

Applications

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Technical Report

Accurate and precise pipetting of DMSO with the epMotion® 5070/5075

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Abstract

Dimethyl sulfoxide (DMSO) is a powerful organic solvent that can dissolve most organic substances to high loading levels, including carbohydrates, polymers and peptides. Therefore, DMSO is widely used for compound dissolution in pharmaceutical and research laboratories. Even when performed in the low to mid throughput range, compound testing assays require a high degree of standardization and reproducibility. An automated pipetting system can help to meet these requirements. In this report we show that DMSO* can be pipetted with the Eppendorf epMotion automated pipetting system at an excellent accuracy and precision over a broad volume range.

Introduction

The excellent pipetting accuracy of the epMotion automated pipetting system has made it a popular tool for many demanding small volume molecular biology reaction set-ups [1]. Routine pipetting tasks, like serial dilutions, reagent distributions and sample transfers can equally benefit from automation through increased reproducibility and complete assay standardization. The epMotion pipetting tools work with an air cushion piston stroke system and disposable tips. The unique optical sensor can measure liquid levels contact free, also with non-conducting liquids like DMSO. Liquid type parameters for the tools can be adapted to many

different liquids from aqueous solutions to organic solvents. Safe operation is ensured by the completely contained housing that prevents manual interference in the process and possible contact with hazardous substances.

Materials and Methods

When working with pure DMSO, the liquid type class „98 % alcohol“ should be set in the epMotion software [2]. With this setting a prewetting step is performed to saturate the air inside the tip with the solvent and the aspiration and dispensing is done at low speed. Water based solutions with low DMSO content should be pipetted with the liquid type class „water“.

For the accuracy and precision measurement of DMSO the epMotion was equipped with a Mettler SAG high precision balance. The measurements were taken and recorded electronically using the PICASO® Pipette calibration software [3]. Used tools were taken randomly from the training laboratory. The density of DMSO was set to 1.101 mg/µl. For the single channel TS tools the measurements were taken according to EN ISO 8655: 10 measurements each at 10 %, 50 % and 100 % of the maximum volume of the tool. For each volume, the average out of these 10 measurements, the corresponding systematic error (Accuracy) and the random error (Precision) was calculated.



Figure 1: epMotion 5075 LH, Version with PC software

* Please note that DMSO can be explosive. DMSO should be used in well ventilated areas when working with concentrated solutions.

For the eight channel TM-8 tools 12 measurements in total with 4 separate channels were taken at 10 %, 50 % and 100 % of the maximum filling volume. Per individual channel 3 measurements were taken. For each volume the average, the systematic error (Accuracy) and the random error (Precision) was calculated for the 4 channels.

The results are shown in Table 1. The technical specifications for the epMotion pipetting tools and the accuracy and precision limits for the pipetting of double distilled water can be found in the epMotion manual or on the internet at www.eppendorf.com/epmotion.

Table 1: Automated pipetting of DMSO with the epMotion system: Accuracy and precision results.

Dispensing tool	Volume range	Volume	Average	Systematic error (Accuracy, es)	Random error (Precision, CV)
TS 50	1 -50 µl	5 µl	5.21 µl	4.18%	0.84%
		25 µl	25.27 µl	1.09%	0.48%
		50 µl	50.47 µl	0.95%	0.25%
TS 300	20 - 300 µl	30 µl	30.41 µl	1.36%	0.47%
		150 µl	150.1 µl	0.06%	0.13%
		300 µl	300.1 µl	0.05%	0.06%
TS 1000	40 - 1000 µl	100 µl	100.97 µl	0.97%	0.36%
		500 µl	500.3 µl	0.06%	0.05%
		1000 µl	997.0 µl	-0.03%	0.02%
TM 50-8	1 -50 µl	5 µl	5.35 µl	6.97%	3.04%
		25 µl	25.28 µl	1.13%	0.83%
		50 µl	50.37 µl	0.73%	0.40%
TM 300-8	20 - 300 µl	30 µl	30.81 µl	2.70%	0.83%
		150 µl	150.98 µl	0.65%	0.19%
		300 µl	299.73 µl	-0.10%	0.09%
TM 1000-8	40 - 1000 µl	100 µl	101.02 µl	1.02%	0.44%
		500 µl	501.4 µl	0.27%	0.03%
		1000 µl	1000.13 µl	0.01%	0.01%

Conclusion

The data clearly demonstrate that DMSO can be pipetted by the epMotion with a very high accuracy and precision over the complete volume range. The results were obtained with pipetting tools from standard laboratory equipment and were not precalibrated before the test. This shows the excellent mechanical quality and reproducibility of the tools.

With the single channel pipetting tools a CV below 1% at 5 µl and below 0.05% at 1000 µl could be achieved. These values clearly lie within the Eppendorf technical specification limits for the epMotion tools set for the pipetting of double distilled water.

References

- [1] Accuracy and precision of the epMotion system, Eppendorf Application Note 104, December 2004.
- [2] epMotion 5070/5075 Operating Manual, Eppendorf AG, Hamburg.
- [3] PICASO Pipette calibration software, Eppendorf AG, Hamburg.

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