Applications

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Technical Report

The Eppendorf Research® plus pipette – fully autoclavable, easy adjustment, quick and simple maintenance

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Abstract

Modern quality management in the laboratory requires routine cleaning and maintenance, as well as testing of the dispensing systems, at regular intervals. The Research plus pipettes are easy to clean and maintain. Hence, routine maintenance can be easily performed by the user, saving valuable time.

Introduction

In order to meet the high requirements of a modern laboratory, high quality piston stroke pipettes of the new generation should be partly or fully autoclavable as well as UV resistant. The new Eppendorf Research plus pipettes can be decontaminated either by UV light or by autoclaving the entire instrument. Thus, cleaning following use with infectious or contaminated samples is easily possible.

Furthermore, changing the pipette's adjustment is an important feature when liquids of a density different from water are dispensed, or if a change in adjustment by certain external influences is determined during calibration. The availability of adjustment change allows the correct and easy dispensing of materials with different densities.

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Re-adjustment for specific liquids or altitude

During production, piston stroke pipettes are adjusted to distilled water under certified measuring conditions. To indicate the adjustment, all Research plus pipettes carry an adjustment seal [Fig. 1]. If necessary readjustment for specific liquids or for altitude can be carried out easily. The red adjustment seal, which is applied to the adjustment opening following re-adjustment, serves to visualize a change of adjustment [Fig.1].

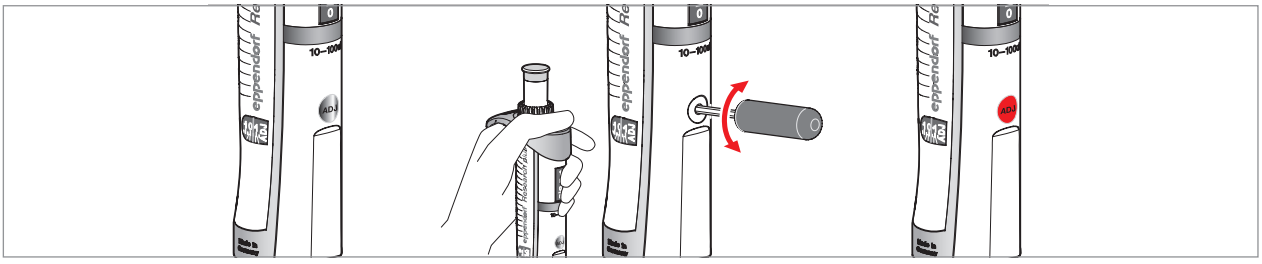

Fig. 1: Original adjustment seal — Adjustment change — Adjustment seal following adjustment change

A novel feature of the Research plus pipettes is the additional indication of a change to the factory adjustment through the adjustment window [Fig. 2]. Here, the exact change of adjustment is immediately visible [Fig. 3], even if the original seal was removed and the adjustment opening is possibly open. Using the adjustment window, changing of the adjustment back to the original setting, as well as adjustment change to accommodate liquids with a different density than water, are easily performed. In every case, a change in adjustment needs to be verified gravimetrically.

Fig. 2: Factory adjustment

Fig. 3: Change of adjustment

Procedure: If the adjustment is changed, the volume changes by a certain value. Strictly speaking, the change only applies to the testing volume.

Example: You readjust a 10 – 100 µL pipette with a volume setting of 100 µL by 1 µL (1 µL = 1 %). If the volume setting is 10 µL, the pipette is also adjusted by 1 µL (= 10 %)

1. Remove the grey calibration seal.
2. Keep the ejector pressed.
3. Insert the adjustment tool (from the delivery package).
4. Turn the adjustment tool until the desired value is displayed on the adjustment display.
5. Carry out weighings to verify accuracy and precision.
6. After the checks, stick the red adjustment seal (from the delivery package) on.

If the adjustment is meant for a specific liquid, mark the pipette accordingly. Use the labeling area on the pipette for this purpose and write down the liquid and the volume.
Carry out a gravimetric test for each change to the adjustment. Follow the test procedures of EN ISO 8655-2 and 8655-6. A SOP (Standard Operation Procedure) for the test is available on our website www.eppendorf.com.

Setting values Research plus for 50 % glycerol:

Tab. 1: Research plus single channel

Nominal volume; Color code	Nominal volume adjustment display in position	50 % of the nominal volume adjustment display in position
2.5 µL; dark grey	It is not necessary to change the setting	It is not necessary to change the setting
10 µL; medium grey	It is not necessary to change the setting	It is not necessary to change the setting
20 µL light grey	+ 1	It is not necessary to change the setting
10 µL, 20 µL; yellow	+ 1	It is not necessary to change the setting
25 µL, 50 µL, 100 µL; yellow	+ 1	+ 1
200 µL; yellow	+ 1	+ 1
300 µL; orange	+ 1	+ 1
1000 µL; blue	+ 1	+ 1
5 mL; purple	+ 1	+ 0.5
10 mL; turquoise	+ 2	+ 0.5

Tab. 2: Research plus multi-channel

Nominal volume; Color code	Nominal volume adjustment display in position	50 % of the nominal volume adjustment display in position
10 µL; medium grey	It is not necessary to change the setting	It is not necessary to change the setting
100 µL; yellow	It is not necessary to change the setting	It is not necessary to change the setting
300 µL; orange	+ 0.5	+ 0.5

Explanations: The above setting values are for orientation only as the systematic and random error are affected by the operation, the tip used and other factors (e.g. temperature). The above setting values were calculated for an 50 % (w/w) aqueous glycerol solution at room temperature. At 25 °C the glycerol solution used had a density of 1.1238 g/mL (=mg/µL). The data were calculated for wall dispensing. Blow out was triggered approx. 3 seconds after dispensing. The tips were not pre-wetted. A new tip was used for each dispension. The work was carried out relatively quickly and thus under realistic conditions. It is essential to check the data according to your own work method.

Setting values Research plus for 45 % cesium chloride:

Tab.3: Research plus single channel

Nominal volume; Color code	Nominal volume adjustment display in position	50 % of the nominal volume adjustment display in position
2.5 µL; dark grey	Data not detemined	Data not detemined
10 µL; medium grey	+ 6.5	+ 3.5
20 µL; light grey	+ 6.5	+ 2.5
10 µL, 20 µL; yellow	+ 6.5	+ 2.5
25 µL, 50 µL, 100 µL; yellow	+ 3	+ 3
200 µL; yellow	+ 2.5	+ 2
300 µL; orange	+ 2.5	+ 2.5
1000 µL; blue	+ 2	+ 2
5 ml; purple	+ 1.5	+ 1.5
10 mL; turquoise	+ 5	+ 4

Tab.4: Research plus multi-channel

Nominal volume; Color code	Nominal volume adjustment display in position	50 % of the nominal volume adjustment display in position
10 µL; medium grey	+ 3	+ 3
100 µL; yellow	+ 1	+ 1
300 µL; orange	+ 1	+ 1

Explanations: The above setting values are for orientation only as the systematic and random error are affected by the operation, the tip used and other factors (e.g. temperature). The above setting values were calculated for an 45 % (w/v) aqueous cesium chloride solution at room temperature. At 22 °C the cesium chloride solution used had a density of 1.5010 g/mL (=mg/µL). The data were calculated for wall dispensing. Blow out was triggered approx. 3 seconds after dispensing. The tips were not pre-wetted. A new tip was used for each dispension. The work was carried out relatively quickly and thus under realistic conditions. It is essential to check the data according to your own work method. To change the factory adjustment please read the operating manual for the Eppendorf Research plus (www.eppendorf.com).

Autoclaving and UV-sterilization

The piston stroke pipettes used today are either fully autoclavable, or the parts which become contaminated during improper use can be autoclaved. Thus, remaining doubts of the user regarding sterility can be dispelled, opening up new fields of application for this technology. Autoclaving of air cushion pipettes and pipette tips (with the exception of filter tips) is normally performed at 121 °C at an excess pressure of 1 bar (100 kPa) for 20 min.

The new pipette Research plus can be fully autoclaved. Following the autoclave cycle, the pipette needs to dry completely and cool down. In case the pipette was autoclaved in parts, all parts need to cool completely prior to re-assembly. Otherwise, plastic parts may be overexpanded and damaged. Greasing of the pipette piston following autoclaving is not necessary with Eppendorf pipettes.

UV resistance of the plastic materials used in the production of a pipette is of main importance for many areas of application. UV-resistant pipettes, such as the Research plus pipette, can remain in areas of cell culture labs without risk, since the UV light used to disinfect these work areas will not have any adverse effects on the pipette material, nor on the function of the pipette. UV light does not lead to discoloration of the Research plus pipette.

During decontamination using UV light, the following parameters should be regarded: A 30 Watt low-pressure mercury-vapor lamp with a characteristic wavelength of 254 nm is to be used. The optimal distance between lamp and pipette is approximately 60 cm.

The following methods for cleaning or decontamination of the Research plus pipette may not be combined:

- Disinfectants, DNA-/RNA-decontaminating agents or sodium hypochlorite with additional
- Steam autoclaving or UV-irradiation.

Specifics regarding maintenance and cleaning

The Research plus pipettes are easy to clean. Only the lower part should be cleaned on a regular basis, in accordance with the frequency of use [Fig. 4].

To this end, the ejector sleeve (4.1) will be pulled off while the ejection button is pushed down. The ring on the lower part with the label “PUSH TO RELEASE“ (4.2) has to be slid up by approximately 5 mm (4.3) until the lower part is released. Subsequently, the lower part is to be taken out of the upper part (4.4).

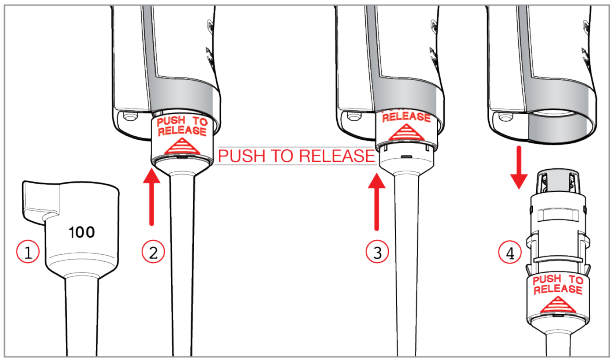

Fig. 4: Removing the lower part

Specifics regarding maintenance and cleaning

For the multichannel pipettes, opening of the lower part occurs as follows:
The lever (5.1) on the lower part has to be slid to the left or right (5.2). The lower part is released and can be removed.

Put down the lower part with the lever facing downwards and use a coin to slide the two latches down (5.3).
For re-assembly, push the lower part into the upper part until it engages audibly.

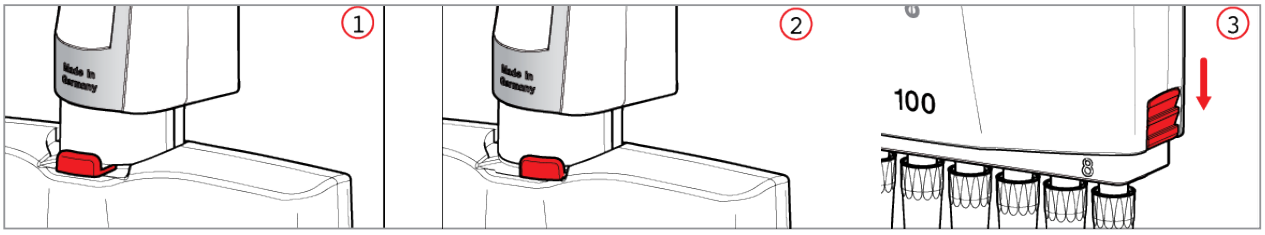

Fig. 5: Opening of the multichannel lower part

The individual pistons of the multichannel pipettes can be released from their holders for cleaning. For this purpose, position a pipette tip under the piston (6.1) and take the piston off the upper rail (6.2). Subsequently, pull the piston carefully out in an upward direction.

Take the tip cone at the lower end and push slightly upwards (6.3) and take it off the lower rail (6.4). Then remove the tip cone, including the cylinder and the spring, from their mounting (6.5). Re-assembly is performed in reverse order.

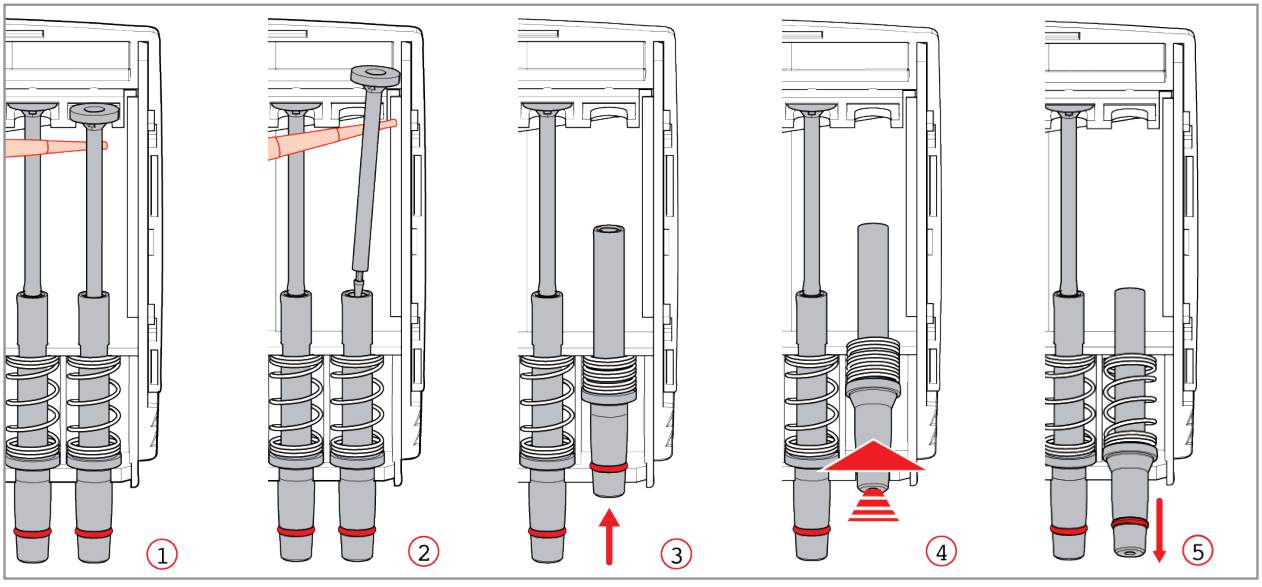

Fig. 6: Removal and installing channels

The use of multichannel pipettes with fewer than 8 or 12 channels opens up possibilities for new applications. These are described in Application Note No. 197 (www.eppendorf.com).

Outlook

In today's research environment, function and handling forces of a pipette play important roles; however, additional deciding factors include simple cleaning and maintenance procedures, as well as decontamination by autoclaving and UV-irradiation. The simple and secure adjustment of a piston stroke pipette is one further demand during daily laboratory routine. The Research plus pipettes meet these criteria in every respect and are thus the ideal instrument for everyday pipetting in the laboratory.

Ordering information Research® plus

Description	Order no.
Single channel, adjustable	
0.1 – 2.5 µL; dark grey	3120 000.011
0.5 – 10 µL; medium grey	3120 000.020
2 – 20 µL; light grey	3120 000.097
2 – 200 µL; yellow	3120 000.038
10 – 100 µL; yellow	3120 000.046
20 – 200 µL; yellow	3120 000.054
30 – 300 µL; orange	3120 000.100
100 – 1000 µL; blue	3120 000.062
0.5 – 5 mL; purple	3120 000.070
1 – 10 mL; turquoise	3120 000.089
Single channel, fixed	
10 µL; medium grey	3121 000.015
10 µL; yellow	3121 000.023
20 µL; light grey	3121 000.031
20 µL; yellow	3121 000.040
25 µL; yellow	3121 000.058
50 µL; yellow	3121 000.066
100 µL; yellow	3121 000.074
200 µL; yellow	3121 000.082
200 µL; blue	3121 000.090
250 µL; blue	3121 000.104
500 µL; blue	3121 000.112
1000 µL; blue	3121 000.120
Multichannel, 8-channel	
0.5 – 10 µL; medium grey	3122 000.019
10 – 100 µL; yellow	3122 000.035
30 – 300 µL; orange	3122 000.051
Multichannel, 12-channel	
0.5 – 10 µL; medium grey	3122 000.027
10 – 100 µL; yellow	3122 000.043
30 – 300 µL; orange	3122 000.060

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