WHITE PAPER No. 008 I September 2012

Eppendorf Easypet® 3 –

Efficient aid for pipetting with state-of-the-art technology

Arora Phang[1], Claus von Hessert[2] Sophie Manuello[2]

[1] Eppendorf Asia Pacific Headquarters, Kuala Lumpur, Malaysia, [2] Eppendorf AG, Hamburg, Germany

Abstract

Pipette controllers are routinely used in many laboratory activities such as cell culture, chemical-analytical procedures and highly specialized applications. As many of these tend to run for long periods of time, the use of electronic pipette controllers is quite common.
The operating time, the ergonomic aspects and the maximum speed for the transfer of liquids, as well as the choice and the better regulation of different speeds, are all important criteria to be considered when developing a pipette controller.
This White Paper provides information on these general features of the Easypet 3 and compares them with competitor devices.

Ergonomic design of the Easypet 3 ensuring an easy, comfortable experience.

Introduction

The emphasis in pipetting is no longer only precision and accuracy. The focus has also shifted onto the user-friendly operating features of the device, without letting such modifications hinder the overall performance of the pipette. Pipette controllers provide a way for the easy intake and dispensing of liquids. These can be divided into two categories: manual and electronic battery supported pipette controllers. Manual pipette controllers, e.g., the bulb filler, are used for small series or for very small volumes of liquid. Electronic pipette controllers, such as the Easypet 3, are suitable for long series of liquid handlings (e.g., in cell culture). Such pipette controllers generally possess aspirating or dispensing buttons as well as a separate dial/button for speed preselection (e.g., low, medium and high). However, Easypet 3 is the only device that does not require such speed preselection. In fact, the speed for liquid pipetting and dispensing in Easypet 3 is directly regulated via its aspiration and dispensing buttons in terms of how much stress is put on them.
Liquid aspiration in electronic pipette controllers works by the creation of vacuum by the pipette controller's motor, which prompts liquid into being aspirated inside the attached pipette. On the other hand, there are two options for dispensing liquids, flow-out and blow-out. When a user holding a filled pipette is about to perform a flow-out with a pipette controller, the internal valve will be opened and liquid will drain from the pipette as a result of atmospheric pressure (gravity drain). In case the user wants to dispense this liquid at greater speed, the internal pump is activated. The resulting force from the pump ensures that no liquid residue is left inside the pipette, strongly negating a liquid´s adhesion to the surface.

A battery-supported pipette controller offers cordless convenience, a feature which is particularly useful for liquid handling in the laboratory. Since these instruments are typically used over a prolonged period of time, it is important for them to have a long battery life. Long periods of usage also demand a pipette controller which is designed to fit the best user comfort, as the repetitive task of pipetting could strain a particular set of muscle tissues, in time possibly leading to repetitive strain injury (RSI). Other important criteria are maximum speed for filling and dispensing a particular liquid and the regulation and choice of different speeds for various applications.
The following experiments were designed to address the key features of the Easypet 3 and compared these features against six competitor devices.

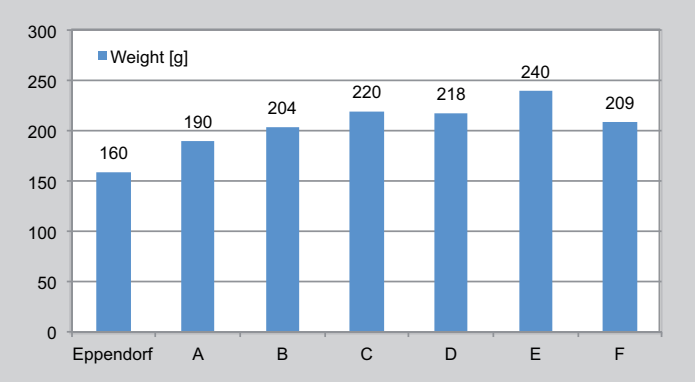

Figure 1: Comparison between Easypet 3 and competition in terms of total weight (with battery).

Material and Methods

1. Total weight
The total weight of the Easypet 3 (battery included) and six other competitors were measured using a balance.

2. Aspiration speed
The time taken for Easypet 3 and six other competitors to aspirate a defined volume was measured. Data were collected for three different volumes, namely 25 mL, 50 mL and 100 mL. The average values from a total of five readings were used for comparison.

3. Charging and operation times
The time taken to fully charge the Easypet 3 and six other competitors was determined. The amount of hours in which a fully-charged device could run was determined by filling and emptying a 25 mL pipette with water up to the nominal volume by using the respective pipette controller's highest speed.

Results and Discussion

Lightweight
Easypet 3 features the lightest weight in relation to the other pipette controllers tested in the experiment (Figure 1), thus allowing efficient pipetting and maximum operating comfort during usage. Easypet 3 is 30 g lighter than its next lightest competitor (A) and 80 g lighter than the heaviest competitor device (E). As pipetting work is a repetitive task often carried out throughout a long period of time, the additional weight would impact negatively on the user's muscles, potentially contributing to RSI.

Aspiration Speed
Easypet 3 has an average aspiration speed of 7.1 mL/s, the second highest value after competitor device F with 7.4 mL/s (Figure 2). The remaining tested devices have speed performances below 7 mL/s.
Easypet 3 features a pump and suction speed for filling and dispensing that can be set accurately because of its internal valve system. This particular system allows for precise and sensitive meniscus adjustment at all volume sizes. With the Easypet 3, the aspiration and dispensing of liquids is simply done by pressing the two independent buttons. This allows for simultaneous adjustment of the speed during pipetting, allowing for one-hand operation.
Highly efficient, convenient and maximum operating comfort during use is thus achieved, which results in fatigue-free, stress-free and efficient pipetting.

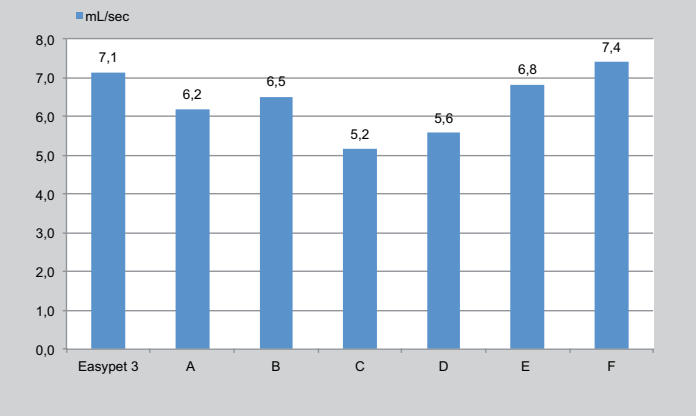

Figure 2: Average aspiration speed of Easypet 3 with competition from measurement of volumes 25, 50 and 100 mL.

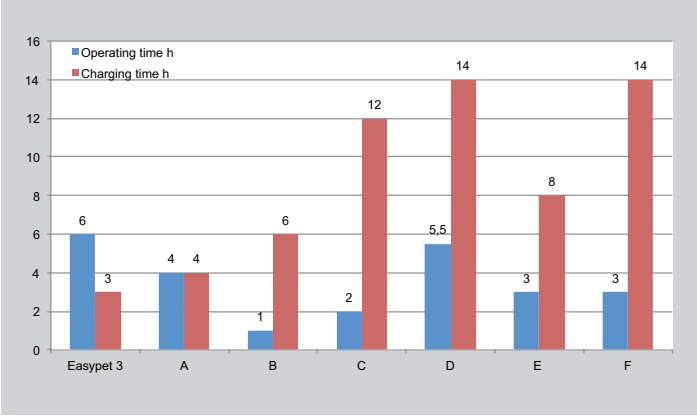

Figure 3: Comparison of Easypet 3 total operating and charging time with competition

In the way speed is important in terms of providing a quick workflow, easy and sensitive speed control with fine and coarse adjustments plays an important role, too. The accuracy and precision depends on the pipette being used as well as on the ability of the pipette controller to set the volume easily to the graduation of the serological pipette.

Battery Lifespan and Operating Capacity

There are currently four types of batteries available in the market used to power electronic pipette controllers: nickel-cadmium (NiCd), nickel-metal hydride (NiMH), lithium-ion (Li-ion) and lithium-polymer (Li-poly) (a derivative of the lithium ion battery).
Easypet 3 makes use of a lithium-polymer battery. One benefit of this kind of battery is the higher energy density, i.e. the material can store a larger amount of energy at the same weight, thereby guaranteeing a longer operating time on a single charge. As can be observed in Figure 3, Easypet 3 requires three hours to reach a full charge, whereas competitor devices require 4-14 hours, being C, D and F´s times the longest ones. Moreover, unlike the NiCd and NiMH batteries used by the tested competitor devices, Li-poly batteries do not suffer from memory effect, i.e. if the battery is not fully discharged before charging it again, the capacity of the battery will not be reduced. Furthermore, the parallel use of the device while charging is possible and does not interfere with the main performance.

The Li-poly battery used in Easypet 3 generates a high (3 times that of NiCd or NiMH batteries) and steady average voltage (~3.6 V). This steady terminal voltage during discharge (i.e. the operation of the device) assures a smooth operation, which results in optimum accuracy and precision. To further safeguard a smooth experimental workflow, Easypet 3 comes equipped with three backlit LEDs at the back, which displays the battery status and serves as a reminder to the user when the Easypet 3 needs to be recharged, providing users a peace of mind during operation.

Conclusion

All things considered, Easypet 3 is a pipette controller that features capabilities that outdo its competitors' attributes and therefore can be regarded as state-of-the-art technology.
Easypet 3 is a lightweight, well-balanced cordless electronic pipette controller for use with graduated and volumetric glass or plastic serological pipettes from volumes of 0.1 – 100 mL. Weighing only 160 g with its battery equipped, Easypet 3 has a fast average aspiration speed of 7.1 mL/s. Although Easypet 3's average aspiration speed is the second fastest, its lightweight property and the 6-hour operating time, requiring only 3 hours to charge, make it the most convenient pipette controller, as revealed in the comparative experiments described in this paper.

Ordering Information

Description	International Order No.	Order No. North America
Eppendorf Easypet® 3 incl. power supply, wall mounting device, shelf stand, 2 membrane filters (unsterile) 0.45 µm	4430 000.018	–
Eppendorf Easypet® 3 incl. power supply, wall mounting device, 2 membrane filters (unsterile) 0.45 µm	–	4430000026
Membrane filter, sterile, 0.45 µm, pack of 5	4421 601.009	022232002
Membrane filter, sterile, 0.2 µm, pack of 5	4430 606.005	4430606005
Lithium-polymer rechargeable battery for Eppendorf Easypet® 3	4430 605.009	4430605009

Your local distributor: www.eppendorf.com/contact
Eppendorf AG 22331 Hamburg Germany
eppendorf@eppendorf.com

www.eppendorf.com