Modularity of Thermo Scientific VERSETTE automation platform and its performance with ARTEL MVS System

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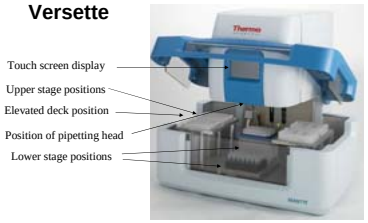
ABSTRACT: Versette, an automation platform for liquid handling experimentation derives its name from its use as a versatile pipette. Versette offers nineteen liquid handling options, can be equipped with 1, 8, 12, 96 and 384 channels and encompasses functionality across 0.1-1250 mL volume range. Its ability to handle sub-microliter to milliliter volumes facilitates its use in low/mid/high throughput lead discovery, biochemical and cell biology applications. One of the major challenges in developing this automation platform for several different applications is to efficiently validate performance across a wide range of volumes. In our approach to developing robust liquid handling instrumentation for biological experimentation, we envisage optimization of a scientific application as a two tier approach. The first tier includes optimizing the liquid handling parameters and the second tier includes optimization of the specific assay parameters. During the development phase of Versette, we applied previously determined liquid handling optimization parameters to perform validation studies. After our initial optimization, the liquid transfers were evaluated using the Artel Multichannel Verification System (MVS). The MVS dual dye system is a widely known approach and has been used in the automation field to calibrate liquid volumes from a variety of automation platforms. The MVS system includes dye solutions, a plate reader, a plate mixer and user friendly analysis software. This system serves as a standardized validation method to measure performance both for calibration purposes, as well as device optimization of automated platforms. Here, we validated a pre launch model of Versette using our in-house calibration methods for fifteen different volumes dispensed by single, 8, 12 and 96 channel pipetting heads. We compared our in-house validation results with results generated using the MVS system. In all cases we observed a significant correlation between both the methods. The liquid handling capability of Versette and calibration/tracking via MVS provide an excellent platform for reliable use in scientific applications. The features of Versette and performance results are discussed in this poster.

Versette

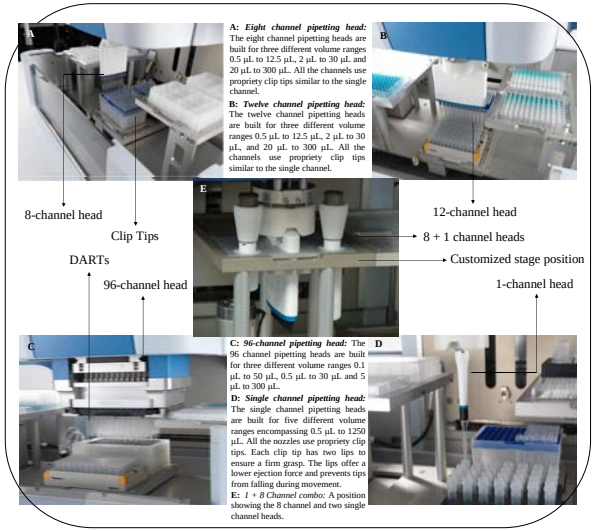


Features of Versette: Versette can be equipped with 96, 384, 12, 8 or single channel pipetting heads. The central portion of the instrument can be replaced with the head/channels for the required volumes. Versette shown here is a six position stage instruments and is controlled by either using the touch screen display on its face or via the ControlMate software. The four elevated stage positions can come together above the two below positions.

Touch screen and programming interface for Versette

Programming interface for Versette: Versette can be controlled both via touch screen and software. A1, A2 and A3 are three different screen shots of the touch screen interface. The touch screen has various options that can be used to operate Versette. Panel B shows icons of Control Mate software that is used to operate Versette. The ControlMate is user friendly and consists of drag and drop icons for easy programming.

Modules of Versette



A: ***Eight channel pipetting head:*** The eight channel pipetting heads are built for three different volume ranges 0.5 µL to 12.5 µL, 2 µL to 30 µL and 20 µL to 300 µL. All the channels use propriety clip tips similar to the single channel.

B: ***Twelve channel pipetting head:*** The twelve channel pipetting heads are built for three different volume ranges 0.5 µL to 12.5 µL, 2 µL to 30 µL, and 20 µL to 300 µL. All the channels use propriety clip tips similar to the single channel.

C: ***96-channel pipetting head:*** The 96 channel pipetting heads are built for three different volume ranges 0.1 µL to 50 µL, 0.5 µL to 30 µL and 5 µL to 300 µL.

D: ***Single channel pipetting head:*** The single channel pipetting heads are built for five different volume ranges encompassing 0.5 µL to 1250 µL. All the nozzles use propriety clip tips. Each clip tip has two lips to ensure a firm grasp. The lips offer a lower ejection force and prevents tips from falling during movement.

E: *1 + 8 Channel combo:* A position showing the 8 channel and two single channel heads.

Multichannel verification system (MVS)

Artel Multichannel Verification System (MVS): The MVS system offers a systematic validation of the liquid handling instrument. It includes dye solutions (sample and diluent), a calibrator plate, an orbital plate mixer, spectrophotometric read out and data analysis software. All plates and dye solutions are tracked within the experiment using a bar code scanner. A range of dye solutions are available for calibrating volumes from 0.1 – 350 µL. Briefly, the procedure used herein involved the following steps. A) wet dispensing the appropriate dye solution into the plates with the liquid handler to be tested (the plates were pre-filled with diluent), B) scanning reagent and plate information into the MVS software, C) mixing the plate, and D) measuring the absorbance. The MVS software analyzes the data and presents a statistical analysis of the results.

Performance of Versette with MVS

1 Channel

Volume (µL)	%CV (MVS)	%CV (Lab)	%Error (MVS)	%Error (Lab)
2	5.3	2.2	5	10
3	1.1	2.1	3.8	1
30	0.7	0.3	1.5	2.1

The single channel heads are available for volumes ranging from 0.5 to 1250 µL. These heads use clip tips which offer a firm grasp and easy dispense. They also prevent tips from falling during operation.

8 Channel

Volume (µL)	%CV (MVS)	%CV (Lab)	%Error (MVS)	%Error (Lab)
2	6.4	4.6	9.6	8.5
3	5	4	1.1	0.3
30	1.3	0.8	1.9	1.5

The single channel heads are available for volumes ranging from 0.5 to 1250 µL. These heads use clip tips which offer a firm grasp and easy dispense. They also prevent tips from falling during operation.

12 Channel

Volume (µL)	%CV (MVS)	%CV (Lab)	%Error (MVS)	%Error (Lab)
2	2.6	8.5	5.3	10
3	1.8	4.4	4.1	5
30	0.6	1	1.2	0.9

The single channel heads are available for volumes ranging from 0.5 to 1250 µL. These heads use clip tips which offer a firm grasp and easy dispense. They also prevent tips from falling during operation.

96 Channel

Volume (µL)	%CV (MVS)	%CV (Lab)	%Error (MVS)	%Error (Lab)
0.5	12.6	7.2	12.2	8.6
3	1.4	1.4	3.6	1.1
7	0.5	1.6	1.2	1.7
14	0.6	0.7	0.5	1.6
24	0.5	1.1	0.9	-1.2
30	0.8	1.1	1	0.7

The 96 channel heads are available for volumes ranging from 0.5 to 300 µL. These heads use disposable automation research tips (DARTs) which offer a firm grasp and easy dispense. The precision and accuracy are shown in the table.

In-house and MVS process steps: *In-house process:* a) Dispense appropriate dye for the volume selected using Versette into the plate, b) Shake for three min at 1000 rpm, c) Centrifuge at 1700 rpm for 1 min. d) read absorbance at 412nm. *MVS method:* a) Dispense appropriate dye for the volume selected using Versette into the plate, b) Shake for one min. at 1200 rpm, c) centrifuge for one min. at 1700 rpm, d) read absorbance. Data analysis for the in-house and MVS methods was performed using excel spread sheet and MVS software respectively. Both the methods are similar in several respects except for dye solutions and minor process variations. However, since the MVS has been used for several automation types of automation platforms, it serves as a means of comparison and helps us dissect problems in case of failures.

Conclusion: A modular automation platform, Versette, was designed for scientific applications. The different modules address the liquid handling need for varying types of experimental procedures. Performance of the pipetting heads in the modules has been validated using our in-house calibration methods and Artel multichannel verification system. Comparable results were obtained for both the methods. The liquid handling capability of Versette and calibration capability of MVS system offer a reliable liquid handling platform for a wide range of applications. Validation of Versette for some common scientific applications is underway.