



Eppendorf Research[®] Family fix · variable · multi

Bedienungsanleitung · Instruction Manual · Mode d'emploi
Istruzioni d'impiego · Manual de Instrucciones



eppendorf

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U.S. Patent No. 5,531,131; 4,961,350

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Fig./Abb. 1 Research Family – variable / fix

Single-Channel / Einkanal

Research variable	0,1 – 2,5 µl			
	0,5 – 10 µl			
	2 – 20 µl		10 – 100 µl	20 – 200 µl

Research fix	- 20 µl	- 100 µl		
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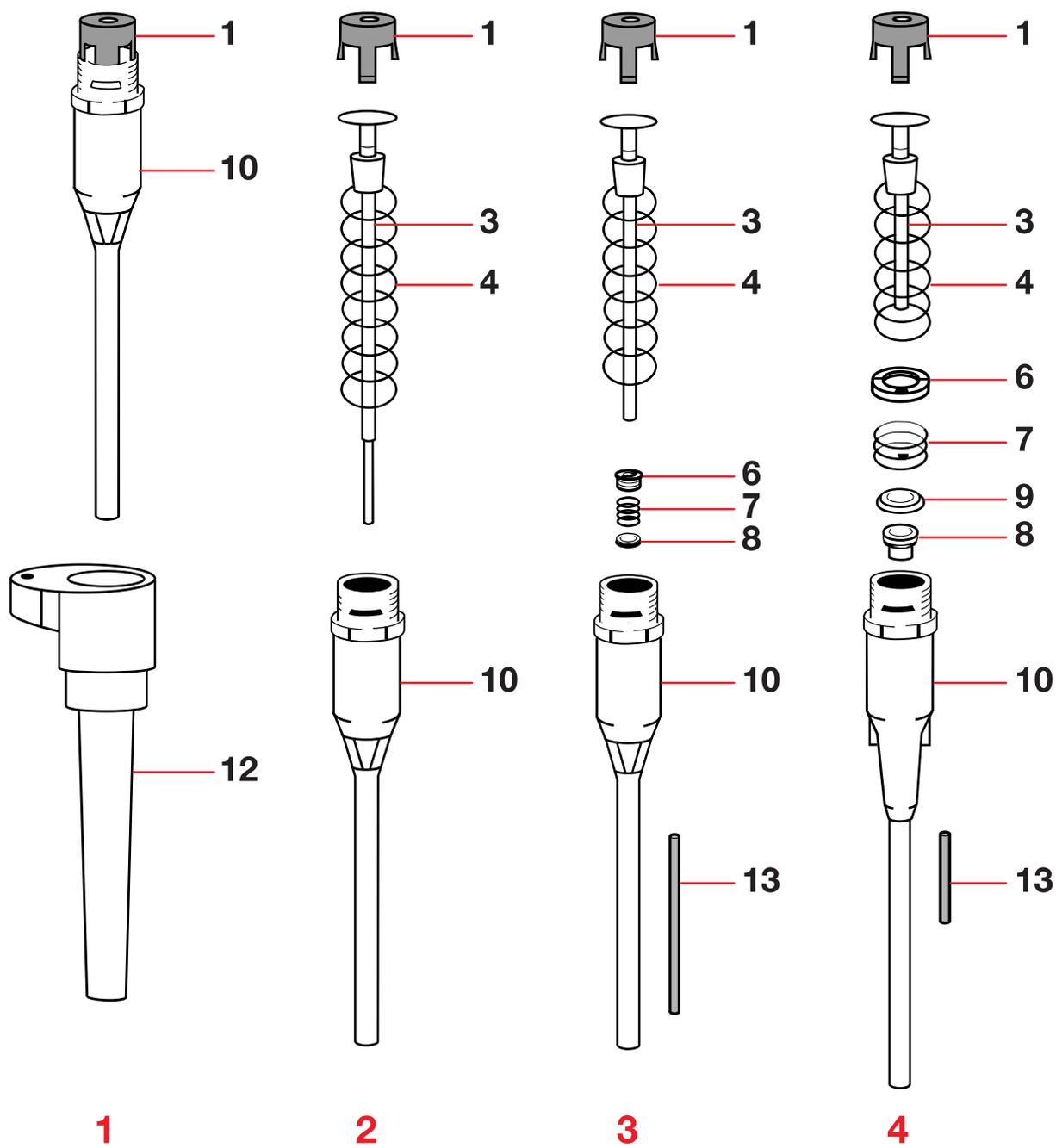


Fig./Abb. 1 Research Family – variable / fix

Single-Channel / Einkanal

100–1000 µl

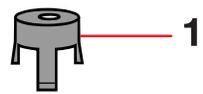
500–5000 µl

1–10 ml

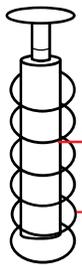
Research variable

–1000 µl

Research fix

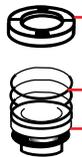


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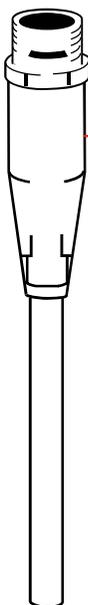
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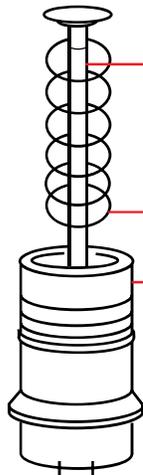
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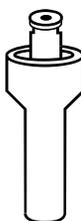
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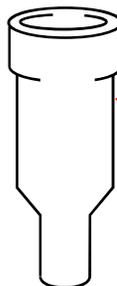
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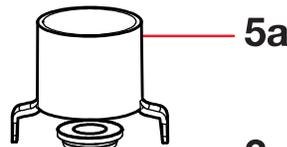


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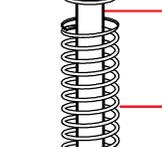
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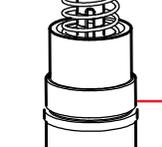


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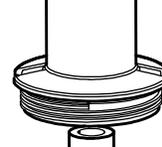
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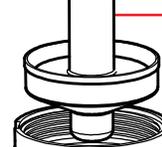
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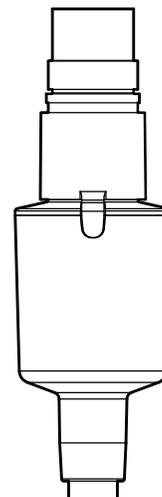


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1 Safety precautions and applicational limitations

The Research pipette is a lab device. It may only be operated by appropriately qualified lab personnel.

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.
- Pipette tips are solely designed for disposable usage.
- Use the 1 – 10 ml pipette only with filter inserted.
- 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 suitability of use with 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 original spare parts and accessories (pipette tips) only.

2 Technical data

2.1 Research, fixed-volume

Model / volume	epT.I.P.S.	Systematic error (Inaccuracy)	Random error (Imprecision; CV)
10 µl	2– 200 µl	± 1.2 %	≤ 0.6 %
20/25 µl	2– 200 µl	± 1.0 %	≤ 0.3 %
50 µl	2– 200 µl	± 0.7 %	≤ 0.3 %
100 µl	2– 200 µl	± 0.6 %	≤ 0.2 %
200– 1 000 µl	50– 1 000 µl	± 0.6 %	≤ 0.2 %

2.2 Research, adjustable-volume

Model	epT.I.P.S.	Volume	Systematic error (Inaccuracy)	Random error (Imprecision; CV)
0.1– 2.5 µl	0.1– 10 µl	0.25 µl	± 12.0 %	≤ 6.0 %
		1.25 µl	± 2.5 %	≤ 1.5 %
		2.5 µl	± 1.4 %	≤ 0.7 %
0.5– 10 µl	0.5– 20 µl	1 µl	± 2.5 %	≤ 1.8 %
		5 µl	± 1.5 %	≤ 0.8 %
		10 µl	± 1.0 %	≤ 0.4 %
2– 20 µl	2– 200 µl	2 µl	± 5.0 %	≤ 1.5 %
		10 µl	± 1.2 %	≤ 0.6 %
		20 µl	± 1.0 %	≤ 0.3 %
10– 100 µl	2– 200 µl	10 µl	± 3.0 %	≤ 1.0 %
		50 µl	± 1.0 %	≤ 0.3 %
		100 µl	± 0.8 %	≤ 0.2 %
20– 200 µl	2– 200 µl	20 µl	± 2.5 %	≤ 0.7 %
		100 µl	± 1.0 %	≤ 0.3 %
		200 µl	± 0.6 %	≤ 0.2 %
100– 1 000 µl	50– 1 000 µl	100 µl	± 3.0 %	≤ 0.6 %
		500 µl	± 1.0 %	≤ 0.2 %
		1 000 µl	± 0.6 %	≤ 0.2 %
500– 5 000 µl	100– 5 000 µl	500 µl	± 2.4 %	≤ 0.6 %
		2 500 µl	± 1.2 %	≤ 0.25 %
		5 000 µl	± 0.6 %	≤ 0.15 %
1– 10 ml	1– 10 ml Standard	1 000 µl	± 3.0 %	≤ 0.6 %
		5 000 µl	± 0.8 %	≤ 0.2 %
		10 000 µl	± 0.6 %	≤ 0.15 %

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

Model	epT.I.P.S.	Volume	Systematic error (Inaccuracy)	Random error (Imprecision; CV)
0.5 – 10 µl	0.5 – 20 µl	1 µl	± 8.0 %	≤ 5.0 %
		5 µl	± 4.0 %	≤ 2.0 %
		10 µl	± 2.0 %	≤ 1.0 %
10 – 100 µl	2 – 200 µl	10 µl	± 3.0 %	≤ 2.0 %
		50 µl	± 1.0 %	≤ 0.8 %
		100 µl	± 0.8 %	≤ 0.3 %
30 – 300 µl	20 – 300 µl	30 µl	± 3.0 %	≤ 1.0 %
		150 µl	± 1.0 %	≤ 0.5 %
		300 µl	± 0.6 %	≤ 0.3 %

The technical data is valid only when the quoted Eppendorf pipette tips are used. Tests carried out in accordance with ISO 8655 for piston-stroke pipettes with an air cushion using a fine balance with moisture trap approved by the standardization authorities.

Note: on the 1 – 10 ml pipette, when the 1 – 10 ml tip, long (see ordering information) is used, the quoted tolerance range increases by a factor of 2 compared to when the standard tip is used.

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. If the place where the pipette is used is at extremely high altitude, an adjustment must be made in line with the ambient air pressure.

3 Function principle

The pipettes belonging to the Research family 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 separate tip ejection.

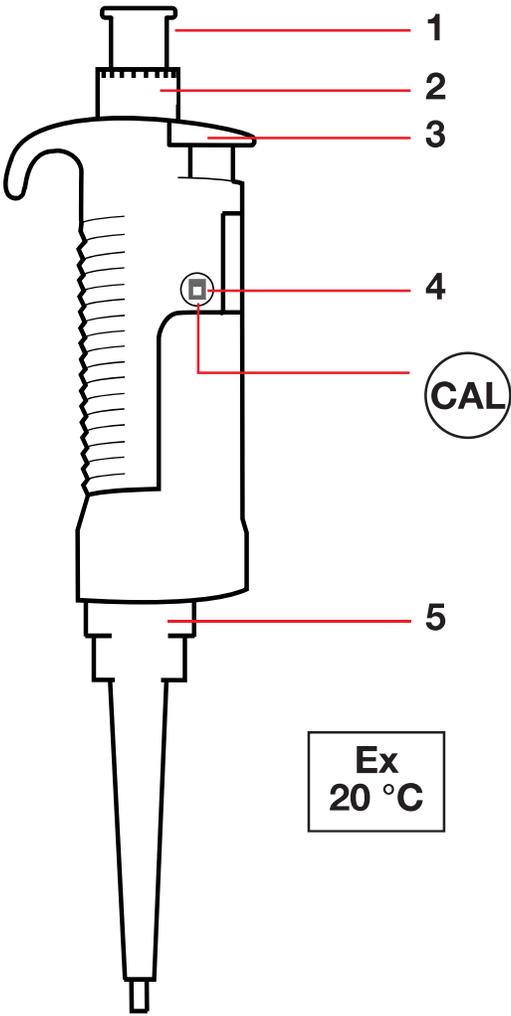
Each channel of the multi-channel model has its own piston, which means that is possible to attach fewer than eight or twelve tips.

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

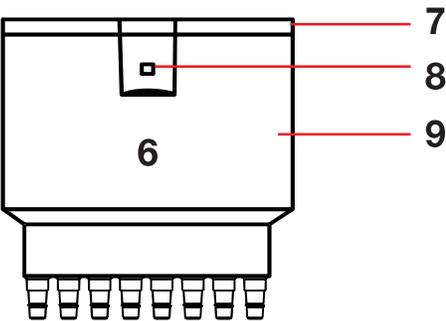
Research Family – Part A – Section 3

It is possible to choose between a lower part for eight channels and for twelve channels. Both cover the same volume range.

Fig. 2 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
with overlapping calibration seal for inserting the wrench during adjustment.
- 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. 2-2). 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 a suitable tip, the color of the 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.

4.3 Aspirating liquid

- The liquid which is to be aspirated is taken from a suitable vessel (for multi-channel pipettes, we recommend the "Tip-Tub").
- Attach suitable tips the pipette firmly (observe the color coding).
- 1 – 10 ml model: use pipette only with filter inserted.
- Press down the control button (Fig. 2-1) to the first stop (measuring stroke).
- Immerse the pipette tip(s) approx. 3 mm into the liquid.
For Research, adjustable volume, 500–5000 µl and 1 – 10 ml: approx. 5 mm.
- Allow the control button to slide back **slowly**.
- Before removing Research, adjustable volume, 500–5000 µl and 1 – 10 ml 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. When doing so, ensure that no liquid comes out of the tip(s).

Note:

For Research, adjustable volume, 500–5 000 μl and 1 – 10 ml: 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. 2-1) 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. 2-3).



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

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.

5 Testing / alignment

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.

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 Alignment

5.2.1 When should alignment 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 and provided with a calibration seal at the factory.

In the case of doubts arising with regard to the accuracy of the pipetted volume, the following points should be clarified:

- 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?

If the place where the pipette is used is at extremely high altitude, an adjustment must be made in line with the ambient air pressure. At 1,000 m above sea level, there is a volume error of approx. -0.4% .

Assistance with these questions is contained in Eppendorf's SOP (**S**tandard **O**perating **P**rocedure), which is available upon request. An SOP can be called up from our home page www.eppendorf.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 alignment 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 ($=10\%$!)

- a The pipette, tip and water must all be the same temperature (20–25 °C, constant to ± 0.5 °C).
- b 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:

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

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

- d To align to the volume displayed, side D (or side B with multi-channel pipettes) of the wrench is inserted horizontally through the calibration seal into the alignment opening (Fig. 2-4) in the pipette grip. (When doing so, hold the pipette vertically.) The wrench is then rotated into a vertical position. The calibration seal is thereby destroyed and removed.
- 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 – 1000 µl	approx. 50 µl
500 – 5000 µl	approx. 250 µl
1 – 10ml	approx. 510 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

10 µl	approx. 0.8 µl	200 µl	approx. 38 µl
20 µl	approx. 0.8 µl	250 µl	approx. 38 µl
25 µl	approx. 4 µl	500 µl	approx. 38 µl
50 µl	approx. 4 µl	1000 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.

Next, close the adjustment opening with one of the supplied calibration seals.

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 carefully wiped clean using 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").

In order to ensure the consistent quality of the pipettes, we recommend using the corresponding parts of the same generation (PhysioCare Concept + PhysioCare Concept, Standard + Standard*).

* please review old operating instructions

Visual differentiating features of PhysioCare Concept pipettes:



Single-channel



Black piston holder

Multi-channel



Black tip holder

6.2 Sterilization

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

If necessary, 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 lower part (with pipettes up to 1000 µl, this may require the assistance of opening A of the wrench provided).

Variant 1 – 10 ml

Pull filter (14) down out of the nose cone. The filter swells up slightly during autoclaving. Compress gently when reinserting. This does not impair function. Only autoclave filter 1x. Unscrew the complete lower part (10) from the grip by turning to the left, **not** turning the ejection sleeve (12) at the same time. The ejection sleeve comes out of its bracket automatically during turning and can be removed from the lower part.

Single-channel, adjustable-volume 500 – 5000 μ l

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

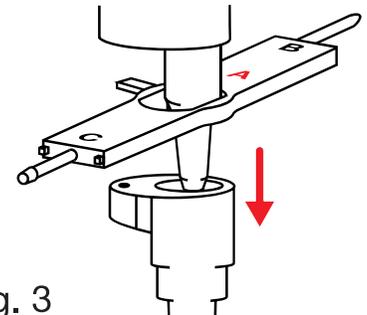


Fig. 3

6.2.2 Multi-channel model

With the multi-channel model, the complete lower part (Fig. 2-6) 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.

6.3 Decontamination prior to dispatch



If the Research pipette is to be checked, repaired or calibrated by Eppendorf AG or another service partner, it must be free of hazardous substances and clean!

A form called "Decontamination certificate for pipettes" is enclosed with the packaging when the pipette is delivered.

A form called "Decontamination certificate for return of goods" and general notes about decontamination are available on our home page:

www.eppendorf.com

A signed decontamination certificate must be enclosed with the pipette when it is returned. The serial number of the Research must be entered on the decontamination certificate.

The bottom part of the Research can be decontaminated of potentially infectious substances by being steam-autoclaved (see Sec. 6.2).

The surfaces of the pipette can be disinfected with alcohol (ethanol, propanol) or with a disinfectant containing alcohol.

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. <p>For 500–5000 µl/1–10 ml pipette:</p> <ul style="list-style-type: none"> – Pipetting was too fast. – 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. – Seal is damaged. – The pipette lower part is loose. <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. – Allow the control button to slide back slowly. – 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 500–5000 µl and 1–10 ml model, replace the piston (Part B, "Maintenance"). – Tighten the pipette lower part by hand. – Replace defective O-ring (Part B, "Maintenance").

Research Family – Part A – Section 7

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 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.

If there is doubt that dispensing data are correct

To avoid dispensing errors, the precision and accuracy of the Research need to be checked regularly. The PICASO II software program (see ordering information) is available to determine permitted systematic and random measuring deviation (see Section 2 "Technical data"). An SOP (**S**tandard **O**perating **P**rocedure) for checking pipettes can be called up from our home page www.eppendorf.com.

For liquids whose physical data deviate significantly from those of water, calibration needs to be changed in accordance with Section 5.2.3.

Calibration will also need to be changed if the pipette is being used at a very high altitude.

Research Family – Part B – Contents

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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.

Research Family – Part B – Maintenance

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

Single-channel pipettes

All maintenance work is carried out using this wrench.

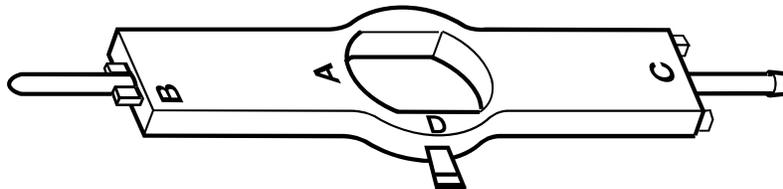


Fig. 4

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.

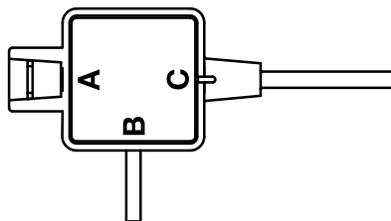


Fig. 5

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.
An exception is the 1 – 10 ml model:
see Section B "Replacing pistons and seals".
- Unscrew the pipette lower part (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 µl** (see Fig. 1 / point 2):

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

Research Family – Part B – Maintenance

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.

Research Family – Part B – Maintenance

Fixed- and adjustable-volume pipettes **up to 1000 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 – 5000 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:

- 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.

Research variable **1 – 10 ml** (see Fig. 1 / point 7):

the seal is changed by replacing piston (3).

- Pull filter (14) down out of the nose cone.
- Unscrew the complete lower part (10) from the grip by turning to the left, **not** turning the ejection sleeve (12) at the same time. The ejection sleeve comes out of its bracket automatically during turning and can be removed from the lower part.

Research Family – Part B – Maintenance

- Pull the locking mechanism (5a), which is located on the cylinder attachment (5), off upwards.
- Unscrew cylinder (11) from the cylinder attachment (5) by turning to the left.
- Put the disassembly aid supplied over the cylinder attachment (5) from above and press down, which pushes the piston down at the same time.
- Keep the disassembly aid depressed on the cylinder attachment in the lowest position using your forefinger and thumb and use the other hand to pull off the piston (3) using force.
- Keep the disassembly aid depressed and push a new piston onto piston rod (2) up to the stop. Remove the disassembly aid.
- Screw cylinder (11) back up tightly so that the grooves of the cylinder and the cylinder attachment line up.
- Place locking device (5a) on cylinder attachment (5) from above so that the lugs extend into the grooves.
- Put ejection sleeve (12) on the lower part and hold steady.
- Push lower part of pipette (10) into grip with one hand, using the other to fix the ejection sleeve in position in its bracket.
- Screw up the lower part of the pipette firmly.
- Insert a new filter if necessary.

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. 6).

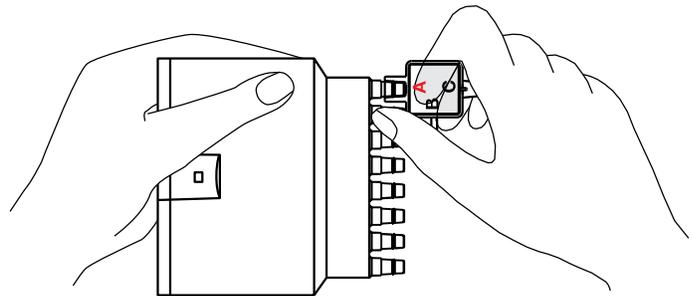


Fig. 6

- 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.

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.

Information: Only O-rings made of red silicone are now available for the Research Pipettes. The force required for fitting or ejecting pipette tips has been further reduced with these red O-rings – in comparison with the previous black O-rings. Uniform alignment of the pipette tips on the lower part of the multi-channel model has also been improved. It is no longer necessary to relubricate the red O-rings.

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. 2-6) 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. 2-8) in the housing (Fig. 2-9).



The two stop hooks on the inside are depressed and the cover plate (Fig. 2-7) pops up!

Research Family – Part B – Maintenance

- Pull the housing off the cover plate.
- Hold the lower part firmly, as shown in Fig. 7.
- 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. 8).
- 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 4 and 5
8-channel 10 – 100 µl / 30 – 300 µl	Pistons 3, 4 and 5
12-channel 0.5 – 10 µl	Pistons 6 and 7
12-channel 10 – 100 µl / 30 – 300 µl	Pistons 4, 5, 6 and 7

Removing the seals

- The tip holder contains the following for each channel: press piece, spring and spring plate, with the piston seal underneath (Fig. 9).
- 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 µl and 10 – 100 µl

- 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. 10).

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. 11a) 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. 11b). 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. 7.
- 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.

Research Family – Part B – Ordering information

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

In order to ensure the consistent quality of the pipettes, we recommend using the corresponding parts of the same generation (PhysioCare Concept + PhysioCare Concept, Standard + Standard*).

* please review old operating instructions

I. Fixed-volume pipettes

Pipettes / spare parts

Models:

10 µl Yellow control button	3112 000.010
20 µl Yellow control button	3112 000.029
25 µl Yellow control button	3112 000.037
50 µl Yellow control button	3112 000.045
100 µl Yellow control button	3112 000.053
200 µl Blue control button	3112 000.061
250 µl Blue control button	3112 000.070
500 µl Blue control button	3112 000.088
1000 µl Blue control button	3112 000.096
1 Piston holder (5 pcs.)	3111 609.003
3 Pistons	
2 – 20 µl	3110 818.008
10 – 100 µl	3110 813.006
100 – 1000 µl	3110 815.009
4 Stroke spring	
10 – 100 µl	3111 607.000
200 – 1000 µl	3111 608.007
6 Screw	not sold separately
7 Spring	not sold separately
8 Seal	
10 – 100 µl, incl. (6), (7)	4910 820.007
100 – 1000 µl, incl. (6), (7)	3110 845.005
10 Pipette lower part	
2 – 20 µl, incl. seal	3110 858.000
10 – 100 µl, incl. (6), (7), (8), (13)	3110 859.006
100 – 1000 µl, incl. (6), (7), (8)	3110 855.000

Research Family – Part B – Ordering information

12 Ejection sleeve	
10 – 100 μ l	3110 861.000
200 – 1000 μ l	3110 865.006
13 Filling tube (5 pcs., 1 wire punch)	3110 872.002
Wrench	3111 501.016

II. Adjustable-volume pipettes

Pipettes / spare parts

Models

0.1 – 2.5 μ l	Dark gray control button	3111 000.114
0.5 – 10 μ l	Light gray control button	3111 000.122
2 – 20 μ l	Yellow control button	3111 000.130
10 – 100 μ l	Yellow control button	3111 000.149
20 – 200 μ l	Yellow control button	3111 000.157
100 – 1000 μ l	Blue control button	3111 000.165
500 – 5000 μ l	Violet control button	3111 000.173
1 – 10 ml	Turquoise control button	3111 000.181
1 Piston holder (5 pcs.)		3111 609.003
2 Piston rod		
500 – 5000 μ l		3110 806.000
1 – 10 ml		3110 806.000
3 Pistons		
0.1 – 2.5 μ l		3110 810.007
0.5 – 10 μ l		3110 817.001
2 – 20 μ l		3110 818.008
10 – 100 μ l		3110 813.006
20 – 200 μ l		3110 814.002
100 – 1000 μ l		3110 815.009
500 – 5000 μ l		3110 816.005
1 – 10 ml		3111 601.002
4 Stroke spring		
0.1 – 2.5 μ l		3111 607.000
0.5 – 10 μ l		3111 607.000
2 – 20 μ l		3111 607.000
10 – 100 μ l		3111 607.000
20 – 200 μ l		3111 608.007
100 – 1000 μ l		3111 608.007
500 – 5000 μ l		3110 826.000
1 – 10 ml		3110 826.000

Research Family – Part B – Ordering information

5	Cylinder attachment	
	500 – 5000 μ l	3110 836.006
	1 – 10 ml	3111 602.009
5a	Locking mechanism (for 10 ml only)	3111 604.001
6	Screw	not sold separately
7	Spring	not sold separately
8	Seal	
	10 – 100 μ l, incl. (6), (7)	4910 820.007
	20 – 200 μ l, incl. (6), (7), (9), centering aid	3110 844.009
	100 – 1000 μ l, incl. (6), (7)	3110 845.005
9	Press piece	not sold separately
10	Pipette lower part	
	0.1 – 2.5 μ l, incl. seal	3110 850.009
	0.5 – 10 μ l, incl. seal	3110 857.003
	2 – 20 μ l, incl. seal	3110 858.000
	10 – 100 μ l, incl. (6), (7), (8), (13)	3110 859.006
	20 – 200 μ l, incl. (6), (7), (8), (9), (13)	3110 849.000
	100 – 1000 μ l, incl. (6), (7), (8)	3110 855.000
	500 – 5000 μ l, incl. (2), (3), (4), (5), (11)	3110 856.007
	1 – 10 ml, incl. (2), (3), (4), (5), (5a), (11)	3111 603.005
11	Cylinder	not sold separately
12	Ejection sleeve	
	0.1 – 2,5 μ l	3110 860.004
	0.5 – 10 μ l	3110 861.000
	2 – 20 μ l	3110 861.000
	10 – 100 μ l	3110 861.000
	20 – 200 μ l	3110 863.003
	100 – 1000 μ l	3110 865.006
	500 – 5000 μ l	3110 866.002
	Ejector	
	1 – 10 ml	3111 605.008
13	Filling tube (5 pcs., 1 wire punch)	
	10 – 100 μ l	3110 872.002
	20 – 200 μ l	3110 873.009
14	Filter for 10 ml pipette (50 pcs., in bag)	3111 606.004
	Wrench	3111 501.016
	Disassembly aid (for 500 – 5000 μ l and 1 – 10 ml)	3110 110.021

III. Multi-channel pipettes

Pipettes/spare parts

8-channel:

0.5 – 10 µl Control button	light gray	3114 000.115
10 – 100 µl Control button	yellow	3114 000.131
30 – 300 µl Control button	yellow	3114 000.158

12-channel:

0.5 – 10 µl Control button	light gray	3114 000.123
10 – 100 µl Control button	yellow	3114 000.140
30 – 300 µl Control button	yellow	3114 000.166

Lower part, 8-channel:

0.5 – 10 µl, cpl.		3114 608.008
10 – 100 µl, cpl.		3114 610.002
30 – 300 µl, cpl.		3114 612.005

12-channel:

0.5 – 10 µl, cpl.		3114 609.004
10 – 100 µl, cpl.		3114 611.009
30 – 300 µl, cpl.		3114 613.001

Tool

0.5 – 10 µl, cpl.		4908 829.005
10 – 100 µl, cpl.		4860 735.003
30 – 300 µl, cpl.		4908 832.006

1 set of O-rings for nose cones,
incl. assembly aid for 100 and 300 µl

4908 836.001

Set of piston seals

(see fold-out cover at the rear of this manual;
set of piston seals contains further:
press piece, spring, spring plate)

0.5 – 10 µl, cpl.		4908 833.002
10 – 100 µl, cpl.		4860 721.002
30 – 300 µl, cpl.		4908 835.005

IIIa. Additional accessories

Silicone grease		0013 063.010
"Tip-Tub", autoclavable multi-channel reagent attachment, 1 set (10 tubs + 10 lids)		0030 058.607
Instruction manual		3111 900.115
PICASO II (Pipette Calibration Software)		3113 004.001
PICASO accessories see eppendorf catalog		
Calibration seal, red (5 pcs.)		3111 610.001

Research Family – Part B – Ordering information

IV. Pipette holder

Adapter only for Pipette carousel 4807 (old)	
Adapter for Research variable 500 – 5000 µl	3110 112.008
Adapter for Research Multi-channel pipettes	3114 607.001
Pipette carousel 3115	
Pipette carousel, incl. 6 pipette supports	3115 000.003
Pipette holder (replacement for stand)	3115 600.019
Pipette holder (with adhesive surface for attachment to lab benches and wall)	3115 000.020

V. Pipette tips

epT.I.P.S.

(The packaging units stated represent the minimum ordering quantity).

	Color code	Order no.
Standard , in bags, 2x 500 = 1000 tips		
0.1 – 10 µl	anthracite	0030 000.811
0.1 – 20 µl	dark gray	0030 000.838
0.5 – 20 µl L	light gray	0030 000.854
2 – 200 µl	yellow	0030 000.870
20 – 300 µl	orange	0030 000.897
50 – 1000 µl	blue	0030 000.919
100 – 5000 µl (500 tips)	violet	0030 000.978
1 – 10 ml, standard (200 tips)	turquoise	0030 000.765
1 – 10 ml, long (200 Tips)	turquoise	0030 000.781
Set , 1 Box, incl. 5x 96 tips		
0.1 – 10 µl	anthracite	0030 073.207
0.1 – 20 µl	dark gray	0030 073.223
0.5 – 20 µl L	light gray	0030 073.240
2 – 200 µl	yellow	0030 073.266
20 – 300 µl	orange	0030 073.282
50 – 1000 µl	blue	0030 073.304
Reloads , 10x 96 = 960 tips		
0.1 – 10 µl (in stacks)	anthracite	0030 073.363
0.1 – 20 µl	dark gray	0030 073.380
0.5 – 20 µl L	light gray	0030 073.401
2 – 200 µl (in stacks)	yellow	0030 073.428
20 – 300 µl	orange	0030 073.444
50 – 1000 µl	blue	0030 073.460

Research Family – Part B – Ordering information

	Color code	Order no.
Reloads PCR-clean, 10x 96 = 960 tips		
0.1 – 10 µl (in stacks)	anthracite	0030 073.746
0.1 – 20 µl	dark gray	0030 073.762
0.5 – 20 µl L	light gray	0030 073.789
2 – 200 µl (in stacks)	yellow	0030 073.800
20 – 300 µl	orange	0030 073.827
50 – 1000 µl	blue	0030 073.843
Box, 1 box plus 96 tips		
0.1 – 10 µl	anthracite	0030 073.002
0.1 – 20 µl	dark gray	0030 073.029
0.5 – 20 µl L	light gray	0030 073.045
2 – 200 µl	yellow	0030 073.061
20 – 300 µl	orange	0030 073.088
50 – 1000 µl	blue	0030 073.100
100 – 5000 µl (24 tips)	violet	0030 073.169
Racks Eppendorf Biopur, colorless, sterile, pyrogen-free, DNA-free, RNase-free, ATP-free		
5x 96 = 480 tips		
0.1 – 20 µl	dark gray	0030 075.005
2 – 200 µl	yellow	0030 075.021
20 – 300 µl	orange	0030 075.048
50 – 1000 µl	blue	0030 075.064
1 – 10 ml standard (120 tips)	turquoise	0030 075.145
Singles (Eppendorf Biopur), individually wrapped, 100 tips		
0.1 – 20 µl	dark gray	0030 010.019
2 – 200 µl	yellow	0030 010.035
50 – 1000 µl	blue	0030 010.051
Filter, sterile, PCR-clean, in racks,		
10x 96 = 960 tips		
0.1 – 10 µl S	anthracite	0030 077.008
0.1 – 10 µl M	dark gray	0030 077.024
0.5 – 10 µl L	light gray	0030 077.040
2 – 20 µl	yellow	0030 077.148
2 – 100 µl	yellow	0030 077.067
2 – 200 µl	yellow	0030 077.377
20 – 300 µl	orange	0030 077.083
50 – 1000 µl	blue	0030 077.105
100 – 5000 µl, 5x 24 = 120 tips	violet	0030 077.342
1 – 10 ml, long (100 pcs.) individually blister-packed	turquoise	0030 077.164
GELoader® tips (f. 0.5 – 10 µl)		
1 set = 200 tips	light gray	0030 001.222

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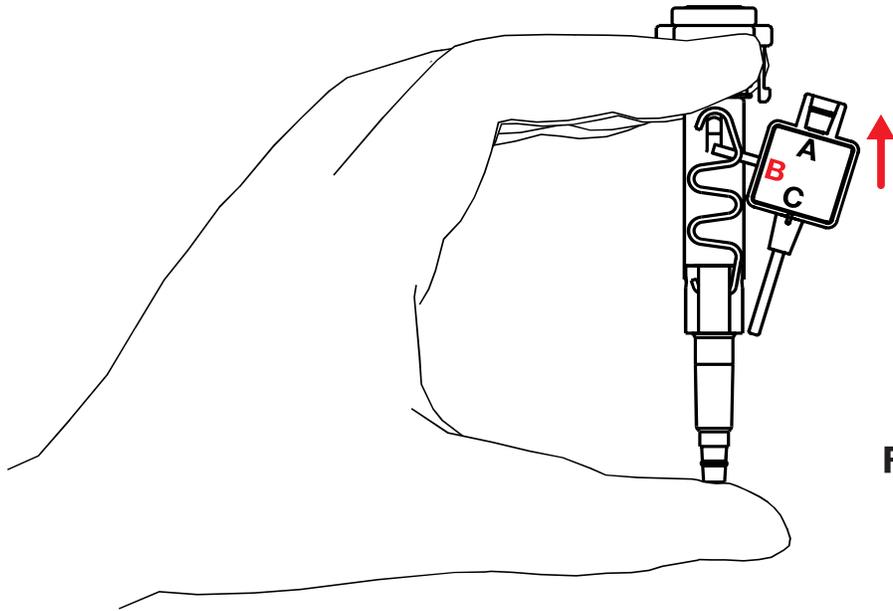


Fig./Abb. 7

Fig./Abb. 9

- Press piece —  Niederhalter
 Presseur
 Pezzo premente
 Sujetador
- Spring —  Feder
 Ressort
 Molla
 Muelle
- Spring plate —  Federteller
 Plaque pour ressort
 Piastrina per molla
 Platinillo de muelle
- Seal —  Dichtung
 Joint
 Guarnizione
 Junta

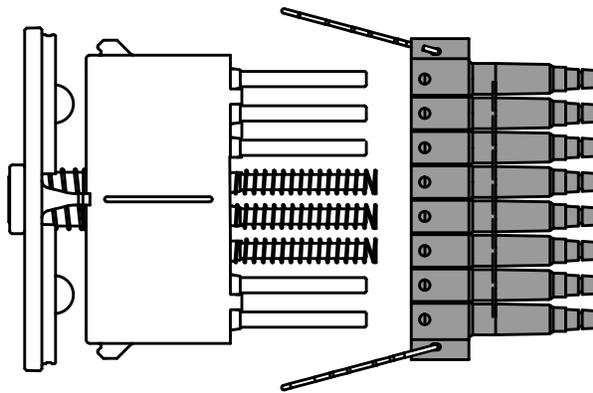


Fig./Abb. 8

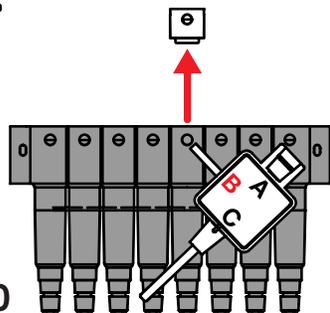


Fig./Abb. 10

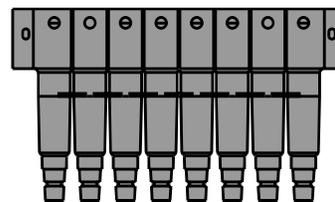
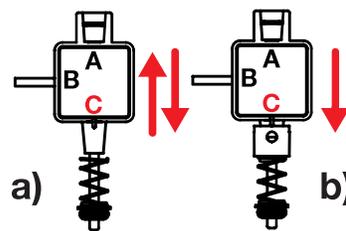


Fig./Abb. 11

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