Eppendorf Research® pro

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

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Research pro pipettes are manufactured under
U.S. Patent No. 4,671,123; 4,905,526; 5,187,990; 6,199,435; 6,499,365

Part A – Contents

This operating manual is valid as of software version V.1.56 and data record 2.
Software version and data record appear in the display after the battery pack has been inserted (see Sec. 3.2).

A

Contents

1 Safety precautions and applicational limitations

⚠ The Research pro is a lab device. It may only be operated by appropriately qualified lab personnel.
Before using the Research pro for the first time, please read the entire operating manual.

To guarantee problem-free, safe operation of the pipette, it is essential to observe the following points:

Handling

– Use the Research pro only when a pipette tip is attached.

– Pipette tips are solely designed for disposable usage.

– Do not lay down the Research pro when a filled pipette tip is attached.

– After liquid has been aspirated, press the Actuate key only when you are sure that the liquid shall be dispensed correctly.

– When the pipette is switched on and when the Reset key is pressed, the piston may move. Please ensure beforehand that the liquid in the pipette tip shall be dispensed correctly.

– Emergency stop: A moving piston can be stopped by pressing the Reset key.

– When using infectious, radioactive, toxic and other solutions which may pose health risks, please observe the safety precautions laid down for your country.

– Do not use the Research pro in a potentially explosive environment or with potentially explosive chemicals.

– When using organic solvents and aggressive chemicals or their vapors, please check their compatibility with the pipette tip (PP) and pipette.

– When using solutions with physical data which deviates greatly from those of water, carry out the procedure for checking the dispensing volume, as described in Sec. 5.11.1.

– Operate the Research pro at temperatures between 15 °C and 40 °C only and at a humidity of max. 80 % at a temperature up to 31 °C.

– When using Filtertips or 200 µl tips with the 300 µl pipette, observe the volume restriction (see Sec. 5.11).

Care and maintenance

– Do **not** clean the display or any of the labeling using acetone or aggressive solutions.

– Do not allow any liquid to enter the device.

– Repairs may be carried out by authorized service personnel only.

– Use original spare parts and accessories (battery, pipette tips) only.

1 Safety precautions and applicational limitations

Battery

– Charge up the battery before operating the device for the first time (see Sec 3).

– Charge the battery in the pipette only, using the charging adapter or the charging stand and the original power unit.

– If a flashing battery symbol appears in the display, stop dispensing and charge the battery.

– When changing the battery, do not allow the battery to come into contact with any metallic surfaces.

– Dispose of used batteries in accordance with legal regulations.
Batteries may not be disposed of with household waste!

– If rechargeable batteries are damaged, avoid touching them with the hands.

– Never charge the Research pro without a battery.

– Before storing the Research pro for a long period, be sure to remove the charged battery.

– When the Research pro is stored for a long time, charge the batteries approximately every six months.

Transfer
If the device is passed on to someone else, please include the instruction manual.

Disposal
In case the product is to be disposed of, the relevant legal regulations are to be observed.

Information on the disposal of electrical and electronic devices in the European Community

The disposal of electrical devices is regulated within the European Community by national regulations based on EU Directive 2002/96/EC on waste electrical and electronic equipment (WEEE).
According to these regulations, any devices supplied after 13.08.05 in the business-to-business sphere, to which this product is assigned, may no longer be disposed of in municipal or domestic waste. They are marked with the following symbol to indicate this.

As disposal regulations within the EU may vary from country to country, please contact your supplier if necessary.

2 Technical data

Volume range	Step size	Color code	Pipette tip	Volume	Systematic error (Bias; Inaccuracy)	Random error (Imprecision, CV)
µl	µl		epT.I.P.S.	µl	%	%
Single-channel						
0.5 – 10	0.01	gray	20 µl L	1	± 2.5	≤ 1.8
				5	± 1.5	≤ 0.8
				10	± 1.0	≤ 0.4
5 – 100	0.1	yellow	200 µl	10	± 2.0	≤ 1.0
				50	± 1.0	≤ 0.3
				100	± 0.8	≤ 0.2
20 – 300	0.5	yellow	300 µl	30	± 2.5	≤ 0.7
				150	± 1.0	≤ 0.3
				300	± 0.6	≤ 0.2
50 – 1000	1	blue	1000 µl	100	± 3.0	≤ 0.6
				500	± 1.0	≤ 0.2
				1000	± 0.6	≤ 0.2
100 – 5000	10	violet	5 ml	500	± 3.0	≤ 0.6
				2500	± 1.2	≤ 0.25
				5000	± 0.6	≤ 0.15
Multi-channel						
0.5 – 10	0.01	gray	20 µl L	1	± 5.0	≤ 3.0
				5	± 3.0	≤ 1.5
				10	± 2.0	≤ 0.8
5 – 100	0.1	yellow	200 µl	10	± 2.0	≤ 2.0
				50	± 1.0	≤ 0.8
				100	± 0.8	≤ 0.25
20 – 300	0.5	yellow	300 µl	30	± 2.5	≤ 1.0
				150	± 1.0	≤ 0.5
				300	± 0.6	≤ 0.25
50 – 1200	5	green	1.25 ml	120	± 6.0	≤ 0.9
				600	± 2.7	≤ 0.4
				1200	± 1.2	≤ 0.3

The technical data is valid only when the Research pro is used with Eppendorf pipette tips. The multi-channel data is valid for eight- and twelve-channel pipettes. The 50 – 1,200 model is available as an eight-channel version only.

Test conditions in accordance with ISO 8655 for piston-stroke pipettes with an air cushion by means of a standardized fine balance with a moisture trap.

Number of determinations:
10 pipettings;
degassed distilled water, 20 °C – 25 °C ± 0.5 °C;
maximum speed;
PIP in standard mode of operation (Sec. 5.3);
prewetted pipette tip;
dispensing onto inside of tube.

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.

2 Technical data

Battery

Nickel-metal hydride battery pack, 1,200 mAh / 2.4 V reversible overcurrent and over-temperature protection. Overcharging protection when connected to Research pro. Charging time: approx. 9.5 hours for a fully discharged battery.

Power unit

Input voltage, country-specific: 230 V ± 10 %, 50/60 Hz; 120 V ± 10 %, 60 Hz; 100 V ± 10 %, 50/60 Hz; 240 V ± 10 %, 50 Hz
Output voltage: 9 V DC; 200 mA (1.8 VA)

Technical specifications subject to change!

3 Startup

3.1 Delivery package

The Research pro is supplied as a single-channel, eight-channel or twelve-channel pipette for different volume ranges. The pipette is delivered with or without a charging adapter, depending on the order number. If the pipette is ordered without an adapter, a charging stand for one or four pipettes is required. If this charging stand is not already available in the lab, it must be ordered separately. According to the type of order, the delivery package contains the following:

• Charging adapter with connected power unit or, if necessary, charging stand with separate power unit
• Special tool(s) according to the pipette type
• Operating manual with EC declaration of conformity, brief instructions, quality certificate.
• Ni-MH battery pack
• Tube of silicone grease
• For multi-channel pipettes: Tip-tub for liquid aspiration

3.2 Inserting the battery ⚠
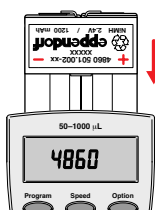
Using your thumb and forefinger, take hold of the lid of the battery compartment on the rear of the pipette and remove it by tilting it to the side and pulling it upwards. Insert the battery pack (see diagram). Close the lid of the battery compartment. If the battery has been inserted incorrectly, the lid cannot be closed properly. The positive and negative poles of the battery should not come into contact with any metallic objects outside the pipette. When the battery is inserted, the Research pro carries out a test routine (e.g. for the display of pipette type, software version, data record). The battery must be fully charged before the device is used for the first time.

3.3 Charging the battery ⚠

The battery is charged in the pipette. Charging may only be carried out using the charging adapter supplied or the charging stand with the original power unit. A pipette which **does not contain** a battery must not be recharged! A new battery does not attain its full capacity until two or three complete charging/discharging cycles have been completed.
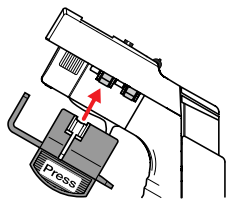
Before recharging, please compare your voltage requirements with the voltage specifications on the plug-in unit.
For charging purposes, the charging adapter is placed upon the Research pro. Alternatively, the Research pro can be placed in the charging stand.
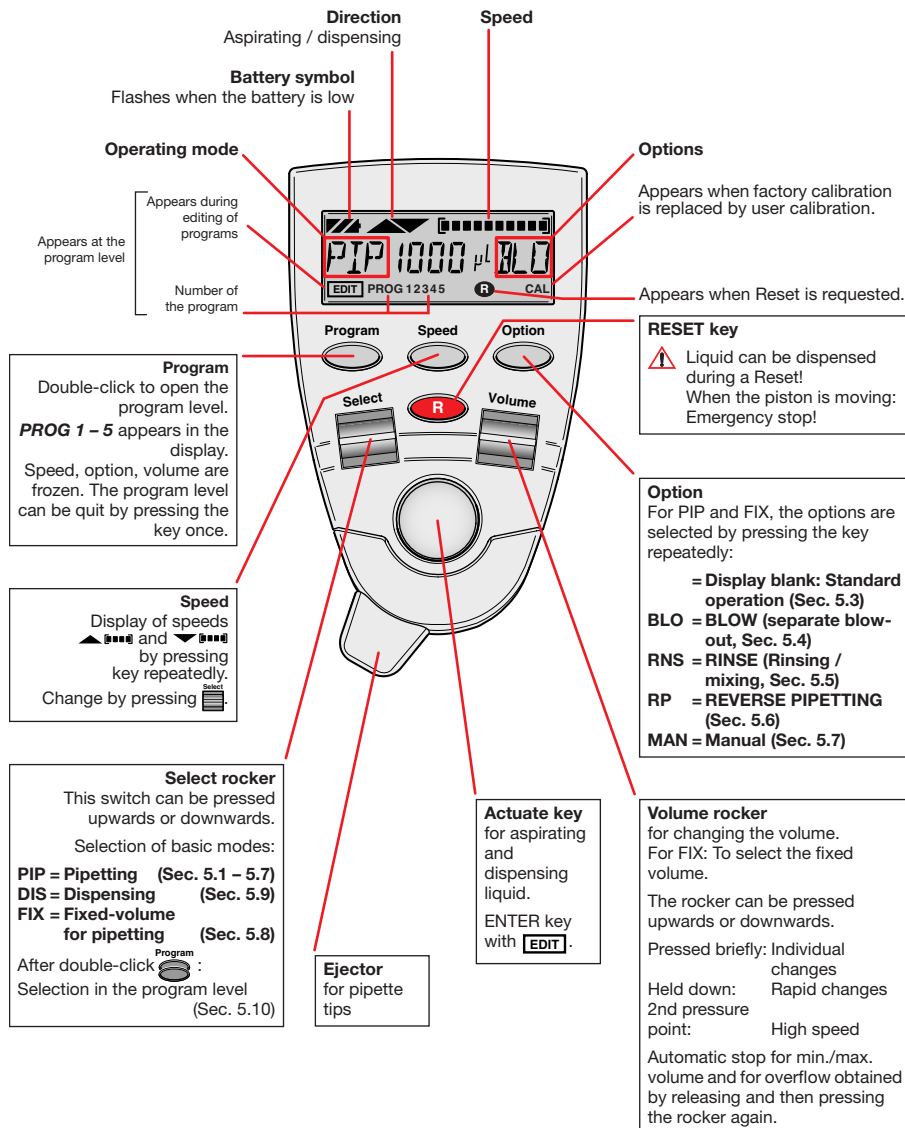During the start and termination of the charging process, "CON" appears briefly on the left-hand side of the display. The display is switched on during the charging process. The battery symbol appears in a rolling form. During charging, the Dispensing function is frozen. When the charging process has finished, the battery symbol appears in the display without moving. When the pipette has been charged, it may remain in the charging stand. To increase the charging capacity, the battery should occasionally be discharged until the flashing battery symbol appears. To avoid a total discharge, the fully charged battery should be removed from the Research pro before extended periods of non-use (e.g. several months). In this case, all data remains stored. In order to avoid a total discharge, the battery that has been removed should be re-charged every six months. Dispose of used batteries in accordance with legal regulations.
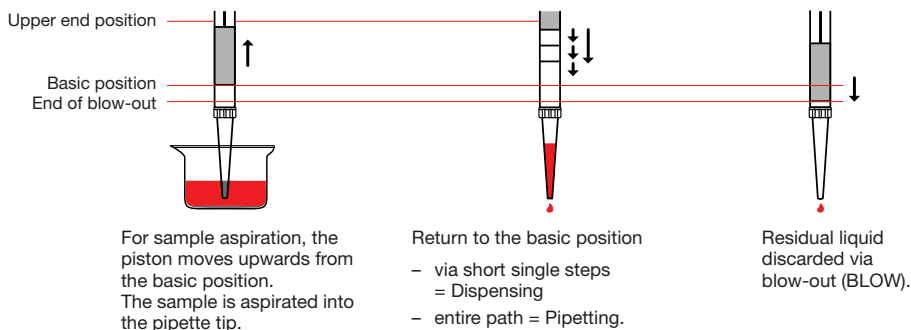
4 Operating principle

4.1 Display and keypad

Direction
Aspirating / dispensing

Speed

Battery symbol
Flashes when the battery is low

Operating mode

Appears during editing of programs

Appears at the program level

Number of the program

Options

Appears when factory calibration is replaced by user calibration.

PIP 1000 μ^L BLO

EDIT PROG 1 2 3 4 5   R   CAL

Appears when Reset is requested.

Program   Speed   Option

Select   **R**   Volume

RESET key
⚠ Liquid can be dispensed during a Reset!
When the piston is moving: Emergency stop!

Program
Double-click to open the program level.
PROG 1 – 5 appears in the display.
Speed, option, volume are frozen. The program level can be quit by pressing the key once.

Speed
Display of speeds
▲ ▥▥▥ and ▼ ▥▥▥
by pressing key repeatedly.
Change by pressing ▤.

Select rocker
This switch can be pressed upwards or downwards.

Selection of basic modes:

PIP = Pipetting   (Sec. 5.1 – 5.7)
DIS = Dispensing   (Sec. 5.9)
FIX = Fixed-volume
for pipetting   (Sec. 5.8)
After double-click ▤ :
Selection in the program level
(Sec. 5.10)

Ejector
for pipette tips

Actuate key
for aspirating and dispensing liquid.

ENTER key with EDIT .

Option
For PIP and FIX, the options are selected by pressing the key repeatedly:

       = Display blank: Standard operation (Sec. 5.3)
BLO = BLOW (separate blow-out, Sec. 5.4)
RNS = RINSE (Rinsing / mixing, Sec. 5.5)
RP = REVERSE PIPETTING (Sec. 5.6)
MAN = Manual (Sec. 5.7)

Volume rocker
for changing the volume.
For FIX: To select the fixed volume.

The rocker can be pressed upwards or downwards.

Pressed briefly: Individual changes
Held down: Rapid changes
2nd pressure point: High speed

Automatic stop for min./max. volume and for overflow obtained by releasing and then pressing the rocker again.

To switch on: Press any key firmly
To switch off: Automatically after 10 min of non-use

4.2 Function units

The Research pro is a microprocessor-controlled pipette which executes the piston movement with the aid of a stepper motor. The power supply is a rechargeable nickel-metal hydride battery.

Upper end position

Basic position
End of blow-out

For sample aspiration, the piston moves upwards from the basic position.
The sample is aspirated into the pipette tip.

Return to the basic position
– via short single steps
= Dispensing
– entire path = Pipetting.

Residual liquid discarded via blow-out (BLOW).

Dispensing and Reverse Pipetting require a different basic position than that for Pipetting. The request to change the basic position is indicated in the display by Ⓡ.

Ejector with extension
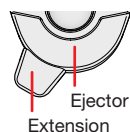
Ejector
Extension

The force translation of the ejector for pipette tips ensures that tips are ejected very easily. The extension can be individually adjusted to accommodate left- and right-handed users as well as different hand sizes. Select the desired setting by simply sliding the extension into the position as required.

Hook on the hand rest
Loosening the screw enables the hook on the rear of the pipette to be adjusted to suit all hand sizes.

Contact surface on the rear of the pipette
Both upper surfaces are required for charging the nickel-metal hydride battery.
The lower surfaces are the data interfaces for the Service Department.
The contact to the charging adapter or the charging stand cannot be confused with any other contacts.

Acoustic signals
Certain signals assist the user for different operations:

– Short signal to acknowledge that the keypad has been pressed.
– Slightly higher tone to indicate that the function for which the key has been pressed cannot be executed.
– Louder tone to indicate that a piston movement has ended.
– Longer tone to indicate that a specific sequence of steps (e.g. Dispensing) has ended.
– Louder tone to indicate an error message.

The acoustic signals are a great help when you are familiarizing yourself with the operating procedure of the Research pro. They can also be switched off if required (see Sec. 5.11).

4

Operating principle

5 Operation

5.1 Mode of operation

The Research pro is switched on by pressing any key. Attach an Eppendorf pipette tip to the Research pro. The color coding of the Actuate key corresponds to the color code of the racks for pipette tips. The dispensing liquid is aspirated into the pipette tip.
When the 200 µl tips are used together with the 300 µl pipette and when Filtertips are used, the volume restriction option must be activated in the device parameters (Sec. 5.11).
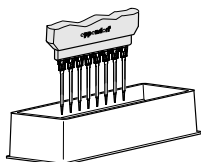
The liquid which is to be aspirated is taken from a suitable vessel. When multi-channel pipettes are used, the "Tip-tub" vessel is recommended.
Before commencing pipetting activities with multi-channel pipettes, turn the lower part in the required direction.
In addition to the description found in the subsequent sections 5.3 – 5.11, the following general procedure takes place:
Attach the pipette from the rack. Slight force may be used if necessary.

When aspirating liquid, immerse the pipette vertically – and as little as possible – into the liquid. Following aspiration, remove the pipette tip from the liquid after the acoustic signal has been emitted. If air bubbles have been aspirated, this process must be repeated.

Never lay the pipette down when the tip is filled!

If necessary, carefully remove any external wetting from the pipette tip.
To dispense liquid, position the pipette tip in the aspirating vessel, as shown in the illustration.
Depending on the type of problem (carryover, contamination), discard the pipette tip after that by pressing the Eject key, attach a new tip and reaspirate liquid.

5.2 Essential operating information

The following sections contain step-by-step explanations of the operating procedure. It is essential to work through these sections with the pipette in your hand. The volume shown in the display information contained in the operating manual does not necessarily correspond to the volume range of your pipette.
As a supplement to this manual, an interactive demonstration is available to familiarize users with the operation of the Research pro – see our home page *www.eppendorf.com*

Reset

If a Reset is requested in the display, this Reset is always accompanied by a piston movement. For this reason, please ensure that any residual liquid in the pipette tip is dispensed beforehand! A Reset can also be used to empty the pipette tip and to end an operating process. If you quit an input field during programming (e.g. changing the speed) using Reset, the changes which have been made are not stored.
If ⓡ is pressed during the piston movement, this functions as an emergency brake. Pressing ⓡ again empties the pipette tip.

5 Operation

Motor-reset
If ⬤ is held down until a piston movement begins, a motor reset is effected. This reset routine lasts roughly 10 seconds.
The accuracy of the piston movement is ascertained with the motor reset.

Program
The Research pro has two operating levels. The basic modes for pipetting (PIP and FIX) and dispensing (DIS) are accessed in the first level by pressing the Select rocker. **PROG** appears in the display by double-clicking the "Program" key. You are now in the second level (program level). Using the Select rocker, select from the programs (Sec. 5.10). This level can be quit by pressing the "Program" key briefly once. **PROG** disappears from the display.

Please note the following descriptions of the symbols used in the program sequence:

An Actuate key which has been pressed briefly is light.

An Actuate key which has been held down is dark.

If the piston movements appear in the display without any volumes, this indicates a process which is **not** connected to liquid aspiration or dispensing.

Aspirating and dispensing speeds
The selected speed can be viewed by pressing the Speed key several times. The speed is changed as follows:

Sequence for pressing keys	Magnifying glass indicates important display information	Comment
Speed Select	PII ▲▪▪▪▪ µl	Display and selection of aspirating speed.
Speed Select Speed *	PII ▼▪▪▪ µl	Display and selection of dispensing speed.

* This procedure does not necessarily have to be completed using the Speed key. Any key – with the exception of Reset – may be used. If a key other than the Speed key is used to complete the procedure, the function of this key is also executed at the same time.

The direction of the arrow for speed flashes in this input field.
The speed can be altered before every dispensing or aspiration.
Different speeds can already be stored for the three basic modes (PIP, DIS, FIX).

Important! High speeds [▪▪▪▪▪▪▪▪▪] have a much lower current consumption than low speeds.

Loading gels
With the 10 µl and 100 µl Research pro, the lowest speeds for liquid dispensing ▼ are ideal for loading gels. To enable users to work rapidly and with a low electricity consumption, the highest possible speed for liquid aspirating ▲ should be used. Depending on the task at hand, gels can be loaded in the Standard mode (Sec. 5.3) or by using the BLO (Sec. 5.4) or MAN (Sec. 5.7) options. Using the BLO option makes it possible to discharge the blowout outside of the gel pouch, thus preventing turbulence in the gel pouch.

5 Operation

5.3 Pipetting in the standard mode
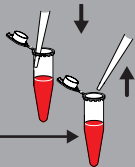
In the Standard mode, blow-out is executed automatically when liquid is dispensed.
The standard mode is recommended for rapid series pipetting with aqueous solutions.

Programming

Select	PIP 000 µl	*If **PROG** appears in the display:* Press the **Program** key briefly until ***PROG*** disappears.	Activate the selection rocker until "PIP" appears in the left side of the display.
Volume	PIP 800		Volume selection (here: 800 µl). The volume rocker has two pressure points for fast or slow volume adjustment for up and down.
Option **Option** **tion** •••	PIP 800		If necessary, press the Option key several times. In the Standard mode, the display remains blank in this case.

Pipetting procedure

If ® appears in the display: Press the ® key briefly.
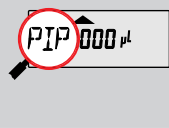
○	PIP 800 µl	↑	Liquid is aspirated.
○	PIP 800 µl	↓	Liquid is dispensed with blow-out.
Alternative pipetting procedure ●	PIP 800 µl ⟶ PI --- µl	↓ ↑	If the Actuate key is held down when liquid is dispensed, the device returns ↑ to the basic position when the key is released. **Note:** Necessary when dispensing into existing liquid: Before releasing the key, remove the pipette tip from the solution in order to prevent any solution from being aspirated unintentionally.
	PIP 800 µl		The pipette is now once again ready to aspirate.

5.4 Pipetting with separate blow-out (Blow = BLO)
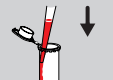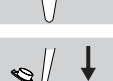
BLO is recommended for use with liquids with a high wetting power or with liquids which are prone to the formation of foam (e.g. solutions containing protein). The residual liquid is dispensed by pressing the Actuate key separately.

Programming

Select	`PIP 000 µl`	*If **PROG** appears in the display:* Press the **Program** key briefly until **PROG** disappears.	Select "PIP" for pipetting.
Volume	`PIP 800 µl`		Volume selection (here: 800 µl). The volume rocker has two pressure points for fast or slow volume adjustment for up and down.
Option Option Option •••	`PIP 800 BLO`		If necessary, press the Option key several times until BLO appears in the display. BLO is selected for blow-out.

Procedure

If ⓡ appears in the display: Press the ⓡ key briefly.

	`PIP 800 µl BLO`		Liquid is aspirated.
	`PIP 800 µl BLO`		Liquid is dispensed.
	`PIP 800 µl BLO`		Blow-out: Delayed dispensing of residual liquid.
Alternative blow-out procedure	`PIP 800 µl BLO` `P: --- µl BLO`		If the Actuate key is held down during the blow-out, the return ↑ does not take place until the key has been released.
	`PIP 800 µl BLO`		The pipette is now once again ready to aspirate.

5 Operation

5.5 Pipetting with separate rinsing (Rinse = RNS)

Rinsing (RNS) is recommended for volumes below 10 µl. RNS is suitable for mixing the dispensing volume and the specimen liquid when large volumes are used.
It is strongly recommended to use the "max. speed" setting.

Programming

Select	PIP 10 µl	*If **PROG** appears in the display:* Press the **Program** key briefly until **PROG** disappears.	Select "PIP" for pipetting.
Volume	PIP 5		Volume selection (here: 5 µl). The volume rocker has two pressure points for fast or slow volume adjustment for up and down.
Option Option Option •••	PIP 5 RNS		If necessary, press the Option key several times until RNS appears in the display. RNS is selected for rinsing.

Procedure

If ® appears in the display: Press the ® key briefly.

○	PIP 5 µl RNS	↑	Liquid is aspirated.
○	PIP 5 µl RNS PIP 5 µl 3	↓ ↓↑	Rinsing/mixing takes place three times after liquid has been dispensed. Mixing volume results from dispensing volume and the volume of the blow-out step (BLO).
Alternative mixing procedure ○	PIP 5 µl 10	↓↑	If the Actuate key is held down when liquid is dispensed, mixing takes place until the key is released.
○	P --- µl RNS		Return to basic position by pressing the key when device is not immersed in the liquid.
	PIP 5 µl RNS		The pipette is now once again ready to aspirate.

5.6 Reverse Pipetting (RP)

RP is recommended for solutions with a high viscosity or with a slightly higher vapor pressure. "Reverse Pipetting" is liquid aspiration with a blow-out. The liquid is dispensed without a blow-out. If Filtertips are used, please observe the volume restriction (Sec. 5.11).

Programming

Select	$PIP\ 000\ \mu l$	If **PROG** appears in the display: Press the Program key briefly until **PROG** disappears.	Select "PIP" for pipetting.
Volume	$PIP\ 800$		Volume selection (here: 800 µl). The volume rocker has two pressure points for fast or slow volume adjustment for up and down.
Option Option Option •••	$PIP\ 800\ RP$		If necessary, press the Option key several times, until RP appears in the display. RP is selected.

Procedure

If ⓡ appears in the display: Press the ⓡ key briefly.

	$PIP\ 800\ RP$		Aspiration of liquid with blow-out.
	$PIP\ 800\ \mu l\ RP$		Liquid is dispensed.
	$P\ ---\ \mu l\ RP$		Blow-out is discarded. If necessary, replace the tip.
	$PIP\ 800\ \mu l\ RP$		Pipette is once again ready to aspirate liquid with blow-out.

Alternative procedure for dispensing and aspirating

	$PIP\ 800\ \mu l\ RP$		If the Actuate key is held down when liquid is dispensed, the next liquid aspiration without blow-out takes place when the key is released. The liquid from the blow-out may continue to be used.
	$PIP\ 800\ \mu l\ RP$		

5.7 Pipetting with the MAN option

Note: The MAN (manual) option is the equivalent of operation with a mechanical piston-stroke pipette. Liquid is aspirated and dispensed only when the Actuate key is held down. The volume display increases the number of applications available in comparison to a mechanical pipette:

1. Aspirating: Measuring a small, unknown amount of liquid via aspiration into the pipette tip. The volume of aspirated liquid appears in the display. If necessary, dilute the liquid to the defined end volume by aspirating additional liquids. Liquids can be separated by aspirating air bubbles. The display shows the total volume.

2. Dispensing: Titration is carried out. The amount of liquid dispensed appears in the display. There is no blow-out.
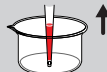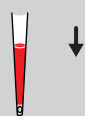
Setting lower speeds is strongly recommended.

Programming

Select	PIP 000 µl	If **PROG** appears in the display: Press the **Program** key briefly until **PROG** disappears.	Select "PIP" for pipetting.
Volume	PIP 1000		Volume selection (here: 1,000 µl). The volume rocker has two pressure points for fast or slow volume adjustment for up and down.
Option Option ⟩tion •••	PIP 1000 MAN		If necessary, press the Option key several times, until MAN appears in the display. MAN is selected.

Carrying out liquid aspiration

If ⓡ appears in the display: Press the ⓡ key briefly.

◯	PIP 172 µMAN	↑	Liquid is aspirated. The aspirated liquid appears in the display.
Volume	PIP 172 µMAN		The direction is changed using the volume rocker.
◯	PIP 165 µMAN	↓	Volume correction, e.g. for removing an air bubble.

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Volume	PIP 165 µMAN		The direction is changed again using the volume rocker. This change of direction can be repeated without restriction.
⬤	PIP 1000 µMAN		A defined end volume has been reached. A special acoustic signal is emitted. Dispensing is carried out by pressing the key again.

Carrying out dispensing/titration

⬤	PIP 1000 µMAN		Aspirate the defined total volume by holding down the Actuate key.
◯	PIP 12 µMAN		When the key is pressed briefly: The amount of liquid dispensed appears in the display.
◯	PIP 48 µMAN		Press key again: Total of dispensed liquid is displayed.

Note: We recommend low speed for dispensing. The speed can also be reduced between individual dispensing steps (see Ch. 5.2, "Speed for aspiration and discharge").

or ◯ ⬤	PIP 1000 µMAN		Total amount of liquid is dispensed. A special acoustic signal is emitted. Blow-out is not executed. Blow-out can be actuated by pressing the ⓡ key.
⬤	PIP 1000 µMAN		Press the key again to aspirate liquid.
Note: **Volume**	PIP MAN		The direction can also be changed after partial dispensing. The volume display changes after the Actuate key has been pressed. No additional projection of the volume occurs following the repetition of the procedure. The display starts at 0.
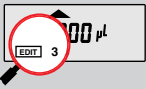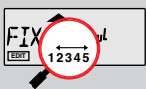
5.8 Pipetting with a preselected fixed volume (FIX)

FIX is used to rapidly set five frequently used pipetting volumes.
Five FIX volumes are predefined in the pipette. FIX volumes can be changed via programming.
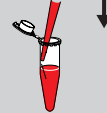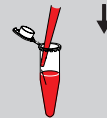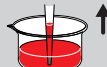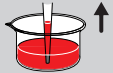
Programming FIX fixed volumes

Select	FIX 000 µl	*If PROG appears in the display:* Press the Program key briefly until *PROG* disappears.	Select "FIX" for fixed volume.
Program	00 µl EDIT 3		**Hold down** the Program key until EDIT appears. The volume flashes.
Select	FIX EDIT 12345 µl		Select the memory slot using the Select rocker.
Volume	FIX 632 µl EDIT 5		Using the Volume rocker, select the volume for the memory slot (here: 5).
Select	FIX EDIT 12345 µl		Select the next memory slot for purposes of changing the volume.
Volume	FIX 300 µl EDIT 3		Define the next volume (here: memory slot 3).
Program	FIX 300 µl 3		The program is ended by pressing the Program key. EDIT and the flashing volume disappear from the display.

or

If Ⓡ appears in the display: Press the Ⓡ key briefly.

◯	FIX 300 µl 3		The selected volume is aspirated. Programming is ended. EDIT and the flashing volume disappear from the display.

5 Operation

Selecting a fixed volume (with option and speed)

Select	FIX 632 µl	*If PROG appears in the display:* Press the Program key briefly until PROG disappears.	Select "FIX" for fixed volumes.
Volume	FIX 300 µl		Select from the five FIX volumes.
Option Option ●●●	FIX 300 RP		Press the Option key repeatedly until the desired option appears.
Speed Select	FI µl		Display and selection of aspirating speed.
Speed Select Speed	FI µl		Display and selection of dispensing speed.

Note: The option and speeds selected are applicable for all fixed volumes.
It is possible to store the pipetting volume with speed and option by using *Prog* (Sec. 5.10).

Procedure
The procedure depends on the option selected. Information on the procedure according to the option selected is contained in Sections 5.3 to 5.7.

5 Operation

5.9 Dispensing (DIS)

During this procedure, the aspirated liquid is dispensed in defined partial steps.
This makes DIS a very rapid dispensing technique. As with "Reverse Pipetting", slightly more liquid is aspirated than is necessary for the sum of the dispensing steps.
During dispensing, the measured value deviations quoted for pipetting (Sec. 2) are exceeded.
The use of filter tips is not particularly recommended! If Filtertips are used, please observe the volume restriction (Sec. 5.11).

Programming

Select	DIS $100 \mu l$ 10	*If **PROG** appears in the display:* Press the **Program** key briefly.	Select "DIS" for dispensing (multi-dispensing).
Volume	DIS $50 \mu l$ 20		Select the volume per dispensing step (here: 50 µl). In the right-hand side: max. dispensing steps per filling of the pipette tip (here: 20 steps; 1,000 µl pipette).
Option **Select** **Option**	DIS 50 12		If necessary, minimize the dispensing steps. The dispensing steps flash with Select.
Speed **Select**	DI μl		Display and selection of aspirating speed.
Speed **Select** **Speed**	DI μl		Display and selection of dispensing speed.

Procedure

If 🅡 appears in the display: Press the 🅡 key briefly.

◯	DIS $50 \mu l$ 12		Aspiration of total amount of liquid (here: > 600 µl).

⚠ **Changed procedure as of software version V.1.56!**

◯	DIS $\_\_\_\_$ 12	Free jet discharge Discharge to wall	Activation of the return stroke. **This is not a dispensing step!** Dispensing of liquid into the sampling tube.

			First dispensing step is executed.
○	DIS 50 11	Free jet discharge / Discharge to wall	
○	DIS 50 10	Free jet discharge / Discharge to wall	Second dispensing step is executed.
○	DIS 50 0	Free jet discharge / Discharge to wall	Last dispensing step is executed. Here: special acoustic signal is emitted.
○	DIS ____ 0		Blank step with special acoustic signal.
○	DI ___ µl 0		Blow-out is discarded. No dispensing step. If the Actuate key is held down during dispensing, the device does not return ▲ to the basic position until the key is released.
	DIS 50 µl 12		Pipette is once again ready to aspirate liquid.

Free jet dispensing

Free jet dispensing is possible at volumes greater than ≥ 20 µl. The small drop that forms after each free jet dispensing of a partial volume in the dispensing mode is part of the following partial volume.

For greater precision and accuracy:
– Activate return stroke (see procedure) in the free jet for free jet dispensing.
– Activate return stroke with the pipette tip against the tube wall for wall dispensing.

5.10 Notes on the programs

To reach the programming level, the **Program** key must be double-clicked.
PROG appears in the display together with a memory slot number from *1 – 5*.
With the aid of the **Select** rocker, five programs can be shown in the left-hand side of the display.
To program the five memory slots, it is possible to select from seven different program sequences:

PIP = Pipetting
As per PIP outside the program level. The complete sequence with volume, option and speeds is programmed in one memory slot. After programming has been completed, the procedure *can no longer* be changed by repeatedly pressing the keys or the volume rocker. This is also applicable for the other program sequences.

SP = Sequential Pipetting
Up to ten different pipettings can be linked up to each other. Volume, option and speeds are defined for each pipetting sequence.
The MAN option is not available here.

DIS = Dispensing
As per DIS outside the program level. The complete procedure is programmed in one memory slot with dispensing volume, dispensing steps and speeds.
The use of filter tips is not particularly recommended!

⚠️ **The dispensing procedure was changed as of V.1.56.**
Prior to this version the liquid is directly dispensed following the automatic return stroke.

SD = Sequential Dispensing
Up to 20 dispensing steps can be defined. Each dispensing step may have a different partial volume. The total volume may exceed the filling level of a pipette tip.
This means that new liquid for the pipette tip must be aspirated during the dispensing procedure. Only one aspirating and dispensing speed is defined for all dispensing steps.
The use of filter tips is not particularly recommended!
Changed procedure as of software version V.1.56! See description for DIS.

ADS = Automatic Dispensing
With the Actuate key held down, all dispensings are executed automatically with the same volume and in a user-defined rhythm (0.1 – 10.0 seconds). Automatic dispensing may be interrupted by releasing the Actuate key. Apart from this, the procedure is identical to that of DIS. The use of filter tips is not particularly recommended!
Changed procedure as of software version V.1.56! See description for DIS.

DIL = Diluting
During the diluting process, a diluent, then an air bubble and finally a sample are aspirated into the pipette tip. The diluent volume and the sample volume are defined by the user. The air bubble is dependent on the sample volume and is always specified specimen by the program.
The entire contents of the pipette tip can be dispensed by selecting a pipetting option.
Depending on the pipette used, the dilution ratio is between approximately 1+1 and 1+48 (applies as of V.1.56 and data set 2).

SDI = Serial Diluting
For serial diluting, a defined volume of liquid is aspirated into the pipette tip. This liquid is dispensed and then mixed with a specific liquid volume by means of a programmable mixing process (volume, mixing cycles). The mixing procedure (MIX) is started by pressing the Actuate key separately.

ASP = Aspirate (multiple aspiration of one volume)
In this program, a defined volume can be aspirated several times. If multiple aspiration of a volume is complete, the filled pipette tip is emptied. This procedure is the equivalent to a "reverse dispensing". The program may be used for exchanging nutrient solutions.

EDIT
If **PROG** is in the display, the programming level can be opened by **holding down** the Program key. The Program key must be held down until the word **EDIT** appears in the display in front of **PROG 1 – 5**. Step-by-step programming is explained in the following sub-section.
If the programming of a program sequence is quit by pressing RESET, the entries for the program sequence are not stored.
The same program sequence – with, for example, different volumes or options – can be stored in several memory slots. It would therefore be possible for different pipetting sequences to be stored permanently in the program level.
Program sequences can be overwritten at any time under **EDIT** (Hold down the Program key).
During the programming process, the entry which is to be defined flashes in the display. Selections are made using the Select rocker. Volumes are selected using the Volume rocker.

Data is stored by pressing the Actuate key (ENTER function).
Options and speeds can be selected in the programming level by using the Select rocker or by using the Option or Speed key. Descriptions of how to use the Option and Speed keys can be found in Secs. 5.2 – 5.9. We recommend that you read these sections before you start programming. The following section on programming for pipetting contains only a description of operation using the rockers. Programming and execution of the other programs is contained in Part B of this manual, which is printed in English and German.

5 Operation

5.10.1 Example for programming pipetting in the program level

Programming

| Program | | Double-click the key until **PROG** appears in the display. |

PROG 12345

| Select | | Select the memory slot. |

PROG 12345

| Program | | **Hold down** the key until **EDIT** appears. |

EDIT   PROG 12345

| Select | *PIP* | ENTER | The input field flashes. Select **PIP**. Press the Actuate key. |

EDIT PROG 12345

| or Volume | Select | *PIP 500* | ENTER | The input field flashes. Select the volume and store. |

EDIT PROG 12345

| Select | | ENTER | Select the aspirating and dispensing speed, and store. The direction arrow flashes. |

PIP 00 µl
EDIT PROG 12345

| Select | | ENTER | The option is selected and stored. (The magnifying glass shows the standard mode.) |

PIP 500
EDIT PROG 12345

| | PIP 500 µl | Programming is now complete (here: standard mode; no option). EDIT disappears. |

PROG 12345

Programming can be ended prematurely and then stored by pressing the ⬯ Program key. EDIT disappears from the display.
If EDIT is ended with the 🔴 key before completion of programming for the memory slot, the changes are not transferred (emergency exit).

Procedure
The procedure depends on the pipetting option selected.
Depending on the option, procedure is identical to Sections 5.3 to 5.7.

When Prog. 1 – 5 are carried out, the Option and Speed keys as well as the Volume rocker are all disabled.

5.11 Device parameters

⚠️ **Device parameters may be changed only after thorough inspection and only by persons who are trained to do so!**

Device parameters are made up of the following:

BE 1: To switch on/off the acoustic signal for the keypad (short beep).

BE 2: To switch on/off the second acoustic signal for the end position of the dispensing piston, for warning and for confirmation (different beeps).

CAL: Display of calibration data µl, axle section (b) and gradient (m).

VOL: Volume restriction for – using the 200 µl tips on the 300 µl pipette.
– "RP" and DIS option when using Filtertips.

INI: To initialize the original pipette data upon delivery.

The device parameters can all be found on one list. The Actuate key functions as an Enter key. After Enter has been pressed, the next line appears in the display.

If a device parameter is quit using Reset, the setting which was made prior to change is valid.

Device parameters are called up as follows:

Speed **Option**	BE1 on		With the pipette switched on, press both keys **briefly at the same time**.
Select	BE1 on/oFF	ENTER	To switch off/on acoustic signal for keypad.
Select	BE2 on/oFF	ENTER	To switch on/off (on), second acoustic signal.
	CAL 0.0 µlb	ENTER	To view calibration data here: standard values, thus no CAL appears in the display. For changes, see Sec. 5.11.1.
	CAL 1.000 m	ENTER	
or **Select Volume**	VOL 100 µlMAX		Display and change of maximum volume for aspiration and dispensing. A reduction to 20 % of the pipetting volume is possible. A recommedation for Filtertips can be found on the next page.
	VOL 80 µlMAX	ENTER	

After changes have been made down to the smaller volume, a reminder to make the necessary changes for volume programming is also issued by means of the error message VOL.

	INI ____	ENTER	To exit the device parameters. For information on the INI procedure, see 5.11.2.

Operation

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5 Operation

ep Dualfilter T.I.P.S.	Volume restriction for "RP" and DIS option
10 µl	9 µl
20 µl	17 µl
100 µl	100 µl
300 µl	280 µl
1000 µl	970 µl

5.11.1 Changing the calibration (CAL)

The Research pro must be calibrated only for solutions with a density, viscosity, surface tension and vapor pressure that are greatly different to that of water. If the density of an aqueous solution changes (e.g. due to a different salt concentration) by roughly ± 10 %, the volume changes by approximately ± 0.2 %. This does not apply when other relevant sizes change as well.

The actual volume can be checked via weighing (see Sec. 2, "Technical data"):

$$\text{Actual volume} = \frac{\text{Mean value of weighings}}{\text{Density of liquid at weighing temperature}} \qquad (1)$$

The density of water is approx. 0.9982 mg/µl at 20 °C.

If the volume selected (display volume) is the same as the actual volume, no correction is necessary.

If there is a significant difference between the actual volume and the display volume, the following points must be answered "**Yes**" before calibration is modified:

- the pipette is leaktight. The aspirated liquid does not drip straight out of the pipette following aspiration.
- there is no difference in temperature between the pipette and the solution.
- the optimum pipetting option was selected for the liquid.
- the precision scale has not been subjected to shocks, draughts etc..
- the correct numerical value for "dense liquid at weighing temperature" was selected for the calculation according to (1).
- the check was made with epT.I.P.S. and the correct size of epT.I.P.S.
  (see Sec. 2 "Technical data").

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 %

The internal volume correction of the Research pro uses the following formula:

Actual volume = m • "Stroke movement" + b   *(2)*

"**m**" is the definition of the gradient and "**b**" is the definition of the axis section of this equation *(2)*.

When the device is delivered, **m** = 1,000 and **b** = 0.0 µl. If this data is changed, the *CAL* symbol appears in the bottom right of the display. If the device is reset to the original values, the *CAL* symbol disappears.

If the *CAL* symbol appears in the display, the "**stroke movement**" which is selected or displayed is converted **by the pipette** using the user-defined "**m**" and/or "**b**" in order to ensure that the actual volume of the liquid used corresponds to the display volume.

⚠ **It is essential to inform all users of the changes made to the calibration data! We recommend labeling the pipette as follows (example only):**
Pipette calibrated only for use of "xy" with option "ZZZ".

5 Operation

Examples and notes for volume correction (balance in mg; density in mg/µl = g/ml).

*1. An actual volume of 98 µl was calculated using formula **(1).***
The display volume is 100 µl.
In this case, the following formula should be used:

$$\frac{\text{Display volume } 100 \ \mu l}{\text{Actual volume } 98 \ \mu l} = 1.02$$

The value 1.02 is entered under "m". This means that, although 100 µl appears in the display, the piston makes a stroke movement which is larger by a factor of 1.02, so that 100 µl of this liquid can be aspirated.
If only 100 µl of this liquid is dispensed in every case or if the same factor is produced when other volumes are tested, a correction of "m" only is sufficient.

2. If greatly differing factors are produced for different volumes, it is advisable to carry out a correction of axis section "b" and gradient "b". This requires a calculator with the "linear regression" statistics function [y=mx+b]. The data for "m" and "b" are calculated by entering the actual volume (x) and the display volume (y). The actual volume (x) and the display volume (y) must consist of at least two pairs of different volumes, each of which differ greatly.. Linear regression can also be carried out using PICASO II.

⚠️ **Following programming, the calculated data must then be checked via weighing and by using formula (1).**

Note: In the case of mechanical pipettes, only axis section "b" can be corrected.

The calibration data can be changed as follows:
– Call up the device parameters (see 5.11).
– Proceed using "ENTER" until "CAL   0.0 µL   b" is entered.
– Hold down the "Program" key until the number flashes.
– Set the desired number using the "Volume" or "Select" key.
  The **CAL** symbol appears when b ≠ 0.0.
– Confirm the number selected by pressing "ENTER".
– The entry for "m" flashes. This can also be changed by pressing "Volume" or "Select".
  Entries are stored by pressing "ENTER".
– The ranges for "m" and "b" differ slightly according to the volume size of the pipette.

5.11.2 Information on initialization (INI)

If the Research pro is to be used at another workstation and if all volumes and programs defined by the user should no longer be used, the pipette can be initialized as per delivery package by means of INI.

⚠️ **Following initialization all user settings and programs are deleted!**

Initialization is carried out as follows:

– Using "ENTER", access "INI" in the device parameters.
– Hold down the "Program" key.
– Initialization is completed when the device parameter "INI" disappears from the display.

6 Care, sterilization and maintenance

6.1 Care

The outside of the pipette can be wiped with a moist cloth. The use of water with cleaning wetting agent is also permitted.

⚠ **Do not allow any liquid to enter the pipette!**

After that, the **lower part only** of the pipette should be rinsed with distilled water and dried. The pipette may be carefully wiped clean with Isopropanol. The procedure for replacing defective O-rings (when the pipette tips fit incorrectly) is described in Sec. 6.3.

If the pipette is severely contaminated or if very aggressive chemicals are dispensed, the lower half of the Research pro should be disassembled (see Sec. 6.2 for the single-channel model and Part B: "Ordering information" for the multi-channel model). The individual parts are rinsed in distilled water and then dried. The piston is then lightly lubricated using silicone grease.

⚠ **Prior to assembling the pipette, check that the piston is positioned correctly. Following reassembly, a motor reset must take place. This is effected by holding down the Reset key until a ® appears in the display and the motor starts.**

6.2 Sterilization

Only the lower half of the pipette can be steam-autoclaved (121 °C, 1 bar* overpressure, 20 minutes). The autoclaved parts must be allowed to dry at room temperature. The entire lower part of the multi-channel model can be autoclaved as one unit. With the single-channel model, the individual parts of the lower part must be autoclaved separately.

Lower part of multi-channel model
Disassembly: Disassembly of old type of "construction":
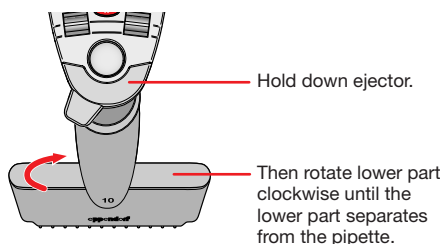
Hold down ejector.

Then rotate lower part clockwise until the lower part separates from the pipette.

Piston

Opening for metal pin
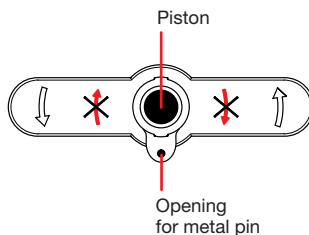
To loosen the lower part of the multi-channel pipette, rotate it in the arrow direction which is normally not permitted.

Pull the lower part downwards slowly. The multi-channel piston, which is held in place magnetically, jerks sharply and then comes off.

* (1 bar ≙ 100 kPa ≙ 14.5 psi)

6 Care, sterilization and maintenance

Assembly:
- Hold down the ejector.
- Position the lower part in such a way as to enable the metal pin on the ejector to enter the corresponding opening on the lower part. The pistons of the lower parts must be in the highest position. If the pistons are not in the highest position, they can be moved upwards by banging the thread side firmly against a soft surface. If this proves to be unsuccessful, the lower part is most probably dirty! The lower part must be opened and cleaned.
  A detailed description of how ro do so is contained in the "Ordering information" section of Part B of this manual.
- The magnetic coupling of the piston of the upper and lower part is indicated by a clicking noise.
- Do **not** hold down the ejector any longer and push the lower part firmly onto the metal pin of the ejector.
- Rotate the lower part counterclockwise. When the lower part is rotated, a low "click" indicates that the safety coupling has connected and the lower part is firmly in place.
- Following reassembly, check that the ejector is functioning correctly.
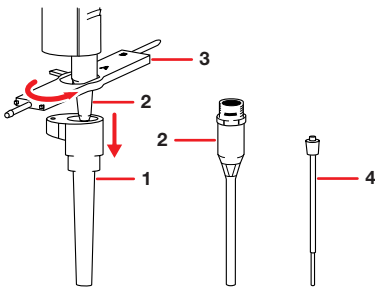- Following reassembly, trigger a motor reset by holding down the Reset key.
- Check that the dispensing function of the pipette is working correctly.

Lower part of single-channel model

All volumes except 5,000 µl:

Hold down the ejector and pull off the ejector sleeve (1). Force may be required.
Unscrew the lower part (2) using the key (3).
Make sure that the piston is not damaged.
Unscrew the piston (4). If necessary, first loosen the piston at the upper end using the flat-nose pliers. The piston is moved into its lowest position

For 5,000 µl:
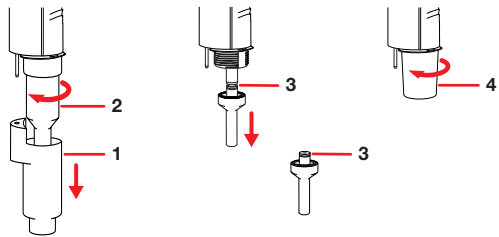
Hold down the ejector and pull off the ejector sleeve (1). Force may be required.
Unscrew the cylinder (2). The piston (3) is held in place magnetically.
Pull the piston (3) out of the upper part.
Using the disassembly tool in the accessories package (4), unscrew the cylinder bearing.
During removal, the spigots of the disassembly tool are inserted into the openings on the cylinder bearing.

Assemble in reverse order.
Check the magnetic coupling of the 5,000 µl piston.
Trigger a motor rest by holding down the Reset key.
Check that the dispensing function of the pipette is working correctly.

6.3 Maintenance

Apart from general care and occasional discharging (when the battery symbol starts flashing) and recharging of the pipette, no special maintenance is necessary if the pipette is used correctly. For information on charging the battery pack when the pipette is stored for a long period, see Sec. 3.3. The lower part of the pipette may be replaced completely. (see Sec. 6.2.) The process for replacing the seals in the lower part is described in Part B: "Ordering information/service parts". Maintenance on the Research pro may be carried out by the Service Department. If you require maintenance work, send your pipette to your authorized distributor. The current addresses of our marketing partners can be found on our home page at *http://www.eppendorf.com*.

In the case of the lower parts of the eight- and twelve-channel models, it is necessary to replace the O-rings (seals for pipette tips), which means that the lower part must be unscrewed. A tool for replacing the O-rings is contained in the accessories package:
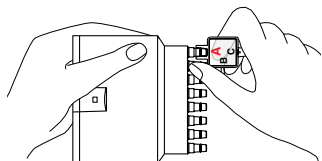
– Press opening A of the tool over the nose cone. The sharp edge in the opening of the tool fits together with the O-ring.
– To cut the O-ring, press the tool heavily against the nose cone. The tool and the O-ring are then removed.
– Put the assembly aid (a shortened pipette tip) onto the nose cone and slide the new O-ring onto the nose cone.

With the 1,200 µl version, the O-ring is severed by pressing the tool firmly onto the nose cone. The O-ring is removed. The new O-ring can be attached without any assembly aids.

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.

6.4 Decontamination prior to dispatch

⚠ **If the Research pro is to be checked, repaired or calibrated by Eppendorf AG or another service partner, it must be free of hazardous substances and clean!**
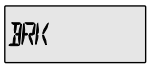
A form called "Decontamination certificate for pipettes" is enclosed with the packaging when the pipette is delivered.
A form called "Decontamination certificate for return of goods" and general notes about decontamination are available on our home page: *www.eppendorf.com*
A signed decontamination certificate must be enclosed with the pipette when it is returned. The serial number of the Research pro must be entered on the decontamination certificate. The serial number becomes visible on the housing of the Research pro when the ejector is operated.
The bottom part of the Research pro 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

Display information	Cause	Solution
Middle segment flashes.	The battery is run down.	Complete pipetting and recharge the battery (see Sec. 3.3).
All segments flash.	The battery is severely run down.	Stop pipetting **immediately** and recharge the battery (see Sec. 3.3).
Segments roll through the display.	The charging process is underway. All dispensing functions are blocked.	Charge the pipette until the battery symbol appears in the display without moving.
Segments appear in the display without moving.	Charging process is finished.	Pipette is ready to use again.
BAT Error 11	The pipette does not contain a battery!	Stop the recharging process **immediately** and insert a battery into the pipette!
CON	Pipette was inserted into, or removed from, the charging adapter or the charging stand.	
(Display is dark)	– Pipette is in the Sleep mode. – The pipette does not contain a battery. – The battery is completely run down (the battery discharges even when it is not used).	– Press any key to switch on the pipette. – Insert the battery into the pipette. – Recharge the battery.
BRK	The piston movement was stopped by pressing the ⓡ key (emergency stop). A request to reset appears in the display.	Eject the pipette tip! When the ⓡ key is pressed a second time, the piston returns to its basic position.
R ⓡ	The piston in the pipette must be moved to the basic position requested.	Press the ⓡ key. Caution! As the piston is moving, liquid may be dispensed!
VOL	Appears when Actuate key is pressed. The volume cannot be aspirated because volume restriction is active.	Select the volume within a restricted range (Filtertips, 100 µl tip). Alternatively, cancel the volume restriction (Sec. 5.11).

Any other error message which appear in the display is only for error diagnosis by the Service Department.
If the error message does not disappear after a motor reset or after the battery has been removed and reinserted (see Sec. 3.2), please contact the Service Department.

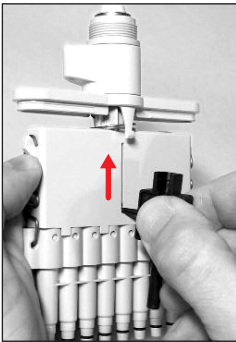| Error	Cause	Solution
Pipette is dripping; the volume dispensed is incorrect.	– The tip may be loose. – There may be foreign matter between the pipette and the tip. – The piston, nose cone and cylinder may be damaged or contaminated. – The lower part may be loose. – For multi-channel model: The O-ring may be damaged.	– Attach the tip firmly. Make sure that an Eppendorf tip is used. – Wipe the pipette. Ensure that the tip is protected from dust. – Treat the lower half of the pipette as described in Sec. 6 and Part B "Ordering Information/service parts".
Residual liquid is in the tip; dispensing is incomplete.	– See above. – The dispensing speed may be too high. – The incorrect pipetting option may have been selected.	– See above. – The procedure for checking the function is described in Sec. 5, "Operation".
Motor stops during the dispensing procedure.	– The battery may be run down. – The pipette may be heavily contaminated.	– Discard the dispensing as it is incorrect. Recharge the battery (Sec. 3.3) or treat the pipette as described in Sec. 6.
Multi-channel: Pipette doesn't aspirate liquid. (Continued on next page)	The magnetic coupling on the multi-channel lower part no longer works. In the case of the Research pro Pipette 4860, strong impact stress can result in a separation of the magnetic connection between the spindle and the piston actuator. As a result of this separation, the pipette no longer aspirates liquid, despite movement of the motor.	In order to reestablish the connection, proceed as follows: – Separate the ejector from the lower part. – To do this, press the lower part against a surface until it springs in. Simultaneously press the stop clutch inward with side "B" of the universal tool. The ejector cover panel springs up.

Error	Cause	Solution
(Continued) Multi-channel: Pipette doesn't aspirate liquid.		Push the piston actuator back into the upper position using side "B" of the universal tool and then remount the ejector. ⚠️ **Following assembly:** **Trigger a motor reset by holding down the Reset key (until Ⓡ appears in the display and the motor moves).**

If there is doubt that dispensing data are correct

To avoid dispensing errors, the precision and accuracy of the Research pro 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 5.11.1. Calibration will also need to be changed if the pipette is being used at a very high altitude.

Program notes only for program version prior to V. 1.56

Error	Cause	Solution
The program level cannot be opened.	Programm version of the pipette does not match the description.	With the old program version, the program level was opened by pressing the key once.
The ASP program cannot be found.	Programm version of the pipette does not match the description.	With the old program version, the ASP program did not exist.
VOL was not found among device parameters.	Programm version of the pipette does not match the description.	With the old program version, the parameter was called OPT; A choice between two volumes can be made by using Select.

Part B Contents / Teil B Inhaltsverzeichnis

Part B Programs / Teil B Programme

I. Introduction / Einleitung

This section contains a complete description of the additional seven program sequences (see Sec. 5.10).

During programming (*EDIT* and *PROG* in display), the Speed and Option keys and the Volume rocker can also be used. This enables users to skip backwards and forwards during the program sequence.
When the programs are executed (only *PROG* is in the display), the Speed and Option keys and the Volume rocker are blocked.

If only parts of the program have to be changed, programming can be ended prematurely by pressing the Program key briefly.

If a memory slot is quit using Reset before programming has been completed, the changes which have been carried out for this memory slot are not carried out. EDIT disappears from the display.

In diesem Teil der Bedienungsanleitung befindet sich die vollständige Auflistung der weiteren sieben Programmabläufe (vergl. Kap. 5.10).

Bei der Programmierung (*EDIT* und *PROG* im Display) können die Tasten Speed, Option und die Volume-Wippe zusätzlich genutzt werden. Dadurch kann im Programmierablauf vor- und zurückgesprungen werden.
Bei der Ausführung der Programme (nur *PROG* im Display) sind die Tasten Speed, Option und Volume-Wippe gesperrt.

Sollen nur Teile eines Programms geändert werden, so kann die Programmierung durch kurzes Drücken der Taste Program vorzeitig abgeschlossen werden.

Wird vor Abschluss der Programmierung ein Speicherplatz mit Reset verlassen, werden die durchgeführten Änderungen für diesen Speicherplatz nicht übernommen. EDIT im Display erlischt.

II. SP = Sequential Pipetting / Sequentielles Pipettieren

This program is suitable for sequences in which different volumes have to be pipetted consecutively on a regular basis. It is possible to program up to ten volumes with option and speed.
The MAN option may not be used for this program!

Dieses Programm ist geeignet für Arbeitsabläufe, in denen nacheinander verschiedene Volumina regelmäßig pipettiert werden müssen. Es können bis zu zehn Volumina mit Option und Geschwindigkeit programmiert werden.
Die Option MAN darf bei diesem Programm nicht verwendet werden!

Programming / Programmierung

Program		
	PROG 1 2 3 4 5	Double-click: *PROG* in the display. Doppelklick: *PROG* im Display.

Part B Programs / Teil B Programme

Select	PROG **12345**		Select the memory slot.
			Speicherplatz wählen.
Program	EDIT PROG 12345		**Hold down** the key until *EDIT* appears.
			Taste **lang** drücken, bis *EDIT* erscheint.
Select	SP EDIT PROG 12345	ENTER	Select *SP.*
			SP wählen.
Select	SP 1-10 SEQ EDIT PROG 12345	ENTER	Selection of the pipetting sequences (1 – 10). After ENTER: Select "1" for the first sequence in the display.
			Auswahl der Pipettier-sequenzen (1 – 10). Nach ENTER: Kurz "1" für erste Sequenz im Display.
or / oder **Volume Select**	SP 100 EDIT PROG 12345	ENTER	Select the first volume, and store.
			1. Volumen wählen und speichern.
Select	SP 100 µl EDIT PROG 12345	ENTER	Select the speeds.
			Geschwindigkeiten wählen.
Select	SP 100 EDIT PROG 12345	ENTER	Select the option.
			Option wählen.
Volume	SP 200 EDIT PROG 12345	ENTER	Select the second volume.
			2. Volumen wählen.
	SP 100 PROG 12345		Programming is complete. EDIT disappears.
			Programmierung abge-schlossen. EDIT erloschen.

Part B Programs / Teil B Programme

Procedure / Durchführung

SP *100* µl
PROG 12345

Sample is aspirated. *If* **R** *appears in the display, press* **R**.

Probe wird aufgenommen. *Falls* **R** *im Display:* Taste **R**.

How you now proceed depends on the pipetting option selected and on the number of sequences. The procedure carried out according to the option is identical to that described in Sec. 5.3 to Sec. 5.7.

Die weitere Durchführung hängt von der gewählten Pipettieroption und Anzahl der Sequenzen ab. Durchführung je nach Option identisch zu Kapitel 5.3 bis 5.7.

III. DIS =Dispensing as a program / DIS = Dispensieren als Programm

As a program, dispensing is protected from any accidental alterations.
The use of filter tips is not particularly recommended!

⚠ **Changed procedure as of software version V.1.56!**

Als Programm ist das Dispensieren hier vor zufälligen Änderungen geschützt.
Die Verwendung von Filtertips ist weniger empfehlenswert!

⚠ **Ab Software-Version V.1.56 geänderte Prozedur bei der Durchführung!**

Programming / Programmierung

Program	PROG 12345	Double-click: *PROG* in the display. Doppelklick: *PROG* im Display.
Select	PROG 12345	Select the memory slot. Speicherplatz wählen.
Program	EDIT PROG 12345	**Hold down** the key until *EDIT* appears. Taste **lang** drücken, bis *EDIT* erscheint.
Select	DIS EDIT PROG 12345 ENTER	Select *DIS*. *DIS* wählen.

or / oder Volume Select		ENTER	Select the dispensing volume. The max. number of dispensing steps appears in the right-hand side of the display. Dispensiervolumen wählen. Max. Dispensierschritte rechts im Display.
Select		ENTER	Select the speeds. Geschwindigkeiten wählen.
Select		ENTER	Reduction of dispensing steps. Reduzierung der Dispensier-schritte.

The dispensing procedure is described in Sec. 5.9.

Durchführung Dispensieren siehe Kap. 5.9.

IV. SD = Sequential Dispensing / Sequentielles Dispensieren

This program can be used when different volumes of a solution have to be dispensed consecutively. Up to 20 dispensing steps can be defined.
If the sum of the dispensing steps is larger than the volume of the pipette tips, the procedure for normal dispensing is applicable when a liquid is aspirated repeatedly.
The use of filter tips is not particularly recommended!

⚠ **Changed procedure as of software version V.1.56!**

Müssen unterschiedliche Volumina einer Lösung nacheinander dispensiert werden, so kann dies Programm für diese Aufgabe genutzt werden. Es können bis zu 20 Dispensierschritte definiert werden.
Ist die Summe der Volumina der Dispensierschritte größer als das Volumen der Pipettenspitze, gilt für die wiederholte Aufnahme einer Lösung der gleiche Ablauf wie beim normalen Dispensieren. Die Verwendung von Filtertips ist weniger empfehlenswert!

⚠ **Ab Software-Version V.1.56 geänderte Prozedur bei der Durchführung!**
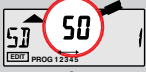
Programming / Programmierung

| Program | | Double-click: **PROG** in the display.

Doppelklick: **PROG** im Display. |
| Select | | Select the memory slot.
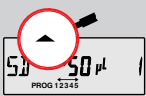
Speicherplatz wählen. |

Part B   Programs / Teil B   Programme

Program	EDIT PROG 12345		**Hold down** the key until *EDIT* appears. Taste **lang** drücken, bis *EDIT* erscheint.
Select	5D EDIT PROG 12345	ENTER	Select *SD*. *SD* wählen.
Select	5D 20 5EQ EDIT PROG 12345	ENTER	Determine the dispensing steps 1–20. Festlegung der Dispensier-schritte 1–20.
or / oder **Volume Select**	5D 50 1 EDIT PROG 12345	ENTER	Volume of the first dispensing step. Volumen 1. Dispensierschritt.
or / oder **Volume Select**	5D 200 20 EDIT PROG 12345	ENTER	Volume of the last dispensing step. Volumen letzter Dispensier-schritt.
Select	5D 200 µl 20 EDIT PROG 12345	ENTER	Select the speed for all dispensings. Geschwindigkeit für alle Dispensierungen wählen.
	5D 50 µl 1 PROG 12345		Programming is complete. EDIT disappears. Programmierung abge-schlossen, EDIT erloschen.

Procedure / Durchführung

	5D 50 µl 1 PROG 12345		The necessary or largest possible amount of liquid is aspirated. *If ⓡ appears in the display, press* ⓡ. Aufnahme der erforderlichen oder maximal möglichen Flüssigkeitsmenge. *Falls ⓡ im Display:* Taste ⓡ.

Part B Programs / Teil B Programme

⚠ **Changed procedure as of software version V.1.56!**
Ab Software-Version V.1.56 geänderte Prozedur bei der Durchführung!

○	5ᴅ – – – – 1	Free jet discharge / Discharge to wall	Activation of the return stroke. **This is not a dispensing step!** Dispensing of liquid into the sampling tube. Auslösen des Umkehrhubes. **Dies ist kein Dosierschritt!** Flüssigkeitsabgabe in das Entnahmegefäß.
○	5ᴅ 50 1 PROG 12345	Free jet discharge / Discharge to wall	The first step is dispensed. Abgabe 1. Dispensierschritt.
○	5ᴅ 55 2 PROG 12345	Free jet discharge / Discharge to wall	The second step is dispensed. Abgabe 2. Dispensierschritt.
○	5ᴅ – – – –		Blank step with special acoustic signal. Leerschritt mit spezieller akustischer Rückmeldung.
○	5ᴅ – – –		Blow-out is discarded. **Not a** dispensing step. Aspiration then occurs for the next dispensing steps. Verwerfen des Überhubs. **Kein** Dispensierschritt. Danach Aufnahme für die nächsten Dispensierschritte.

Part B Programs / Teil B Programme

V. ADS = Automatic Dispensing / Automatisches Dispensieren

When microtiter plates are filled, a specific amount of liquid must often be dispensed in rapid succession.The program is recommended for this task.
Please observe the volume restriction for Filtertips (see Sec. 5.11).
The use of filter tips is not particularly recommended!

⚠ **Changed procedure as of software version V.1.56!**

Beim Befüllen von Mikrotiterplatten muß oftmals eine bestimmte Flüssigkeitsmenge schnell hintereinander dispensiert werden. Für diese Aufgabe ist das Programm zu empfehlen.
Die Verwendung von Filtertips ist weniger empfehlenswert!

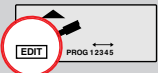⚠ **Ab Software-Version V.1.56 geänderte Prozedur bei der Durchführung!**

Programming / Programmierung

Program		
	PROG 1 2 3 4 5	Double-click: **PROG** in the display. Doppelklick: **PROG** im Display.
Select	PROG **1 2 3 4 5**	Select the memory slot. Speicherplatz wählen.
Program	EDIT PROG 1 2 3 4 5	**Hold down** the key until **EDIT** appears. Taste **lang** drücken, bis **EDIT** erscheint.
Select	ADS EDIT PROG 1 2 3 4 5 ENTER	Select **ADS**. **ADS** wählen.
or / oder **Select Volume**	ADS 5 20 EDIT PROG 1 2 3 4 5 ENTER	Select the dispensing volume, and store. Dispensiervolumen wählen und speichern.
Select	ADS 5 µl EDIT PROG 1 2 3 4 5 ENTER	Select the aspirating and dispensing speed. Auf- und Abgeschwindigkeit wählen.
Select	ADS 5 15 EDIT PROG 1 2 3 4 5 ENTER	Reduction of the dispensing steps. Reduzierung der Dispensier-schritte.

Part B   Programs / Teil B   Programme

Select	FRQ **1** SEC EDIT PROG 12345	ENTER	Dispensing frequency. Delays between dispensings: 0.1 to 10 seconds. Dispensierfrequenz. Verzögerungszeit zwischen den Dispensierungen: 0,1 bis 10 Sekunden.
	ADS 5 µl 15 PROG 12345		Programming is complete. Programmierung abgeschlossen.
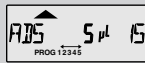
Procedure / Durchführung

◯	ADS 5 µl 15 PROG 12345	Aspiration of liquid. *If ⓡ appears in the display, press* ⓡ. Aufnahme Flüssigkeit. *Falls ⓡ im Display:* Taste ⓡ.

⚠ **Changed procedure as of software version V.1.56!**
Ab Software-Version V.1.56 geänderte Prozedur bei der Durchführung!
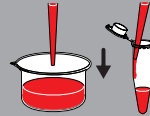
◯	ADS _ _ _ _ 0	Free jet discharge — Discharge to wall	Activation of the return stroke. **This is not a dispensing step!** Dispensing of liquid into sampling tube. Auslösen des Umkehrhubes. **Dies ist kein Dosierschritt!** Flüssigkeitsabgabe in das Entnahmegefäß.
⬤	ADS 5 14 PROG 12345 • • •	Free jet discharge — Discharge to wall	Dispensing with Actuate key held down. An acoustic signal is emitted after the dispensing step. **Interruption:** Release the Actuate key. Dispensierung mit gedrückt gehaltener Auslösetaste. Akustische Rückmeldung nach Dispensierschritt. **Unterbrechung:** Auslösetaste loslassen.
⬤	ADS _ _ _ 0 PROG 12345		Dispensing is complete. Dispensierung abgeschlossen.
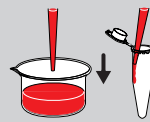
Part B   Programs / Teil B   Programme

			Blank step with special acoustic signal.
○	ADS ____ 0		Leerschritt mit spezieller akustischer Rückmeldung.

			Blow-out is discarded.
○	ADS ___ 0		Verwerfen des Überhubs.

VI. DIL = Diluting / Diluieren

In this case, the reagent – or diluent – first and then the sample are aspirated into a pipette tip. Both liquids are initially separated by an air bubble. In the case of larger sample volumes, the air bubble can dissolve following aspiration. A pipetting option can be used for dispensing both liquids.

Hier werden Reagenz – oder Diluent – und anschließend Probe in eine Pipettenspitze aufgenommen. Die beiden Flüssigkeiten sind anfänglich durch eine Luftblase getrennt. Bei größerem Probevolumina kann sich die Luftblase am Ende der Aufnahme auflösen. Bei der Abgabe der beiden Flüssigkeiten kann eine Pipettieroption benutzt werden.

Programming / Programmierung
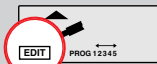
Program	PROG 12345		Double-click: *PROG* in the display. Doppelklick: *PROG* im Display.
Select	PROG 12345		Select the memory slot. Speicherplatz wählen.
Program	EDIT PROG 12345		**Hold down** the key until *EDIT* appears. Taste **lang** drücken, bis *EDIT* erscheint.
Select	DIL EDIT PROG 12345	◯ ENTER	Select *DIL*. *DIL* wählen.
or / oder **Select Volume**	SPL 20.0 µl EDIT PROG 12345	◯ ENTER	Sample volume: see table. Probevolumen: siehe Tabelle.
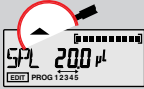
Part B Programs / Teil B Programme

Select			Aspirating speed for sample.
	SPL 20.0 µl	ENTER	Aufnahmegeschwindigkeit Probe.

| or / oder
Select Volume | DIL 60.0 µl | ENTER | Diluent volume: see table.
Diluentvolumen: siehe Tabelle. |

| Select | DIL 60.0 µl | ENTER | Aspirating speed of diluent.
Aufnahmegeschwindigkeit Diluent. |

| Select | SUM 80.0 µl | ENTER | Sum of sample + diluent. Selection of dispensing speed.
Summe Probe + Diluent. Wahl Abgabegeschwindigkeit. |

| Select | SUM 80.0 | ENTER | Pipetting options: BLO, RNS or Standard.
Wahl der Option: BLO, RNS oder Standard |
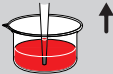
Volume table Diluting (DIL); valid after data set 2
Volumentabelle Diluieren (DIL); gültig ab Datensatz 2

Pipette	Sample / Probe * (µl) min. – max.	Air / Luft * (µl) min. – max.	Diluent * (µl) min. – max.
5000 µl	100 – 2500	50 – 150	100 – 4850
1200 µl	50 – 600	12 – 36	48 – 1138
1000 µl	50 – 500	10 – 30	50 – 940
300 µl	20 – 150	3 – 9	18 – 277
100 µl	5 – 50	1 – 3	5 – 94
10 µl	0.5 – 5	0.1 – 0.3	0.5 – 9.4

* The total volume of the pipette cannot be exceeded.
For example, the maximum diluent volume can only be used with the minimum sample.

* Gesamtvolumen der Pipette kann nicht überschritten werden, z.B. bei max. Diluent ist nur min. Probe möglich.
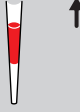
Procedure / Durchführung

| | DIL 60.0 µl | | Diluent is aspirated. *If Ⓡ appears in the display, press Ⓡ.*
Aufnahme Diluent. *Falls Ⓡ im Display: Taste Ⓡ.* |

Part B Programs / Teil B Programme
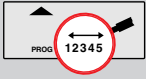
◯	AIR 2.0 µl PROG 1 2 3 4 5	🔺	↑	Air bubble is aspirated. The volume is calculated by the program. Aufnahme Luftblase. Volumen wird vom Programm errechnet.
◯	SPL 20.0 µl PROG 1 2 3 4 5	🔺	↑	Sample is aspirated. Aufnahme Probe.
◯	SUM 80.0 µl PROG 1 2 3 4 5	🔻		Sample – air – diluent are dispensed. Please observe the pipetting option! Abgabe Probe – Luft – Diluent. Pipettieroption beachten!

VII. SDI = Serial Dilution / Serielles Diluieren

In this program, pipetting is linked up to a specified number of mixing cycles. The program is used with a specimen liquid. The pipetting sample is mixed together with the specimen liquid.

Dies Programm verknüpft die Pipettierung mit einer bestimmten Anzahl Mischzyklen. Die zu pipettierende Probe wird in eine bereits vorgelegte Flüssigkeit (Diluent) eingebracht und gemischt.

Programming / Programmierung
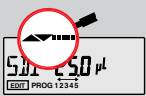
Program ⬭	PROG 1 2 3 4 5		Double-click: PROG in the display. Doppelklick: *PROG* im Display.
Select ▤	PROG 1 2 3 4 5		Select the memory slot. Speicherplatz wählen.
Program ⬭	EDIT PROG 1 2 3 4 5		**Hold** until *EDIT* appears. Drücken, bis *EDIT* erscheint.
Select ▤	SDI EDIT PROG 1 2 3 4 5	◯ ENTER	Select *SDI*. *SDI* wählen.

Part B   Programs / Teil B   Programme

or / oder				
Select **Volume**	`SDI` `25.0` µl `EDIT PROG 12345`	ENTER	Volume of sample. Volumen Probe.	
Select	`SDI` `25.0` µl `EDIT PROG 12345`	ENTER	Aspirating and dispensing speed. Select a high speed! Auf- und Abgeschwindigkeit. Hohe Geschwindigkeit wählen!	
Select	`MIX` `100.0` µl `EDIT PROG 12345`	ENTER	Stroke for mixing. [*1] Hub zum Mischen. [*1]	
Select	`REP` `6` `EDIT PROG 12345`	ENTER	Mixing cycles (max. 20). Mischzyklen (max. 20).	
Select	`SDI` `25.0` `BLO` `EDIT PROG 12345`	ENTER	BLO pipetting option or standard operation. Pipettieroption BLO oder Standardbetrieb.	

Procedure / Durchführung

( )	`SDI` `25.0` µl `BLO` `PROG 12345` ▲	↑	Aspiration of sample. *If ® appears in the display, press the ® key.* Aufnahme Probe. *Falls ® im Display:* Taste ®.
( )	`SDI` `25.0` µl `BLO` `PROG 12345` ▼	↓	Sample is dispensed. Abgabe Probe.
( )	`SDI` `25.0` `BLO` `PROG 12345` ▼	↓	With BLO: Blow-out is executed. Bei BLO: Durchführung Überhub.
( )	`MIX` `100` µl `6` `PROG 12345`	↓ ↓↑	Start mixing cycles (here: 6). The counter runs backwards. [*1] Start Mischzyklen (hier: 6). Zähler läuft rückwärts. [*1]

[*1]   Mixing volume is somewhat higher than displayed.
[*1]   Mischvolumen ist etwas höher als angezeigt.

Part B Programs / Teil B Programme
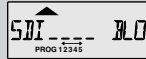
Return to the basic position by pressing the key outside the liquid.

Rückkehr in die Grundposition durch Tastendruck außerhalb der Flüssigkeit.

VIII. ASP = Aspirate / Mehrfachaufnahme

From program version V.1.56 onwards
With ASP, several volumes of the same size are aspirated simultaneously into a pipette tip. If the tip is filled, the entire content is dispensed. This procedure is a "reverse dispensing".

Ab Programmversion V.1.56
Bei ASP werden mehrere gleiche Volumina in eine Pipettenspitze aufgenommen. Ist die Spitze gefüllt, wird der gesamte Inhalt abgegeben. Der Ablauf ist ein "umgekehrtes Dispensieren".

Programming / Programmierung

Program	PROG 12345		Double-click: PROG in the display. Doppelklick: **PROG** im Display.
Select	PROG 12345		Select the memory slot. Speicherplatz wählen.
Program	EDIT PROG 12345		**Hold down** the key until **EDIT** appears. Taste **lang** drücken, bis **EDIT** erscheint.
Select	ASP EDIT PROG 12345	ENTER	Select **ASP**. **ASP** wählen.
or / oder Volume Select	ASP 100 10 EDIT PROG 12345	ENTER	Select the aspirating volume. For max. number of aspirating steps, see right-hand display. Aufnahmevolumen wählen. Max. Aufnahmeschritte rechts im Display.
Select	ASP 100 µl EDIT PROG 12345	ENTER	Select the speeds. Geschwindigkeiten wählen.

Part B Programs / Teil B Programme
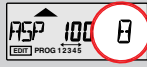
| Select | ASP 100 8 EDIT PROG 12345 | ENTER | Reduction of aspirating steps. Reduktion Aufnahmeschritte. |

Procedure / Durchführung

○	ASP 100µl 8 PROG 12345	↑	1. Volume is aspirated. 1. Volumen wird aufgenommen.
○	ASP 100µl 7 PROG 12345	↑	2. Volume is aspirated. 2. Volumen wird aufgenommen.
○	ASP 800µl 1 PROG 12345		Step-by-step aspiration is finished. Confirm by pressing ○ Enter. Schrittweise Aufnahme beendet. Wird mit Tastendruck auf ○ Enter bestätigt.
○	ASP 800µl 1 PROG 12345	↓	Next time ○ Enter is pressed: Dispensing of the entire aspirated liquid. Beim nächsten Drücken von ○ Enter: Abgabe der gesamten aufgenommenen Flüssigkeit.

Part B Ordering information / Teil B Bestellinformationen

Eppendorf Research pro, single-channel / Einkanal

incl. charging unit / mit Ladeadapter *	0.5 – 10 µl		4860 000.011
incl. charging unit / mit Ladeadapter *	5 – 100 µl		4860 000.020
incl. charging unit / mit Ladeadapter *	20 – 300 µl		4860 000.038
incl. charging unit / mit Ladeadapter *	50 – 1000 µl		4860 000.046
incl. charging unit / mit Ladeadapter *	100 – 5000 µl		4860 000.054
without charging unit / ohne Ladeadapter °	0.5 – 10 µl		4860 000.062
without charging unit / ohne Ladeadapter °	5 – 100 µl		4860 000.070
without charging unit / ohne Ladeadapter °	20 – 300 µl		4860 000.089
without charging unit / ohne Ladeadapter °	50 – 1000 µl		4860 000.097
without charging unit / ohne Ladeadapter °	100 – 5000 µl		4860 000.100

Eppendorf Research pro, 8-channel / 8-Kanal

incl. charging unit / mit Ladeadapter *	0.5 – 10 µl		4860 000.518
incl. charging unit / mit Ladeadapter *	5 – 100 µl		4860 000.534
incl. charging unit / mit Ladeadapter *	20 – 300 µl		4860 000.550
incl. charging unit / mit Ladeadapter *	50 – 1200 µl		4860 000.577
without charging unit / ohne Ladeadapter °	0.5 – 10 µl		4860 000.313
without charging unit / ohne Ladeadapter °	5 – 100 µl		4860 000.330
without charging unit / ohne Ladeadapter °	20 – 300 µl		4860 000.356
without charging unit / ohne Ladeadapter °	50 – 1200 µl		4860 000.372

Eppendorf Research pro, 12-channel / 12-Kanal

incl. charging unit / mit Ladeadapter *	0.5 – 10 µl		4860 000.526
incl. charging unit / mit Ladeadapter *	5 – 100 µl		4860 000.542
incl. charging unit / mit Ladeadapter *	20 – 300 µl		4860 000.569
without charging unit / ohne Ladeadapter °	0.5 – 10 µl		4860 000.321
without charging unit / ohne Ladeadapter °	5 – 100 µl		4860 000.348
without charging unit / ohne Ladeadapter °	20 – 300 µl		4860 000.364

° Pipettes without a charging unit must be charged in the charging stand.
° Pipetten ohne Ladeadapter müssen mittels Ladeständer geladen werden.

Charging stand / Ladeständer

for one pipette / einfach *		4860 000.267
for four pipettes / vierfach *		4860 000.860

* If the delivery address is not in the country in which the device shall be used:
  When placing your order, please specify the country in which the device is to be used and the voltage used in that country. Only then is it possible for us to deliver the power unit of the charging unit/stand with the necessary input voltage.

* Falls die Lieferadresse nicht das Bestimmungsland ist:
  Bitte bei der Bestellung das Bestimmungsland mit der dort verwendeten Spannung angeben. Nur so kann das Netzteil des Ladeadapters oder Ladeständers mit der erforderlichen Eingangspannung ausgeliefert wird.

Pipette tips / Pipettenspitzen – epT.I.P.S.
The packing units stated represent the minimum order quantity.
Die angegebenen Mengen bilden die kleinste Bestelleinheit.
(Box = reusable box / Mehrwegbox, Rack = disposable rack / Einmalbox)

	Color code	Farbcode	Order no.
Standard, in bags, 2x 500 = 1000 tips / Standard, in Beuteln, 2x 500 = 1000 Tips			
0.1 – 10 µl	anthracite	anthrazit	0030 000.811
0.1 – 20 µl	dark gray	dunkelgrau	0030 000.838
0.5 – 20 µl L	light gray	hellgrau	0030 000.854
2 – 200 µl	yellow	gelb	0030 000.870
20 – 300 µl	orange	orange	0030 000.897
50 – 1000 µl	blue	blau	0030 000.919
50 – 1250 µl	green	grün	0030 000.935
100 – 5000 µl (500 tips)	violet	lila	0030 000.978
Set, 1 Box, incl. 5 trays with / mit 96 tips = 480 tips (Starter Kit)			
0.1 – 10 µl	anthracite	anthrazit	0030 073.207
0.1 – 20 µl	dark gray	dunkelgrau	0030 073.223
0.5 – 20 µl L	light gray	hellgrau	0030 073.240
2 – 200 µl	yellow	gelb	0030 073.266
20 – 300 µl	orange	orange	0030 073.282
50 – 1000 µl	blue	blau	0030 073.304
50 – 1250 µl	green	grün	0030 073.320
Reloads, 10 trays with / mit 96 tips = 960 tips			
0.1 – 10 µl (in stacks)	anthracite	anthrazit	0030 073.363
0.1 – 20 µl	dark gray	dunkelgrau	0030 073.380
0.5 – 20 µl L	light gray	hellgrau	0030 073.401
2 – 200 µl (in stacks)	yellow	gelb	0030 073.428
20 – 300 µl	orange	orange	0030 073.444
50 – 1000 µl	blue	blau	0030 073.460
50 – 1250 µl	green	grün	0030 073.487
Reloads PCR-clean, 10 trays with / mit 96 tips = 960 tips			
0.1 – 10 µl (in stacks)	anthracite	anthrazit	0030 073.746
0.1 – 20 µl	dark gray	dunkelgrau	0030 073.762
0.5 – 20 µl L	light gray	hellgrau	0030 073.789
2 – 200 µl (in stacks)	yellow	gelb	0030 073.800
20 – 300 µl	orange	orange	0030 073.827
50 – 1000 µl	blue	blau	0030 073.843
50 – 1250 µl	green	grün	0030 073.860

	Color code	Farbcode	Order no.
Box, 1 box plus 96 tips			
0.1 – 10 µl	anthracite	anthrazit	0030 073.002
0.1 – 20 µl	dark gray	dunkelgrau	0030 073.029
0.5 – 20 µl L	light gray	hellgrau	0030 073.045
2 – 200 µl	yellow	gelb	0030 073.061
20 – 300 µl	orange	orange	0030 073.088
50 – 1000 µl	blue	blau	0030 073.100
50 – 1250 µl	green	grün	0030 073.126
100 – 5000 µl (24 tips)	violet	lila	0030 073.169

Racks Eppendorf Biopur, colorless, sterile, pyrogen-free, DNA-free, RNase-free, ATP-free
Racks Eppendorf Biopur, farblos, steril, pyrogenfrei, DNA-frei, RNase-frei, ATP-frei

5x 96 = 480 tips			
0.1 – 20 µl	dark gray	dunkelgrau	0030 075.005
2 – 200 µl	yellow	gelb	0030 075.021
20 – 300 µl	orange	orange	0030 075.048
50 – 1000 µl	blue	blau	0030 075.064
50 – 1250 µl	green	grün	0030 075.080

Singles (Eppendorf Biopur), individually wrapped, 1 set = 100 tips
Singles (Eppendorf Biopur), einzeln verpackt, 1 Satz = 100 Tips

0.1 – 20 µl	dark gray	dunkelgrau	0030 010.019
2 – 200 µl	yellow	gelb	0030 010.061
50 – 1000 µl	blue	blau	0030 010.100

ep Dualfilter T.I.P.S., sterile, PCR-clean, in racks, 10x 96 = 960 tips

0.1 – 10 µl S	anthracite	anthrazit	0030 077.008
0.1 – 10 µl M	dark gray	dunkelgrau	0030 077.024
0.5 – 10 µl L	light gray	hellgrau	0030 077.040
2 – 100 µl	yellow	gelb	0030 077.067
2 – 200 µl	yellow	gelb	0030 077.377
20 – 300 µl	orange	orange	0030 077.083
50 – 1000 µl	blue	blau	0030 077.105
100 – 5000 µl (5x24=120)	violet	lila	0030 077.342

Additional accessories / Sonstiges Zubehör

Spare Ni-MH battery, 1,200 mAh / Ersatzpack Ni-MH Akku 1200 mAh	4860 501.002
Silicone grease / Silikonfett	0013 063.010
"Tip-tub", autoclavable multi-channel reagent attachment, 1 set (10 tubs + 10 lids)	0030 058.607
"Tip-tub", autoklavierbare Reagenzaufnahme Mehrkanal, 1 Satz (10 Gefäße + 10 Deckel)	
Lid of battery compartment / Deckel Akkufach	4860 701.001
Instruction manual / Bedienungsanleitung	4860 900.012
PICASO II (Pipette Calibration Software)	3113 004.001

PICASO accessories – see eppendorf catalog / PICASO-Zubehör – siehe eppendorf Katalog

Wrench (not for 5,000 µl) / Schlüssel (nicht für 5000 µl)   3110 110.013
Disassembly aid 5,000 µl / Demontagehilfe 5000 µl   3110 110.021
Tools for multi-channel model / Werkzeuge für Mehrkanal

0.5 – 10 µl	4908 829.005
5 – 100 µl	4860 735.003
20 – 300 µl	4908 832.006
50 – 1200 µl	4860 736.000

Charging unit as replacement part / Ladeadapter als Ersatzteil
Note: A charging stand can be used in place of a replacement charging stand.
Hinweis: Anstelle des Ersatz-Ladeadapters kann auch ein Ladeständer benutzt werden.
Charging unit 230 V, "Europe" / Ladeadapter 230 V, "Europa"   4860 801.006
Charging unit 100 V, "Japan" / Ladeadapter 100 V, "Japan"   4860 803.009
Charging unit 230 V, "UK" / Ladeadapter 230 V, "UK"   4860 804.005
Charging unit 240 V, "Australia" / Ladeadapter 240 V, "Australien"   4860 805.001
Charging unit 120 V, "USA" / Ladeadapter 120 V, "USA"   4860 802.002

Spare parts for single-channel pipettes / Ersatzteile Einkanal
The disassembly procedure can be found in Sec. 6.2 / Demontage siehe Kapitel 6.2

Ejection sleeve / Abwurfhülse

0.5 – 10 µl	3110 861.000
5 – 100 µl	3110 861.000
20 – 300 µl	3110 863.003
50 – 1000 µl	3110 865.006
100 – 5000 µl	3110 866.002

Piston / Kolben

0.5 – 10 µl	4860 705.007
5 – 100 µl	4860 706.003
20 – 300 µl	4860 707.000
50 – 1000 µl	4860 708.006
100 – 5000 µl	4860 709.002

Lower part incl. seal
Unterteil inkl. Dichtung

0.5 – 10 µl	3110 857.003
5 – 100 µl	4860 711.007
20 – 300 µl	4860 712.003
50 – 1000 µl	3110 855.000
100 – 5000 µl	4860 714.006

(Cylinder and cylinder attachment for 100 – 5000 µl)
(Zylinder und Zylinderaufnahme für   100 – 5000 µl)

Sealing inside lower part
(Change service parts see next page)
Dichtungen im Unterteil
(Wechsel Serviceteile siehe nächste Seite)
3 – Sealing set
3 – Dichtungssatz

5 – 100 µl	4910 820.007
20 – 300 µl	4860 703.004
50 – 1000 µl	3110 845.005

5 – Filling tube (5 pieces, 1 wire punch)
(To change filling tube, see next page)
5 – Füllschlauch (5 St. mit Ausschiebedorn)
(Wechsel Füllschlauch siehe nächste Seite)

5 – 100 µl	4910 837.007
20 – 300 µl	3110 873.009

Part B   Ordering information / Teil B   Bestellinformationen

Change Service parts (single-channel) / Wechsel Serviceteile (Einkanal)

5 – 100 µl   20 – 300 µl   50 – 1000 µl
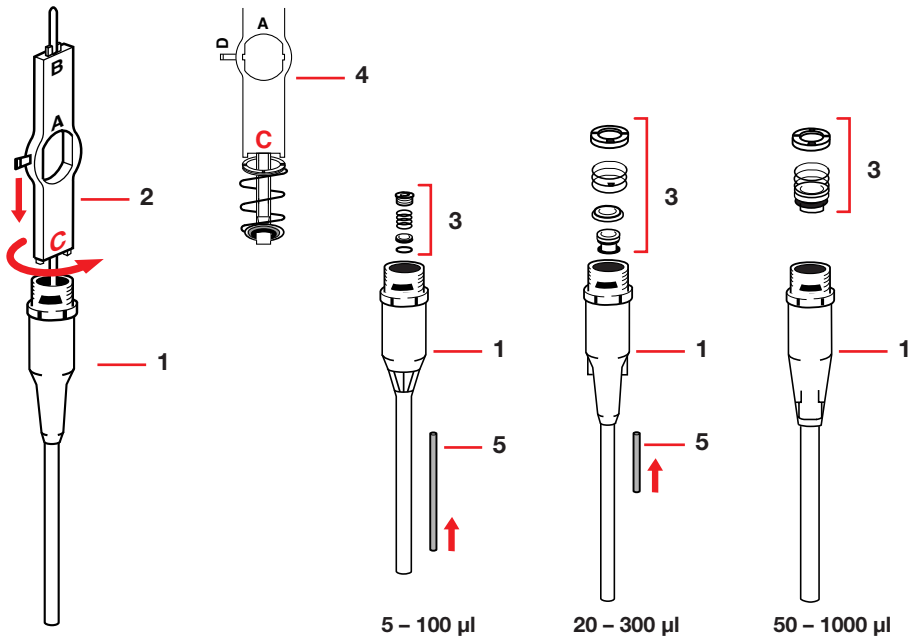
The seals in the lower part (1) are unscrewed from the lower part (which has been separated from the pipette; see Sec. 6.2) using the wrench (2). The lower parts for 0.5 – 10 µl and 100 – 5,000 µl do not contain any seals. With the 10 – 100 µl pipette, side B of the wrench (2) is used for screwing/unscrewing. Parts of the seal are then pulled out using side C (3). With the other pipettes, the seals are unscrewed using side C of the wrench or are tapped out after having been loosened. For mounting, the sealing set (3) is placed onto the wrench (4). When screwing together, do not tighten too much. The filling tube (5) is delivered as a spare-parts pack together with a wire punch. After assembling, trigger a motor reset and check the dispensing function.

Die Dichtungen im Unterteil (1) werden mit Hilfe des Schlüssels (2) aus dem von der Pipette abgetrennten Unterteil (vgl. Kap. 6.2) ausgeschraubt. Die Unterteile der Volumen 0,5 – 10 µl und 100 – 5000 µl enthalten keine Dichtungen. Bei der Pipette 10 – 100 µl wird mit der Seite "B" des Schlüssels (2) im Unterteil geschraubt. Anschließend werden mit der Seite "C" Teile der Dichtung (3) herausgezogen. Bei den anderen Pipetten erfolgt das Ausschrauben mit der Seite "C" des Schlüssels. Ggf. nach dem Lösen Teile rausklopfen. Zur Montage wird der Dichtungssatz (3) auf den Schlüssel (4) gesetzt. Beim Einschrauben nicht zu fest anziehen. Der Füllschlauch (5) wird als Ersatzteilpack mit Ausschiebedorn geliefert. Nach Zusammenbau Motorreset auslösen und Dosierfunktion prüfen.

Spare parts for multi-channel model / Ersatzteile Mehrkanal
The disassembly procedure can be found in Section 6.3 / Demontage siehe Kapitel 6.3

O-rings for nose cone (12 pieces)
incl. mounting aid (silicone, red,
no lubrication required; see section 6.3)
O-Ringe für Arbeitskonen (12 Stück)
inkl. Montagehilfe (Silikon, rot,
kein Fett erforderlich; vgl. Kap. 6.3)

5 –	100 µl and / und	
20 –	300 µl	4908 836.001
50 –	1200 µl (8 pieces/8 St.)	4860 716.009

Lower parts, cpl., 8-channel
Unterteile, kpl., 8 Kanal

0.5 –	10 µl	4860 725.008
5 –	100 µl	4860 727.000
20 –	300 µl	4860 729.003
50 –	1200 µl	4860 731.008

Lower parts, cpl., 12-channel
Unterteile, kpl., 12 Kanal

0.5 –	10 µl	4860 726.004
5 –	100 µl	4860 728.007
20 –	300 µl	4860 730.001

Tools for multi-channel model
Werkzeuge für Mehrkanal

0.5 –	10 µl	4908 829.005
5 –	100 µl	4860 735.003
20 –	300 µl	4908 832.006
50 –	1200 µl	4860 736.000

Piston seals for multi-channel model
Set of piston seals
(Change service parts see below and next page)
Kolbendichtungen Mehrkanal
Satz Kolbendichtungen
(Wechsel Serviceteile s. unten und nächste Seite)

0.5 –	10 µl	4908 833.002
5 –	100 µl	4860 721.002
20 –	300 µl	4908 835.005

Volume unit / Volumeneinheit

50 – 1200 µl		4860 723.005

Change volume unit 50 – 1200 µl
Loosen the srews in the housing lower part
and lift the top half of the lower part. Press
down the volume unit below which is to be
exchanged, so that the upper part is lifted
out of the groove.

Wechsel Volumeneinheit 50 – 1200 µl
Die Schrauben am Gehäuseunterteil lösen,
die obere Hälfte des Unterteils abheben.
Die auszutauschende Volumeneinheit
unten herunterdrücken, damit sich der
obere Teil aus der Nut heraushebt.

Important notes regarding ordering information
Only parts with order numbers are available. Please only use the accessories recommended by
Eppendorf. Using disposables which we have not recommended can reduce the imprecision,
inaccuracy and the life of the pipette. We do not honor any warranty or accept any
responsibility for damage resulting from such action.

Wichtige Hinweise zu den Bestellinformationen
Nur die mit Bestellnummern versehenen Teile sind erhältlich. Bitte verwenden Sie ausschließlich
das von uns empfohlene Original-Zubehör. Unpräzision, Unrichtigkeit und Lebensdauer unserer
Geräte können bei Verwendung anderer als von uns empfohlener Ersatzteile und Einmalartikel
beeinträchtigt werden. Jegliche Gewährleistung und Haftung für dadurch verursachte Schäden
ist ausgeschlossen.

B

Ordering information / Bestellinformationen

Change Service parts multi-channel up to 300 µl
Wechsel Serviceteile Mehrkanal bis 300 µl

1

3

2

Piston seals
Kolbendichtung

Pressure piece
Niederhalter

Piston / Kolben

4a   4b

4
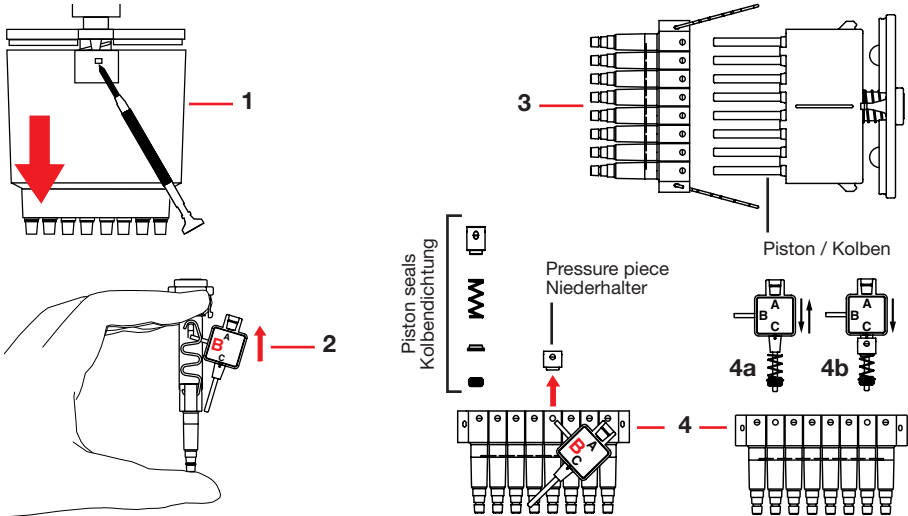
1   Using the screwdriver, press in the catch and pull off the housing.

2   Using the tool, lever off the metal clips from the safety hook. This part is under spring tension. Hold the part as shown in the diagram and loosen the metal clip on both sides.

3   Pull off the tip holder (nose cones).
     It is advisable to clean the piston with isopropanol. Lightly lubricate the piston using silicone grease.

4   Loosen the pressure piece using the punch (B) on the tool. The pressure piece is under spring tension. Hold the piece using your forefinger. Pull out the springs and the sealing ring using the tool (4a). Reassemble in reverse order. The parts are placed onto the tool (4b). Move piston in upper position. After assembling, trigger a motor reset and check the dispensing function.

1   Mit Schraubenzieher Rastung eindrücken und Gehäuse abziehen.

2   Mit dem Werkzeug Metallklammern vom Sicherungshaken abhebeln. Teil steht unter Feder-spannung. Wie in der Abbildung gezeigt festhalten und Metallklammer auf beiden Seiten lösen.

3   Spitzenhalter (Arbeitskonen) abziehen.
     Zum Reinigen der Kolben Isopropanol verwenden. Kolben anschließend dünn mit Silikonfett einreiben.

4   Niederhalter mit dem Dorn (B) am Werkzeug lösen. Der Niederhalter steht unter Feder-spannung. Zeigefinger auflegen. Federn und Dichtungsring mit dem Werkzeug (4a) heraus-ziehen. Der Zusammenbau erfolgt in umgekehrter Reihenfolge. Teile werden dazu auf das Werkzeug (4b) gesetzt. Kolben in obere Stellung bringen. Nach Zusammenbau Motorreset auslösen und einwandfreie Dosierfunktion prüfen.

EG-Konformitätserklärung
EC Conformity Declaration

Das bezeichnete Produkt entspricht den einschlägigen grundlegenden Anforderungen der
aufgeführten EG-Richtlinien und Normen. Bei einer nicht mit uns abgestimmten Änderung des
Produktes oder einer nicht bestimmungsgemäßen Anwendung verliert diese Erklärung ihre Gültigkeit.

The product named below fulfills the relevant fundamental requirements of
the EC directives and standards listed. In the case of unauthorized modifications to the product
or an unintended use this declaration becomes invalid.

Produktbezeichnung, Product name:

Eppendorf Research ® pro 4860

Produkttyp, Product type:

elektrische Pipette / electronic pipette

Einschlägige EG-Richtlinien/Normen, Relevant EC directives/standards:

73/23/EWG, EN 61010-1

89/336/EWG, EN 55011/B, EN 61000-6-1, EN 61000-3-2, EN 61000-3-3

98/79/EG, EN 14971

Vorstand, Board of Management:

14.06.2006

Hamburg, Date:

Projektmanagement, Project Management:

eppendorf

ISO CERTIFIED 9001

0015 033.509-02

4860 900.993-02

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