

Ultra High Performance Liquid Chromatograph

Nexera XR



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The Most Accessible UHPLC Available _____

Developed with expandability and compatibility in mind, the Nexera XR ultra high performance liquid chromatograph enables more customers to make use of high-speed, high-resolution systems. Configure the optimal system to meet the specific analysis objective by selecting from among a wide range of highly accurate and reliable modules.

The next milestone in the evolution of liquid chromatography, the Nexera XR promises to become an indispensable tool in laboratories in a variety of fields, including pharmaceuticals, biochemistry, chemistry, environmental, and foods.



Expanding the Possibilities of UHPLC

Superb Functionality

Accuracy and reproducibility of solvent delivery and injection volume are particularly important performance aspects. Shimadzu addressed these features by incorporating superb technology as a fundamental element. Furthermore, improved hardware components support high-speed analyses, which have accelerated via advances in column technology.

As the most accessible UHPLC available, with a pressure resistance of 66 MPa, the Nexera XR truly provides the optimal solution for a diverse range of applications.

Extensive Lineup

A solvent delivery unit compatible with small-capacity, low-pressure gradient units is the latest addition to the Nexera XR lineup. With its modular design, the Nexera XR allows configuration of systems geared to meet specific application requirements. Each module delivers excellent, reliable performance across an extensive analytical range, from HPLC to UHPLC.

Balancing Performance with User-Friendliness

The most accessible UHPLC available, the Nexera XR provides excellent performance while ensuring ease-of-use. In addition, although the Nexera XR is in the UHPLC category, the replacement frequency for consumables has been kept to a minimum, making the ease of maintenance comparable to that of an HPLC system.

Method Compatibility

Constructed with a focus on compatibility with general UHPLC systems, the Nexera XR is optimized for method transfer from competing systems. In addition, the system capacity can be changed to suit the objective, enabling smooth HPLC method transfer.

Detectors Offering World-Leading* Sensitivity

The SPD-M30A photodiode array detector and the RF-20Axs fluorescence detector offer world-leading sensitivity. Equipped with a temperature control function to suppress the effects of room temperature fluctuations, these detectors achieve excellent baseline stability and reproducibility.

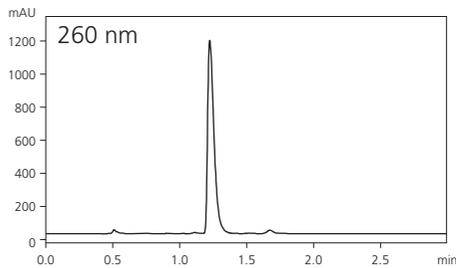
* As of August 2013, according to Shimadzu survey.

The Optimal Autosampler for MS Front End LC

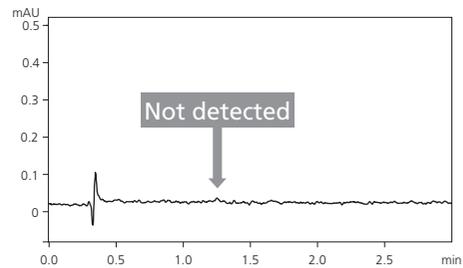
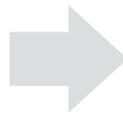
▸ Low Carryover Supports MS with Higher Accuracy

Low carryover is essential for high-sensitivity LC/MS/MS systems. Shimadzu autosamplers have been engineered with this in mind. The structure of the needle seal and the materials for the parts in contact with fluids have been thoroughly revised to keep sample component adsorption to the absolute minimum.

As a result, no carryover has been detected even for substances prone to adsorption.



2 µL Injection of 1.2 mg/mL Chlorhexidine Hydrochloride



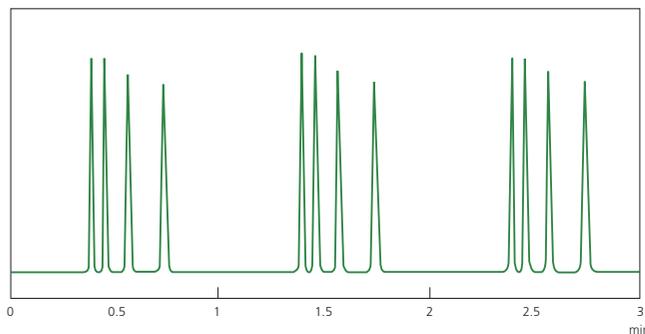
Blank Sample Analysis Directly after Sample Injection

▸ Improved Throughput

The SIL-20AXR /20ACXR autosamplers require a mere 10 seconds (under specified conditions) for sample injection. Combine with high-speed separation columns to achieve analysis cycles of one minute or less.

Using a rack changer makes it possible to significantly increase the number of samples that can be loaded at one time.

In addition, refrigerated storage is available, allowing processing of samples in sequence by simply placing them in the changer after completing preparation.



One-Minute Cycle Analysis



Rack Changer II

▸ Excellent Reproducibility

The Nexera XR is equipped with a high-performance scale to accurately measure samples, achieving excellent reproducibility on the order of 0.2 % RSD or less, even for trace-quantity injections.

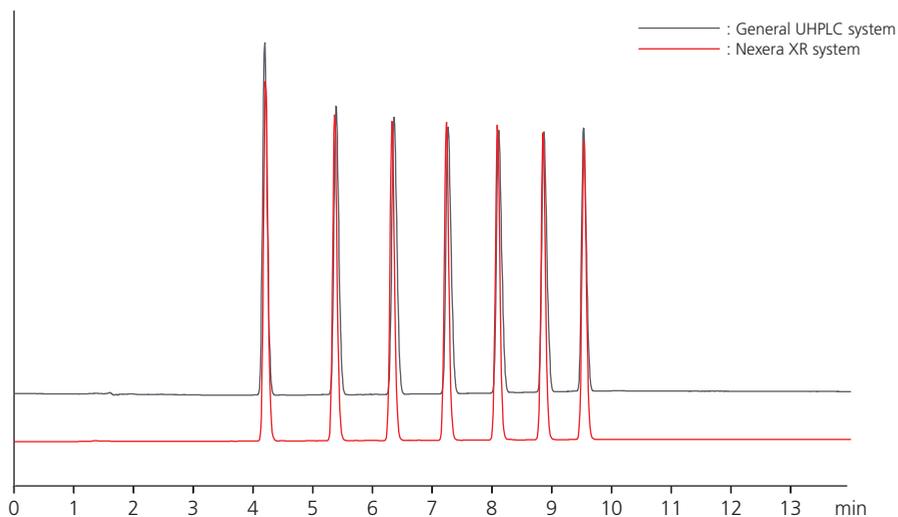
Injection Volume	Area Value	
	Average	%RSD
1 µL	37596	0.148
2 µL	75249	0.097
5 µL	188382	0.026
10 µL	375846	0.021

20 mg/L caffeine used, n=6

Solvent Delivery Performance that Supports High-Accuracy Analysis

▸ System Capacity with a Focus on Compatibility

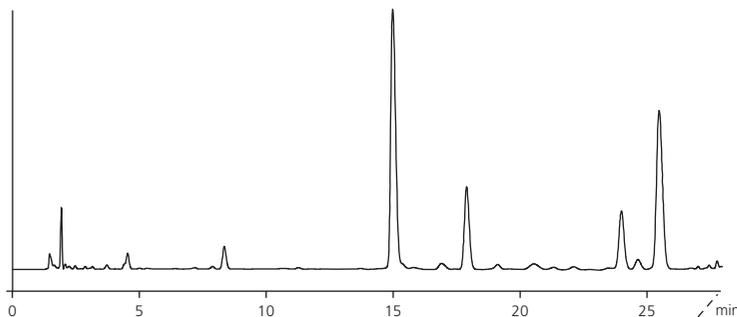
Designed to be compatible with general UHPLC systems, Nexera XR can be controlled from competing workstations, and can use methods created with competing systems.



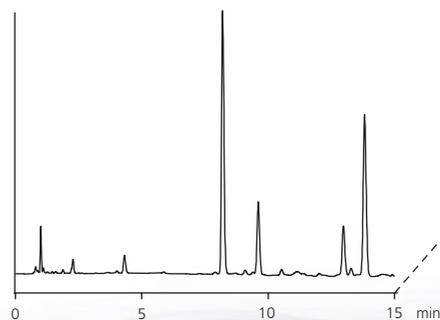
▸ Supporting Both HPLC and UHPLC Analyses

Nexera XR accepts both standard HPLC columns and 2 μm to 3 μm high-speed, high-separation columns. As a standard UHPLC model, it supports the speed-up of existing methods.

Triart C18 150 mmL. \times 4.6 mmI.D. 5 μm , Flow rate : 1.0 mL/min



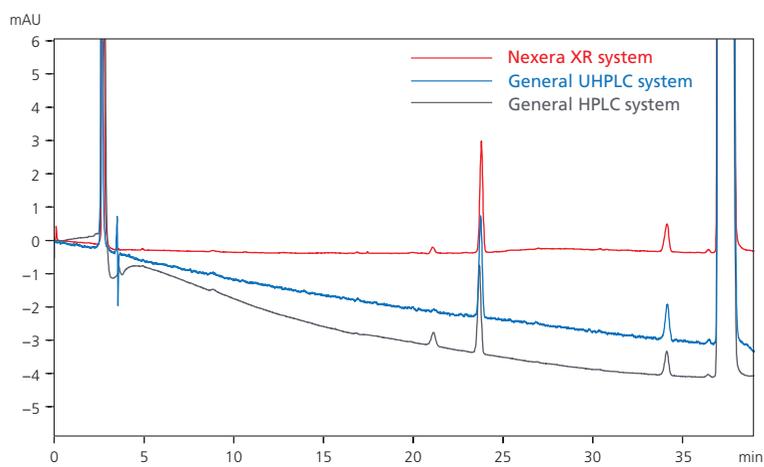
Triart C18 100 mmL. \times 3.0 mmI.D. 3 μm , Flow rate: 0.6 mL/min



Mobile phase A	0.1 % aqueous formic acid solution
Mobile phase B	Acetonitrile
GE conditions (%B)	5 % \rightarrow 12 % \rightarrow 50 % \rightarrow 5 %
Sample	Liquid tea extract
Column temperature	40 $^{\circ}\text{C}$
Detection wavelength	230 nm

▸ Baseline Stability

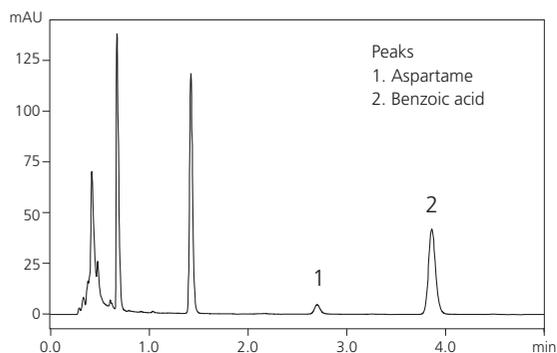
Baseline stability is affected by numerous factors, including the performance of the pump, oven, detector, and other components. By utilizing temperature-controlled detectors, the Nexera XR improves baseline stability for the system as a whole.



Sample	Escitalopram
Analytical conditions	Listed in USP

▸ Supports a Variety of Analysis Conditions

With its 66 MPa pressure resistance, Nexera XR expands the scope of high-speed, high-resolution analysis. This may include analysis under room temperature conditions, improvement of separation using long columns, and the use of a water/methanol mobile phase.



Analysis of Sweeteners

Column	Shim-pack XR-ODS II (75 mmL x 3 mmI.D.)
Mobile phase	40 mmol/L acetic acid (sodium) buffer solution pH 4.0 / Methanol = 4/1 (v/v)
Flow rate	1.0 mL/min
Sample	Soft drink
Detection	250 nm
Temperature	40 °C
Injection volume	4 µL

▸ Standard Nexera XR System



Nexera XR Quaternary System

This system is equipped with a low-pressure gradient system recognized for its concentration accuracy.



Nexera XR Binary System

This high-pressure mixed system provides excellent gradient response. It can be configured as a quaternary system by adding a low-pressure gradient unit.

Detectors Featuring World-Leading Sensitivity

Photodiode Array Detectors

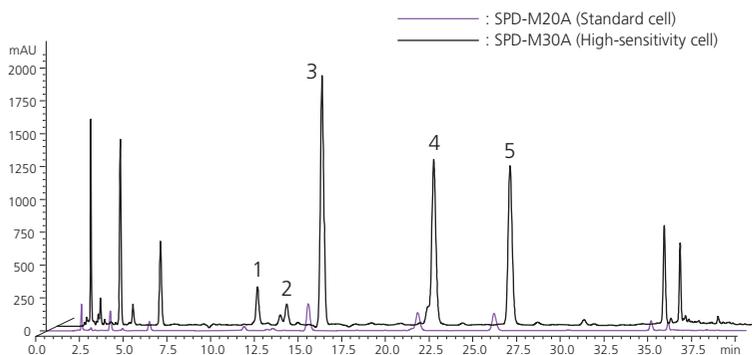
The lineup of photodiode array detectors consists of the SPD-M20A and SPD-M30A. Both models are temperature-controlled, heightening data reliability and baseline stability with respect to room temperature fluctuations. The SPD-M30A incorporates a new type of capillary cell to function as a higher-sensitivity and lower-dispersion system. The SPD-M20A is an easy-to-use model that covers a wide detection range.



SPD-M30A

85 mm Optical Path Length Significantly Enhances Sensitivity

The SPD-M30A high-sensitivity cell is also effective under HPLC conditions. The analysis below shows a comparison of measurements of caffeine in a commercial soft drink using the SPD-M20A and SPD-M30A. It is apparent that the SPD-M30A improves the S/N ratio by up to eleven times.

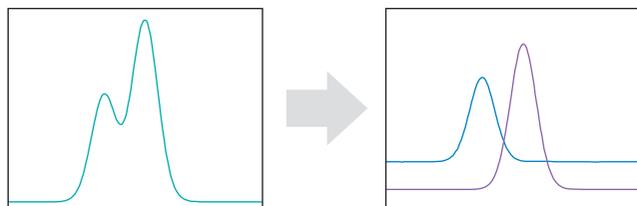


	SPD-M20A (Standard cell)	SPD-M30A (High-sensitivity cell)	S/N Relative Ratio
1	2794	26814	9.60
2	1527	15021	9.84
3	16153	179070	11.09
4	10894	118523	10.88
5	10394	113870	10.96

Column	Shim-pack VP-ODS 150 mmL x 4.6 mmI.D.
Mobile phase A	0.1 % aqueous solution of phosphoric acid
Mobile phase B	Acetonitrile
Flow rate	1 mL/min

▶ New Analytical Techniques to Better Utilize PDA Detector Data

Separation of Unseparated Peaks (*i*-PDeA*)



This technique fully separates unseparated peaks and visualizes small peaks hidden by a principal component. It is convenient when poor separation occurs under conditions for accelerated analysis and for quantitation of small peaks overlapped by a principal component peak.

* *i*-PDeA: Intelligent Peak Deconvolution Analysis

Extending the Dynamic Range (*i*-DReC**)



This powerful technique permits quantitation of samples in the high-concentration range. It enables the simultaneous analysis of high- and ultra-low-concentration samples and the creation of calibration curves across a broad concentration range.

** *i*-DReC: Intelligent Dynamic Range Extension Calculator

See the separate technical reports for more details about *i*-PDeA and *i*-DReC.

Fluorescence Detectors

The RF-20A/20Axs fluorescence detectors offer world-leading* sensitivity and ease of maintenance. The high-sensitivity RF-20Axs model incorporates a temperature-controlled cell with cooling functionality. This maintains a constant detector cell temperature, even if the room temperature fluctuates significantly, to ensure superb reproducibility with no drop in sensitivity.



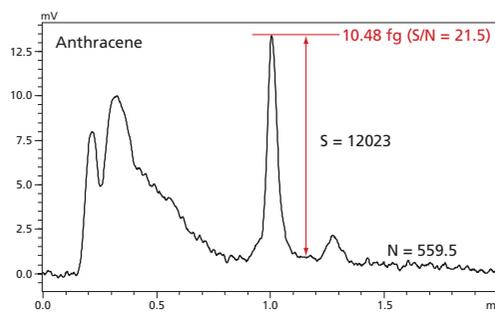
RF-20Axs

* As of August 2013, according to Shimadzu survey.

Ultra-High-Sensitivity Analysis of Anthracene (RF-20Axs)

An S/N ratio of 21.5 was achieved for an injection of 10.48 fg anthracene (RF-20Axs). This is equivalent to approx. 1.5 fg limit of detection (S/N ratio = 3), which is excellent.

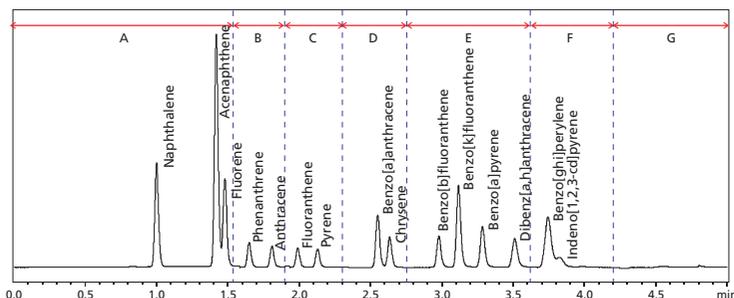
Column	Shim-pack XR-ODS (50 mL. × 2.0 mm I.D.)
Mobile phase	Water / acetonitrile = 30 / 70 (v/v)
Flow rate	0.6 mL/min
Temperature	40 °C
Detection	250 nm excitation wavelength, 400 nm emission wavelength



High-Sensitivity Analysis of Anthracene

Multi-Component, High-Sensitivity UFLC Analysis

The highly sensitive simultaneous analysis of multiple components requires detection at the optimal wavelengths. The RF-20A/20Axs permit ultra fast, high-sensitivity multi-component analysis using wavelength switching via a time program.



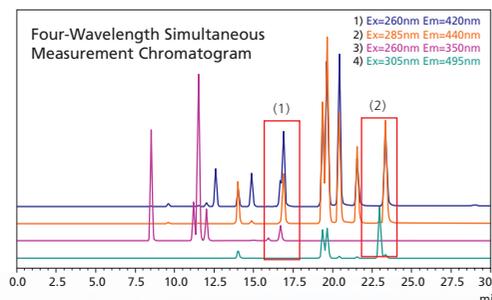
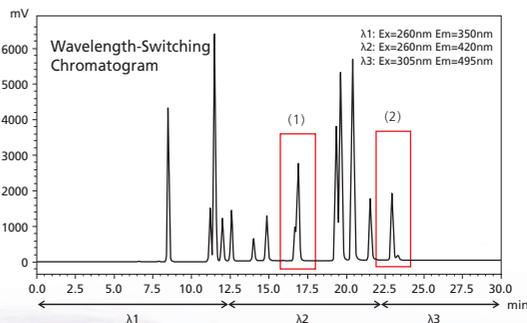
Ultra Fast Simultaneous Analysis of 15 Polycyclic Aromatics

A	270 nm excitation wavelength, 330 nm emission wavelength
B	250 nm excitation wavelength, 370 nm emission wavelength
C	330 nm excitation wavelength, 430 nm emission wavelength
D	270 nm excitation wavelength, 390 nm emission wavelength
E	290 nm excitation wavelength, 430 nm emission wavelength
F	370 nm excitation wavelength, 460 nm emission wavelength
G	270 nm excitation wavelength, 330 nm emission wavelength

Support for Improved Quantitative Analysis Accuracy: Utility of Four-Wavelength Measurement Function

Using detection at a single wavelength when performing multicomponent simultaneous analysis of components with different optimal detection wavelengths necessitates sacrificing sensitivity for certain components. The RF-20A/20Axs detectors eliminate this issue by incorporating a four-wavelength measurement function that permits detection of

each component at the optimal wavelength. Detection using wavelength switching in the left-hand diagram exhibits incomplete separation in area (1) and one peak of reduced size in area (2). In such a case, setting up to four optimal wavelengths enhances the quantitative analysis accuracy by reducing the effects of adjacent peaks and improving sensitivity.

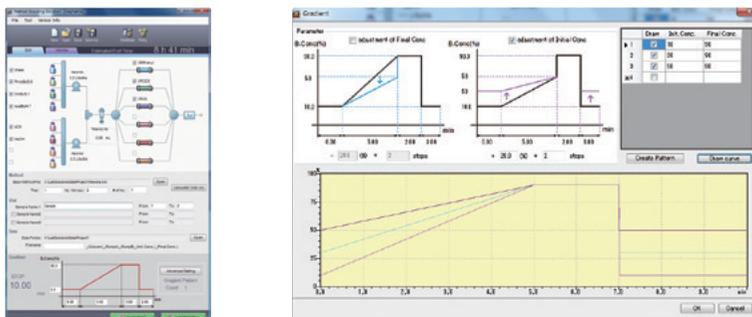


Analysis of Polycyclic Aromatics by Four-Wavelength Simultaneous Measurement (Elution sequence shown in previous diagram)

For More Efficient Method Development

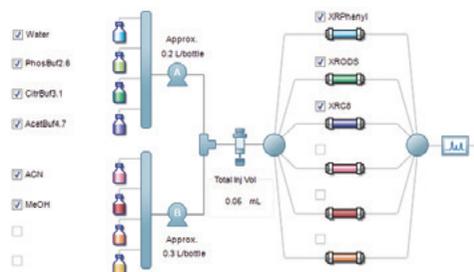
Compatible with the Method Scouting System, Which Automates the Method Development Process

The Method Scouting method development system acquires data in sequence by automatically switching between up to 96 combinations of unique separation conditions. Automated functionality enables continuous data acquisition overnight for more efficient method development.



Automation Reduces Analysis Preparation Time and Prevents Errors

The Method Scouting system not only significantly reduces the preparation time involved in analysis work, but can also prevent human errors in the configuration of method files and schedules. With up to 6 columns, 8 mobile phases, and 10 gradient settings, there are 96 conceivable combinations. This system streamlines the process for more efficient and accurate method development.

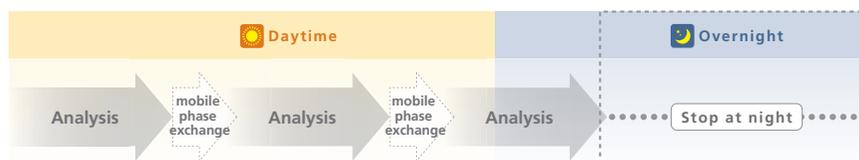


Select the check boxes for the mobile phases and columns used to automatically generate methods

Improved Method Development Efficiency Via Utilization of Equipment Overnight

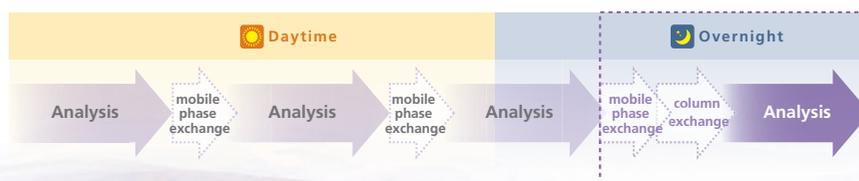
Once analysis starts, special software is used to automatically switch the columns and mobile phases to implement analysis. Analysis can be performed overnight and on holidays when users are not present, freeing them from the burden of creating method files, preparing mobile phases, and even switching columns. These synergistic effects can improve the throughput involved in method development more than tenfold.

Typical HPLC/UHPLC System



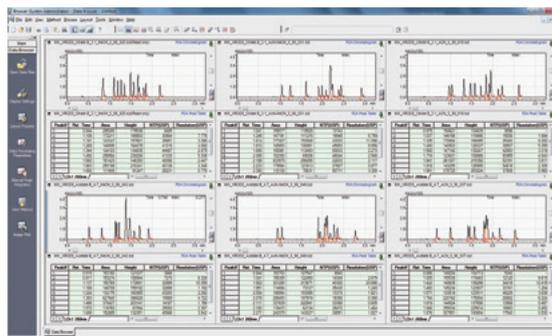
Nexera Method Scouting

Analysis can be performed while mobile phases and columns are switched automatically overnight.



Fast Data Browsing

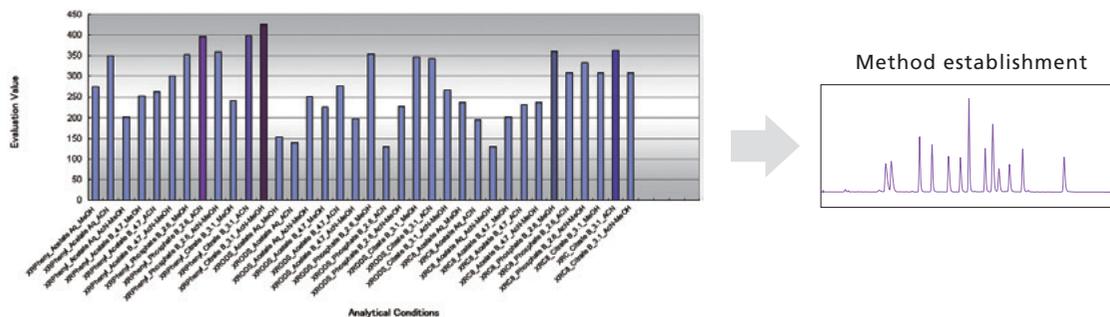
The ability to quickly search the large quantity of data obtained from method scouting for suitable conditions is important. The data browser function provided with LabSolutions meets this need by displaying a list of these chromatograms and analysis results. In addition to retention time, area, and height, analysis results include the degree of separation, separation coefficients, theoretical plate numbers, symmetry coefficients and other indices for chromatogram evaluation, supporting the process of checking the large amount of data for optimal conditions.



Quantitation of Scouting Results via CLASS-Agent Report

CLASS-Agent Report enables quantitation in order to search the data obtained from method scouting for optimal data. With CLASS-Agent Report, numerical data and graphs can be created, utilizing Microsoft Excel, from calculations based on the degree of separation and the number of peaks*. As a result, in addition to visual comparison of chromatograms, determinations can be made based on quantitation of determination standards.

* For evaluation methods using Agent Report, refer to the technical reports separately.



Nexera Method Scouting System

This comprehensive method development support system automatically switches between combinations of mobile phases and columns.





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