Validation of Magnetic Bead Vortex on VERSA Gene Workstation

Every NGS library preparation protocol involves the same basic procedure: nucleic acid fragment isolation, adaptor and barcode ligation, DNA fragment size selection, fragment amplification and reaction clean-up. Magnetic beads play an essential role in all of these steps and have a direct impact on the yield, concentration, consistency, and quality of your library and ultimately your sequencing results. Uniform bead distribution and accurate bead dispensing is critical.

Our innovative and unique magnetic bead vortex, housed on the deck of the VERSA Gene, ensures that magnetic beads are uniformly suspended in the source tube and are constantly mixed directly before distribution to the target wells of the library preparation plate. Since magnetic beads can be expensive and are supplied in small volumes, the magnetic bead vortex minimizes dead volume by ensuring a homogenous mixture in the source tube thereby negating the use of a reservoir. The magnetic bead vortex has significant advantages to manual pipette mixing, as the latter results in bead clumping and attaching to the interior of the pipette tip leading to bead wastage, inefficient mixing and making bead dispensing time-sensitive as the magnetic beads settle quickly.

Advantages of the Magnetic Bead Vortex

- **Minimizes dead volume** as magnetic beads are dispensed from the source tube and not a reservoir.
- **More efficient bead mixing** limits bead clumping and wastage as a result of beads attaching to the pipette tip and reservoir.
- **Bead dispensing is no longer time-sensitive** because the beads are kept in constant suspension versus the risk of bead settling in a reservoir.

Consistent Automated Bead Distribution&Dispensing

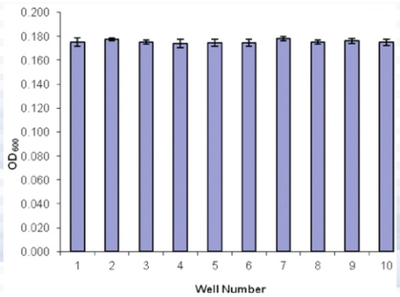

Figure 1: Magnetic bead stock solution was mixed using the magnetic bead vortex. Magnetic beads were dispensed via the VERSA automated liquid handling module in single channel mode. Concentration of magnetic beads dispensed into target wells was determined by spectrophotometry (OD_{600}, n = 3).

The magnetic bead vortex and automated dispensing of beads to target wells resulted in uniform and consistent bead dispensing (Figure 1) indicating the suitability of the magnetic bead vortex for bead-based workflows. This is further evidenced by end-user data where NGS libraries prepared by manual versus automatic bead mixing were compared side-by-side (see below).

Library preparation on the VERSA Gene

Tube No.	Sample ID	Qubit Reading (ng/mL)	Library Conc. (ng/mL)	QC
1A	POS Ctrl_2 (Manual Library)	78.1	1562	PASSES QC
2A	POS Ctrl_2a	71.9	1438	PASSES QC
3A	NEG Ctrla	81.8	1636	PASSES QC
4A	POS Ctrl_2b	71.5	1430	PASSES QC
5A	NEG Ctrlb	86.2	1724	PASSES QC
6A	POS Ctrl_2c	60.6	1212	PASSES QC
7A	NEG Ctrlc	101.0	2020	PASSES QC
8A	NEG Ctrl (Manual Library)	93.9	1878	PASSES QC

Table1 - Purified amplified NGS library concentrations for positive and negative controls for both manual and automated procedures were found to be within the acceptable quality control limits as outlined by the end-user.

Automated library versus positive control manual library (r^2)	Automated library versus negative control manual library (r^2)
0.997	0.998
0.995	0.998
0.995	0.999
0.993	0.982
0.994	
0.995	

Table 2 - Correlation of sequencing data obtained by manual and automated NGS library preparation procedures.

Purified amplified library concentrations for positive and negative controls from both the manual and automated procedures were found to be within the acceptable quality control (QC) limits for sequencing analysis (Table 1). Furthermore, sequencing data from libraries prepared using manual and automated procedures showed a high degree of correlation (r^2) for both the positive and negative controls (Table 2) suggesting that automated procedures produce high quality sequencing data. Sequencing quality and reproducibility can be attributed to the uniform suspension and accurate dispensing on magnetic beads by the VERSA Gene magnetic bead vortex and automated liquid handling modules.

NOTE: Instrument specifications may change without notice as an ongoing effort of product improvement.

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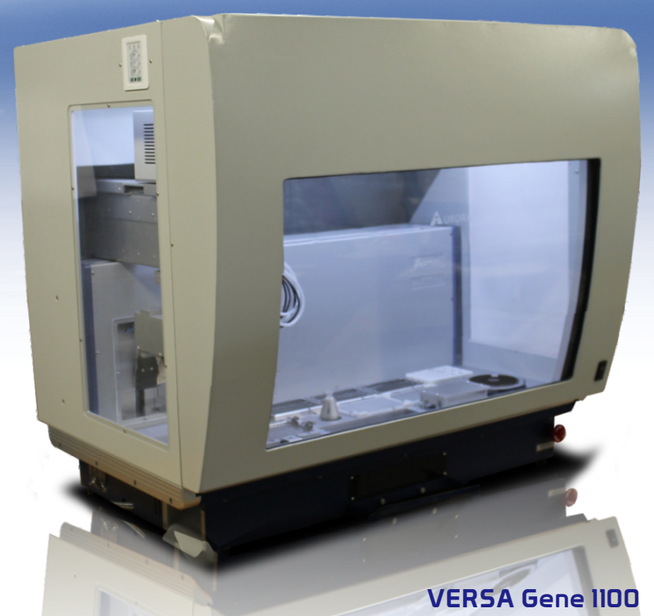
VERSA Gene for NGS Library Preparation

Automated Liquid Handling Workstations



VERSA Gene 1100

VERSA Gene 10

SOLUTIONS FOR LIFE SCIENCES & MOLECULAR DIAGNOSTICS

VERSA Gene for NGS Library Preparation

Automated Liquid Handling Workstations

Next generation sequencing (NGS) has revolutionized the ability to perform genomic analyses by providing the power to sequence an entire genome economically in a single day. Automation to support NGS technologies needs to meet the throughput demands of NGS workflows and offer both robustness and flexibility to fully realize the power of NGS.

The VERSA Gene 1100 was developed as a complete walk-away solution for all genomic workflows. It features an 8-channel pipetting head enabling the high throughput demanded by NGS technologies, but offers the flexibility to handle tasks such as library normalization and sample pooling via the single channel function of the pipetting head. Aurora has worked to streamline the library preparation process by offering unique features such as the magnetic bead vortex, the magnet/shaker elevator, and the 96-tip aspirator. These modules were designed with the goal of reducing library preparation time while improving sample recovery and consistency.

The VERSA Gene 10, while not as robust as the 1100, is a compact and cost-effective solution. The VERSA Gene 10 supports various genomic workflows including PCR set-up, enzymatic reactions, sample pooling and portions of the NGS library preparation workflow. It provides a scalable solution, processing 1 to 96 samples in parallel depending on your throughput demands.

FEATURES AND BENEFITS

- Magnetic bead vortex ensures homogenous bead suspension
- 96-tip aspirator reduces protocol time and tip usage costs
- Magnet/shaker elevator reduces protocol time and increases available deck space
- ReagentDrop module provides accurate dispensing of bulk reagents allowing conservation of reagents and tips
- HEPA filtered UV/fluorescent light enclosure with automatic door keeps samples contaminant-free
- Open system - compatible with diverse kit chemistry and labware
- Scalable solution - processes 1 to 96 samples in parallel depending on your throughput demands

APPLICATIONS

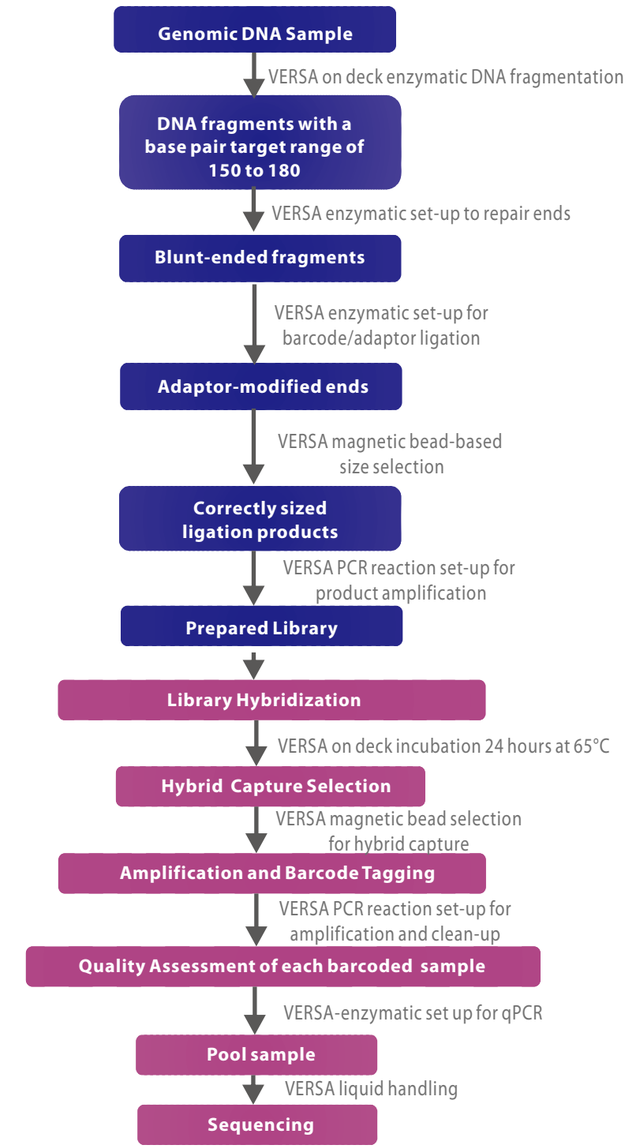
Genomic:

- NGS library preparation
- DNA/RNA purification and cleanup
- DNA/RNA fragment size selection
- Enzymatic reaction setup
- Library normalization and pooling
- Single and multiplex real-time PCR setup
- Sequencing reaction setup
- Oligo-based gene synthesis plate setup
- Magnetic bead based applications

General Liquid Handling:

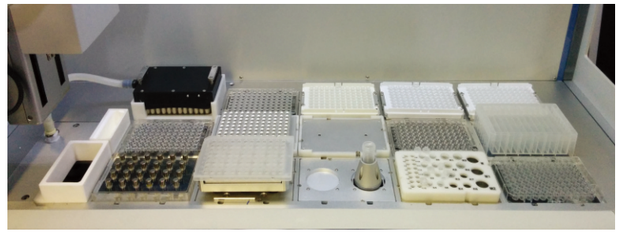
- Cherry picking and sample pooling
- Plate transfer, replication and reformatting
- Serial and parallel dilution
- Master Mix preparation and distribution

A Representative NGS Library Preparation Workflow on VERSA Gene

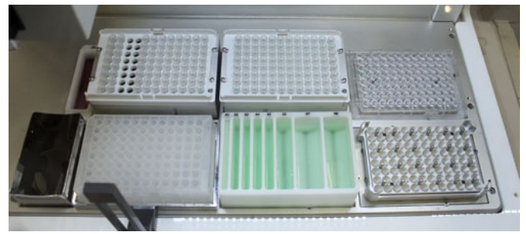


LIQUID HANDLING AUTOMATION FOR YOUR PROTOCOLS

At Aurora we believe that automation should give you the freedom to walk away from your protocols. Our dedicated team of engineers and application scientists work closely with each client to determine the best instrument to fit their needs. The VERSA Series are built to meet your specific requirements, and our diverse array of modular adaptors and accessories offer the flexibility to perform almost any laboratory application.



VERSA Gene 1100 Deck Layout for NGS Library Preparation



VERSA Gene 10 Deck Layout

Modules and Adapters include:

- ReagentDrop bulk dispensing system*
- Reagent and plate temperature control from 2 - 90°C
- 96 channel pipetting head*
- Dual directiona orbital shaker
- Magnetic blocks
- 96-tip Aspirator*
- Magnetic bead vortex*
- Gripper* or plate transporter

* use recommended on VERSA Gene 1100 only

Reagent Block

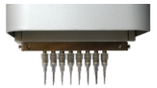
96-Channel Pipetting Head

Shaker

Gripper

Magnetic Block

Plate Cooler/Heater Block



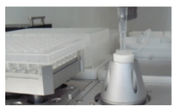
8-Channel Pipetting Head

4-Channel Pipetting Head

Plate Transporter

Magnet/Shaker Elevator

ReagentDrop & 8-Channel Pipetting Head



Magentic Bead Vortex

96-Tip Aspirator

SPECIFICATIONS

	VERSA GENE 10	VERSA GENE 1100	
		BASIC CONFIGURATION	RECOMMENDED CONFIGURATION
SYRINGE PIPETTOR (disposable tip)	4 or 8-channel	8-channel	8 or 96-channel
REAGENTDROP CHANNELS (multiple reagents)	N/A	up to 8	8
LIQUID-LEVEL SENSING	Optional	Optional	Optional
PLATE SHAKER	1	1	1
96-TIP ASPIRATOR	N/A	1	1
TEMPERATURE REGULATION BLOCK	1	2	4
REAGENT COOLING BLOCK	1	1	1
MAGNETIC BLOCK	Magnetic Block	Magnetic Block	Magnet/Shaker Elevator
PLATE GRIPPER/TRANSPORTER	Transporter	Gripper	Gripper
HEPA / UV / FLUORESCENT LIGHT ENCLOSURE	Optional	Optional	Included
LENGTH	65 cm / 25.6in	98.5 cm / 38.8 in	98.5 cm / 38.8 in
DEPTH	43 cm / 16.9 in	75.2 cm / 29.6 in	75.2 cm / 29.6 in
HEIGHT	52 cm / 20.5 in	89 cm / 35 in	108.2 cm / 46.2 in
WEIGHT	27 kg/ 59.5 lbs	165 kg/ 364 lbs	200 kg / 441lbs
DECK CAPACITY	6	15	15