SHIMADZU
Excellence in Science

Fully Automated Sample Preparation Module for LCMS

CLAM-2030

Fully Automated Sample Preparation Module for LCMS™ Based on Shimadzu's Extensive Experience with Clinical Examination Systems for Blood Coagulation Analysis

Simply Place Blood Collection Tubes in Position and the Module Automatically Performs Everything from Sample Pretreatment to LCMS Analysis

Achieves Reliable Data Acquisition

- Fully automates processes from pretreatment to LCMS analysis.
- Reduces variability in internal standard substance concentration (using vials with septa installed).
- Equipped with improved and expanded accuracy control functionality.
- Reduces operator errors and risk of infection.

Eliminates the Need to Review Settings for Routine Work

- Automates processes from searching toxicological drug libraries to generating reports.[1]
- Provides the optimal analytical method.[2]

Further Improves Efficiency of Research or Business Processes

- Makes it easy to create or review new pretreatment protocols.
- Samples can be added or processing interrupted in an emergency.[3]
- Text files can be used to load analysis requests from an LIS or output concentration values to a specified folder.

*1: Requires the LC/MS/MS forensic toxicological database or rapid toxicology screening system ver. 2, which are sold separately.
*2: Limited to commercial LCMS analysis kits and other methods available for supply.
*3: The number of interruptions or samples that can be added is limited by the number of pretreatment vials placed.

Innovation in Automation

CLAM™-2030

Deproteinizes blood, urine, serum and plasma samples and adds an internal standard substance automatically.

Nexera™ X2 System

Pretreated samples are automatically transferred to the Nexera autosampler and analysis is started.

LCMS-8060
LCMS-8050
LCMS-8045
LCMS-8040

Fully Automated Sample Preparation Module for LCMS

CLAM-2030

CLAM-2030 Features

1

Automates All Process Steps, from Pretreating to Measuring Blood, Urine, Serum and Plasma Samples

- Enables seamless analysis and management of samples throughout the entire process from pretreatment to LC/MS/MS measurement.
- Automation means samples can be analyzed automatically at nights or on days off.

2

Supports Measuring a Wide Range of Compounds

- Flexible HPLC and MS configuration to meet application need.
- Measure hundreds of compounds in a single analysis.
- Easily change between different methods.

3

Checking Various Measurement Results Is Easy

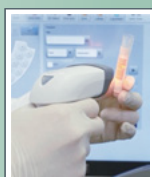- Facilitates data review and flags inconsistent data and instrument conditions.

- Whole blood
- Blood plasma
- Blood serum
- Urine

Analysis of blood serum/plasma components requires pretreating samples by centrifuging in advance.
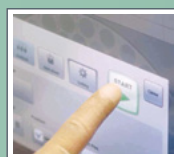
Prepare a blood collection tube.

Perform by the CLAM-2030 module. (Operator Labor Time: 3 min)

Obtain sample ID.

Select the analysis process steps (kit).

Press the [START] button.

Full automation

- Add blood or urine samples.
- Add internal standard substance.
- Add organic solvent to denature proteins.
- Stir.
- Filter using suction.
- Derivatize by heating (optional).
- Transfer samples to the HPLC autosampler.

Conventional Manual Pretreatment
(Operator Labor Time: 15 min)

1. Dispense samples.
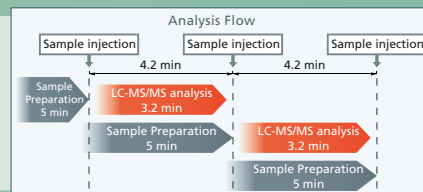2. Dispense reagent.

3. Stir.

4. Separate by centrifuging.

5. Transfer supernatant to vials.
6. Place vials in a rack.
7. Request analysis.

Dedicated Control Software Enables Analysis Using Triple Quad LCMS-8060/8050/8045/8040 Systems

- Complete integration of CLAM-2030 with LCMS enables seamless analysis.
- Successfully tested using a wide range of compounds (full list available on page 8).

Analysis Flow

Sample injection   Sample injection   Sample injection

4.2 min   4.2 min

Sample Preparation 5 min

LC-MS/MS analysis 3.2 min

Sample Preparation 5 min

LC-MS/MS analysis 3.2 min

Sample Preparation 5 min

- Check quantitative results (concentration values) and the mass chromatograms for each component.
- Display calibration curve accuracy % (precision) and data alarms with respect to the measurement results for substances subject to accuracy control.
- As qualitative analysis, output reports on library search results.

Report creation
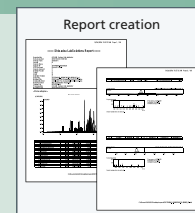
Reduces Operator Errors and Risk of Infection During Manual Operations

Reduces Operator Errors

By simply placing uncapped blood collection tubes (or sample cups) and pretreatment vials in the system, and requesting analysis, the system performs all other process steps automatically, from pretreatment to LCMS analysis. With an LCD touch panel screen and a user interface that requires no instruction manual, the system helps ensure reliable and rapid operations with minimal operator errors due to manual operations.
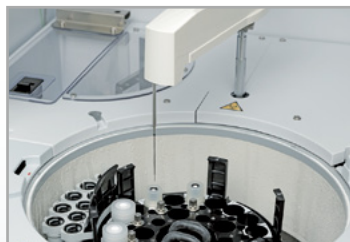

❶ Carousel for samples and reagents
❷ Racks for pretreatment vials
❸ Dispensing probe for samples
❹ Dispensing probe for reagents

| Dispense samples	Dispense reagents	Stir

Reduces Infection Risk

The CLAM-2030 minimizes human contact with potentially hazardous samples through automation. Following pretreatment, solid and liquid waste are contained within the body of the CLAM-2030 and collected. Integrated sensors alert users through the software that waste levels are high and require emptying.

Touch panel LCD

Liquid waste tank

Waste box
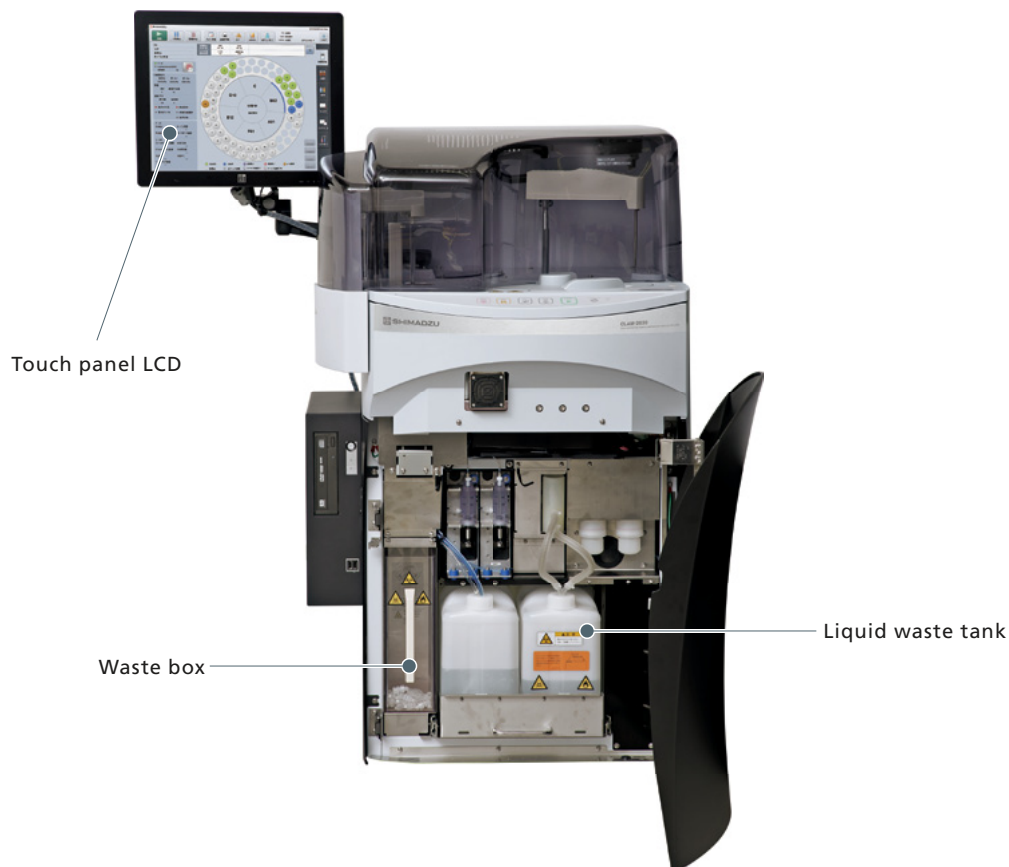
Filter	Heat	Transfer to SIL unit
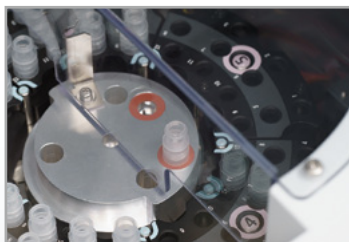
Applications

The follow are examples of applications using a CLAM module.

Target Components
6-acetylmorphine, Aldosterone, Amikacin, Amiodarone, Amisulpride, Amphetamine, Androstenedion, Anhydroecgonine methyl ester, Arbekacin, Aripiprazole
8 Barbiturate drug and Bromovalerylurea, BDB, Benzoylecgonine, 39 Benzodiazepines and their metabolites, Bepridil, Buprenorphine
Carbamazepine (CBZ), Carbamazepine10-11-epoxide, 2C-B, 2-Cl, CBZ-Diol, Cibenzoline, Ciprofloxacin, Clopazine, Cocaethylene, Cocaine, Codeine, Corticosterone, Cortisol, Cyclosporine
Daptomycin, Dehydroaripiprazole, 11-Deoxycortisol, Desmethylclopazine, Dextromethorphan, DHEA, DHEA-S, Diazepam, Dihydrocodeine, DOACs (Apixaban, Rivaroxaban, Edoxaban, Dabigatran)
Ecgonine methylester, EDDP, Ethosuximide, Ethylmorphine, Everolimus
Felbamate, Flecainide
Gabapentin, Gentamicin
Haloperidol, Hydoromorphone, Hydrocodone, 25-hydroxyvitamin D3, 25-hydroxyvitamin D2, Hygromycin C
Kanamycin, Ketamine
Lacosamide, Lamotrigine, Levetiracetam, Levofloxacin, Levomepromazine, Linezolid
6-MAM, MBDB, MDA, MDEA, MDMA, Melperone, Mephedrone, Metanephrin, Methadone, Methamphetamine, Methaqualone, Methcathinone, Methiopropamine, 3,4-Methylenedioxypyrovalerone, Methylphenidate, Mexiletine Morphine, *m*-CPP, 4-MTA
Naloxone, Naltrexone, N-Desmethylolanzapine, NDMS, Neomycin B, Nimetazepam, Norbuprenorphine, Norephedrine, Norfenfluramine, Norketamine Noroxycodone, Normetanephrin, Norpseudoephedrine, Norquetiapine, n-Desethylamiodarone
10-OH-CBZ, 17-OH-Progesterone, 9-OH-Risperidone, Olanzapine, Oxacarbazepine, Oxycodone
Paromycin, PEMA, Perampanel, Perazine, Phencyclidine, Phenobarbital, Phenytoin, Pholcodine, Pilsicainide, Pipamperone, Pregabalin, Primidone, Progesterone, Promethazine, Propoxyphene, Pyridoxal-5'-Phoshate (P5P)
Quetiapine Risperidone
Rapamycin (Sirolimus), Retigabine, Ritalinic acid, Rufinamide
Sertindole Sulpiride, Sotalol, Stiripentol, Streptomycin, Sultiame
Tacrolimus (FK 506), Teicoplanin, Teststerone, Thiamin Pyrophosphate (TPP), Thioridazine, Tiagabine, Topiramate, 12 Tri-/Tetra-cyclic antidessant
Valpronic acid, Vancomycin
Ziprasidone, Zonisamide, Zotepine Zuclopenthixol, (Z)-Chorprothixene

High-Speed High-Separation
Analysis Connectible to LCMS Systems

CLAM-2030 modules can be connected to Nexera LC-MS/MS ultra high performance liquid chromatograph systems, which offer exceptional speed and resolving power. By connecting a CLAM-2030 module to a Nexera LC-MS/MS system, the CLAM-2030 control software can be used to acquire data by automatically analyzing pretreated samples in the LCMS system. The MS detector can be selected based on the target components, analysis frequency, and sensitivity requirements of the customer.

MS Detectors

Low

LCMS-8040

This triple quadrupole mass spectrometer offers increased sensitivity (compared to previous Shimadzu models), based on advancements in ion optics.

LCMS-8045

Triple quadrupole mass spectrometer features a newly designed heated ESI probe and collision cell.

Sensitivity

LCMS-8050

With a heated ESI probe and the UFsweeper™ III collision cell, the LCMS-8050 achieves outstanding measurement speeds and quantitative performance.

LCMS-8060

This triple quadrupole mass spectrometer features Shimadzu's patented "UF Technologies."
By including an optimized ion loading unit and new UF-Qarray™ technology, it achieves even higher sensitivity than the LCMS-8050.

High

Please consult your local sales representative for more information on which system is best suited for your application.

Optional Software

LC/MS/MS Rapid Toxicology Screening System Ver. 2

This system includes methods for simultaneously or individually analyzing 161 components, including abused drugs, psychiatric and neurological drugs, and hypnotics and sedatives.

Predetermined Analytical Conditions

This system provides MRM transitions, LC separation conditions, retention times, spectral libraries, and report files, enabling rapid implementation of a screening method for many important toxicological substances.

Screening for 161 Compounds

Developed in conjunction with front-line researchers in the toxicology field, the method analyzes several classes of substances. LCMS MRM optimization has been performed for common drugs of abuse, hypnotics, psychotropics, pharmaceuticals and other natural toxins. Shimadzu's Ultra-Fast MS technology enables triggered product ion scans, which provide MS/MS data during MRM acquisition.

LC/MS/MS Forensic Toxicological Database

This database includes compound data necessary for analyzing abused drugs, psychiatric and neurological drugs, pharmaceuticals, pesticides, and natural toxins, and for other toxicological analysis.

Simplified Acquisition and Identification

The Forensic Toxicology Database includes optimized LC-MS/MS data acquisition parameters and a library database to help clinical and forensic researchers build screening and quantitation methods quickly, simplifying method development.

MRM & Spectral Library Database Contains Information on More Than 2,500 Compounds

The spectral library database is built using two separation conditions (ODS and Biphenyl). Both methods have information on clinical and forensic compounds of interest in routine analysis. The ODS method contains information on 1,250 compounds and the Biphenyl method contains 1,281 compounds. Compound datasheet includes: monoisotopic mass, RT, CAS number, formula and compound class. This package provides Synchronized Survey Scan™ parameters (MRM parameters, MRM intensity threshold and triggered product ion scan parameters) optimized for screening analysis.

Enhanced Identification by Merged Spectrum

Each certified reference material was acquired with three different collision energies to generate an information-rich merged-CE spectrum which can be used in library matching and compound verification. Matching with a merged-CE spectrum library can be a powerful tool to identify compounds with a library score.

Consumables

Specifications for Specialized Pretreatment Vials

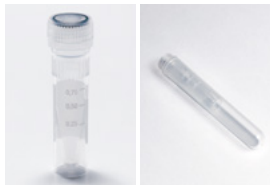Dedicated disposable pretreatment vials are used. Filter and collection vials are used as a pair.

Specialized Filter Vial

Specialized Collection Vial

P/N	Description
241-16593-41	Vial Set (set of 100 pairs)
241-16593-42	Vial Set (set of 500 pairs)
241-16593-43	Vial Set (set of 2,000 pairs)

Vial Material	Polypropylene (PP)
Filter Material	PTFE, with 0.45 μm pore size
Reusability	None (disposable)

Specifications of Applicable Sample and Reagent Vials

Sample Vials

13 mm body diameter × 75 mm height

Examples: BD brand Vacutainer® blood collection tubes, Terumo brand VENOJECT® II blood collection tubes, Nipro brand Neotube blood collection tubes

Note: Select the type of blood collection tube based on the type of analysis.

2 mL Cup (1000 pieces in a bag)
P/N 038-00180

Micro-Volume Cup (1000 pieces in a bag)
P/N 241-94045-01

For Cap-on Tubes
Left: P/N 038-00051-68
1.5 mL Tube
Right: P/N 046-00342-01
Test Tube

Reagent Vials

1.5 mL Vial

P/N 228-16965-91	Vial (100 pieces in a bag)
P/N 241-18511-41	Septum sets for 1.5 mL vial (100 sets in a bag) • Caps • Septum • Filter paper

6 mL Vial

P/N 241-16619-43	Vial (50 pieces in a bag)
P/N 241-18512-41	Septum sets for 6 mL vial (50 sets in a bag) • Septum • Filter paper
P/N 038-00199-33	Cap, 6 mL

12 mL Vial

P/N 223-81340-41	Vial
P/N 223-81468-02	Septum to Prevent Absorbing Humidity
P/N 038-00199-34	Cap, 12 mL

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