

Ultra High-Performance
Liquid Chromatograph
ChromasterUltra Rs

HITACHI
Inspire the Next[™]

ChromasterUltra^{Rs}



Distributor of Hitachi High-Tech America, Inc.

Visualize the future

**A new UHPLC, designed for a new era,
has emerged to lend indispensable
support to your research.**

We set out to view the issues from a new angle;
visualizing the future with no preconceptions.

Toward the realization of high resolution
and high sensitivity, achieved through advanced
technologies,

our daring approach resulted
in the ChromasterUltra Rs.

The future of UHPLC starts here and now.



TEMP D2 LAMP

High Resolution

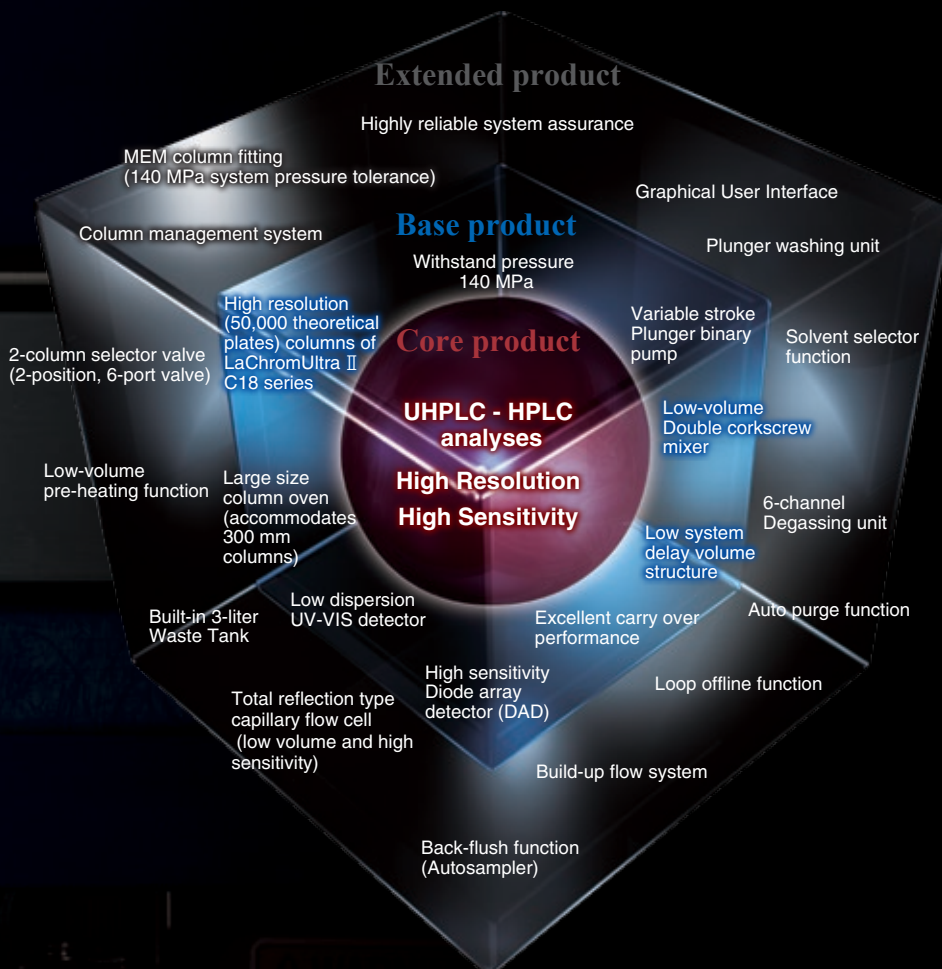
High Sensitivity

Ease of Use

UHPLC will also support HPLC analyses

- High resolution analysis is realized through the world's highest system pressure (140 MPa) *1
- World-class analysis when combined with the high resolution separation column (LaChromUltra II) for UHPLC, which has 50,000 theoretical plates
- High sensitivity and high resolution stand side by side thanks to the total reflection capillary flow cell design
- A system compatible with both HPLC and UHPLC analyses
- Features designed for operational excellence including the MEM column fitting with 140 MPa system pressure tolerance, the built-in Waste Tank, etc.

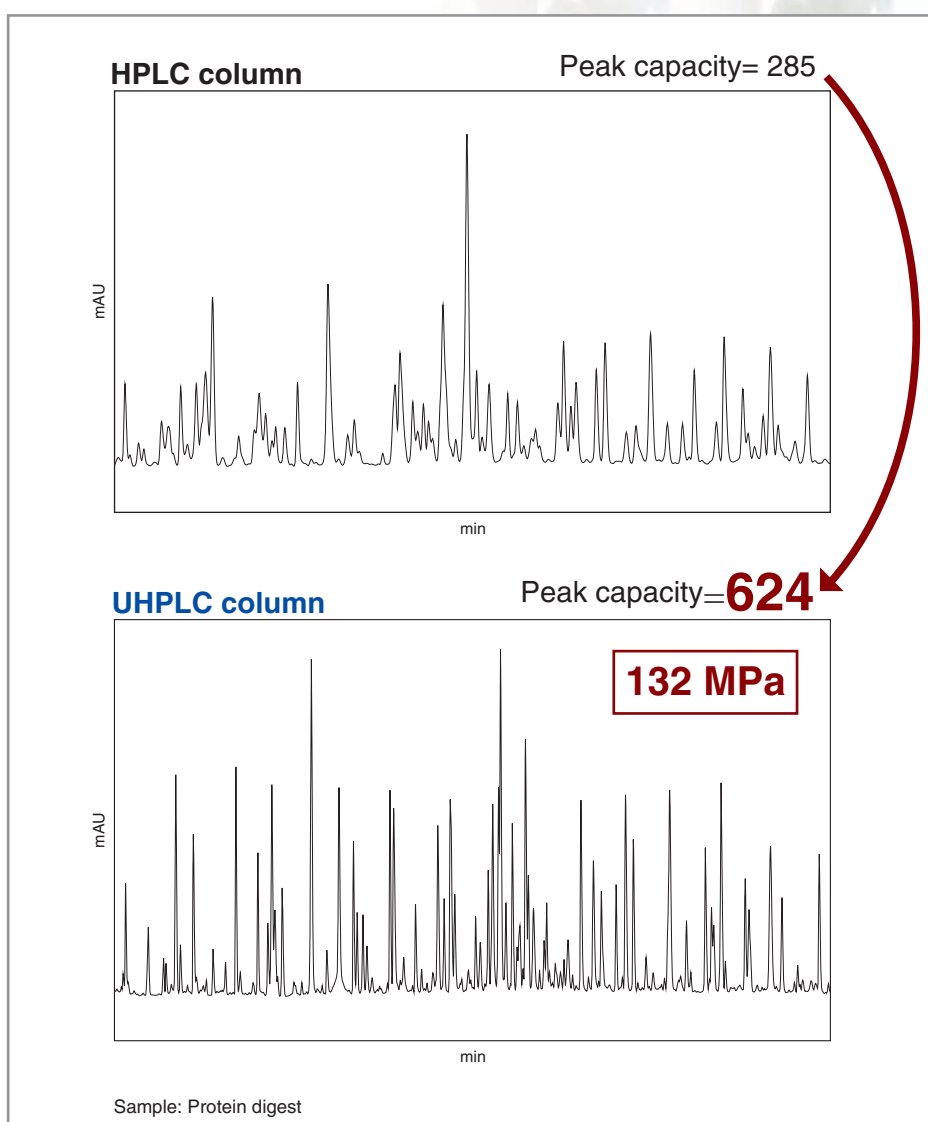
*1: Among models sold in Japan, surveyed by Hitachi High-Technologies as of July 2013



High Resolution

Sharp peaks hint at the capability of this system

When true separation performance is required, tap into the high resolution analysis that only UHPLC can offer.



▶ See P. 9 for details

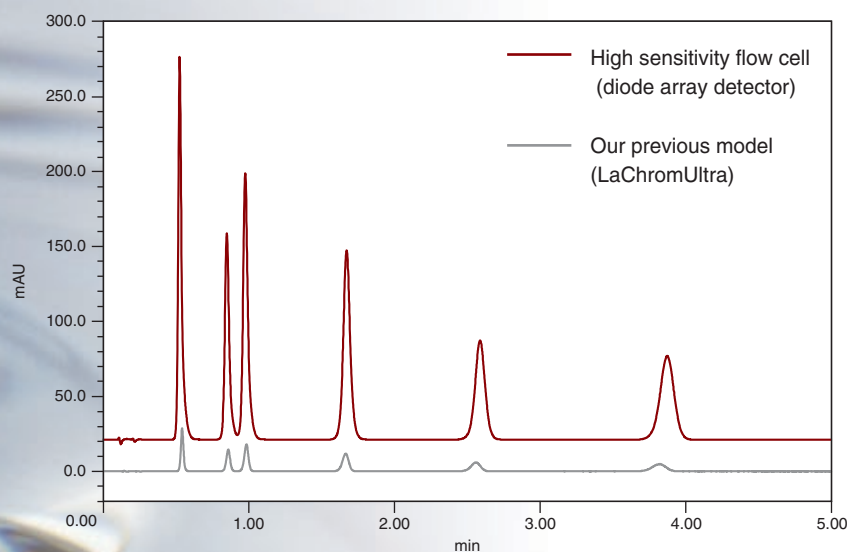




High Sensitivity

Even peaks normally obscured by noise will not be missed

Lower the risk of missing trace components and impurities.



▶ See P. 11 for details

ChromasterUltra*RS*

Thorough inspection of individual systems just prior to shipment assures delivery of high quality products



Lineup

- Diode array detector (DAD) system
- UV-VIS system

RS Resolution
Sensitivity

Contents

UHPLC will support HPLC analyses

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High Resolution

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High Sensitivity

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Operability

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Extensibility

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LaChromUltra II series

▶ P.17, 18

UHPLC will support HPLC analyses

Excellent performance up to 140 MPa system pressure

Stable solvent delivery is realized for a broad range of pressure, as high as 140 MPa, by incorporating a new control technology (LBT*) into the Binary pump. Even for gradient analysis under high pressures, highly reproducible analyses are available.

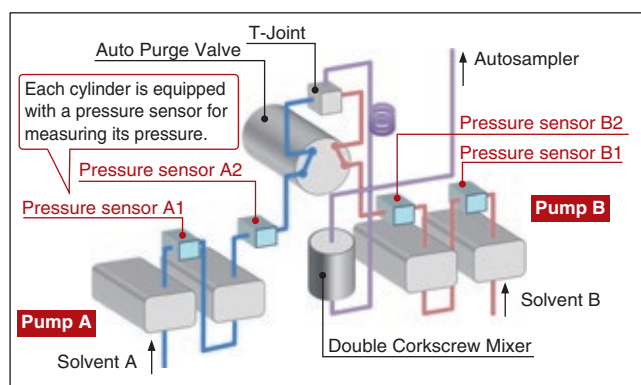
Moreover, ultra fast analyses are supported by improving the gradient response using an extremely low system volume.

*1 Liquid Beat Technology

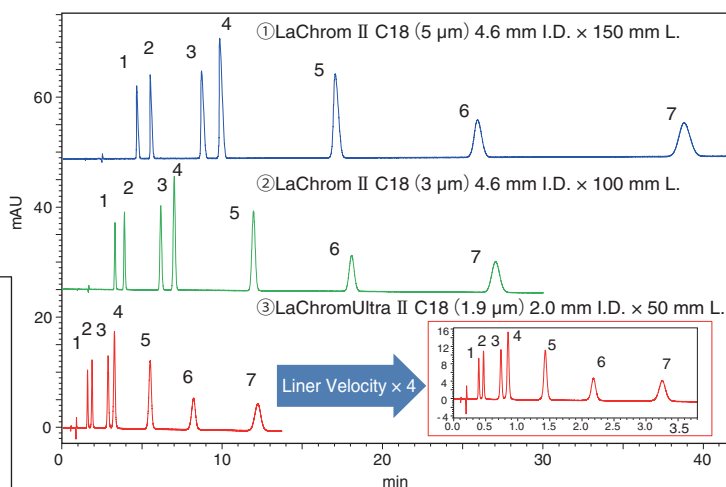
Stable solvent delivery allows a broad range of analyses from UHPLC to HPLC

Stable solvent delivery is realized, independent of pressure and solvent composition, by incorporating LBT control and by correcting the bulk modulus of solvent.

Stable analyses are achieved with 5 μm columns, 3 μm columns, and 1.9 μm columns.



System configuration of Binary pump

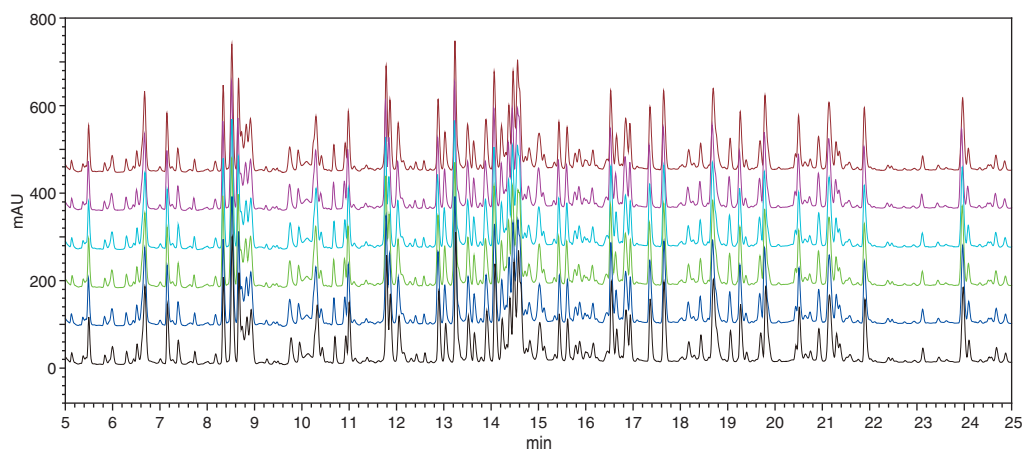


[Conditions]
Eluent: 20 mM KH_2PO_4 / CH_3CN = 95/5
Detection: 274 nm

[Sample]
1. 1-Methyluric acid
2. 3-Methylxanthine
3. 1,3-Dimethyluric acid
4. Theobromine
5. Theophylline
6. β -Hydroxyethyltheophylline
7. Caffeine

Excellent reproducibility

Even for gradient analysis under high pressure conditions, highly reproducible, high resolution results are achieved.



[Conditions]
Column: LaChromUltra II C18 (1.9 μm)
3.0 mm I.D. x 250 mm L.
Eluent: A) 0.05% TFA/ H_2O (v/v)
B) 0.05% TFA/ CH_3CN (v/v)
5%B (0 min) \rightarrow 45%B (30 min)
Flow rate: 0.85 mL/min
Column Temperature: 40°C
Detection: UV 214 nm

[Sample]
Protein digest

Highly reproducible analyses are also possible for analyses of protein digests, which produce numerous peptide peaks.

High Resolution Helping you with even higher resolution

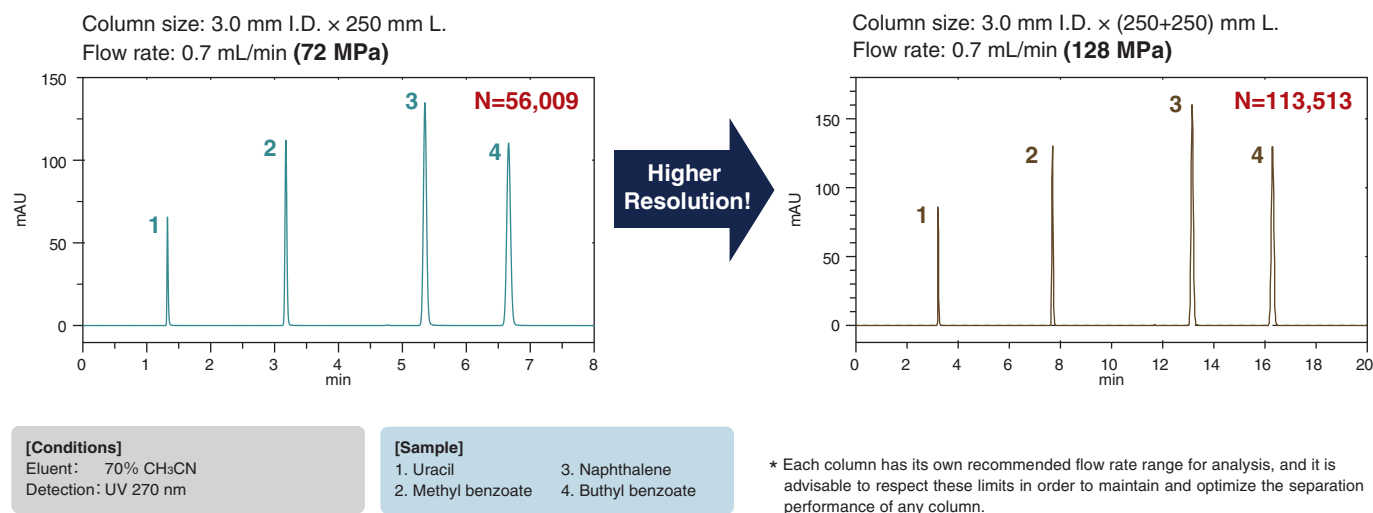
It has been generally accepted that high-resolution analyses of impurities and structural analogs of synthetic compounds, such as medicines and chiral molecules, are challenging, even with UHPLC. Now, however, the newly developed high-resolution column, LaChromUltra II, designed for UHPLC applications with system pressures up to 140 MPa can achieve more advanced separation analyses and industry-leading performance.

High-resolution column for UHPLC applications: Number of theoretical plates of 50,000 per column

For the LaChromUltra II C18 (1.9 μm) column, a high system pressure tolerance of 140 MPa* is realized by using grafted material comprised of organic-inorganic silica, the physical and chemical durability of which is improved compared to the conventional silica gel particle. The combination of this column and the ChromasterUltra Rs will enable a system pressure tolerance of 140 MPa with 50,000 or more theoretical plates per column.

<Features>

- High system pressure tolerance of 140 MPa*
- Mobile phase selectable for a wide range of pH from 1 to 12
- Ultra high resolution analyses by connecting columns in series



Thoroughly minimized system volume

The ChromasterUltra Rs is designed with reduced piping volume and minimized piping length, thereby improving the gradient response and reducing the extra-column dispersion.

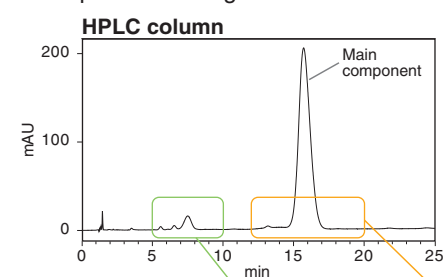
Standard total reflection type capillary flow cell (optical path length of 10 mm) for diode array detector

The diode array detector (DAD) is equipped with a standard total reflection type capillary flow cell. Through the incorporation of capillary structure, the flow cell volume and the dispersion within the flow cell are reduced, leading to high resolution separation.



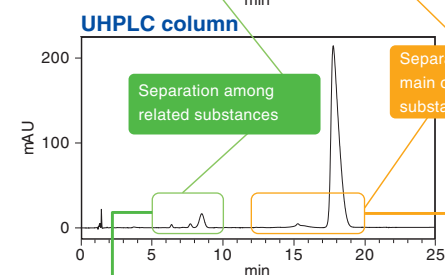
High-resolution analyses of related substances (impurities)

Erythromycin (a macrolide antibiotic having a basic structure comprised of a 14-membered ring) is used as a sample model for separation of the main component and related substances to compare the separation using an HPLC column vs. the separation using a UHPLC column.



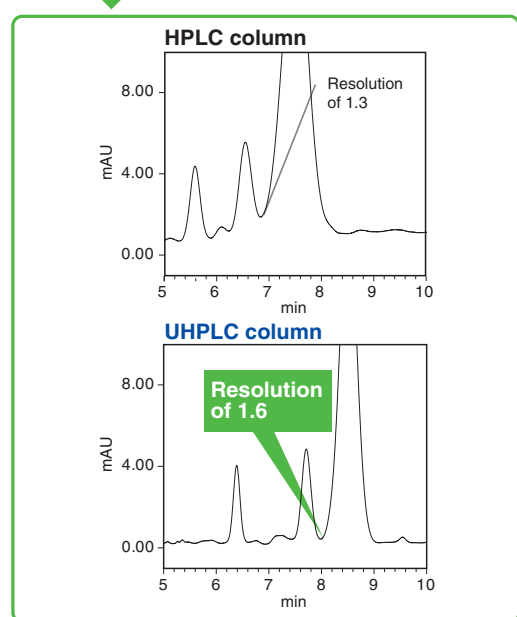
HPLC column

[Conditions]
Column: LaChrom II C18 (5 μ m) 4.6 mm I.D. x 150 mm L.
Flow rate: 1.0 mL/min
Eluent: 20 mmol/L Phosphate Buffer/CH₃CN/CH₃OH = 45/40/15
Detection: DAD 210 nm

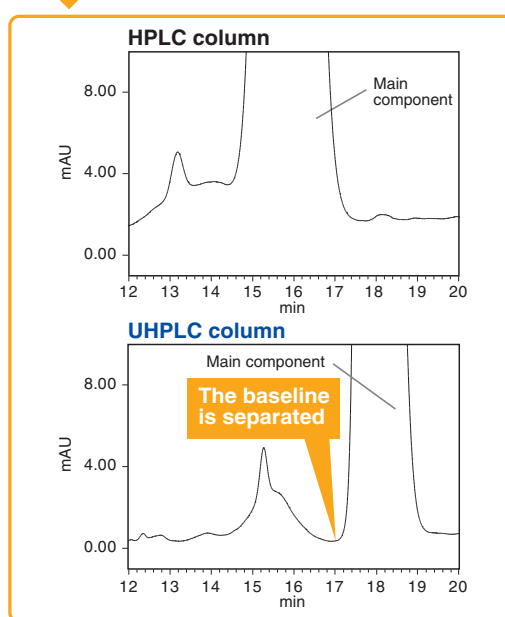


UHPLC column

[Conditions]
Column: LaChromUltra II C18 (1.9 μ m) 3.0 mm I.D. x 250 mm L.
Flow rate: 0.710 mL/min
Eluent: 20 mmol/L Phosphate Buffer/CH₃CN/CH₃OH = 45/40/15
Detection: DAD 210 nm



Complete separation of related substances



Separation of the main component peak

More satisfactory separations are attained by the use of the newly developed high resolution column for UHPLC applications.

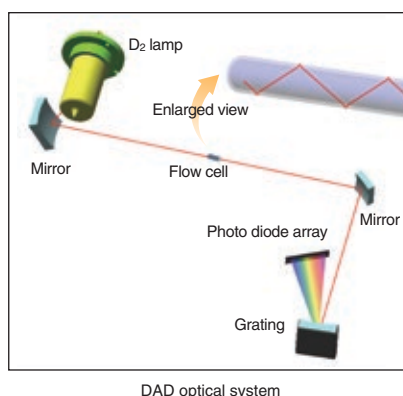
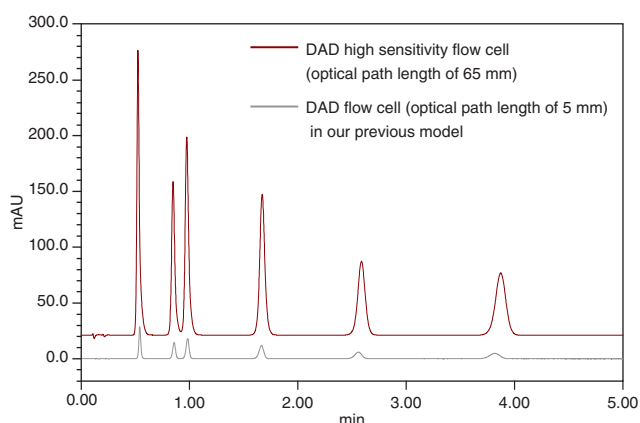
* The "complete separation" stipulated in the Japanese Pharmacopoeia is resolution of 1.5 or more.

High Sensitivity Hidden risks will not be missed

A total reflection type capillary flow cell is incorporated into the diode array detector to cope with the increasing need for high sensitivity analyses of hazardous substances, genotoxic impurities, etc. A high sensitivity flow cell with an optical path length of 65 mm is also available. In addition to high sensitivity analyses, carryover is reduced through the use of a double corkscrew mixer.

High-sensitivity total-reflection type capillary flow cell

The diode array detector (DAD) exhibits low noise and low drift, achieved through the use of a new optical system providing optimal conditions for high-sensitivity analysis. The optional high-sensitivity flow cell (optical path length of 65 mm) further enhances sensitivity; about a 10-fold increase is obtained compared with our previous model (LaChromUltra), thus making possible applications including impurities from side-reactions, genotoxic impurities, etc. The acquisition of impurity profiles during all stages of synthesis and in raw materials used in medicines and chemicals, intermediate by-products, and finished drugs would be one of the useful applications.



A quartz glass capillary tube is adopted as the flow cell channel, and the efficient total reflection at the capillary surface is harnessed to minimize the loss of flow cell transmission light. Consequently, even with the elongated optical path length of the flow cell, the baseline performance is comparable to the previous flow cell, resulting in a sensitive detector.

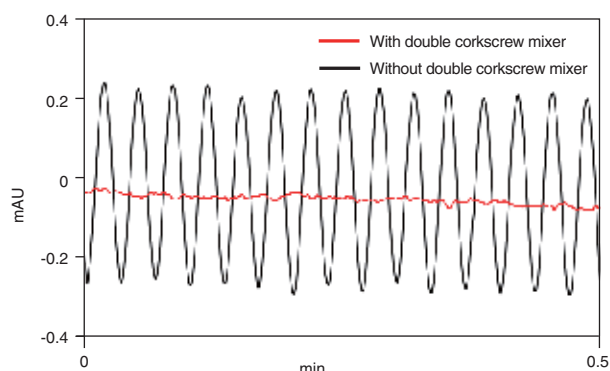
Double corkscrew mixer

The Binary pump is equipped with the latest design in microfluidic double corkscrew mixers. An efficient mixture is attained even for a low volume, resulting in a baseline that is extremely stable during gradient analysis, enabling higher sensitivity analysis.



Double corkscrew mixer flow path diagram

Structure of double corkscrew mixer: Repeated branching and merging of channels within the mixer provide effective solvent mixing (mixer volume of 55 μ L).

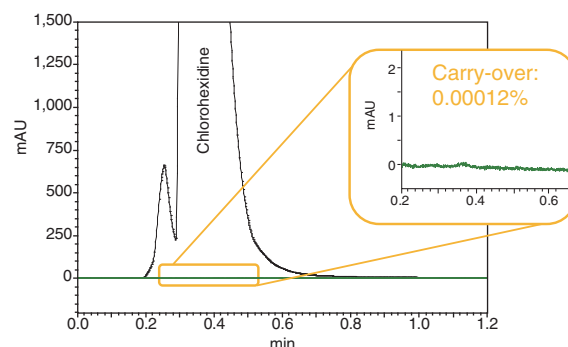
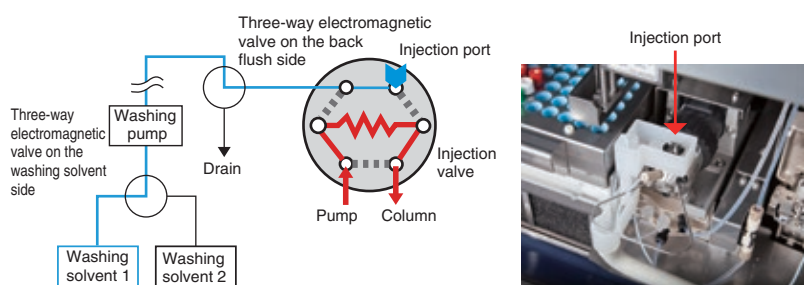


[Conditions]
Column: LaChromUltra II C18 (1.9 μ m) 2.0 mm I.D.x50 mm L.
Eluent: A) 0.1% TFA/H₂O (v/v)
B) 0.1% TFA/CH₃CN (v/v)
A/B=50/50
Flow rate: 0.500 mL/min
Detection: UV 214 nm

Carry-over

Low carry-over (0.001% or less) is attained via an optimized injection port structure.

- The dead volume of the injection port is reduced
- High flow rate washing is achieved through the use of a washing pump dedicated to the autosampler
- Two solvents are available for washing the needle inner wall as well as the inside of the injection valve
- A back flush function for the injection port is a newly incorporated feature



[Conditions]

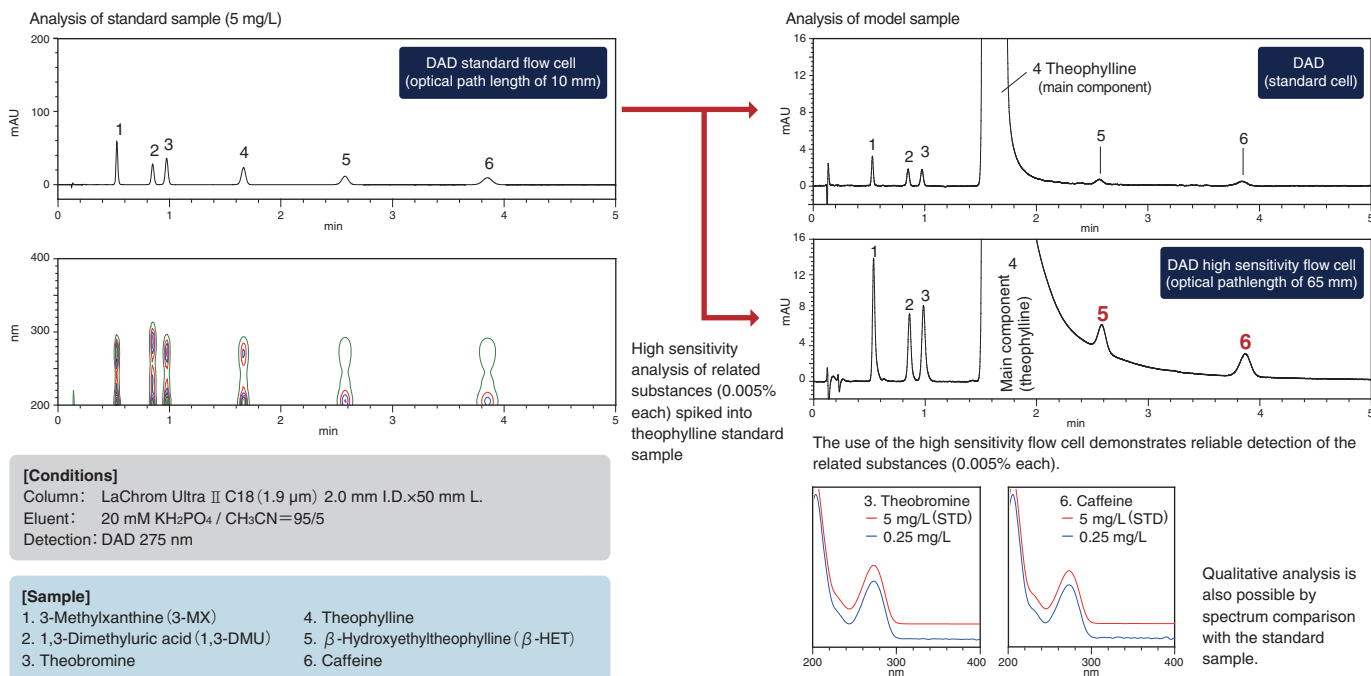
Column: LaChromUltra II C18 (1.9 μ m) 2.0 mm I.D.x50 mm L.
 Eluent: A) 0.1% TFA/H₂O (v/v)
 B) 0.1% TFA/CH₃CN (v/v)
 A/B=50/50
 Detection: UV 257 nm
 Wash Fluid: A/B=50/50

[Sample]

Chlorhexidine

High sensitivity analysis

In developing drug and chemical materials, the characterization of active ingredients and impurities contained in raw materials and final products is an important process. Impurity profiling is achieved when high sensitivity detection of active ingredients and all impurities is complete. As an example, a model sample which contains theophylline as the main component is analyzed for comparing detection sensitivity.



Operability Ease of operation helping your analysis

Daily maintenance and replacement of consumables can be performed from the front side of the instrument, providing enhanced operational efficiency. This includes the replacement of pump plunger seals, check valve cartridges, autosampler injection port seals, the detector lamp, and flow cell. The front access for easy maintenance has been available on Hitachi HPLC products for several years, and has gained favor with users.

Auto purge valve

The auto-purge valve provides automatic switching from purging action to analysis. Furthermore, the addition of the GUI controller (optional) allows Wakeup (automatic pre-analysis tasks) and Sleep (post-analysis tasks) programs to enhance user efficiency.

6-channel Degassing unit

The 6-channel degassing unit can be used for four solvents when the solvent selector is in use and for two solvents for the autosampler. This feature prevents trouble caused by bubble generation during operation.

Plunger washing unit

Damage to the plungers caused by salt precipitation from buffer solutions or plunger seal wear from debris can be greatly reduced by using the plunger wash unit to perform automatic washes after each analysis.

Build-up flow system

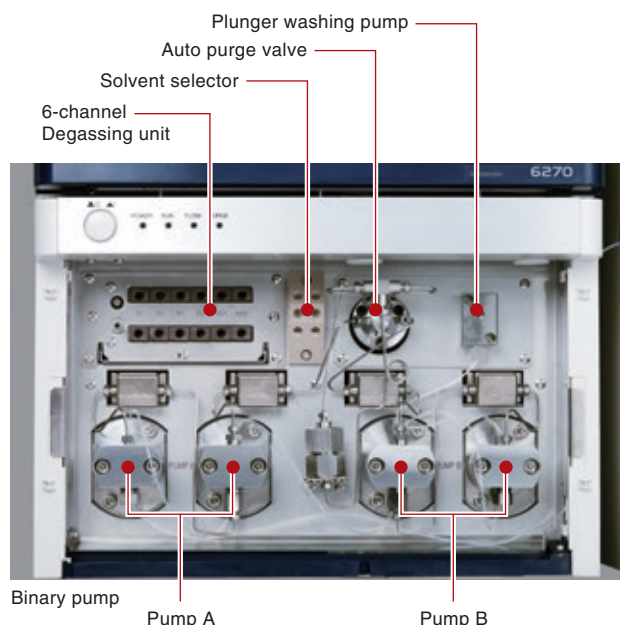
This function will minimize damage to the column resulting from rapid changes in the flow rate or column pressure. When pumping starts or during flow rate changes, the system can automatically accelerate or decelerate the flow rate to the set point.

MEM column fitting (optional)

Hitachi's own Moment Enhancing Mechanism (MEM) column fitting is a simple but exciting new development. The finger-tight piping integral fitting, which has a very small dead volume, is capable of safely tolerating system pressures as high as 140 MPa.

Solvent selector

The solvent selector is standard equipment. Two types of eluent can be selected by either pump. This is particularly useful during analysis method development.



MEM column fitting



A view of operation of attaching a column

Wide designed, high precision column oven

The oven temperature can be set within the range from 4°C to 90°C,*1 and the setpoint is reached quickly

- Temperature control: within $\pm 0.1^\circ\text{C}$ over the entire range of temperature settings
- Newly designed, low-volume pre-heating piping is an available option
- Up to three, 300 mm columns can be accommodated.*2

*1: The range of temperature control depends on the ambient temperature.

*2: When MEM column fitting and optional valves are not used.



A view of column oven accommodating columns

Built-in 3-liter Waste Tank

A 3-liter Waste Tank is housed within the column oven.

Typically, a waste solution container is placed underfoot, but now the space for the container can be utilized for other purposes, and safety is also improved.

(User is able to utilize a different waste solution container, if preferred. Contact Hitachi for details.)



3-liter Waste Tank

Autosampler with a large-size window

A large-size tinted window (155 mm in height and 280 mm in width) plus a built-in LED lamp allow easy visual confirmation of the operating conditions and the number of samples inside the autosampler during system operation.



A large-size autosampler window

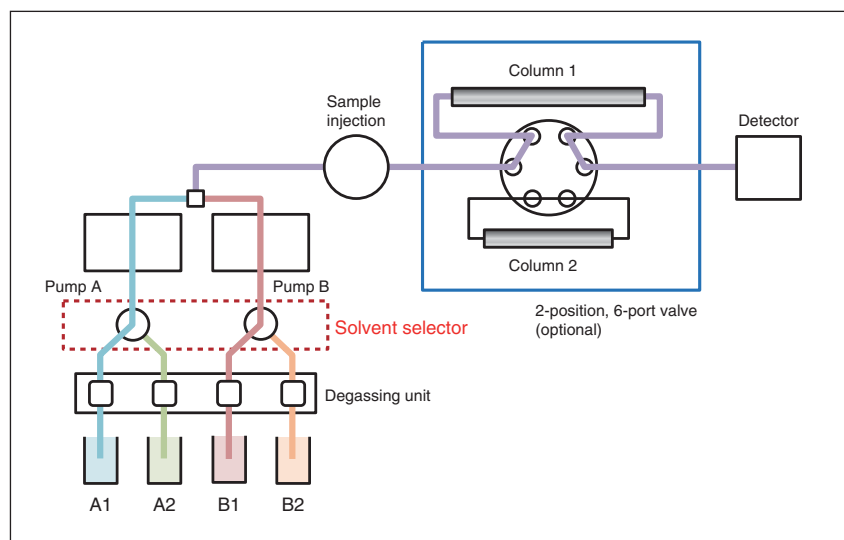
Extensibility A very high degree of functionality is available

All sorts of features to meet your analytical needs, including column switching, column management, and an intuitive GUI controller, are offered with this system.

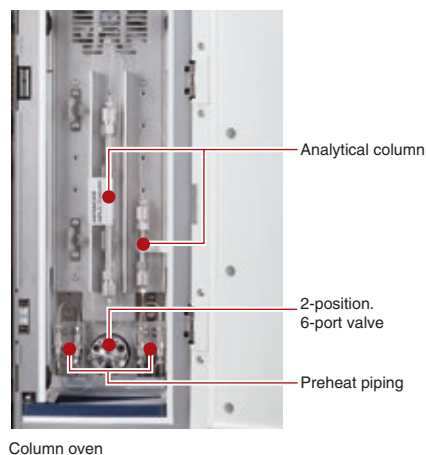
2-position, 6-port valve (optional)

The column oven, can be fitted with an optional 2-column selector valve. The combination of column switching and the solvent selector allows testing and analysis of various chromatographic conditions.

(When the 2-position, 6-port valve is incorporated, columns in length up to 250 mm can be used.)



Demonstrating the utility of the 2-column selector



Column oven

able to meet a broad range of analysis needs

Column management system (optional)

The Hitachi column management system can be used to track the log information on analytical columns and guard-columns from any manufacturer. Log information can be written and read through a connector mounted on the column oven or a USB port in the computer.

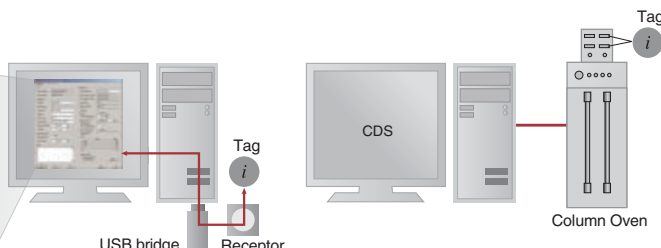
* Up to two columns can be fitted at the same time.

Column management information editing software screen



Read button Write button Print button

Column specifications can be input manually and saved. (Enter (an approximate) column life to cause the display of alert messages.)



Injection counts are automatically written from the CDS and the data is saved on the tag.



A view of connector for column management system connected

GUI controller (optional)

All modules can be controlled from the Graphical User Interface (GUI) controller.

The GUI is comprised of a color LCD monitor (5.7-inch color TFT display with LED back-light) and a touch panel makes for easy viewing and simple operation.

Up to 10 programs including a timer function, pre-analysis tasks (Wakeup), and post-analysis tasks (Sleep) can be created for a system. The GUI controller enables you to check the status of consumables usage for all units that are connected to the system.

[Main settings in the modules]

- Pump: Solvent feeding on/off, pump purging, and plunger washing
- Autosampler: Needle washing, rinse-port washing, and syringe purging
- Oven: Temperature settings and valve switching
- Detector: Lamp on/off and auto-zero



A view of GUI screen display



Operation



Maintenance (GLP)



Conditioning

Ordering Information

Description	Hitachi P/N	VWR Cat. No.
System		
ChromasterUltra RS DAD System	889-0016	76493-022
ChromasterUltra RS UV-VIS System	889-0026	76493-024
Detectors		
6420 UV-Vis Detector	889-0706	76493-028
6430 DAD Detector	889-0806	76493-030
6440 FL Detector	889-0836	76493-032
Options		
MEM Column Fitting	889-0620	76501-090
2-pos, 6-port valve (2 columns)	892-0322	76493-138
Column Management System	892-0324	76493-140
GUI Controller	892-0913	76493-206

For sales, service and support, visit:

<https://vwr.com>

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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-Tech continues to develop the latest technologies and products for its customers.

NOTICE: The system is For Research Use Only, and is not intended for any animal or human therapeutic or diagnostic use. These data are an example of measurement; the individual values cannot be guaranteed.

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