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Eppendorf Xplorer[®]/Xplorer[®] plus

Adjustment

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Further information can be found on the enclosed CD or on our website www.eppendorf.com.

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English (EN)

1 General information on adjustment



This operating manual applies to devices with software version 2.01.00 or higher.

The piston stroke of Xplorer pipettes can be changed using the *Adjustment* option. This document provides information on when the *Factory settings* adjustment should be replaced by a different adjustment and what items need to be observed during this process. A selected adjustment can be changed again at any time. The adjustment can also be reset *Factory settings* at any time.

If the Xplorer adjustment *Factory settings* is not valid, this will be indicated using the  symbol at the top left of the header of the display.



NOTICE! Incorrect dispensing volume with special liquids and from temperature differences.

Solutions which differ greatly from water in terms of their physical data, or temperature differences between the pipette, pipette tip and liquid, can result in incorrect dispensing volumes.

- ▶ Avoid temperature differences between pipette, pipette tip and liquid.
- ▶ Check the dispensing volume and make sure that you can affirm all the questions listed in the general information.



The random and systematic errors determined before delivery can be found in the enclosed **Eppendorf Certificate**. If the factory settings are superseded by a different adjustment, the **Eppendorf Certificate** is no longer valid. If you reset the adjustment to the factory settings, the random and systematic errors determined before delivery and the enclosed **Eppendorf Certificate** are once again valid.

The Xplorer pipette was calibrated before delivery and tested with double distilled water according to ISO 8655.

Changing the adjustment of the Xplorer pipette is sometimes recommended for solutions with a density, viscosity, surface tension and/or vapor pressure that vary greatly from that of water. If the density of an aqueous solution changes by approximately $\pm 10\%$, e.g., due to the salt concentration, the volume changes by approximately $\pm 0.2\%$. This statement does not apply if other relevant properties of the liquid also change.

If the pipette is used at extremely high altitudes, it must be calibrated to the ambient air pressure. At 1 000 m above sea level, the volume error of a 100 μL pipette is about -0.3% .

Changing the adjustment can improve the dispensing accuracy (systematic error) when using tips that have a very different geometry than standard tips.

You can cancel a modified adjustment using simple steps.

Changes to the adjustment do not affect the precision (random error) of the dispensing. The precision (random error) can be improved by replacing worn parts. Furthermore, handling has a strong influence on the precision (random error).

General information on adjustment

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Before the adjustment is changed, the existing adjustment must be checked in the factory settings using distilled water.

The actual volume can be checked by weighing:

$$\text{Actual volume} = \frac{\text{Mean value of the weighings}}{\text{Density liquids at weighing temperature}}$$

The density of distilled water is Approx. 0.9982 mg/μL at 20°C and 0.9965 mg/μL at 27°C.

If the set volume corresponds to the actual volume, no correction is necessary.

If there is a difference between the actual volume and the set volume of distilled water, please check the following:

- Is there any liquid dripping from the tip?
- Is the pipette tip fitted leak-proof?



Adequate leak tightness is ensured when no drop is formed at the pipette tip after aspiration of the nominal volume with distilled water and a waiting time of approx. 15 s. Hold the pipette vertically, without touching the pipette tip. Prewet the pipette tip several times.

- Is the tip cone undamaged?
- Are the piston and the cylinder leak-proof?
- Does the temperature of the pipetted liquid correspond to:
 - The temperature of the device?
 - The ambient air temperature?
- Is the weighing location free from drafts?
- Does the work method and pipetting speed permit complete aspiration and dispensing of the liquid?
- Has the correct numerical value for "Density liquids at weighing temperature" been used for the calculation of the actual volume?
- Is the set volume correct?
- For very small volumes (<10 μL): is the fine balance sufficiently sensitive (balance resolution: 0.001 mg)?
- Were original epT.I.P.S pipette tips used for testing?



The pipette tip which must be used as the test tip for checking technical data is listed in the "Technical data" chapter in the operating manual.

No adjustment changes are allowed unless you can answer all the questions with "yes".

In all other cases, the problems associated with the questions answered with "no" must be eliminated. If the problem is remedied by exchanging a complete lower part or other parts that have an effect on the volume, proper assembly must be verified by carrying out a gravimetric test. The systematic and random errors which must be met are listed in the technical data.

If you would like to conduct a 1-3 point adjustment for a liquid other than water on the Xplorer, the items listed above should also be precisely observed when determining the balance results. In particular, please note that the density of the test liquid must be precisely determined at the test temperature. The density is dependent on the temperature. The use of an incorrect density will lead to an incorrect volume calculation.



Furthermore, use the specifications in the *Standard Operating Procedure for Pipettes* document on the Xplorer CD as the foundation for determining the weighing results and errors.

2 Change adjustment








Proceed as follows to perform an adjustment for special conditions, or to reset the adjustment to the factory setting.



If you select the *Factory setting* adjustment the previously selected adjustment will be deleted. This adjustment is not accompanied by a symbol appearing in the left half of the header in the display.


- ▶ Move the selection dial to **Opt.**
- ▶ Select the *Adjustment* option with the rocker.
- ▶ Press the *Select* softkey to open the Options.

The user has the following possibilities to change the adjustment:

- *Factory settings*
- *Ethanol 75 %* 
- *Glycerol 50 %* 
- *epTIPS long* 
- *Altitude* 
- *1-point adjust.* 
- *2-point adjust.* 
- *3-point adjust.* 



The adjustments *Ethanol 75 %* or *Glycerol 50 %*, *epTIPS long* and *Altitude* can be combined with each other. Before routine use, check whether the combination of the adjustments meets your requirements.

- ▶ Use the rocker and the softkeys to activate the desired adjustment.
The adjustment is now active in all modes.
- ▶ Turn the selection dial to any operating mode.
The adjustment has been activated successfully the  symbol appears in the display. To the right of the symbol, another symbol indicates the adjustment version.

Change adjustment

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2.1 Pswrd. protection

Xplorer plus

Only available for the Xplorer plus pipette

For the Xplorer plus, the adjustment can be protected with a four-digit numeric password. The password for the *Edit* mode and *Adjustment* option can vary. The password can be changed or deactivated after it has been entered. Please contact Eppendorf AG Application Support or conduct a reset if you lose the password.



The adjustment can no longer be changed if the password has been lost.

- ▶ Press the rocker upward to activate the password protection.
ON appears in the display.
- ▶ Press the *Select* softkey.
- ▶ Use the rocker to select the digit.
- ▶ Press the *Next* softkey to switch to the next field.
- ▶ Enter data in all of the fields.
- ▶ Press the *Save* softkey to save the password.
- ▶ Reenter the password after completing the saving procedure. Press the *Enter* softkey.
Password protection is now active.

2.2 Factory settings

To aspirate liquid into a pipette tip, a piston is moved upwards in a cylinder in the Xplorer pipette. The pipette tip is approximately conical in shape. This requires that the piston stroke in the cylinder be adapted for aspiration in the conical pipette tip. The mathematical correction of the piston stroke is different for each volume size of the Xplorer pipette. The respective correction of the piston stroke has been optimized in the factory setting for the test tip specified in the technical data.



The factory setting is usually the best setting for all dispensing tasks with purely aqueous solutions at room temperature.

When verifying the measurement deviations listed in the technical data, the factory setting must be used with the test tip listed in the technical data.

2.2.1 Reset to the factory setting

1. Move the selection dial to **Opt.**
2. Select the *Adjustment* option with the rocker.
3. Press the *Select* softkey to open the adjustment.
4. Select the *Factory settings* option with the rocker.
5. Press the *Select* softkey to reset the adjustment to the factory setting.
6. Press the *Yes* softkey to confirm the confirmation request.
The factory setting will become active after a few seconds.
7. Turn the selection dial to any operating mode to exit the options.
The wrench symbol and the adjacent adjustment symbol have disappeared from the header.

2.3 Liquid type ethanol 75%

The factory setting is changed by a factor in order to allow 75% ethanol to be dispensed with higher accuracy (smaller systematic error) with the Xplorer pipette. The internally used factor takes into account the density. Perform pipetting with this adjustment in the **Pip** operating mode as follows:

1. Hold the Xplorer pipette vertically and prewet the tip with liquid three times at room temperature. Make sure that no outer wetting remains on the tip.
2. Use speed level 5 (standard setting) for aspiration and dispensing.
3. Dispense liquid at a slight angle against the wall of the tube of the destination tube.
4. About 2 seconds after dispensing keep the rocker pressed to trigger the blow-out (blow). Only release the rocker after leaving the dispensing vessel.
5. Eject the pipette tip.



Before routine use, check whether this adjustment meets your requirements. If the concentration is different, check whether the 1 – 3 point adjustment would be a better solution.

2.4 Liquid type glycerol 50%

The factory setting is changed by a factor in order to allow 50 % glycerol to be dispensed with higher accuracy (smaller systematic error). The internally used factor takes into account the density of the 50% glycerol and the same work technique as described for ethanol 75% in the **Pip** mode.



Before routine use, check whether this adjustment meets your requirements. If the concentration is different, check whether the 1 – 3 point adjustment would be the better solution.

Change adjustment

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2.5 epT.I.P.S. long

In addition to the "standard tips", a second longer tip is available for most Xplorer pipettes. When *epTIPS long* is selected, the tip geometry of this longer tip is considered in the internal volume calculation. This increases dispensing accuracy when using these tips.

Xplorer Nominal volume Volume range	Color code Xplorer rocker	epTIPS long adjustment is valid for		
		Color code epT.I.P.S.	Type epT.I.P.S.	Length epT.I.P.S.
10 µL 0.5 - 10 µL	Medium gray	light gray	20 µL Long	46 mm
100 µL 5 - 100 µL	Yellow	Orange	300 µL	55 mm
300 µL 15 - 300 µL	Orange	not available		
1,000 µL 50 - 1 000 µL	Blue	dark green	1 250 µL Long	103 mm
1 200 µL 50 - 1 200 µL	Green	dark green	1 250 µL Long	103 mm
5 mL 0.25 - 5 mL	Purple	not available		
10 mL 0.5 - 10 mL	Turquoise	Turquoise	10 mL Long	243 mm



The 5 mL and 10 mL Xplorer pipettes are only available as a single-channel version. The 10 µL to 1 000 µL Xplorer pipettes are available as a single-channel, 8-channel and 12-channel version. All the mentioned epT.I.P.S. long are also available as epDualfilter T.I.P.S..



Before routine use, check whether this adjustment meets your requirements.

2.6 Altitude

At increased altitudes there is a fall in air pressure so that the aspiration volume of a piston-stroke pipette is reduced. The average air pressure at the corresponding height is used to correct the piston stroke of the Xplorer pipette when this option is activated. The altitude can be selected in 250 m (820 ft) steps. The maximum altitude that can be selected is 5 000 m. The Xplorer pipette is set to an altitude of 0 m on delivery. This is the factory setting.



The adjustments *Ethanol 75%* or *Glycerol 50%*, *epTIPS long* and *Altitude* can be combined with each other. Before routine use, check whether the combination of adjustments meets your requirements.

2.7 User adjustment

For your own adjustments you can select between a 1-point adjustment, 2-point adjustment and 3-point adjustment. For this you need to know the exact density of the liquid, and, depending on the adjustment, the corresponding mean values of the weighing results for the selected 1 – 3 volumes. The mathematical operations required for the correction are automatically carried out by the Xplorer pipette for the 1 – 3-point adjustment. The changed adjustment is applied in all modes. Use a fine balance with a high resolution to determine the weighing results. Dispensing operations under 10 μL require a balance with a resolution of 0.001 mg.



CAUTION! Falsified adjustment due to incorrect procedure.

The following steps require that the adjustment *Factory settings* is activated for the Xplorer pipette. This also applies when working with an epT.I.P.S.long or at an altitude other than 0 m above sea level.

- ▶ Activate the adjustment *Factory settings*.



Refer to the general information before making the decision whether an adjustment should be changed. This also contains information on verifying the determined gravimetric data.



In the case of very high densities (density above 2 mg/ μL) or also if the vapor pressure is very high, you should check as an alternative whether a more precise result could be achieved by dispensing with the positive displacer Multipipette/Repeater (X)stream and the Combitips plus.

Change adjustment

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2.7.1 1-point adjust.

After you enter the density, the selected volume and the corresponding mean value of the weighing results, the Xplorer pipette will determine a correction factor. The factor is only correct for the selected volume and the selected work technique. However, the factor is used for the entire volume range of the Xplorer pipette. You must carry out a gravimetric test to check the validity of the factor.

Example of the 1-point adjust.

- The systematic error of a 40% salt solution should be improved by a 1-point adjustment for the pipetting of 500 µL.
- You use a 1 000 µL Xplorer pipette with the volume range 50 – 1 000 µL with 1 000 µL epT.I.P.S. pipette tips.
- The adjustment *Factory settings* is active for the Xplorer pipette.
- The density of the salt solution is, for example, 1.43 mg/µL (mg/µL = g/mL) at 20°C.
- In preliminary tests you have optimized your work technique (speed, handling blow-out (blow), angle of inclination and working speed) so that you have achieved the best possible precision (random error) and handling for your task.
- You have carried out at least 10 weighings for the 500 µL on a fine balance.
- The calculated mean value of the weighings is, for example, 709 mg.



With a density of 1.43 mg/µL, 709 mg is equivalent to a volume of 495.8 µL. Without changing the adjustment, pipetting 500 µL should result in a lesser finding of 4.2 µL (approx. 0.8 %).

Inputting the data

1. Move the selection dial to **Opt**.
2. Mark the *Adjustment* option with the rocker. Press the *Select* softkey.
3. Mark the adjustment *1-point adjust.* with the rocker. Press the *Select* softkey.
4. Set the density with the rocker (example: 1.43 mg/µL). Press the *Next* softkey.
5. Set the first volume with the rocker (example: 500 µL). Press the *Next* softkey.
6. Set the mean value of the weighings with the rocker (example: 709 mg). Press the *Next* softkey.
For the 5 mL and 10 mL Xplorer pipettes enter the values in mL and g.
7. Confirm the confirmation prompt with the *Yes* softkey.
8. To check this, turn the selection dial to a dispensing mode.

If the adjustment *1-point adjust.* was successfully activated, the header of the display will show the symbols:



1P ADJ

What happens in the Xplorer pipette?

The Xplorer pipette uses the data entered to carry out the volume calculation and the correction of the piston stroke.

Example values for the calculation of the correction factor <ul style="list-style-type: none"> • Mean value of the weighings: 709 mg • Density of the liquid: 1.43 mg/μL • Nominal volume: 500 μL 	Calculation of the actual volume: $709 \text{ mg} \div 1.43 \text{ mg}/\mu\text{L} = 495.8 \mu\text{L}$
	Calculation of the volume difference: $500 \mu\text{L} - 495.8 \mu\text{L} = \mathbf{4.2 \mu\text{L}}$

The piston stroke of the adjustment *Factory settings* is increased by a factor. The factor is formed from the specified data.

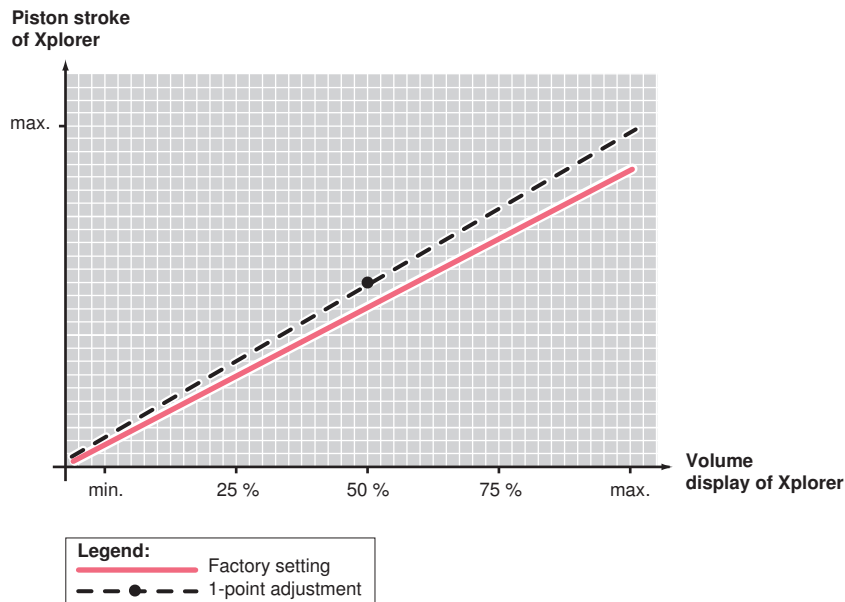


Fig. 2-3: Example: Correction of the piston stroke with "1-point adjust."

In this example, the piston stroke of the factory setting is increased by a factor. Strictly speaking, the correction only applies to the test volume (example: 500 μL). However, the correction with this factor is used for the entire volume range. The correction is different to that for a mechanical pipette. A correction with a factor for a small volume results in a smaller stroke correction than with a large volume (see Fig. 2-1 on p. 13).

For comparison purposes: The stroke of a mechanical pipette can only be changed by a fixed volume (see Fig. 2-4 on p. 14). This volume change applies to the entire measurement range of the mechanical pipette. The existing adjustment is changed in parallel by a fixed amount. If, for example, the volume was increased by 10 μL in order to reach the nominal volume of a 1 000 μL Research plus, this increase of 10 μL will also apply to all volumes below. The correction of the piston stroke of the Xplorer pipette with a factor corresponds rather to practical requirements.

Change adjustment

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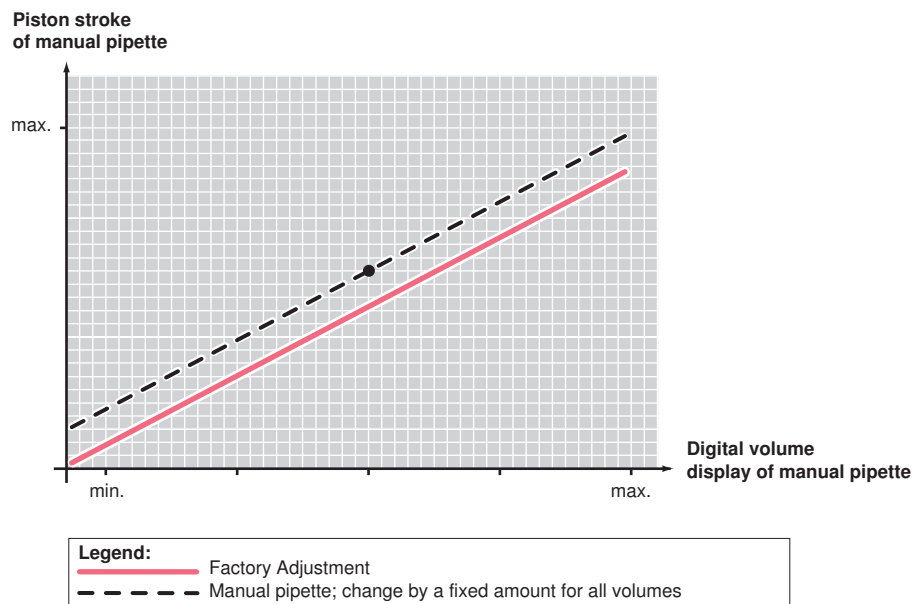


Fig. 2-4: Example: Changing the piston stroke of a mechanical pipette

2.7.2 2-point adjust.

After you enter the density, two different volumes and the corresponding mean value of the two weighing results, the Xplorer pipette determines a correction factor. The factor is only correct for the selected volume range and the selected work technique. However, the factor is used for the entire volume range of the Xplorer pipette, i.e., below and above the two measuring points as well. You must carry out a gravimetric test to check the validity of the factor. When entering the two volumes and the two mean values of the weighing results, follow the instructions as for the example of 1-point adjustment (see p. 12). Strictly speaking, the correction only applies to the range between 25% to 50% of the nominal volume (see Fig. 2-5 on p. 15). However, the correction is used for the entire measurement range.

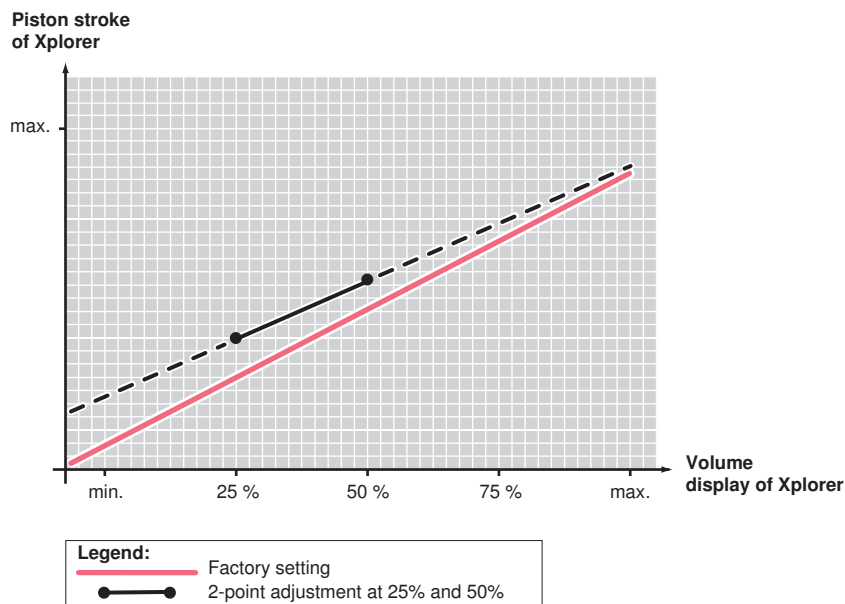


Fig. 2-5: Example 2-point adjustment: Correction data was entered for 25% and 50% of the nominal volume.



Select two significantly different volumes suitable for your task. When using two slightly different volumes (for example, 50% and 45% of the nominal volume), measured values outside of the test volumes may be strongly falsified.

Change adjustment

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2.7.3 3-point adjust.

After you enter the density, three different volumes and the mean value of the corresponding weighing result, the Xplorer pipette determines two correction factors. The factors are correct from measuring point to measuring point in the selected volume regions and for the selected work technique. The respective factor is, however, also used below the first and above the third measuring point. You must carry out a gravimetric test to check the validity of the factors. When entering the data for the three volumes and the three weighing results, follow the instructions as for the example of 1-point adjustment (see p. 12). In the following example the adjustment was changed for 25%, 50% and 75% of the nominal volume (see Fig. 2-6 on p. 16). Strictly speaking, the correction only applies to the range between 25% to 75%. However, the correction is used for the entire measurement range.

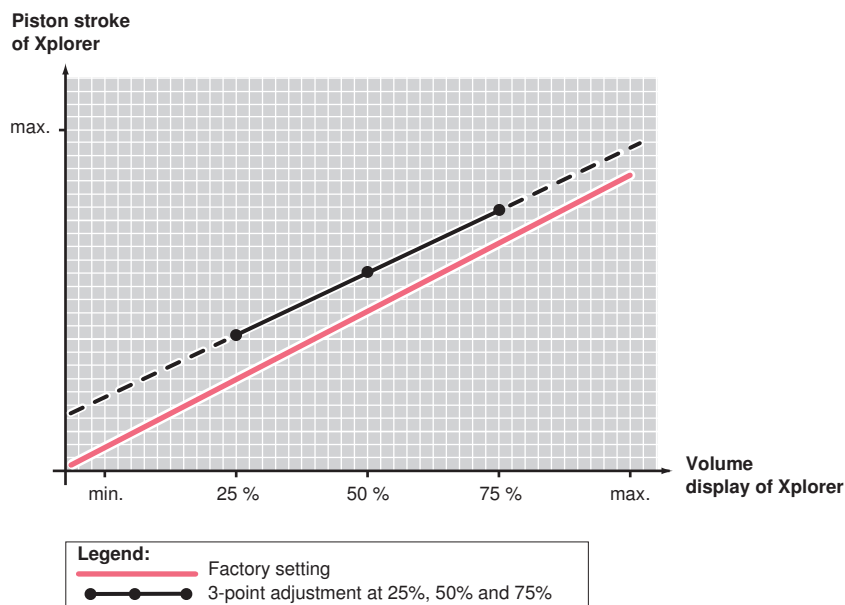


Fig. 2-6: Example 3-point adjustment: Correction data was entered for 25%, 50% and 75% of the nominal volume



Select three significantly different volumes suitable for your task. When using three slightly different volumes (for example, 55%, 50% and 45% of the nominal volume), measured values outside of the test volumes may be strongly falsified.

2.8 Marking the Xplorer pipette to show the adjustment has been changed

You must carry out a gravimetric test of each Xplorer pipette whose factory setting you have changed by selecting and carrying out one of the previously described adjustments. This is the only way of ensuring that the selected adjustment meets your requirements regarding precision and accuracy.

1. Mark each Xplorer pipette whose adjustment has been changed with a clearly visible label indicating the type of change made.
2. Indicate all the key information on the liquid and steps carried out on the label.
3. If the temperature of the liquid is different to that of the Xplorer pipette and the pipette tips, record the number of piston strokes required for prewetting the pipette tips on the pipette label.

In the lab journal, record the weighing results and all the general conditions for which you have changed the adjustment. In the lab journal, note the conditions in which the readjusted Xplorer pipette has to be operated:

- How the blow-out (blow) is performed
- Volume range
- Operating mode
- Pipette tip type (for example, filter, LoRetention, long)
- Frequency of tip replacement
- Frequency of prewetting the tip
- Special angle of inclination during aspiration and dispensing
- Special work technique (for example, "reverse pipetting")
- Liquid (name, composition, density)
- Aspiration speed (speed)
- Dispensing speed (speed)
- Temperature

This way you can ensure that other users will be informed of the changes to the adjustment, in addition to the information provided in the header of the display. This allows the Xplorer pipette to be operated exactly according to the general conditions for the changed adjustment.

You can repeatedly change an existing 1 - 3 point adjustment. Each change is preceded by a confirmation request. After a 1 – 3 point adjustment has been changed, the corresponding symbol appears unchanged in the header.

ErrorEppendorf Xplorer®/Xplorer® plus
English (EN)**3 Error****3.1 Limiting values for measurement deviations according to ISO 8655 ddd****3.1.1 Xplorer pipette, single-channel**

Model	Test tip epT.I.P.S. Color code Volume range Length	Testing volume	Error limits ISO 8655			
			Error			
			Systematic error		Random error	
			± %	± µL	± %	± µL
0.5 - 10 µL Increment: 0.01 µL	Medium gray 0.1 - 20 µL 40 mm	1 µL	±12.0	±0.12	±8.0	±0.08
		5 µL	±2.4	±0.12	±1.6	±0.08
		10 µL	±1.2	±0.12	±0.8	±0.08
5 - 100 µL Increment: 0.01 µL	Yellow 2 - 200 µL 53 mm	10 µL	±8.0	±0.8	±3.0	±0.3
		50 µL	±2.0	±0.8	±0.6	±0.3
		100 µL	±0.8	±0.8	±0.3	±0.3
15 - 300 µL Increment: 0.2 µL	Orange 20 - 300 µL 55 mm	30 µL	±13.0	±3.9	±5.0	±1.5
		150 µL	±3.0	±3.9	±1.0	±1.5
		300 µL	±1.3	±3.9	±0.5	±1.5
50 - 1 000 µL Increment: 1 µL	Blue 50 - 1 000 µL 71 mm	100 µL	±8.0	±8.0	±3.0	±3.0
		500 µL	±2.0	±8.0	±0.6	±3.0
		1,000 µL	±0.8	±8.0	±0.3	±3.0
0.25 - 5 mL Increment: 5 µL	Purple 0.1 - 5 mL 120 mm	0.5 mL	±8.0	±40.0	±3.0	±15.0
		2.5 mL	±1.6	±40.0	±0.6	±15.0
		5.0 mL	±0.8	±40.0	±0.3	±15.0
0.5 - 10 mL Increment: 10 µL	Turquoise 1 - 10 mL 165 mm	1.0 mL	±6.0	±60.0	±3.0	±30.0
		5.0 mL	±1.2	±60.0	±0.6	±30.0
		10.0 mL	±0.6	±60.0	±0.3	±30.0



You can select a volume up to 0.20 mL for the 5 mL Xplorer pipette. The handling significantly affects the achievable errors for the 0.2 mL-0.5 mL volume range.

3.1.2 Xplorer pipette, multi-channel

Model	Test tip epT.I.P.S. Color code Volume range Length	Testing volume	Error limits ISO 8655			
			Error			
			Systematic error		Random error	
			± %	± µL	± %	± µL
0.5 - 10 µL Increment: 0.01 µL	Medium gray 0.1 - 20 µL 40 mm	1 µL	±24.0	±0.24	±16.0	±0.16
		5 µL	±4.8	±0.24	±3.2	±0.16
		10 µL	±2.4	±0.24	±1.6	±0.16
5 - 100 µL Increment: 0.01 µL	Yellow 2 - 200 µL 53 mm	10 µL	±16.0	±1.6	±6.0	±0.6
		50 µL	±3.2	±1.6	±1.2	±0.6
		100 µL	±1.6	±1.6	±0.6	±0.6
15 - 300 µL Increment: 0.2 µL	Orange 20 - 300 µL 55 mm	30 µL	±26.0	±7.8	±10.0	±3.0
		150 µL	±5.2	±7.8	±2.0	±3.0
		300 µL	±2.6	±7.8	±1.0	±3.0
50 - 1 200 µL Increment: 1 µL	Green 50 - 1 250 µL 76 mm	120 µL	±26.67	±32	±10.0	±12.0
		600 µL	±5.33	±32	±2.0	±12.0
		1 200 µL	±2.66	±32	±1.0	±12.0

Error

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3.2 Eppendorf AG limiting values for measurement deviations

3.2.1 Xplorer pipette, single-channel

pipette Increment	Pipette tip Color code Volume range Length	Testing volume	Error limits			
			Error			
			Systematic error		Random error	
μL		$\pm\mu\text{L}$	$\pm\%$	$\pm\mu\text{L}$	$\pm\%$	$\pm\mu\text{L}$
0.5 μL – 10 μL Increment: 0.01 μL	Medium gray 0.1 μL – 20 μL 40 mm	1 μL	± 2.5	± 0.025	± 1.8	± 0.018
		5 μL	± 1.5	± 0.075	± 0.8	± 0.04
		10 μL	± 1.0	± 0.1	± 0.4	± 0.04
5 μL – 100 μL Increment: 0.1 μL	Yellow 2 μL - 200 μL 53 mm	10 μL	± 2.0	± 0.2	± 1.0	± 0.1
		50 μL	± 1.0	± 0.5	± 0.3	± 0.15
		100 μL	± 0.8	± 0.8	± 0.2	± 0.2
15 μL – 300 μL Increment: 0.2 μL	Orange 15 μL – 300 μL 55 mm	30 μL	± 2.5	± 0.75	± 0.7	± 0.21
		150 μL	± 1.0	± 1.5	± 0.3	± 0.45
		300 μL	± 0.6	± 1.8	± 0.2	± 0.6
50 μL – 1 000 μL Increment: 1 μL	Blue 50 μL – 1000 μL 71 mm	100 μL	± 3.0	± 3.0	± 0.6	± 0.6
		500 μL	± 1.0	± 5.0	± 0.2	± 1.0
		1000 μL	± 0.6	± 6.0	± 0.2	± 2.0
mL	mL	mL	$\pm\%$	$\pm\text{mL}$	$\pm\%$	$\pm\text{mL}$
0.25 mL – 5 mL Increment: 0.005 mL	Purple 0.1 mL – 5 mL 120 mm	0.5 mL	± 3.0	± 15.0	± 0.6	± 3.0
		2.5 mL	± 1.2	± 30.0	± 0.25	± 6.25
		5 mL	± 0.6	± 30.0	± 0.15	± 7.5
0.5 mL – 10 mL Increment: 0.01 mL	Turquoise 1 mL – 10 mL 165 mm	1 mL	± 3.0	± 30.0	± 0.60	± 6.0
		5 mL	± 0.8	± 40.0	± 0.20	± 10.0
		10 mL	± 0.6	± 60.0	± 0.15	± 15.0

3.2.2 Xplorer pipette, multi-channel

pipette Increment	Pipette tip Color code Volume range Length	Testing volume	Error limits			
			Error			
			Systematic error		Random error	
μL		μL	$\pm\%$	$\pm\mu\text{L}$	$\pm\%$	$\pm\mu\text{L}$
0.5 μL – 10 μL Increment: 0.01 μL	Medium gray 0.1 μL – 20 μL 40 mm	1 μL	± 5.0	± 0.05	± 3.0	± 0.03
		5 μL	± 3.0	± 0.15	± 1.5	± 0.075
		10 μL	± 2.0	± 0.2	± 0.8	± 0.08
5 μL – 100 μL Increment: 0.1 μL	Yellow 2 μL – 200 μL 53 mm	10 μL	± 2.0	± 0.2	± 2.0	± 0.2
		50 μL	± 1.0	± 0.5	± 0.8	± 0.4
		100 μL	± 0.8	± 0.8	± 0.25	± 0.25
15 μL – 300 μL Increment: 0.2 μL	Orange 15 μL – 300 μL 55 mm	30 μL	± 2.5	± 0.75	± 1.0	± 0.3
		150 μL	± 1.0	± 1.5	± 0.5	± 0.75
		300 μL	± 0.6	± 1.8	± 0.25	± 0.75
50 μL – 1200 μL Increment: 1 μL	Green 50 μL – 1250 μL 76 mm	120 μL	± 6.0	± 7.2	± 0.9	± 1.08
		600 μL	± 2.7	± 16.2	± 0.4	± 2.4
		1200 μL	± 1.2	± 14.2	± 0.3	± 3.6

4 Speed table Eppendorf Xplorer

4.1 Speed table for Xplorer single-channel

The following speed table applies to Xplorer pipettes starting with software version 2.01.00.

Speed level	10 µL	100 µL	300 µL	1 000 µL	5 mL	10 mL
(Speed)	Time [s]	Time [s]	Time [s]	Time [s]	Time [s]	Time [s]
1	12.0	12.0	12.0	12.0	12.0	12.0
2	8.0	8.0	8.0	8.0	8.0	8.0
3	4.0	4.0	4.0	4.0	6.0	6.0
4	2.8	2.8	2.8	2.8	4.8	4.8
5	2.2	2.2	2.2	2.2	3.6	3.6
6	1.6	1.6	1.6	1.6	3.2	3.2
7	1.2	1.2	1.2	1.2	2.8	2.8
8	0.9	0.9	0.9	0.9	2.6	2.6



You can select a volume of up to 0.20 mL for the 5 mL Xplorer pipette. For the 0.2 mL – 0.5 mL volume range, handling has a strong influence on the achievable random errors.

4.2 Speed table for Xplorer multi-channel

The following speed table applies to Xplorer pipettes starting with software version 2.01.00.

Speed level	10 µL	100 µL	300 µL	1 200 µL
(Speed)	Time [s]	Time [s]	Time [s]	Time [s]
1	12.0	12.0	12.0	12.0
2	8.0	8.0	8.0	8.0
3	4.0	4.0	4.0	4.0
4	2.8	2.8	2.8	2.8
5	2.2	2.2	2.2	2.2
6	1.6	1.6	1.6	1.6
7	1.2	1.2	1.2	1.2
8	0.9	0.9	0.9	1.0

5 Volume limit

ep Dualfilter T.I.P.S.	Volume limit	
	Ads/Dis	Reverse pipetting
10 µL	Not required	Not required
100 µL	Not required	Not required
200 µL	Not required	Not required
300 µL	270 µL	260 µL
1,000 µL	Not required	950 µL
1 250 µL Long*	Not required	1 130 µL
5 mL	4.9 mL	4.6 mL*
10 mL*	9.75 mL	8.5 mL*

* When using these filter tips we recommend to use the adjustment *epTIPS long* in order to increase the accuracy of dispensing. The volume limit stated applies only to the changed adjustment.

** We also recommend these restrictions on volume limits for "reverse pipetting" when using the 5 mL and 10 mL epT.I.P.S. without filter.

6 Additional volumes during aspiration

Xplorer Single-channel and multi-channel	Additional volume during aspiration	
	Ads/Dis	Reverse pipetting
10 µL	Approx. 0.6 µL	Approx. 2 µL
100 µL	Approx. 7 µL	Approx. 20 µL
300 µL	Approx. 20 µL	Approx. 60 µL
1,000 µL	Approx. 65 µL	Approx. 200 µL
1 200 µL	Approx. 140 µL	Approx. 220 µL
5 mL	Approx. 0.3 mL	Approx. 1 mL
10 mL	Approx. 0.55 mL	Approx. 1.8 mL

PatentsEppendorf Xplorer®/Xplorer® plus
English (EN)**7 Patents**

U.S. Patent No.	6,499,365	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL, 1000 µL, 1200 µL, 5 mL and 10 mL
U.S. Patent No.	6,778,917	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL, 1000 µL, 1200 µL, 5 mL and 10 mL
U.S. Patent No.	7,434,484	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL and 1000 µL
U.S. Patent No.	7,585,468	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL, 1000 µL, 1200 µL, 5 mL and 10 mL
U.S. Patent No.	7,673,532	Is used by Xplorer / Xplorer plus pipettes (multi-channel) with following nominal volumes:	10 µL, 100 µL and 300 µL
U.S. Patent No.	7,674,432	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL, 1000 µL, 1200 µL, 5 mL and 10 mL
U.S. Patent No.	7,694,592	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL, 1000 µL, 1200 µL, 5 mL and 10 mL
U.S. Patent No.	8,028,592	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL, 1000 µL, 1200 µL, 5 mL and 10 mL
U.S. Patent No.	8,096,198	Is used by Xplorer / Xplorer plus pipettes (single-channel and multi-channel) with following nominal volumes:	10 µL, 100 µL, 300 µL, 1000 µL, 1200 µL, 5 mL and 10 mL

Evaluate your manual

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