SPECIFICATIONS FOR AUTOMATED LIQUID HANDLING SYSTEM

Latest state-of-the-art Automated Liquid Handling System with open platforms and modules for performing the following applications:

- High-throughput Library preparation
- Re-formatting and re-arraying of library
- High throughput Screening
- Cherry/Hit picking
- Genomic DNA/Plasmid DNA/RNA Extraction using Vacuum based technique. Future upgradation capability for Magnetic bead based technique
- PCR Setup
- DNA/RNA Quantification and normalization
- Growth Kinetic assays
- Absorbance, Luminescence and Fluorescence assays

Hardware and Software offered should be integrated with the main platform to successfully run the above applications.

Mandatory items and features:

1) **Deck size and capacity:** The system should have a deck size between 1.4m and 1.7m in length for holding SBS format plates and other accessories like vacuum manifold, temperature controlled carriers, reagent troughs etc. The deck size should exclude the size of any additional modules or bins.

2) **HEPA hood/filter, UV, and table:** System should be supplied and fitted with HEPA Hood/filter and UV enclosure for operation under microbiologically sterile conditions. Appropriate table/tables of suitable strength and dimensions should be provided with the system for the installation of the platform (in the hood) as well as all accessories supplied with the system.

3) **Pipetting arms:** The system should come with at least 2 pipetting arms (one pipetting arm with 96-channel head and one pipetting arm with 8 independent channels). The arms should be capable of working independently and in parallel to enhance the throughput and parallel processing.

Pipetting Arm with 96-channel Head

Pipetting arm with 96-channel head should be capable of working with disposable tips and future upgradability for working with washable tips/pin tools. The 96-channel head should be able to aspirate and dispense liquid in 96-well and 384- well microplates as well as 96-well and 384-well deep well plates. The 96-channel head arm should have the flexibility to pick disposable tips from maximum accessible positions on the deck. The 96-channel head should have the capability to perform serial dilution both row-wise and column-wise. The 96-channel head should be able to pipette in any single position of the SBS format plate using only one tip at a time without any need of pre-configured tip boxes. The 96-channel head should allow for use involving re-formatting and re-arraying of plates. The 96-channel head should be able to pipette 1µl – 200 µl, or a larger range of volumes. The supplier should specify the pipetting range, different tip sizes, and pipetting precision and accuracy.

It should be possible to upgrade the multichannel pipetting arm to hold 384-channel head in the future. The 96- and 384- channel heads should be conveniently interchangeable by the users, or the 384-channel head should be able to work like a 96-channel head, with appropriate adaptors.

Quote, as optional, different tips, sizes and volumes (in single frame and stacked manner) for disposable tips for the 96-channel head. The number of tips will be finalized with the successful bidder.

Pipetting Arm with 8 independent channels

Pipetting arm with 8 channels should work independently and in parallel with 96-channel pipetting arm. In case the individual channel pipetting arm works by using a fluid-displacement technique, the system should come with arrangements for a suitable system fluid (liquid/air) for flushing the tubing and wash station for cleaning the flow path. In all cases, the fluid-displacement technique quoted should be compatible with future upgradation to 5 ml pipetting range for the individual channel head. Individual channel pipetting arm should be capable of working with both disposable tips and washable tips/needles. The disposable and washable tips/needles should be conveniently interchangeable by the users.

Each channel of the pipetting arm should be capable of independent liquid level detection, liquid availability check, detection of blockage of flow during aspiration or dispensing, and automatic detection of presence and absence of tips, with one or the other of different tip-types. The individual channel pipetting arm should be capable of dispensing 1- 1000 µl liquid without any hardware changes. The system should be future upgradable to dispense liquid volume as high as 5 ml using the individual channel pipetting arm. The company should quote one 5ml pipetting channel for independent channel head as optional.

The channels should have independent and flexible movement in X, Y and Z axis. The arm should have a Y-spacing feature for access to all SBS and non-SBS format labwares. Arm should have independent Z axis control and capable of aspirating variable volume in each tip in single go. The channels should have the capability of stock solution preparation, their serial dilution and mixing of samples.

Quote, as optional, different tips, sizes and volumes (in single frame and stacked manner) for both transparent and conductive disposable tips. The number of tips will be finalized with the successful bidder.

4) **Gripper and robotic arm:** The system should come with a gripper with the capability of transporting plates and lids on the deck. The gripper should be able to de-lid and re-lid plates.

The system should come with a robotic arm with the capability of transporting plates and lids to and from outside the deck. The robotic arm should be able to de-lid and re-lid plates. Movement of the robotic arm should be such that it allows integration of modules outside the deck. Parallel and independent processing/movement of the robotic arm with both the individual channel and the 96-channel pipetting arms is absolutely required.

The gripper and robotic arm should enable integration of various equipment modules [specifically, a multimode reader, an incubator shaker (either on-deck or off-deck, but with sterility maintained), a vacuum manifold, and temperature controlled carriers] for successful functioning of all the applications listed above. All items mentioned in parentheses above must also be quoted (see section on application-specific accessories)

5) **Carriers and labware:** The following carriers and labware should be provided with the system:
*Carriers to accommodate 10 or more microplates on independent positions and 5 or more deep well plates on independent positions.
*Carriers for disposable tip boxes and for stacking disposable tip racks for individual channel pipetting arm with a minimum of 3 positions.
*Carriers for disposable tip boxes and for stacking disposable tip racks for 96-channel pipetting arm with a minimum of 3 positions.
*Carriers and adapters for test tubes, 2 ml tubes, 1.5ml tubes, and 0.2 ml PCR tubes.

*Reagent troughs and Carriers for reagent troughs for individual channel arm: 10 or more reagent troughs of capacity 50-100 ml of each variety, and 2 or more carriers for reagent troughs of each variety.
*10 or more reagent troughs of capacity 50-100 ml, and 2 or more carriers for reagent troughs for 96 channel pipetting arm.
*Provision for waste disposal.
*Labware for stacking >15 microplates and >5 deep well plates on the deck (note: also see section on optional items for additionally quoting capability for random access, if available).
*Disposable tips (800 tip boxes of 50 µl tips, 200 tip boxes of 200-300 µl tips and 100 tip boxes of 1000 µl tips) for use with both 96-channel and individual channel arms.
*Stackable disposable tip racks (10,000 tips of 50 µl, 10,000 tips of 200-300 µl and 5000 tips of 1000 µl).
*2 sets of washable tips/needles for individual channel arm.

The system should be supplied with consumables (e.g., tips, 96- and 384- well microplates, 96- and 384-well deep well plates, genomic DNA isolation kits) required for installation and demonstration of the system.

6) **Application specific accessories:** Accessories should be provided with the system for the following:
Vacuum filtration based DNA/RNA extraction
System should be supplied with Vacuum manifold with 2 position block. The required vacuum pump and various adaptors for plates should be supplied along with the system. The vacuum pump should be controlled through software provided with the system. Waste disposal container should have necessary sensors and reflect the warning message to avoid overflow. Vacuum filtration system should work independently without interrupting the work flow. The system should be an open system wherein kits manufactured by different companies can be used for flexibility and cost effectiveness. The necessary application protocols should be optimized, demonstrated and necessary training should be imparted to the users on site.

PCR Setup
Temperature controlled on deck carrier with minimum of 2 positions with temperature range of 4°C to 30°C or better for storage and use of PCR components and PCR assay plate. Adapters should be provided with the system for holding the PCR plates, 1.5ml tubes and PCR tubes on the carriers.

Incubator shaker
Incubator shaker should be provided to run 4-6 plates simultaneously for growth curve assays. The incubator shaker should allow random access of plates and should come with accessories to hold 96-well microplates. The incubator shaker should operate in a temperature range of ambient +5°C to +45°C or better and should be able to hold all the plates at the same set temperature. The shaker should have a controllable speed with a maximum speed of 1500 rpm or better.

Multimode Reader: Monochromator-based, automation compatible multimode reader with the following features should be provided with the platform.

1) Capable of Absorbance, Fluorescence intensity (top and bottom reading), and Luminescence (both flash and glow with minimum two injectors, DLR certified) based detection.
2) Xenon flash lamp or better light source.
3) The reader should integrate with the platform and all accessories on the platform including incubator shaker. It should also be possible to use the reader alone.
4) Wavelength range- Absorbance: 230-1000 nm or better; Fluorescence: 250-850 nm or better
5) 2 excitation and 2 emission monochromators for fluorescence mode.
6) Capable of working with 6- to 384- well plates.

7) Capable of endpoint assays, kinetic assays, spectral scanning and well scanning in all detection modes.
8) The reader should have a temperature control ranging from ambient +5°C to 40°C or better.
9) Capable of linear and orbital shaking
10) System should come with control software, computer and printer.
11) Future upgradation capability for monochromator based Fluorescence polarization, Time resolved fluorescence, FRET, HTRF/TR-FRET, Alphascreen/Alpha Lisa.
12) Future upgradation capability for environmental control of the chamber (CO_2 and O_2 conditions) to maintain culture conditions and cell growth.

All the above accessories should be integrated with the main platform.

7) Software: The system should be provided with complete software for operation, application development, assay optimization (or some equivalent process), process monitoring, cataloging, and error detection. The software should be capable of controlling the Liquid handling instrument and other peripherals supplied along with the system.

The platform should be provided with user friendly software with Graphical Simulation feature to simulate protocol/programme before starting the actual run to evaluate script and estimate time to complete the assay. The software should alert if there are any mistakes in the programmed protocol to save time and reagents. The software should have advanced pipetting features for pipetting different reagents i.e., database of validated liquid classes for different solvent types, and library of different labwares. Software should have inbuilt pipetting techniques to dispense reagents against the wall of a well, tip touching, bulk dispense etc. Software should have Pause/Stop button and in an event of Pause, run should resume from where it stopped.

Software should have the flexibility of creating report for each plate format with sample and Plate ID, and should have features like Scheduling and data tracking. Software should have advanced wizards for Complex Script designing e.g. Cherry/hit picking, Normalization etc. Data analysis software should be provided for Growth curves, luminescence, fluorescence, and absorbance assays. Software should have the flexibility of importing/exporting data in both CSV and ASCI format for various applications.

Software provided should be 100% licensed version with unlimited validity and should be able to load on to multiple computers for offline method development and optimization /validation. Multiple user administration should be possible.
The necessary application protocols should be optimized, demonstrated and necessary training should be imparted to the users on site.

Software offered should enable running all the applications listed above by integrating various modules both on and off the deck. Software should be capable of handling future system upgradation and integrations with third party equipments from other manufacturers.

8) The system should come with safety screen/curtain to prevent unintentional access to work area.
9) The system should be compatible with plasticware manufactured by different companies for flexibility and cost effectiveness.
10) Offered system should be supplied with Branded High End Computer (i5 processor or better, Hard disk of storage capacity 1 terabytes or more, RAM of 4GB or more, 22 inches or bigger screen) for operating the system, storage and analysis of the data.
11) Appropriate online branded UPS to support the entire system with a minimum backup time of 30 min with power surge protection and reverse phase should be provided with the system.

12) There should be a possibility of future upgradation with third party instruments and for other applications.

Optional items and features:

1) Pipetting Arm with 96-channel Head

The following features of the 96-channel head should be quoted:
*automatic liquid level detection (capacitance- and pressure- based)
*detection of presence or absence of disposable tips
*detection of blockage of flow during aspiration or dispensing
*protection against aerosol/vapor cross-contamination during tip ejection

2) Pipetting Arm with 8 independent channels

The following features of the individual-channel arm should be quoted:
*protection against aerosol/vapor cross-contamination during tip ejection

3) Carriers and labware

*Labware for stacking >15 microplates and >5 deep well plates on the deck or outside the deck with random access.
*Quote different tips, sizes and volumes (in single frame and stacked manner) for disposable tips for the 96-channel head.
*Quote one 5ml pipetting channel for individual channel head.
*Quote different tips, sizes and volumes (in single frame and stacked manner) for both transparent and conductive disposable tips for individual channel head.

4) Optional application specific accessories

On deck Shaker: On deck shaker for use with individual channel and 96 Head arm for mixing of reagents should be quoted. The shaker should have a controllable speed with a maximum speed of 1500 rpm or better, and a temperature range of 5°C to 70°C or better. The shaker should be able to hold microplates, deep well plates, 1.5ml tubes, 2ml tubes and PCR tubes.

Magnetic bead based DNA/RNA extraction

The system should be an open system wherein kits manufactured by different companies can be used for flexibility and cost effectiveness.

Integration of the above accessories with the main platform should be possible.

5) Timer for UV light

General Terms and Conditions

1) Comprehensive warranty for 4 years for the complete system including hardwares and spares should be provided. The company should also quote both CMC and AMC charges for next 5 years after the expiration of warranty. We reserve the right to change the final warranty period, and terms and conditions including CMC and AMC.
2) All the specifications should be supported by documentation in the form of original brochure/catalog. Photocopy will not be accepted. We reserve the right to disqualify parties who do not comply with the original documents. Compliance statement should be attached with markings in the original catalog.
3) The company should quote latest, state-of-the-art robotics system. The party should take an undertaking that they will supply the components of the instrument for the next 10 years after its installation at the site.

Softwares and any other accessories that are upgraded by the company within 2 years of installation should be provided free of cost.

4) The company should provide individual component break up prices.

5) Technical Support should be available within 24 Hr.

6) The installation of the equipment should be within 6-8 weeks of supply.

7) The quoted price should include installation, operator instructions and institutional training onsite.

8) Installation will be considered complete only after successful demonstration of all the applications for which this system is being set up for. On-site training for one week should be provided by personnel from the original company. The calibration of the system should be demonstrated for pipetting precision and accuracy by its essential validation tools.

9) It should be the responsibility of the vendor to integrate any third party module.

10) We reserve the right to change the final configuration of this system.