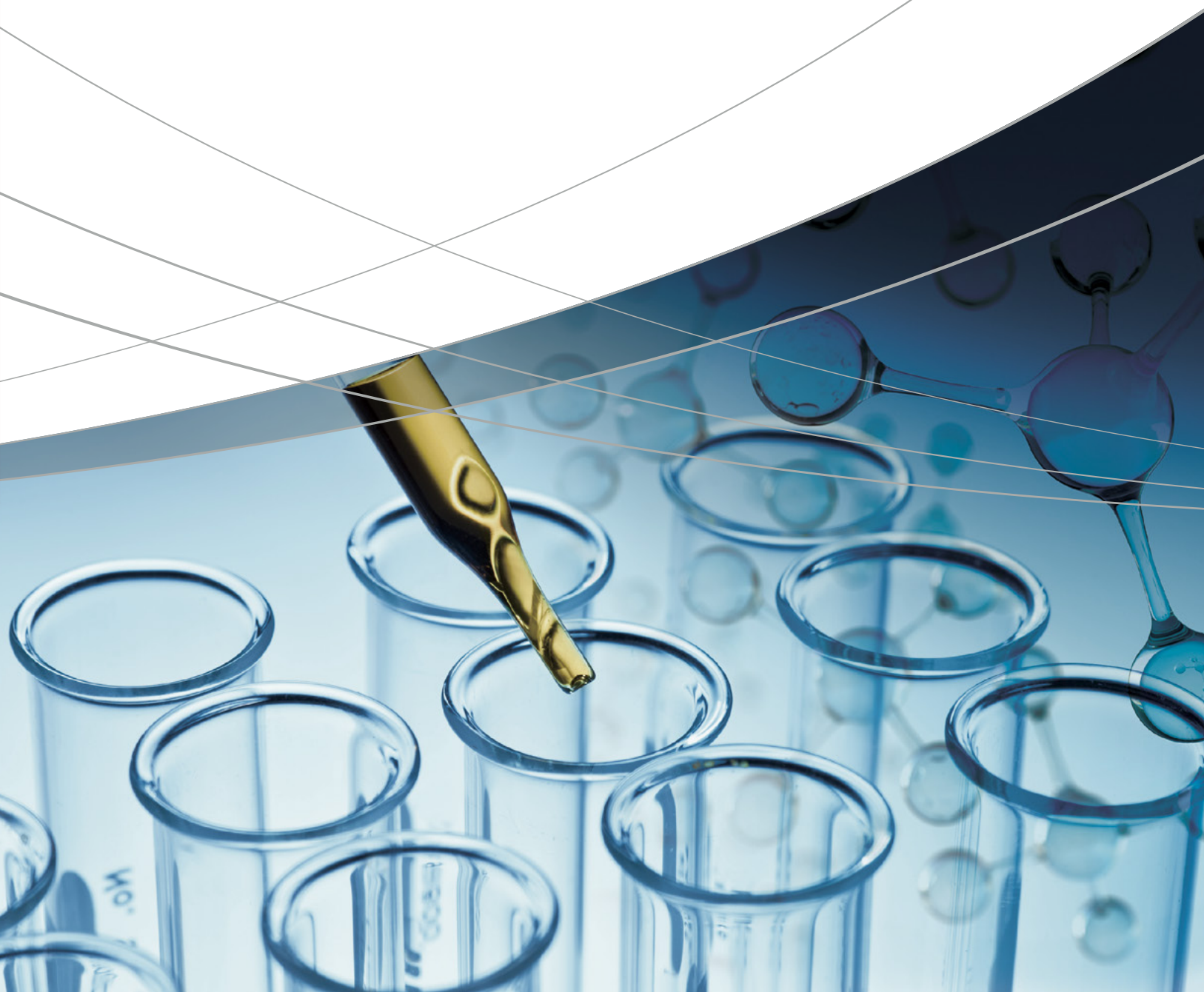
C10G-E077A

SHIMADZU
Excellence in Science

Solutions for

Medicinal Chemistry



Solutions for Medicinal Chemistry

Shimadzu provides medicinal chemistry laboratories with separation techniques on both analytical and preparative scales.

SFC

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Nexera UC

Supercritical Fluid Chromatography System for Chiral Screening

Analytical

Preparative

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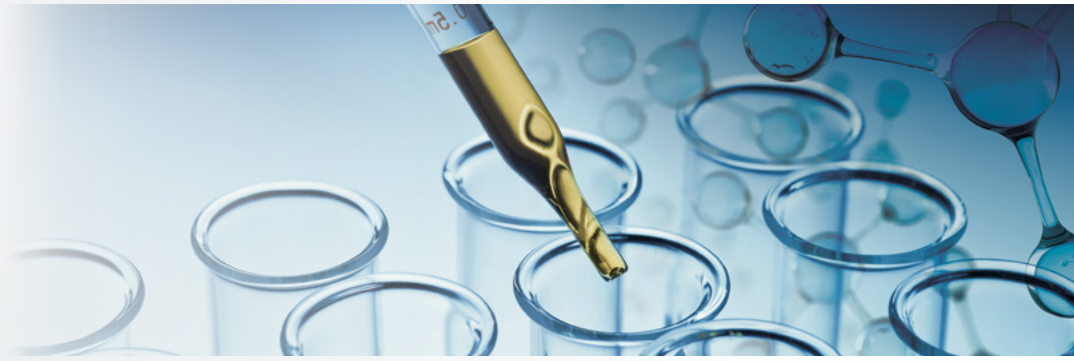
Nexera UC Prep

Semi Preparative Supercritical Fluid Chromatography System



U/HPLC

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Nexera Prep

Preparative/Purification
LC/LCMS System

Nexera UC

Supercritical Fluid Chromatography System for Chiral Screening

When considering analytical conditions for the analysis of chiral compounds, various combinations of analytical columns and mobile phases need to be evaluated through trial and error, resulting in considerable time and labour taken up by method development.

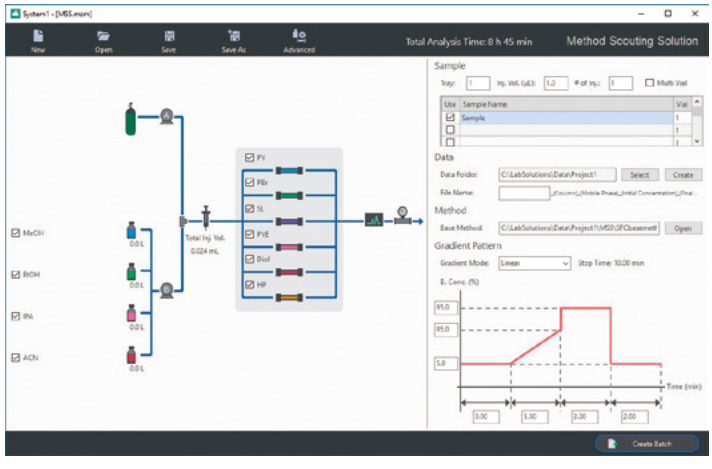
This process can be streamlined and sped up significantly with the use of Shimadzu's Nexera UC Chiral Screening System for screening analytical conditions, in combination with Daicel's CHIRALPAK and CHIRALCEL series chiral separation columns.

Evaluating analytical conditions with the Nexera UC Chiral Screening System

When using the system for supercritical fluid chromatography (SFC) analysis of chiral compounds, with the mobile phase being a supercritical fluid with high diffusivity, it is possible to carry out analysis in 1/3 to 1/5 the time compared to a conventional HPLC system. The Nexera UC Chiral Screening System not only allows for SFC analysis, but can also automatically switch between up to 12 columns, 4 modifiers, and blends of those modifiers during analysis, greatly reducing the overall workflow.

With the dedicated software, "Method Scouting Solution", the columns and modifiers to be used can be managed in a database, and various analytical conditions can be applied by simply selecting them from the graphical user interface (GUI).

It supports evaluation of analytical conditions in multiple ways: calculating modifier and sample amounts required, prevention of degradation through column rinsing and changeover of enclosed fluids post-analysis, and prediction of analysis completion times.



Combining the Nexera UC Chiral Screening System with Diacel columns

Here we present the results of screening 36 SFC analysis conditions resulting from combinations of 12 Daicel columns and 3 modifiers using the Nexera UC Chiral Screening System.

Because the system can switch automatically between modifiers and columns during analysis, the analysis can be carried out continuously night or day, allowing for speedier evaluation of analysis conditions. The example shown on this page was completed in one night.

Data can be collected by simply setting the samples and mobile phases and initiating analysis, resulting in a significant reduction in labor. The user is free to carry out other tasks while analysis is in progress, increasing the overall productivity of the lab.

In addition, Shimadzu's LabSolutions HPLC workstation data browser assists in fast and reliable data processing after evaluation of chiral analysis conditions. A large amount of scouting data can be viewed at once, along with chromatogram data such as retention times, area values, separation values, and symmetry factors.

Scouting conditions

Chiral columns for SFC

(1) CHIRALPAK	IA-3	(7) CHIRALPAK	AD-3
(2) CHIRALPAK	IB-3	(8) CHIRALPAK	AS-3
(3) CHIRALPAK	IC-3	(9) CHIRALPAK	AY-3
(4) CHIRALPAK	ID-3	(10) CHIRALCEL	OD-3
(5) CHIRALPAK	IE-3	(11) CHIRALCEL	OJ-3
(6) CHIRALPAK	IF-3	(12) CHIRALCEL	OZ-3

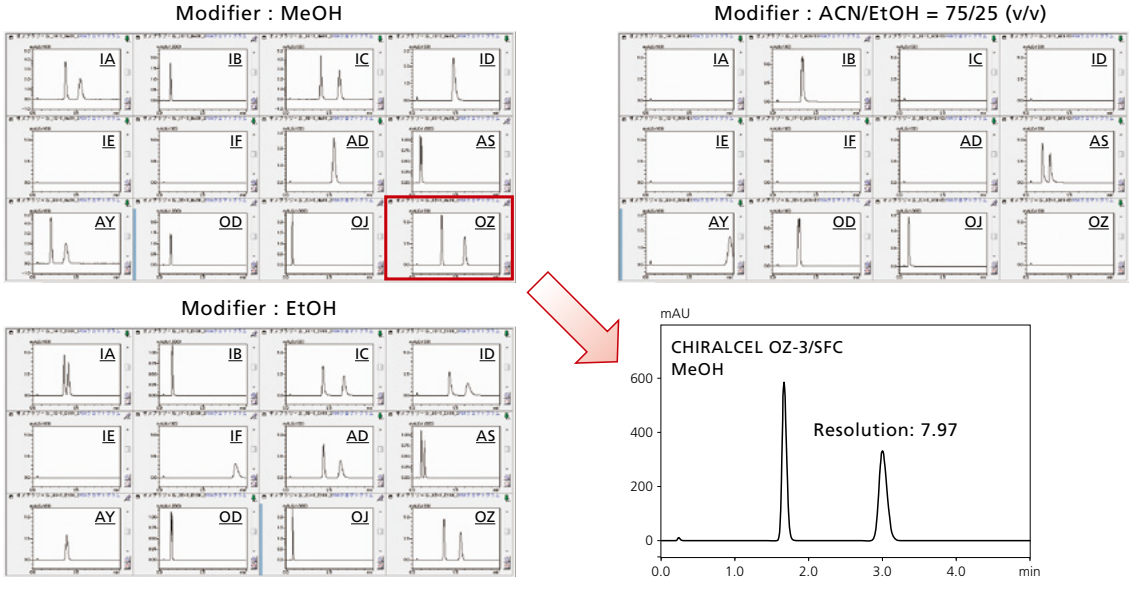
All columns have I.D. 3.0 mm, length 100 mm, particle size 3 µm

Modifiers

(1) Methanol
(2) Ethanol
(3) Acetonitrile/Ethanol = 75/25 (V/V)

For all analyses CO_2/modifier = 8/2 (V/V)

Automatic analysis for all 36 SFC chiral screening conditions



Screening Results

Nexera UC Prep

Semi Preparative Supercritical Fluid Chromatography System

The Nexera UC Prep is a new preparative supercritical fluid chromatography system that offers both the high basic performance developed for the previous Nexera UC model and original state-of-the-art preparative SFC technologies.

It resolves a number of issues in preparative tasks, allowing users to overhaul their workflow, reducing labor and improving efficiency while fitting into pre-existing workflows. Not only does the Nexera UC Prep achieve superior fractionation recovery rates for purification, it provides flexible system configurations in a compact design, requiring low installation space and allowing you to maximize lab resources.

High recovery rates

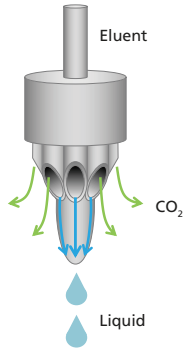
In preparative SFC, one factor that results in lower recovery rates is increased dispersion of the eluant when the CO_2 returns suddenly from a supercritical to a gaseous state. The Nexera UC Prep's patented gas-liquid separator, the LotusStream separator, successfully reduces sample dispersion and carryover, while also achieving high recovery rates. These high recovery rates can be obtained regardless of flow rate or modifier concentration, even for volatile compounds such as the fragrance linalool.

Comparison for 1% linalool

Equipment	Recovery rate
Conventional separator	78.0%
LotusStream separator	96.7%

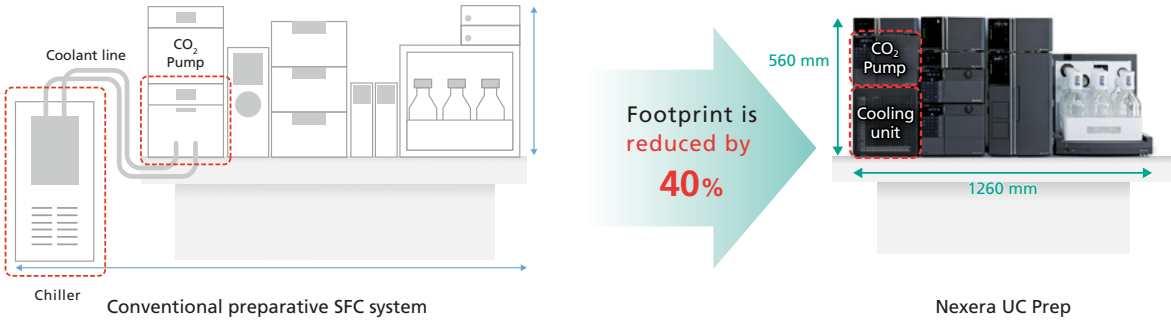
LotusStream separator (patented technology)

Decreases flow speeds without increasing the tubing diameter by splitting flow through multiple flow channels. The CO_2 is discharged externally while the liquid travels along the column and drips directly below without dispersing or scattering the eluate.



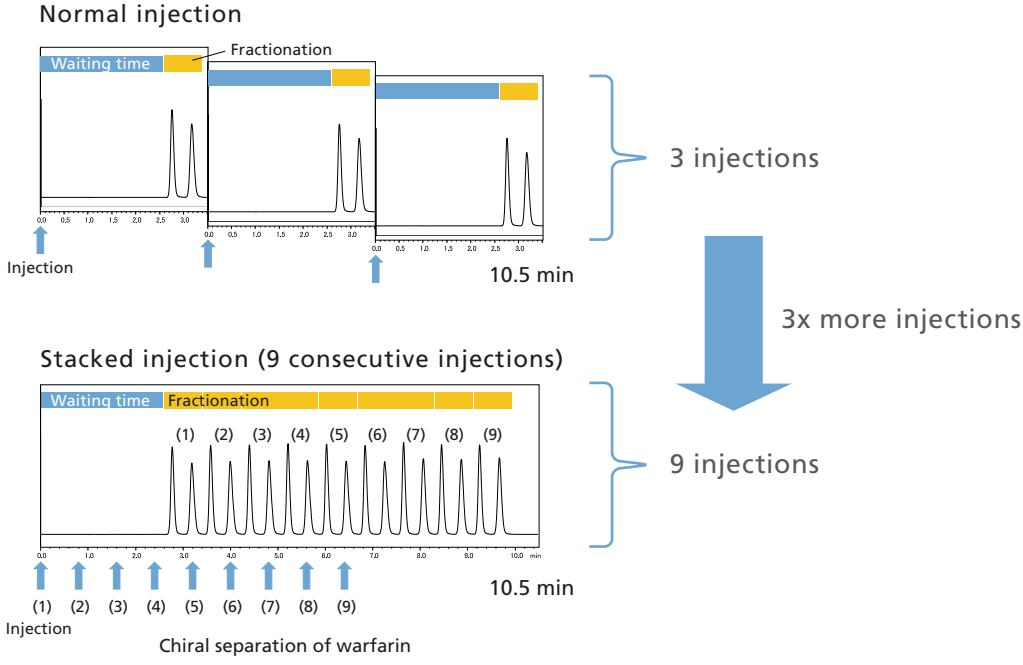
Benchtop system that can be installed anywhere

Usually a chiller is required to cool the solvent delivery pump when pumping CO_2 at high flow rates. However, the Nexera UC Prep features a compressor-type cooling unit, reducing the size of the system and allowing it to be installed anywhere. Its footprint is equivalent to an analysis-scale SFC system.



Stacked injection function eliminates waiting time

Normal injection wastes time between peak elutions. Using the Nexera UC Prep's stacked injection function, samples can be injected continuously without any waiting time, enabling more samples to be processed. Settings for this function can be specified easily in the dedicated software.



Chiral separation of warfarin

Compatible with multiple detectors (max. 4 channels)

If only the UV signal is used as a trigger in the preparative workflow, components with low UV absorption are difficult to separate and there is also a risk of accidentally fractionating unseparated components in the same detection channel. By using the MS signal as the trigger, high-purity fractions can be recovered simply by specifying the *m/z* value of the target components.

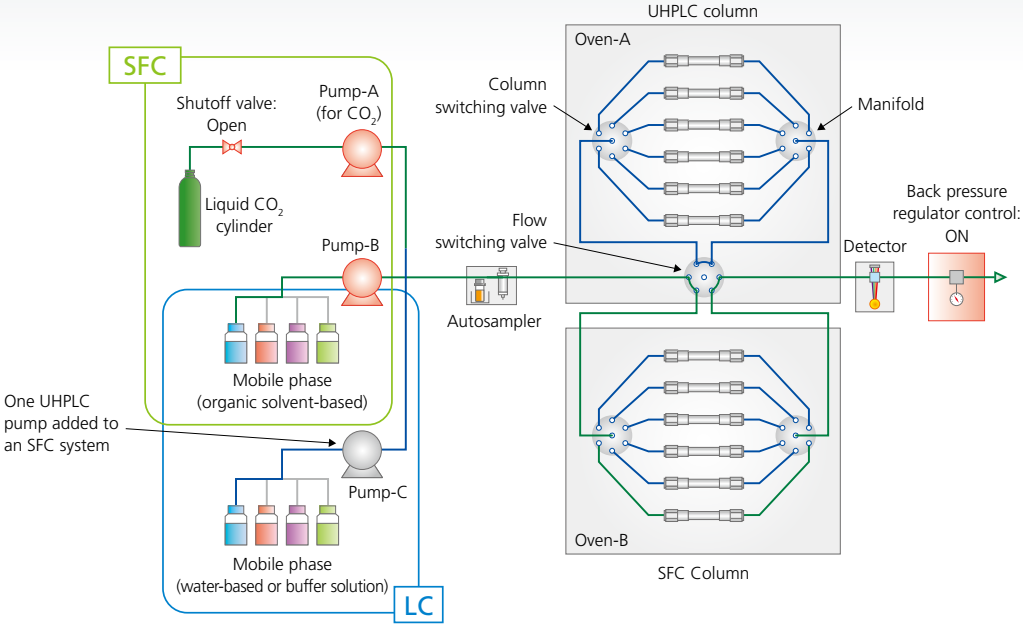
Nexera UC UHPLC/SFC

Efficient Method Development using the UHPLC/SFC Switching System

When considering separation conditions, using both UHPLC and SFC can help to optimize conditions further. The Nexera UC/s UHPLC/SFC switching system provides the ability to use both UHPLC and SFC analysis modes in a single system. The figure below shows a flow diagram for this system. The system was configured by adding a supercritical carbon dioxide delivery unit and back pressure regulator unit to a standard UHPLC system. Both UHPLC and SFC analysis modes can be used by switching of delivery units (control mode ON or OFF) and switching the pressure of the back pressure regulator.

Sharing the solvent delivery unit (for pumping organic solvents), autosampler, column oven, and detector for both SFC and UHPLC analysis minimizes space requirements and equipment cost and reduces equipment downtime. In addition, an existing UHPLC system can be upgraded to this system.

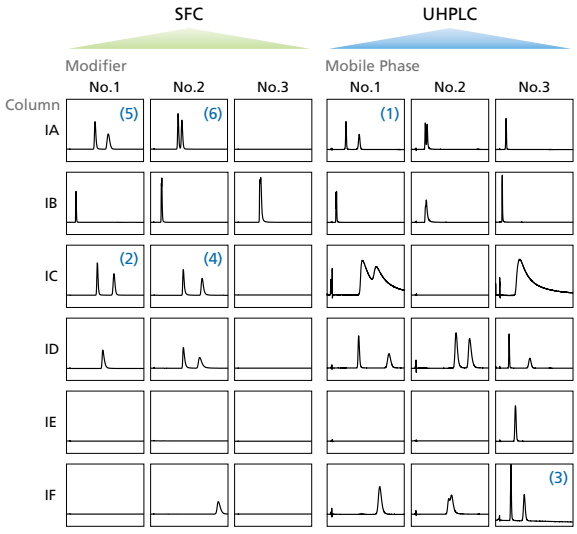
By using the mobile phase solvent switching valve in combination with the column switching valve, mobile phase conditions can be changed automatically and continuously for up to twelve columns to enable a wide variety of conditions, improving method development efficiency.



Nexera UC/s UHPLC/SFC switching system and flow line diagram (Equipment in green frame used for SFC)

The following describes an example of using the UHPLC/SFC switching system to increase the speed of method scouting. The Nexera UC/s UHPLC/SFC switching system was used to automatically optimize the separation conditions for two chiral compounds (omeprazole and warfarin).

A total of 36 combinations of six chiral columns (CHIRALPAK® series) and the three mobile phases shown in the tables below (18 combinations each for UHPLC and SFC) were evaluated.



Chromatograms of omeprazole under 36 different analytical conditions

Table 1 UHPLC Analytical Conditions for Chiral Compounds

No.	Mobile phase (Upper: A and Lower: B)	Others
1	Hexane Ethanol	B Conc. (%) : 20% (Isocratic) Flow Rate : 2 mL/min Column Temperature : 40 °C Inj. Vol. : 1 µL Detection : PDA@220 nm Step GE
2	Hexane Isopropyl alcohol	
3	Methyl tertiary butyl ether Ethanol	

0 - 6 min	20%	Analysis
6 – 8 min	40%	Column washing
8 – 12 min	20%	Equilibration

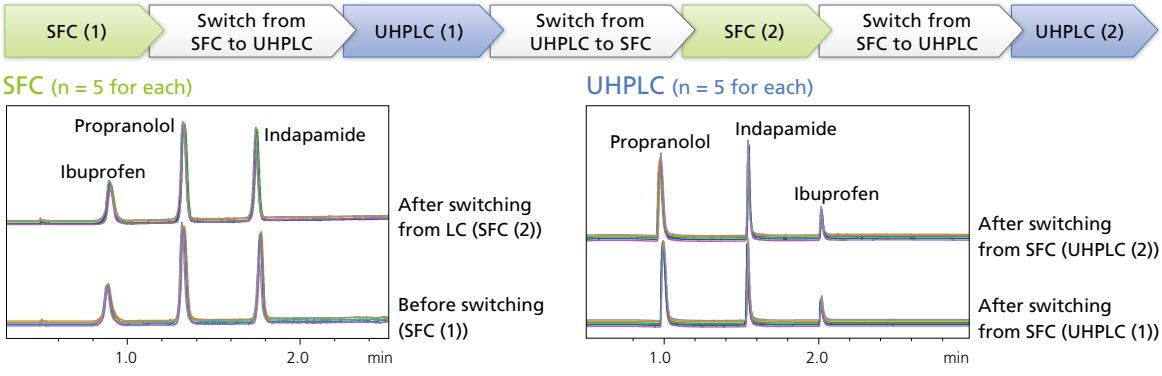
Table 2 SFC Analytical Conditions for Chiral Compounds

No.	Modifier	Others
1	Methanol	Modifier Conc. (%) : 20% (Isocratic) Flow Rate : 3 mL/min Column Temperature : 40 °C Inj. Vol. : 1 µL BPR Press : 10 MPa Detection : PDA@220 nm Step GE
2	Ethanol	
3	Acetonitrile / Ethanol = 75 / 25 (v/v)	

0 - 5 min	20%	Analysis
5 – 7 min	40%	Column washing
7 – 10 min	20%	Equilibration

Reproducibility for continuous switching

Using the switching system, three drug components were analyzed by continuous switching between UHPLC and SFC analysis three times. The resulting chromatograms are shown in Fig. 10. The chromatograms show that reliable results were obtained, with no effects from switching flow lines, even if mobile phases and separation characteristics are significantly different.



Chromatograms for three drug components, obtained by switching between UHPLC and SFC analysis modes

Note: CHIRALPAK® is a registered trademark of Daicel Corporation.

Open Solution Analytical

Open Access LCMS System

Compound identification

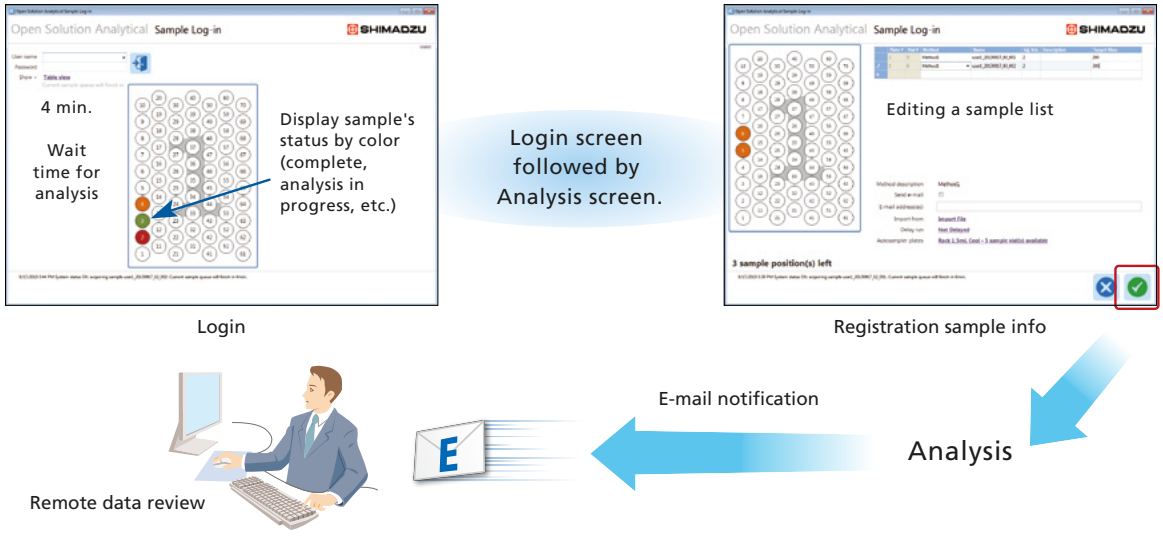
Specifying the molecular weight of the target compound in the Sample Log-in screen enables easy identification of the target compound in the Data Browser.

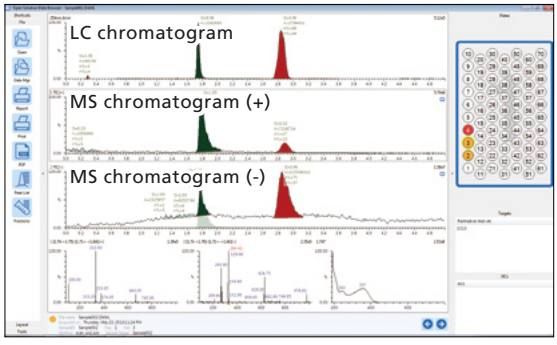
Remote data review

Once data acquisition is completed, the software automatically sends an e-mail containing a URL to a quantitative results report in the Data Browser, allowing chemists to check their results remotely. The user has full functionality - even peak data processing and peak integration can be performed.

Automatic LC management

A built-in software function allows a user to automatically wash the flow line after each sample analysis, even when using multiple LC columns, to prevent damage to or contamination of the LC column. An additional feature makes it possible to set a specific timeframe or day of the week to start up the system in preparation for analysis.





Easily submit a sample

After log-in, submit a sample and perform analysis on the same screen as sample registration. After the data acquisition is finished, the software automatically sends an e-mail with a URL to the quantitative results report. The progress of the analysis and queue time is shown in the Sample Log-in window for easy verification of system status.

Remote data review

Review results remotely by clicking the link in the automatically generated e-mail to open the Data Browser. The user has full functionality - even peak data processing and peak integration can be performed.

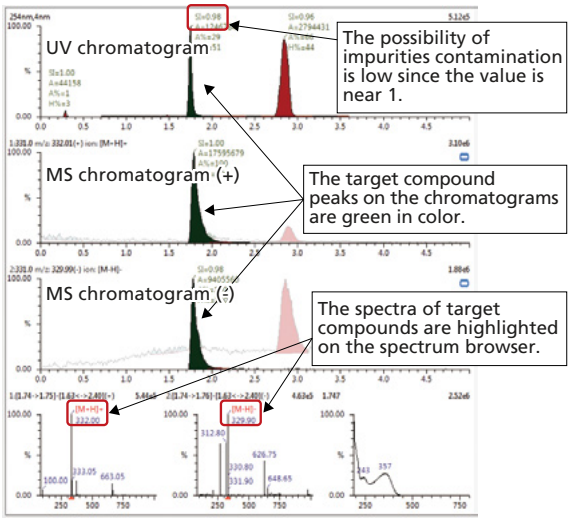
Specialized software not required

Launch the Data Browser and review results from any PC connected to the Open Solution Analytical network. There is no need to install any specialized software on each PC.*

* Free software provided by Microsoft® should be installed.

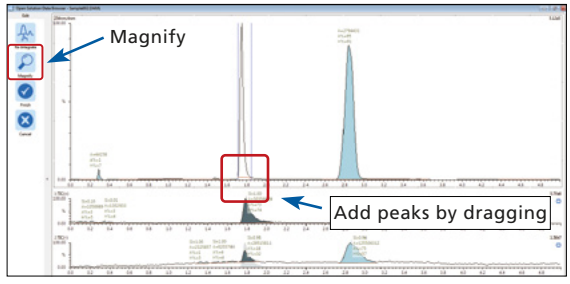
Monitor target compounds

The chromatogram peak is highlighted in green when the target compound is found. The MS spectrum in the peak is processed and the index of the spectral integrity is shown in the peak annotation.



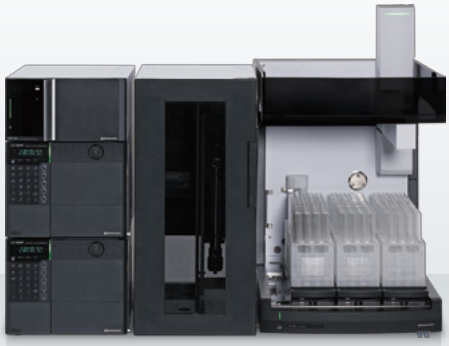
Peak integration

Peaks may be easily added to or deleted from the LC/PDA chromatogram, which can be magnified, in the browser window. Processing can be performed via simple mouse commands, allowing users remote access to basic chromatographic analysis.



Nexera Prep

Preparative/Purification LC/LCMS System

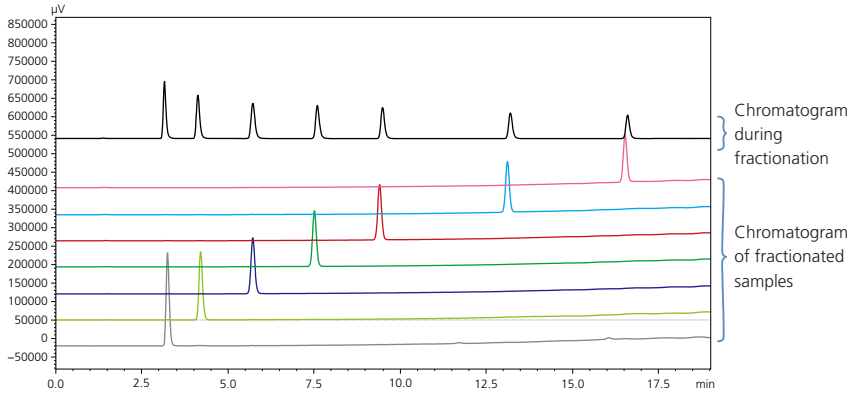


Nexera Prep LC System

Nexera Prep MS-Trigger LCMS System

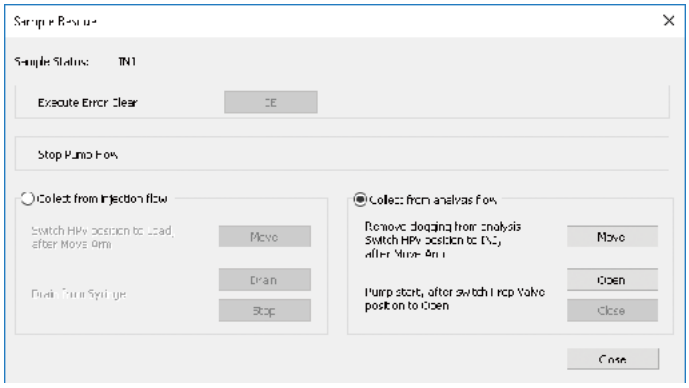
Fraction purity checks (LH-40)

A fraction purity check can easily be performed with a single system. Purity checks can be performed without changing the fraction recovery container, so the workload is reduced and throughput is improved.

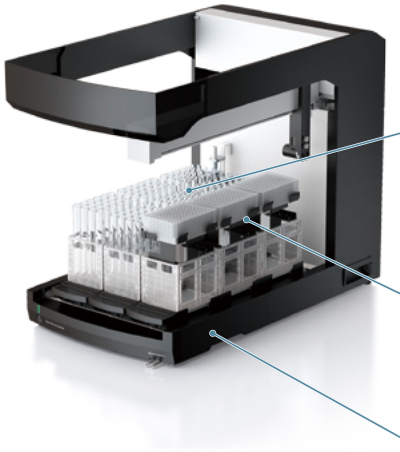


Sample rescue function prevents the loss of precious samples (LH-40, FRC-40)

Even if a problem occurs during preparative work, the sample remaining in the system can be recovered. By following the rescue instructions, the precious sample is recovered into the specified container rather than being discarded. Additionally, by using the optional waste collector, samples that cannot be recovered due to fractionation mistakes can be retained.



FRC-40, the highly flexible fraction collector



Accommodates up to 3,240 test tubes

Large-scale fractions of the order of one liter can be accommodated, in addition to 96 well MTPs and a variety of test tubes. Up to six units can be connected, allowing users to customize the unit to their capacity needs.

A variety of containers can be selected

The system is compatible with various capacity racks to suit the volume needs of almost any workflow, reducing the work involved in switching containers.

Space-saving design

With its small installation footprint, up to nine MTP, standard vial racks, or test tube racks can be selected, contributing to the effective use of laboratory space.

Sample racks

A variety of containers can be placed including MTPs, vials, and various types of test tubes. Six colors are available, so a separate color can be apportioned to each user in order to avoid confusing samples.

Multi fraction collector kit

Up to six FRC-40 fraction collectors can be connected, making it easy to increase the number of fractions.

The LH-40 liquid handler: a combination of autosampler and fraction collector

Provides both a sample injection function and a fraction collection function

A single unit can perform everything from sample injection to fraction recovery.

Suppresses contamination

A proprietary injection method minimizes carryover, significantly limiting contamination to subsequent samples. (When a 4000 mg/L caffeine sample is injected, the carryover is 0.004 % or less.)

Capable of injection from a variety of containers

With its long needle stroke, the system is compatible with containers of varying depths, including microtiter plates (MTP), vials, test tubes, and sample bottles.

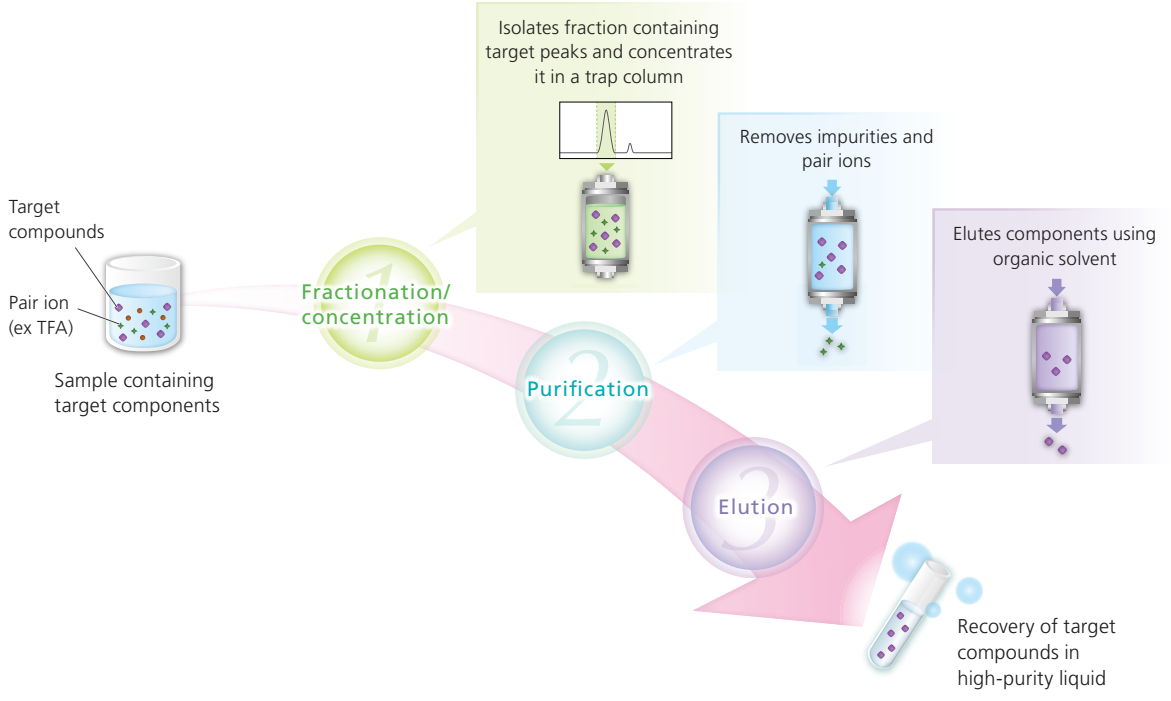
UFPLC

Ultra Fast Preparative and Purification LC System

When developing new drugs, structural analysis of impurities and metabolites is a critical process. Analyzing the structure of target components in the fractionated liquids obtained after purification of synthesized substances using a preparative LC system is time-consuming. In addition, it is difficult to recover target components with high purity.

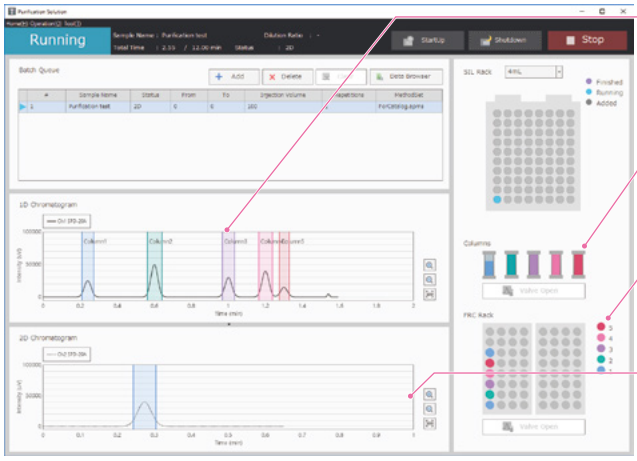
However, using the UFPLC system, all preparative processes can be performed online, from fractionation to concentration, purification, and recovery, which can significantly reduce the time required for preparative purification. In addition, using Shimadzu's unique trap concentration and purification technology, trace components included in synthesized substances can be recovered at high concentrations and with high purity. Due to the high volatility of the organic solvents used to recover target components, the solvents can be evaporated and components dried in less than one tenth the time of previous systems.

Furthermore, using a rinse solution to rinse away counter ions means target components can be recovered as a high-purity free base. Consequently, it significantly improves the quality of new drug discovery research, such as for efficacy screening and pharmacokinetic testing for drug candidates affected by counter ions.



Purification solution simplifies settings related to preparative purification

The special Purification Solution software is equipped with peak tracking functions that enable the target peaks and fractionate and be checked at a glance.



Chromatogram

Individual fraction peaks are color-coded.

Trap Column

Trap columns are displayed with the same color as their corresponding faction peaks.

Fraction Collector

This displays which vial in the fraction collector was used to collect the eluate recovered from the trap column.

Elution Chromatogram

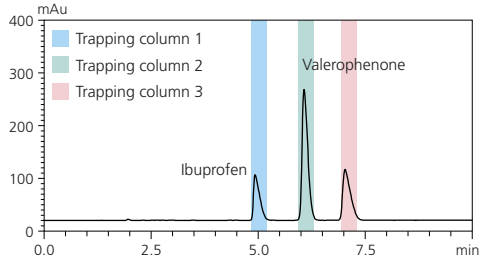
The chromatogram range is color-coded in accordance with the trap column and fraction collector vial display colors.

Applications

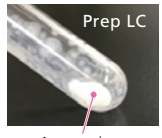
Removal of salts in the mobile phase solvent

Removal of ammonium chloroacetate salts from ibuprofen

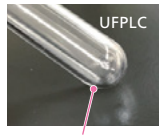
Ibuprofen, the target component, is cleaned by retention in a trap column. As a result, the ammonium chloroacetate salts contained in the mobile phase solvent were removed. This can prevent the retention of salts contained in the mobile phase solvent during powderization, so that only the target component is recovered.



Preparative Chromatogram for Ibuprofen and Analogous Substances (UFPLC)



Ammonium Chloroacetate Salts



Ibuprofen

Heightening the efficiency of enrichment purification for trace components

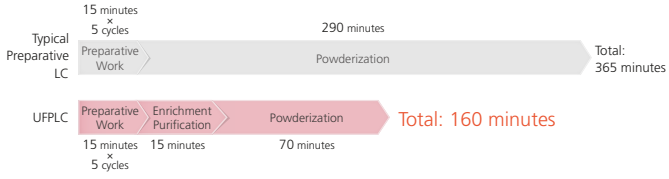
High speed powderization of cyclosporine A

The target compound fraction is repeatedly injected into the trap column, enriched by trapping, and eluted by an organic solvent. This enables recovery with a smaller volume of liquid, so subsequent powderization can be performed in a shorter time. In this way, the same volume of powdered sample can be purified in a shorter time versus elution in reverse phase conditions.

Comparison of Preparative LC and UFPLC Fractionation

Fraction of Cyclospolin A	Fraction vol. (mL)	Fraction conc. (mg/mL)	Drying time* (min)
Prep LC	62.5	0.04	290
UFPLC	8.10	0.29	70

* Comparison of drying times when a centrifugation enrichment dryer is used



Comparison of Procedural Times for Typical Preparative LC and UFPLC

HPLC/SFC Column Guide

Shim-pack Scepter HPLC Columns

Excellent stability and performance could be achieved under a wide range of LC conditions with Shim-pack Scepter LC columns, which are the next generation organic silica hybrid based columns. With different chemistry characteristics, Shim-pack Scepter columns are effective for method development/scouting with suitability for use in a wide variety of applications. With different particle sizes (1.9 µm, 3 µm, 5 µm) and different column dimensions, Shim-pack Scepter LC columns are fully scalable between UHPLC, HPLC and preparative LC making method transfer seamless between different laboratory instrumentation.

Shim-pack Scepter	Reversed Phase			
	C18	HD-C18	C8	C4
Ligand Type	Trifunctional C18 Generic Purpose Type	Trifunctional C18 High Density Type	Trifunctional C8	Trifunctional C4
Particle	Organic Silica Hybrid			
Particle Size	1.9 µm, 3 µm, 5 µm			
Pore Size	12 nm	8 nm	12 nm	30 nm
End Capping	Proprietary			
pH Range	1 - 12			1 - 10
100% Aqueous Condition	Yes	No	No	Yes
USP Classification	L1	L1	L7	L26

Shim-pack Scepter	Reversed Phase		HILIC
	Phenyl	PFPP	Diol-HILIC
Ligand Type	Trifunctional Phenylbutyl	Trifunctional Pentafluorophenylpropyl	Trifunctional Dihydroxypropyl
Particle	Organic Silica Hybrid		
Particle Size	1.9 µm, 3 µm, 5 µm		
Pore Size	12 nm		
End Capping	Proprietary	None	
pH Range	1 - 10	1 - 8	2 - 10
100% Aqueous Condition	Yes	Yes	N/A
USP Classification	L11	L43	L20

Shim-pack Scepter Analytical Columns

Chemistry		C18			HD-C18		
Particle Size (µm)	Length (mm) \ ID (mm)	2.1	3	4.6	2.1	3	4.6
1.9	50	227-31012-03	227-31013-01		227-31026-03	227-31027-01	
	75	227-31012-04	227-31013-02		227-31026-04	227-31027-02	
	100	227-31012-05	227-31013-03		227-31026-05	227-31027-03	
	150	227-31012-06	227-31013-04		227-31026-06	227-31027-04	
3	50	227-31014-03	227-31015-01	227-31016-02	227-31028-03	227-31029-01	227-31030-02
	75	227-31014-04	227-31015-02	227-31016-03	227-31028-04	227-31029-02	227-31030-03
	100	227-31014-05	227-31015-03	227-31016-04	227-31028-05	227-31029-03	227-31030-04
	150	227-31014-06	227-31015-04	227-31016-05	227-31028-06	227-31029-04	227-31030-05
	250			227-31016-06			227-31030-06
5	50	227-31017-03	227-31018-01	227-31020-02	227-31021-02	227-31022-01	227-31024-02
	75	227-31017-04	227-31018-02	227-31020-03	227-31021-03	227-31022-02	227-31024-03
	100	227-31017-05	227-31018-03	227-31020-04	227-31021-04	227-31022-03	227-31024-04
	150	227-31017-06	227-31018-04	227-31020-05	227-31021-05	227-31022-04	227-31024-05
	250			227-31020-06			227-31024-06

Chemistry		C8			C4		
Particle Size (µm)	Length (mm) \ ID (mm)	2.1	3	4.6	2.1	3	4.6
1.9	50	227-31033-03	227-31034-01		227-31175-03	227-31176-01	
	75	227-31033-04	227-31034-02		227-31175-04	227-31176-02	
	100	227-31033-05	227-31034-03		227-31175-05	227-31176-03	
	150	227-31033-06	227-31034-04		227-31175-06	227-31176-04	
3	50	227-31035-03	227-31036-01	227-31037-02	227-31177-03	227-31178-01	227-31179-02
	75	227-31035-04	227-31036-02	227-31037-03	227-31177-04	227-31178-02	227-31179-03
	100	227-31035-05	227-31036-03	227-31037-04	227-31177-05	227-31178-03	227-31179-04
	150	227-31035-06	227-31036-04	227-31037-05	227-31177-06	227-31178-04	227-31179-05
	250			227-31037-06			227-31179-06
5	50	227-31038-03	227-31039-01	227-31041-02	227-31180-03	227-31181-01	227-31183-02
	75	227-31038-04	227-31039-02	227-31041-03	227-31180-04	227-31181-02	227-31183-03
	100	227-31038-05	227-31039-03	227-31041-04	227-31180-05	227-31181-03	227-31183-04
	150	227-31038-06	227-31039-04	227-31041-05	227-31180-06	227-31181-04	227-31183-05
	250			227-31041-06			227-31183-06

Chemistry		Phenyl			PFPP		
Particle Size (µm)	Length (mm) \ ID (mm)	2.1	3	4.6	2.1	3	4.6
1.9	50	227-31063-03	227-31064-01		227-31053-03	227-31054-01	
	75	227-31063-04	227-31064-02		227-31053-04	227-31054-02	
	100	227-31063-05	227-31064-03		227-31053-05	227-31054-03	
	150	227-31063-06	227-31064-04		227-31053-06	227-31054-04	
3	50	227-31065-03	227-31066-01	227-31067-02	227-31055-03	227-31056-01	227-31057-02
	75	227-31065-04	227-31066-02	227-31067-03	227-31055-04	227-31056-02	227-31057-03
	100	227-31065-05	227-31066-03	227-31067-04	227-31055-05	227-31056-03	227-31057-04
	150	227-31065-06	227-31066-04	227-31067-05	227-31055-06	227-31056-04	227-31057-05
	250			227-31067-06			227-31057-06
5	50	227-31068-03	227-31069-01	227-31071-02	227-31058-03	227-31059-01	227-31061-02
	75	227-31068-04	227-31069-02	227-31071-03	227-31058-04	227-31059-02	227-31061-03
	100	227-31068-05	227-31069-03	227-31071-04	227-31058-05	227-31059-03	227-31061-04
	150	227-31068-06	227-31069-04	227-31071-05	227-31058-06	227-31059-04	227-31061-05
	250			227-31071-06			227-31061-06

Chemistry		Diol-HILIC		
Particle Size (µm)	Length (mm) \ ID (mm)	2.1	3	4.6
1.9	50	227-31043-03	227-31044-03	
	75	227-31043-01	227-31044-01	
	100	227-31043-02	227-31044-02	
	150			
3	50	227-31045-03	227-31046-01	227-31047-02
	75	227-31045-04	227-31046-02	227-31047-03
	100	227-31045-05	227-31046-03	227-31047-04
	150	227-31045-06	227-31046-04	227-31047-05
	250			227-31047-06
5	50	227-31048-03	227-31049-01	227-31051-02
	75	227-31048-04	227-31049-02	227-31051-03
	100	227-31048-05	227-31049-03	227-31051-04
	150	227-31048-06	227-31049-04	227-31051-05
	250			227-31051-06

Shim-pack Scepter Preparative Columns

Chemistry	Length (mm) \ ID (mm)	10	20	30
C18	50		227-31102-01	227-31103-01
	75			227-31103-02
	100		227-31102-02	227-31103-03
	150	227-31101-01	227-31102-03	227-31103-04
	250	227-31101-02	227-31102-04	227-31103-05
HD-C18	50		227-31105-01	227-31106-01
	75			227-31106-02
	100		227-31105-02	227-31106-03
	150	227-31104-01	227-31105-03	227-31106-04
	250	227-31104-02	227-31105-04	227-31106-05
C8	50		227-31108-01	227-31109-01
	75			227-31109-02
	100		227-31108-02	227-31109-03
	150	227-31107-01	227-31108-03	227-31109-04
	250	227-31107-02	227-31108-04	227-31109-05

Chemistry	Length (mm) \ ID (mm)	10	20	30
C4	50		227-31185-01	227-31186-01
	75			227-31186-02
	100		227-31185-02	227-31186-03
	150	227-31184-01	227-31185-03	227-31186-04
	250	227-31184-02	227-31185-04	227-31186-05
Phenyl	50		227-31114-01	227-31115-01
	75			227-31115-02
	100		227-31114-02	227-31115-03
	150	227-31113-01	227-31114-03	227-31115-04
	250	227-31113-02	227-31114-04	227-31115-05
PFPP	50		227-31111-01	227-31112-01
	75			227-31112-02
	100		227-31111-02	227-31112-03
	150	227-31110-01	227-31111-03	227-31112-04
	250	227-31110-02	227-31111-04	227-31112-05

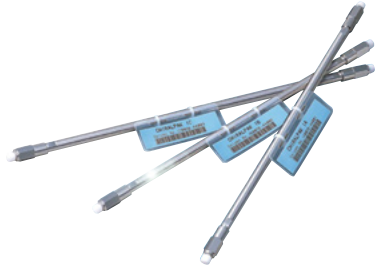
Shim-pack UC SFC Columns

Shim-pack UC series columns are designed specifically for Nexera UC series SFC systems. When using supercritical fluids for analysis, separation behavior can vary significantly depending on the type of solid phase. To optimize separation, a variety of columns should be used to determine the parameter settings. The extensive choice of column sizes available means that operations can be scaled up seamlessly from analytical SFC to preparative SFC.

	Functional group	4.6 x 250mm	10 x 250mm	20 x 250mm	28 x 250mm
Shim-pack UC-Diol II	Diol	227-32606-02	227-32606-03	227-32606-04	227-32606-05
Shim-pack UC-Sil II	–	227-32607-02	227-32607-03	227-32607-04	227-32607-05
Shim-pack UC-HyP	3-hydroxphenyl	227-32600-02	227-32600-03	227-32600-04	227-32600-05
Shim-pack UC-Py	Pyridinyl	227-32601-02	227-32601-03	227-32601-04	227-32601-05
Shim-pack UC-PBr	Pentabromobenzyl	227-32602-02	227-32602-03	227-32602-04	227-32602-05
Shim-pack UC-Choles	Cholesteryl	227-32603-02	227-32603-03	227-32603-04	227-32603-05
Shim-pack UC-PyE	Pyrenylethyl	227-32604-02	227-32604-03	227-32604-04	227-32604-05
Shim-pack UC-Triazole	Triazole	227-32605-02	227-32605-03	227-32605-04	227-32605-05

A variety of stationary phases: Daicel's chiral columns for SFC

Daicel's CHIRALPAK and CHIRALCEL series chiral columns are used worldwide for SFC analysis. They come with a range of stationary phases, to tackle chiral separation of a wide variety of compounds.



Column series	Stationary phase	
CHIRALPAK IA/SFC, IA-3/SFC	Amylose tris(3,5-dimethylphenylcarbamate)	Polysaccharide derivative solvent-resistant type
CHIRALPAK IB/SFC, IB-3/SFC	Cellulose tris(3,5-dimethylphenylcarbamate)	
CHIRALPAK IC/SFC, IC-3/SFC	Cellulose tris(3,5-dichlorophenylcarbamate)	
CHIRALPAK ID/SFC, ID-3/SFC	Amylose tris(3-chlorophenylcarbamate)	
CHIRALPAK IE/SFC, IE-3/SFC	Amylose tris(3,5-dichlorophenylcarbamate)	
CHIRALPAK IF/SFC, IF-3/SFC	Amylose tris(3-chloro-4-methylphenylcarbamate)	
CHIRALPAK AD/SFC, AD-3/SFC	Amylose tris(3,5-dimethylphenylcarbamate)	Polysaccharide derivative coating type
CHIRALPAK AS/SFC, AS-3/SFC	Amylose tris[(S)-α-methylbenzylcarbamate]	
CHIRALPAK AY/SFC, AY-3/SFC	Amylose tris(5-chloro-2-methylphenylcarbamate)	
CHIRALPAK AZ/SFC, AZ-3/SFC	Amylose tris(5-chloro-4-methylphenylcarbamate)	
CHIRALCEL OD/SFC, OD-3/SFC	Cellulose tris(3,5-dimethylphenylcarbamate)	
CHIRALCEL OJ/SFC, OJ-3/SFC	Cellulose tris(4-methylbenzoate)	
CHIRALCEL OX/SFC, OX-3/SFC	Cellulose tris(4-chloro-3-methylphenylcarbamate)	
CHIRALCEL OZ/SFC, OZ-3/SFC	Cellulose tris(3-chloro-4-methylphenylcarbamate)	

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