INTEGRA

VIAFLO Electronic Pipettes Operating instructions

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INTEGRA

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INTEGRA Biosciences – 2 Wentworth Drive, Hudson, New Hampshire 03051

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VIAFLO Electronic Pipettes	**Models: 4011, 4012, 4013, 4014, 4015, 4021, 4022, 4023, 4024, 4031, 4032, 4033, 4034, 4041, 4042, 4121, 4122, 4123, 4124, 4131, 4132, 4143, 4144, 4163, 4164**

in accordance with EC directives | gemäss der EU-Richtlinien | est conforme au terme de la directives CE | de acuerdo con las directivas CE | in conformità alle direttive CE

2006/95/EC	Low voltage equipment
2004/108/EC	Electromagnetic compatibility
2002/95/EC	Restriction of Hazardous Substances
2002/96/EC	Waste Electrical and Electronic Equipment

is in compliance with the following normative documents: | mit den folgenden normativen Dokumenten übereinstimmt: | aux documents normatifs ci-après: | cumple las documentos normativos: | soddisfa le normative seguenti:

EN 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - General requirements.
EN 61326-1	Electrical equipment for measurement, control and laboratory use - EMC requirements.

Standards for Canada and USA

CAN/CSA-C22.2 No. 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - General requirements.
UL Std. No. 61010-1	Safety requirements for electrical equipment for measurement, control and laboratory use - General requirements.
FCC, Part 15, Class A	Emission

Hudson, New Hampshire, USA - April 29, 2012

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Imprint

This operating instruction manual applies to firmware version 2.44 or higher until a newer revision is released.

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Customer service

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Further information and operating instructions in other languages are available from info@integra-biosciences.com.

1 Introduction

These operating instructions contain all the information required for installation, operation and maintenance of the VIAFLO Electronic Pipettes. This chapter informs about the symbols used in these operating instructions, the intended use of the VIAFLO Electronic Pipettes and the general safety instructions.

1.1 Symbols used

The operating instructions specifically advise of residual risks with the following symbols:

WARNING

This safety symbol warns against hazards that could result in injury. It also indicates hazards for machinery, materials and the environment. It is essential that you follow the corresponding precautions.

CAUTION

This symbol cautions against potential material damage or the loss of data in a microprocessor controller. Follow the instructions.

NOTE

This symbol identifies important notes regarding the correct operation of the device and labour-saving features.

1.2 Intended use

VIAFLO Electronic Pipettes are microprocessor controlled and stepper motor driven pipettes. They are used for aspirating and dispensing liquids in the volume range of 0.5 - 5000 µl using GripTip pipette tips.

1.3 Warranty Agreement

The INTEGRA Biosciences Corp. warranty applies to the original retail purchaser. INTEGRA Biosciences will repair or replace (at INTEGRA Biosciences's discretion) any INTEGRA liquid handling device which is found to be defective in materials or programming from one year from purchase date. If an instrument fails to function properly at anytime during the first year, INTEGRA Biosciences should be contacted immediately. INTEGRA Biosciences's warranty does not cover any damage or malfunction resulting from normal wear, misuse, or use in any way contrary to the instructions in the operating instructions. Any evidence of misuse or abuse will void this warranty.

1.4 Safety notes

VIAFLO Electronic Pipettes comply to the recognized safety regulations and is safe to operate. VIAFLO Electronic Pipettes can only be operated when in perfect condition and while observing these operating instructions.

The device may be associated with residual risks if it is used or operated improperly by untrained personnel. Any person operating the VIAFLO Electronic Pipettes must have read and understood these operating instructions, and particularly, the safety notes, or must have been instructed by supervisors so that safe operation of the device is guaranteed.

Use only an INTEGRA battery.

Regardless of the listed safety notes, additional applicable regulations and guidelines of trade associations, health authorities, trade supervisory offices, etc. must be observed.

Do not open or modify the VIAFLO Electronic Pipettes in any way. Repairs may only be performed by INTEGRA Biosciences AG or by an authorised after-sales service member.

Parts may be replaced with original INTEGRA Biosciences parts only.

WARNING

Do not use the VIAFLO Electronic Pipettes near flammable material or in explosive areas. Also, do not pipette highly flammable liquids such as acetone or ether.

When handling dangerous substances, comply with the material safety data sheet (MSDS) and with all safety guidelines such as the use of protective clothing and safety goggles.

CAUTION

Do not immerse the VIAFLO Electronic Pipettes in liquid. The fluid can damage internal parts. Avoid pipetting of liquids whose vapors could attack the materials PA (polyamide), POM (polyoxymethylene), FPM (fluor-rubber), NBR (nitrile-rubber), CR (chloroprene), silicone. Corrosive vapors could also damage metallic parts inside the device.

NOTE

Prolonged exposure of the VIAFLO Electronic Pipettes to UV-light can cause discolouration and/or yellowing of the control unit. However, this will not affect the performance of the device in any way.

2 Description of the device

2.1 Scope of delivery

- VIAFLO pipette
- Rechargeable battery (located inside the pipette, (Li-ion, 3.7 V, 1050 mAh)
- Bag of spare O-rings (300 and 1250 µl versions only)
- Accuracy and precision certificate

CAUTION

Verify the scope of delivery when unpacking the device and check for potential transportation damage. Do not operate a device that is damaged, instead contact your local dealer.

2.2 Pipette configurations

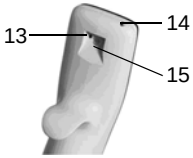
VIAFLO single and multichannel pipettes couple an easy-to-use touch wheel controller with intuitive programming. They are microprocessor controlled and stepper motor driven. In addition, the VIAFLO VOYAGER adjustable tip spacing pipettes provides you with the ability to vary tip spacing.

2.3 Overview of the VIAFLO Electronic Pipettes

2.3.1 VIAFLO pipette parts

1 **Display**
2 **Back button**, to navigate backward
3 **Touch wheel,** spin to scroll and move the cursor
4 **OK button**, to make a selection
5 **Left and right arrow buttons**, for selections
6 **Purge button**, to empty tips
7 **Run key**, to start operations
8 **Tip ejector**
9 **Finger hook**, facilitates easy operation
10 **Volume indicator label**, color matches GripTip rack insert.
11 **Ejector sleeve**
12 **Tri-lobe tip interface**

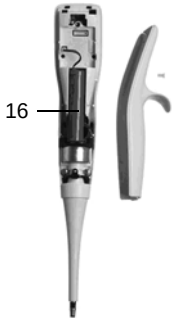
2.3.2 Back view



13 **Reset button**

14 **Power connector**

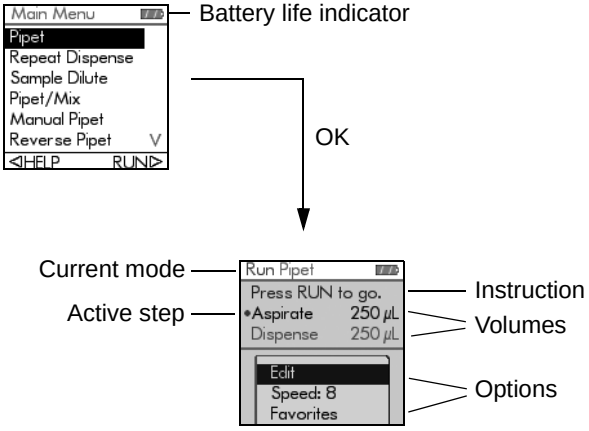
15 **Charging stand interface**



16 **Battery**

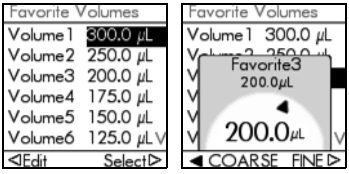
2.3.3 Display

The Display shows all pipetting options.



2.3.4 Touch wheel

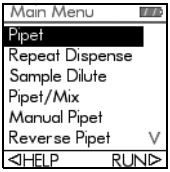
The **Touch wheel** is fully operational with only one hand. Rotational finger movements translate into up and down cursor movement on the display. The **Touch wheel** is fully functional with the use of latex gloves.



Move finger on the **Touch wheel** to choose (and highlight) an option on the display. Press **OK** (4) to make the selection.

When a setting dial is displayed, spin the **Touch wheel** to change the value and press **OK**.

2.3.5 Left and right arrow buttons



At times, you will see ◁ and ▷ on a display screen. These buttons are used to select options.

Press ◁ to select the option indicated with the left arrow (HELP, in the example beside). Press ▷ to select the option indicated with the right arrow (RUN, in the example).

For Voyager models, these buttons are also used for tip spacing adjustments.

2.3.6 Purge button

During pipetting, you can interrupt the current pipetting protocol and purge all remaining liquid currently in the GripTips. To do so, press **Purge** (6).

The pipette will display a prompt:

To proceed, press and release the **Run key** (7). Upon completion of the dispense, the first step in the current program will be displayed.

2.3.7 Run key

Press and release the Run key to initiate aspiration, dispense, mix, purge, and special pipetting operations. This button is centrally located for left- or right-handed actuation.

During dispense, you can press and hold the Run key to perform a two-step blowout, see “4.4.1 Edit option” on page 23.

2.3.8 Tip ejector

The tip ejector easily ejects tips from the tip cones.

The serial number can be found beneath the tip ejector. Press and hold the tip ejector in the down position to see the 7-digit serial number.

2.3.9 Reset button

The reset button (13) is located on the back of the VIAFLO pipettes. It is used to reset the RAM in the pipette. The programs stored in memory are maintained. Once pressed, the VIAFLO startup screen will be displayed.

Press any key to continue and allow the instrument to initialize and home the pipette. The routine ends by displaying the Main Menu.

3 Installation

3.1 Operating environment

The VIAFLO Electronic Pipettes have been designed for use in a laboratory. They shall be operated in a dry and dust-free location with a temperature of 5–40 °C and a maximal (non-condensing) relative humidity of 80 %.

3.2 Charging the battery

All VIAFLO hand-held pipettes share the same rechargeable, long-life, lithium-ion battery that has a capacity of 1050 mAmp/hours. The battery should be charged for at least one hour before pipetting. A full charge takes 2.5 hours and will provide approximately 3500 pipetting cycles.

A battery indicator is provided on the pipette display (2.3.3) indicating different states:
- Blinking red icon: Low battery. A recharging message will appear.
- Blinking grey icon: Pipette is recharging.
- Blinking green icon: Pipette is recharging and battery is 90% charged.
- Solid green icon: Battery is fully charged and the pipette is still connected to the mains adapter.
- Three static grey bars: Battery is fully charged.

CAUTION

Use only the approved INTEGRA battery, power supply or charging stand. Use of an incompatible power transformer can damage the pipette.

Battery charging can take place in two ways, using a pipette charging stand or the Universal Voltage Power Supply (UPS), that allows for pipetting while charging the battery, see (“8.1 Accessories” on page 62).

3.2.1 Charging the battery on a stand

Use one of the different charging stands - single position with two- (#4210) or four prong connector (#4211), or four position with two prong connector (#4215) - to charge the battery.

Place the pipette on the charging stand by fitting the power receptacle (15, on the top back of the pipette) over the prong connector on the top of the stand.

Plug the cable of the adequate power supply to the socket at the base of the stand (see “8.1 Accessories” on page 62).

CAUTION

Always use the correct power supply for the charging stand.

The pipette will turn fully on when placed on the stand. When the dimming time is achieved the startup screen is displayed on the pipette. When the turnoff time is reached, the pipette turns off. For disconnecting simply lift the pipette up from the stand.

3.2.2 Charging the battery with UPS

With the optional Universal Voltage Power Supply (UPS, #4200), you can use the pipette while charging through the line cord.

Insert the UPS connector into the receptacle on the top back of the pipette (14). Plug the UPS into a wall outlet.

It will take approximately 30 seconds of charging to begin running the motor.

The pipette will turn fully on when the line cord is connected. The current screen remains displayed. If the pipette is idle while charging, the display may dim (see “4.1 Turn on/off the device” on page 20), but it will continue to show the battery life indicator. When the display shut off time is reached, the instrument will shut off.

3.3 Toolbox - adapt your VIAFLO Electronic Pipettes

The Toolbox provides options to adapt the device to appropriate applications, setting personal preferences, calibration, computer connectivity and storing owner information.

Toolbox mode	Description
Preferences	Customizes the system parameters.
Calibration & Service	Sets calibration and service history options.
Communications	Enables communication between your VIAFLO Electronic Pipettes and a PC.
Owner Information	View your pipettor’s serial number and set a personal ID.
Help Language	Sets language specific help.
Write Protect	Protects programs or menu options from modification.
Password Key	Displays the encrypted password.

3.3.1 Preferences

Preferences customizes your system parameters. Select a preference and press **OK** to access.

Preference	Description	Range
Sound	Simple tones indicate completion of operations and errors. Select an option and press **OK** to change the status of the beep tone between On and Off: • **Step complete**: at the end of a program step • **Program complete**: at program completion • **Purge key**: when Purge is pressed. • **Error message**: when an error message appears or when illegal data entry is attempted. • **Spinner**: When spinning the **Touch wheel**. • **Last dispense**: before the last dispense in Repeat Dispense and Variable Dispense.	On/Off
Display	Customizes your display. Press **OK** to select an option, use the **Touch wheel** to display the desired value. • **Start up display**: Select the startup display at one of the following: VIAFLO Logo, None or Custom (up to two, uploaded with VIALINK). Press ▷ to Save your selection. • **Display dim time**: The display will dim after a set number of minutes. A shorter dim time helps preserve battery life. Press **OK** to save your selection. • **Turn off time**: By default, the pipette will turn off after 5 minutes of idle time. A shorter turn off time helps preserve battery life. You can change this setting. Press **OK** to save your selection.	VIAFLO Logo, None, Custom 1 or 2 Never, 1-20 min. 5-20 min, 1 hour
Main Menu	Select a function to be hidden from the main menu (Off) and press **OK**, e.g. Tip Spacing, Pipet, Repeat Dispense, Dilute, Pipet/Mix.	On/Off
Spinner	Adjust your **Touch wheel** spin sensitivity.	Low, Medium, High
Pipetting	Select an option and press **OK**. • **Purge key speed**: Choose the desired purge speed and press **OK** to save your selection. • **Delayed blowin**: Choose a timed delay between the blowout and the blowin (delay before the piston homes) at the end of a dispense, if no two step blowout is performed, see “4.3.2 Blowout modes” on page 21.	1-10 0/0.5/1/1.5 s

After changing desired settings, press ▷ to Save.

3.3.2 Calibration & Services

These options enable you to set calibration features, review service history and move the pipettor head into the parking position.

Calibration & Services	Description	Range
Calibration	Allows for re-calibration of the VIAFLO Electronic Pipettes to restore accuracy. The calibration factors for Pipet and Repeat type are displayed. To edit the calibration volumes, press ◁. • **Target Volume**: This is the volume you are interested in using for the calibration. • **Actual Volume**: This is the measured volume obtained when dispensing the target volume. • **Factory Reset**: Resets the correction factor back to the original factory setting. Press ▷ to apply the factory setting. • **Current Factor**: Displays the factor currently in use.	-
Calibration Reminder Time or Cycles	Sets a calibration reminder based on a specified time frame or number of pipetting cycles. When the calibration reminder is displayed, press any key to confirm. However, the reminder will reappear every time the pipettor is turned on until you change the reminder time or use the reset option. • **Timer**: Press **OK** to turn the reminder timer On or Off. • **Remind in**: Use the **Touch wheel** to set a reminder interval for calibration (time in months or in thousands of cycles). • **Reset**: Resets the timer to the defined calibration interval. With this option highlighted, press **OK** and ▷ Save to enable.	On/Off 1 -12 months or 10 k - 240 k cycles
Service History	Displays notes of any service that took place on the VIAFLO Electronic Pipettes listed newest entry first.	-
Calibrate Tip Spacing	Starts calibration of tip spacing of VOYAGER pipettes.	

After changing desired settings, press ▷ to Save.

3.3.3 Communications

The VIAFLO Electronic Pipettes can be programmed from a PC via a Single Pipette Programming Stand (#4211) or via wireless Bluetooth connection. For download of VIALINK software and further information refer to “VIALINK operating instructions” on www.integra-biosciences.com. Press **OK** to toggle between On and Off.

Communi-cations	Description	Range
Serial	Turn serial communication mode “On” to begin bi-directional communication. To exit the communications mode reset the VIAFLO pipette or follow screen prompt. Serial communication further allows (in addition to the functions of Blue tooth): • Firmware updates • Bi-directional communication from PC to pipette.	On/Off
Bluetooth	Each pipette needs its own Blue Tooth chip. Blue Tooth communication has an open field connectivity of about 300 meters. It can be used for: • File handling of pipetting protocols • Image downloads • Service history tracking	On/Off

3.3.4 Owner Information

Owner Information	Description	Range
VIAFLO	The first line is highlighted. Press ▷ to enter personal information for your VIAFLO Electronic Pipettes. • Use the **Touch wheel** to highlight a character and press **OK**. You can press ◁ to Delete the last character entered. After entering the desired text, press ▷ to Save.	-

In addition, information about your VIAFLO Electronic Pipettes, such as serial number (SN), pipette size, indication of single or multi channel, and version number, are displayed automatically.

3.3.5 Help Language

Help Language	Description	Range
Help Language	You can choose the language in which all help screens are displayed (English, French, German, Spanish, simplified Chinese, Japanese). Scroll to the desired language and press ▷ to Save.	-

3.3.6 Write protect

Select this option to protect programs and menu options from inadvertent modification. The pipetting programs can still be used.

Write protect	Description	Range
	Select an option and press **OK** to switch protection On or Off: • **Standard programs** • **Custom programs** • **Calibration** • **Toolbox** • **VOYAGER** • **Password protect**: Protect the access to the write protect menu by selecting “On”. • **Edit password**, if password protect is “On”. To enter a password use the **Touch wheel** to highlight a character and press OK. Press ▷ to save the password. The password must be entered before you can access the write protect menu.	On/Off

Keep the password in a safe place.

3.3.7 Password key

This menu displays the encrypted password, if set. Should you lose your password, contact INTEGRA Biosciences Corp. to retrieve your password using these numbers.

4 Operation

4.1 Turn on/off the device

Turn on:
Press and release the **Run key** (7) to turn on the pipette.

CAUTION
Remove hands from the Tri-lobe tip interface () at switch on and during homing. Also do not touch the touch wheel, because it is calibrated during the start up process.

The pipette flashes the startup screen and performs a full motor homing routine, ensuring the motor is in the run position. “Home” is the base point for the pipette. Homing is the process whereby the pipette motor moves the piston(s) to a sensor position. This position ensures that no liquid remains in the tips. For the Voyager, homing also includes the tip spacing motor. After homing, the tips move to the last position they occupied.

After homing the menu last used is displayed. Press the **Back button** (2) as many times as necessary to return to the Main menu.

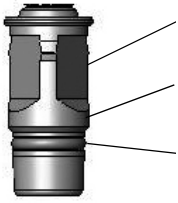
Turn off:
To turn off the pipette, press and hold the **Back button** (2) for 3 seconds.

NOTE
The VIAFLO Electronic Pipettes will dim and turn off automatically after a preset duration of inactivity. This duration is 5 minutes, by default, and configurable with the Toolbox (see “3.3.1 Preferences” on page 16).

4.2 Attaching and removing GripTips

CAUTION
To ensure optimal performance of your VIAFLO Electronic Pipettes always use GripTips which have been designated for the use with the VIAFLO Electronic Pipettes, see “8.2 Consumables” on page 62.

The unique tri-lobe design of the VIAFLO Electronic Pipettes reduces attachment and ejection forces, ensures a perfect fitting to prevent the tips from falling off and to provide a perfect sealing. On a multichannel pipette all tips sit on the same height.



Tri-lobes minimize contact surface and temporarily deforms the tip shaft

Shoulder provides a positive stop to prevent over tightening and all tips seal at the same height

O-ring provides forgiving and robust seal surface for the pipet tip

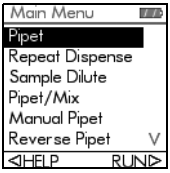
Attach the tips:
When loading tip(s), press the pipette into the appropriate GripTip(s) until you hear and "feel" a click indicating that a seal has been achieved. Once you feel the click, stop applying pressure.

Discard your used tips:
If liquid is in the tips, empty them by pressing the **Purge button** (6). Tips are easily removed by pressing the **Tip ejector** (8).

4.3 Start pipetting

4.3.1 Pipetting

Use the **Touch wheel** (3) to scroll to your desired pipetting mode and press **OK** (4). Selected parameters for the action you are about to perform will be displayed on the Run screen.



Insert the tips into the liquid to be transferred. Press and release the **Run key** (7) to aspirate the volume selected in the first step of your protocol (shown on the Run screen).

To execute subsequent steps, press the **Run key**.

For a detailed description see "5.2 Detailed description of pipetting modes" on page 32. You can change the parameters of your pipetting mode at any time, see the following sections.

4.3.2 Blowout modes

During the last dispense of a program, a blowout is performed. Liquid may be aspirated back into the tips when the pistons move back to the home position, a process called blowin. There are two ways to start the blowin:

- **Automatic blowout**: Pressing (and releasing) the **Run key** starts the dispense with blowout and automatic blowin. You can choose a timed delay between the blowout and the blowin, see "Pipetting - Delayed blowin" under "3.3.1 Preferences" on page 16.
- **Two-step blowout**: Perform a two-step blowout to manually delay the blowin:
  - Press and hold the **Run key** to start dispense with blowout.
  - Remove the tips from the target vessel.
  - Release the **Run key** to start blowin.

4.3.3 Recommendations for pipetting

INTEGRA Biosciences recommends the following techniques for enhancing pipetting results. These techniques are consistent with ISO standard 8655-2.

- Before liquid aspiration, make sure the pipette tip is immersed approximately 2-3 mm into liquid in order to prevent any aspiration of air.
- Pre-wet GripTips. After loading tips onto your pipette, simply aspirate and dispense the desired liquid 2-3 times to coat the inside of the intended pipet tips. Pre-wetting ensures that the liquid and air inside the GripTips are at equal temperature, further enhancing accuracy.
- During incremental dispensing, touch the GripTip(s) against the side of the well plates to prevent any liquid from clinging to the pipette tip. This process is referred to as “touching off.”
- For optimal precision when incrementally dispensing a series of volumes, consider the following techniques:
  - Aspirate approximately 10% more liquid than is required and discard this extra volume to waste or back to the source.
  - Pre dispense the first volume. As the piston motor changes direction from Aspirate to Dispense, volumetric error can be observed. To eliminate this error, simply discard the first volume after the aspiration step. It is possible to preprogram a smaller first volume to be discarded.
  - Program a last-dispense volume that is discarded.
- To properly dispense liquids, ensure that the pipette tip is at a 0-30° angle against the wall of the container or well. After dispense touch tip against wall in order to rid tip of residual liquid.
- Viscous samples should be aspirated and dispensed at the slowest speeds to ensure accurate pipetting.
- Calibrate based on fluid type. All Vision and Voyager Pipettes are tested and calibrated at the factory for use with distilled water at room temperature. It may be necessary to re-calibrate your pipette if the liquid to be used has different physical properties (specific gravity and vapor pressure) than water. Calibration mode can be accessed in the Toolbox menu.
- When using factory calibration, the liquid to be pipetted should not contain specific gravity and vapor pressure that is significantly different from distilled water.
- For pipetting liquids with high vapor pressures (such as alcohol, methanol, or ethanol), use relatively fast pipetting speeds and avoid prolonged pauses after aspiration.

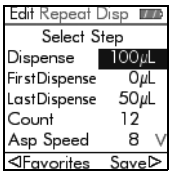
WARNING

Avoid pipetting for extended periods. To minimize the risk of repetitive strain injury, include pauses of several minutes.

4.4 Pipetting options and settings

4.4.1 Edit option

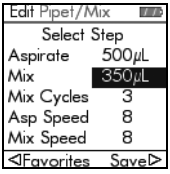
The Edit option is available for each mode. It enables you to access the variables that you can adjust for a pipetting mode. These variables include Speed, Volume, Pace, Count, Mix Cycles, Rows and Direction. Additional steps include First dispense, Last dispense, Air gap, Aspirate speed, Dispense speed, etc.

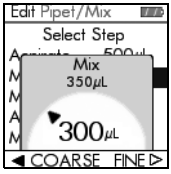


Select a pipetting mode. Then, select Edit on the list of options and press **OK**. A list of associated steps is displayed. For example, if selecting Edit on the Repeat Dispense screen, the modifiable steps associated with Repeat Dispense are displayed.

4.4.2 Volume selection

To change a volume select the Edit option and press **OK**. The adjustable volumes are displayed.





Use the **Touch wheel** to highlight the volume you want to change (Aspirate, Dispense, Mix, or Air Gap).

Press **OK** and a Volume setting “dial” is displayed.

Use the **Touch wheel** to change the volume. Press **OK** to confirm your volume selection and ▷ to save.

NOTE

Use the navigation buttons to change the volume in coarse or fine increments. Select COARSE (with ◁) to change the volume in larger increments. Select FINE (with ▷) to change the volume in smaller increments. The increment sizes vary based on the pipette volume range, as shown under “7.4 Pipette Specifications” on page 58.

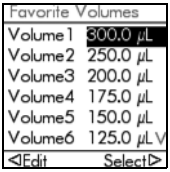
Define and select favorite volumes

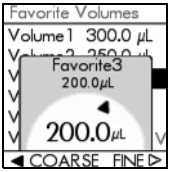
You can define, save, and select up to ten favorite volumes for quick access. These volumes can only be within the pipette volume range.

There are two ways to access and customize the list of favorite volumes:

- When in Pipet mode, use the **Touch wheel** to highlight Favorites and press **OK**.

- When in other modes, select the Edit option and press **OK**. The steps with volumes to be adjusted are displayed. Use the **Touch wheel** to highlight the desired volume and press ◁ Favorites to display the list of favorite volumes.





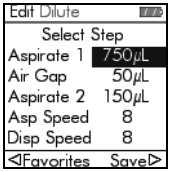
Use the **Touch wheel** to highlight the desired volume and press ▷ Select. Alternatively, modify a volume by pressing ◁ Edit.

Save your setting ▷.

4.4.3 Speed selection

The speed option controls the speed at which liquid is aspirated, dispensed, or mixed in each mode. Speed can be set as a value from 1 (slowest) to 10 (fastest), see also "7.3 Pipetting speed" on page 57.

When in Run mode, use the **Touch wheel** to highlight the Speed option and press **OK**. Select the speed and press **OK** to save your setting.



Speed may be changed in most Edit menus. Scroll to the Speed and press **OK**. Choose the speed, press **OK**, and press ▷ to save your selection.

The speeds selected in each mode (i.e., Pipet, Repeat Dispense, etc.) are stored for that mode only.

Speeds can be set independently for each operation (Aspirate, Dispense, Mix).

NOTE

Viscous samples should be aspirated and dispensed at the slowest speeds to ensure accurate pipetting.

To dispense liquids with low viscosity and high vapor pressure, such as alcohol, use relative fast pipetting speeds and avoid prolonged pauses for aspiration.

4.4.4 Pace

The Pace option sets the time gap between dispenses in repeat pipetting. Pace is used in the Repeat Dispense and Variable Dispense modes. While you press and hold the **Run key**, the pipettor will dispense multiple programmed volumes with the selected pace. Release the **Run key** to stop the paced dispense. Press **Run** to continue dispensing.

Use the **Touch wheel** to select the desired Pace option and press **OK**.
Select the pace, from None, 1 (slowest) to 9 (fastest).
Press **OK** to save your setting.

4.4.5 Count, Mix Cycle and Rows

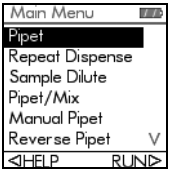
The Count, Mix Cycle, and Rows steps are used in various modes. Each is accessed with the Edit option. Use the **Touch wheel** to highlight the step and press **OK**.

Count sets the number of dispensing steps. Mix Cycle sets the number of mixes. In serial dilution mode, Columns sets the number of columns. A column indicator will notify the number of dilutions performed. Columns (first number) and Mix Cycles (second number) are tracked on the display. Mix Cycles are shown in red when mixing. A green dot on the column number indicates the active program step.

Select a desired value. Press **OK** and then press ▷ to save your setting(s).

4.4.6 Help

The Help information available for each mode describes the mode operation. You can select Help in two ways:



- While in the Main menu, highlight a pipet mode, then press ◁ to select the Help option.
- While in a pipet mode, find the Help option from the list and press **OK**.

4.5 VOYAGER tip spacing

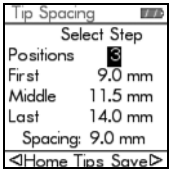
The VOYAGER multichannel pipettes provides you with the ability to vary tip spacing. The tip spacing is expressed in millimeters and represents the distance between adjacent tips. This spacing can be adjusted in either 0.1 mm or 0.25 mm increments depending on the instrument selected.

NOTE

Tip spacing is only displayed if "Tip Spacing" is switched on under Toolbox - Preferences - Main Menu.

4.5.1 Set the number of tip positions and the tip spacing

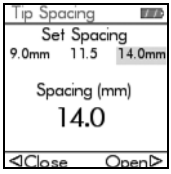
It is possible to set two or three tip spacing values based on labware types to be used.



Use the touch wheel to highlight Tip Spacing on the Main Menu. Press **OK**. The tip spacing menu displays:

- The number of positions the VOYAGER will move between (2 or 3).
- The First, Middle, and Last positions.
- The current spacing that the tips are in.

To change the number of positions to move between, use the touch wheel to scroll to Positions and highlight either 2 or 3.
Press **OK** to toggle between 2 or 3 positions. Press ▷ to Save this selection. If 2 positions are chosen, the Middle position is grayed out.



To change the tip spacing use the touch wheel to scroll to the position to be changed. Press OK and the Tip Spacing menu appears.

Press ◁ (Close) to reduce or ▷ (Open) to increase the tip spacing incrementally. The tips will physically move allowing you to visually match the tip spacing to the target vessels. When the desired tip spacing is achieved, press **OK**.

Make the desired changes to all positions. Upon completion, press ▷ to Save all the selections.

4.5.2 Tip spacing operation

Select the pipetting function of interest (Pipet, Repeat Dispense, Sample Dilute, etc.). Then, the bottom of the screen displays the Tip Spacing that the instrument is set at.

The First, Middle, and Last positions are displayed from left to right.

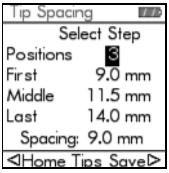
In the adjacent figure, 9.0 mm is the First position, 11.5 mm is the Middle position, and 14.0 mm is the Last position. The current position is highlighted in yellow.

Press ◁ or ▷ to move the tip position to the next value. Pressing or moves the tip spacing selection in a circular loop.

This process can be executed at any step in the program.

4.5.3 Homing the tips

Homing the tips may be necessary if the tip spacing motor was restricted from achieving its proper position. Every time the pipette is turned on, the tip spacing motor homes and returns to the position that it was last in.



You also may home the tip spacing motor as needed.

To do so, press ◁ on the Tip Spacing menu to select the Home Tips option

4.6 Troubleshooting/FAQ

4.6.1 General

Problem	Probable cause	Remedy
Pipette leaks or does not fill with liquid after reassembly.	• O-ring was not properly installed. • During reassembly, the O-ring was damaged.	• Replace the tip fitting O-ring, see 6.3.2.
Leakage.	• Tip incorrectly attached. • Foreign particles between tip and tip cone. • Foreign particles between the piston, the O-ring, and the cylinder. • Damaged red O-ring.	• Attach a new tip. • Clean tip cones. Attach new tips. • Change the red O-ring, see 6.3.2. • If leak persists, contact service.
Dispense results are inaccurate.	• Unsuitable calibration. • Incorrect aspirate and dispense speed.	• Recalibrate with the liquids in question. • Adjust aspiration and dispense speed depending on liquid: - High viscosity liquids may require calibration. - High vapor pressure liquids may require pre-wetting.
No dispensing/ aspirating.	• Piston stuck or not connected. • Motor not running. • O-ring not installed.	• Contact service.
Droplets on the tips.	Temperature of liquid differs from that of air inside the tips.	Pre-wet tips up to 3 times.
	Liquid of low viscosity and high vapor pressure.	Increase dispensing speed.

4.6.2 Electronic

Problem	Probable cause	Remedy
When pressing Run, a “Battery Low” message appears on the Run screen.	• Low battery.	• Re-charge the battery in order to resume pipetting operation. • Plug the power cord into the pipette. Note: It takes 15-30 seconds to store enough voltage to operate the pipette.
Display turns off completely.	• Dead battery.	• Charge the battery with a power cord or charge stand. • Sometimes a dead battery can be saved by unplugging the battery for 5 seconds. Then plug in battery and try to turn on pipette. If it powers up, immediately connect to power supply. If pipette does not turn on after this procedure, replace with new battery.
Spinner response is erratic and uncontrollable.	• A finger was on the spinner when the pipette was turned on. • Sensitivity setting is not set correctly.	• Reset the pipette without touching the spinner during reset. • Adjust the spinner sensitivity with Toolbox, Preferences, Spinner, see 3.3.1.
Displayed characters are scrambled.	• Unknown.	• Reset the pipette.
Battery charging indicator is not pulsing while on the stand. Unit does not turn on when placed on the charging stand.	• Charge stand pins are out of place.	• Check that both charge stand conductor pins are at the same height. • Make sure the charger is plugged in.
Error message is displayed: “Home Found” or “Home Not Found.”	• Indicates too much friction was encountered during operation. • Indicates possible motor failure.	• Reset the pipette. • If problem persists, please contact service for technical assistance.

Problem	Probable cause	Remedy
Motor sounds rough and aspiration is very slow.	• Pipette has been set to the slowest speed.	• Verify the speed setting. The slowest speed setting normally causes the motor to run slowly and louder than normal.

5 Pipetting modes

This chapter describes how to program the VIAFLO Electronic Pipettes in two ways:

- **Function-based pipetting modes**: You can select from ten predefined pipetting modes that you can quickly and easily edit and execute. They are described in the following sections.
- **Custom step-based programming mode**: You can create and store up to twenty multi-stepped pipetting protocols on the pipettor using the five basic functions of “Aspirate, Mix, Dispense, Purge and Prompt” presented in “5.2 Detailed description of pipetting modes” on page 32. The custom programming mode is described in “5.3 Custom step-based programming mode” on page 41

5.1 Overview pipetting modes

The table below provides an overview of the selectable pipetting modes. All modes are accessed from the Main Menu. Use the **Touch wheel** to scroll to your desired pipetting mode.

Pipetting mode	Description
Pipet	Allows liquid transfers when aspirate and dispense volumes are equal.
Repeat Dispense	Allows dispensing multiple aliquots of the same volume without refilling the tips after each dispense for fast microplate filling and processing.
Sample Dilute	Allows aspirating of sample and diluent divided by a defined air gap into one tip, followed by a complete dispense.
Pipet/Mix	Allows multiple mixing by aspiration and dispensing of defined volume for automatic re-suspension of pellets.
Manual Pipet	Allows the operator to control the aspiration and dispensing up to the set volume.
Reverse Pipet	Allows liquid transfers of viscous or high vapor pressure liquids by preventing introduction of any air into the sample. The aspiration volume is higher than the volume to be dispensed.
Variable Dispense	Allows dispensing multiple aliquots of different volumes.
Variable Aspirate	Allows aspirating multiple aliquots of different volumes.
Sample Dilute/Mix	Allows aspirating two liquids separated by an air gap followed by a complete dispense and Mix step.
Serial Dilution	Allows aspirating a transfer volume followed by a mix. Columns and Mix Cycles are tracked on the display.
Custom	Allows to create and store of up to 20 multi-stepped pipetting protocols.

Press the **OK** to access the pipetting mode and to start defining parameters.

5.2 Detailed description of pipetting modes

The VIAFLO Electronic Pipettes offers ten predefined pipetting modes. Most liquid handling protocols can be easily accommodated using one or more of these modes. The options and steps of the different pipetting modes are described in the following subsections.

5.2.1 Pipet mode

Application: Use this mode for quick transfer of liquid to or from microplates.

Options	Steps	Description
Edit	Aspirate	Sets the aspiration volume that is equal to the dispense volume.
Speed		Sets speed for the current pipetting step (1 = low, 10 = fast).
Favorites		Defines up to 10 favorite volumes
Help		Help information is available for each mode.

Operation:

- With the tip(s) in liquid, press and release the **Run key** to aspirate.
- With the tip(s) in the destination plate, press and hold the **Run key** to execute the dispense and perform a two-step blowout, see “4.4.1 Edit option” on page 23.
- When the tips are removed from the target plate, release the **Run key**.

5.2.2 Repeat dispense mode

Application: This mode can be used for fast reagent addition to microplates from one source container. You can dispense a large aspirated volume of liquid in multiple aliquots to multiple targets.

Options	Steps	Description
Edit	Dispense	Sets the volume for repetitive dispensing. The aspirated volume is calculated automatically.
	First Dispense	A pre-dispense volume can be selected independently to improve accuracy and precision. The dispense is discarded.
	Last Dispense	A last-dispense volume can be selected independently to improve accuracy and precision. The dispense is discarded.
	Count	The maximum number of dispenses possible (count) is calculated automatically. This count may be reduced to the desired number.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Disp. Speed	Sets speed uniquely for dispensing (1 = low, 10 = fast).
Speed		Sets speed of the current pipetting step.
Pace		Sets the time duration between dispenses, if keeping **Run key** pressed.
Help		Help information is available for each mode.

Operation:

- With the tip(s) in liquid, press and release the **Run key** to initiate the aspirate step.
- Press and release the **Run key** for every dispense. Alternatively, press and hold **Run** to execute paced dispenses. The dispense number is shown on the display.
- The pipettor will stop paced dispenses when it reaches the Last Dispense. This aliquot contains the accumulated error from all prior dispenses. You can choose to use this Last Dispense or discard it. During the Last dispense, press and hold the **Run key** to perform a two-step blowout.

5.2.3 Sample dilute mode

Application: Accomplish accurate sample dilutions by using diluent to “chase” small sample volumes from the pipet tips. An air gap keeps liquid separated in the tips and helps to minimize carryover of diluent when aspirating the sample.

Options	Steps	Description
Edit	Aspirate 1	Sets the volume of the diluent aspirated first in the tip.
	Air Gap	Sets the volume of the air gap to keep both liquids separated.
	Aspirate 2	Sets the volume of the sample in the tip.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Disp. Speed	Sets speed uniquely for dispensing (1 = low, 10 = fast).
Speed		Sets speed of the current pipetting step.
Help		Help information is available for each mode.

Operation:

- Press and release the **Run key** to initiate each aspiration (remove tips from liquid for air-gap aspiration).
- Press and hold the **Run key** to perform a two-step blowout. The entire tip contents will be dispensed together.

5.2.4 Pipet/mix mode

Application: Use this mode when mixing is required immediately after transfer of liquid. This mode saves a programming step by incorporating the mix option after dispensing.

Options	Steps	Description
Edit	Aspirate	Sets the aspiration volume that is equal to the dispense volume.
	Mix	Sets the mixing volume after dispensing.
	Mix Cycles	Sets the number of mix cycles.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Mix Speed	Sets speed uniquely for mixing (1 = low, 10 = fast).
Speed		Sets speed of the current pipetting step.
Help		Help information is available for each mode.

Operation:

- Press and release the **Run key** to initiate the aspiration.
- Press and release the **Run key** to dispense. Mixing occurs automatically after the dispense step.
- Upon completing the desired number of mixes, a blowout is initiated automatically prompting you to remove the tip(s) from the liquid and press **Run** to complete the blowout.

5.2.5 Manual pipet mode

Application: This mode can be used when the aspiration volume is not defined or unknown. You have control over the aspiration and dispense steps and can view the display to confirm how much liquid has been aspirated or dispensed. Manual control over the dispense steps is perfect for performing Titrations or for controlling the loading of samples in gel lanes.

Options	Steps	Description
Edit	Aspirate	Sets the aspiration or dispensing volume. Toggle between Aspirate and Dispense using the Direction menu option.
Speed		Sets speed of the current pipetting step (1 = low, 10 = fast).
Direction		Changes the direction of pipetting between aspiration and dispensing.
Favorites		Defines up to 10 favorite volumes
Help		Help information is available for each mode.

Operation:

- When aspirating, the motor will stop when you release the **Run key** or when the programmed aspirate volume is reached.
- You can change pipetting direction at any time even if aspiration volume is not reached. Change the direction of pipetting by pressing **OK** on the Direction option. The notation on the display changes between △ (Aspirate) and ▽ (Dispense).
- Titrations can be performed by dispensing in this mode. The volume remaining in the tip(s) is always actively displayed.

NOTE

Use slower pipetting speeds (1-5) for better control and resolution.

5.2.6 Reverse pipet mode

Application: Use this mode when performing reagent addition where a blowout is not desired when dispensing, e.g. for solutions with high viscosity or tendency to foam. The dispense method used in this mode, prevents introduction of any air into the sample.

Options	Steps	Description
Edit	Aspirate	Sets the aspiration and dispense volume.
	Last Dispense	Sets the volume to leave in the tip until final blowout.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Disp. Speed	Sets speed uniquely for dispensing (1 = low, 10 = fast).
Speed		Sets speed of the current pipetting step.
Help		Help information is available for each mode.

Operation:

- Press and release the **Run key** to initiate the aspiration. The total volume aspirated is the sum of desired dispense volume and last dispense volume.
- Depending on whether you press and release or hold the **Run key** at the start of a dispense step, you can repeat the aspirate and dispense process:
  - **Press and hold the Run key**: Dispense the programmed volume without a blowout, keeping the Last Dispense volume in the tip. Upon release of the **Run key**, you can aspirate the programmed volume again and repeat the dispense process as many times as needed.
  - **Press and release the Run key**: Finish the aspirate and dispense process. The programmed volume will be dispensed. Last Dispense is the next active step.
- To purge the Last Dispense volume with a two-step blowout, press and hold the **Run key**.

5.2.7 Variable dispense mode

Application: Use this mode when differing dispense volumes are required. This mode could be used to quickly set up a dilution series in plates or for feeding similar samples to different assay plates where different sample volumes are needed.

Options	Steps	Description
Edit	Count	Sets the total number of dispensing steps.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Disp. Speed	Sets speed uniquely for dispensing (1 = low, 10 = fast).
	Dispense 1...5	Sets up to 5 different volumes for repeated dispensing. The total volume is automatically calculated.
Speed		Sets speed of the current pipetting step.
Pace		Sets the time interval between dispenses in repeat pipetting (1 = long, 9 = short).
Help		Help information is available for each mode.

Operation:

- Press and release the **Run key** to initiate the aspiration of total volume.
- Press and release the **Run key** to initiate each subsequent dispense. The pipettor stops and beeps when ready for the Last Dispense step, i.e. to purge the calculated waste volume amount.
- Alternatively, press and hold the **Run key** to execute paced dispenses. The pipettor stops paced dispensing when it reaches the Last Dispense. This aliquot contains the accumulated error from all prior dispenses. You can choose to use this Last Dispense or discard it.
- During the Last dispense, press and hold the **Run key** to perform a two-step blowout.

5.2.8 Variable aspirate mode

Application: This mode can be used for a variety of collection applications where the aspiration volume is well known. This mode is also suited for supernatant collection in microplates.

Options	Steps	Description
Edit	Count	Sets the total number of aspirating steps.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Disp. Speed	Sets speed uniquely for dispensing (1 = low, 10 = fast).
	Aspirate 1...5	Sets up to 5 different volumes used for sequentially aspirating (in the same tip) followed by a single dispense.
Speed		Sets speed of the current pipetting step.
Help		Help information is available for each mode.

Operation:

- With the tip(s) in liquid, press and release the **Run key** to initiate the first aspiration volume. Again in liquid, press and release the **Run key** to initiate the second aspiration volume, etc.
- Press and hold the **Run key** to start Dispense and perform a two-step blowout.

5.2.9 Sample dilute/mix mode

Application: Use this mode to perform sample dilutions where mixing of sample and diluent is required. This mode could also be used to introduce and mix diluent and sample to the first column of a serial dilution plate.

Options	Steps	Description
Edit	Aspirate 1	Sets the volume of the diluent aspirated first in the tip.
	Air Gap	Sets the volume of the air gap to keep both liquids separated.
	Aspirate 2	Sets the volume of the sample in the tip.
	Mix	Sets the mixing volume after dispensing.
	Mix Cycles	Sets the number of mix cycles.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Mix Speed	Sets speed uniquely for mixing (1 = low, 10 = fast).
Speed		Sets speed of the current pipetting step.
Help		Help information is available for each mode.

Operation:

- With the tip(s) in liquid, press and release the **Run key** to initiate aspiration 1. With the tip(s) out of the liquid, press and release the **Run key** for the Air Gap. Again in liquid, press and release the **Run key** to initiate aspiration 2.
- Press and release the **Run key** to dispense the entire tip contents and begin the mixing routine. Upon completing the desired number of mixes, a blowout occurs automatically. Remove tips from liquid and press and release the **Run key** to complete the blowout.

5.2.10 Serial dilution mode

Application: Use this mode to perform serial dilutions. The Serial Dilution mode enables aspiration of a specific volume followed by a mix sequence and ending with the original aspiration volume in the tips.

Options	Steps	Description
Edit	Aspirate	Sets the aspiration volume that is identical to the dispense volume.
	Mix	Sets the mixing volume after dispensing.
	Mix Cycles	Sets the number of mix cycles.
	Columns	Sets the number of columns. A column indicator will notify the number of dilutions performed.
	Asp. Speed	Sets speed uniquely for aspirating (1 = low, 10 = fast).
	Mix Speed	Sets speed uniquely for mixing (1 = low, 10 = fast).
	Disp. Speed	Sets speed uniquely for dispensing (1 = low, 10 = fast).
Speed		Sets speed of the current pipetting step.
Help		Help information is available for each mode.

Operation:

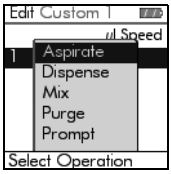
- With the tip(s) in liquid, press and release the **Run key** to initiate the aspiration of the reagent.
- Submerge the GripTips in the sample located in the first column. Press the **Run key** to activate the dispense. The mix sequence will automatically initiate following the dispense. After the mix steps, position the GripTips in the second column and press the **Run key** to start the second dilution.
- Columns (first number) and Mix Cycles (second number) are tracked on the display. Mix Cycles are shown in red when mixing. A green dot on the column number indicates the active program step.

5.3 Custom step-based programming mode

Application: Use the Custom program mode to create personalized pipetting tasks. Up to twenty programs can be stored.

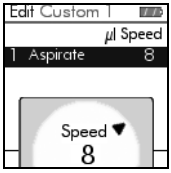
5.3.1 Create a custom program

Select “Custom” to create a personalized protocol. Programs can contain up to 98 individual steps based upon five basic operations: Aspirate, Mix, Dispense, Purge, Prompt and Tip spacing. A prompt is any message that is displayed during the program.



Press ▷ to create a new program. The program is assigned a name automatically (e. g. Custom 1). The custom programs can later be renamed with alphanumeric characters.
A Custom program must begin with an Aspirate, Mix, Prompt or Tip spacing.

Use the **Touch wheel** to select the first step and press **OK**, e.g. Aspirate.



Set the volume value and press **OK**.

Set the speed for that step and press **OK**.

When starting with an “Aspirate” step followed by a “Mix” step, the tips contain the aspirate volume after completing the last mix cycle. When starting with a “Mix” step, the tips are emptied upon completion of the last mixing cycle. A “Purge” step is automatically integrated at the end of a program if the last programming step leaves liquid in the tips.

Next, you have the options of adding a new step, editing a step, or deleting a step.

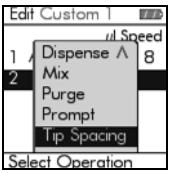
Select “New step” and press **OK**. Use the **Touch wheel** to select the position where the new step should be inserted, press **OK** and select an operation.

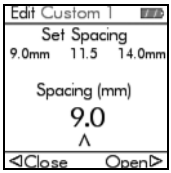
To define a Prompt use the **Touch wheel** to select one of 3 lines and press **OK**. Highlight a character that you want to use and press **OK**. You can press ◁ to Delete the last character entered. After you enter the desired text, press ▷ to Save.

To save and store a Custom program, press ▷.

5.3.2 Program tip adjustments in a custom program

From the Main Menu, select Custom and press ◁ to create a new program.

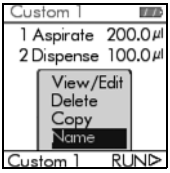




Scroll down to highlight Tip Spacing and press **OK**.

Either select one of the three favorite Tip Spacings by using the touch wheel or press ◁ and ▷ to set the desired Tip spacing.

5.3.3 Modify existing programs



At the Custom program display, use the **Touch wheel** to highlight an existing program. Press the OK button to select it. Select an option (View/Edit, Delete, Copy, Name) to modify the program.

Press Back to return to the list of Custom programs. To run the program, press ▷.

5.3.4 Example of custom mode

Application: The task is to combine 2 different liquids in a 96 well plate for a kinetic assay and then mixing it to achieve a homogenous solution. The custom program would be set up as followed:

Program step	**Action**
1. Aspirate liquid 1: 160 µl (e.g. diluent)	With tips in liquid 1 press **Run key**.
2. Aspirate air: 20 µl	Move tips out of liquid and press **Run key.**
3. Aspirate liquid 2: 50 µl (e.g. reagent)	With the tips in liquid 2 press **Run key.**
4. Dispense: 230 µl	Press and hold **Run key** until liquid is dispensed and tips are removed from the liquid (two-step blowout).
5. Mix 3x: 200 µl	Press **Run key**.

Purge (does not need to be programmed). The residual liquid is dispensed into the waste container. Press and hold **Run key** until liquid is purged and tips are removed from the liquid (two-step blowout). For a detailed description see “4.4.1 Edit option” on page 23.

6 Maintenance

WARNING
Always turn off power and disconnect the VIAFLO Electronic Pipettes from the mains when carrying out maintenance work.

6.1 Cleaning

The materials used on the exterior of the VIAFLO Electronic Pipettes support regular cleaning intervals. Clean the external components with a lint-free cloth lightly soaked with mild soap solution in distilled water or with a 70 % dilution of Isopropyl or Ethanol. Never use acetone or other solvents.

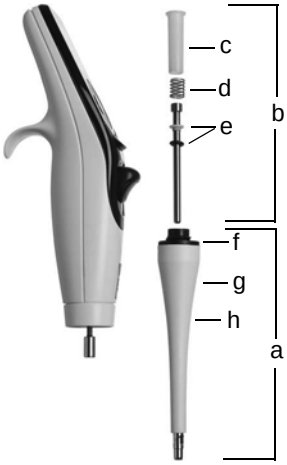
WARNING
Do not immerse the entire pipette into a cleaning solution or spray cleaning solution directly onto the exterior body of the pipette as this can potentially damage internal electronics.
If liquid ever enters the internals of VIAFLO Electronic Pipettes, please contact your service technician.

Follow the instructions below for disassembly necessary for trouble shooting and autoclaving.

6.1.1 Assembly of single channel pipettes

Disassembly
Disassemble the lower portion of the single channel Vision pipette as follows:

1) Ensure the pipette is in the “home” or down position (at the end of a pipetting cycle).
2) Turn off power and unplug the power supply.
3) Unscrew clockwise to remove the Cylinder Assembly (a) from the pipette. Slide the Cylinder Assembly down from the pipette body. This will expose the Piston Assembly (b)



4) Slide the following components from the Piston:
   - O-Ring (black) and Seal (white) Assembly (e)
   - Seal Retainer Spring (d)
   - Seal Retainer (c)

   Set these components aside or place them in an autoclave pouch.
5) Separate the Piston Assembly (b) from the upper portion of the pipette. The Piston is held in place by a small magnet.
6) With the Cylinder Assembly in hand, turn counterclockwise to remove the black Sealing Ring (f) that holds the Ejector Sleeve (h) in place.
7) Remove the Ejector Sleeve from the Cylinder Assembly.
8) Remove the Ejector Sleeve Spring (inside, g).
9) Set all components aside or place them in an autoclave pouch.

Reassembly

Before reassembling the pipette, check each component for lint or dust particles. It is recommended to replace the O-Ring (black) and Seal (white) Assembly (e) before reassembly. The O-Ring and Seal slide on/off the piston and can be replaced easily.

1) Lightly lubricate the piston and seals (see "6.3.3 Lubrication" on page 49). Position the Piston (b) at the small magnet to connect the Piston to the upper portion of the pipette.
2) Slide the Seal Retainer (c) onto the Piston and up into the pipette.The end of the Seal Retainer that has an extended edge (lip) should be closest to the upper portion of the pipette (over the magnet).
3) Slide the Seal Retainer Spring (d) onto the Piston. It will rest against the Seal Retainer.
4) Slide the lightly lubricated Seal (white) and O-Ring (black) Assembly (c) onto the Piston. The white Seal will be closest to the Seal Retainer Spring. Be sure the black O-Ring is securely in place on the white Seal.
5) With the Ejector Sleeve (h) in hand, slide the Ejector Sleeve Spring (g) onto the top of the Sleeve.
6) Slide the Ejector Sleeve into the Cylinder Assembly (a).
7) Position the black Sealing Ring (f) over the Ejector Sleeve (h) at the top of the Cylinder Assembly. Turn clockwise until the Sealing Ring snaps into place and secures the Ejector Sleeve in the Cylinder Assembly.
8) Slide the Cylinder Assembly over the Piston.

9) Screw counterclockwise to attach the Cylinder Assembly to the body of the pipette.

Check the pipette performance after reassembly.

6.1.2 Assembly of multichannel fixed spacing pipettes

Before reassembling the pipette, check each component for lint or dust particles. It is recommended to replace the O-Rings, see "6.3.2 Changing O-rings of tip fittings" on page 48.

Step 1
Disassembly:
Rotate counter-clockwise to remove the lower housing.

Reassembly:
Rotate clockwise until a stop is felt; then back off to align.

Step 2
Disassembly:
Gently pull to separate the upper and lower housing to expose the ball and socket.

Reassembly:
Gently push together the upper and lower assembly.

Step 3
Disassembly:
Disengage the ball and socket to separate the parts.

Reassembly:
Reengage the ball and socket to reconnect.

Step 4
Disassembly:
Remove the aluminum ring from the upper assembly.

Reassembly:
Slide the aluminum ring back onto the upper assembly. (The flanged surface goes into the upper assembly.)

Step 5
Disassembly:
Remove the chrome ring.

Reassembly:
Slide the chrome ring back into place (with the stepped surface up).

Step 6
Disassembly:
Carefully remove the volume label to expose the screw. (Save the label for reassembly.)

Reassembly:
Reattach the volume label where previously removed.

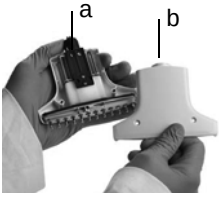
Step 7
Disassembly:
Remove the two small screws.

Reassembly:
Replace the two small screws on the front housing where the volume label had been removed (if not completed in the previous reassembly step).

Step 8
Disassembly:

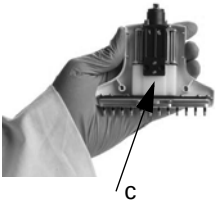
Remove the two screws from the rear housing.

Reassembly:
Replace the small screws from the rear housing.



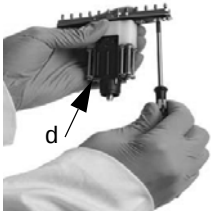
Step 9
Disassembly:
Separate the housing from the cylinder/piston assembly.

Reassembly:
Place the rear housing (b) back onto the front housing/piston assembly (a).



Step 10
Disassembly:
Remove the foam tape from the front and rear (carefully note the position of the tape and save for reassembly in exactly the same position, c).

Reassembly:
Reattach the foam tape to the front and rear housing where it was removed previously. Place the piston assembly in the front housing, registering on the two bosses. Turn over and replace the two small screws (do not over tighten).



Step 11
Disassembly:
Unscrew the manifold screw one full turn (2 to 6 screws depending on volume size) and pull the piston plate (d) to the up position.

Reassembly:
Be sure the piston plate is in the up position and tighten the manifold screws exactly one full turn (you should feel light pressure on the screws).

6.2 Sterilization

If the surface of the VIAFLO Electronic Pipettes have been in contact with biohazardous material, they must be decontaminated in accordance to good laboratory practice. Whisk and wipe the surface with a lint-free cloth, lightly soaked e. g. with the following disinfectants:

- Ethanol 70 %
- Microcide SQ 1:64
- Glutaraldehyde solution 4%
- Virkon solution 1-3%

Follow the instructions provided with the reagents.

It is not recommended to autoclave the VIAFLO pipettes except for decontamination before sending them for service and repair. Only the lower assembly of the VIAFLO single and multi channel pipettes can be autoclaved.

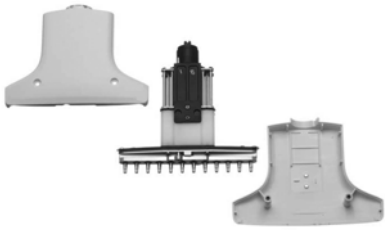
WARNING
A service is required after autoclaving the VIAFLO pipettes!
Do not autoclave the entire unit. The extreme heat can damage the display and other electrical components. VOYAGER pipettes can NOT be autoclaved, they might be damaged!
As-found calibration (measurement report, indicating "before" data) is not possible after autoclaving!

6.2.1 Autoclaving the disassembled components

Place the disassembled components (see 6.1) to steam autoclave in an autoclave pouch:

Single channel

Multichannel fixed spacing



You may autoclave the components at 121°C, 1 bar overpressure for 20 minutes.

After autoclaving send the pipette for service.

6.3 Servicing

6.3.1 Shipping to INTEGRA Biosciences

For any service or repairs, purchaser is responsible for initial shipping cost of product. INTEGRA Biosciences is responsible for return shipping costs when product is within the warranty period. Use original packaging when shipping, if possible.

WARNING

If working with infectious materials, e. g. human pathogens, VIAFLO pipettes need to be decontaminated before sending them to service and the declaration on the absence of health hazards must be signed. This is necessary to protect service personnel.

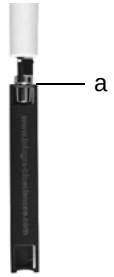
Please call, fax, or use INTEGRA Biosciences's online RMA page for a return authorization number and Decontamination Document before returning any product.

6.3.2 Changing O-rings of tip fittings

300 µl, 1250 µl and 5000 µl VIAFLO pipettes feature tip fittings with red O-rings. This O-ring is used to seal against the inside wall of GripTips and serve to reduce the required tip loading and ejecting forces.

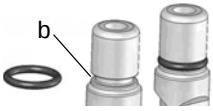
O-rings are made of durable silicone. If necessary, e.g. in case of a leakage due to damaged O-ring, you can replace these O-rings. A set of spare O-rings and an O-ring removal tool are included with the large volume multi-channel pipettes and can be ordered separately, see "8 Accessories" on page 62.

WARNING
Avoid mechanical damage of the tip fittings.



For 300 µl or 1250 µl pipettes choose the side of the O-ring removal tool corresponding to the size of the pipetting head (300 µl or 1250 µl). Slide the O-Ring removal tool sidewards onto the tip fitting until the O-ring (a) builds a loop. Cut the O-ring with a fine scissor and remove it.

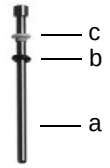
For 5000 µl pipettes use forceps to remove the O-ring.



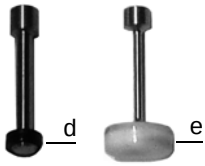
Slide a new O-ring over the tip fitting (b).

6.3.3 Lubrication

The internal seals and O-rings are subject of very slow wear out. An undamaged thin lubricant film is important to keep the seals tight. The lubricant recommended depends on the VIAFLO pipette size, see "8.2 Consumables" on page 62:



Single channel 12.5 µl, 125 µl, 300 µl:
Use Fluorocarbon Gel (#100-00136-50) to lightly lubricate the piston (a) without components slided onto. Put a drop of grease onto your fingers, lubricate the black O-ring (b) at slide it over the white seal (c).



Single channel 1250 µl and 5000 µl:
Use the Super-O-Lupe (#100-00135-50) to lightly lubricate the outer ring of the Cup Seals (d, e). For the 5000 µl pipette also lubricate the bottom of the white Cup Seal.

6.4 Calibration

The VIAFLO Pipettes are factory tested and calibrated under environmentally controlled conditions using a gravimetric procedure in accordance with ISO 8655 standards. For the accuracy and precision specifications, see “7.4 Pipette Specifications” on page 58.

Several conditions that would require recalibration of your pipette include a desire to:
- Optimize your pipette’s accuracy at a specific volume using aqueous liquid.
- Enable accurate displacement of non-aqueous based liquids (with different specific gravities than water).
- Enhance accuracy when pipetting heated or cooled liquids.

6.4.1 Materials

- Precision balance with 0.01 mg readability (Ohaus AP250D)
- ASTM Class 2 or OIML E2 test weights
- Evaporation trap for balance
- Weighing vessel (optimally the height-to-diameter ratio is at least 3:1)
- Measurement equipment for temperature, humidity and atmospheric pressure (Testo 435-2 Professional)
- Distilled water (Grade 3 according to ISO 3696)
- New non-filtered GripTips matching the pipette volume (see section 6.3)
- Single channel pipettor charging stand
- 2 beakers with distilled water
  - 1 for pre-wetting
  - 1 for calibration procedure

6.4.2 Definitions

Blow-out: Discharges any residual liquid from the tip.
Blow-in: After the blow-out, the piston moves back into home position. This causes a slight intake of air (or liquid if tips remain in the liquid).
Two step blow-out: To avoid an early blow-in, keep the run button pressed while dispensing, remove the tips from liquid and then release the run button.
Pre-wet: The action of pre-coating the inside of the liquid contacting parts with a thin film of the same liquid. Additionally, it equilibrates humidity of the air space inside tip and the pipette.
Touch off: Touching the pipette tip against the surface liquid or side of well-plate to release any sample liquids that might be on the end of the pipettor tip.

6.4.3 Test Conditions and Environment

Tests and calibrations should be performed in conditions and environment according to ISO 8655-6 standard.

- Temperature needs to be between 18–25 °C and remain constant (±0.5 °C) throughout the calibration.
- Optimal relative humidity of the environment is >50% and around the dispensing position 80%.
- GripTips, pipettes and distilled water need to be in the calibration laboratory for at least 2 hours prior to calibration to reach temperature equilibrium with the environment.
- The balance must be validated using reference weights before and after a measuring series. A low and high volume weight should be used. E.g.:
  100 g (Mettler Toledo, #11119250)
  10 g (Mettler Toledo, #11119220)
  1 g (Mettler Toledo, #11119190)
  10 mg (Mettler Toledo, #11119130)

CAUTION

Always use new, pre-wetted GripTips for leak test and calibration.

6.4.4 Pre-wetting of tips

Pre-wet new GripTips three times prior to starting tests and calibrations. This is required every time a tip is changed.

1) Attach a new unused GripTip which correspond to the volume range of the pipette directly from the rack without touching the tip by hand.
2) Use a separate waste container for pre-wet dispenses.
3) In the Pipet mode, program the pipette to aspirate full volume. Set aspirating speed at 6. Aspirate by pressing the **Run key**.
4) Dispense: Keep the **Run key** pressed until all liquid is expelled, remove the tip from the liquid and then release the **Run key** to perform a two-step blowout, see “4.3.2 Blowout modes” on page 21.

6.4.5 Leak test

It is recommended to perform a leak test every 3 months or when errors occur.

1) Prewet tips as described above.
2) In the Pipet/Mix mode, program the VIAFLO Electronic Pipettes to aspirate full volume at speed 6 and mix at full volume. Set to mix to 6 cycles and set mixing speed at 6.
3) Aspirate full volume and verify liquid level is not decreasing during 2-3 seconds while GripTips are still in distilled water.
4) Remove the GripTips from the liquid and hold the pipette at a 30° angle. Wait for 20 seconds.
   a) Observe whether liquid droplets are forming at the end of the GripTips.
   b) On a multichannel pipette, verify liquid level is even across all channels.
5) Immerse GripTips approx. 2 mm into distilled water and press **Run key** to start mix cycle.
   a) Observe whether air bubbles are forming when dispensing.
   b) On a multichannel pipette, check whether the levels stay approximately on the same level across all channels.
   c) At the end of a last dispense it is normal to have air bubbles because a blow-out is performed.

For a VOYAGER pipette, carry out steps 1-5 for closed and open tip positions (min. and max. tip spacing).

Signs indicating a leak

1) During the mix cycle in the leak test, the liquid level of 1 channel is decreasing.

NOTE

A decreasing liquid level at aspiration could be an indication of a slow leak. Performing a retest at 10 mixes may help identify a slow leak.

2) Liquid is left in a tip after the last dispense during the leak test.
3) One or more channels show air bubbles during the mix cycle in the leak test.
4) Droplets are forming when holding the pipette in the air for 20 seconds, even if a pre-wet was performed.
5) The liquid levels are not equal on all channels after aspiration.

If the pipette is leaking, change O-rings (see 6.3.2) and lubricate pistons (see 6.3.3) or contact your service technician.

6.4.6 Obtaining the Actual Volume

INTEGRA certifies the pipettes at 10%, 50% and 100% of the nominal value. For each volume 5 measurements are taken from all channels.

General

a) Always use new, unused GripTips, also when changing the test volume (e.g. from 125 µl to 12.5 µl).
b) Always pre-wet (section 6.4.4) when using a new GripTip. For a low volume measurement, first select the maximum volume for the pre-wet and then change to the volume to be measured.
c) After dispensing, perform a touch off to make sure no liquid remains on the tip.

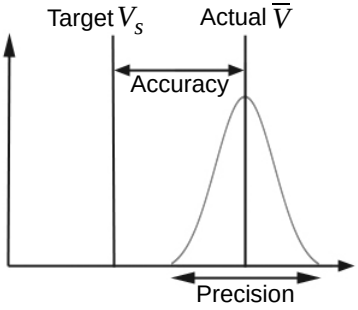
Gravimetric testing

1) Write down the ambient temperature and air pressure.
2) Perform a pre-wet, see 6.4.4.
3) In the Pipet mode program the high test volume and set pipettor to dispense at speed 8 for 125 µl and 300 µl and speed 6 for 12.5 µl, 1250 µl and 5000 µl.
4) The first and second dispense to the balance should not be recorded. After each dispense re-tare the balance.
5) Aspirate the Target volume of water keeping the pipette in a vertical to 30-degree position while immersing the pipet tip 2–3 mm below the surface of the water. When withdrawing the tip from the liquid, gently wipe the tip against the side wall of the vessel to remove any liquid from the outside of the pipet tip.
6) Start the first measurement. Always pipet directly into the liquid of the weigh container on the balance. During dispense, keep the run button pressed until the pipette is removed again from the weigh vessel to perform a 2-step blowout. Record the weight from the balance.
7) After completing the 5 high volume measurements, continue with the mid and low test measurements by repeating steps 2-6.

6.4.7 Calculation of accuracy and precision

Accuracy
The ability of a pipettor to aspirate or dispense the exact volume desired. It indicates the proximity of measurement results to the true value. Accuracy is also know as systematic error and as the name indicates, can be corrected/calibrated.

Precision, Coefficient of variation (CV)
Precision indicates the repeatability or reproducibility of the measurement. It is also called random error and is therefore an unpredictable error, which can not be corrected/ calibrated.



The following symbols are used throughout this text:

V_s = Selected test or target Volume
m_i = Measured Liquid Weight (g)
Z = Z factor, see 7.5
$\overline{V}$ = Actual mean Volume (ml or µl)
n = Number of measurements

Conversion of the mass to volume
The values obtained by balance readings are in grams. These values need to be converted to micro liters using the Z correction factor. It takes into account the water density and air buoyancy during weighing at the corresponding test temperature. To determine the correct Z factor, find the intersection between temperature and air pressure in Table 7.5. Round up temperature and air pressure values.

Add together the weights m_i (e.g. n=5) obtained in 6.4.6, divide the sum by n to calculate the mean weight and then multiply it by the corresponding Z factor.

Mean volume $\overline{V}$ (in milliliters or micro liters), which is the Actual Volume:

$$\overline{V} = \left(\frac{1}{n} \times \sum_{i=1}^{n} V_i \right) \times Z$$

Calculation of systematic error (Accuracy)
The systematic error e_s can be calculated using the following equation with V_s being the selected test volume:

$$e_s = \overline{V} \times V_s$$

or in percent:

$$e_s = \frac{100 \times (\bar{V} \times V_s)}{V_s}$$

Calculation of random error (Precision %)

To calculate the random error as the repeatability standard deviation s_r, use the following equation:

$$s_r = \sqrt{\frac{\sum_{i=1}^{n} (V_i - \bar{V})^2}{n-1}}$$

The random error can also be expressed as a percentage, by the coefficient of variation CV, using equation:

$$CV = 100 \times \frac{s_r}{\bar{V}}$$

If the pipette is properly calibrated, the Target volume V_s should equal the Actual volume $\bar{V}$ within the accuracy specifications of the pipette.

6.4.8 Adjusting VIAFLO Electronic Pipettes

Compare the calculated accuracy and precision values with the corresponding pipette specifications given in section 7.4.

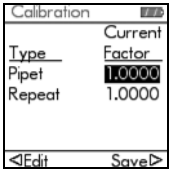
In case a VIAFLO Electronic pipette has not met the calibration specifications it needs to be adjusted. This can easily be corrected by the pipettor's software.

There are two modes for calibration of VIAFLO Pipettes, "Pipette Calibration Mode", for neat transfers and "Repeat Calibration Mode" for pipetting aliquots.

The industry standard is to test and present specifications using neat transfers. This is aspirating and dispensing the same volume. The "pipette" factor of the pipette's software determines the performance of neat transfers and is therefore adjusted in case a pipette performs out of specifications. Adjusting a pipette in "Repeat Calibration Mode" is normally not required and is not described in this document.

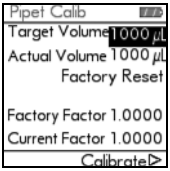
The following example is for a 125 µl pipette.

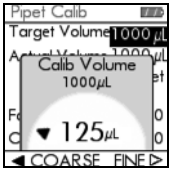
Select Toolbox on the Main Menu. Select the Calibration & Service and then the Calibration option. Press **OK**.



Highlight the Pipet Current Factor.

Press ◁ to edit the volume.



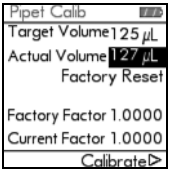


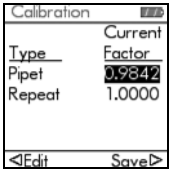
Highlight Target Volume (V_t) on the Pipet Calib menu. Press **OK**.

Use the touch wheel to enter the Target Volume. Always use the nominal volume (100%) to adjust a VIAFLO pipette (125 µl in this example). Press **OK** to save your selection.

Move the cursor to the Actual Volume ($\overline{V}$).

Use the touch wheel to enter the Actual Volume. The actual volume is the mean weight corrected by the Z factor, resulting in $\overline{V}$, the mean volume in micro liters (see section 6.4.6, 127 µl in this example). Press **OK** to save your selection.





Press ▷ to Calibrate and apply the factor universally to all future Pipet mode motor movements. This will correct for any measured inaccuracies observed in the validation process. The Old and New Factors are displayed. You are returned to the Calibration menu. Press ▷ to Save your settings.

A message will indicate that the pipette recalibration is complete. To check and revalidate, repeat Steps 1–7 in Section 6.4.6.

In case a calibration reminder was set, it can be reset in the Calibration Reminder menu for either time and/or cycles.

NOTE

In case an error message appears when setting the new correction factor (step 8), follow these steps:

a) *Select the Repeat factor in the calibration menu and enter the target and actual (measured) volume.*
b) Press calibrate.
c) Then select Pipet factor and enter target and actual volume.
d) Press calibrate.
e) Both factors should be the same now.
f) Press Save.

6.5 Equipment disposal

The VIAFLO Electronic Pipettes must not be disposed of with unsorted municipal waste.

Dispose of the VIAFLO Electronic Pipettes in accordance with the laws and regulations in your area governing disposal of devices.

7 Technical Data

7.1 Environmental conditions

	Operation
Temperature range	5–40 °C
Humidity range	< 85 % RH non-condensing
Altitude range	< 2000 m

7.2 Specification of the device

Power Requirements	100–240 VAC, 50/60 Hz
Universal Power supply	Input: 100–240V, 50/60Hz Output: 6V, 0–1.75A DC (set at 0.5 A)
Pipetting channels	single, 4, 6, 8, 12 or 16
Pipetting speed	10 steps
Pipetting technology	Air displacement
User interface	Touch wheel, color display

7.3 Pipetting speed

	Pipette Size Pipetting speed (micro liters per second)				
Speed	**12.5 µl**	**125 µl**	**300 µl**	**1250 µl**	**5000 µl**
1	0.44	4.48	11.26	45.16	174.40
2	0.88	8.86	22.29	89.36	345.07
3	2.12	21.38	53.79	215.69	832.93
4	2.56	25.83	65.00	260.63	1006.46
5	3.00	30.24	76.10	305.12	1178.29
6	3.97	40.00	100.65	403.55	1558.39
7	5.35	53.91	135.65	543.91	2100.43
8	6.83	68.89	173.33	695.00	2683.89
9	7.69	77.50	195.00	781.88	3019.38
10	8.79	88.57	222.86	893.57	3450.71

7.4 Pipette Specifications

VIAFLO Electronic Pipettes							ISO8655 limits	
Chan-nel	Part No.	Volume Range (µl)	Volume Incre-ments (µl)	Test Volume (µl)	Accuracy (±%)	Precision (≤%)	Accuracy (±%)	Precision (≤%)
1	4011	**0.5–12.5**	0.01	1.25	5.00	4.00	16.00	8.00
				6.25	1.50	0.80	3.20	1.60
				12.5	1.00	0.40	1.60	0.80
1	4012	**5.0–125.0**	0.1	12.5	3.00	1.00	12.80	4.80
				62.5	1.20	0.40	2.56	0.96
				125	0.60	0.20	1.28	0.48
1	4013	**10.0–300.0**	0.5	30	2.00	0.60	13.33	5.00
				150	1.00	0.30	2.67	1.00
				300	0.60	0.15	1.33	0.50
1	4014	**50.0–1250.0**	1	125	3.00	0.60	12.80	4.80
				625	1.00	0.30	2.56	0.96
				1250	0.60	0.17	1.28	0.48
1	4015	**100.0–5000.0**	5	500	3.00	0.75	8.00	3.00
				2500	1.20	0.30	1.60	0.60
				5000	0.60	0.15	0.80	0.30
8	4021	**0.5–12.5**	0.01	1.25	10.00	6.00	32.00	16.00
				6.25	4.00	1.60	6.40	3.20
				12.5	2.00	0.80	3.20	1.60
8	4022	**5.0–125.0**	0.1	12.5	3.75	1.50	25.60	9.60
				62.5	2.50	0.70	5.12	1.92
				125	1.60	0.35	2.56	0.96
8	4023	**10.0–300.0**	0.5	30	4.00	1.20	26.67	10.00
				150	2.00	0.60	5.33	2.00
				300	1.60	0.35	2.67	1.00
8	4024	**50.0–1250.0**	1	125	6.00	1.10	25.60	9.60
				625	2.40	0.50	5.12	1.92
				1250	1.20	0.30	2.56	0.96

VIAFLO Electronic Pipettes							**ISO8655 limits**	
Chan-nel	**Part No.**	**Volume Range (µl)**	**Volume Incre-ments (µl)**	**Test Volume (µl)**	**Accuracy (±%)**	**Precision (≤%)**	**Accuracy (±%)**	**Precision (≤%)**
12	4031	**0.5–12.5**	0.01	1.25	10.00	6.00	32.00	16.00
				6.25	4.00	1.60	6.40	3.20
				12.5	2.00	0.80	3.20	1.60
12	4032	**5.0–125.0**	0.1	12.5	3.75	1.50	25.60	9.60
				62.5	2.50	0.70	5.12	1.92
				125	1.60	0.35	2.56	0.96
12	4033	**10.0–300.0**	0.5	30	4.00	1.20	26.67	10.00
				150	2.00	0.60	5.33	2.00
				300	1.60	0.35	2.67	1.00
12	4034	**50.0–1250.0**	1	125	6.00	1.10	25.60	9.60
				625	2.40	0.50	5.12	1.92
				1250	1.20	0.30	2.56	0.96
16	4041	**0.5–12.5**	0.01	1.25	10.00	6.00	32.00	16.00
				6.25	4.00	1.60	6.40	3.20
				12.5	2.00	0.80	3.20	1.60
16	4042	**5.0–125.0**	0.1	12.5	3.75	1.50	25.60	9.60
				62.5	2.50	0.70	5.12	1.92
				125	1.60	0.35	2.56	0.96

The multichannel and VOYAGER pipettes' specifications represent the performance of all channels of the pipettes. Precision = Coefficient of Variation.

VOYAGER Tip Spacing Pipettes							**ISO8655 limits**		
Chan-nel	**Part No.**	**Volume Range (µl)**	**Volume Incre-ments (µl)**	**Test Volume (µl)**	**Accu-racy (±%)**	**Precision (≤%)**	**Accu-racy (±%)**	**Precision (≤%)**	**Tip Spacing (mm)**
4	4143	**10.0–300.0**	0.5	30 150 300	5.00 2.75 1.80	2.00 1.00 0.50	26.67 5.33 2.67	10.00 2.00 1.00	9.0–32.5
4	4144	**50.0–1250.0**	1	125 625 1250	6.00 3.00 1.50	1.50 0.75 0.50	12.80 2.56 1.28	4.80 0.96 0.48	9.0–32.5
6	4163	**10.0–300.0**	0.5	30 150 300	5.00 2.75 1.80	2.00 1.00 0.50	26.67 5.33 2.67	10.00 2.00 1.00	9.0–19.5
6	4164	**50.0–1250.0**	1	125 625 1250	6.00 3.00 1.50	1.50 0.75 0.50	12.80 2.56 1.28	4.80 0.96 0.48	9.0–19.5
8	4121	**0.5–12.5**	0.01	1.25 6.25 12.5	15.00 5.00 2.50	10.00 3.20 1.60	32.00 6.40 3.20	16.00 3.20 1.60	4.5–14.0
8	4122	**5.0–125.0**	0.1	12.5 62.5 125	6.00 3.00 2.00	3.50 1.00 0.70	25.60 5.12 2.56	9.60 1.92 0.96	4.5–14.0
8	4123	**10.0–300.0**	0.5	30 150 300	5.00 2.75 1.80	2.00 1.00 0.50	26.67 5.33 2.67	10.00 2.00 1.00	9.0–14.0
8	4124	**50.0–1250.0**	1	125 625 1250	6.00 3.00 1.50	1.50 0.75 0.50	12.80 2.56 1.28	4.80 0.96 0.48	9.0–14.0
12	4131	**0.5–12.5**	0.01	1.25 6.25 12.5	15.00 5.00 2.50	10.00 3.20 1.60	32.00 6.40 3.20	16.00 3.20 1.60	4.5–9.0
12	4132	**5.0–125.0**	0.1	12.5 62.5 125	6.00 3.00 2.00	3.50 1.00 0.70	25.60 5.12 2.56	9.60 1.92 0.96	4.5–9.0

The multichannel and VOYAGER pipettes' specifications represent the performance of all channels of the pipettes. Precision = Coefficient of Variation.

7.5 Z Correction Factors

Temp. (°C)	Air Pressure (kPa)						
	80	85	90	95	100	101.3	105
18.0	1.0022	1.0023	1.0023	1.0024	1.0025	1.0025	1.0025
18.5	1.0023	1.0024	1.0024	1.0025	1.0025	1.0026	1.0026
19.0	1.0024	1.0025	1.0025	1.0026	1.0026	1.0027	1.0027
19.5	1.0025	1.0026	1.0026	1.0027	1.0027	1.0028	1.0028
20.0	1.0026	1.0027	1.0027	1.0028	1.0028	1.0029	1.0029
20.5	1.0027	1.0028	1.0028	1.0029	1.0029	1.0030	1.0030
21.0	1.0028	1.0029	1.0029	1.0030	1.0031	1.0031	1.0031
21.5	1.0030	1.0030	1.0031	1.0031	1.0032	1.0032	1.0032
22.0	1.0031	1.0031	1.0032	1.0032	1.0033	1.0033	1.0033
22.5	1.0032	1.0032	1.0033	1.0033	1.0034	1.0034	1.0034
23.0	1.0033	1.0033	1.0034	1.0034	1.0035	1.0035	1.0036
23.5	1.0034	1.0035	1.0035	1.0036	1.0036	1.0036	1.0037
24.0	1.0035	1.0036	1.0036	1.0037	1.0037	1.0038	1.0038
24.5	1.0037	1.0037	1.0038	1.0038	1.0039	1.0039	1.0039

Z values in microliters per milligram

8 Accessories

8.1 Accessories

Charging options and Bluetooth	Part No.
Universal voltage power supply	4200
Lithium ion battery, 3.7 V	4205
Single-pipettor charging stand	4210
VIALINK update stand	4211
4-pipettor charging stand	4215
Vision Bluetooth module	4220
Bluetooth PC module with PC software	4225
Universal voltage power supply for 4-pipettor charging stand	436-00002-00

General	Part No.
O-ring removal tool	130-00731-00

8.2 Consumables

O-rings for tip fittings		Part No.
300 µl	Replacement kit 24/pack	100-00027-50
1250 µl	Replacement kit 24/pack	100-00028-50
5000 µl	Replacement kit 24/pack	100-00029-50

Lubricant for VIAFLO pipettes and O-rings		Part No.
Lube	Parker Super-O-Lube, Silicone based, 50 g / 2 oz, for single channel 1250 µl and 5000 µl pipettes	100-00135-50
Grease	Grease Nye Fluorocarbon Gel 807, 5 g / 0.2 oz, for single channel 12.5 µl, 125 µl and 300 µl pipettes	100-00136-50

Reagent Reservoirs		Part No.
10 ml	Disposable reagent reservoirs, sterile, individually sealed, 30 reservoirs per case	4331
	Disposable reagent reservoirs, sterile, four sleeves of 50 reservoirs per case	4332
	Reservoir Base, 10 pack	4306

Reagent Reservoirs		Part No.
25 ml	Disposable reagent reservoirs, sterile, individually sealed, 30 reservoirs per case	4311
	Disposable reagent reservoirs, sterile, four sleeves of 50 reservoirs per case	4312
	Reservoir Base, 10 pack	4304
100 ml	Disposable reagent reservoirs, sterile, individually sealed, 30 reservoirs per case	4321
	Disposable reagent reservoirs, sterile, four sleeves of 50 reservoirs per case	4322
	Reservoir Base, 10 pack	4305

GripTips for VIAFLO Electronic Pipettes		Part No.
12.5 µl	Bulk, 1000 tips per bag, non-sterile	4411
	5 inserts of 384 tips, non-sterile, GREEN CHOICE	4412
	5 racks of 384 tips, non-sterile	4413
	5 racks of 384 tips, sterile	4414
	5 racks of 384 tips, sterile, with filter	4415
	5 inserts of 384 tips, pre-sterilized, GREEN CHOICE	4416
125 µl	Bulk, 1000 tips per bag, non-sterile	4421
	5 inserts of 384 tips, non-sterile, GREEN CHOICE	4422
	5 racks of 384 tips, non-sterile	4423
	5 racks of 384 tips, sterile	4424
	5 racks of 384 tips, sterile, with filter	4425
	5 inserts of 384 tips, pre-sterilized, GREEN CHOICE	4426
300 µl	Bulk, 1000 tips per bag, non-sterile	4431
	5 inserts of 96 tips, non-sterile, GREEN CHOICE	4432
	5 racks of 96 tips, non-sterile	4433
	5 racks of 96 tips, sterile	4434
	5 racks of 96 tips, sterile, with filter	4435
	5 inserts of 96 tips, pre-sterilized, GREEN CHOICE	4436

1250 µl	Bulk, 1000 tips per bag, non-sterile	4441
	5 inserts of 96 tips, non-sterile, GREEN CHOICE	4442
	5 racks of 96 Tips, non-sterile	4443
	5 racks of 96 Tips, sterile	4444
	5 racks of 96 Tips, sterile, with filter	4445
	5 inserts of 96 tips, pre-sterilized, GREEN CHOICE	4446
5 ml	Bulk, 250 tips per bag, non-sterile	4451
	Individually wrapped, 100 tips per case, sterile	4456