C146-E469

SHIMADZU
Excellence in Science

Fully Automated Sample Preparation Module for LC-MS

CLAM-2040

24/7 LC/MS capability in your lab... Now![1]

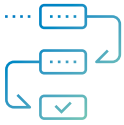
Pave the way for the future of clinical research.

Simplifications of LC-MS systems have made LC/MS an advantageous technique for clinical research thanks to its specificity, its accuracy, and its capability to analyze several targets simultaneously. CLAM™-2040 is an online automated sample preparation module that brings LC/MS smoothly into your laboratory.

(1) Not including preventive maintenance

EFFORTLESS PERFORMANCE

- An intuitive, user-oriented design for greater comfort in the work routine.
- No technical knowledge is required to operate the system.
- Easy to pilot, with straightforward steps, for rapid analysis starting.
- Sample extraction and analysis are fully automated; simply insert the sample tube.



STANDARDIZED WORKFLOW

- The latest quality control functionalities, including out-of-specification alerts.
- Reduces variability in sample results thanks to the absence of manual steps.
- Prevents operator errors during the sample preparation procedure.
- Lowers the risk of infections, improving workplace safety.

OPERATIONAL PRODUCTIVITY

- Improved overall efficiency - higher throughput at a lower cost.
- Automation enables LC/MS analysis to be performed any time, any day.
- Samples can be added continuously, along with an option to insert priority analyses.
- LC/MS technology enables multiplex analysis.
- Capability to connect to your laboratory information system.

FLEXIBILITY

- Freedom to use our dedicated assays, but also any assay of your choice.
- Freedom to choose your LC-MS configuration and to upgrade it in the future.
- High resolution LC-MS is also available (Q-TOF), facilitating large screenings.
- Various sample containers available to meet the diversity of your routine needs.

INNOVATION

- Create a laboratory ready for tomorrow's transitions to LC/MS with no human intervention between the conveyor and the result.
- Be a pioneer and lead the way with a future-proof clinical research laboratory.


CLAM-2040


SHIMADZU

Easy to use and to maintain.

Reduced workload for operators.

Simply uncap blood collection tubes (or specialized sample cups) and place them into the system. Select the appropriate method from the touch screen, and then the CLAM-2040 performs the next steps automatically: dispensing the sample onto the specialized filter vial, adding reagents, shaking, heating, filtering, and transferring the extracted sample to the LC-MS system autosampler. The LCD touchscreen allows for rapid control through the dedicated user-oriented software. Containers for liquid waste and filter waste reduce the infection risk and ensure operator safety. Easy access to all system automated parts, consumables, and waste also allows for easy maintenance over time.

SPECIALIZED EXTRACTION FILTERS

Specialized filter vials for biological sample.
Single use for no cross-contamination.
Continuous filter loading capability.

REAGENT PROBE

A dedicated probe for dispensing reagents ensures absence of reagent contamination.
Several rinsing solvents are also available.

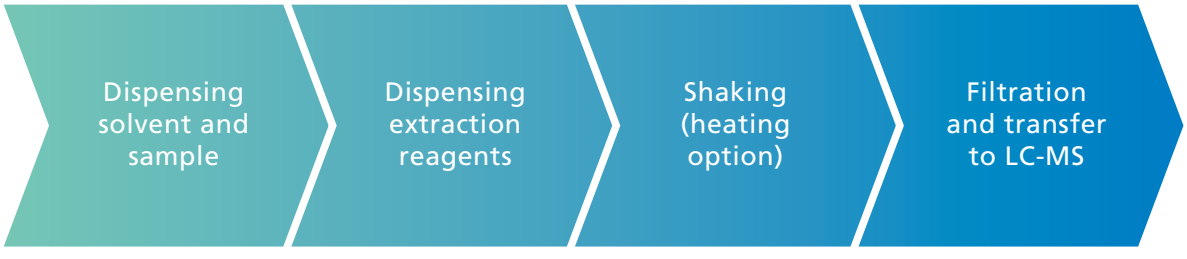
SAMPLES AND REAGENTS

A dedicated area for samples and reagents.
Temperature control for longer stability.
A wide range of glass vials, tubes and cups to fit the variety of routine needs.
Checks sample ID via barcodes.
Continuous sample loading capability.
Priority sample option also available.

SAMPLE PROBE

A dedicated probe for dispensing samples.
Several rinsing solvents are available to ensure absence of cross-contamination.

Typical protocol of automated sample extraction

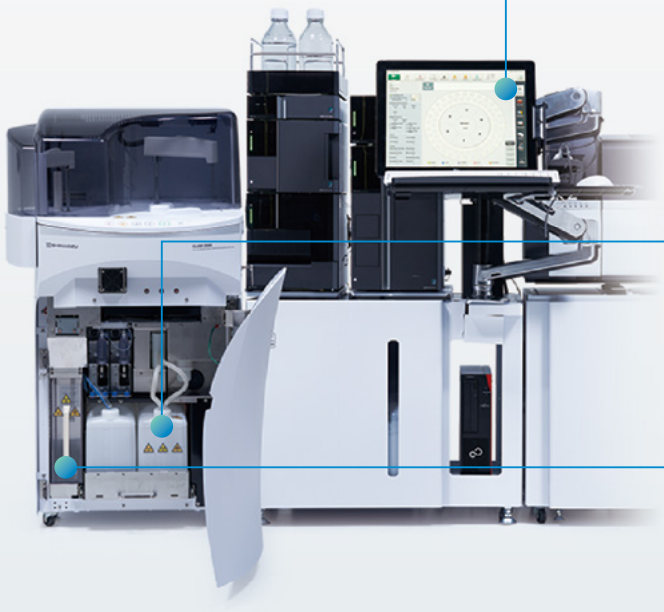


"The CLAM system is very robust and easy to use." "We can do the programming of the system on our own." "The system is analyzing the samples automatically, so it's kind of fire-and-forget. It's doing all the work for you."

— **Dr. rer. nat. Lars Kröner**, Labor Wisplinghoff, Cologne, Germany.

"The CLAM system is an ideal tool which allows personal with nonspecific chromatographic and mass spec experience to measure samples. On the other hand, the automate also allows the specialist to implement new parameters freely, when there is no commercially available method on the market."

— **Dr. rer. nat. Frank Streit**, University Hospital, Göttingen, Germany.



LCD TOUCHSCREEN *option

Intuitive, user-oriented software.
No technical knowledge is required.
Easy to pilot, straightforward steps.

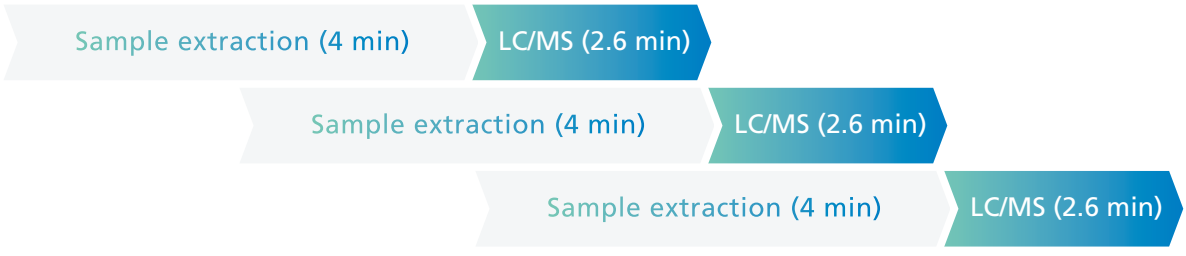
WASTE LIQUID CONTAINER

After each analysis, the liquid waste is collected in a dedicated bio-safety container, reducing the risk of infection.

WASTE FILTER CONTAINER

After each analysis, the specialized filter pretreatment vial is collected in a dedicated bio-safety container.

SAMPLE PREPARATION OVERLAP: **ONE RESULT EVERY 2.6 MIN** IN AN OPTIMIZED WORKFLOW.



Operational productivity.

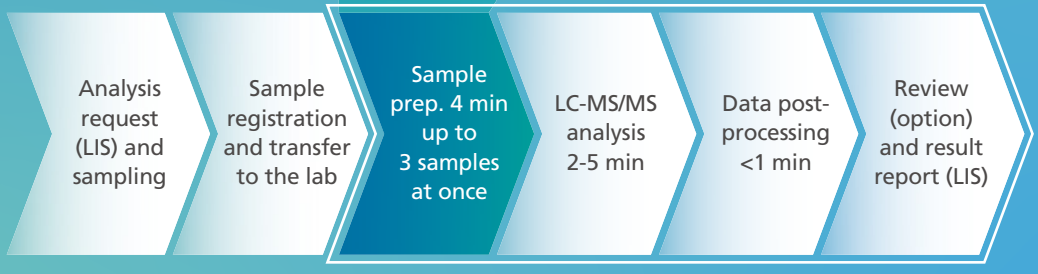
Automates all process steps from pretreatment to result.

The CLAM-2040 and LC-MS instrument accompanies you on most of the analytical workflow and improves your overall throughput by drastically reducing the sample preparation time. Additionally, the CLAM-2040 has the capability to prepare up to 3 samples simultaneously to further optimize your routine. While the manual or semi-automated sample extraction will deliver one result every 12 to 60 min, the CLAM-2040 and LC-MS, in optimized conditions, will deliver up to one result every 2.6 min.

Typical LC/MS analysis workflow in the clinical research laboratory.

One result every 12 to 60 min.

CLAM-2040 + LC/MS improved analysis workflow.



These steps are managed by the CLAM-2040 and LC-MS instrument.

Up to one result every 2.6 min.

No compromise.

High efficiency and high comfort.

IMPROVED EFFICIENCY

Higher throughput at a lower cost by reducing manual operations. Open access system with no need for an intensive user training (meaning no additional cost).

MULTIPLEX ANALYSIS

Associated with the CLAM-2040, Shimadzu's LC/MS technology enables you to analyze several compounds simultaneously, leading to time saving and overall cost reduction.

24 HOURS / 7 DAYS CAPABILITY

Run samples at night and weekends. Add samples and consumables continuously with the option to submit priority analysis requests for urgent samples.

HIGHER USER COMFORT

Decrease of manual operation makes the workflow more comfortable for the user. Controlled safety creates peace of mind, and the intuitive software makes it effortless to run samples.

The Shimadzu advantage.

CLAM-2040, the unique **flexible** LC/MS automation.

Shimadzu has always attached great importance to providing the best solutions while maintaining the highest possible flexibility for the operator and providing products of great robustness. These key advantages are at the heart of our developments and in all our products. Here too, the CLAM-2040 provides high flexibility and reliability, maintaining confidence over time thanks to its high robustness.

USE ANY APPLICATION OF YOUR CHOICE

- Compatible with a wide range of Shimadzu methods.
- Supports Alsachim reagents.
- Compatible with third-party reagents.
- Easily transfer your laboratory developed tests (LDT).

FREEDOM TO CHANGE

- Methods can be optimized and modified.
- New methods can be freely added with no need for Shimadzu intervention.
- Creating your in-house method (LDT) is possible at any time.

FLEXIBILITY

- Freedom to choose your LC-MS configuration and to evolve it at will (see details hereafter).
- A wide range of purifications available, such as online solid phase extraction (SPE).
- Various sample and reagent containers available to meet the diversity of routine needs.
- The LC-MS system can also be used independently.

OPERATIONAL CONNECTIVITY

- Feel free to connect with your laboratory information system at any time.
- Feel free to connect your LC-MS system to online automation when you need it.

ROBUSTNESS

- Standardized workflow reduces variability in sample results.
- Includes the latest quality control functionalities.
- Robustly built to cope with a high volume of analysis.
- Consistent results over time enables reduced calibration frequency.

One automated system, unlimited possibilities.

Full evolution potential.

Free to evolve your LC/MS technology at any time.

To meet your required sensitivity, you are free to choose your LC-MS/MS system by selecting one of our triple quadrupoles, from the LCMS-8040 (not shown below) to the LCMS-8060NX. Your needs evolve? You can change your MS system at any time. For your most exigent screenings, high resolution is also available with our time-of-flight systems (QTOF). These options keep your flexibility at maximum.

Time-of-flight
(toxicology screening, metabolomics...)

Easy MS upgrade

- LCMS-9050
- LCMS-9030

Resolution

Triple quadrupoles
(Drug quantitation, toxicology...)

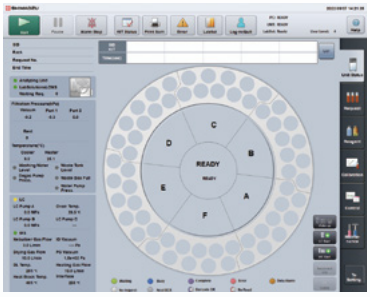
Easy MS upgrade

- LCMS-8060NX
- LCMS-8060
- LCMS-8050
- LCMS-8045

Sensitivity

Easy, intuitive, smart.

Rapid control by simple user-oriented software.



INTUITIVE SOFTWARE

- Easy to pilot with no need for expertise nor training.
- Easy to optimize and modify existing methods.
- Easy to configure your own methods.

Create * → Modify * → Pilot

* optional steps

EASY REAGENT MANAGEMENT

- Reagent vials of 3 different volumes for maximum adaptability and flexibility : 1.5 mL, 6 mL, or 12 mL.
- Free configuration of your reagents (commercial or in-house).
- Clear display of available reagents and remaining usage count.
- Automatic detection of missing reagent before starting analysis.

Open configuration with clear visualization.

STRAIGHTFORWARD ANALYSIS

Simply scan your sample ID using the barcode reader, select the analysis method, and press start. The CLAM-2040 will perform the next steps automatically.

Scan sample ID → Select the method → Press [START]

EASY DATA REVIEW

- Easy visualization of calibration results (precision and accuracy).
- Easy visualization of Quality Control results (precision and acceptance range).
- Data alerts when results are out of specification.
- Easy review of quantitative results (concentrations).
- Possibility to check individual chromatograms when needed.
- Direct communication with LIS for data reporting.

Designed for routine use.

Flexible, open.

A wide range of applications within reach.

Open configuration of methods and reagents

- Compatible with Alsachim reagents and Shimadzu methods.
- Supports Shimadzu databases for toxicology (TQ or high resolution).
- Supports Shimadzu Metabolites Method Package Suite.
- Also compatible with third-party reagents.
- Compatible with your laboratory developed tests (LDT).

A WIDE RANGE OF EXISTING APPLICATIONS

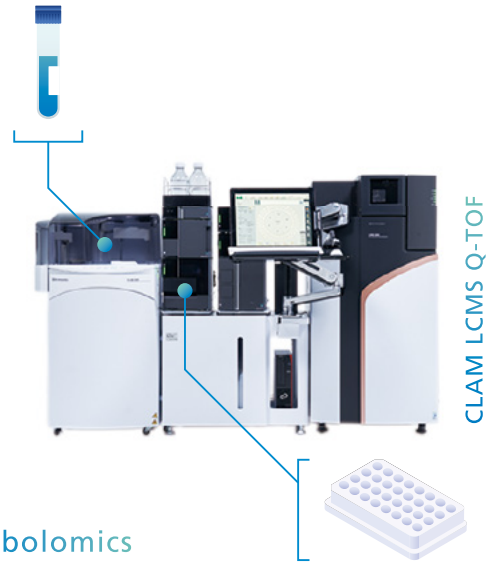
Examples of applications demonstrating the automation by CLAM

- Analysis for Voriconazole Antifungal Drug in Plasma (App. No. C146-E464)
- Tacrolimus from dry blood spot (App. No. 01-00276-EN)
- Choline, TMA, and TMAO in plasma (App. No. 01-00238-EN)
- Primary Metabolites in plasma (App. No. 01-00217-EN)
- Organic acids in serum (DOI: 10.3390/diagnostics11122195)
- First-Line toxicological screening in plasma (DOI: 10.1093/jat/bkaa075)
- Antiarrhythmic drugs in plasma (App. No. LAAN-A-LM-E123)
- Remdesivir and metabolites in plasma (App. No. C217)
- Raltegravir, Dolutegravir, Elvitegravir, and Bictegravir in Plasma (DOI: 10.15369/sujms.32.91)
- Uracil and dihydrouracil in plasma (DOI: 10.1016/j.jchromb.2020.122038)
- Anticoagulants (NOAC) in plasma (App. No. PO-CON1851E)
- Toxicological quantification in whole blood, plasma and urine (DOI: 10.1016/j.cca.2019.03.076)
- Mycophenolic acid and metabolite in plasma (poster "Integration of mycophenolic acid and its metabolite analysis in plasma using LC-MS/MS with full-automated sample preparation")
- Drugs of abuse in plasma (DOI: 10.1007/s00216-018-1159-7), in urine (App. No. PO-CON1737E), and in oral fluids (App. No. PO-CON1753E)
- Hydrophilic metabolites in serum and plasma (App. No. PO-CON1720E)
- Novel system for analyzing hydrophilic blood metabolites in Plasma (DOI: 10.1016/j.jbiosc.2017.01.015)
- Psychoactive drugs in serum, whole blood and urine (App. No. PO-CON1714E)
- Metanephrine and normetanephrine in plasma (App. No. PO-CON1751E)
- Unbounded amino acids in urine (App. No. PO-CON1733E)
- Antibiotics in plasma (poster "Antibiotics in Plasma: A Novel, Seamlessly Automated LC-MS Solution to Increase Sensitivity, Specificity and Routine Throughput effectiveness")
- Antiepileptics, benzodiazepines, neuroleptics, and TCA in serum (App. No. PO-CON1786)
- Neuroleptics drugs in plasma (App. No. PO-CON1785E)
- Tricyclic antidepressant drugs in serum (App. No. PO-CON1777E)
- Benzodiazepines in serum (App. No. PO-CON1776E)
- Antiepileptics drugs in plasma and in serum (App. No. PO-CON1788E and PO-CON1775E)
- 25-OH Vitamin D2/D3 in Serum (App. No. PO-CON1692E)
- Steroids in serum (App. No. PO-CON1691E)

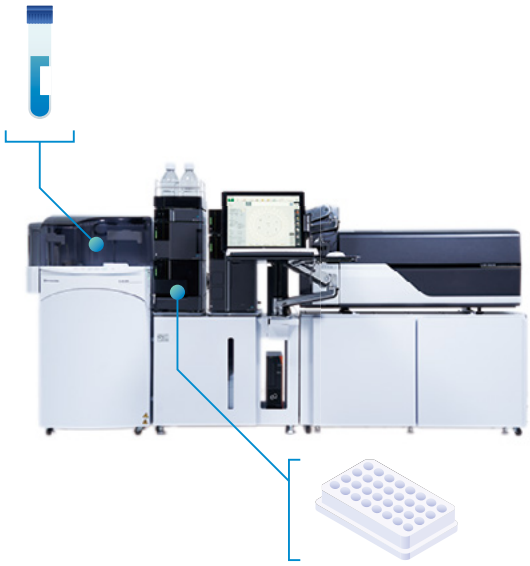
One system, multiple uses.

Build the clinical research laboratory of the future.

From the sample tube, the CLAM can perform extraction and LC/MS analysis automatically.



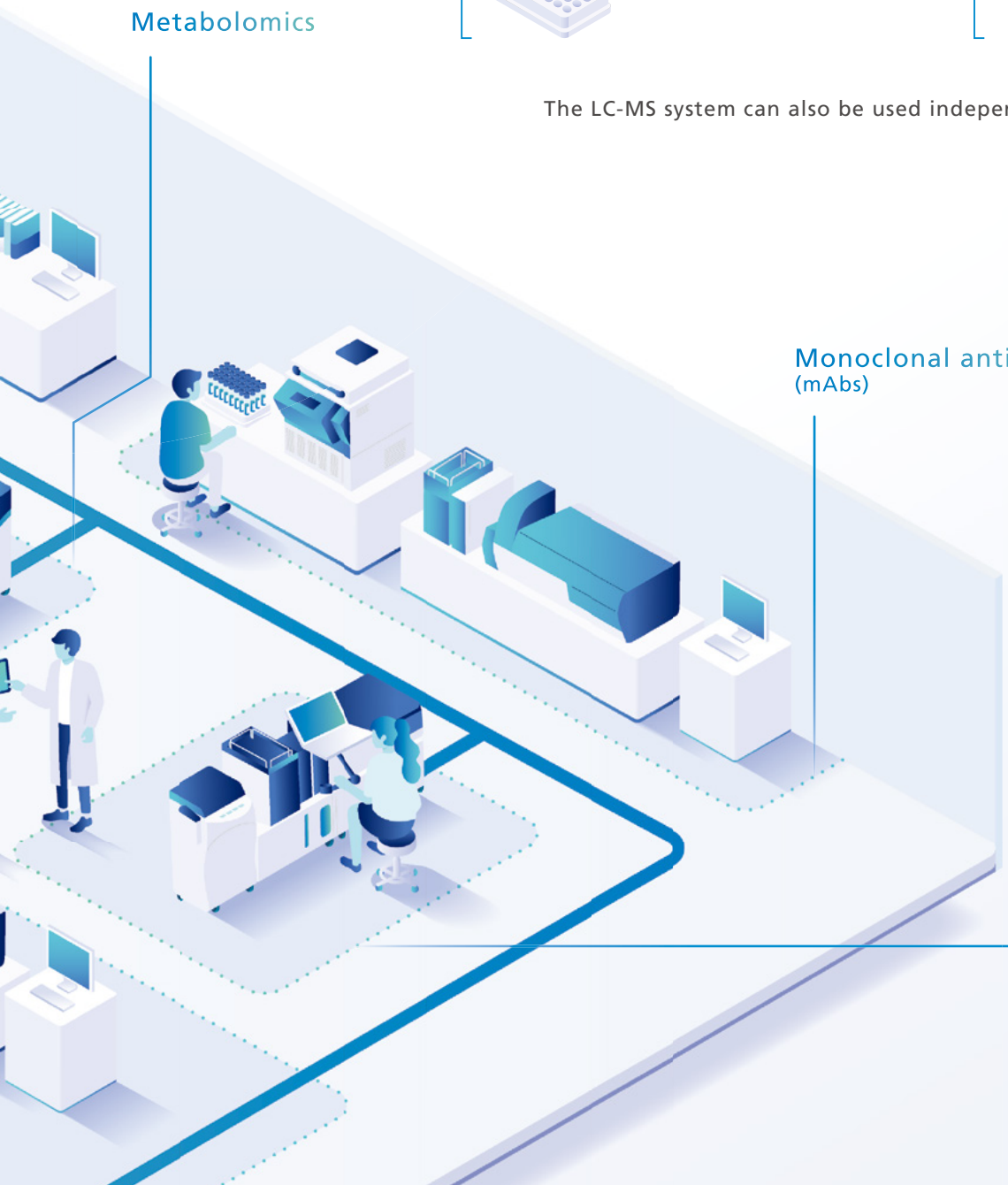
CLAM LCMS Q-TOF



CLAM LCMS TQ

Metabolomics

The LC-MS system can also be used independently at any time.



Monoclonal antibodies
(mAbs)

Endocrinology

Best for our customers.

Shimadzu support team is conscious of your exigence.

The Shimadzu support team is aware of the demanding environment of clinical research and fully understands your work challenges and its importance. We know that smooth and efficient communication with our engineers is critical to maintain continuous analysis workflow.

PERSONALIZED SUPPORT CONTRACT

Together with your local Shimadzu representative, build your personalized support contract by selecting the best options to fit your needs. This could cover interventions for emergencies, preventive maintenances planned on a regular basis over the year, as well as any necessary spare parts. This will ensure the safe routine use of the system, and your peace of mind. Our service engineers are based in regions as close as possible to your laboratory to ensure quick response. Please contact your local Shimadzu representative for detailed information.

Full flexibility, unlimited capability.

Get the most out of your clinical research laboratory.

The CLAM-2040 is the online automated sample preparation module for LC-MS that integrates the LC/MS performance smoothly into your laboratory :

- Effortless performance with no need for technical knowledge.
- Capability to connect to your laboratory information system.
- Flexibility to use our dedicated assays, but also any assay of your choice.
- Flexibility to choose your LC-MS configuration and to evolve it at any time.

System summary

Applications	Shimadzu methods / Alsachim reagents / third-party reagents / your own LDT
Throughput	Up to 23 samples per hour (under specific conditions)
Sample Capacity	60 samples (primary tubes or sample cups) - new sample loading at any time
Sample Matrix	Whole blood, plasma, serum, urine, oral fluids, dried blood spots.
Barcode support	Code 39, NW-7, Code 128, 2 OF 5
Connectivity	HL7 standards
Dimensions	W 670 mm, D 700 mm, H 1190 mm (Main Unit)

Shimadzu Corporation
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