

focus on Laboratory Products

A Traceable Method for Verifying the Performance of 96- / 384-well Pipettes

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The standard method of determining a pipette's liquid delivery performance is measuring the weight of the transferred liquid. Every channel of a multichannel pipette is measured by taking up to ten gravimetric readings. However, for liquid handling systems with 96- or 384-channels this method is neither feasible nor economic because it is a time intensive process. An alternative method is photometry. It allows working with microplates and thus assessing 96- and 384-channels in quick succession. Integra provides an optimised measurement protocol, which combines both gravimetric and photometric measurements to minimise time expenditure and achieve confident results. If the required equipment is not readily available, commercial systems, such as Artel's Multichannel Verification System (MVS®), can be used. The MVS offers a user friendly and standardised approach for the validation of liquid handling performance in the test volume range of 10 nl to 350 µl and provides results which are traceable to the International Systems of Units.

In this technical note we present accuracy and precision data for VIAFLO 96-channel pipetting heads, measured using Artel's MVS.

Product Description

VIAFLO 96 is an affordable handheld 96-channel pipette that closes the gap between traditional hand pipettes and robotic systems. It is used like a standard hand held electronic pipette. Controlled by hand eye coordination and supported by servo motors, the system provides an effortless workflow and enables precise targeting of the microplate wells.

The working volume range of VIAFLO 96 can always be adapted to the application's requirements by changing the pipetting head and thus achieve optimal pipetting results.

VIAFLO 96 can be used for any sample transfer from reservoir to plate, plate to plate or within plates.

Up to ten predefined pipetting modes and the ability to create personalized custom programs add even more functionality to satisfy many application needs.



Materials and Methods

A 96-channel pipetting head of each volume range was measured using Artel's MVS. The MVS is composed of standardised dye solutions, characterised microplates, a dedicated microplate reader and analysis software.

Test volumes for the pipetting heads were selected at 8% and 100% of the nominal volume with the exception of the 1250 µl head, which was measured at 8% only due to the volume limitation of the MVS. In preparation of the tests, the pipetting heads were pre-conditioned by pre-wetting (n=5) with water at nominal volume. The tips were then ejected, replaced with new tips and the pre-wetting was repeated with sample solution (n=2) before the assay was started. All liquid transfers were performed using the standard 'pipet mode' (= neat transfer) and were wet transfers.

First the diluent was dispensed into the plate and then the MVS sample solution corresponding to the test volume was added (Table 3). The pipetting speed was set to level 6 for the 1250 µl and 12.5 µl heads, and to level 8 for the 300 µl and 125 µl heads. After dispensing diluent and sample solution, the plates were placed on a plate shaker for 2 minutes to mix thoroughly.

A total of 3 plates per volume were prepared one after the other. Before measuring, every plate was carefully checked for the presence of air bubbles.

Technical Data Pipetting System

Table 1. Overview of technical data for VIAFLO 96 and VIAFLO 384

Instrument	VIAFLO 96	VIAFLO 384*
Channels	96	96, 384
Pipetting technology	Air displacement	
Microplate formats	96- and 384-well, shallow and deep well	
Dimensions	42 cm x 30 cm x 54 cm (17" x 12" x 21")	

* VIAFLO 384 is an enhanced version of the VIAFLO 96 and is capable of operating with both 96- and 384-channel pipetting heads.

Pipetting Head Overview

Table 2. Volume range and number of channels of the different VIAFLO pipetting heads

Part number	6101	6131	6102	6132	6103	6104
Vol. range [μ l]	0.5 – 12.5	0.5 – 12.5	5 – 125	5 – 125	10 – 300	50 – 1250
Channels	96	384	96	384	96	96

Table 3. Liquid handling performance results of VIAFLO pipetting heads using ARTEL MVS

Head Part No.	Target Volume [μ l]	MVS Range Sample Solution	Measured		Specified	
			Accuracy [\pm %]	Precision [CV, \leq %]	Accuracy [\pm %]	Precision [CV, \leq %]
6101	1	D	-5.3	1.8	20.0	12.0
	12.5	B	+0.2	0.8	2.0	1.5
6102	10	C	+3.0	0.9	5.0	2.5
	125	A	-1.2	0.4	2.0	1.5
6103	25	B	+1.5	1.0	4.0	3.0
	300	HV	-0.1	0.3	2.0	1.5
6104	100	A	-0.3	0.3	5.0	2.5

Results

The reader results of the test plates (n=3) were averaged per channel and then the systematic error (accuracy) and coefficient of variation (%CV) were calculated over all 96 channels to perform an inter-channel comparison.

Table 3 summarises the test results and compares them to the pipetting head specifications given by Integra.

Discussion

The data obtained by the Artel MVS confirms the specifications for the VIAFLO pipetting heads and indicates superior actual performance. Represented is the performance of a typical head in each volume range, all yielding exemplary results. It stands out that Integra's specifications for the pipetting heads are a multiple of what was actually measured, especially at low volumes below 2 μ l. There are safety margins in the specifications that take into account that these heads are operated in many different environment conditions. Temperature, air pressure and humidity are factors influencing the pipetting performance. Hence, the specifications represent the maximal, permissible error for all pipetting heads.