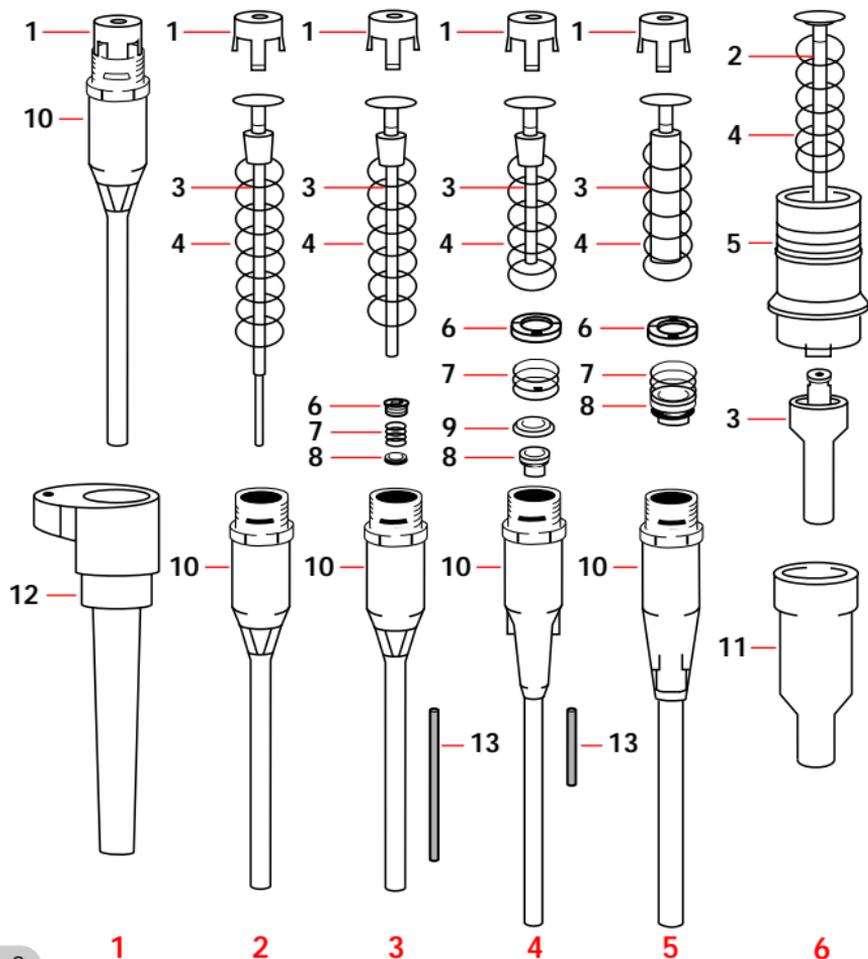
| | | | | |
|-------------------------|-------------------|-------------------|---------------------|---------------------|
| 0.1 – 2.5 μL | 10 – | 20 – | 100 – | 500 – |
| 0.5 – 10 μL | 100 μL | 200 μL | 1,000 μL | 5,000 μL |
| 2 – 20 μL | | | | |

Research fix:

– 20 μL

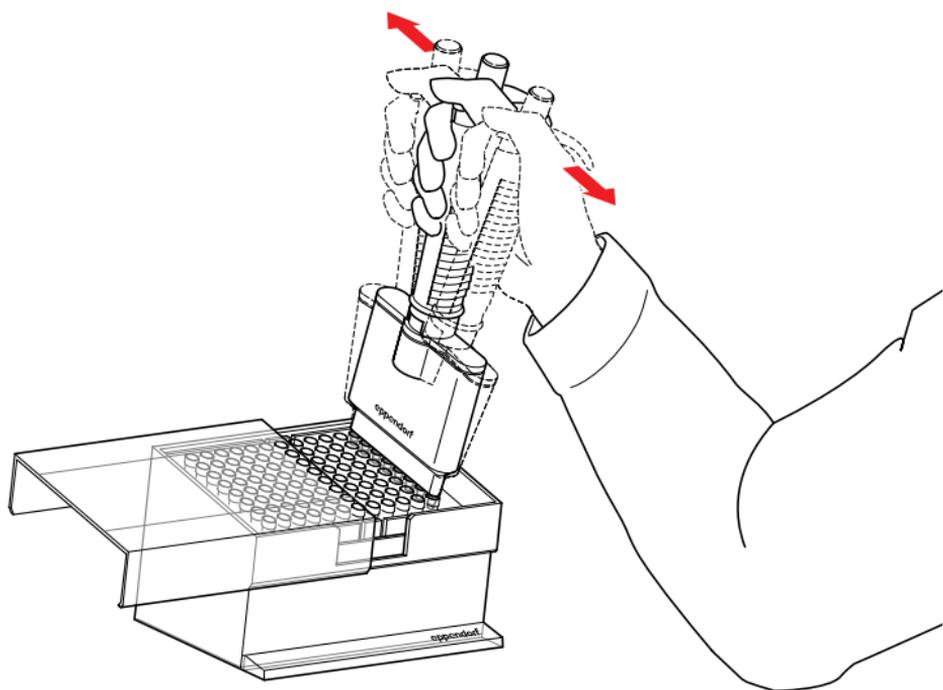
– 100 μL

– 1,000 μL



Multi-channel / Multicanal

Tip attachment
Prélèvement des pointes
Toma de puntas



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1 Safety precautions and applicational limitations

Before working with the Research pipette, please read the operating manual. To ensure safe, problem-free experiments with the Research pipette, it is essential to observe the following points:

1.1 Handling

- Only use pipettes in the Research family when a pipette tip has been attached.
- Do not lay down the pipette when a filled pipette tip is attached.
- When using infectious, radioactive, toxic and/or solutions that pose a health risk, please observe the safety precautions valid for the country in which the pipette is being used.
- When using organic solvents and aggressive chemicals, check the chemical compatibility of the pipette tips (made of PP = polypropylene) and the pipettes.
- When using solutions with physical characteristics which are considerably different to those of water (e.g. glycerol), check the dispensing volume as described in Section 5.2.
- Avoid differences in temperature between pipettes and pipette tips as well as the liquid used as this may lead to incorrect volumes being dispensed.
- The above may also occur when liquids with a high vapor pressure are used.

1.2 Care and maintenance

- Do not allow any liquid to enter into the pipette.
- Do **not** clean the pipette with acetone or aggressive solutions.
- Use Eppendorf spare parts and accessories (including pipette tips) only.

2 Technical data

2.1 Research, fixed-volume

| Model / volume | Inaccuracy | Imprecision |
|---|--------------|---------------|
| 5 μL | $\pm 4.0 \%$ | $\leq 2.5 \%$ |
| 10 μL | $\pm 1.8 \%$ | $\leq 0.6 \%$ |
| 20 μL | $\pm 1.0 \%$ | $\leq 0.3 \%$ |
| 25 μL | $\pm 1.0 \%$ | $\leq 0.3 \%$ |
| 50 μL | $\pm 0.7 \%$ | $\leq 0.3 \%$ |
| 100 μL through 1,000 μL | $\pm 0.6 \%$ | $\leq 0.2 \%$ |

2.2 Research, adjustable-volume

| Model | Volume | Inaccuracy | Imprecision |
|---------------------------|---------------------|---------------|----------------|
| 0.1 – 2.5 μL | 0.2 μL | $\pm 12.0 \%$ | $\leq 6.0 \%$ |
| | 1.0 μL | $\pm 2.5 \%$ | $\leq 1.5 \%$ |
| | 2.5 μL | $\pm 1.4 \%$ | $\leq 0.7 \%$ |
| 0.5 – 10 μL | 1 μL | $\pm 2.5 \%$ | $\leq 1.8 \%$ |
| | 5 μL | $\pm 1.5 \%$ | $\leq 0.8 \%$ |
| | 10 μL | $\pm 1.0 \%$ | $\leq 0.4 \%$ |
| 2 – 20 μL | 2 μL | $\pm 5.0 \%$ | $\leq 1.5 \%$ |
| | 10 μL | $\pm 1.2 \%$ | $\leq 0.6 \%$ |
| | 20 μL | $\pm 1.0 \%$ | $\leq 0.3 \%$ |
| 10 – 100 μL | 10 μL | $\pm 3.0 \%$ | $\leq 1.0 \%$ |
| | 50 μL | $\pm 1.0 \%$ | $\leq 0.3 \%$ |
| | 100 μL | $\pm 0.8 \%$ | $\leq 0.2 \%$ |
| 20 – 200 μL | 20 μL | $\pm 2.5 \%$ | $\leq 0.7 \%$ |
| | 100 μL | $\pm 1.0 \%$ | $\leq 0.3 \%$ |
| | 200 μL | $\pm 0.6 \%$ | $\leq 0.2 \%$ |
| 100 – 1,000 μL | 100 μL | $\pm 3.0 \%$ | $\leq 0.6 \%$ |
| | 500 μL | $\pm 1.0 \%$ | $\leq 0.2 \%$ |
| | 1,000 μL | $\pm 0.6 \%$ | $\leq 0.2 \%$ |
| 500 – 5,000 μL | 500 μL | $\pm 2.4 \%$ | $\leq 0.6 \%$ |
| | 2,500 μL | $\pm 1.2 \%$ | $\leq 0.25 \%$ |
| | 5,000 μL | $\pm 0.6 \%$ | $\leq 0.15 \%$ |

2.3 Research, multi-channel, adjustable volume (8- and 12-channel)

| Model | Volume | Inaccuracy | Imprecision |
|------------------------|-------------------|--------------|---------------|
| 0.5 – 10 μL | 1 μL | $\pm 8.0 \%$ | $\leq 5.0 \%$ |
| | 5 μL | $\pm 4.0 \%$ | $\leq 2.0 \%$ |
| | 10 μL | $\pm 2.0 \%$ | $\leq 1.0 \%$ |
| 10 – 100 μL | 10 μL | $\pm 3.0 \%$ | $\leq 1.0 \%$ |
| | 50 μL | $\pm 1.0 \%$ | $\leq 0.3 \%$ |
| | 100 μL | $\pm 0.8 \%$ | $\leq 0.2 \%$ |
| 30 – 300 μL | 30 μL | $\pm 3.0 \%$ | $\leq 1.0 \%$ |
| | 150 μL | $\pm 1.0 \%$ | $\leq 0.5 \%$ |
| | 300 μL | $\pm 0.6 \%$ | $\leq 0.2 \%$ |

The technical data is valid only when Eppendorf pipette tips are used.

Tests carried out in accordance with DIN 12650 for piston-stroke pipettes with an air cushion using a fine balance with moisture trap approved by the standardization authorities.

Number of determinations:

10 (for the multi-channel model: 10 per channel); degassed, bidistilled water, 20 °C – 25 °C, constant to ± 0.5 °C; with pre-wetted pipette tip; dispensing carried out on inner wall of vessel; for volumes ≤ 10 μL , the test must be carried out upon removal from the weighing vessel, due to the risk of evaporation.

3 Function principle

The Research family of pipettes are piston-stroke pipettes that operate according to the air-cushion principle.

The Research family consists of fixed-volume pipettes, adjustable-volume pipettes and eight- and twelve-channel pipettes, which also have an adjustable volume setting.

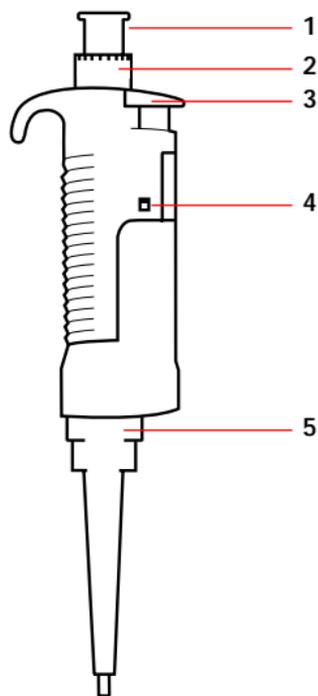
All models belonging to the Research family have a separate ejector button.

Each channel of the multi-channel model has its own piston, which means that it is possible to attach fewer than eight or twelve tips.

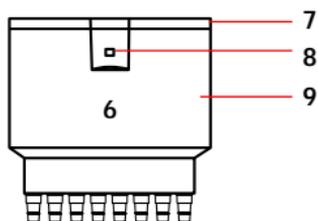
In addition, the lower part can be rotated into a user-defined position as required.

It is possible to switch between 8- and 12-channel manifolds within the same volume range.

Fig. 3 Research (single-channel) and multi-channel lower part



- 1 Control button**
First stop (measuring stroke); the aspirated volume is dispensed.
Second stop (blow-out); the liquid remaining in the tip is blown out.
- 2 Setting ring**
To set the volume
For fixed-volume pipettes, this ring is for adjustment purposes only.
- 3 Ejection button**
Tip ejection.
- 4 Adjustment opening**
For inserting the wrench to make volume adjustments.
- 5 Ejection sleeve**
To extract liquids from long vessels, the ejection sleeve may be pulled off when the ejection button is held down.



- 6 Multi-channel lower part with:**
- 7 Cover plate**
- 8 Opening for the tool for disassembly**
- 9 Housing**

4 Operation

4.1 Volume setting (not valid for fixed-volume model)

The volume can be changed continuously by rotating the setting ring (Fig. 3-2). The figures in the digital display are read from top to bottom.

It is advisable to carry out volume setting from the higher down to the lower value. i.e. first go above the desired volume and then return to the lower value.

4.2 Pipette tips

The pipette can function only when a pipette tip is attached into which the liquid is aspirated.

To facilitate the search for the correct tip, the color of the Research control buttons corresponds to the color of the Eppendorf tip racks.

When pipetting liquids with wetting properties different to those of water, please observe the recommendations contained in Section 4.5.

Attaching tips to multi-channel pipettes:

Remove the tips from the tip box using the pipette, as shown in Fig. 2 (on the fold-out page).

4.3 Aspirating liquid

- The liquid which is to be aspirated is taken from a suitable vessel (for multi-channel pipettes, we recommend the "Reagent Reservoir").
- Attach suitable tips the pipette firmly (observe the color coding).
- Press down the control button (Fig. 3-1) to the first stop (measuring stroke).
- Immerse the pipette tip(s) approx. 3 mm into the liquid, making sure that the pipette remains in a fully vertical position.
For Research, adjustable volume, 500–5,000 μL : approx. 5 mm.
- Allow the control button to slide back **slowly**.
Before removing Research, adjustable volume, 500–5,000 μL from the liquid, wait approximately three seconds.
- Pull the tip(s) out of the liquid **slowly**.
- To remove any remaining droplets, dab with non-fibrous cellulose.
Please note: When doing so, ensure that no liquid comes out of the tip(s).

Note:

For Research, adjustable volume, 500–5,000 μL : If the tip is removed from the liquid too quickly, coaxial forces may push liquid out of the tip. This may result in the pipetted volume being too low.

4.4 Dispensing liquid

- Hold the tip(s) at an angle against the inside wall of the tube/well of the microtiter plate.
- Press down the control button (Fig. 3-1) slowly to the first stop (measuring stroke) and wait until the liquid stops flowing.
- Press down the control button to the second stroke (blow-out) until the tip(s) is/are completely empty.
- Hold down the control button and pull the tip(s) up the inner wall of the tube.
- Allow the control button to slide back slowly.

Tips are ejected by pressing the ejection button on the side of the pipette (Fig. 3-3).



Please do not lay down the pipette when a filled pipette tip is attached as this may result in liquid entering the pipette!

4.5 Special notes**Volumes >10 μL :**

To guarantee precision and accuracy, we recommend pre-wetting all new tips by aspirating and dispensing liquid two or three times before pipetting.

With the tip not in contact with the liquid, empty it completely on the inner wall of the tube (via blow-out).

Explanation: Why does the pipette tip have to be **pre-wetted**?

To compensate for the properties of the liquid.

Wetting liquids (serum, detergent) form a thin film on the inner wall of the pipette tip. When the first pipetting is carried out, the volume dispensed would thus be too low.

When pipetting serum or high-viscosity solutions, wait a few seconds when aspirating and dispensing liquid.

Volumes < 10 μL :

The specified values for accuracy and precision can only be attained if the volume from a tip that has **not been pre-wetted** is **rinsed** into a specimen liquid!

- After the sample has been aspirated, immerse the filled pipette tip into the specimen liquid. Press the control button several times.
- Execute a blow-out and pull the tip upwards along the inner wall of the tube. Discard the tip.

5 Testing / Calibration

The serial number is on the setting ring on the control button.

5.1 Testing

Research, single-channel:

Volumes < 1 μL :

We recommend the photometric test. Our brochure "Photometric test for testing the precision and accuracy of small volumes" is available upon request.

Volumes \geq 1 μL :

For volumes \geq 1 μL , the test can be performed by weighing the volume using an analytical balance with a suitable level of sensitivity.



The bidistilled water, weighing vessel, pipette and pipette tip must all be the same temperature!

To calculate the volume, divide the weight by the density of the water (at 20 °C: 0.9982).

Volumes 1–10 μL :

The test is performed by taking the volume from a weighed, water-filled tube using a tip that has not been pre-wetted.

Volumes > 10 μL :

Distilled water is dispensed from a pre-wetted tip into a tube and is then weighed.

Research, multi-channel:

Multi-channel pipettes are usually tested by dispensing the volume from a pre-wetted tip into a tube.

5.2 Calibration

5.2.1 When should calibration be carried out?

The pipettes belonging to the Research family were tested during production in accordance with the test conditions for water listed in Section 2.

In the case of doubts arising with regard to the accuracy of the pipetted volume, the following points should be clarified prior to making any adjustments to the pipette:

- Is the pipette leaking? (This is one possible reason for dispensed volumes being too low; troubleshooting and solutions are contained in Sec. 7.)
- What is the temperature of the sample? (In open tubes, water at room temperature evaporates)
- What is the temperature of the pipette?
- What is the temperature of the air?
- Has ml been converted into μL ?
- Does the sample have a different density to that of water?
- Is the pipetting speed too high?

Assistance with these questions is contained in Eppendorf's SOP (Standard Operation Procedure), which is available upon request or can be downloaded from the Brinkmann website at www.brinkmann.com

If these checks prove to be unsuccessful, it is safe to assume that the alignment of the pipette has altered (e.g. due to several components having been replaced).

5.2.2 Follow-up calibration in the case of error

From a technical point of view, this is a zero-point shift. The value by which the setting of the pipette is shifted remains constant across the entire measuring range. If, for example, in the case of a 10–100 μL , follow-up alignment of 1 μL takes place at 100 μL (=1 %), the pipette is also adjusted by 1 μL at 10 μL (= 10 %!)

- The pipette, tip and water must all be the same temperature (20 – 25 °C, constant to ± 0.5 °C).
- In the case of adjustable pipettes, the pipette is set to the nominal volume required.

- c With a pipette tip attached to the pipette, the desired volume is pipetted and weighed 10 times (for multi-channel pipettes, this is carried out for each channel). The mean of this weighing is converted into μL using the following formula:

$$\text{Volume} = \frac{\text{Weight}}{\text{Density of liquid}} \\ \text{(at the temperature specified)}$$

The value obtained is the actual setting (density of water at 20 °C: 0.9982).

- d To align to the volume displayed, side D of the wrench is inserted horizontally into the alignment opening (Fig. 3-4) in the pipette grip. (When doing so, hold the pipette vertically.) The wrench is then rotated into a vertical position.

e Research, adjustable-volume and multi-channel

When the setting ring is rotated (either in the + or - direction), the piston stroke of the pipette is altered (although the volume-setting dial remains unchanged).

One rotation is equal to the following:

Research, adjustable-volume:

| | |
|---------------------------|---------------------------|
| 0.1 – 2.5 μL | approx. 0.1 μL |
| 0.5 – 10 μL | approx. 0.5 μL |
| 2 – 20 μL | approx. 1 μL |
| 10 – 100 μL | approx. 5 μL |
| 20 – 200 μL | approx. 10 μL |
| 100 – 1,000 μL | approx. 50 μL |
| 500 – 5,000 μL | approx. 250 μL |

Research, multi-channel:

| | |
|------------------------|---------------------------|
| 0.5 – 10 μL | approx. 0.5 μL |
| 10 – 100 μL | approx. 5 μL |
| 30 – 300 μL | approx. 10 μL |

Research, fixed-volume

To reduce the volume, turn the setting ring clockwise. To increase the volume, turn the setting ring counterclockwise.

One rotation is equal to the following:

Research fix:

| | | | |
|-------------------|---------------------------|---------------------|--------------------------|
| 5 μL | approx. 0.8 μL | 200 μL | approx. 38 μL |
| 10 μL | approx. 0.8 μL | 250 μL | approx. 38 μL |
| 20 μL | approx. 0.8 μL | 450 μL | approx. 38 μL |
| 25 μL | approx. 4 μL | 500 μL | approx. 38 μL |
| 50 μL | approx. 4 μL | 1,000 μL | approx. 38 μL |
| 100 μL | approx. 4 μL | | |

- f Remove the wrench and move the setting ring backwards and forwards until the counter and the stroke system lock together.
- g Repeat step c). The readings must be within the tolerances specified in the technical data.

If the nominal volume does not correspond with the measuring result, repeat steps d) and e).

Since this adjustment affects the entire measuring range, it is imperative to check the other volumes of this pipette specified in the technical data.

5.2.3 Adjustment for liquids with a density different to that of water

It is possible to adjust one **specific volume** of liquid with a density different to that of water in such a way that the volume displayed corresponds to the volume pipetted.

All other values for the adjustable pipettes are now out of alignment, i.e. an adjustable-volume pipette has been converted into a fixed-volume pipette!

Proceed as described in steps a) to g) of Section 5.2.2.



A pipette set in this way delivers a pipetting value that correlates with that in the display **only for the liquid used and for the volume tested!** For this reason, we recommend labeling the converted pipette as a **fixed-volume pipette** for "Solution y"!

The error for liquids with a higher vapor pressure (e.g. organic solvents) cannot be aligned in this way. In this case, we recommend using an Eppendorf positive-displacement pipette.

6 Care / sterilization

6.1 Care

Depending on the frequency of use, all pipettes should be cleaned in a soap solution or should be sterilized using 60 % Isopropanol. They should then be rinsed in distilled water and dried.

The seals are maintenance-free and the pistons should be lubricated lightly (using the silicone grease provided) when cleaned or replaced.

With the multi-channel model, the visible O-rings on the tip holder should be lightly lubricated after cleaning and then wiped using a lint-free cloth. Defective O-rings must be replaced (see Part B, "Maintenance").

Severe contamination caused by the liquid entering the pipette can be removed after the pipette has been disassembled (see Part B, "Maintenance").

6.2 Sterilization

The lower half of the pipette can be sterilized by means of steam-autoclaving (121 °C, 1 bar, 20 minutes).

It is recommended to allow the autoclaved parts to dry at room temperature. Do not re-assemble the pipette until it has cooled down completely.

6.2.1 Single-channel model

With single-channel models, the ejection sleeve (Fig. 1-12) and the lower part (Fig. 1-10) may be autoclaved.

To do so, hold down the ejection button and pull off the ejection sleeve, then unscrew the pipette's lower part (with pipettes up to 1,000 μ L, this may require the assistance of opening A of the wrench provided).

Single-channel, adjustable-volume 500 – 5,000 μ L:

The piston must be removed before the pipette's lower part can be unscrewed (see Part B, "Maintenance").

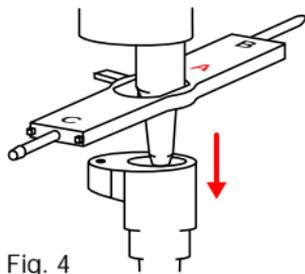


Fig. 4

6.2.2 Multi-channel model

With the multi-channel model, the complete lower part (Fig. 3-6) is placed into the autoclave.

To do so, hold down the ejection button and unscrew the lower part from the grip by rotating it counterclockwise.

All pipettes belonging to the Research family may be exposed to UV light. Any discoloration which may occur has no effect on the function of the pipette.

7 Troubleshooting

| Error | Cause | Solution |
|--|--|--|
| Droplets on the inner wall of the pipette tip. | <ul style="list-style-type: none"> - Uneven wetting of the plastic wall. - A pipette tip with poor wetting properties has been used. | <ul style="list-style-type: none"> - Attach a new pipette tip. - Use an original Eppendorf tip. |
| Pipette is dripping and/or the volume pipetted is incorrect. | <ul style="list-style-type: none"> - The tip is loose. - A poorly fitting pipette tip has been used. - Liquid with a high vapor pressure has been pipetted. - The tip was removed too quickly from the liquid. - The pipette is dripping because: <ul style="list-style-type: none"> Piston is contaminated. Piston is damaged. Seal is damaged. - The pipette lower part is loose. <p>For 500 – 5,000 µL pipette:</p> <ul style="list-style-type: none"> - Pipetting was too fast. <p>For multi-channel model:</p> <ul style="list-style-type: none"> - The O-ring of the channel is damaged. | <ul style="list-style-type: none"> - Press the tip on firmly. - Use an original Eppendorf tip. - In this case, we recommend pipetting using a positive-displacement pipette. - Pull the tip slowly out of the liquid. - Clean and lightly lubricate the piston (Part B, "Maintenance"). - Replace the piston and seal (Part B, "Maintenance"). - Replace the seal; with the 500 – 5,000 µL model, replace the piston (Part B, "Maintenance"). - Tighten the pipette lower part by hand. - Allow the control button to slide back slowly. - Replace defective O-ring (Part B, "Maintenance"). |

| Error | Cause | Solution |
|---|--|--|
| The control button jams and does not move smoothly. | <ul style="list-style-type: none"> - The piston is contaminated. - The seal is contaminated. - Solvent vapors have entered the pipette. | <ul style="list-style-type: none"> - Clean the piston and lubricate lightly (Part B, "Maintenance"). - Remove the piston from the pipette lower part (Part B, "Maintenance"). Rinse out the lower part with warm water, then rinse with distilled water and allow to dry. Replace the seal if necessary. - Remove the piston from the lower part (Part B, "Maintenance") and aerate the lower part. Clean and lightly lubricate the piston. |
| Pipette is blocked; too little liquid is aspirated. | <ul style="list-style-type: none"> - Liquid has entered the nose cone and dried. | <ul style="list-style-type: none"> - Remove the piston from the pipette lower part (Part B, "Maintenance"). Rinse out the lower part with warm water, then rinse with distilled water and allow to dry. |

Maintenance

| | | |
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For information on replacing pistons and seals as well as on disassembling and assembling the different members of the Research family, please refer to the fold-out cover at the front and back of this manual.

Single-channel pipettes:

All maintenance work is carried out using this wrench.

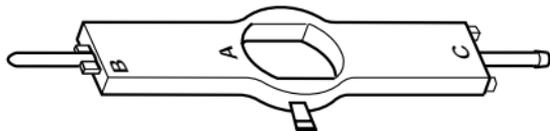


Fig. 5

Opening A: To loosen the pipette lower part from the grip.

Side B: To replace the seals.

Side C: To replace the seals.

Side D: To align the pipette.

Multi-channel pipettes:

All maintenance work is carried out using this tool.

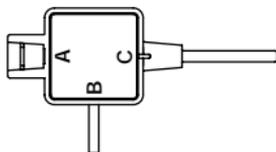


Fig. 6

Side A: To replace the O-rings on the nose cones.

Side B: To remove the lower housing, to loosen the metal clips, to remove the press piece and to align the pipette.

Side C: To replace the seals.

I. Single-channel model

Please open the fold-out cover (Fig. 1) at the front of this manual.

A general description of disassembly and assembly for all single-channel models is followed by instructions on how to replace specific parts for special pipette types.

A Disassembly and assembly (Fig. 1 / point 1)

Disassembly:

- Hold down the ejection button on the side of the pipette and pull off the ejection sleeve (12) using force.
- Unscrew the lower part of the pipette (10) from the grip by turning it to the left (if necessary, use position A of the wrench provided).
- Press the piston holder (1) together and remove it.



The piston is subject to spring tension!

- Remove the piston (3) with spring (4) and replace if necessary.

Assembly:

- Insert the piston (3) with spring (4) into the pipette lower part.
- Place the piston holder (1) over the piston, press it together and slide it into the grooves on the lower part.
- Screw the pipette lower part hand-tight into the grip. (Do not use the wrench.)
- Hold down the ejection button and re-attach the ejection sleeve.

B Replacing pistons and seals

For fixed- and adjustable-volume pipettes up to **20 μ L** (see Fig. 1 / point 2):

- Disassemble the pipette.
- The seal is changed by replacing the entire pipette lower part (10).

For fixed- and adjustable-volume pipettes up to **100 μL** (see Fig. 1 / point 3):

- Disassemble the pipette.
- Using side B of the wrench, undo the screw (6) and tap out the internal spring (7).
- Press in side C of the wrench, pull out the seal and O-ring (8) and replace.
- Push the screw, followed by the spring, followed by the seal (with the O-ring facing downwards) onto side B of the wrench and then rotate it into the pipette lower part (do not over-tighten).

The pipette lower part (10) is also available as a complete unit, with seal.

Replacing the filling tube (13)

- Disassemble the pipette lower part.
- After removing the seal, push out the filling tube from below using the wire punch and push in a new tube from above. Replace the seal at the same time.

Research, adjustable-volume, **20 – 200 μL** (see Fig. 1 / point 4):

- Disassemble the pipette.
- Undo the screw (6) using side C of the wrench.
- Tap out the spring (7), the press piece (9) and the seal (8). Replace the seal.
- Slide the centering aid (tube) over side C of the wrench. Push the screw, spring, press piece and new seal (in the order shown) on to the wrench and screw it into the lower part.

The pipette lower part (10) is also available as a complete unit, with seal.

Replacing the filling tube (13)

- Disassemble the pipette lower part.
- After removing the seal, push out the filling tube from below using the wire punch and push in a new tube from above.

Fixed- and adjustable-volume pipettes **up to 1,000 μL** (see Fig. 1 / point 5):

- Disassemble the pipette.
- Undo the screw (6) using side C of the wrench.
- Tap out the spring (7), the press piece (9) and the seal (8). Replace the seal.
- Attach the spring to the new seal and then insert both parts, together with the screw, into the pipette lower part and tighten.
The pipette lower part (10) is also available as a complete unit, with seal.

Research, adjustable-volume, **500 – 5,000 μL** (see Fig. 1 / point 6):

- The seal is changed by replacing the piston (6).
- Hold down the ejection button and pull off the ejection sleeve (12) using force.
- Unscrew the cylinder (11) by turning it to the left.
- Press and hold down the operating button and pull off the piston (3) using force.
- Slide the new piston onto the piston rod up to the stop.
- Screw the cylinder onto the cylinder attachment (5).

For autoclaving Research, adjustable-volume, 500 – 5,000 μL :

- Remove the piston (3), as described above.
- Slide the disassembly aid over the cylinder attachment (5) and unscrew it from the pipette upper part by turning it to the left.
- After autoclaving, screw the cylinder attachment with the piston rod (2) and stroke spring (4) into the pipette upper part.
- Slide the piston (3) onto the piston rod up to the stop.
- Screw the cylinder onto the cylinder attachment.

II. Multi-channel model

A Replacing the O-rings

- Hold down the ejection button on the side of the pipette and unscrew the lower part counterclockwise from the grip.
- Push opening A of the tool (suitable for the pipette size at hand) from below over the nose cones in such a way as to ensure that the sharp edge in the opening of the tool is overlapping with the O-ring (see Fig. 7).
- Using your index finger, press the tool from behind against the nose cone. Using your thumb, apply pressure from the other side.
- The O-ring is severed at one point and can be removed from the nose cone.

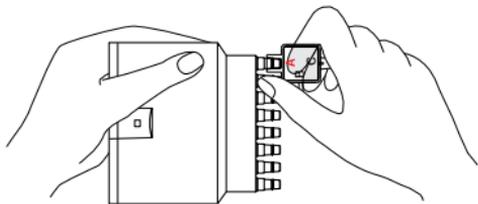


Fig. 7

Attaching a new O-ring

- Attach the assembly aid (shortened pipette tip) onto the nose cone.
- Slide the new O-ring over the tip and onto the nose cone.

B Replacing the piston seals

Please open the fold-out cover at the back of this manual.

- Hold down the ejection key and unscrew the lower part (Fig. 3-6) counterclockwise from the grip.
- With the cone facing downwards, place the pipette lower part horizontally onto a table and press it down slightly.
- Press side B of the tool into the opening (Fig. 3-8) in the housing (Fig. 3-9).



The two stop hooks on the inside are depressed and the cover plate (Fig. 3-7) pops up!

- Pull the housing off the cover plate.
- Hold the lower part firmly, as shown in Fig. 8.
- Press side B of the tool under the metal clip and slide it upwards. Lever the clip off the safety hook.
- Turn the lower part until the second clip is facing forwards. When doing so, grip the tip holder with your thumb (the tip holder is subject to spring tension). Lever off the second clip from the safety hook.
- Pull off the tip holder (Fig. 9).
- To **clean the piston**, pull off the springs (the pistons were deliberately loaded unevenly), wipe all pistons (with 60 % isopropanol as required) and lubricate lightly.
- Re-attach the springs and turn them slightly.
- Arrangement of the pistons:

| | |
|---|---|
| 8-channel 0.5 – 10 μL | Pistons 3, 4, 6 or 4, 6, 7 |
| 8-channel 10 – 100 μL / 30 – 300 μL | Pistons 3, 4, 5, 6 |
| 12-channel 0.5 – 10 μL | Pistons 3, 4, 5, 6 |
| 12-channel 10 – 100 μL / 30 – 300 μL | Pistons 4, 5, 6, 8, 9 or 5, 6, 8, 9, 10 |

Removing the seals:

- The tip holder contains the following for each channel: press piece, spring and spring plate, with the piston seal underneath (Fig. 10).
- To remove the seals, put your index finger onto the opening of the channel in the tip holder which contains the defective seal.



The press piece is under spring tension and may pop out during removal!

0.5 – 10 μ L and 10 – 100 μ L:

- Press the wire punch (side B) on the tool into the openings on the tip holder and slide the press piece upwards slightly. This loosens the press piece and it can be removed (Fig. 11).

30 – 300 μL :

- Proceed as with the other sizes, The press piece is discarded.
- Using side C of the tool, pull out the spring, spring plate and seal (Fig. 12a) and replace the defective seal.

Assembly:

0.5 – 10 μL and 10 – 100 μL :

- Load side C of the tool with the press piece, then the spring, then the spring plate and then the seal. Re-insert side C into the tip holder and press it in (Fig. 12b). Make sure that the press piece is in the correct position.

30 – 300 μL :

- Place a **new** press piece onto the tool and proceed as with the other sizes.

For all sizes:

- The press piece locks into place in the opening of the tip holder.
- Slide the tip holder completely over the piston. When doing so, hold it as shown in Fig. 9.
- Using your thumb, press the first clip firmly upwards over the safety hook. Then rotate the lower part, pressing the tip holder against the upper part when doing so. Using your thumb, press the second clip firmly over the hook.
- Slide on the housing, press the stop hooks together slightly and press down the cover plate until it locks into place.



After the spare parts have been inserted or any other interventions have been made, the pipette must be tested to see whether it is functioning correctly (calibration included).

If these instructions for eliminating faults prove to be unsuccessful, send the pipette to your authorized dealer for repair.

I. Fixed-volume pipettes

Pipettes / spare parts

Models:

| | | |
|---------------------|---|---------------------|
| 5 μL | Light gray control button | 22 44 300-3 |
| 10 μL | Yellow control button | 22 44 305-4 |
| 20 μL | Yellow control button | 22 44 310-1 |
| 25 μL | Yellow control button | 22 44 315-1 |
| 50 μL | Yellow control button | 22 44 320-8 |
| 100 μL | Yellow control button | 22 44 325-9 |
| 200 μL | Blue control button | 22 44 330-5 |
| 250 μL | Blue control button | 22 44 335-6 |
| 450 μL | Blue control button | 22 44 338-1 |
| 500 μL | Blue control button | 22 44 340-2 |
| 1,000 μL | Blue control button | 22 44 345-3 |
| 1 | Piston mount (5 pcs.) | 22 47 620-3 |
| 3 | Pistons | |
| 2 - | 20 μL | 22 47 627-1 |
| 10 - | 100 μL | 22 47 628-9 |
| 100 - | 1,000 μL | 22 47 632-7 |
| 4 | Lifting spring | 22 47 638-6 |
| 6 | Screw | not sold separately |
| 7 | Spring | not sold separately |
| 8 | Seal | |
| 10 - | 100 μL , incl. (6), (7) | 22 47 528-2 |
| 100 - | 1,000 μL , incl. (6), (7) | 22 47 646-7 |
| 10 | Pipette lower part | |
| 2 - | 20 μL , incl. seal | 22 47 667-0 |
| 10 - | 100 μL , incl. (6), (7), (8), (13) | 22 47 669-6 |
| 100 - | 1,000 μL , incl. (6), (7), (8) | 22 47 672-6 |
| 12 | Ejection sleeve | |
| 10 - | 100 μL | 22 47 649-1 |
| 200 - | 1,000 μL | 22 47 652-1 |
| 13 | Reducing tube (5 pcs., 1 wire punch) | 22 47 655-6 |
| | Wrench | 22 47 658-1 |
| | Silicone grease for pistons, 60 g | 22 34 850-1 |
| | Silicone grease for pistons, 2 g | 22 34 851-5 |

II. Adjustable-volume pipettes

Pipettes / spare parts

Models

| | | |
|---|---|---------------------|
| 0.1 – 2.5 μL | Dark gray control button | 22 47 185-6 |
| 0.5 – 10 μL | Light gray control button | 22 47 190-2 |
| 2 – 20 μL | Yellow control button | 22 47 195-3 |
| 10 – 100 μL | Yellow control button | 22 47 200-3 |
| 20 – 200 μL | Yellow control button | 22 47 205-4 |
| 100 – 1,000 μL | Blue control button | 22 47 210-1 |
| 500 – 5,000 μL | Violet control button | 22 47 215-1 |
| 1 | Piston mount (5 pcs.) | 22 47 620-3 |
| 2 | Piston rod (for 500 – 5,000 μL) | 22 47 636-0 |
| 3 | Pistons | |
| 0.1 – 2.5 μL | | 22 47 622-0 |
| 0.5 – 10 μL | | 22 47 625-4 |
| 2 – 20 μL | | 22 47 627-1 |
| 10 – 100 μL | | 22 47 628-9 |
| 20 – 200 μL | | 22 47 630-1 |
| 100 – 1,000 μL | | 22 47 632-7 |
| 500 – 5,000 μL | | 22 47 634-3 |
| 4 | Lifting spring | |
| 0.1 – 2.5 μL | | 22 47 638-6 |
| 0.5 – 10 μL | | 22 47 638-6 |
| 2 – 20 μL | | 22 47 638-6 |
| 10 – 100 μL | | 22 47 638-6 |
| 20 – 200 μL | | 22 47 638-6 |
| 100 – 1,000 μL | | 22 47 638-6 |
| 500 – 5,000 μL | | 22 47 640-8 |
| 5 | Cylinder mount (for 500 – 5,000 μL) | 22 47 642-4 |
| 6 | Screw | not sold separately |
| 7 | Spring | not sold separately |
| 8 | Seal | |
| 10 – 100 μL , incl. (6), (7) | | 22 47 528-2 |
| 20 – 200 μL , incl. (6), (7), (9), centering aid | | 22 47 644-1 |
| 100 – 1,000 μL , incl. (6), (7) | | 22 47 646-7 |
| 9 | Press piece | not sold separately |

| | | |
|----|--|-------------|
| 10 | Pipette lower part | |
| | 0.1 – 2.5 μL , incl. seal | 22 47 662-9 |
| | 0.5 – 10 μL , incl. seal | 22 47 665-3 |
| | 2 – 20 μL , incl. seal | 22 47 667-0 |
| | 10 – 100 μL , incl. (6), (7), (8), (13) | 22 47 669-6 |
| | 20 – 200 μL , incl. (6), (7), (8), (9), (13) | 22 47 670-0 |
| | 100 – 1,000 μL , incl. (6), (7), (8) | 22 47 672-6 |
| | 500 – 5,000 μL , incl. (2), (3), (4), (5), (11) | 22 47 674-2 |
| 11 | Cylinder | |
| 12 | Ejection sleeve | |
| | 0.1 – 2.5 μL | 22 47 648-3 |
| | 0.5 – 10 μL | 22 47 649-1 |
| | 2 – 20 μL | 22 47 649-1 |
| | 10 – 100 μL | 22 47 649-1 |
| | 20 – 200 μL | 22 47 650-5 |
| | 100 – 1,000 μL | 22 47 652-1 |
| | 500 – 5,000 μL | 22 47 654-8 |
| 13 | Reducing tube (5 pcs., 1 wire punch) | |
| | 10 – 100 μL | 22 47 655-6 |
| | 20 – 200 μL | 22 47 656-4 |
| | Wrench | 22 47 658-1 |
| | Silicone grease for piston, 60 g | 22 34 850-7 |
| | Disassembly aid (for 500 – 5,000 μL) | 22 47 660-2 |

III. Multi-channel pipettes

Pipettes/spare parts

8-channel:

| | | |
|------------------------|---------------------------|-------------|
| 0.5 – 10 μL | Control button light gray | 22 45 200-2 |
| 10 – 100 μL | Control button yellow | 22 45 202-9 |
| 30 – 300 μL | Control button yellow | 22 45 204-5 |

12-channel:

| | | |
|------------------------|---------------------------|-------------|
| 0.5 – 10 μL | Control button light gray | 22 45 206-1 |
| 10 – 100 μL | Control button yellow | 22 45 208-3 |
| 30 – 300 μL | Control button yellow | 22 45 210-0 |

Lower part, 8-channel:

| | | |
|-------------------------------|--|-------------|
| 0.5 – 10 μL , cpl. | | 22 45 388-2 |
| 10 – 100 μL , cpl. | | 22 45 390-4 |
| 30 – 300 μL , cpl. | | 22 45 392-1 |

| | |
|--|-------------|
| Lower part, 12-channel: | |
| 0.5 – 10 μL , cpl. | 22 45 394-7 |
| 10 – 100 μL , cpl. | 22 45 396-3 |
| 30 – 300 μL , cpl. | 22 45 398-0 |
| Tool | |
| 0.5 – 10 μL , cpl. | 22 45 689-0 |
| 10 – 100 μL , cpl. | 22 46 703-4 |
| 30 – 300 μL , cpl. | 22 45 691-1 |
| 1 set of O-rings for nose cones, 24 pcs., for 100 and 300 μL | 22 45 635-1 |
| Piston seals (1 press piece, 12 piston seals, 1 spring, 1 spring plate) | |
| 0.5 – 10 μL , cpl. | 22 45 653-9 |
| 10 – 100 μL , cpl. | 22 46 721-2 |
| (12 press pieces, 12 piston seals, 1 spring, 1 spring plate) | |
| 30 – 300 μL , cpl. | 22 45 655-5 |
| Reagent Reservoir, for extracting reagents; individually autoclavable | |
| 1 set (10 Reagent Reservoir and 10 lids) | 22 26 580-6 |
| Silicone grease, 60 g | 22 45 850-7 |

IV. Pipette tips

(The amounts given are the minimum ordering unit).

Bulk-packaged tips

in bags of 1,000:

| | |
|--------------------------------|-------------|
| 2.5 μL | 22 35 142-7 |
| 20 μL | 22 35 156-7 |
| 200 μL | 22 35 130-3 |
| 300 μL | 22 35 141-9 |
| 1,000 μL | 22 35 090-1 |
| 5,000 μL (500 pcs.) | 22 35 081-1 |

Enviroset

1 Envirobox
autoclavable, plus 7 x 96 Envirotips in racks:

| | |
|---------------------|-------------|
| 2.5 μL | 22 49 049-4 |
| 20 μL | 22 49 050-8 |
| 200 μL | 22 49 055-9 |
| 300 μL | 22 49 057-5 |
| 1,000 μL | 22 49 060-5 |

| | |
|---|-------------|
| Envirotips tip refills in Racks, 10 x 96= 960 pcs.: | |
| 2.5 µL | 22 49 039-7 |
| 20 µL | 22 49 040-1 |
| 200 µL | 22 49 042-7 |
| 300 µL | 22 49 043-5 |
| 1,000 µL | 22 49 044-3 |
| Enviroboxes , 1 Envirobox plus 96 Envirotips | |
| 2.5 µL | 22 49 079-6 |
| 20 µL | 22 49 080-0 |
| 200 µL | 22 49 085-1 |
| 300 µL | 22 49 087-7 |
| 1,000 µL | 22 49 090-7 |
| 5,000 µL (28 pcs.) | 22 49 105-9 |
| Eppendorf Biopur pipette tips , colorless, sterile, pyrogen-free, DNA-free, RNase-free, ATP-free in boxes of 5 x 96 = 480 pcs.: | |
| 20 µL | 22 49 000-1 |
| 200 µL | 22 49 002-8 |
| 300 µL | 22 49 003-6 |
| 1,000 µL | 22 49 006-1 |
| Eppendorf Biopur pipette tips , individually packaged: 1 set = 100 pcs. | |
| 200 µL | 22 49 004-4 |
| 1,000 µL | 22 49 008-7 |
| Filtertips , sterile, in boxes, 5 x 96 = 480 pcs. | |
| 10 µL | 22 49 030-3 |
| 100 µL | 22 49 032-0 |
| 250 µL | 22 49 035-4 |
| 1,000 µL | 22 49 034-6 |
| Autoclavable racks | |
| Ultra Micro Tip, 2.5 µL, 960 tips | 22 35 098-6 |
| Ultra Micro Tip, 20 µL, 960 tips | 22 35 153-2 |
| Flex-Tip, 200 µL, 960 tips | 22 35 157-1 |
| Tip, 300 µL, 960 tips | 22 35 144-3 |
| Tip, 1,000 µL, 960 tips | 22 35 097-8 |



Please use only the accessories recommended by Eppendorf.
Using spare parts and consumables that we have not recommended may reduce the precision, accuracy and life of the devices. We do not honor any warranty or accept any responsibility for damage resulting from such action.

Multi-channel / Multicanal

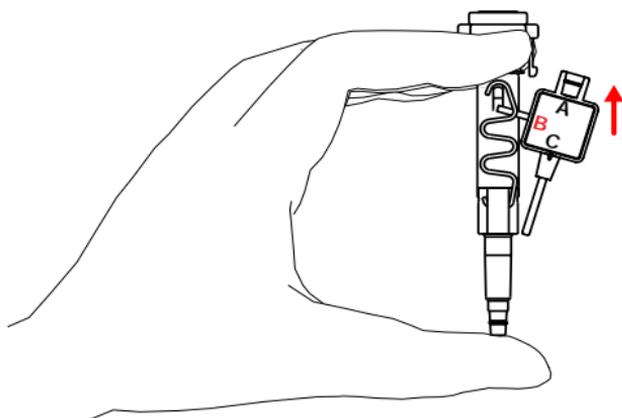


Fig. 8

Fig. 10

Press piece
Presseur
Sujetador



Spring
Ressort
Muelle



Spring plate
Plaque pour ressort
Platillo de muelle



Seal
Joint
Junta

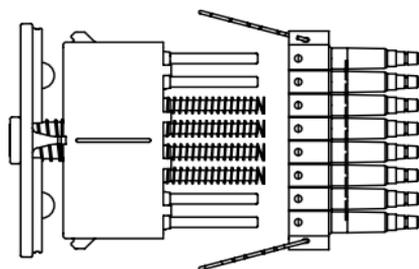


Fig. 9

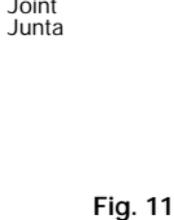


Fig. 11

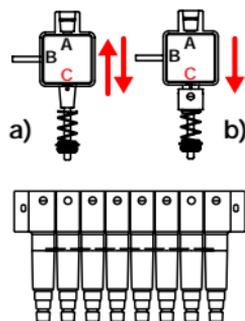


Fig. 12

