C196-E061G

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SHIMADZU

Prominence

Shimadzu
High Performance
Liquid Chromatograph

Do you know Prominence ?

Prominence

Shimadzu High Performance Liquid Chromatograph

A Network-Compatible HPLC Designed for a Rapidly Advancing Information Society

With fierce competition in many industries, stronger legal restrictions, and the rapid spread of IT, business is changing daily at a blinding pace. In this climate, the problems and needs of customers are diversifying. This applies to high-performance liquid chromatographs, which are used for a variety of purposes, such as R&D, quality control, and environmental measurement. In order to adapt quickly to these diversifying user needs, Shimadzu Corporation has developed the "Prominence" high-performance liquid chromatograph. In addition to bolstering basic performance, this product can be used as part of a comprehensive control system that can interface with advanced networks. It enables the centralized management of devices and data, thereby ensuring efficient analysis.

- Advanced Networks with Web Browser Control Capability
  Centralized Management of Analytical Instruments
- Optimization as Front-End Component for MS
  Outstanding Performance
- Full Automation of Analysis Workflow
  Freedom from the Laboratory

Contents

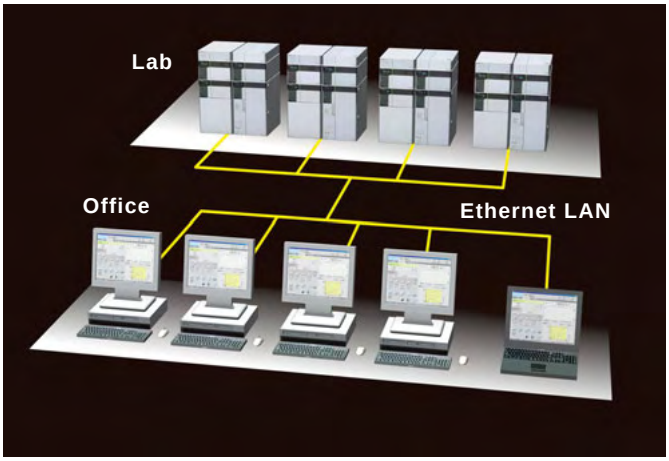
Advanced Networks with Web Browser

[Centralized Management of Analytical Instruments]

Ensuring the efficiency of analysis work and the security of data by centralizing the management of analytical instruments and data will become an integral part of laboratory practice in the future. The Prominence system achieves these crucial requirements now by

Connection to LC Workstations in the Network

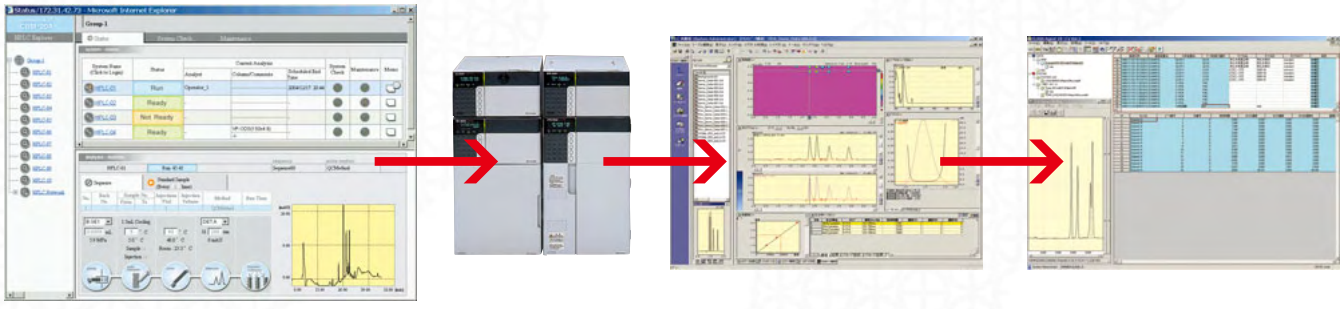
The Prominence system can connect to LC workstations in the network via Ethernet. In addition to increasing the degree of freedom of the installation and fostering more efficient use of laboratory space, it enables access to the HPLC system from multiple client PCs and provides a flexible analytical environment.



Example of network environment using Prominence

Total Support Covering Analysis, Data Management, and Device Management

Analysis and data processing are performed with LCsolution or CLASS-VP (on an LC workstation), data management is performed with CLASS-Agent, and the remote monitoring of devices, maintenance management, and scheduling are performed from a Web browser, thereby providing total support.



Device Management from a Web Browser (IE)

Data Analysis with LCsolution or CLASS-VP

Data Management with CLASS-Agent

Control Capability

providing efficient and comprehensive support for data management and instrument control via the network, where users can monitor analysis, maintenance management, and analysis scheduling in workgroup units.

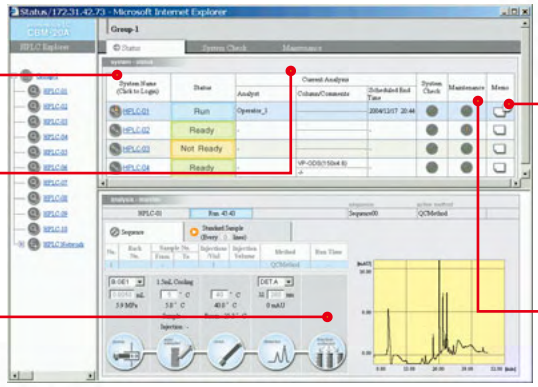
System Control Using a Web Browser

Use any computer with Microsoft Internet Explorer 6.0 to control and monitor the Prominence HPLC system. Connection to the CBM-20A with a static IP address requires no special software to control and monitor HPLC systems on the network from the client PC. Easily check the status of networked HPLC systems, or monitor consumable parts for increased work efficiency.

Up to 10 LC units managed as one workgroup.

Column information is managed automatically via the CMD (Column Management Device).

Each device can be controlled and its operating status can be monitored.



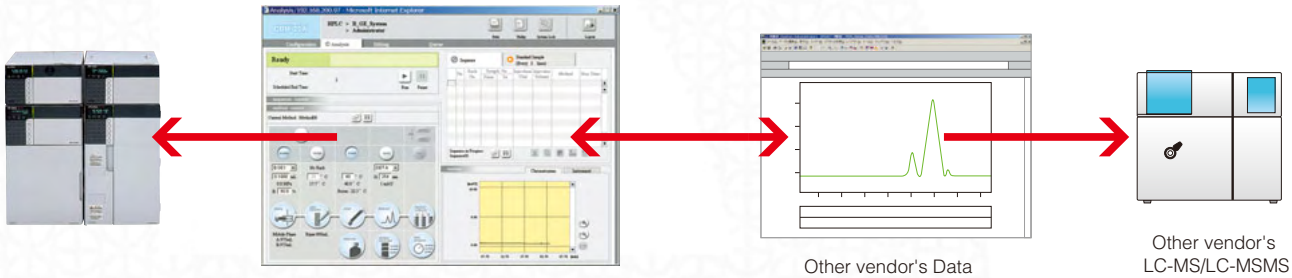
One of the CBM-20A's Web-server functions is a memo function. This function can be used for scheduling the use of devices by sending memos such as "Use next week" or "Perform maintenance".

The maintenance status of devices can be checked at a glance.

Innovative Network Compatibility

Multi-vendor Compatibility through Web Browser

Operation is performed from a PC using a Web browser; therefore, even users utilizing another vendor's data processing system can perform monitoring, control, and maintenance management for the Prominence system with ease. It is also possible to use Prominence as the front-end component in an LC-MS/LC-MSMS system while controlling it from an MS workstation.



Optimization as a Front-End Component for MS

[Outstanding Performance]

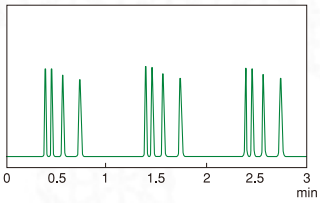
At a time when the importance and widespread use of LC-MS is increasing, an HPLC system must be able to attain a high level of performance as an MS front-end component. In addition to a high level of basic performance, including micro-range solvent delivery, high throughput, and the suppression of carryover, the Prominence system is a truly effective HPLC system that enables high-level LC-MS analysis.

Superior Micro-Range Solvent Delivery Performance

In addition to enhancing the micro-volume plunger, which already has an established reputation, by refining the control firmware, the accuracy of the flow rate and gradient concentration at lower flow rates have been significantly improved.

→ P14 Solvent Delivery Unit

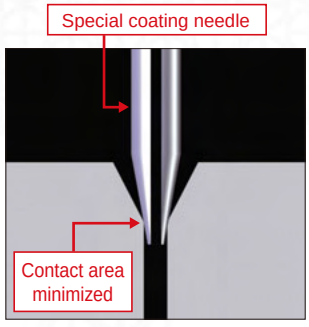
Ultra-high Throughput



Our fastest sample injection speed (10 sec. for an injection of 10 µL) ensures greater MS throughput. Also, mounting a rack changer makes it possible to perform continuous processing for up to 12 microplates.

→ P16 Auto-Sampler

Sample Carryover Reduced to an Absolute Minimum



A special coating on the needle and a low-adsorption valve ensure hardly any carryover, even with basic or hydrophobic compounds. Also, using the optional multi-rinse mode ensures that the optimum rinsing method is selected, even for sample constituents that are difficult to rinse, such as proteins.

→ P16 Auto-Sampler

System Expansions to Suit a Variety of Purposes

This system offers superior expandability and can be configured into a variety of compact systems for MS, such as dual high-pressure gradient systems and 2D HPLC systems.

→ P8 System Variations

Full Automation of Analysis Work

[Freedom from the Laboratory]

The basic requirements of an HPLC system remain constant: it must be easy for anyone to use and it must yield highly reliable data. With the Prominence system, all the units operate in harmony, achieving a level of automation as yet unseen with modular systems, and significantly reducing the effort and cost required to perform analysis.

Auto-Startup and Auto-Shutdown

Combining the Harmonize functions for each unit makes it possible to fully automate all the processes involved in analysis workflow, from startup to shutdown. Simply set the mobile phase and sample and start the system. The system will recognize the operating status and execute analysis. This significantly reduces the time the user must devote to analysis at startup.

Main Types of Automated Analysis Procedures

- Starting and stopping of system operation at specified times
- Replacement of mobile phase (purge)
- Rinsing and cooling of column
- Automatic judgment of baseline stabilization
- Sample injection

Expert Function

The system is equipped with a function that continuously monitors the operating status and, if there is a problem, provides notification and tries to resolve it. For example, if the pressure falls below a certain value during serial analysis, the function detects the problem, purges the mobile phase, and then resumes analysis after restoring normal status. The reliability of operating performance is also increased with a variety of diagnostic functions.

Main Types of Automated Check Items

- Remaining amount of mobile phase
- Noise/drift check
- Vial detection

Auto-Validation

The Prominence system also incorporates consideration of validation. IQ/OQ at the time of installation, operational qualification for each unit in periodic inspections, and management of maintenance information can all be executed with ease. This means that inspections and modifications can be performed quickly and simply, significantly reducing the validation cost. Also, using an optional CMD (Column Management Device) makes it possible to recognize the column name and serial number, and to leave a record of information, such as the amount of mobile phase that has pumped and the number of sample injections.

Automated Operational-Qualification (OQ) Items

- Accuracy of solvent-delivery flow rate
- Solvent-delivery pulsation
- Lamp energy
- Wavelength accuracy (built-in, low-pressure, mercury lamp)

Flexible System Variations

By combining the modules appropriately, the Prominence system can be configured in a variety of ways to suit different analytical objectives and methods.

High-Pressure Gradient System [Prominence HGE-UV]

- Configuration: High-performance system that uses the 2-solvent high-pressure mixing gradient elution method.
- Applications: In addition to general analysis, it can be used as an LC-MS front-end component for micro and semi-micro HPLC.

Incorporating an SPD-M20A high-sensitivity photodiode array detector makes it easy to examine specificity-related items, such as identifying impurities and checking peak purity.

P/N	Description	Model Name	Q'ty
228-45011-38	System Controller	CBM-20Alite	1
228-45002-XX	Solvent Delivery Unit	LC-20AB	1
228-45018-32	Online Degasser	DGU-20A3	1
228-45093-93	Mixer 0.5-2.6mL HP	–	1
228-45007-XX	Auto-Sampler	SIL-20AC	1
228-45010-XX	Column Oven	CTO-20AC	1
228-45004-XX	UV-VIS Detector	SPD-20AV	1
---	LC Workstation	LCsolution Single	1

Low-Pressure Gradient System [Prominence LGE-UV]

- Configuration: Flexible system that uses the 4-solvent low-pressure mixing gradient elution method.
- Applications: This system can be used in a variety of ways, ranging from method development to routine analysis.

This system is equipped with a comprehensive set of functions, including a validation function, for supporting conformance to GxP/ISO regulations.

P/N	Description	Model Name	Q'ty
228-45011-38	System Controller	CBM-20Alite	1
228-45001-XX	Solvent Delivery Unit	LC-20AT	1
228-45040-31	Low-Pressure Gradient Unit	–	1
228-45019-32	Online Degasser	DGU-20A5	1
228-45093-93	Mixer 0.5-2.6mL HP	–	1
228-45007-XX	Auto-Sampler	SIL-20AC	1
228-45010-XX	Column Oven	CTO-20AC	1
228-45004-XX	UV-VIS Detector	SPD-20AV	1
---	LC Workstation	LCsolution Single	1

Isocratic System [Prominence ISO-UV]

- Configuration: Basic system that uses the isocratic elution method.
- Applications: Ideal for applications such as teaching practice.

Despite the simple configuration, there is no loss in performance capability and reliable data can be obtained. The system can be upgraded by adding units as required.

P/N	Description	Model Name	Q'ty
228-45011-38	System Controller	CBM-20Alite	1
228-45000-XX	Solvent Delivery Unit	LC-20AD	1
228-45018-32	Online Degasser	DGU-20A3	1
228-32210-91	Manual Injecter	Rheodyne 7725	1
228-45009-XX	Column Oven	CTO-20A	1
228-45003-XX	UV-VIS Detector	SPD-20AV	1
---	LC Workstation	LCsolution Single	1

High-Throughput System [Prominence HTLC]

- Configuration: Connecting a rack changer to the SIL-20A, which offers high-speed injection and low carryover, makes it possible for this system to perform multi-sample processing.
- Applications: Ideal for the serial analysis of multiple samples in R&D.

P/N	Description	Model Name	Q'ty
228-45011-38	System Controller	CBM-20Alite	1
228-45002-XX	Solvent Delivery Unit	LC-20AB	1
228-45018-32	Online Degasser	DGU-20A3	1
228-45093-93	Mixer 0.5-2.6mL HP	–	1
228-45007-XX	Auto-Sampler	SIL-20AC	1
228-45030-XX	Rack Changer C	–	1
228-45010-XX	Column Oven	CTO-20AC	1
228-45004-XX	UV-VIS Detector	SPD-20AV	1
---	LC Workstation	LCsolution Single	1

Biological-Sample Analysis System [Prominence Co-Sense for BA]

- Configuration: Automatically performs complicated sample-pretreatment procedures, such as dilution and concentration.
- Applications: Incorporates optimum functions for life-science research.

P/N	Description	Model Name	Q'ty
228-45012-38	System Controller	CBM-20A	1
228-45000-XX	Solvent Delivery Unit	LC-20AD	2
228-45002-XX	Solvent Delivery Unit	LC-20AB	1
228-45019-32	Online Degasser	DGU-20A5	1
228-45093-93	Mixer 0.5-2.6mL HP	–	1
228-45007-XX	Auto-Sampler	SIL-20AC	1
228-45010-XX	Column Oven	CTO-20AC	1
228-45013-91	High-Pressure Flow-Line Selection Valve	FCV-12AH	1
228-45005-XX	PDA Detector	SPD-M20A	1
---	LC Workstation	LCsolution Multi-PDA	1

Dual High-Pressure Gradient System [Prominence Dual-HGE]

- Configuration: This system uses trap injection with two high-pressure gradient flow lines.
- Applications: Ideal for rapid analysis when used as a front-end HPLC in LC-MS.

P/N	Description	Model Name	Q'ty
228-45011-38	System Controller	CBM-20Alite	2
228-45000-XX	Solvent Delivery Unit	LC-20AD	1
228-45002-XX	Solvent Delivery Unit	LC-20AB	2
228-45018-32	Online Degasser	DGU-20A3	2
228-45007-XX	Auto-Sampler	SIL-20AC	1
228-45010-XX	Column Oven	CTO-20AC	1
228-45013-91	High-Pressure Flow-Line Selection Valve	FCV-12AH	2
228-45015-XX	High-Pressure Flow-Line Selection Valve	FCV-20AH2	1
228-45003-XX	UV-VIS Detector	SPD-20AV	1
---	LC Workstation	LCsolution Multi	1

List of Units

Networks

PC (Internet Explorer)

System Controllers →P12

CBM-20Alite (228-45011-38)

CBM-20A (228-45012-XX)

SCL-10AVP (228-45051-XX)

Peripheral Devices →P15

Low-Pressure Gradient Unit
(228-45040-91)

Online Degassers

DGU-20A3 (228-45018-32)
DGU-20A5 (228-45019-32)

Reservoir Tray
(228-45041-91)

Mobile-Phase Selection Valves

- **FCV-7AL** (228-45077-91)
- **FCV-11AL** (228-45048-91)
- **FCV-11ALS** (228-45049-91)
- **FCV-13AL** (228-45016-91)
- **FCV-130AL** (228-45078-91)

Solvent Delivery Units →P14

LC-20AD (228-45000-XX)
LC-20ADSP (228-45091-XX)

LC-20AT (228-45001-XX)

LC-20AB (228-45002-XX)

- **LC-10Ai** (228-45089-XX)
- **LC-6AD** (228-45068-XX)
- **LC-8A** (228-45069-XX)

Auto-Samplers →P16

Rack Changer C (228-45030-XX)

SIL-20A (228-45006-XX)
SIL-20AC (228-45007-XX)

- **SIL-HTA** (228-45061-XX)
- **SIL-HTC** (228-45062-XX)
- **SIL-10AF** (228-45056-XX)
- **SIL-10AP** (228-45057-XX)
- **SIL-10Ai** (228-45075-XX)

● Use the CBM-20A or the SCL-10AVP with the SIL-10AF/10AP/10Ai.

● Low-pressure gradient units can be incorporated in the LC-20AD and LC-20AT.

LC Workstation →P24

LCsolution

Data Processors →P25

C-R7A plus (223-04220-XX)

C-R8A (223-04500-XX)

Column Ovens →P18

CTO-20A (228-45009-XX)
CTO-20AC (228-45010-XX)

- **CTO-10ASVP** (228-45059-XX)

Detectors →P20

SPD-20A (228-45003-XX)
SPD-20AV (228-45004-XX)

SPD-M20A (228-45005-XX)

- **RID-10A** (228-45095-XX)
- **RF-10AXL** (228-45096-XX)
- **CDD-10AVP** (228-45054-XX)
- **ELSD-LTⅡ** (228-45115-XX)

- The CDD-10AVP can be controlled only with the SCL-10AVP .
- The ELSD-LTⅡ and L-ECD-6A output only analog signals. A CBM-20A or a SCL-10AVP and a PC-55N A/D board (223-04202-91) are required for analog signal acquisition.

Fraction Collector →P29

FRC-10A (228-45070-XX)

- Use the CBM-20A or the SCL-10AVP with the FRC-10A.

Flow-Line Selection Valves →P19

FCV-20AH2 (228-45015-XX)
FCV-20AH6 (228-45017-XX)

- **FCV-12AH** (228-45013-91)
- **FCV-14AH** (228-45014-91)

- Use the CBM-20A or the SCL-10AVP to control the FCV-20AH6.
- Two FCV-12AH or FCV-14AH units can be incorporated in the CTO-20A or CTO-20AC. An option box VP (optional: 228-45060-91) is required to connect more units.

MS Detector →P38

LCMS-2020 (225-13300-34)

Ethernet
RS-232C
Optical-fiber cable
Special cable

The Prominence system is configured with component units. Refer to the relevant page for details on each unit.

CBM-20A

The CBM-20A/CBM-20Alite is a system controller equipped with a data buffering function and acts as an interface for connecting LC workstations, network-client computers, and analytical instruments via Ethernet.

Supporting a Variety of Systems

CBM-20A

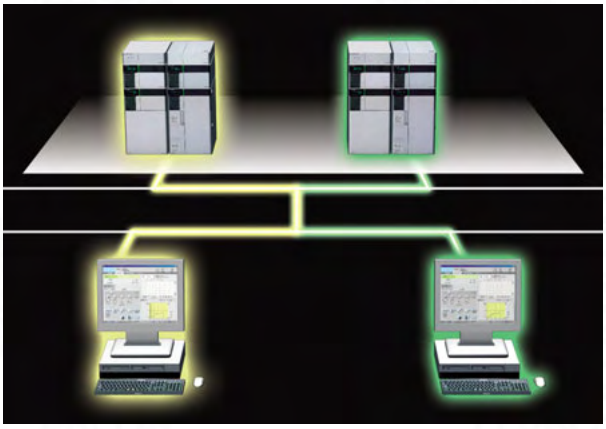
Up to eight units can be connected to the box-type CBM-20A. Also, adding an optional A/D conversion board makes it possible to accept chromatogram signals from other companies' detectors at LC workstations.

Space-Saving Type

CBM-20Alite

The card-type CBM-20Alite is used by incorporating it into an LC-20A-series solvent delivery pump or auto-sampler. It can control up to five units, including the unit in which it is incorporated.

Providing a Flexible Installation Environment



CBM-20A/CBM-20Alite units and computers are connected via Ethernet. LAN cables can be used for connection; therefore, analytical instruments and computers can be installed in remote locations.
Also, the data buffering function protects important analytical data from unexpected communication errors.

*The data buffering function is available only when using LCsolution.

Achieving Auto-Purge with a Modular HPLC System

The Prominence system is equipped with auto-purge, a function that is normally available only with all-in-one HPLC systems. This makes it unnecessary to open or close the drain valve when, for example, replacing the mobile phase. Combining this function with the startup and baseline-check functions enables fully automatic analysis with a modular HPLC system.

Equipped with Web-Server Functions

The CBM-20A/CBM-20Alite not only enables connection to computers via Ethernet, but is also equipped with Web-server functions. These allow system control, monitoring, and maintenance management of devices to be performed from Internet Explorer without installing special software.

Checking Device Status at a Glance

It is possible to browse information about the operating status, including the status of devices and the existence of errors, as well as information about device maintenance, including the results of the latest system checks and whether or not consumable parts have been used beyond recommended limits. Also, messages such as "Use next week" or "Perform maintenance" can be communicated between users with the memo function.

The operating status of devices in the network can be checked at a glance.

Control Possible via Network

Devices can be controlled from Internet Explorer without using a special workstation. Execution and monitoring of device conditioning before analysis can be carried out from another room or some other remote location. This makes it unnecessary to keep visiting the laboratory to check on the devices.

Centralized Management of Maintenance Information

Maintenance information, such as the usage frequency of consumable parts in analytical instruments, can be obtained quickly via Internet Explorer. This function is very useful for ensuring the stability and effective use of analytical instruments.

- CBM-20A (228-45012-XX) Number of connectable units: 8 Data buffering: Approx. 24 hours (for a sampling rate of 500 ms) Event I/O: 4 inputs, 4 outputs
  Connectable units: 4 solvent delivery units, 1 auto-sampler, 1 column oven, 2 detectors, 1 fraction collector, 2 sub-controllers
- CBM-20Alite (228-45011-38) Number of connectable units: 5 (including the unit in which it is incorporated) Data buffering: Approx. 24 hours (for a sampling rate of 500 ms)
  Event I/O: 2 inputs, 2 outputs Connectable units: 4 solvent delivery units, 1 auto-sampler, 1 column oven, 2 detectors, 2 sub-controllers

LC-20A

Thanks to drive-system modifications, the LC-20AD/20AT/20AB offers a level of solvent delivery performance previously unseen. It provides the ideal system for a range of applications from conventional LC to micro LC. Also, incorporating a system controller

Superior Solvent Delivery Performance

LC-20AD

The LC-20AD is a solvent delivery unit that offers the fastest solvent delivery performance in the world. With an automatic pulsation-correction mechanism and high-speed micro plunger driving, it achieves pulse-free solvent delivery. Thanks to improvements in solvent-delivery control firmware, solvent delivery performance in the micro-flow-rate range below 50 µL/min has been significantly improved.

Superior Maintainability

LC-20AT

The LC-20AT is a solvent delivery unit that possesses a high level of maintainability while delivering high performance. The ability to remove bubbles has been improved by modifying the pump-head structure and the flow line.

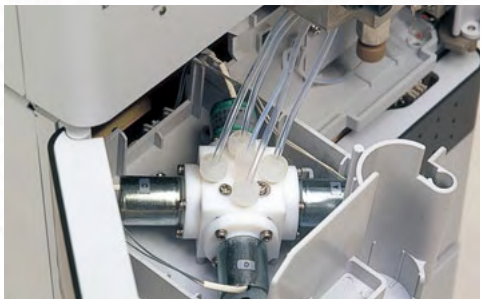
Binary Solvent Delivery Unit

LC-20AB

The LC-20AB is a binary, high-pressure gradient solvent delivery unit that incorporates two sets of LC-20AD solvent delivery systems. Its space-saving design can be used to create a two-solvent high-pressure gradient.

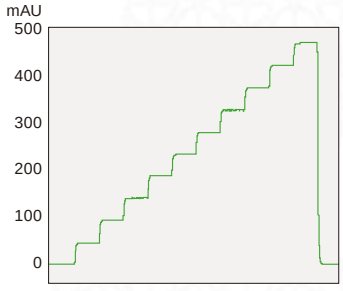
Low-Pressure Gradient Unit

The optional low-pressure gradient unit can be incorporated in the LC-20AD/20AT, enabling gradient elution in a compact space with a small void volume. Automatic matching adjustment of the solenoid valve and pump gives concentration accuracies of ±0.5% (LC-20AD) and ±1.0% (LC-20AT).



Accurate Gradient Solvent Delivery

By harmonizing two solvent delivery systems, the LC-20AB delivers solvent with an accurate concentration across a wide range from the micro-flow-rate region to the conventional flow-rate region.



Set value(%)	Measured value(%)	Error
10	9.98	-0.157%
20	20.05	0.262%
30	30.09	0.287%
40	40.03	0.069%
50	50.03	0.066%
60	60.02	0.032%
70	70.01	0.011%
80	80.00	0.001%
90	90.05	0.054%

(CBM-20Alite) in this unit makes it possible to control and monitor the operating status from PCs in the network, and perform device management for the whole system.

Continued Improvements to Solvent Delivery Specifications

The flow-rate accuracy and precision in the micro-flow-rate region have been improved thanks to the adoption of a new type of check valve and modifications to the solvent-delivery control method. Nonpolar organic solvents, such as hexane, can be delivered stably.

Flow-Rate Accuracy

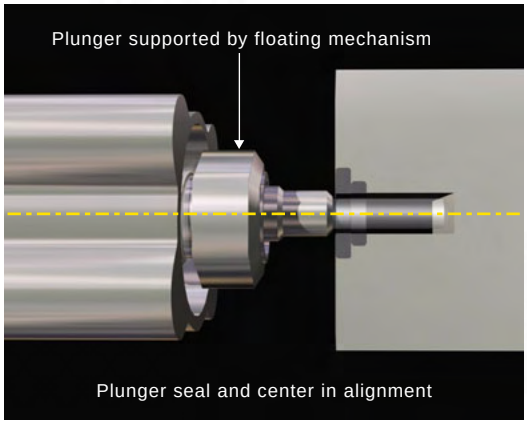
Set value (mL/min)	Measured value, n=6 (mL/min)	Error (%)
0.010	0.010	-1.20%
0.050	0.050	-0.06%
0.200	0.201	0.43%
1.000	1.000	-0.10%

Flow-Rate Precision

Set value (mL/min)	Flow-rate reproducibility, n=6 (RSD%)
0.010	0.49
0.050	0.08
0.200	0.08
1.000	0.01

Improved Durability

A new type of plunger made with a technique that reflects consideration of the material structure and a precise plunger-holding mechanism help to increase the service life of plunger seals and enable stable solvent delivery over long periods.



- LC-20AD Solvent delivery method: Parallel-type double plunger, Plunger capacity: 10 µL, Maximum discharge pressure: 40 MPa, Flow-rate setting range: 0.0001 to 10.0000 mL/min
- LC-20AT Solvent delivery method: Series-type double plunger, Plunger capacity: 47µL on primary side, 23 µL on secondary side, Maximum discharge pressure: 40 Mpa, Flow-rate setting range: 0.001 to 10.000 mL/min
- LC-20AB Solvent delivery method: Parallel-type double plunger (2 sets), Plunger capacity: 10 µL, Maximum discharge pressure: 40 MPa, Flow-rate setting range: 0.0001 to 10.0000 mL/min

Gradient
- LC-20AB Gradient type: High-pressure mixing, Number of mixed solvents: 2, LC-20AB high-pressure GE system
- LC-20AD/20AT Gradient type: High-pressure mixing, Number of mixed solvents: 2 or 3, LC-20AD/20AT high-pressure GE system
- LC-20AD/20AT Gradient type: Low-pressure mixing, Number of mixed solvents: 4 max, LC-20AD/20AT low-pressure GE system

DGU-20A3/20A5 Degasser

The DGU-20A3 / 20A5 is an on-line degasser that uses fluoroethylene membrane. The internal capacity is small at 0.4 mL, only 1/25th of that for existing Shimadzu models, and the waiting time at mobile-phase replacement or stabilization can be significantly reduced. The degassing efficiency has also been improved, ensuring thorough degassing even at high flow rates.

- Number of degassed solvents for DGU-20A3: 3
- Number of degassed solvents for DGU-20A5: 5

SIL-20A

The SIL-20A/20AC offers greater analysis efficiency, achieved through improvements in sample injection speed and processing capacity. Also, comprehensive sample

Supporting High-Throughput Analysis

SIL-20A

The SIL-20A is a total-volume injection-type auto-sampler that enables high-speed injection and multi-sample processing. It was designed to ensure greater stability, with improved durability attained through modifications in valves and sample loops.

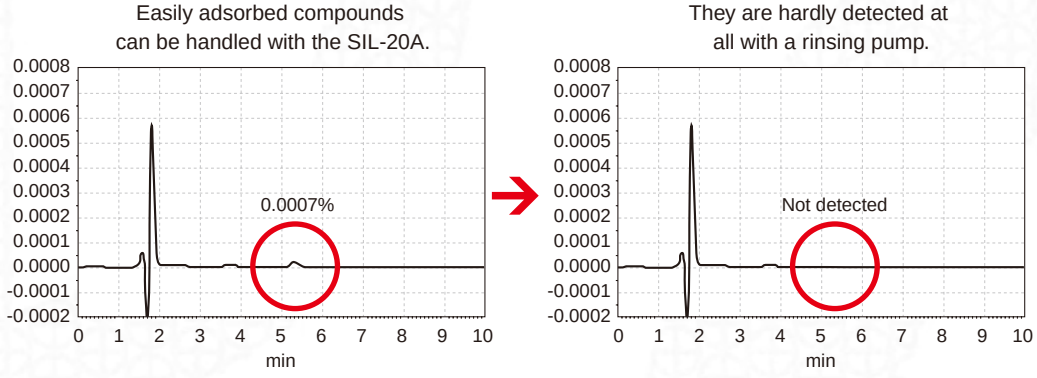
Equipped with Cooling Function

SIL-20AC

The SIL-20AC is equipped with a sample cooler that incorporates a dehumidifying function. Samples can be maintained at a fixed temperature in the range of 4°C to 40°C. The high cooling speed makes it possible to keep easily decomposed sample constituents in a stable condition.

Carryover Reduced to an Absolute Minimum

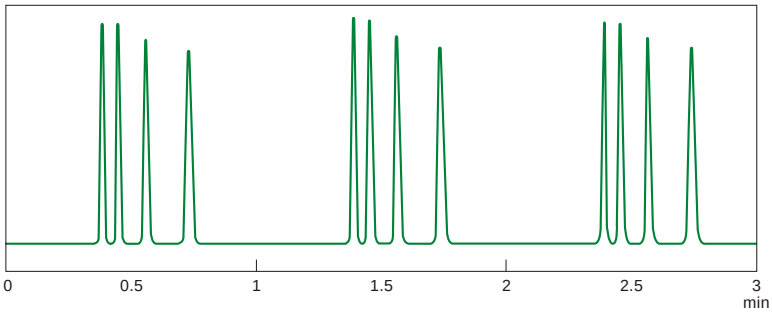
Adsorption of sample constituents has been reduced to an absolute minimum by using a special processing technology for the sampling needle (patent pending) and rethinking the structure of the needle seal and the materials used in flow-line parts. As a result, there is hardly any sample carryover. Also, the adoption of a PEEK rotor seal allows use over a wide pH range, from strongly acidic conditions to strongly basic conditions. Using the optional rinse kit (228-43042-91) makes it possible to rinse the sampling needle with two different solvents, selected in accordance with the purpose.



Sample Carryover Test for Chlorhexidine

carryover countermeasures make it possible to perform analysis without carryover, even in high-sensitivity LC-MSMS.

High Throughput



Only 10 seconds* are required for sample injection. High-speed vertical motion of the needle enables ultra-high speed sample processing, which was considered impossible with conventional auto-samplers. Using in combination with a high-speed-separation column makes an analysis cycle of less than one minute a reality.

*10 µL injection

Precise Sample Injection

Injection-Volume Accuracy

Set value (µL)	Measured value (µL)	Error (%)
1	0.99	-0.90
2	1.99	-0.70
5	5.01	0.20
10	10.00	0.00
20	19.92	-0.40
50	49.90	-0.20
100	99.70	-0.30

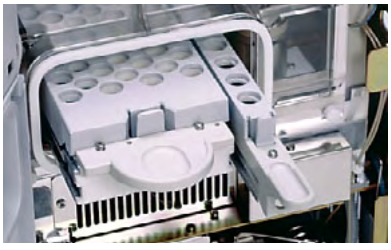
Injection-Volume Precision

Injection volume (µL)	Area reproducibility (%RSD)
1	0.43
2	0.25
5	0.06
10	0.04
20	0.03
50	0.10
100	0.11

Greater accuracy has been attained by incorporating a high-performance sampling device that can measure out the samples with high precision. The design reflects an emphasis on basic performance as well as functionality. Also, using direct injection means valuable samples are not wasted.

- SIL-20A Injection method: Total-volume sample injection, variable injection volume
  Injection-volume setting range: 0.1 to 100 µL (standard), 1 to 2,000 µL (option)
  Number of processed samples: 175 (1 mL vials), 105 (1.5 mL vials), 50 (4 mL vials), two 96-well MTPs, two 384-well MTPs, and ten 1.5 mL vials in addition to these.
- SIL-20AC Injection method: Total-volume sample injection, variable injection volume
  Injection-volume setting range: 0.1 to 100 µL (standard), 1 to 2,000 µL (option)
  Number of processed samples: 175 (1 mL vials), 70 (1.5 mL vials), 105 (1.5 mL vials), 50 (4 mL vials), two 96-well MTPs, two 384-well MTPs, and ten 1.5 mL vials in addition to these.

*A sample rack for 1.5mL vials and a control vial rack are included in the SIL-20A/20AC as a standard accessory.



Rack Changer: Increasing the Number of Processed Samples

A rack changer is an optional product that can be used to change the microplates in the auto-sampler's racks and thereby facilitate serial analysis. Up to 12 plates can be mounted in the rack changer.
This model incorporates a cooling function. When the samples have been prepared, simply set them in the rack changer to perform continuous sample processing.

- Rack changer C (228-45030-XX) Compatible plates: 96-well MTPs, 96-well DWPs
  384-well MTPs, 384-well DWPs
  1.5mL vial plate (54 vials)
  Number of processed plates: 12
  Sample cooler: Block cooling/heating,
  used together with dehumidifying function, 4°C to 40°C

CTO-20A

The CTO-20A/20AC precisely regulates the temperature around the column and supports stable analysis that is not influenced by the ambient temperature.
In addition to the column, various other parts and units can be accommodated, including

Accommodating Multiple Columns

CTO-20A

The CTO-20A is a forced air-circulation-type column oven. It can regulate the temperature in a range going from 10°C above room temperature to 85°C. It also allows the setting of complex temperature programs by incorporating, for example, linear or step-wise increases and decreases in temperature.

Cooling Also Supported

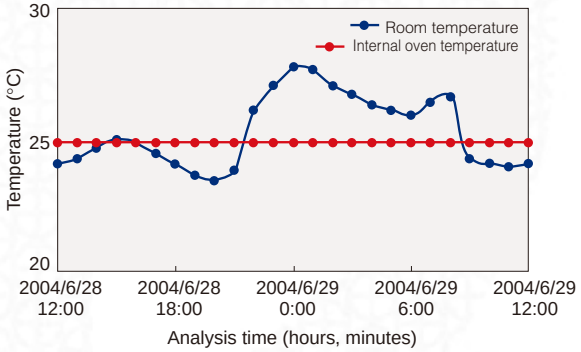
CTO-20AC

The CTO-20AC model is equipped with a cooling function. Using an electronic cooler, it can regulate the temperature in a large range going from 10°C below room temperature to 85°C.

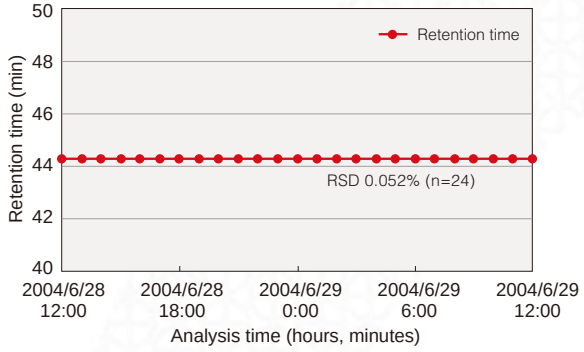
Precise Temperature Regulation

The interior of the oven is precisely regulated with a high-performance thermistor. Also, the temperature is calibrated at two different temperatures to ensure a high level of temperature accuracy.

Changes in Room Temperature and Internal Oven Temperature in One Day



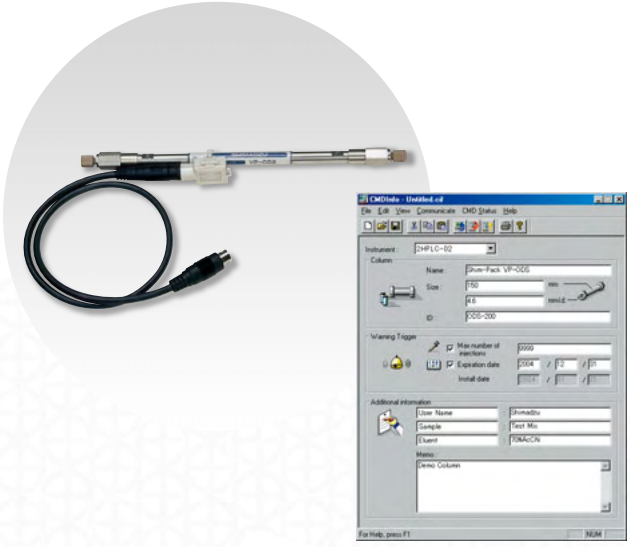
Changes in Room Temperature and Stability of Retention Time for Vitamin A Acetate in One Day



a manual injector, gradient mixer, high-pressure flow-line selection valves (2-position/6-port valves or 6-position/7-port valves, two in total), a conductivity-detection cell block, and a reaction coil.

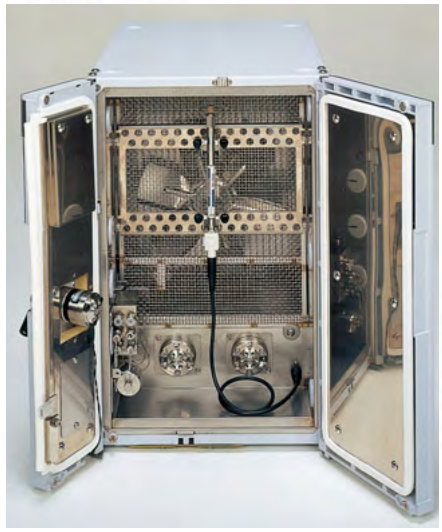
Installation of CMD (Option)

This product supports installation of the CMD (Column Management Device), which can be used to record information about the way the column is used, such as the number of injections, the amount of mobile phase that flows, and the composition of the last mobile phase used. This information can be managed at an LC workstation (LCsolution / CLASS-VP) or a PC in the network using the Web-control function.



Incorporation of Flow-Line Selection Valve

The FCV-12AH/14AH high-pressure flow-line selection valve can be incorporated and controlled. Position display is also possible.



- CTO-20A Temperature-control method: Forced air-circulation Cooling method: None Temperature setting range: 4°C to 85°C
  Temperature-control precision: 0.1°C max. (typically 0.04°C max.) Temperature-control range: 10°C above room temperature to 85°C
- CTO-20AC Temperature-control method: Forced air-circulation Cooling method: Electronic cooling Temperature setting range: 4°C to 85°C
  Temperature-control precision: 0.1°C max. (typically 0.04°C max.) Temperature-control range: 10°C below room temperature to 85°C

FCV-20AH2/20AH6 Flow-Line Selection Valves

The FCV-20AH2/20AH6 is a stand-alone, high-pressure, flow-line selection valve. The valve position is controlled by event signal input. Direct control is also possible from the unit itself.

- FCV-20AH2 Valve type: 2-position/6-port rotary valve Maximum operating pressure: 39.6 MPa (400 kg /cm^2)
  Operating pH range: pH1 to pH10 Operating temperature range: 4°C to 35°C
- FCV-20AH6 Valve type: 6-position/7-port rotary valve Maximum operating pressure: 39.6 MPa (400 kg /cm^2)
  Operating pH range: pH1 to pH10 Operating temperature range: 4°C to 35°C

SPD-20A

The SPD-20A/20AV/M20A is an absorbance detector that offers a high level of sensitivity and stability. The lineup consists of the SPD-20A/20AV dual-wavelength absorbance

Highest Level of Sensitivity in the World

UV-VIS Detector

SPD-20A / 20AV

The SPD-20A/20AV is a UV-VIS detector that takes sensitivity to the limit. It has a noise level of 0.5 x 10^{-5} AU max., making it one of the most sensitive models of its kind in the world. The SPD-20AV has a mode that allows the deuterium lamp and tungsten lamp to be lit simultaneously, enabling high-sensitivity wavelength-programming detection for ultraviolet light and the entire visible-light range.

Sensitivity Levels Approaching Those of UV-VIS Detectors

PDA Detector

SPD-M20A

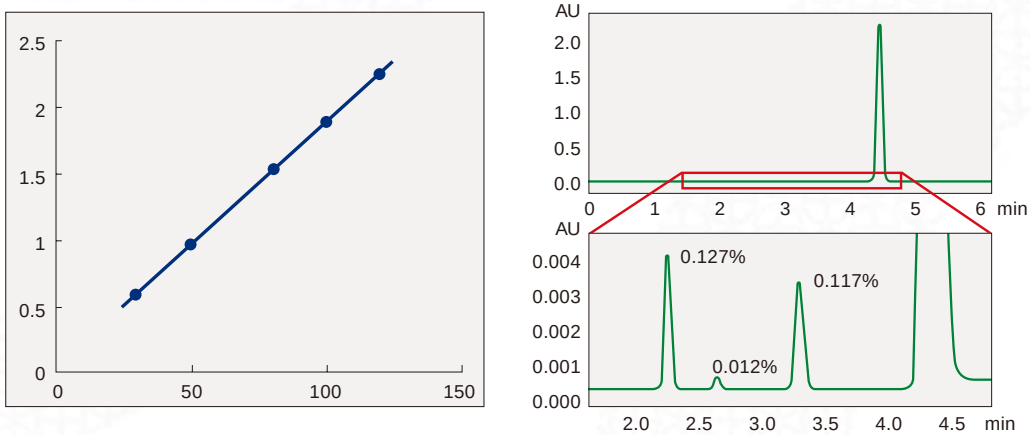
The SPD-M20A also has a high-sensitivity mode. Using light-source compensation, it offers a sensitivity level that, at 0.6 x 10^{-5} AU, is comparable to that of UV-VIS detectors.

Superior Linearity

Using newly developed signal processing technology, the stray-light correction function has been enhanced, and the linearity has been improved to a point where it satisfies the following ASTM standards:

- SPD-20A/20AV : 2.5AU
- SPD-M20A : 2.0AU

This product ensures greater analysis precision in, for example, purity tests.

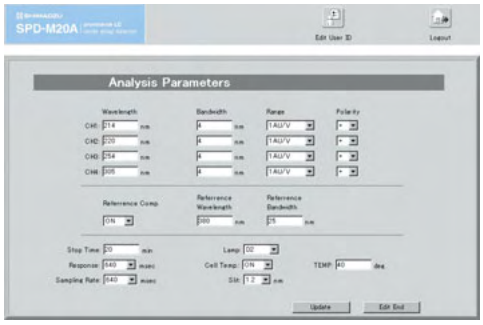


Concentration Linearity for Drug Substance A and Purity Test

detector and the SPD-M20A photodiode array detector. They are equipped with temperature-controlled flow cells to increase the peak-response and baseline stability.

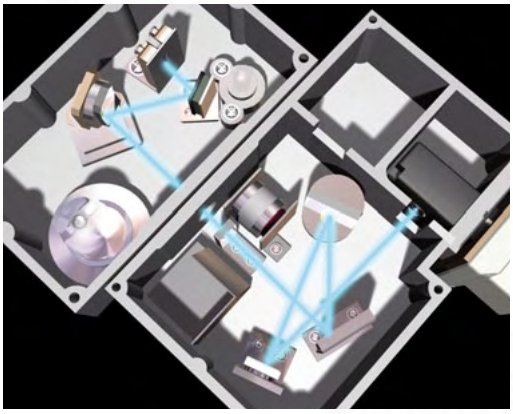
Browser Control Supported

The SPD-M20A is equipped with an Ethernet interface and Web-server functions, allowing devices to be monitored and controlled from PCs in the network. Also, as a stand-alone, high-sensitivity, multi-wavelength detector, it can be incorporated into other companies' HPLC systems.



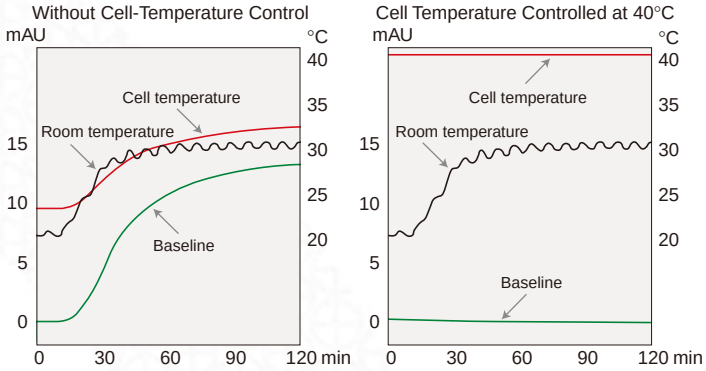
Consideration Given to Validation

The incorporation of a low-pressure mercury lamp for wavelength calibration ensures simple calibration in the ultraviolet region.



Greater Stability Achieved with a Temperature-Controlled Flow Cell

The SPD-20A/20AV and SPD-M20A are equipped with a temperature-controlled flow cell as a standard feature. This helps increase the baseline stability and the analysis reliability.



Effect of Temperature-Controlled Flow Cell: Behavior of Baseline When Room Temperature is Changed from 20°C to 30°C

- SPD-20A Light source: Deuterium (D2) lamp Wavelength range: 190 to 700 nm Bandwidth: 8 nm Wavelength accuracy: 1 nm max.
- SPD-20AV Light source: Deuterium (D2) lamp, tungsten (W) lamp Wavelength range: 190 to 900 nm Bandwidth: 8 nm Wavelength accuracy: 1 nm max.
- SPD-M20A Light source: Deuterium (D2) lamp, tungsten (W) lamp Number of diode elements: 512 Wavelength range: 190 to 800 nm Slit width: 1.2 nm (high-resolution mode), 8 nm (high-sensitivity mode) Wavelength accuracy: 1 nm max.

- Optional cells for SPD-20A/20AV: Semi-micro temperature-controlled flow cell (228-45605-93), micro-cell (228-25293-92), inert cell (228-33338-91), and other types of preparative cells.
- Optional cell for SPD-M20A: Semi-micro temperature-controlled flow cell (228-45605-94), micro-cell (228-25293-93), inert cell (228-34187-91), and other types of preparative cells.

Specifications for Prominence Syste

CBM-20A / 20Alite — System Controller

→P12

	CBM-20A (228-45012-XX)	CBM-20Alite (228-45011-38)
Connectable units	Solvent delivery units: 4 max.; Auto-samplers: 1, Column ovens: 1; Detectors: 2 max.; Fraction collectors: 1; Sub-controllers: 2 max.	Solvent delivery units: 4 max.; Auto-samplers (SIL-10AF/10AP/10Ai): 1; Column ovens: 1; Detectors: 2 max.; Sub-controllers: 2 max.
Number of connectable units	8 (expansion possible up to 12)	5 (including the unit incorporating the system controller)
Data buffering	Approx. 24 hours for one analysis (at 500-ms sampling rate; available only with LCsolution)	
Event I/O	4 inputs, 4 outputs	2 inputs, 2 outputs
Analog boards	Up to 2 boards can be mounted.	Mounting not supported.
Operating temperature range	4°C to 35°C	
Dimensions, weight	260 (W) x 140 (H) x 420 (D) mm, 5.5 kg	120 (W) x 20 (H) x 100 (D) mm, 0.5 kg
Power requirements	AC 110V, 230V, 100VA, 50/60 Hz	Supplied from unit

LC-20AD / 20AT / 20AB — Solvent Delivery Unit

→P14

	LC-20AD (228-45000-XX)	LC-20AT (228-45001-XX)	LC-20AB (228-45002-XX)
Solvent delivery method	Parallel-type double plunger	Series-type double plunger	Parallel-type double plunger (2 sets)
Plunger capacity	10µL	Primary side: 47µL,Secondary side:23µL	10µL
Maximum discharge pressure	40MPa		
Flow-rate setting range	0.0001 mL/min to 10.0000 mL/min	0.001 mL/min to 10.000 mL/min	0.0001 mL/min to 10.0000 mL/min
Flow-rate accuracy	No more than 1% or 2µL/min, whichever is greater (0.01 to 2 mL/min)	No more than 2% or 2µL/min, whichever is greater (0.01 to 5 mL/min)	No more than 1% or 2µL/min, whichever is greater (0.01 to 2 mL/min)
Flow-rate precision	No more than 0.06% RSD or 0.02 min SD, whichever is greater		
Typical pulsation	0.03 MPa (for water at 1.0 mL/min and 7 MPa)	0.08 MPa (for water at 1.0 mL/min and 7 MPa)	0.03 MPa (for water at 1.0 mL/min and 7 MPa)
Constant-pressure solvent delivery	Supported		
Plunger rinsing mechanism	Manual rinsing or automatic rinsing using optional product		
Safety measures	Liquid-leakage sensor, high-pressure/low-pressure limits		
Operating temperature range	4°C to 35°C		
Dimensions, weight	260 (W) x 140 (H) x 420 (D) mm,10 kg	W 260 x H 140 x D 420 mm, 11 kg	W 260 x H 140 x D 420 mm, 13 kg
Power requirements	AC 110V, 230V, 150VA,50/60Hz		AC 110V, 230V, 180VA, 50/60Hz

▼ Gradient System

	LC-20AB	LC-20AD/20AT, high-pressure GE specifications	LC-20AD/20AT, low-pressure GE specifications
Gradient type	High-pressure mixing	High-pressure mixing	Low-pressure mixing
Number of mixed solvents	2	2 or 3	4 max.
Mixing-concentration accuracy	0.5% max.	0.5% max. (LC-20AD), 1.0% max. (LC-20AT)	
Mixing-concentration precision	0.1% RSD max.		

DGU-20A3 / 20A5 — Online Degasser

→P15

	DGU-20A3 (228-45018-32)	DGU-20A5 (228-45019-32)
Number of degassed solvents	3	5
Degassed flow-line capacity	380µL	
Operating temperature range	4°C to 35°C	
Dimensions, weight	260 (W) x 70 (H) x 420 (D) mm, 5 kg	260 (W) x 70 (H) x 420 (D) mm, 5.2 kg
Power requirements	Supplied from LC-20AD/20AT/20AB	

SIL-20A / 20AC — Auto-Sampler

→P15

	SIL-20A (228-45006-XX)	SIL-20AC (228-45007-XX)
Injection method	Total-volume sample injection, variable injection volume	
Injection-volume setting range	0.1µL to 100µL (standard),1µL to 2,000µL (option)	
Number of processed samples	175 (1 mL vials) 105 (1.5 mL vials) 50 (4 mLvials) 192 (two 96-well MTPs) 768 (two 384-well MTPs) Also, ten 1.5 mL vials in addition to each of the above.	175 (1 mL vials) 70 (1.5 mL vials) 105 (1.5 mL vials) 50 (4 mLvials) 192 (two 96-well MTPs) 768 (two 384-well MTPs) Also, ten 1.5 mL vials in addition to each of the above.
Injection-volume accuracy	1% max.	
Injection-volume precision	RSD: 0.3% max. (typically 0.2% RSD max., for 10µL injection, under specified conditions)	
Cross-contamination	0.005% max. (naphthalene, chlorhexidine, typically 0.0025% max.)	
Number of repeated injections	30 max. per sample	
Needle rinsing	Set freely before and after sample injection.	
Sample cooler	None	Block cooling/heating, used together with dehumidifying function, 4°C to 40°C
Operating pH range	pH1 to pH14	
Operating temperature range	4°C to 35°C	
Dimensions, weight	260 (W) x 415 (H) x 500 (D) mm, 27 kg	260 (W) x 415 (H) x 500 (D) mm, 30 kg
Power requirements	AC 110V, 230V, 100VA, 50/60 Hz	AC 110V, 230V, 300VA, 50/60 Hz

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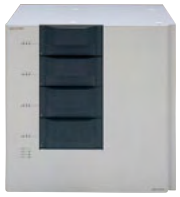
Rack Changer

Rack Changer

→P17



	Rack changer C (228-45030-XX)
Compatible plates	96-well MTP, 96-well DWP, 384-well MTP, 384-well DWP, 1.5mL vial plate (54 vials)
Number of processed plates	12
Sample cooler	Block cooling/heating, used together with dehumidifying function, 4°C to 40°C
Operating temperature range	4°C to 35°C
Dimensions, weight	425 (W) x 415 (H) x 500 (D) mm, 32 kg
Power requirements	AC 110V, 230V, 350VA, 50/60 Hz

CTO-20A / 20AC

Column Oven

→P18

	CTO-20A (228-45009-XX)	CTO-20AC (228-45010-XX)
Temperature-control method	Forced air-circulation	
Cooling method	None	Electronic cooling
Temperature setting range	4°C to 85°C	
Temperature-control precision	0.1°C max. (typically 0.04°C max.)	
Temperature-control range	10°C above room temperature to 85°C	10°C below room temperature to 85°C
Storage capacity	220 (W) x 365 (H) x 95 (D) mm	
Storable devices	2 manual injectors, gradient mixer, 2 high-pressure flow-line selection valves, etc.	
Time program	Linear temperature programs supported.	
Safety measures	Solvent sensor, temperature fuse, temperature upper limit	
Operating temperature range	4°C to 35°C	
Dimensions, weight	260 (W) x 415 (H) x 420 (D) mm, 20 kg	260 (W) x 415 (H) x 420 (D) mm, 23 kg
Power requirements	AC 110V, 230V, 600VA, 50/60 Hz	

FCV-20AH$_2$ /20AH$_6$

High-Pressure Flow-Line Selection Valve

→P19

	FCV-20AH$_2$ (228-45015-XX)	FCV-20AH$_6$ (228-45017-XX)
Valve type	2-position/6-port rotary valve	6-position/7-port rotary valve
Maximum operating pressure	39.6 MPa (400 kg/cm^2)	
Operating pH range	pH1 to pH10	
Operating temperature range	4°C to 35°C	
Dimensions, weight	110 (W) x 140 (H) x 250 (D) mm, 4 kg	110 (W) x 140 (H) x 250 (D) mm, 4 kg
Power requirements	AC 110V, 230V, 100VA, 50/60 Hz	

SPD-20A / 20AV SPD-M20A

UV-VIS Detectors
PDA Detector

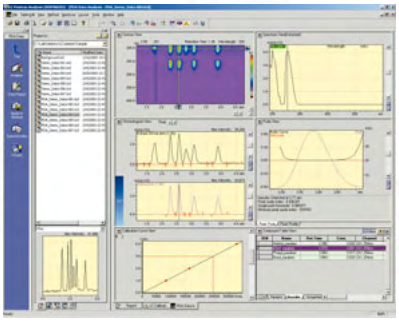
Absorbance Detector

→P20

	SPD-20A (228-45003-XX)	SPD-20AV (228-45004-XX)	SPD-M20A (228-45005-XX)
Light source	Deuterium (D2) lamp	Deuterium (D2) lamp, tungsten (W) lamp	
Number of diode elements	None		512
Wavelength range	190 nm to 700 nm	190 nm to 900 nm	190 nm to 800 nm
Bandwidth, slit width	8 nm		1.2 nm (high-resolution mode), 8 nm (high-sensitivity mode)
Wavelength accuracy	1 nm max.		
Wavelength precision	0.1 nm max.		
Noise	0.5 x 10^{-5} AU (under specified conditions)		0.6 x 10^{-5} AU (under specified conditions)
Drift	1 x 10^{-4} AU/h (under specified conditions)		5 x 10^{-4} AU/h (under specified conditions)
Linearity	2.5 AU (ASTM standard)		2.0 AU (ASTM standard)
Functions	Dual-wavelength detection in the range 190 to 370 nm and upwards of 371nm, ratio-chromatogram output, wavelength scanning		Contour output, spectrum library, MAX plotting
Cell	Optical wavelength: 10 mm, Capacity: 12µL, Pressure: 12 MPa		Optical wavelength: 10 mm, Capacity: 10µL, Pressure: 12 MPa
Cell temperature-control range	5°C above room temperature to 50°C		
Web control	——		Parameter setting, log management, management of consumable parts,etc.
Buffer memory	Refer to the information on the CBM-20A/Alite		Approx. 20 minutes of data in the entire wavelength region (only when using LCsolution)
Operating temperature range	4°C to 35°C		
Dimensions, weight	260 (W) x 140 (H) x 420 (D) mm, 13 kg		260 (W) x 140 (H) x 420 (D) mm,12 kg
Power requirements	AC 110V, 230V, 160VA, 50/60 Hz		AC 110V, 230V, 150VA, 50/60 Hz

LCsolution

[LC Workstation]



Advanced LC Workstation

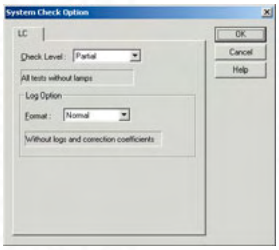
LCsolution

The LCsolution software package provides total support for analysis work, including hardware control of the Prominence series, the LC-VP series and the LC-8A/6AD pumps. Data acquisition, report generation, and data management are standard features.
The control software helps reduce the workload involved in analysis by automating all procedures from instrument conditioning to shutdown. These workstations also offer the functions required for ensuring the reliability of analysis data with respect to issues such as security and audit trails, which are demanded in analysis performed under regulations such as GLP/GMP or FDA 21 CFR Part 11.

Increasing the Efficiency of Analysis Work

Analysis workflow consists of a series of procedures starting from instrument conditioning and judgment of instrument stability, evaluation of sample results, and shutdown after analysis. The automation functions offered by the combination of Prominence systems with LCsolution cover all of these procedures, thereby reducing the workload required to perform analyses. They also make it possible for anyone, even inexperienced operators, to perform analysis under stable conditions.

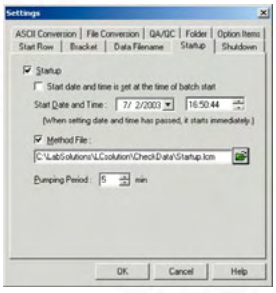
Instrument Condition Check



System Check

Ensures the hardware system is working properly prior to injecting the sample.

Starting Instruments



Startup

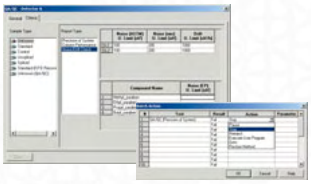
Instrument operation is started at a specified time.

Shutdown

Cooldown

After analysis is completed, appropriate cooldown is performed to protect the column.

Intelligent Instrument Control



Action

Generation of calibration curves, system suitability tests, and judgments of the sample's analysis results are automatically performed. The instrument is controlled intelligently with the action functions.

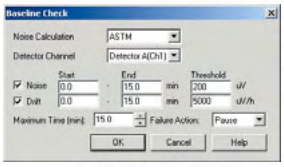
automation

Purge of Mobile Phase

Autopurge

The mobile phase and the autosampler's rinse solvent are purged automatically.

Instrument Stability Check



Baseline Check

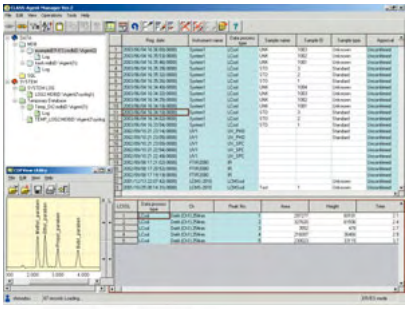
Judgments about column equilibrium and the stability of the instrument are made from noise and drift measurements after the start of solvent delivery.

LCsolution Licensing Information

LCsolution Single	Data acquisition and instrument control of a single Prominence/LC-VP system via CBM-20A, CBM-20Alite, SCL-10AVP or SIL-HT, or a single LC-2010/HT system.
LCsolution Multi	Data acquisition and instrument control of up to four Prominence/LC-VP systems via CBM-20A, CBM-20Alite, SCL-10AVP or SIL-HT, or up to four LC-2010/HT systems.
LCsolution Multi-PDA	Data acquisition and instrument control of up to four Prominence/LC-VP systems via CBM-20A, CBM-20Alite, SCL-10AVP or SIL-HT, or up to four LC-2010/HT systems. Capable of control of up to two SPD-M20A detectors.

Optional Software

LCsolution Postrun Kit	Using the LCsolution Postrun Kit makes it possible to re-analyze the data accumulated by LCsolution at another PC.



Increasing the Efficiency of Data Management

CLASS-Agent

Database management provides an effective way of managing important analysis data safely over long periods of time and accessing it quickly when needed. CLASS-Agent makes this possible by allowing analysis data and information about the conditions at the time of analysis to be managed securely in a database. The CLASS-Agent Network System can be connected to various types of analytical instruments, as well as to LCsolution and CLASS-VP, and helps achieve total data management for laboratories that effectively utilize network resources.

Chromatopac: Chromatography Data Processors

The Chromatopac, which was developed specifically as a device for processing chromatography data, is an integrator that also offers the basic functions of a data processor in an easy-to-use format.

C-R7A plus (223-04220-XX)

- Compact, high-speed parallel printer
- Chromatopac BASIC well-suited to system automation
- Highly reliable optical link control
- Supports GLP, GMP, and ISO-9000
- Sliding display screen saves space

C-R8A (223-04500-XX)

- Inherits data processing capability with established reputation and simple operability
- Equipped with automatic validation functions
- Handles high-speed RS-232C as a standard feature
- Simple operation optimized for factory use

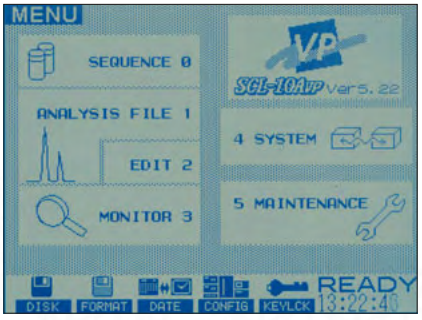
SCL-10AVP

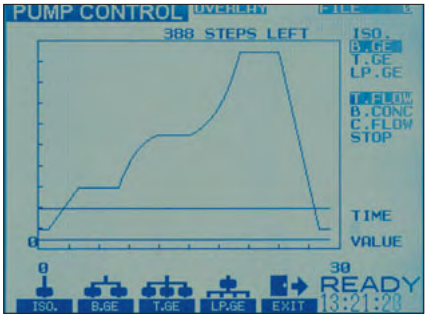
[System Controller]

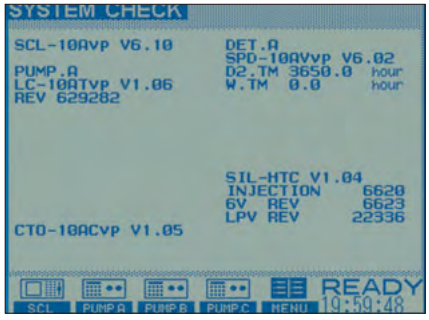
Supports a Wide Variety of System Configurations

The SCL-10AVP performs centralized control of all Prominence* and LC-VP series modules, and the LC-8A/6AD solvent delivery units. It also operates as an interface with LC workstations.

*Prominence modules are operated in VP compatible mode.







Customization Functions for Improving Operability

This controller is equipped with customization functions that allow parameters that are often used in time programs, for example, to be selected and displayed in a single screen. Clearly defined characters and a graphical function-key menu contribute to intuitive operation. With isocratic systems, it is possible to select "simple mode", in which only minimal operation parameters are displayed. For sample preparation such as dilution or reagent addition using autosampler pretreatment, it is possible to select either simple mode (Quick-pret) or a detailed setting mode (Pret-prog, Advanced).

Validation Support

From the maintenance screen, it is possible to load, display, and output operation logs and maintenance information for connected modules.

Specifications (SCL-10AVP)

	SCL-10AVP (228-45051-xx)
Display	Backlit LCD (320 x 240 dots)
Connectable units	Solvent delivery unit: 3 max.; Autosampler: 1; Column oven: 1; Detector: 2 max.; Fraction collector: 1; 2- or 6-position valve: 2 max. (via Option Box VP or Sub-controller VP); Solenoid valve unit: 1(via Sub-controller VP or solvent delivery unit); Helium degasser: 1 (via Sub-controller VP or solvent delivery unit)
Solvent delivery unit control	Solvent delivery control modes: Isocratic, High-pressure gradient, Low-pressure gradient, Constant-pressure delivery Programmable parameters: Flow rate, Pressure, Concentration, Max. pressure, Min. pressure, Linear, Step, Exponential function (all multi-level)
Autosampler control	Sample injection volume, Number of repetitions of injections, Analysis time or analysis file number, Pretreatment file number,Fraction collector file number
Column oven control	Oven temperature, Max. temperature
Detector control	Detection wavelength, Range, Time constant, Lamp switching, Wavelength scanning conditions, etc.
Fraction collector control	15 types of fractionation conditions, Time programs (peak-detection fractionation, high-purity fractionation based on 2-signal processing, etc.)
Input/Output terminals	External start input: 1; Error input: 3 General-purpose output: 4; External power switch control: 1; Optical link for Chromatopac: 1; Optical link for unit control: 8; RS-232C (for PC): 1
Analog boards	2 max. (Option)
Ambient temperature range	4°C to 35°C
Dimensions, weight	260(W) x 140(H) x 420(D)mm, 6kg
Power requirements	AC 110V, 230V, 320VA, 50/60Hz

LC-10Ai / 6AD / 8A

[Solvent Delivery Units]

Solvent Delivery Unit for Bio-inert HPLC System

LC-10Ai

This bio-inert solvent delivery unit incorporates a serial dual plunger and offers low-pulsation performance from an optimized cylinder volume. It can be used together with the SIL-10Ai and SPD-20A (with bio-inert cell) to construct a high-performance bio-inert LC system. The LC-10Ai uses PEEK resin in liquid contact parts and is ideal for the analysis of physiologically active substances and metal ions. Resistance to acids, bases, and high-concentration aqueous NaCl solutions is even higher than with stainless steel.

Solvent Delivery Unit for Analytical to Semi-Preparative Scale

LC-6AD

This multi-purpose pump delivers highly accurate solvent flow in a range from the low flow rate region (< 1 mL/min) to semi-preparative flow rates (up to 20 mL/min). When used with the 6AD recycle kit, it achieves a very high level of recycling efficiency for semi-preparative columns. Depending on conditions, more than one million theoretical plates can be obtained.

Solvent Delivery Unit for Large-Scale Preparative Work

LC-8A

This solvent delivery unit is specifically designed for preparative separations and can perform solvent delivery at high flow rates (up to 150mL/min). With high flow rate accuracy in the analytical region (1-2 mL/min), it is easy and convenient to use the same pump to perform large-scale separation with a preparative column (inner diameter: 20 to 50mm) after studying analytical conditions with a standard-size analytical column.

Specifications (LC-10Ai / 6AD / 8A)

	LC-10Ai (228-45089-xx)	LC-6AD (228-45068-xx)	LC-8A (228-45069-xx)
Solvent-delivery method	Serial dual plunger	Parallel dual plunger	Parallel dual plunger
Plunger capacity	Primary side: 47µL; Secondary side: 23µL	47µL	280µL
Maximum discharge pressure	27.4MPa	49.0MPa	29.4MPa
Flow-rate setting range	0.001 to 9.999mL/min	0.01 to 20.00mL/min 0.001 to 9.999mL/min (with switch selection)	0.1 to 150.0mL/min
Flow-rate accuracy	Within ±2% or ±2µL/min., whichever is larger (0.1 to 5.0mL/min.)	Within ±1% or ±10µL/min., whichever is larger (0.01 to 5.0mL/min.)	Within ±2% (0.5 to 150.0mL/min.)
Flow-rate precision	0.3% max.(RSD: 0.1% max.)	0.3% max.(RSD: 0.1% max.)	0.5% max.
Constant-pressure delivery	Possible	Possible	Possible
Plunger rinse mechanism	Syringe or rinsing pump (228-39625-91) used	Syringe or FCV-7AL (228-45077-91) used	Syringe or FCV-130AL (228-45078-91) used
Ambient temperature range	4°C to 35°C	10°C to 40°C	10°C to 35°C
Dimensions, weight 260	260(W) x 140 (H) x 420 (D)mm, 10kg	260(W) x 160(H) x 500(D)mm, 20kg	350(W) x 210(H) x 450(D)mm, 32kg
Power requirements	AC 110V, 230V, 100VA, 50/60Hz	AC 110V, 230V, 200VA, 50/60Hz	AC 110V, 230V, 750VA, 50/60Hz

* A PC-31L interface (228-31103-91) must be installed in the LC-6AD or the LC-8A to enable connection of the solvent delivery unit to the CBM-20A/Alite or SCL-10AVP system controller.
* System-check software cannot be used with the LC-6AD or the LC-8A.
* Use the 8A preparative mixer (228-20600-91) if the flow rate is greater than or equal to 10mL/min.

SIL-10AF / 10AP / 10Ai / HT

[Autosamplers]

Versatile Autosamplers

SIL-10AF / 10AP

The SIL-10AF and SIL-10AP injectors use the fixed-loop injection method. They can also perform sample pretreatment, including dilution and mixing, at a high speed. The SIL-10AP is a preparative autosampler that can inject up to 5mL while offering the same level of performance and functionality as the SIL-10AF.

Bio-inert Autosampler

SIL-10Ai

This bio-inert autosampler uses PEEK resin in parts that contact liquids. It can be used for the analysis of physiologically active substances and metal ions.

Sample Racks for SIL-10AF / 10AP / 10Ai

- Sample rack S (228-21046-91) for 1.5mL vials
- Sample rack MTP2* (228-40460-91) for 96-well standard/deep-well microtiter plates
- Reagent rack (228-20905) for 15mL reagent vials
- Sample rack L (228-21046-92) for 4.0mL vials
- Sample rack LL* (228-39384-91) for 13mL vials

* Cannot be used with SIL-10Ai.

High-Throughput Autosamplers

SIL-HTA / HTC

The SIL-HT autosampler enables ultra high-speed sample injection and multi-sample processing. It achieves excellent repeatability and near-zero sample carryover, and is ideal for the front-end of an LC-MS system. A Peltier sample cooler and built-in dehumidifier maintain sample temperatures from 4-40°C in the SIL-HTc.

Specifications (SIL-10AF/10Ai/10AP/SIL-HTA/HTC)

	SIL-10AF (228-45056-xx)	SIL-10Ai (228-45075-xx)	SIL-10AP (228-45057-xx)	SIL-HTA (228-45061-xx)	SIL-HTC (228-45062-xx)
Injection method	Loop injection, variable injection volume			Total-volume injection, variable injection volume	
Injection volume setting range	1µL to 50µL (standard) 1µL to 400µL (option) 1µL to 2,000µL (option) 1µL to 5,000µL (option)	1µL to 50µL (standard) 1µL to 250µL (option)	1µL to 5,000µL (standard) 1µL to 400µL (option) 1µL to 2,000µL (option)	0.1µL to 100µL (standard) 1µL to 2,000µL (option)	
Number of samples processed	100 with 1.5mL vials (60 with optional cooler) 80 with 4mL vials (50 with optional cooler) 25 with 13mL vials (not applicable to SIL-10Ai) 192 with two 96-well microtiter plates			350 with 1mL vials 210 with 1.5mL vials (140 with SIL-HTC) 100 with 4mL vials 384 with four 96-well microtiter plates 1,536 with four 384-well microtiter plates	
Injection volume accuracy	Not specified			1% max. (for 50µL injection)	
Injection-volume precision	RSD: 0.5% max. (10µL injection, standard mode)		RSD: 1% max. (10µL injection)	RSD: 0.3% max. (10µL injection, under specified conditions)	
Sample Carryover	Not specified			0.01% max. (caffeine)	
Number of repeated injections	30 max. per sample			99 max. per sample	
Needle rinsing	Set freely before and after sample injection				
Sample cooler	Optional Sample Cooler S (228-45063-xx) or L (228-45064-xx) Block-heating /cooling method 4°C to 70°C			None	Block-heating /cooling method Used together with dehumidifying function 4°C to 40°C
Operating pH range	pH 1 to pH10			pH 1 to pH 14	
Operating temperature range	4°C to 35°C				
Dimensions, weight	Main unit : 260(W) x 280(H) x 420(D)mm, 19kg Syringe unit : 100(W) x 280(H) x 150(D)mm, 4kg			540(W) x 415(H) x 500(D)mm, 40kg(SIL-HTA), 45kg(SIL-HTC)	
Power requirements	AC 110V, 230V, 100VA, 50/60Hz			AC 110V, 230V, 150VA, 50/60Hz	AC 110V, 230V, 300VA, 50/60Hz

FRC-10A

[Fraction Collector]

A Fraction Collector for a Wide Variety of Fractionation Modes

The FRC-10A can be used over a wide range of flow rates, covering small and large-scale preparative work. It flexibly adapts to various applications, such as simple, manual collection performed while viewing chromatograms, and advanced, continuous and automated preparative separation and collection performed in combination with an autosampler and detector.

Convenient Fraction Simulation

Fraction simulation can be performed using LCsolution, so the optimization of fractionation conditions is very simple.

Minimal Influence of Variations in Elution Time

Even if the elution time changes due to the influence of fluctuations in room temperature or the composition of the mobile phase, it is still possible to accurately perform fractionation by catching the target component with special parameters. This function is indispensable for continuous automatic preparative separation.

Options

Fraction collector heads, racks, and collection tubes and vials are available as options. Select according to fraction size required.

	Collector heads	Racks	Collection containers		
Large-scale fractions	Fraction collector head with valve (228-24105-91)	Large- volume kit (228-25324-91)	Commercial reagent bottles (500 to 1,000mL) can be used.		
Semi-large fractions		Rack No. 3: 16 fractions (228-25313-91)	50mL vials (glass, 20 pcs / set) (228-25318-91)	50mL vials (PP (polypropylene), 20 pcs / set) (228-25321-91)	
		Rack No. 2A: 64 fractions (228-25311-91)	20mL test tube (glass, 100 pcs / set) (228-25316-91)	32mL test tube (glass, 100 pcs / set) (228-25317-91)	25mL test tube (PP, 100 pcs / set) (228-25320-91)
Small fractions		Sample cooler L: 50 fractions (228-24975-93)	5L vials (glass, 100 pcs / set) (228-21287-91)	5mL vials (PP, 100 pcs / set) (228-21322-91)	
		Rack No. 1: 144 fractions (228-25310-91)	3.5mL test tube (glass, 250 pcs / set) (228-25315-91)	4.5mL test tube (PP, 250 pcs / set) (228-25319-91)	
	Fraction- collector head (228-25169-91)	Rack No. 5: 120 fractions (228-25314-91)	3.5mL test tube (glass, 250 pcs / set) (228-25315-91)	4.5mL test tube (PP, 250 pcs / set) (228-25319-91)	

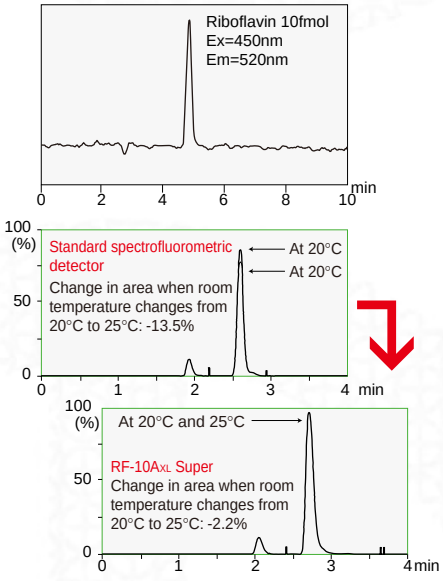
* A "fraction-collector head with valve" allows the eluate to be switched between the fraction side and the drain side using a 3-way solenoid valve. Use this model with standard fractionation in order to fully attain the FRC-10A's functionality.
* A "fraction-collector head" (i.e. without a valve) continuously directs the eluate to the fraction side without using a solenoid valve. It is used for micro-volume fractionation.

Specifications (FRC-10A)

	FRC-10A (228-45070-xx)
Drive system	Arm-movement X-Y system
Maximum number of fractions	16 to 144 (depending on the type of rack used)
Collection method	Solenoid valve (fraction collector head with valve) or direct through nozzle (fraction collector head)
Maximum flow rate	150 mL/min
Fraction modes	Basic mode (using initial parameters), and Time-Program mode (14 different functions available)
Cooling function	Possible with sample cooler L (228-45064-xx)
Ambient temperature range	4°C to 35°C
Dimensions, weight	260(W) x 280(H) x 420(D)mm, 15kg
Power requirements	AC110V, 230V, 100VA, 50/60Hz

RF-10AXL / 10AXL Super

[Spectrofluorometric Detector]



Superior Sensitivity and Reliability

The RF-10AXL offers excellent sensitivity, wavelength accuracy and reproducibility as well as comprehensive GLP/GMP support functions to further increase the reliability of analysis data. The wavelength scanning function determines the optimum detection wavelengths for target constituents, and highly sensitive, efficient, and simultaneous analysis of multiple constituents is performed using the wavelength programming function.

A Step Ahead with High Sensitivity and Reliability

Using an optical system based on an improved light-source / mirror light-source compensation mechanism makes it possible to achieve a very high water-Raman signal-to-noise ratio (300 or higher). This greatly improves the precision attained in the quantitative analysis of trace constituents. More precise wavelength correction helps achieve high wavelength accuracy (±2nm) and reproducibility (±0.2nm). These features further increase the reliability of analysis data.

Significant Reduction of Changes in Fluorescence Intensity Affected by Room-Temperature Fluctuation (RF-10AXL Super)

The RF-10AXL Super employs a temperature-controlled cell unit to maintain a constant temperature of the liquid in the flow cell even if the room temperature changes. This greatly reduces the size of changes in the fluorescence intensity caused by fluctuations in room temperature due, for example, to temperature quenching, and makes it possible to obtain stable analysis data.

Specifications (RF-10AXL / 10AXL Super)

	RF-10AXL (228-45096-xx)	RF-10AXL Super (228-45097-xx)*
Light source	150-W xenon lamp	
Spectrometer	Blazed, holographic, concave diffraction grating, F/2.4	
Wavelength range	200 to 650nm (option: 200 to 750nm *1 or 200 to 900nm *2)	
Bandwidth	15nm (on both excitation and emission sides)	
Wavelength accuracy	±2nm	
Wavelength reproducibility	±0.2nm	
Detection sensitivity	300 or greater, signal-to-noise ratio for Raman line of distilled water (Excitation wavelength: 350nm; Time constant: 1.5sec.)	
Cell (volume, pressure, material)	12µL; 2MPa (approx. 20kgf/cm²) ; SUS316, silica, PTFE	
Wavelength scanning	Scanning of excitation and emission wavelengths; differential spectra possible	
Programming	Time programs for wavelength conditions of up to 32 steps can be created.	
Operating temperature range	4°C to 35°C	4°C to 40°C (on cooling side: down to 15°C below room temperature)
Dimensions, weight	260(W) x 205(H) x 520(D)mm, 17kg	335(W) x 205(H) x 520(D)mm, 18kg
Power requirements	AC110V, 230V, 350VA, 50/60Hz	

* RF-10AXL Super is not CE marked.

Specifications (Temperature Control Section)

Temperature setting range	4°C to 40°C (on cooling side: down to 15°C below room temperature)
Recommended temperature setting	25°C (in order to prevent cell condensation)
Temperature accuracy	Within ±2°C
Temperature precision	Within ±0.1°C (constant room temperature)
	Within ±0.3°C (at room-temperature fluctuation of 3°C/hour)
Operating flow-rate range	0.2 to 2mL/min
Safety features	Overheating-prevention function, built-in temperature fuse

* 1 With optional R3788 photomultiplier (200-75031)
* 2 With optional R928-08 photomultiplier (200-75021)

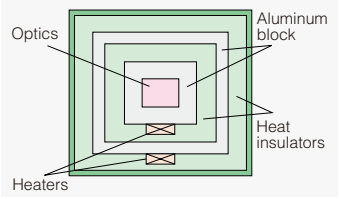
Application	Cell volume	Part number
For Nonmetal (insert)	12µL	228-34197-92
For Semi-micro	2µL	228-34197-93
For Square cells	(10mm square cell)	206-64999

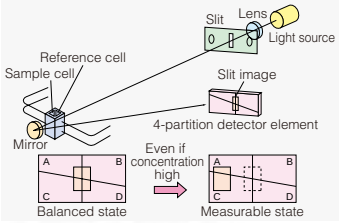
Optional Cells (Nonmetal Cell, Semi-micro Cell, Square-Cell Holders)

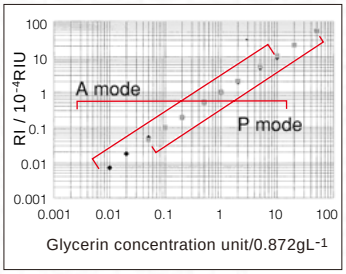
The nonmetal cell is made of PEEK and is effective for bio-inert systems used in life science or protein analysis applications. The semi-micro cell is also made of PEEK and minimizes the amount of dead volume in the tubing and cells in order to reduce band broadening. It is ideal for low flow rate (< 1 mL/min) LC systems. The square cell holder accommodates 10 mm square cuvettes to allow the detector to function as a stand-alone fluorescence spectrometer.

RID-10A

[Refractive Index Detector]







Improving Analysis Productivity in Refractive Index Detection

The RID-10A features dramatic improvements in the productivity of refractive index detection. Dual-temperature control of the optical system helps reduce the stabilization time and baseline drift after power-ON, and the adoption of three measurement modes allows all applications from high-sensitivity analysis to preparative work to be handled with a single unit.

Short Warm-up Time and Improved Baseline Stability

The optical system is housed inside a dual-temperature-controlled block. The temperature of the incoming mobile phase is controlled in two stages; consequently, the stabilization time is significantly shorter than with conventional systems. This dual-temperature control also helps significantly reduce baseline drift, thus increasing the reliability of analysis data.

Broad Application Range - from Analytical to Preparative-Scale HPLC

The adoption of an original 4-partition detector element (U.S. Patent No. 5398110; Japanese Patent No. 2504356) makes it possible to handle all applications from high-sensitivity to preparative analyses with a single unit using the following three measurement modes.

A (Analytical) mode	High sensitivity to general purpose analyses
P (Preparative) mode	High concentration analysis, semi-preparative analysis (up to 20mL/min)
L (Large-scale prep.) mode	Large volume preparative analysis with optional flow selection block (228-34102-91) for flow rates (up to 150mL/min)

4-Partitioned Detector Element

The detector element of the RID-10A is partitioned into four parts, and the parts used can be changed electrically. In A mode (for high-sensitivity analysis), the partitions are grouped left-right (combinations of A+C and B+D), and in P and L modes (for preparative analysis), the partitions are grouped top-bottom (combinations of A+B and C+D). In P and L modes, because measurement is possible regardless of the position of the element's center line, large refractive indexes for high-concentration samples can be handled.

Specifications (RID-10A)

	RID-10A (228-45095-xx)
Refractive index range	1 to 1.75RIU
Noise level	2.5 x 10^{-9} RIU max
Drift	1 x 10^{-7} RIU/hour max.
Range	A mode: 0.01 x 10^{-6} to 500 x 10^{-6} RIU P and L modes: 1 x 10^{-6} to 5,000 x 10^{-6} RIU
Response	0.05 to 10 sec, 10 steps
Polarity switching	With a switch
Zero adjustment	Auto zero, auto-optical zero, fine zero

	RID-10A (228-45095-xx)
Maximum operating flow rate	20mL/min (150mL/min with option)
Temperature control of cell unit	30°C to 60°C (1°C steps)
Cell volume	9µL
Cell pressure	2MPa (approx. 20kgf/cm^2; cell unit)
Operating temperature range	4°C to 35°C
Dimensions, weight	260 (W) x 140 (H) x 420 (D)mm, 12kg
Power requirements	AC110V, 230V, 150VA, 50/60Hz

* Hexafluoroisopropanol (HFIP) cannot be used as the mobile phase.

Option: Pressure Relief Valve (228-33615-91)

The RID-10A incorporates various safety features. Its maximum pressure is five times that of former Shimadzu products and, as a standard feature, it incorporates a sensor that detects leakage from the cell unit. For extra safety, a pressure relief valve that prevents problems related to back-pressure irregularities is also available as an option.

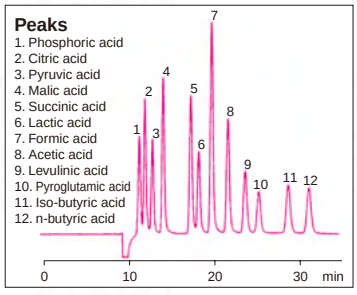
CDD-10AVP

[Conductivity Detector]

Ions	Concentration (µg/L)	RSD (%)
F	50	0.46
Cl	200	0.23
NO_2	15	5.41
Br	100	0.71
NO_3	80	0.54
PO_4	500	0.63
SO_3	200	2.30

Reproducibility in Anion Analysis

(Lower concentration limits of quantitative analysis range for 2001 edition of Water Supply Testing Methods, Japan)



Handles a Wide Variety of Analysis Options

The CDD-10AVP conductivity detector achieves an even higher level of sensitivity and makes it possible to perform a wide variety of analysis scenarios with a single unit. An option card enables the simultaneous 2-channel measurement of anions and cations, and a suppressor option allows expansion to a suppressor system for ultra-high sensitivity work. Organic acids can be analyzed using Shimadzu's unique post-column pH-buffered electroconductivity method.

Perform Analysis with Highest Sensitivity

The sensitivity of detectors that monitor weak electrical signals from analytes is affected by the inherent electrical noise of the detector itself. With the CDD-10AVP, electronic parts with low electrical noise are used, and the layout of the electronic components has been optimized in order to reduce noise levels, thereby attaining an extremely high level of sensitivity. Combining the CDD-10AVP with a suppressor unit makes it possible to perform ultra-high sensitivity ion analysis on the order of 0.25µg/L (detection limit: S/N=3) for Cl^-.

Applicable to Both Suppressor and Non-Suppressor Systems (available in limited regions)

When used with a CTO-20AC, expansion to a full suppressor system can be realized by adding the suppressor option. Suppressor functions can be disabled when necessary, making it possible to switch between anion analysis using a suppressor system and cation analysis using a non-suppressed system. In addition to a single flow-line system, expansion to a dual flow-line system is also possible, allowing the creation of a variety of system configurations. For example, simultaneous analysis of anions and cations using a combination of suppressed and non-suppressed detection is possible.

High-Sensitivity Analysis of Organic Acids

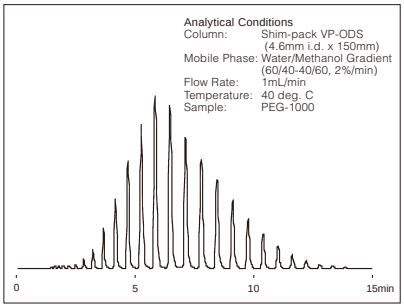
Shimadzu's post-column pH-buffered electroconductivity method (Patent No. 2017498) enables selective, high-sensitivity analysis of organic acids. Even samples that traditionally require time-consuming pretreatment to handle unwanted constituents can be analyzed after simple pretreatment procedures such as dilution and filtration. The level of reliability attained in quantitative analysis is much higher than that attained conventionally with a low-wavelength UV method or a simple conductivity method. Superior linearity enables batch analysis in cases where constituent concentrations differ greatly and, consequently, helps reduce analysis time.

Specifications (CDD-10AVP)

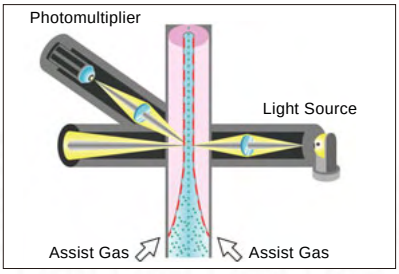
	CDD-10AVP (228-45054-xx)
Temperature coefficient	25nS·cm^{-1}/°C (background: 285µS·cm^{-1}; cell temperature: 43°C)
Cell volume	0.25µL
Cell constant	25µS·cm^{-1}
Material used in parts making contact with liquid	PEEK, SUS316
Maximum operating pressure	2.9MPa (30kgf/cm^2)
Response	0.05 to 10 sec., 10 steps
Zero adjustment	Autozero, baseline shift
Operating temperature range	4°C to 35°C
Dimensions, weight	260 (W) x 140 (H) x 420 (D)mm, 6.0kg
Power requirements	AC110VA, 230V, 250VA, 50/60Hz

ELSD-LTⅡ

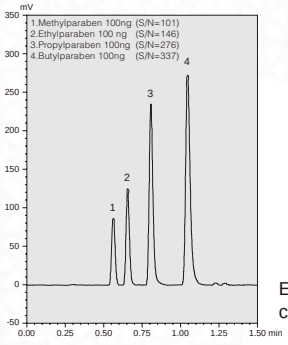
[Evaporative Light-Scattering Detector]



Chromatogram of Non-Chromophoric Compound



Assist Gas Functions



Example of analyzing 4 semi-volatile alkyl parabens, considered difficult to analyze with conventional ELSD detectors.

Highly Versatile Detection Method

Not all compounds have a chromophore or other such structural property that allows the use of an absorbance detector. Refractive Index Detection (RID) is one option but it suffers from the inability to run gradient analysis. Evaporative Light Scattering Detection (ELSD) is a perfect alternative to RID as it is more rugged, quicker to stabilize, and gradient compatible. ELSD is ideal for applications like testing the purity of compounds, measuring the molecular weight distribution of synthetic polymers, and analyzing natural substances.

Detects Most Compounds

With the exception of some highly volatile compounds, the ELSD-LTⅡ is able to detect almost any compound. Unlike traditional absorbance detectors (UV-Vis, PDA, etc.), sensitivity is not dependent on the physical or structural properties of the compound, but rather the absolute quantity of the solute passing through the detector cell. Therefore, it is especially useful for detecting unknown or breakdown compounds and/or validating purity of a target compound. By this mechanism of detection the ELSD-LTⅡ is truly a universal detector.

Note: Due to the evaporative nature of this detector, it must only be used in an area with proper exhaust ventilation.

High Sensitivity by Low Temperature Evaporation

The ELSD-LTⅡ detector uses a unique nebulizer and drift tube design to achieve stable and low-temperature evaporation of mobile phases, making it possible to analyze semi-volatile and / or thermally unstable compounds.

High-sensitivity detection is achieved by focusing the sample at the detection point with assist gas flow. The ELSD-LTⅡ offers high sensitivity with this low-temperature evaporation technology and superb detection technology.

A smaller volume nebulizer and drift tube further improve sensitivity.

Automated Functions

Auto-Powerdown functions for the LED light source and nebulizer gas reduce operating costs. The self-cleaning design makes maintenance of the drift tube easier.

Specifications (ELSD-LTⅡ)

	ELSD-LTⅡ (228-45115-xx)
Measurement Method	Light Scattering
Light Source	LED
Detection	Photomultiplier Tube
Temperature Setting Range	Ambient to 80°C
Nebulizer Gas	Nitrogen (N_2) or Air (see Note 1)
Gas Flow Rate	Max. 3.0 L/min
Gas Pressure	Max. 450 kPa

	ELSD-LTⅡ (228-45115-xx)
Mobile Phase Flow Rate	0.2mL/min - 2.5mL/min (see Note 2)
Analog Output	0V - 1V
Operating Temperature Range	5°C - 40°C
Operating Humidity Range	<80% (5°C - 31°C), <50% (31°C - 40°C)
Power Supply	AC 115V, 230V, 150VA, 50/60Hz
Size	W250 x D550 x H450mm
Weight	20kg

Note 1: Requires gas supply source, such as a gas line, nitrogen generator, or air compressor.
Note 2: 0.04 mL/min to 1.2 mL/min range when using a low-flow nebulizer.

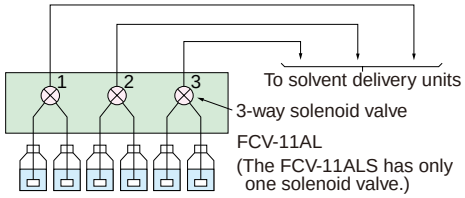
Optional Accessories

FCV Series Flow-Line Selection Valves

Reservoir Selection Valves

FCV-11AL (228-45048-91)
FCV-11ALS (228-45049-91)

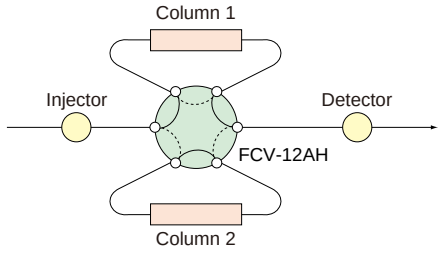
These solenoid valve units can automatically switch between two solenoids (e.g., mobile phase and column rinse solvent) plumbed to one solvent delivery unit. The FCV-11AL can handle the automatic selection of solvents for up to three solvent delivery units whereas the FCV-11ALS is used for one unit.



High-Pressure Flow-Line Selection Valves

FCV-12AH (228-45013-91)
FCV-12AHi (228-45013-94)

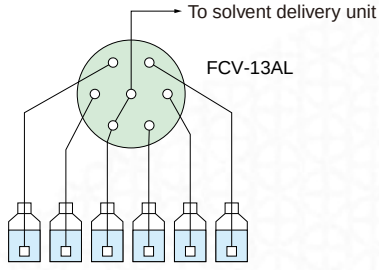
These flow-line selection valves incorporate 6-port, 2-position, high-pressure valves. They can be used for automatic column selection and automatic pretreatment.
* The liquid contact parts of the FCV-12AHi have bio-inert specifications.



Reservoir Selection Valve

FCV-13AL (228-45016-91)

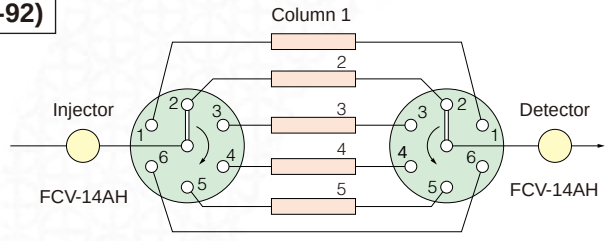
This unit performs automatic solvent selection and incorporates a 7-port, 6-position valve. It can perform the switching of up to six solvents for a stepwise gradient.



Column Switching Valves

FCV-14AH (228-45014-91)
FCV-14AHi (228-45014-92)

This unit performs automatic column selection and incorporates a 7-port, 6-position, high-pressure valve. It can be used for automatic multi-column switching. (Two units used.)
* The liquid contact parts of the FCV-14AHi have bio-inert specifications.



Reservoir Selection Valve

FCV-7AL (228-45077-91)

This device can switch between two solvents using a solenoid valve. It incorporates a pump that can automatically rinse the rear side of the solvent delivery unit's plunger seals.
It can be controlled from the LC-6AD or from a system controller or workstation connected via the LC-6AD.

Reservoir Selection Valve

FCV-130AL (228-45078-91)

This device can switch between two solvents using a solenoid valve. It incorporates a pump that can automatically rinse the rear side of the solvent delivery unit's plunger seals.
It can be controlled from the LC-8A or from a system controller or workstation connected via the LC-8A.

FCV Series Specifications (FCV-11AL/11ALS/12AH/13AL/14AH)

	FCV-11AL	FCV-11ALS	FCV-12AH	FCV-13AL	FCV-14AH
Valve type	Three 3-way solenoid valve	One 3-way solenoid valve	One 6-port, 2-position valve	One 7-port, 6-position valve	
Solvent pH usage range	1 to 14		1 to 10	1 to 14	1 to 10
Maximum pressure (kgf/cm^2)	0.5		350	5	350
Valve switching time	0.02 sec				0.3 sec.
Control	LC-VP solvent delivery unit or SCL-10AVP *1		SCL-10AVP *2		
Dimensions	110(W) x 250(D) x 110(H)mm				
Weight	2.0kg		4.0kg		

* 1 An Option Box VP or a Sub-controller VP is required for control of the FCV-12AH /13AL /14AH. This does not apply to the FCV-12AH /14AH when it is connected to the CTO-20A/20AC. Two FCV-12AH units and a total of two FCV-13AL or FCV-14AH units can be controlled from the SCL-10AVP.
* 2 When using FCV-11AL /11ALS/15AL units for solvent selection, only one of these units can be controlled from the SCL-10AVP or a solvent delivery unit. The SCL-10AVP and Option Box VP or Sub-controller VP is required to use two of these units simultaneously.

Column Oven

Compact and affordable

CTO-10AS *VP* (228-45059-xx)

The CTO-10AS*VP* is a space-saving, compact and affordable oven with a block heating mechanism.
The CTO-10AS*VP* controls temperature from ambient -15°C, and accommodates two manual injectors.

Specifications (CTO-10AS*VP*)

	CTO-10AS*VP*
Type	Biock heating
Temperature setting range	4 to 80°C sept
Temperature control precision	±0.1°C
Temperature control range	(Ambient temp,-15)°C to Room Ambient temp +60°C
Temperature control mechanism	Pre-heating, 10µLx2 channel
Columns accommodatable	25cm(2 columns max.)
Safety features	a) Temperature limit device using maximum temperature setting b) Thermal Fuse c) Solvent leak sensor
Time program	Temperature setting changes Oven ON/OFF 320 steps, 0.1 - 999.9 min
Dimensions	130(W) x 420(D) x 415(H) mm
Weight	12kg
Ambient Temperature range	4 to 35°C
Power requirements	AC 110V, 230V, 120VA,50/60Hz

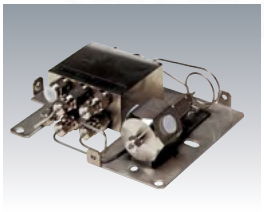
Options for Solvent Delivery Units

Automatic Rinsing Kit

- 20AD Automatic Rinsing Kit (228-45567-91)
- 20AT Automatic Rinsing Kit (228-45568-91)
- 20AB Automatic Rinsing Kit (228-18803-92)

These optional kits are used to continuously, automatically rinse the backs of the plunger seals and plunger units. They wash away the salt that is deposited on the surfaces of the seals and plungers when buffer solution is used as the mobile phase, thereby helping to prolong the service life of these parts.
There are kits for use with the LC-20AD, the LC-20AT, and the LC-20AB.

* The automatic rinse kit for the LC-20AB is shown in the photograph.



Mixer

- Mixer 0.5-2.6mL HP (228-45093-93)
- Mixer 100µL HP (228-35830-93)
- 20A Bio-inert Mixer (228-45093-92)
- 8A Preparative Mixer (228-20600-91)
- 6AD Preparative Mixer (228-20738-92)

These gradient mixers offer superior mixing performance. Mixing volumes of 0.5mL, 1.7mL, and 2.6mL can be selected for the Mixer 0.5-2.6mL HP. The mixing volume for the Mixer 100µL HP is 100µL. The 20A bio-inert mixer incorporates PEEK resin and ceramic for use with bio-inert systems, and two mixing volumes can be selected. There are also mixers for preparative applications. * The Mixer 0.5-2.6mL HP is shown in the photograph.

Helium Degasser

DGU-10B (228-45067-93)

This degasser purges dissolved air from the mobile phase and prevents phenomena such as bubble formation, baseline noise, and drift. The DGU-10B can degas up to four mobile phase solutions with helium gas. It is turned ON/OFF from the solvent delivery unit or system controller.

Options for Chemical Reaction Units

Chemical Reaction Chamber

CRB-6A (228-45065-XX)

This air circulation-type reaction chamber is used for post-column derivatization.
Temperature control range: Between 15°C above room temperature and 150°C
Temperature control precision: ±0.1°C (100V operation only)

Reagent Delivery Pump

PRR-2A (228-07849)

This peristaltic pump delivers reagent and is used for post-column derivatization.
It can deliver up to five liquids. (100V operation only)

Options for Sample Injection Units

Sample Injectors

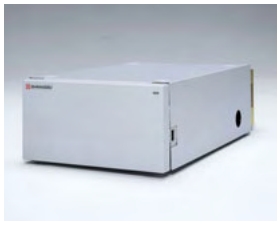
- Rheodyne 7725 (228-32210-91) For general analysis
- Rheodyne 7725i (228-32210-93) For general analysis
- Rheodyne 8125 (228-23200-91) For semi-micro systems
- Rheodyne 9725 (228-32650-91) For bio-inert LC systems
- Rheodyne 9725i (228-32650-93) For bio-inert LC systems

* The Rheodyne 7725i/9725i incorporates a position-sensing switch.

Optional Loops

Volume	Material	Part Number
100 µL	SUS	228-32211-16
	PEEK	228-32651-16
200 µL	SUS	228-32211-17
	PEEK	228-32651-17
500 µL	SUS	228-32211-18
	PEEK	228-32651-18
1 mL	SUS	228-32211-19
	PEEK	228-32651-18

Valve Options



Option Box VP (228-45060-xx) Sub-controller VP (228-35308-xx)

Option Box VP can house up to two FCV-11AL (S)/12AH/13AL/14AH units. One FCV-11AL or FCV-11ALS unit, up to two FCV-12AH units, up to two FCV-13AL/14AH units, and one DGU-10B unit can be controlled from the CBM-20A or SCL-10AVP via Option Box VP. Sub-controller VP has exactly the same control functions as Option Box VP but has no housing capability.

* Option Box VP is shown in the photograph.

Solvent Recycle Valve Kit (228-45080-91)

Using a solvent recycle valve kit during isocratic analysis allows column eluent to return to the reservoir bottle when no peaks are detected according to the set threshold level. This helps reduce consumption of the mobile phase, especially at higher flow rates.

Manual Recycle Valve (228-20401-92)

This manual switching valve is used to perform recycling operations with preparative systems.

Manual Column Switching Valve (228-13000-95)

This manual switching valve is used to switch between preparative columns, or between a preparative column and an analytical column, in an analytical to preparative scaleup system.

Other Options

Reservoir Tray (228-45041-91)

The sturdy plastic tray will hold up to seven 1-liter reservoir bottles. Access behind the front panel allows for neat routing of reservoir tubing.

8A Column Holder (228-45079-91)

This holder supports the mounting of two columns with inner diameters in the range of 20 to 50mm, one analytical column, four manual selection valves of various types, and an 8A preparative mixer or an 8A analytical mixer.

LCMS-2020

MS a Mass Spectrometer is the ultimate detector for a chromatograph.
Using the LCMS-2020 as a detector for HPLC significantly enhances the application range.
The LCMS-2020 is compatible with ultra-fast LC(UFLC) analysis as well as conventional HPLC.

UFscanning 15,000 u/sec fast scanning speed

Controls the voltage applied to the Quadrupole according to the scan speed and m/z.
Adopting this new technology (patent pending) maintains resolution and achieves high ion transmittance even at high scanning speeds.

UFswitching Rapid 15-millisecond positive/negative ionization switching

To detect both positive and negative ions, analysis is performed while switching between the positive and negative ionization modes.
The LCMS-2020 adopts a high-voltage power supply featuring novel technology (patent pending) to achieve an ultra-fast polarity switching time of just 15 ms.

UFsensitivity Superior sensitivity from UFLC

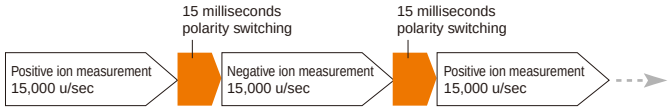
The newly developed Qarray® ion optical system achieves superior sensitivity, reproducibility, and linearity.

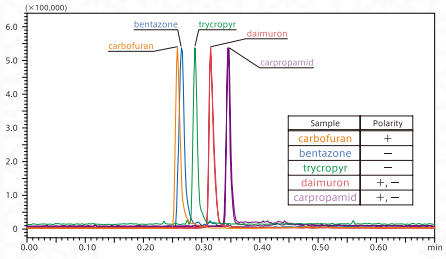
UFscanning & UFswitching

UFLC/MS Measurement

UFscanning and UFswitching are critical for ultra-fast analysis.

For example, in ultra-fast analysis where 6 compounds may elute within 1 minute, ultra-fast (MS measurement) detection is also required. The UFswitching and UFscanning functions are what make possible such ultra-fast MS measurement.

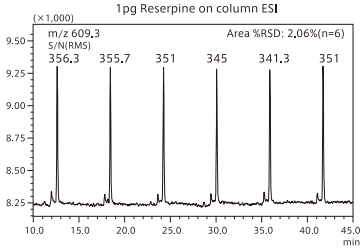


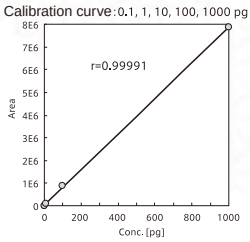


UFsensitivity

Ultra-fast analysis with excellent sensitivity

Newly developed ion optical system and new Qarray® provide excellent sensitivity, repeatability and linearity.



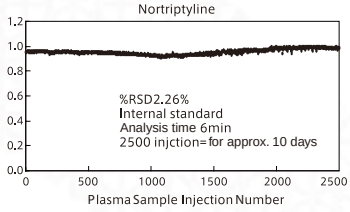


pg	Area
0.1	802.5
1	7743.5
10	84799.7
100	891423.7
1000	7864342.1

Hardware features that powerfully support 3 types of UF functionality

Toughness against dirty samples

In order to check the toughness of the LCMS-2020 against dirty samples, plasma samples simply precipitated with only acetonitrile were injected 2,500 times over 10 days (1µL volume per injection). Excellent reproducibility of peak area was demonstrated and its c.v. was 2.26%.



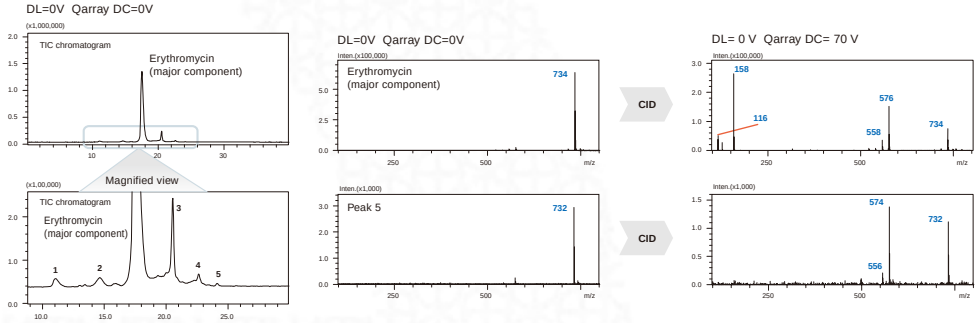
Easy Maintenance

The DL capillary (desolation line), which transfers the sample into the vacuum chamber from the ion source, can be installed and removed without breaking the vacuum, greatly speeding maintenance operations.

Creating Fragment Ions by In-source CID

In-source CID is effective for confirming the molecular weight of synthetic compounds and for the quantification of impurities.

Using in-source CID (collision-induced dissociation) allows the generation of fragment ions. This example shows the composition of impurities in erythromycin estimated from fragment ions generated by in-source CID. The multi-sequence mode permits several other methods within a single analysis, such as CID, positive/negative ion switching modes, and SCAN/SIM modes.
Precisely setting the parameters reduces the risk of erroneous evaluations and enhances the reliability of analysis results.



JQA-0376

Founded in 1875, Shimadzu Corporation, a leader in the development of advanced technologies, has a distinguished history of innovation built on the foundation of contributing to society through science and technology. We maintain a global network of sales, service, technical support and applications centers on six continents, and have established long-term relationships with a host of highly trained distributors located in over 100 countries. For information about Shimadzu, and to contact your local office, please visit our Web site at **www.shimadzu.com**

SHIMADZU

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