

*Hitachi High-Tech*

HITACHI

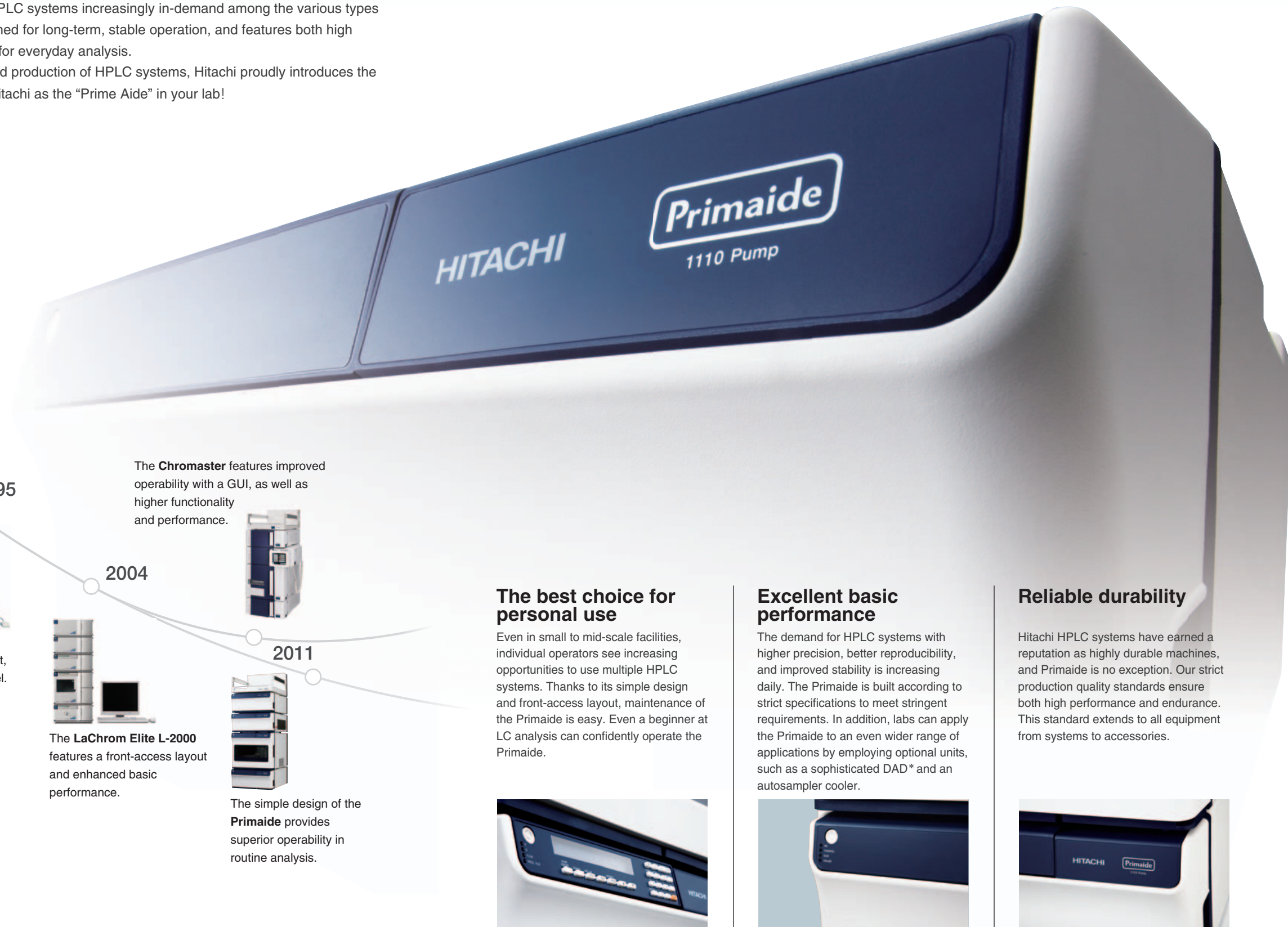
# Primaide

Hitachi High Performance Liquid Chromatograph



# Affordable and robust HPLC system engineered for seamless integration and reliable analyses

High Performance Liquid Chromatography (HPLC) is utilized in a diverse range of fields, including medicine, food production, chemistry, and environmental science, making HPLC systems increasingly in-demand among the various types of analytical equipment. The Hitachi HPLC Primaide is designed for long-term, stable operation, and features both high reliability and great durability. It offers tremendous capability for everyday analysis. Based on over 50 years of experience in the development and production of HPLC systems, Hitachi proudly introduces the Primaide. Make the most of your analytical equipment with Hitachi as the "Prime Aide" in your lab!



1967

**Model 034-0004** was Hitachi's first liquid chromatograph.

1975

**Model 635** was Hitachi's first HPLC system.

1995

**Model L-7000** is a regulation-compliant, PC-controlled model.

The **Chromaster** features improved operability with a GUI, as well as higher functionality and performance.

2004

The **LaChrom Elite L-2000** features a front-access layout and enhanced basic performance.

2011

The simple design of the **Primaide** provides superior operability in routine analysis.

## History of Hitachi HPLC Systems

Hitachi has been involved in the development and production of HPLC systems for nearly half a century. To meet growing demands in an increasingly broad range of fields where HPLC is applied, we never cease improving our technologies to create cutting-edge HPLC equipment.

### The best choice for personal use

Even in small to mid-scale facilities, individual operators see increasing opportunities to use multiple HPLC systems. Thanks to its simple design and front-access layout, maintenance of the Primaide is easy. Even a beginner at LC analysis can confidently operate the Primaide.



### Excellent basic performance

The demand for HPLC systems with higher precision, better reproducibility, and improved stability is increasing daily. The Primaide is built according to strict specifications to meet stringent requirements. In addition, labs can apply the Primaide to an even wider range of applications by employing optional units, such as a sophisticated DAD\* and an autosampler cooler.



### Reliable durability

Hitachi HPLC systems have earned a reputation as highly durable machines, and Primaide is no exception. Our strict production quality standards ensure both high performance and endurance. This standard extends to all equipment from systems to accessories.



\*DAD : Diode Array Detector

# Applications

HPLC supports analysts in various fields involved in the development of novel pharmaceutical compounds and new materials, food safety assurance, and water quality testing for environmental protection.



Chemistry



Pharmaceutical



Food-related industries



Bio-related fields

## Uses of HPLC

- Quality control
- Production process management
- Impurity analysis
- Qualitative/quantitative analysis

# HPLC Principle and System Configuration

HPLC is a system for separating and quantifying the components in a mixed sample. The basic HPLC system consists of a pump, a separation column, and a detector. In many cases, however, systems are also equipped with an autosampler and a column oven.

## Overview of HPLC

The development of HPLC dates back to the beginning of the 20th century, with the discovery of its basic principle by M.S. Tswett, who separated the dyes in a plant extract with petroleum ether (mobile phase) and calcium carbonate powder (solid phase). In recent years, the stationary phase comprises a column of chemically treated silica gel or polymer micro-particles packed in a stainless tube. Pumps are used to make the mobile phase flow. HPLC takes advantage of the phenomenon whereby each component in a sample may take a different amount of time to flow through a column. The elution order and degree of separation depend on the choice of the mobile and stationary phases. HPLC analysis relies on the principle that, under the same conditions of measurement, the time between the injection of a component into the column and the elution of that component is constant. This characteristic can be used to perform qualitative or quantitative analysis.

## Basic demonstration of chromatography

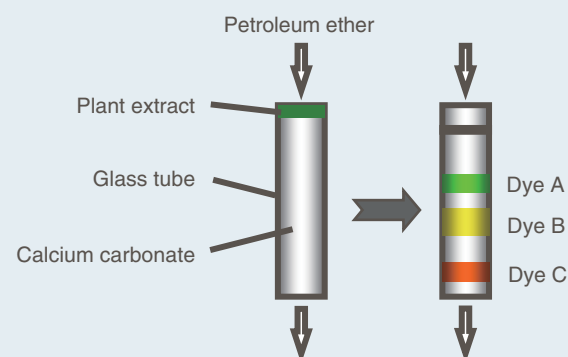


Diagram of Tswett's experiment (a Russian botanist)

## HPLC System Configuration

### Organizer

The organizer accommodates bottles for solvents (mobile phase) as well as a cleaning solution. It also serves as a power supply box for each module.

### Detector

This module detects the components which are eluted from the column. A UV detector is most commonly used to carry out quantitative analysis by measuring absorbance. With a DAD, it is possible to simultaneously obtain not only a UV spectrum but also data for multiple components which absorb different wavelengths of light.

### Column oven

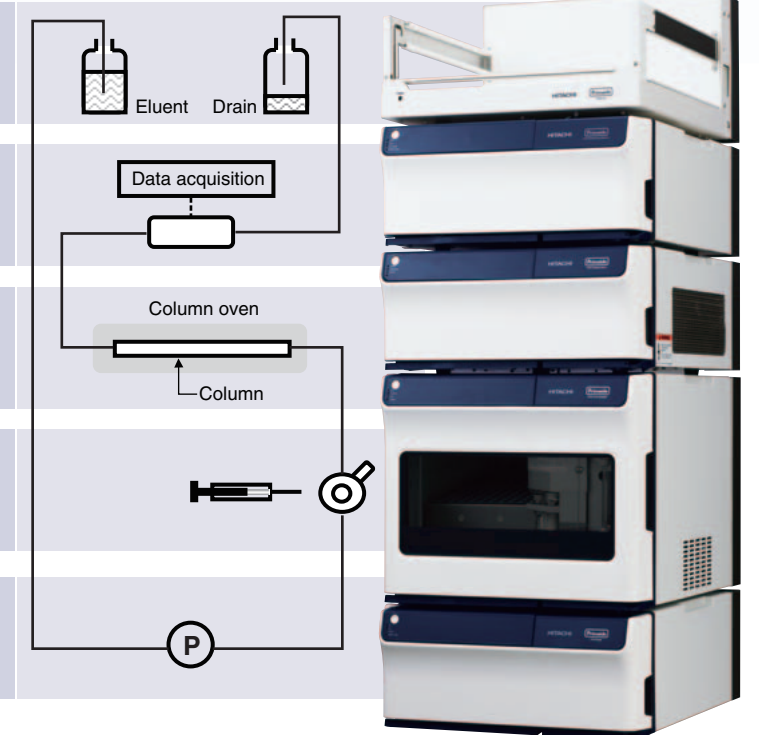
A column oven is necessary to maintain a constant column (stationary phase) temperature. Column temperature is an important parameter for separation, and should be well-controlled in order to achieve the most reproducible results.

### Autosampler

This unit injects the sample automatically, which is very useful in performing the sequential analysis of large numbers of samples and standards.

### Pump

This module pumps the mobile phase. Two techniques are available. In isocratic analysis, the composition of the mobile phase is constant. In gradient analysis, two or more solvents are mixed, and the mix ratio is changed during the analysis.



# Overview of the Primaide

Every detail of the Primaide is well designed to ensure worry-free operation by even a complete beginner at HPLC.

It is an easy-to-use system that incorporates simple design and a user-friendly layout where optional units are contained inside and access from the front enables easy maintenance.

## System Features

### Optional units mounted inside provide clean appearance

All principal options, including a degasser, gradient unit, and sample cooling system can be mounted inside the main body. It is not necessary to make room for optional units.

### Front access layout for improved operation and maintenance

Every module can be accessed and handled from the front. Since connections are arranged on the front side, it is easy to replace columns and manipulate the flow system. To support easier maintenance, the lamp and cell unit can also be accessed easily.

### Leak sensors in all modules

Any leakage in the flow system is detected by leak sensors built into each module. After detection the system halts, ensuring improved safety and reliability.

### Complete control with system manager

A control panel is not necessary, as everything can be controlled via the system manager. By installing a UI-pad (optional), each module can be controlled separately, in a conventional manner.

### e-Line and USB

The e-Line is an advanced version of the existing D-Line. All modules are connected by an e-Line in a single chain, and all the communications are integrated. The use of digital signals improves the reliability of data transactions. The interface between the PC and equipment is via versatile USB. A wide range of PC types are supported, enabling flexible configuration.

### GLP function

A Hg lamp is installed in the detector, and wavelengths in the UV range can be calibrated using its emission line (254 nm) (installed in the Primaide1410 UV / 1430 DAD). Each module stores various types of quality assurance information, for improved data reliability.



### Organizer

The organizer is a power supply box for all of the other modules (except the column oven) and accommodates solvent bottles. The handle on the front side moves vertically for easy bottle replacement. Any spilled solvent flows safely into the drainage tube.



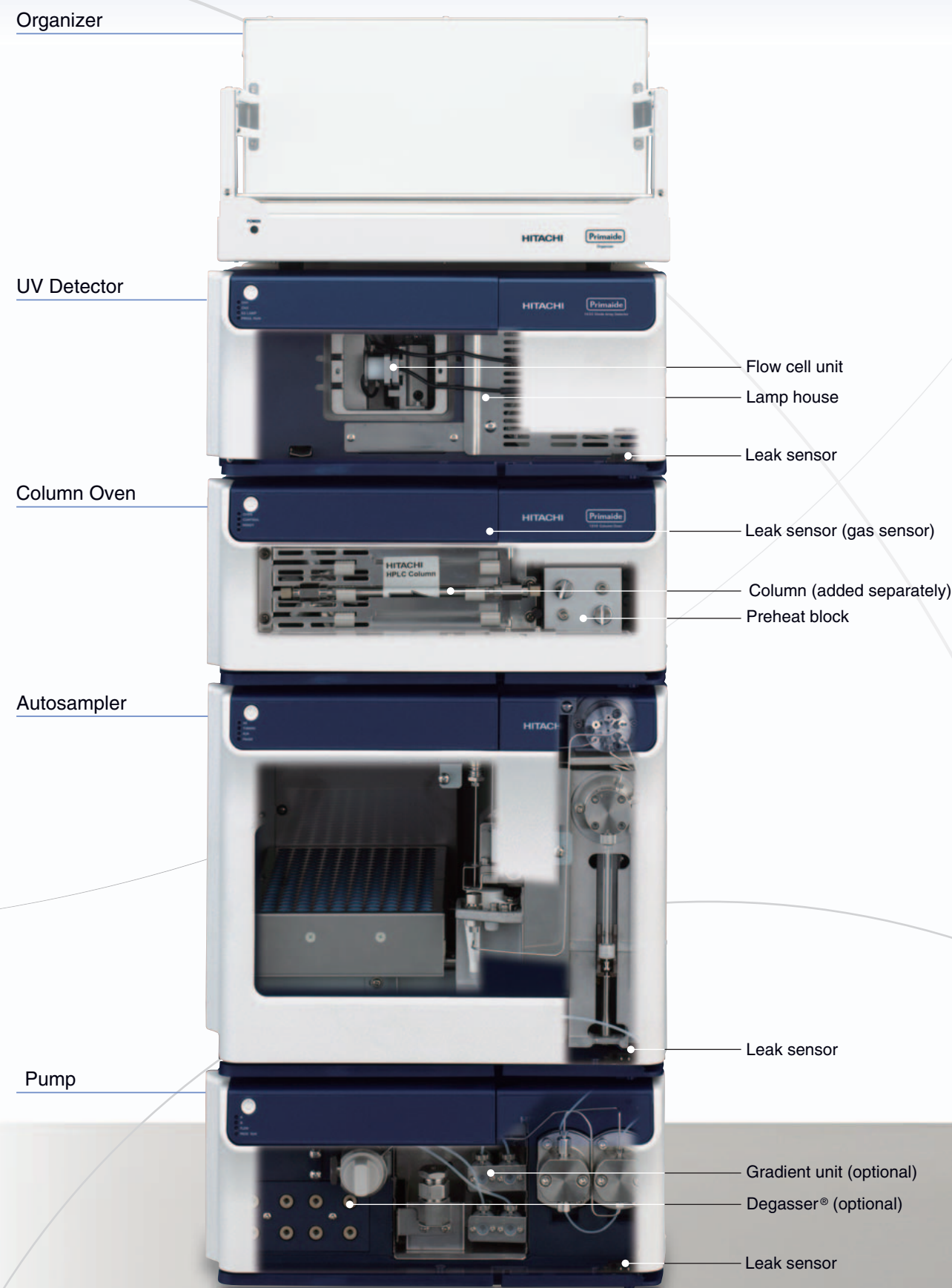
### Useful single-swing door

A single-swing door saves space on the right side of the equipment. A PC can be installed right next to the instrument.



### Wiring and tubing

The arrangement of wiring and tubing between the modules has undergone detailed consideration. Electric cables are stored inside of covers for safety, and solvent/drain tubes are routed to allow easy user handling.



# Primaide module

A pump with a pulse compensation system developed by Hitachi, and an excellent autosampler which enables reproducible injection.

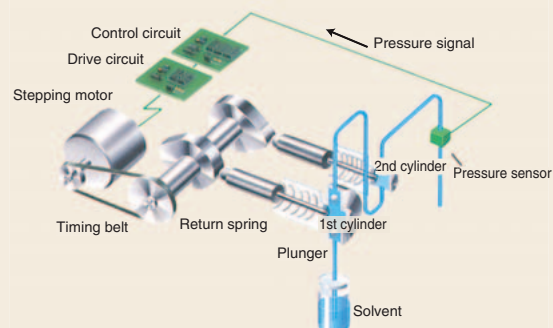
## Pump

The Primaide1110 Pump has been developed for reliable analysis and shares characteristics with Hitachi's existing HPLC pump models. Its consistently high level of performance provides users with strong support in everyday analysis.

### Improvement of flow rate stability

For pulse compensation, a proprietary real-time feedback method has been developed for Hitachi's pumps. Not only has the pulse has been significantly reduced, but the Primaide1110 Pump estimates pressure fluctuations and employs the optimal timing to set the plunger speed interval.

#### Pump mechanism



### Built-in optional units inside pump

Both the degasser and gradient unit can be mounted inside the pump. A built-in degasser minimizes the tubing volume, and yields a more compact system by eliminating the need for additional modules.

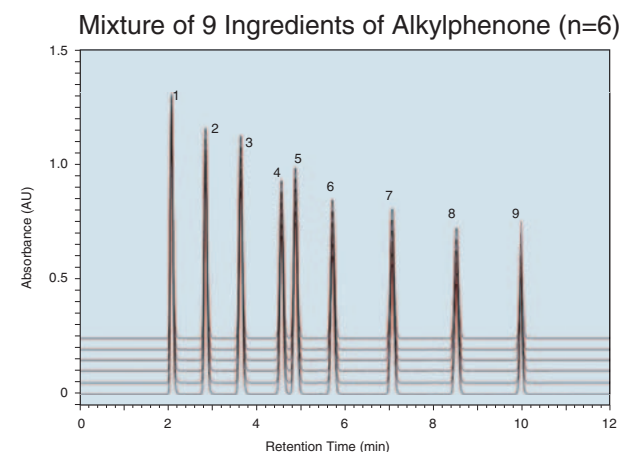
The gradient unit is capable of mixing 4 solvents via its solenoid valves. The placement of the mixer in a high-pressure compartment enables high-precision, stable mixing, even with a single pump.



Configuration of the degasser and low pressure gradient unit

### Improvement of retention time reproducibility

For gradient analysis, injection by the Primaide1210 Autosampler is synchronized with the movements of the pump. This ensures a highly-reproducible retention time, and guarantees precise analysis.



[Condition]  
 Column : HITACHI LaChrom C18 (5 μm) 4.6 mm I.D.x150 mm L.  
 Mobile phase : A : CH<sub>3</sub>CN B : H<sub>2</sub>O  
 Gradient program : 0 - 11 min A 65 → 100%  
 Column Temperature : 40°C  
 Flow rate : 1.0 mL/min  
 Detection : UV 247 nm  
 Injection vol. : 10 μL (100 g/mL each.)

### Gradient Performance Evaluation/RT and Area Reproducibility

Peak No.	Component	Retention time		Area	
		Average / min.	R.S.D. / %	Average	R.S.D. / %
1	Acetanilide	2.032	0.0762	5309454	0.2980
2	Acetophenone	2.793	0.0798	5163106	0.2887
3	Propiophenone	3.581	0.0958	5537572	0.2151
4	Butyrophenone	4.495	0.1019	4609949	0.2772
5	Benzophenone	4.809	0.0982	5044686	0.2999
6	Valerophenone	5.639	0.0832	4178904	0.2499
7	Hexanophenone	6.975	0.0820	4021828	0.2471
8	Heptanophenone	8.413	0.0677	3464625	0.2439
9	Octanophenone	9.882	0.0775	3667659	0.2814



## Autosampler

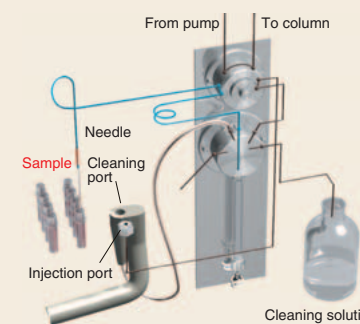
The Primaide1210 Autosampler incorporates direct injection, allowing the automation of consecutive analyses without wasting precious sample.

### Direct injection of micro-quantity samples and quicker analysis

In the direct injection method, the sampling needle becomes part of the flow channel so that the sample in the needle flows into the channel with zero waste. This is a great advantage in the analysis of valuable micro-samples. In addition, since the injection cycle is simpler than using a sampling loop, the injection cycle is shortened by half. This method accelerates throughput and improves efficiency in the analysis of many samples.

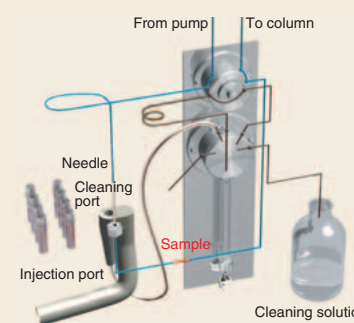
#### Direct injection

##### (1) Diagram of flow channel



[Sample suction]  
 The needle is positioned over the vial, and collects the samples via vacuum suction.

##### (2) Diagram of flow path

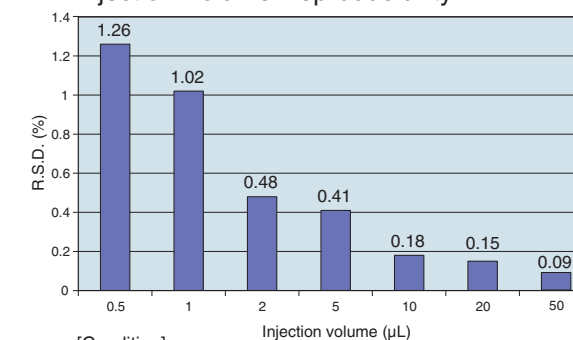


[Sample injection]  
 The needle exterior is first washed in the cleaning port. The needle then moves to the injection port to inject the sample.

### Improved reproducibility results in high-precision analysis

The syringe for sample measurement is driven by a high-performance motor. The drive improves the reproducibility of injection. Furthermore, peak retention times are also more repeatable due to synchronization of injection with the pump motion, achieving higher analytical reliability.

#### Injection Volume Reproducibility



[Condition]  
 Sample : Methyl paraben  
 Mobile phase : CH<sub>3</sub>OH : H<sub>2</sub>O = 60 : 40  
 Flow rate : 1.0 mL/min  
 Detection : UV 265 nm

### Wide opening enables operational checks

A wide sample rack, accommodating 200 1.5 mL vials is mounted on the Primaide, facilitating the measurement of many samples. The wide opening of the autosampler is very convenient for manipulating the rack and for carrying out operational checks of the syringe and needle.



## Glossary

### Gradient

Gradient elution is a technique for changing the composition of the carrier during analysis by mixing multiple solvents, so that elution time can be controlled. This is an effective method if the analysis takes too much time with a constant-component solvent (isocratic method) or the sample contains many components.

### Low-pressure gradient method

Using a single pump, the solvents are switched via solenoid valves, thereby controlling the mix ratio. Compared to the high-pressure gradient method which uses two or more pumps, installation costs are lower. A mobile phase can be prepared in this manner by mixing up to 4 types of solvent.

### Pulse

The flow rate may transiently drop at regular intervals due to the reciprocating motion of the plunger or other factors. To optimize HPLC analysis, the pump should achieve a constant and stable flow rate.

### Retention time

Each substance takes a given amount of time to pass through the column and is detected as a peak in the chromatogram. This time is referred to as the retention time. The reproducibility of this parameter is vital, as it is important in qualitative analysis using HPLC.

### Carry-over

Sample carry-over occurs when residue from injected samples remains inside the needle or flow channel is detected in the next cycle. The needle washer and pipe configuration of the autosampler are well designed to reduce carry-over. However, analysts need to pay extra attention when analyzing highly concentrated or adsorptive samples.

# Primaide module

More resolved peaks are achieved by using a preheating column oven, and a low noise and low drift UV detector

## Column Oven

The Primaide1310 Column Oven also functions as a cooler. The preheating function obtains better performance from columns, achieving a sharper peak shape.

### More resolved peaks with optimized heating

Pre-heating with an efficient block heater improves the symmetry and sharpness of peaks, eliminating the influence of ambient temperature changes. The column installation space, which features an air circulation system, permits the easy mounting and detaching of columns.

#### Inside of Column oven



### Easy-to-use UI-Pad

The UI-Pad is tilted to allow analysts to check and operate it from any direction. The display, which features an LED backlight is easily viewable.



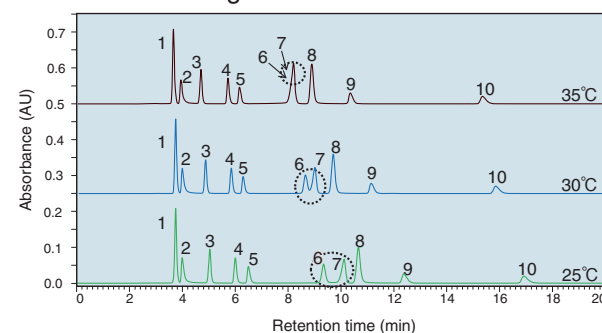
### Cooling function is included as standard

The oven can regulate the temperature from 5°C to 65°C.

### Influence of the column temperature on separation

Changes in column temperature substantially affect the degree of separation. The column oven makes it possible to perform analysis under constant conditions, eliminating the influence of ambient temperature. In order to achieve higher reproducibility of retention time and separation, the use of this column oven is recommended. The cooling function of the standard Primaide1310 Column Oven is useful for measurements around room temperature.

#### Effect of using column oven



[Condition]  
Sample : 10 Ingredients of Organic Acids standard substance  
Column : HITACHI LaChrom C18-AQ (5 μm) 4.6 mm I.D.x250 mm L.  
Mobile Phase : 1.0 mmol/L H<sub>2</sub>SO<sub>4</sub> + 8.0 mmol/L Na<sub>2</sub>SO<sub>4</sub> (pH 2.8)  
Column Temperature : 25°C, 30°C, 35°C  
Flow rate : 1.0 mL/min  
Detection : UV 210 nm

#### [Standard samples] (mg/L)

1. Tartaric acid (1000)
2. Formic acid (1000)
3. Malic acid (1000)
4. Lactic acid (1000)
5. Acetic acid (1000)
6. Pyroglutamic acid (100)
7. Citric acid (1000)
8. Fumaric acid (10)
9. Succinic acid (1000)
10. Propionic acid (1000)



## UV Detector

The optics of the Primaide1410 UV detector allow data collection with lower noise and drift. The lamp and flow cell are situated in a front access layout, and are easily replaceable.

### Low noise for high sensitivity detection

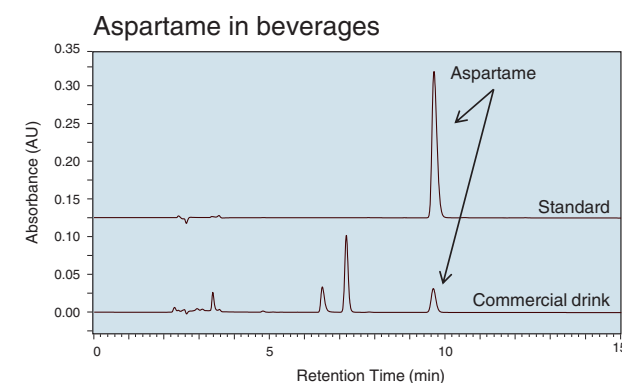
The Primaide1410 UV detector achieves a noise level of not more than  $0.6 \times 10^{-5}$  AU, greatly enhancing trace component analysis.

### High response and low noise, enabling rapid analysis

Analysts can perform low noise measurements in 0.05 seconds. High sensitivity detection is possible, rapidly yielding sharp and accurate peaks.

### Stable, without effects from ambient temperature changes

Since local environments may vary considerably, the optics of the UV detector are well designed to avoid the effects of daily and seasonal temperature changes, guaranteeing stable and reproducible results.



[Condition]  
Column : LaChrom C18 (5 μm) 4.6 mm I.D.x250 mm L.  
Mobile phase : acetonitrile / (0.01 mol/L KH<sub>2</sub>PO<sub>4</sub> (pH = 3.18) = 15 : 85  
Column temperature : 40°C  
Flow rate : 1.0 mL/min  
Detection : UV 210 nm  
Injection vol. : 10 μL (100 μg/mL)

### Wavelength measurement in the UV region with a built-in Hg lamp

Users may employ the 254 nm emission line of the mounted Hg lamp to test the accuracy of wavelength measurement in the UV region, which is the most utilized region in liquid chromatography. This test is conducted using 3 wavelengths from the Hg and D<sub>2</sub> lamps, enabling highly reliable analyses across a broad wavelength range.

### Front access layout and easy maintenance

Both the lamp and flow cell are replaced through the front of the module, allowing easy maintenance, regardless of where the instrument is installed. (Lamp replacement)



A DAD for the Primaide is also available. Please see P.12.

## Glossary

### Advantages of the column oven

The oven maintains temperature and ensures reproducible retention times which could otherwise be affected by the ambient temperature. A temperature rise decreases the viscosity of the solvent, which also decreases the pressure on the apparatus; however, users need to consider the heat tolerance of the sample.

### Pre-heating

The pre-heating function matches the temperature of the mobile phase to the column temperature, before the solvent flows into the column. A temperature gradient between the column ends can broaden and distort peaks.

### Dead volume

Dead volume is the part of the volume between the injector and detector that does not contribute to separation. A dead volume that is too large diffuses samples, resulting in peak broadening and distortion. It is best to take care to minimize tubing length.

### Absorption

In an absorption analysis, the analyst measures the absorbance at a specific wavelength. In general, the measurement is performed at the maximum absorption wavelength of a target component, and the absorbance data is utilized for quantitative analysis.

### Signal-to-Noise ratio (S/N)

This refers to the ratio between the peak intensity and baseline noise. A good S/N is necessary to detect trace amounts of components. A reduced detector noise improves sensitivity.

### Diode Array Detector (DAD)

A Diode Array Detector enables multiple wavelength measurements. A beam passing through a flow cell is dispersed using a grating. UV spectra may be obtained, providing strong support for qualitative analysis. This sophisticated detector can display data in three dimensions (time, absorbance, and wavelength).

# System configuration

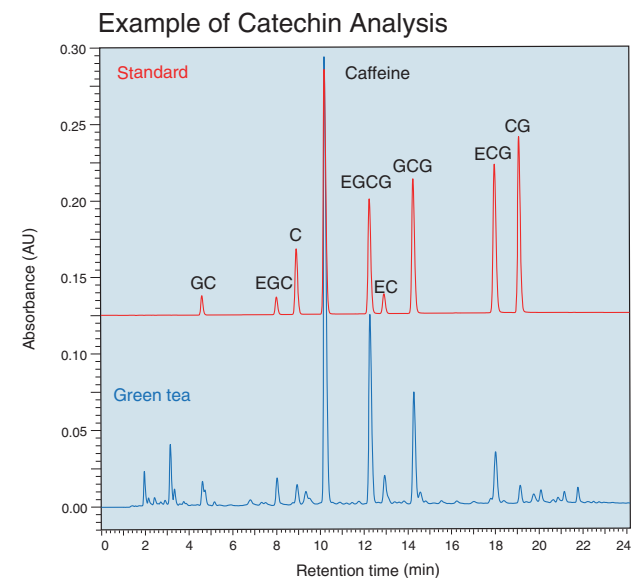
The Primaide consists of modules and features a flexible system configuration which can be varied depending on the intended use.

## Standard System

The standard system is suitable for routine analysis but was developed to meet the demand for high-precision analysis of an increasingly large number of samples.

### ■ Features

- The Primaide1110 Pump assures accurate pumping, even for high flow rates.
- The Primaide1210 Autosampler can automatically process multiple samples (Standard: 200 samples).
- The Primaide1410 UV high response, low noise UV detector provides sharp and accurate peak shapes, enabling sensitive detection in short times.



[Standard samples]  
 GC : (-)-Galocatechin, EGC : (-)-Epigallocatechin, C : (-)-Catechin,  
 EGCG : (-)-Epigallocatechingallate, EC : (-)-Epicatechin, GCG :  
 (-)-Gallogatechingallate, CG : (-)-Catechingallate



Configuration  
 • Primaide1110 Pump • Degasser® • Low-pressure gradient unit  
 • Primaide1210 Autosampler • Primaide1310 Column Oven  
 • Primaide1410 UV • Organizer • USB-IF board • Primaide System Manager

## Manual injection system

In the one instrument one researcher era, we can offer a simple and worry-free system for everyone, including LC beginners.

### ■ Features

- The simple configuration includes a manual injector, which is quick and easy to use.
- A compact and reliable system that is ready when you need it.

Configuration  
 • Primaide1110 Pump • AC adopter • Manual injector • Injector holder  
 • Column holder • Primaide1410 UV • Organizer • USB-IF board  
 • Primaide System Manager



## Photo Diode Array Detector System

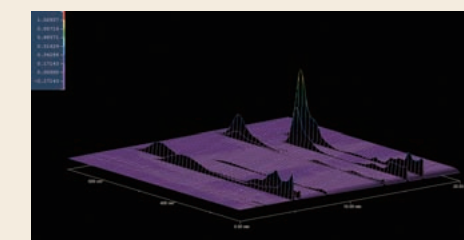
The Primaide1430 Diode Array detector is as sensitive as a UV detector. In addition, the DAD system has many functions, including spectrum collection, chromatography using multiple wavelengths, a peak purity test, a spectral library, and more.

### ■ Features

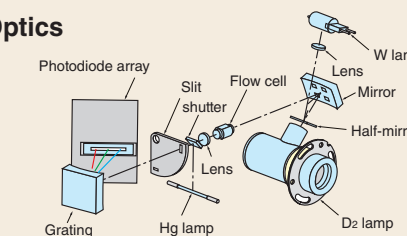
- **High sensitivity**  
 Novel optics and improved software reduce noise considerably ( $0.5 \times 10^{-5}$  AU or less). The idea that "DADs are less sensitive" is now obsolete.
- **Minimizing the influence of temperature changes in the measurement cell**  
 The light source is stabilized via a large lamp housing. The spectrometer and housing are separated and thermally insulated. By cooling the lamp housing separately, the influence of ambient temperature is minimized. The new design incorporates temperature sensors as well as an associated variable rotation speed cooling fan, which largely eliminate temperature changes inside the instrument. This reduces noise and enhances stability, allowing for stable analysis day after day.
- **High resolution and accurate spectra**  
 High wavelength resolution (0.78 nm/data point) is achieved with an array of 1,024 photo diodes. Uniform resolution is maintained throughout a wide range of wavelengths from the UV to VIS, thanks to the diffraction optics, which feature a grating.
- **Digital noise reduction in rapid analysis**  
 Data with a low level of noise are obtained in a very short sampling period (0.05 seconds). Noise-free, sharp peaks are obtained during rapid analysis.
- **Automatic wavelength calibration**  
 A built-in Hg lamp is utilized in the automatic wavelength accuracy test for the commonly-used UV region.



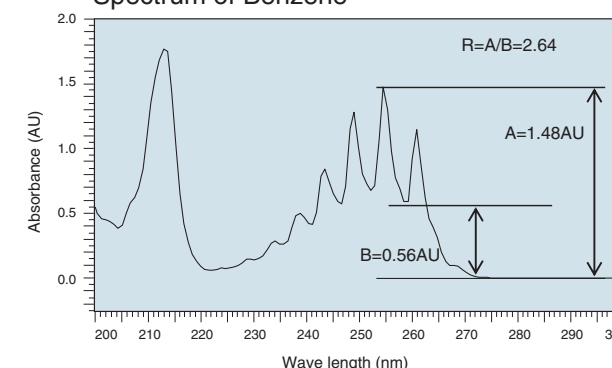
### Three-Dimensional Chromatogram



### Optics

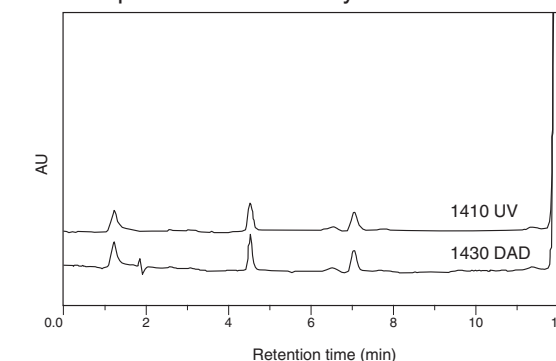


### Spectrum of Benzene



The 1,024-bit photo diode array is very effective for the measurement of samples such as Benzene, which has a characteristic UV spectrum.

### Comparison of Sensitivity between UV and DAD



# Practical examples

The Primaide provides reliable data in diverse settings, ranging from educational laboratories to routine industrial analysis.

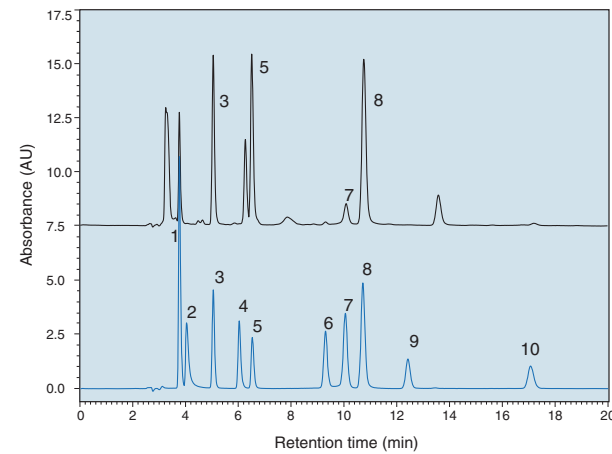
## Food-associated

### ■ Measurements of organic acids

Organic acids are known to influence the taste and flavor of food. Here, we present a measurement of the organic acids in cider vinegar, using the versatile UV detection system along with the “LaChrom C18-AQ” reverse-phase column, which is suitable for the separation of highly polar molecules. Malic acid, which is contained in cider vinegar, was detected.

[Standard Samples]

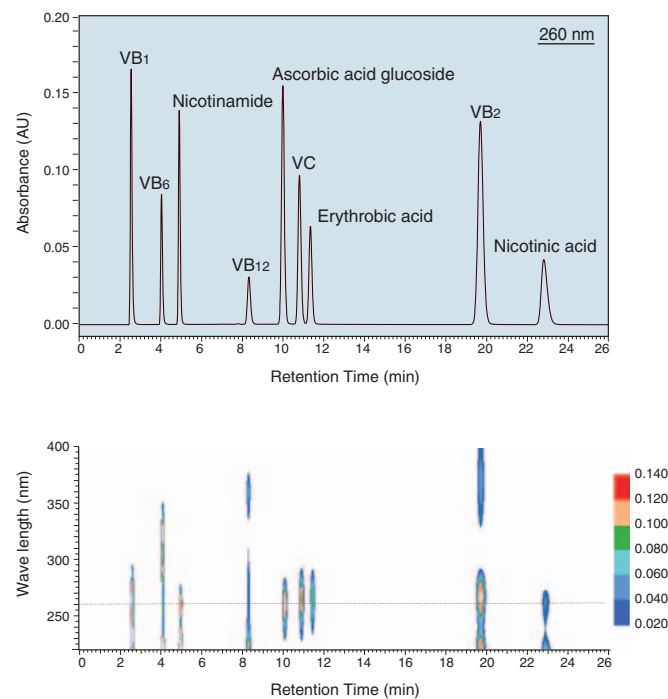
- |                  |                      |
|------------------|----------------------|
| 1. Tartaric acid | 2. Formic acid       |
| 3. Malic acid    | 4. Lactic acid       |
| 5. Acetic acid   | 6. Pyroglutamic acid |
| 7. Citric acid   | 8. Fumaric acid      |
| 9. Succinic acid | 10. Propionic acid   |



Column : HITACHI LaChrom C18-AQ (5 µm)  
4.6 mm I.D. × 250 mm L.  
Solvent : 1.0 mmol/L H<sub>2</sub>SO<sub>4</sub> + 8.0 mmol/L Na<sub>2</sub>SO<sub>4</sub> (pH 2.8)  
Flow rate : 1.0 mL/min  
Temperature : 25°C  
Detection : UV 210 nm  
Injection Vol. : 10 µL

### ■ Measurement of water-soluble vitamins

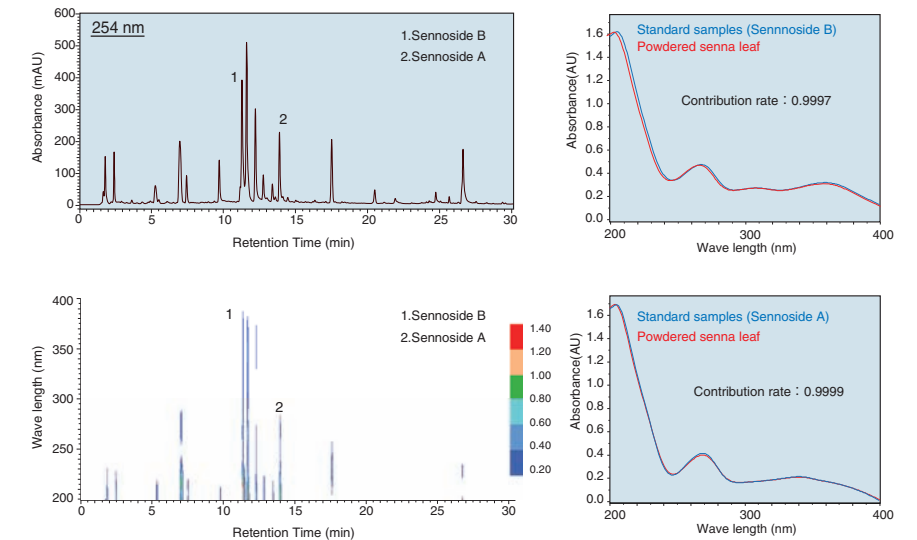
Vitamins are essential nutrients that can be categorized into two groups: water-soluble and lipid-soluble. In this application, nine water-soluble vitamins were subjected to simultaneous analysis with a reverse-phase column and detection with a DAD. Identification via the absorption spectrum using a DAD particularly facilitates analysis in cases when a sample contains many foreign substances.



## Pharmaceutical

### ■ Measurement of natural medicine

Glycosides are regarded as active ingredients in several natural medicines. By utilizing the UV absorption of the aglycones, glycoside content can be analyzed using an HPLC system. Since many peaks from foreign substances will also be present, a DAD is also useful. Researchers can identify the various components by comparing the obtained spectral data with standard spectra.



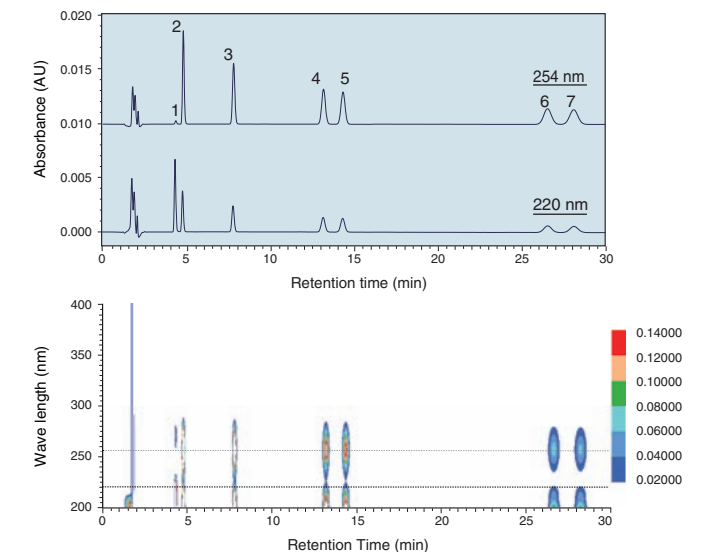
## Chemistry

### ■ Measurement of parabens

Parabens are a class of p-hydroxybenzoate esters, which are used as preserving agents in pharmaceuticals, cosmetics, and food products, due to their ability to prevent fungus and mold. A DAD may be used to detect phenoxyethanol and parabens, simultaneously. For quantitative analysis, a desired component of interest may be targeted by selecting the appropriate wavelength.

[Standard samples]

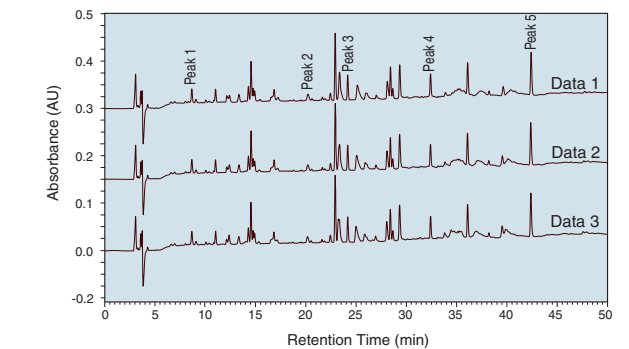
- |                                |                                       |
|--------------------------------|---------------------------------------|
| 1. 2-Phenoxyethanol            | 5. Propyl p-hydroxybenzoate           |
| 2. Methyl p-hydroxybenzoate    | 6. Isobutyl p-hydroxybenzoate         |
| 3. Ethyl p-hydroxybenzoate     | 7. Butyl p-hydroxybenzoate            |
| 4. Isopropyl p-hydroxybenzoate | 10 mg/L each (prepared with methanol) |



## Bio-related

### ■ Peptide mapping

Peptide mapping is a method to identify amino acid changes in a protein. After proteins undergo enzymatic treatment, the resulting peptide fragments are separated, and may be detected via LC or other techniques for comparison of the patterns of their chromatograms. This analysis results in elution patterns with many peptide peaks. Accordingly, reproducible retention times and peak areas are vital factors in peptide mapping.



	Peak 1	Peak 2	Peak 3	Peak 4	Peak 5
Data 1	8.680	20.187	24.217	32.473	42.417
Data 2	8.673	20.207	24.240	32.477	42.440
Data 3	8.673	20.217	24.207	32.447	42.423
Average	8.675	20.204	24.221	32.466	42.427
RSD(%)	0.047%	0.076%	0.070%	0.050%	0.028%

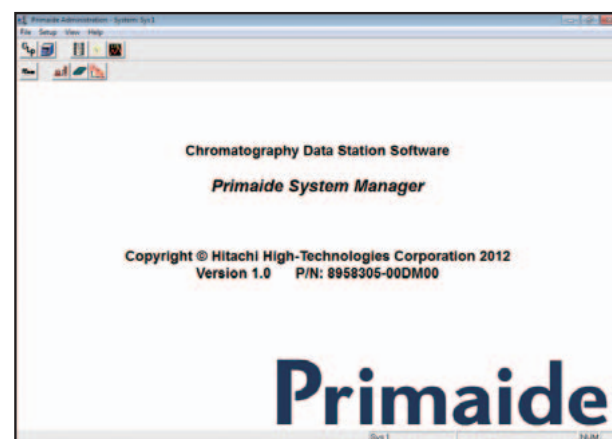


# Hitachi software and columns

Hitachi High-Technologies provides control software and a variety of columns, which facilitate HPLC analysis for a broad spectrum of compounds.

## Primaide System Manager

The intuitive, easy-to-use Chromatography Data Software (CDS). This software is optimal for both student experiments in academia and routine professional use.

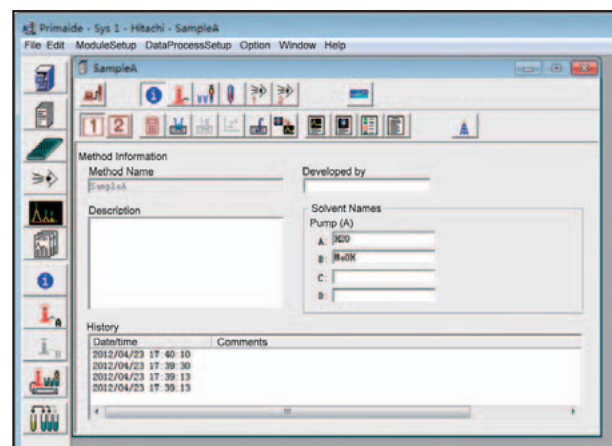


### ■ Easy USB connection

The LaChrom Elite features an installed USB interface. Thus, connection of the HPLC system with a PC is accomplished via a USB cable. There is no need to install a special interface card into the PC.

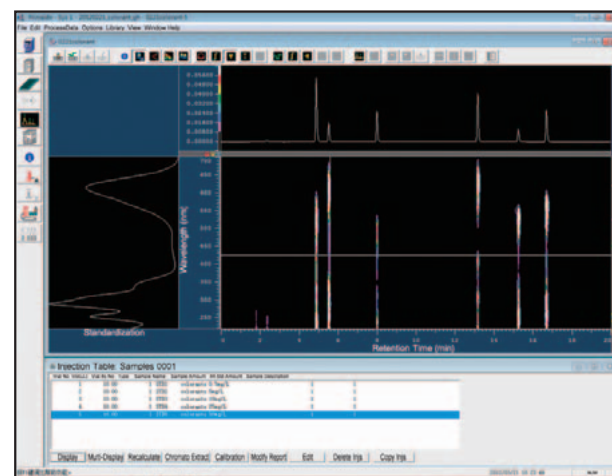
### ■ Measurement sequence visualized at a glance via a Toolbox

The left-hand side of the screen features a Toolbox, which contains icons which may be clicked, in sequence, to quickly and reliably open the windows necessary for measurements.



### ■ Best chromatogram improves measurement sensitivity (when using the DAD)

The best Chromatogram feature improves chromatogram sensitivity by utilizing the wavelength of maximum absorbance for individual peaks. This software tool also allows users to avoid the absorption bands of contaminants and obtain a chromatogram consisting of well-separated components. Apply this function to your application, and after 3D data acquisition, the optimum wavelengths are chosen and processed.



### ■ Data transfer via an online DDE function

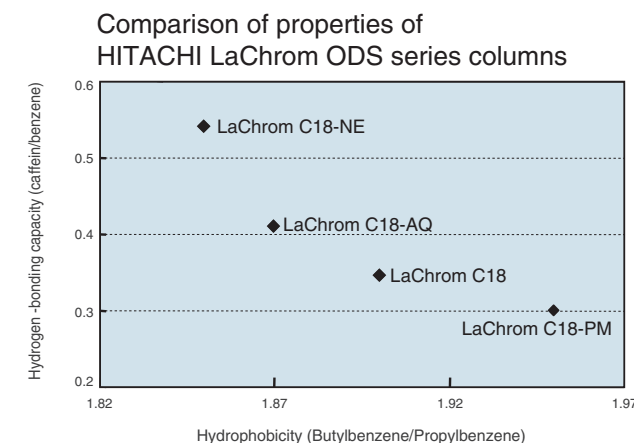
During data acquisition, reports of measurement results can be transferred to Microsoft® Excel® automatically. These reports include a header, chromatogram, calculation results, confidence report, etc., and can be also transferred during re-calculation of the collected data. A Summary Program also delivers multiple results in a chart format. This function facilitates data management with Microsoft® Excel®. (Microsoft® Excel® is necessary for this function.)

## HITACHI LaChrom Column Series

HITACHI LaChrom Columns target a broad range of HPLC applications.

### ■ Four types of C18 columns with different separation properties

By selecting the columns according to the characteristics of the samples to be analyzed, highly optimized separations can be developed.



### ■ In addition to ODS, Hitachi provides reverse phased, normal phase, and HILIC mode columns

C8, Phenyl, Cyano, Amino, Diol, and Silica columns also available.



Product name	Particle size (µm)	Column size (mm I.D. x mm L.)	P/N
<b>HITACHI LaChrom C18</b> C18 column with standard properties. Column of first choice for a wide variety of analyses.	3	4.6x100	891-5030
		4.6x150	891-5035
	5	4.6x150	891-5050
		4.6x250	891-5055
<b>HITACHI LaChrom C18-AQ</b> A low-carbon C18 column for highly polar compounds. Compatible with aqueous mobile phase (including 100% H <sub>2</sub> O).	3	4.6x100	891-5036
		4.6x150	891-5037
	5	4.6x150	891-5058
		4.6x250	891-5059
<b>HITACHI LaChrom C18-PM</b> Polymeric C18 column. Offers a high solid planar recognition and a broad-range pH tolerance (pH 1-10).	3	4.6x100	891-5038
		4.6x150	891-5039
	5	4.6x150	891-5062
		4.6x250	891-5063
<b>HITACHI LaChrom C18-NE</b> Silanol-activated C18 column. For use in the separation of interaction with silanol groups.	5	4.6x150	891-5064
		4.6x250	891-5065

•Guard columns (Holders and Cartridges) are also available.

•LaChrom C18 and LaChrom C18-AQ are also available for UHPLC (2 µm particle size).

Product name	Particle size (µm)	Column size (mm I.D. x mm L.)	P/N
<b>HITACHI LaChrom C8</b> Inhibits retention through the use of short alkyl chains, for reduced analytical time on highly hydrophobic compounds.	5	4.6x150	891-5066
		4.6x250	891-5067
<b>HITACHI LaChrom Ph</b> Retention by π-electron interactions. Useful for the separation of aromatic compounds.	5	4.6x150	891-5068
		4.6x250	891-5069
<b>HITACHI LaChrom CN</b> Can be used in both reverse d and normal phase modes.	5	4.6x150	891-5070
		4.6x250	891-5071
<b>HITACHI LaChrom SIL</b> First choice among normal phase columns, for the separation of lipid-soluble compounds.	5	4.6x150	891-5072
		4.6x250	891-5073
<b>HITACHI LaChrom Diol</b> Interaction with hydroxyl groups. Optimum for analysis in HILIC mode.	5	4.6x150	891-5074
		4.6x250	891-5075
<b>HITACHI LaChrom NH2</b> An amino-silica column with improved durability. Especially for the analysis of sugar chains and oligo saccharides.	5	4.6x150	891-5076
		4.6x250	891-5077

## Specifications / Other products

### Pump

	Primaide1110 pump
Liquid feed system	Dual plunger reciprocating pump (series connection, pulsation suppression)
Flow rate range	0.001 to 9.999 mL/min.
Maximum discharge pressure	39.2 MPa (0.001 to 5.000 mL/min.) 19.6 MPa (5.001 to 9.999 mL/min.)
Flow rate accuracy	±2 µL/min. (0.01 to 0.1 mL/min.) ±2 % (0.101 to 8.0 mL/min.) ±4 % (8.001 to 9.999 mL/min.)
Flow rate stability	SD 0.02min. or RSD 0.075 %, whichever is larger (retention time at 1.0 mL/min.)
Dimensions/weight	340(W) × 464(D) × 159(H) mm, approx. 13.0 kg

Options: Degasser®, Low-pressure gradient unit, Pump seal washing kit, and UI-Pad.

### Gradient Unit

	Primaide Low-Pressure Gradient Unit
LiqNumber of solutions mixable	4 solutions
Mixing system	Solenoid valve opening/closing time control system
Recommended flow rate range	0.4 to 1.8 mL/min.

### Autosampler

	Primaide1210 Autosampler
Number of standard samples	1.5 mL × 200 pcs, 4 mL × 128 pcs (option)
Sample injection system	Direct injection system
Syringe capacity (standard)	100 µL
Sample injection volume	0.1 to 50 µL (standard syringe), up to 4,500 µL (option)
Injection volume reproducibility	0.3 % RSD (when 10 µL is injected)
Dimensions/weight	340(W) × 464(D) × 297(H) mm, approx. 21.4 kg

Options: UI-Pad, 500 µL and 5 mL syringe kit

### Column Oven

	Primaide1310 Column Oven
Temperature control system	Block heating + Air circulation system
Temperature setting range	1 to 65°C (in 1°C step)
Temperature control range	(ambient temperature – 15°C) to (ambient temperature + 50°C)
Temperature control accuracy	± 0.1°C
Column accommodated	Up to 3 columns (250mm length max.)
Dimensions/weight	340(W) × 464(D) × 159(H) mm, approx. 10.6 kg

Options: UI-Pad

### UV Detector

	Primaide1410 UV
Optical system	Double-beam ratio photometry system
Light source	D <sub>2</sub> lamp, Hg lamp (for wavelength check)
Wavelength range	190 to 600 nm
Wavelength accuracy	± 1 nm
Noise	0.6 × 10 <sup>-6</sup> AU or less (250 nm)
Drift	1.0 × 10 <sup>-4</sup> AU/hr or less (250 nm)
Response	0.05, 0.1, 0.5, 1, 2, 4, 8 sec
Dimensions/weight	340(W) × 464(D) × 159(H) mm, approx. 12.6 kg

Options: UI-Pad, Preparative flow cell for UV

### Diode Array Detector

	Primaide1430 DAD
Number of photodiode bits	1024
Light source	D <sub>2</sub> lamp, W lamp, Hg lamp (for wavelength check)
Wavelength range	190 to 900 nm
Wavelength accuracy	± 1 nm
Noise	0.5 × 10 <sup>-6</sup> AU or less (250 / 600 nm)
Drift	0.5 × 10 <sup>-3</sup> AU/hr or less (250 / 600 nm)
Spectrum acquisition cycle	Selectable from 50, 100, 200, 400, 800, 1600, 3200 msec
Dimensions/weight	340(W) × 464(D) × 159(H) mm, approx. 13.5 kg

Options: Preparative flow cell for DAD

### Organizer

	Primaide Organizer
Power supply	AC 100 to 240 V (50/60 Hz), 350VA
Output	DC 24V, 300W (provides DC power supply for 1110 pump × 1, 1210 Autosampler × 1, 1410UV / 1430DAD × 1)
Space to accommodate solvent bottles	314(W) × 280.8(D) mm
Dimensions / weight	340(W) × 445(D) × 207(H) mm, approx. 8.2 kg



## Chromaster / L-8900

Hitachi High-Technologies provides the HPLC "Chromaster," which enables more sophisticated analyses, as well as the Amino Acid Analyzer L-8900. The technology cultivated by Hitachi in the development of its HPLC systems has been applied to the L-8900. Hitachi offers the best systems for your applications.

### Chromaster

Time has shown that HPLC systems need to meet three requirements: improved performance, function, and reliability. By responding to each of these areas, we have improved our HPLC systems down to the smallest detail and have established a new standard for HPLC.

#### Features

- New mixing mode (HFM), yielding improved gradient elution precision
- Autosampler that features a greatly reduced carry-over
- UV/UV-VIS detector enabling simultaneous detection at two wavelengths
- GUI controller consisting of a color LCD and touch panel



### Amino acid analyzer L-8900

The amino acid analyzer continues to evolve as an analytical instrument suitable for routine use. The L-8900 is a highly sensitive analyzer which allows very good separation, based on the post-column ninhydrin method. Since it is specialized for amino acid analysis, operation of the L-8900 is simple and stress-free.

#### Features

- Ion-exchange resin adopted (particle diameter, 3µm)
- Highly efficient TDE<sup>2</sup> Reactor improves sensitivity (option).
- Rapidly-achieved good separation with twin columns
- Highly automated, easy-to-navigate system



Degasser® is a registered trademark of ERC Inc.

Microsoft®, Excel® are registered trademark of Microsoft Corporation in U.S.A and other countries.

CAUTION: For correct operation, follow the instruction manual when using the instrument.

Specifications in this catalog are subject to change with or without notice, as Hitachi High-Technologies Corporation continues to develop the latest technologies and products for our customers.

NOTICE: The system is For Research Use Only, and is not intended for any animal or human therapeutic or diagnostic use.

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## Hitachi High-Technologies Corporation

**Tokyo, Japan**

**<http://www.hitachi-hitec.com/global/science/>**

24-14 Nishi-Shimbashi 1-chome, Minato-ku, Tokyo, 105-8717, Japan

Tel: +81-3-3504-7211 Fax: +81-3-3504-7123

*For technical consultation before purchase, please contact:  
contact@nst.hitachi-hitec.com*

**Hitachi High Technologies America, Inc.**

**<http://www.hitachi-hta.com/hplc>**

1375 North 28th Ave. / P.O. Box 612208

Dallas, TX 75261-2208

Toll free: 800-548-9001

Tel: 972-615-9000 Fax: 972-615-9322

E-mail: Sales-LS@hitachi-hta.com