eppendorf

Eppendorf Xplorer®/ Eppendorf Xplorer® plus

Adjustment

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1 General information on adjustment

ℹ️ This operating manual applies to devices with software version 2.06.00 or higher.

The piston stroke of the Xplorer pipettes can be changed in the *Adjustment* option by the user. This document provides information when you should replace the adjustment *Factory settings* by a different adjustment and what should be considered when doing so. A selected adjustment can be changed again at any time. It is also possible to reset to the adjustment *Factory settings* at any time.

If the adjustment *Factory settings* is not valid for the Xplorer, this will be displayed by the ✒ symbol at the top left in the header in the display.

NOTICE! Incorrect dispensing volume with special liquids and due to temperature differences.
Solutions with physical data very different than water or differences in temperature between pipette, pipette tip and liquid can result in faulty dispensing volumes.

▸ Avoid temperature differences between the pipette, pipette tip and liquid.
▸ Ensure that the temperature is between 20 °C and 27 °C and remains constant at ±0.5 °C.
▸ Check the dispensing volume and make sure that you can affirm all the questions listed in the general information.

ℹ️ Information on the random and systematic errors determined before delivery can be found in the enclosed **Eppendorf Certificate**. If the factory setting has been replaced by a different adjustment, this renders the validity of the **Eppendorf Certificate** invalid. If you reset the adjustment to the factory setting, the random and systematic errors determined before delivery and the enclosed **Eppendorf Certificate** will apply again.

The pipette was adjusted and tested before delivery.

Changing the adjustment is sometimes recommended for solutions which are very different from water with regard to their density, viscosity, surface tension and/or vapor pressure etc. If the density of an aqueous solution changes by approximately ±10%, for example, because of the salt concentration, the volume will change by approximately ±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 1000 m above sea level, the volume error of a 100 µL pipette is about −0.3%.

When using tips which are very different to standard tips with regard to their geometry, changing the adjustment can improve the dispensing accuracy (systematic error).

You can reset a changed adjustment by means of a few simple steps.

Changes to the adjustment will not affect the dispensing precision (random error). Precision (random error) can be improved by replacing worn parts. Precision (random error) is also strongly influenced by handling.

Before making changes to the adjustment, you must check the existing adjustment in the factory setting with 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, making sure not to touch 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?

> Refer to the chapter "Technical data" in the operating manual for information on which pipette tip is to be used as the test tip for checking the technical data.

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. Refer to the technical data for the systematic and random errors to be met.

If you want to use the Xplorer to perform a 1 – 3 point adjustment for a liquid other than water, you must also refer to the points described above when determining the weighing results. Note in particular that the density of the test liquid must be determined exactly at the test temperature. The density is dependent on the temperature. The use of an incorrect density will result in an incorrect volume calculation.

> When determining the weighing results and the measurement deviations, also refer to the instructions given in the document *Standard Operating Procedure for Pipettes*. You can find this document on our website www.eppendorf.com.

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 %* 　　　　　Eth
- *Glycerol 50 %* 　　　　　Gly
- *epTIPS long* 　　　　　▱
- *Altitude* 　　　　　▲▲
- *1-point adjust.* 　　　1P ADJ
- *2-point adjust.* 　　　2P ADJ
- *3-point adjust.* 　　　3P ADJ

> **ⓘ** 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.

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 the *Adjustment* option can vary. The password can be changed or deactivated after it has been entered. If you lose your password, please contact Eppendorf AG Application Support or reset the pipette to the factory setting.

> 🛈   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 Pipette Xplorer. The internally used factor takes into account the density. Perform pipetting with this adjustment in the **Pip** operating mode as follows:

1. Hold the Pipette Xplorer 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.

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.	Model 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
1000 µL 50 – 1000 µL	Blue	Dark green	1250 µL Long	103 mm
1200 µL 50 – 1200 µL	Green	Dark green	1250 µL Long	103 mm
5 mL 0,2 – 5 mL	Violet	Violet	5 mL Long	175 mm
10 mL 0.5 – 10 mL	Turquoise	Turquoise	10 mL Long	243 mm

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 Adjustment by the user

When making your own adjustment you can either select a 1-point adjustment, 2-point adjustment or 3-point adjustment. For this purpose you need to know the exact density of the liquid and, depending on the adjustment, the corresponding average values of the weighing results for the selected 1 - 3 volumes . The calculations required are automatically performed by the Xplore pipette for the 1 - 3-point adjustment. The modified adjustment is applied to all modes. Use an analytical balance with high resolution to determine the weighing results. Dispensing volumes below 10 µL require a balance with a resolution of 0.001 mg.

CAUTION! Falsified adjustment due to incorrect procedure.
For the following steps, the adjustment *Factory settings* of the Xplorer pipette must be activated. This also applies when working with an epT.I.P.S.long or at an altitude other than 0 m above sea level.

‣ Select the adjustment *Factory settings*.

Please refer to the general hints prior to deciding whether an adjustment needs to be changed. There, you also find additional information about the determined gravimetric data.

In case of very high densities (density above 2 mg/µL), or also in case of a very high vapor pressure, you should check if the positive displacer Multipette/Repeater (X)stream and the Combitips plus could be used alternatively to achieve more precise results.

Please note that for making your own adjustment you should use the tip type that was used for the adjustment. If, e.g., the adjustment is made with epT.I.P.S. LoRetention, the same tips must be used for the implementation.

2.7.1 *1-point adjust.*

After you entered the density, the selected volume and the corresponding average 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 for *1-point adjust.*
- The bias of a 40 % saline solution is to be improved for pipetting of 500 µL by means of a 1-point adjustment.
- You use a 1000 µL Xplorer pipette with a volume range of 50 – 1000 µL with 1000 µL epT.I.P.S. pipette tips.
- The adjustment *Factory settings* is selected for the Xplorer pipette.
- The density of the saline solution is, e.g.,1.43 mg/µL at 20 °C (mg/µL = g/mL).
- During previous tests you optimized your working technique (speed, handling of blow-out (blow), inclination and working pace) so that you have achieved the optimal precision (random bias) and handling for the task you have to accomplish.
- You have carried out at least 10 weighings for the 500 µL using an analytical balance.
- The calculated average value of the weighings is, e.g., 709 mg.

> 709 mg correspond to a volume of 495.8 µL at a density of 1.43 mg/µL. Without change of the adjustment, a lower result of 4.2 µL (approx 0.8%) must be expected for pipetting of 500 µL.

Entering data
1. Set the selection dial to **Opt**.
2. Use the rocker to mark the adjustment *Adjustment*. Press the *Select* softkey.
3. Use the rocker to mark the adjustment *1-point adjust.*. Press the *Select* softkey.
4. Use the rocker to select the density (example: 1.43 mg/µL). Press the *Next* softkey.
5. Use the rocker to enter the first volume (example: 500 µL). Press the *Next* softkey.
6. Use the rocker to enter the average value of the weighings (example: 709 mg). Press the *Next* softkey.

   When using the 5 mL and 10 mL Xplorer pipettes, enter the values in mL and g.

7. Press the *Yes* softkey to confirm the confirmation prompt.
8. Carry out a test by setting the selection dial to a dispensing mode.

After successful selection of the adjustment *1-point adjust.*, the following symbols appear in the display header:

🖉   1P ADJ

What happens in the Xplorer pipette?

The explorer pipette calculates the volume and the correction of the piston stroke on the basis of the entered data.

Example values for calculating the correction factor	
• Average value of the weighings: 709 mg • Density of the liquid: 1.43 mg/µL • Nominal volume: 500 µL	Calculation of the actual volume: 709 mg ÷ 1.43 mg/µL = 495.8 µL
	Calculation of the volume difference: 500 µL – 495.8 µL = **4.2 µL**

What happens in the Xplorer pipette?

The piston stroke of the adjustment *Factory settings* is increased by a factor. This factor is calculated on the basis of the data mentioned previously.
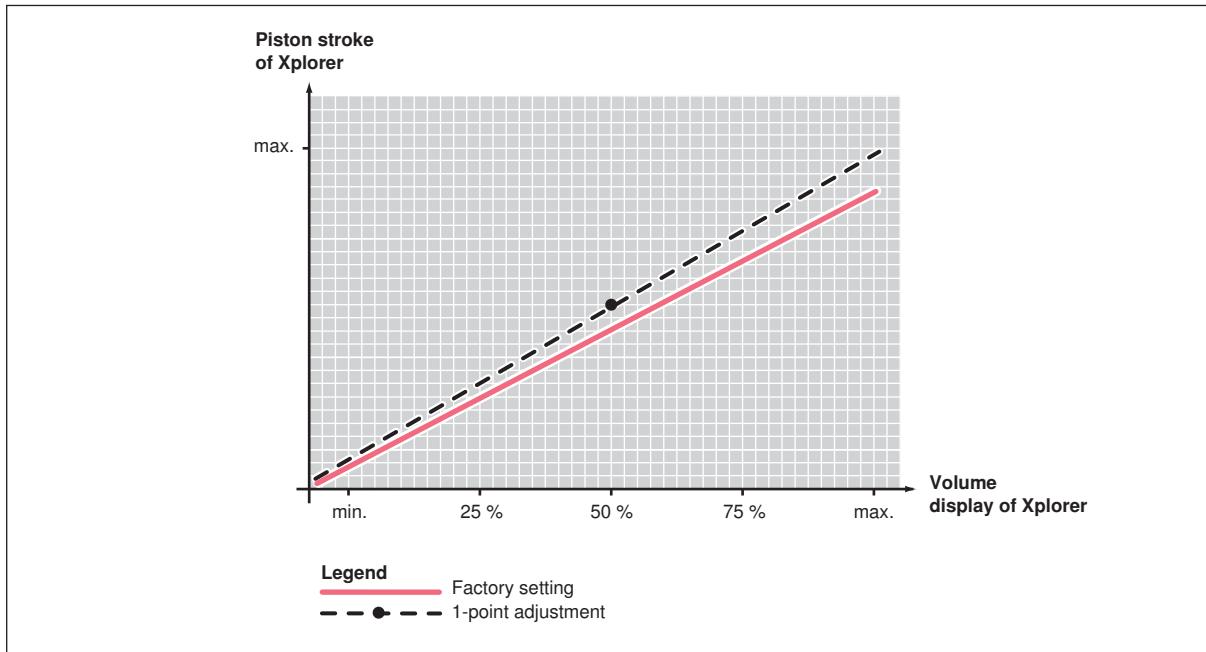
Fig. 2-1:   Example: Correction of the piston stroke for "*1-point adjust.*"

In this example, the piston stroke of the factory settings is increased by a factor. Strictly speaking, the correction is only valid for the testing volume (example: 500 µL). However, the correction with this factor is made in the entire volume range. Corrections are different for mechanical pipettes. When a factor is used for correction, the piston stroke correction is less important for a smaller volume than for a bigger volume (see Fig. 2-1 on p. 13).

Compare: The stroke of a mechanical pipette can only be changed by a fixed volume (see Fig. 2-2 on p. 14). This change of volume is applied to the entire measuring range of the mechanical pipette. The current adjustment is changed parallel by a fixed value. If, e.g., the volume was increased by 10 μL to obtain the nominal volume of a 1 000 μL Research plus, this increase by 10 μL also applies to the other volumes below this. The piston stroke correction of the Xplorer pipette by a factor is more appropriate to meet the requirements of the practice.
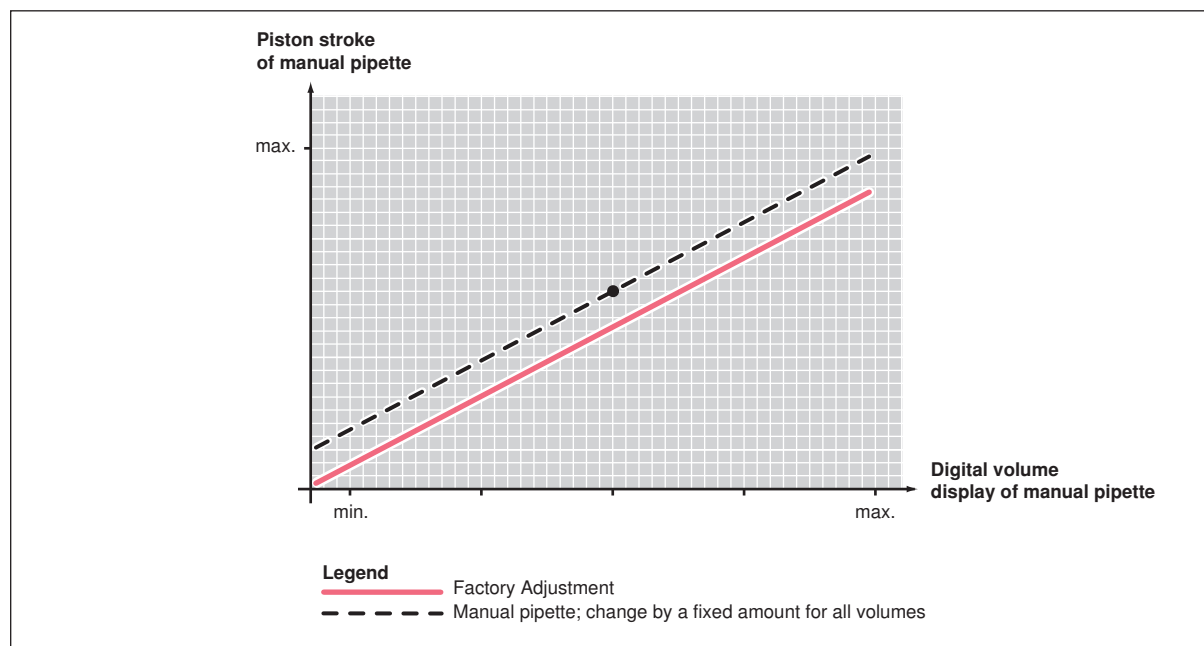
Fig. 2-2:   Example: Change of the piston stroke of a mechanical pipette

2.7.2   *2-point adjust.*

After you entered the density, two different volumes and the corresponding average value of the weighing results, the Xplorer pipette will determine 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. For entering the two volumes and the two average values of the weighing tests, follow the instructions given in the example for a 1-point adjustment(see p. 12). Strictly speaking, the correction is only valid for the range between 25% and 50% of the nominal volume(see Fig. 2-3 on p. 15). However, the correction is applied to the entire measuring range.

Fig. 2-3:   Example for a 2-point adjustment: Correction data for 25% and 50% of the nominal value were entered.

Select two considerably different volumes that match your task. If two only slightly different volumes are selected (e.g. 50 % and 45 % of the nominal volume), this may lead to gross errors of the measuring values below or above the selected testing volumes.

2.7.3   *3-point adjust.*

After you entered the density, three different volumes and the corresponding weighing results, 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 and above the first or third measuring point. You must carry out a gravimetric test to check the validity of the factors. To enter the three volumes and the three weighing results, follow the instructions given in the example for a 1-point adjustment(see p. 12). In the following example, the adjustment for 25%, 50% and 75% of the nominal volume were changed(see Fig. 2-4 on p. 16). Strictly speaking, the adjustment is only valid for the range between 25% and 75%. However, the correction is applied to the entire measuring range.
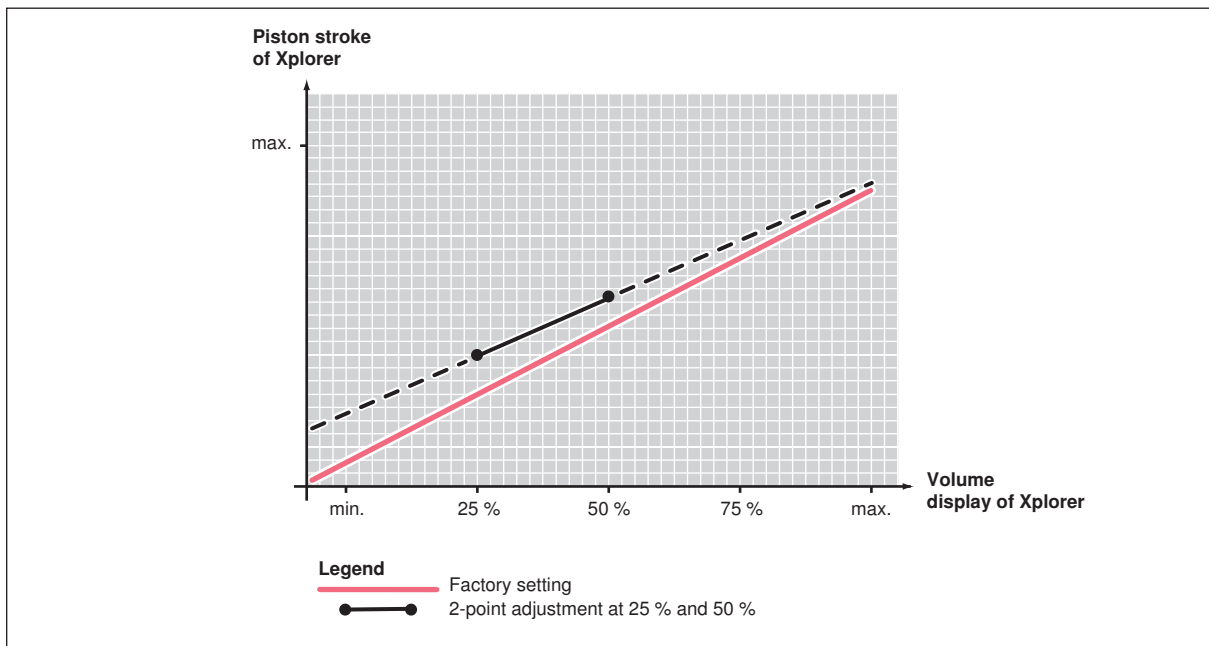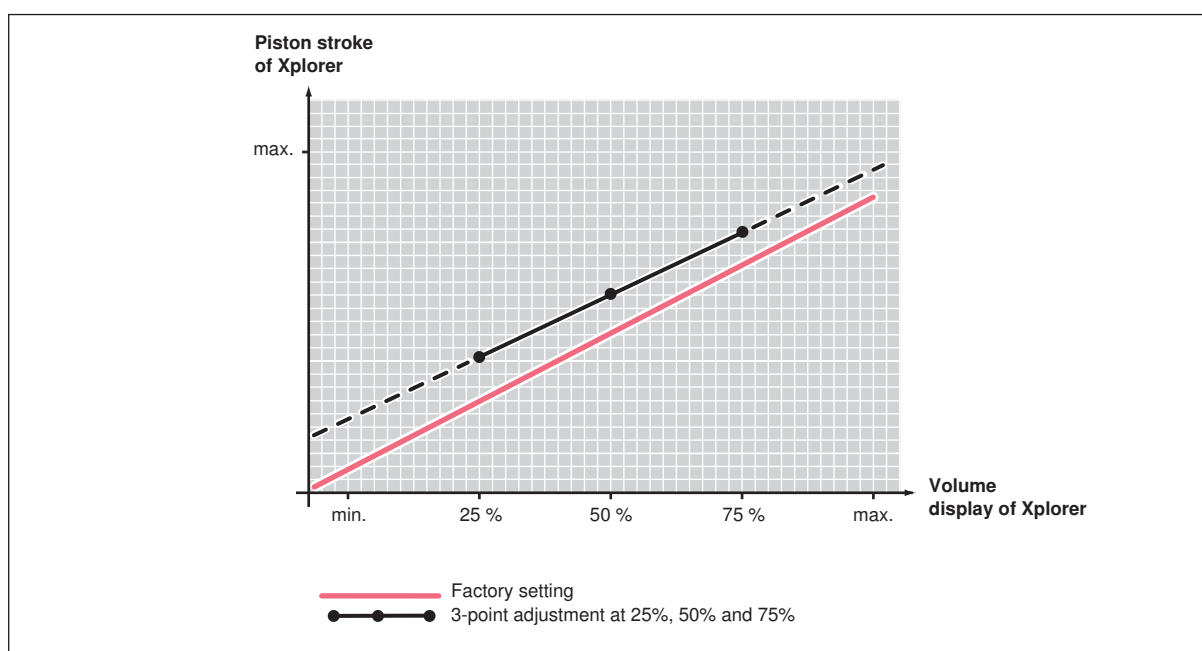
Fig. 2-4:   Example for a 3-point adjustment: Correction data for 25%, 50% and 75% of the nominal value were entered

Select three considerably different volumes that match your task. If three only slightly different volumes are selected (e.g. 55%, 50 % and 45 % of the nominal volume), this may lead to gross errors of the measuring values below or above the selected testing volumes.

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 proceeded by a confirmation request. After a 1 – 3 point adjustment has been changed, the corresponding symbol appears unchanged in the header.

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 – 1000 µL Increment: 1 µL	Blue 50 – 1000 µL 71 mm	100 µL	8.0	8.0	3.0	3.0
		500 µL	2.0	8.0	0.6	3.0
		1000 µL	0.8	8.0	0.3	3.0
0.2 – 5 mL Increment: 5 µL	Violet 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 – 1200 µL Increment: 1 µL	Green 50 – 1250 µL 76 mm	120 µL	26.67	32	10.0	12.0
		600 µL	5.33	32	2.0	12.0
		1200 µL	2.66	32	1.0	12.0

3.2   Eppendorf AG limiting values for measurement deviations

3.2.1   Xplorer pipette, single-channel

Model Increment	Test tip epT.I.P.S. color code Volume range Length	Testing volume	Error limits Eppendorf AG			
			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	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 – 100 µL Increment: 0.1 µL	Yellow 2 – 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 – 300 µL Increment: 0.2 µL	Orange 15 – 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 – 1000 µL Increment: 1 µL	Blue 50 – 1000 µL 71 mm	100 µL	3.0	3.0	0.6	0.6
		500 µL	1.0	5.0	0.2	1
		1000 µL	0.6	6.0	0.2	2
0.2 – 5 mL Increment: 0.005 mL	Violet 0.1 – 5 mL 120 mm	0.5 mL	3.0	15.0	0.6	3
		2.5 mL	1.2	30.0	0.25	6.25
		5 mL	0.6	30.0	0.15	7.5
0.5 – 10 mL Increment: 0.01 mL	Turquoise 1 – 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

Model Increment	Test tip epT.I.P.S. color code Volume range Length	Testing volume	Error limits Eppendorf AG			
			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	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 – 100 µL Increment: 0.1 µL	Yellow 2 – 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 – 300 µL Increment: 0.2 µL	Orange 15 – 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 – 1200 µL Increment: 1 µL	Green 50 – 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	14.4	0.3	3.6

4 Speed table Eppendorf Xplorer

4.1 Dispensing speed of single-channel pipettes

The dispensing speeds apply to single-channel pipettes from software version 2.06.00 upwards.

Speed level	10 µL	100 µL	300 µL	1000 µL	5 mL	10 mL
(Speed)	Time [sec]	Time [sec]	Time [sec]	Time [sec]	Time [sec]	Time [sec]
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

4.2 Speed table for Xplorer multi-channel

The following speed table applies to Xplorer pipettes starting with software version 2.06.00.

Speed level	10 µL	100 µL	300 µL	1200 µL
(Speed)	Time [sec]	Time [sec]	Time [sec]	Time [sec]
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
1000 µL	Not required	950 µL
1250 µL Long*	Not required	1130 µL
5 mL	4.9 mL	4. mL**
5 mL Long*	Not required	Not required
10 mL*	9.75 mL	8.5 mL**

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

** We recommend this volume limit even when performing reverse pipetting and using the 5 mL and 10 mL epT.I.P.S. without a filter.

6 Additional volumes during aspiration

Xplorer single-channel and multi-channel	Additional aspiration volumes	
	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
1000 µL	Approx. 65 µL	Approx. 200 µL
1200 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

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