

## The Electronic Pipette Eppendorf Xplorer® – Better Reproducibility

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### Abstract

Electronic pipettes are designed for versatile and flexible use in laboratory applications. Moreover, they can significantly reduce the physical load in daily laboratory operations. The electronic pipette Eppendorf Xplorer features innovative technical solutions, which have been particularly developed to enable precise liquid dispensing operations in the laboratory. The effect of these technical solutions on dispensing reproducibility was examined on the basis of measurement results and calculations, with subsequent demonstration of the advantages concerning dispensing precision and accuracy.

### Introduction

For users working in the laboratory, the most important criterion regarding electronic pipettes, besides ergonomics and ease of use, is the high reproducibility of results which can be achieved in daily routines. Precise results reduce costs and optimize time because they eliminate the need to repeat analyses and experiments. The electronic Eppendorf Xplorer pipette not only features 8 adjustable dispensing speeds, it also has an innovative spring-loaded

tip cone that supports users in achieving the highest level of reproducible results. This spring-loaded tip cone was introduced with the manual Eppendorf Research plus pipette [1] and is now also available in electronic pipettes for the first time. The effect that these technical functions have on the precision of pipetting results has been examined and will be discussed here.

Reproducibility

Depending on the application, the new electronic pipette Xplorer can be used to select a different speed for aspirating and dispensing liquid volumes. This enables users to determine the optimal dispensing speed for the respective application. As each dispensing step in a series dispenses the samples at a constant speed, a much

higher reproducibility (that is, improved precision of results in comparison to manual pipettes) can be achieved independent of the users' daily condition (Fig. 1). The Eppendorf Xplorer provides 8 speeds for aspiration and dispensing. This means that the pipette is also suitable for special applications.

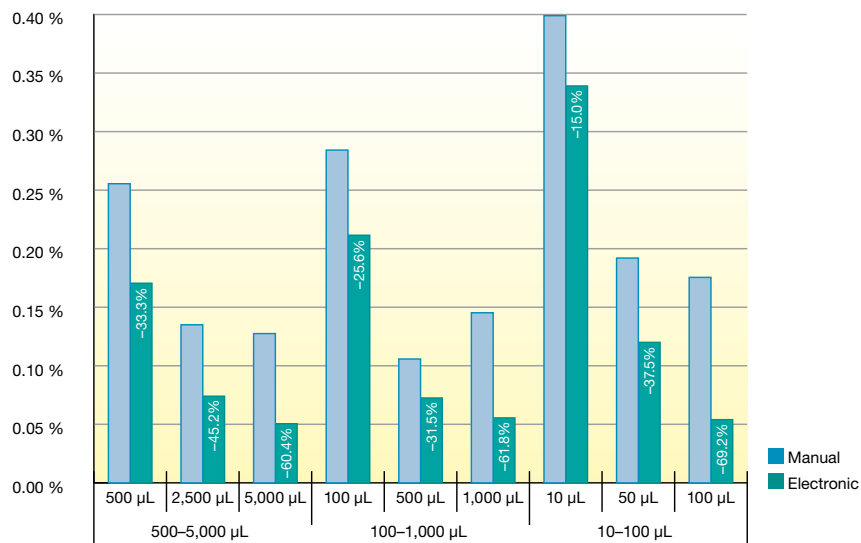


Fig. 1: Comparison of random errors, manual vs. electronic pipette

The new electronic pipette Xplorer from Eppendorf also has a spring-loaded tip cone (Fig.2).

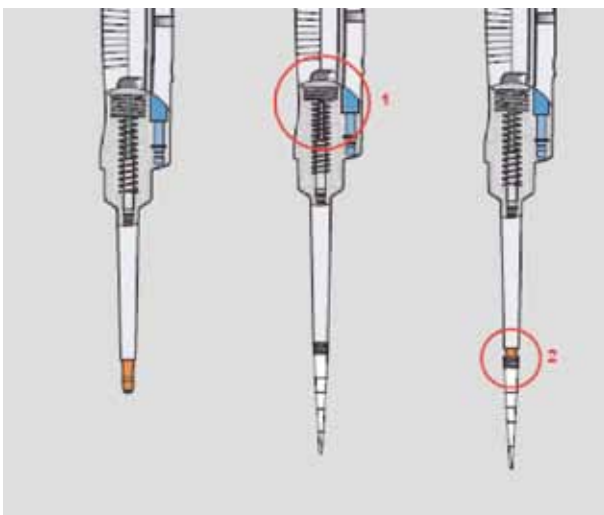


Fig. 2: Spring-loaded tip cone

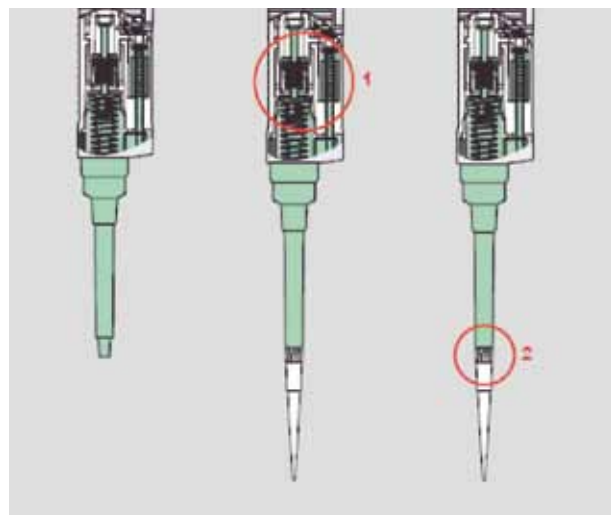


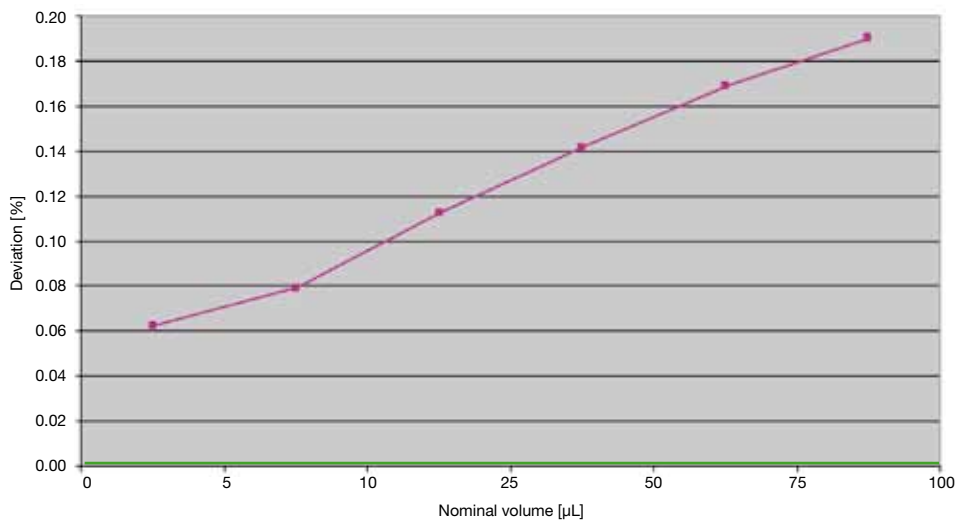
Fig. 3: Pipette without spring loading action

The spring-loaded tip cone (1) provides for an improved fitting of the pipette tip when the pipette tip (2) is attached.

## Reproducibility

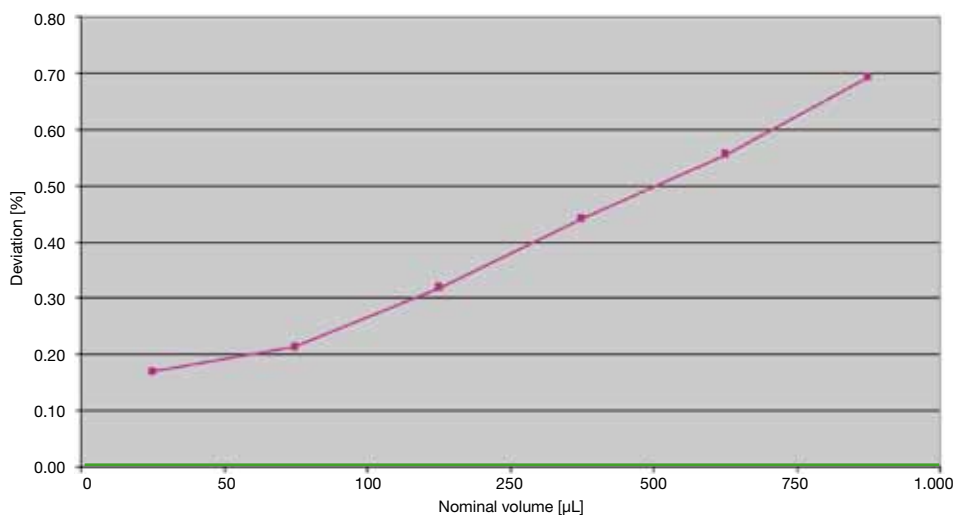
Attaching the pipette tip with minimum attachment force is possible to ensure a perfect tip fit and absolute tightness. The spring loading action also ensures that the tips in multi-channel pipettes are used the same way round. The reproducibility of the pipetting results also depends on how the pipette tip sits on the cone. If there is a variation in how the tip sits on the pipette cone, the dead volume of the pipette will also be different. The dead volume has

a direct impact on the pipetting volume. Figures 4 and 5 show that a lower dead volume (caused by attaching the tip with maximum force) results in an increased pipetting volume (red lines). Due to the spring-loaded tip cone the Eppendorf Xplorer will always ensure that the tip sits on the cone in the same way and, therefore, that the dead volumes are identical. This contributes to a higher reproducibility of the results (green lines in Fig. 4 and 5).



**Fig. 4:** Increase of the pipetting volume with a variable pipette 5–100 µL without spring loaded action

— Eppendorf Xplorer with spring loaded action  
 — Variable pipette 5–100 µL without spring loaded action (calculated data). The pipette tip was attached with a non-limited attachment force, 2 mm higher than with a spring-loaded tip cone.



**Fig. 5:** Increase of the pipetting volume with a variable pipette 50–1000 µL without spring loaded action

— Eppendorf Xplorer with spring loaded action  
 — Variable pipette 50–1000 µL without spring loaded action (calculated data). The pipette tip was attached with a non-limited attachment force, 2 mm higher than with a spring-loaded tip cone.

### Reproducibility

The accuracy of dispensing operations is, among other things, dependent on the air cushion in the pipette. If the pipette tip is pushed further up the pipette cone by the application of greater attachment force, the air cushion changes and consequently the volume of the aspirated liquid. The differences in the level at which the pipette tips were attached produce different pipetting volumes. This, in turn, reduces the reproducibility of dispensing results. As the spring-loading action of the electronic pipette

Xplorer ensures that the tip is always fitted at the same position on the cone, this supports high reproducibility of results.

The spring-loaded tip cone also automatically compensates the additional force used to attach the pipette tip. This means that only minimal effort is required to achieve the optimal tip fit and the subsequent ejection of the tip is also facilitated.

### Outlook

The consistent implementation of technical requirements not only minimizes physical strain, but also significantly improves the reproducibility of pipetting results. In this way, electronic pipettes enable productivity to be increased and everyday laboratory routines to be enhanced.

The electronic pipette Xplorer combines optimum ease of use with maximum precision.

This enables users to carry out sample processing with a maximum of reproducibility.

### References

Application Note 197: The Eppendorf Research plus pipette – lightweight, reliable and ergonomic. [www.eppendorf.com](http://www.eppendorf.com)

## Eppendorf Xplorer® Technical Specifications and Ordering Information

## Single-channel Eppendorf Xplorer®, (incl. charger)

Volume range	Volume	Systematic deviation		Random deviation		Order no.
<b>Medium gray multi-function rocker for 20 µl epT.I.P.S.® pipette tips</b>						
0.5–10 µL	1 µL	±2.5%	±0.025 µL	±1.8%	±0.018 µL	4861 000.015
	5 µL	±1.5%	±0.075 µL	±0.8%	±0.04 µL	
	10 µL	±1.0%	±0.1 µL	±0.4%	±0.04 µL	
<b>Yellow multi-function rocker for 200 µl epT.I.P.S.® pipette tips</b>						
5–100 µL	10 µL	±2.0%	±0.2 µL	±1.0%	±0.1 µL	4861 000.023
	50 µL	±1.0%	±0.5 µL	±0.3%	±0.15 µL	
	100 µL	±0.8%	±0.8 µL	±0.2%	±0.2 µL	
<b>Orange multi-function rocker for 300 µl epT.I.P.S.® pipette tips</b>						
15–300 µL	30 µL	±2.5%	±0.75 µL	±0.7%	±0.21 µL	4861 000.031
	150 µL	±1.0%	±1.5 µL	±0.3%	±0.45 µL	
	300 µL	±0.6%	±1.8 µL	±0.2%	±0.6 µL	
<b>Blue multi-function rocker for 1,000 µl epT.I.P.S.® pipette tips</b>						
50–1,000 µL	100 µL	±3.0%	±3 µL	±0.6%	±0.6 µL	4861 000.040
	500 µL	±1.0%	±5 µL	±0.2%	±1 µL	
	1,000 µL	±0.6%	±6 µL	±0.2%	±2 µL	
<b>Violet multi-function rocker for 5 ml epT.I.P.S.® pipette tips</b>						
0.25–5 mL	500 µL	±3.0%	±15 µL	±0.6%	±3 µL	4861 000.058
	2,500 µL	±1.2%	±30 µL	±0.3%	±6.25 µL	
	5,000 µL	±0.6%	±30 µL	±0.15%	±7.5 µL	
<b>Turquoise multi-function rocker for 10 ml epT.I.P.S.® pipette tips</b>						
0.5–10 mL	1,000 µL	±3.0%	±30 µL	±0.6%	±6 µL	4861 000.066
	5,000 µL	±0.8%	±40 µL	±0.2%	±10 µL	
	10,000 µL	±0.6%	±60 µL	±0.15%	±15 µL	

## Multi-channel Eppendorf Xplorer®, (incl. charger)

Volume range	Volume	Systematic deviation		Random deviation		Order no. 8-channel	Order no. 12-channel
<b>Medium gray multi-function rocker for 20 µl epT.I.P.S.® pipette tips</b>							
0.5–10 µL	1 µL	±5.0%	±0.05 µL	±3.0%	±0.03 µL	4861 000.104	4861 000.112
	5 µL	±3.0%	±0.15 µL	±1.5%	±0.075 µL		
	10 µL	±2.0%	±0.2 µL	±0.8%	±0.08 µL		
<b>Yellow multi-function rocker for 200 µl epT.I.P.S.® pipette tips</b>							
5–100 µL	10 µL	±2.0%	±0.2 µL	±2.0%	±0.2 µL	4861 000.120	4861 000.139
	50 µL	±1.0%	±0.5 µL	±0.8%	±0.4 µL		
	100 µL	±0.8%	±0.8 µL	±0.25%	±0.25 µL		
<b>Orange multi-function rocker for 300 µl epT.I.P.S.® pipette tips</b>							
15–300 µL	30 µL	±2.5%	±0.75 µL	±1.0%	±0.3 µL	4861 000.147	4861 000.155
	150 µL	±1.0%	±1.5 µL	±0.5%	±0.75 µL		
	300 µL	±0.6%	±1.8 µL	±0.25%	±0.75 µL		
<b>Green multi-function rocker for 300 µl epT.I.P.S.® pipette tips</b>							
50–1,200 µL	120 µL	±6.0%	±7.2 µL	±0.9%	±1.08 µL	4861 000.163	—
	600 µL	±2.7%	±16.2 µL	±0.4%	±2.4 µL		
	1,200 µL	±1.2%	±14.4 µL	±0.3%	±3.6 µL		

The data for systematic and random deviations only applies when using Eppendorf epT.I.P.S. pipette tips.

Charging stand	Order no.	Order no.
for 1 pipette	4880 000.000	for 4 pipettes (incl. charging adapter) 4880 000.026

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