C196-E098

SHIMADZU
Excellence in Science

High Performance Liquid Chromatograph

i-Series

ANALYTICAL
INTELLIGENCE

Advanced

i-Series

High Performance Liquid Chromatograph

Finally, an LC as Smart and Flexible as You.

Amid increasing calls for improved work efficiency and a more flexible working style, ideas about what LC analysis should be, are beginning to change. Times now call for an analytical environment that can deliver identical results regardless of whether the analyst is present in the laboratory or familiar with the operating procedures, as long as the analyst performs the same operations and data analysis. The new, integrated i-Series LC system keeps the excellent performance of its predecessor but also addresses the demands of an increasingly varied range of users, locations, and approaches to analysis while always delivering highly reliable analytical results.

Experience a new approach to analysis activities with the new i-Series.

innovative

Remote instrument operation and monitoring allow analysis activities to be performed remotely, thereby reducing the time spent in the laboratory.

intelligent

Software integration ensures both data reliability and improved work efficiency.

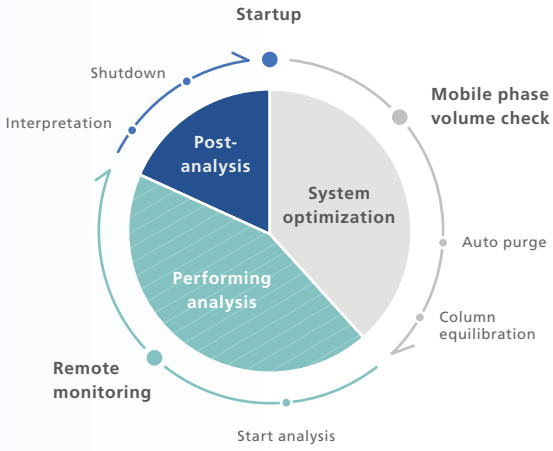
intuitive

Intuitive operation and maintenance facilitate excellent instrument performance and achieve reliable analysis consistently.

Automation and Remote Operation/ Monitoring that Encourage a New Working Style

With FlowPilot, mobile phase monitoring, and other functions, that engineered by Analytical Intelligence, and LabSolutions™ Direct can provide an automated workflow together with remote operation and monitoring from instrument startup to analysis completion.

Automated workflows incorporate the operational expertise of experienced analysts in order to collect data over extended period of time, reduce activities that must be performed in the laboratory, and improve work efficiency.



Using Networks for More Improvements in Work Efficiency

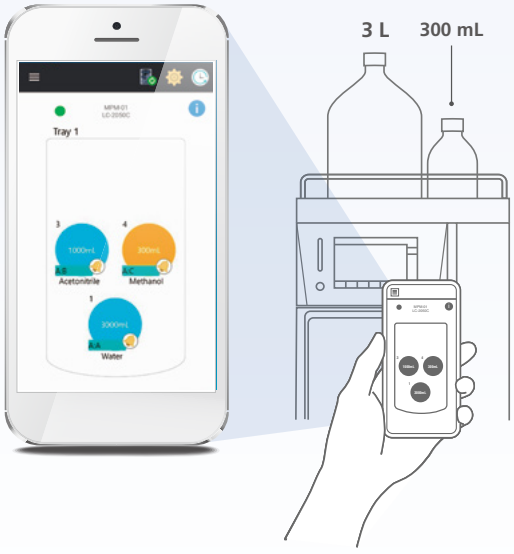
LabSolutions CS allows remote operation and monitoring of all instruments on the analytical network from any locations, even from home.* Analysis data and reports are managed on a centralized database where administrative authorization allows managers to assign appropriate operational restrictions to operators, depending on their expertise and rank.

* Must have a network in place that is appropriate for the workflow.

ANALYTICAL INTELLIGENCE

- Automated support functions utilizing digital technologies, such as M2M, IoT, and Artificial Intelligence (AI), that enable higher productivity and maximum reliability.
- Allows a system to monitor and diagnose itself, handle any issues during data acquisition without user input, and automatically behave as if it were operated by an expert.
- Supports the acquisition of high quality, reproducible data regardless of an operator's skill level for both routine and demanding applications.

START



ANALYTICAL INTELLIGENCE

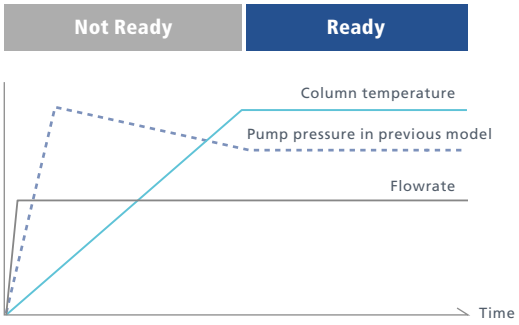
Mobile Phase Monitoring

Preventing Mobile Phase Depletion for Continuous Analysis

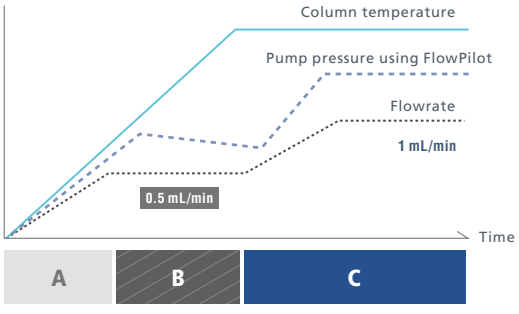
Mobile phase monitoring function*1,*2 automatically monitors mobile phase volumes so multiple analyses can be performed continuously without fail. If the monitoring function detects, either before start of analysis or during analysis, that a mobile phase is likely to become depleted, a notification is sent to the operator's computer or smart device to recommend replenishment. This removes the need for repeated instrument checks and mobile phase replenishment and thus prevent re-analysis, therefore prevents any system downtime.

*1 Optional

*2 Monitors up to 12 liquids when using 1-liter bottles, and up to 4 liquids when using large-volume bottles (2- to 5-liter bottles).



Previous model



When using the FlowPilot function

ANALYTICAL INTELLIGENCE

Mobile Phase Flowrate Control Function

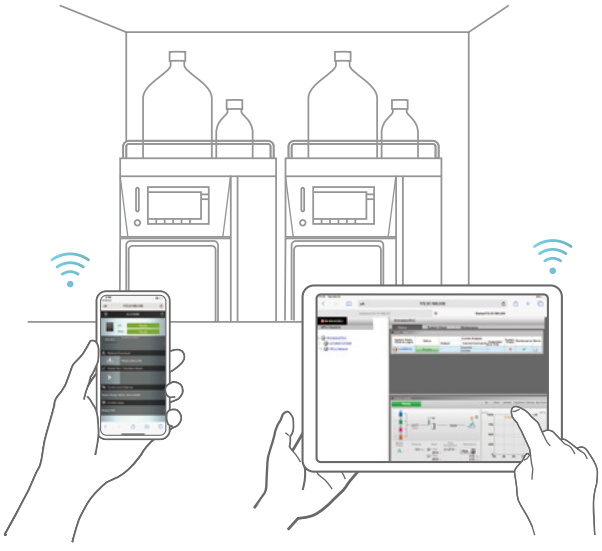
Automating Manual Operations for Experienced Users

The i-Series auto-startup and mobile phase flowrate control function (FlowPilot) can start instruments automatically without burdening the instrument or consumables. This prevents system breakdown and reduces operational cost, while providing highly reliable data over extended period of time.

FlowPilot (Patent pending)

The pump controls the flowrate based on oven temperature

- **A** Gradually increasing the flowrate
- **B** Maintaining the flowrate at half the method flowrate
- **C** When the oven temperature reaches the configured temperature, the flowrate is gradually increased up to the configured flowrate



LabSolutions Direct　　Web monitoring

Remote Operation/Monitoring Function

Operate and Control Instruments from Outside the Laboratory

Using LabSolutions Direct, instruments can be operated remotely to implement pre-configured methods and batch analyses from remote locations outside the laboratory from the web browser of a computer or a smart device. Instrument status and chromatogram can also be monitored remotely to reduce the time and labor required to travel to and from the laboratory and improve the work efficiency of analysts.

LC
Running
01:09:58
Detector A(254nm)
Method Download
Demo_Method.lcm
Realtime Batch
Vial 1 : Tray 1
Inj. Volume 10 uL
Standard
Control and Settings
Confirm data

i-Series

intelligent

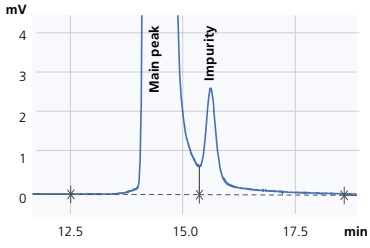
Applications for Analytical Intelligence are not limited to automating the analytical workflow or remote operations. By aggregating and automating the knowledge and skills of experienced analysts, Analytical Intelligence enables anyone to obtain reliable data and analytical results. Analytical Intelligence is also designed for high levels of compatibility with other instruments and comes with a method migration function, thereby creating a work environment where anyone is equally capable to obtain data without the need for complex procedures to resolve the compatibility between different systems.

ANALYTICAL INTELLIGENCE

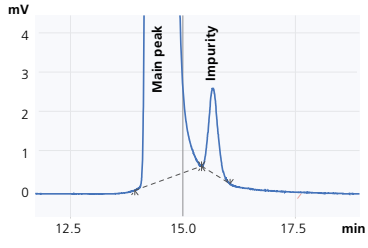
i-PeakFinder Automatic Peak Integration Function

Process Large Volumes of Data with High Precision in a Single Step

Processing baseline undulation and noise-obscured peak is a labor-intensive process that can lead to different results based on the experience level of the analyst. Shimadzu's proprietary i-PeakFinder peak integration algorithm is perfect for troublesome chromatograms like this. The i-PeakFinder algorithm is designed to process large volumes of data with high precision in a single step, thereby enabling the user to interpret data acquired more rapidly through simultaneous analysis of multicomponent analytes.



Baseline processing with no parameters specified



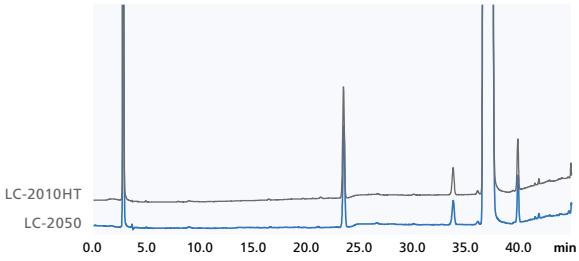
Baseline processing with complete separation

ACTO Method Migration Support Function

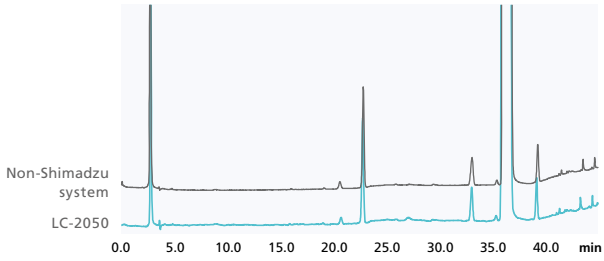
Supporting Instrument Replacement and Method Migration

Migrating a test method (analytical conditions or method) from one instrument to another while obtaining the same chromatogram can be a challenging process. The i-Series is designed with the same internal system volumes as previous Shimadzu systems and competitor systems to ensure system compatibility, and data reproducibility. An Analytical Condition Transfer and Optimization (ACTO) function also adjusts gradient start time automatically, hence analyst can make adjustments to separations obtained by gradient analysis easily.

* Using the delay volume conversion system kit



Migrating an analytical method from a previous Shimadzu system (LC-2010HT) to the LC-2050

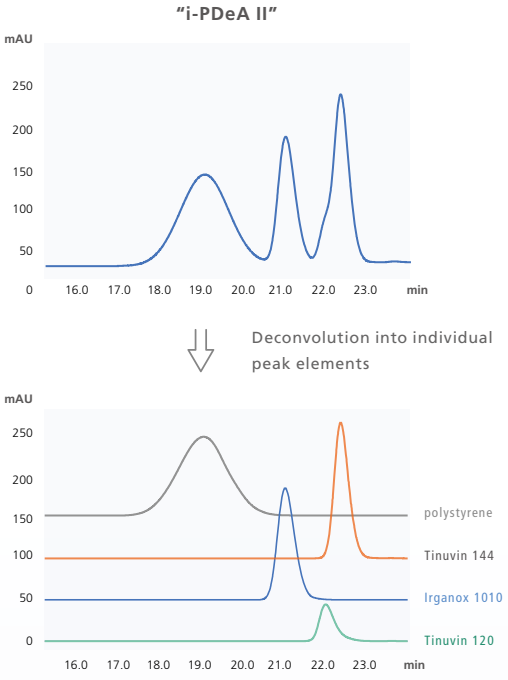


Migrating an analytical method from a non-Shimadzu system to the LC-2050

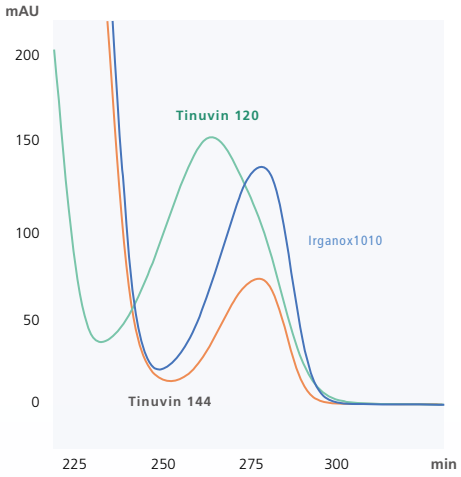
i-PDeA II Peak Deconvolution Function

Preventing Components being Missed Due to Inadequate Separation

The i-PDeA II peak deconvolution function uses a multivariate curve resolution alternating least squares (MCR-ALS) method to enable qualitative and quantitative analysis of peaks not fully separated by the column. The i-PDeA II can also be used to check the purity of target peaks. (Only available when using a PDA detector and LabSolutions.)



i-PDeA II chromatogram



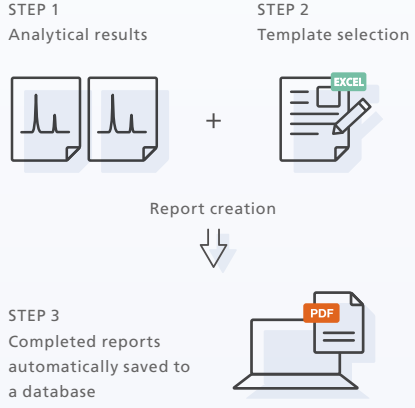
Spectral analysis

Isolating the spectra of hidden peaks

Automatic Report Creation Function

Preventing Errors Introduced during Transfer of Results

An automatic report creation function in LabSolutions automatically compiles analytical results and presents the data on pre-prepared report templates. This function not only reduces the work involved in report creation but also prevents errors and data manipulation associated with manual entry and creates well-made reports. By setting up a network environment, reports can even be created, checked and approved from any location.



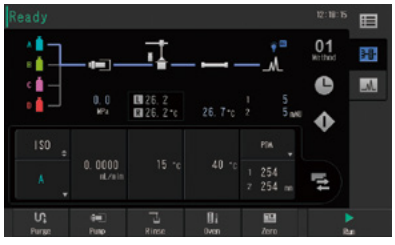
i-Series

intuitive

User Interface

Simplifying i-Series Operation

The user interface replicates system flow channel and is used to visually check the operating status of the system. Method editing can also be performed from the same screen. With its intuitive design, even users who are completely new to liquid chromatography can navigate the user interface with minimal training.

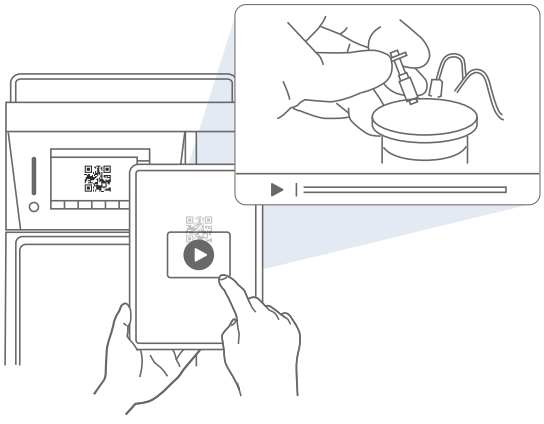


Maintenance Videos

Supporting the Replacement of Consumables

Reading a QR Code® shown on the touch panel directs the user to a website with instructional videos on maintenance. This feature helps improve system availability and increases efficiency.

Instructional maintenance videos



Auto-Validation Function

Stable Operation from System Startup

An auto-validation function means anyone can follow a set procedures and verify the instrument condition easily. The autovalidation function examines solvent delivery stability, wavelength accuracy, absorbance accuracy, gradient accuracy, the presence of any drift/noise, and other parameters. Also, an instrument check function automatically carries out the routine inspections performed before instrument operation and creates a report showing system self-diagnostic results along with a record of consumables usage, including total solvent volume delivered by the delivery pump, total number of injections performed by the autosampler, and the number of hours the lamp has been illuminated. The system check function also manages auto-validation results, making it easy to accurately determine the operating status of the instrument.

Starting Auto-validation

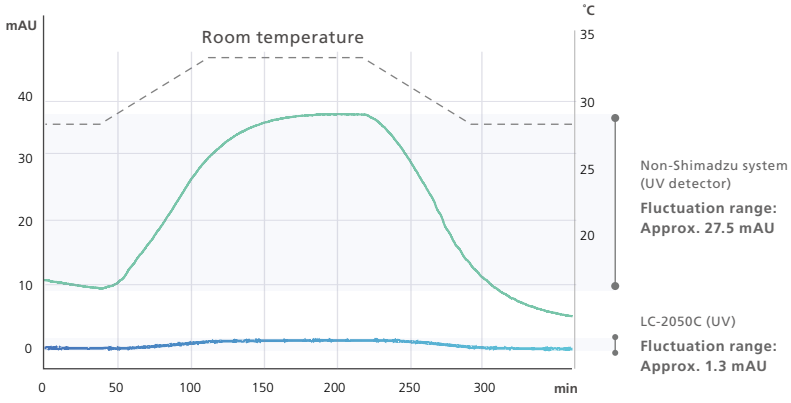
Procedures, mobile phases, and other information necessary for validation are displayed on the screen, allowing you to perform inspections by simply following the instructions.

Creating a System Check Report

Validation results can be viewed from the i-Series main unit. Validation results can also be output in a report format from a workstation.

Dual-Temperature Control with TC-Optics and Flow Cells

Excellent Baseline Stability

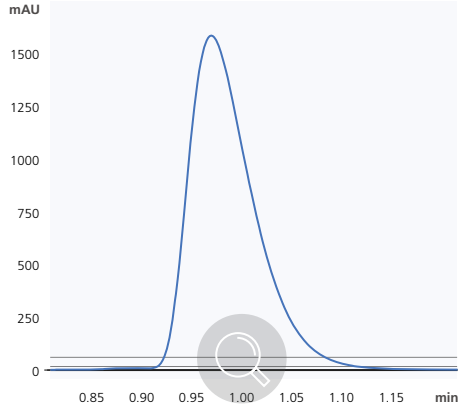


In addition to the temperature control function for flow cells, the i-Series employs new temperature control technology for detector optical systems, known as TC-Optics (Temperature Controlled Optics). This ensures a more stable baseline that is less susceptible to room temperature variation and increased precision during verification testing and quantitative testing of trace components.

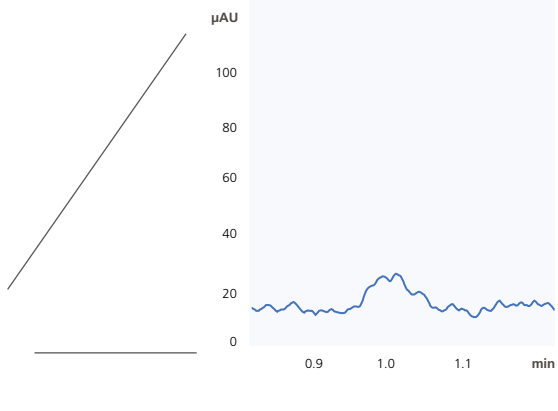
Ultra-Low Carryover Performance Enables High-Sensitivity Analysis

Improved Reliability of Trace Component Analysis

Shimadzu's proprietary flow channel design, parts, and materials reduce the carryover effects of sample residue to almost zero. Ultra-low carryover performance has been improved to 0.0025% (chlorhexidine, assigned conditions), thereby providing highly precise quantitative performance when analyzing complex samples.



Chromatogram after injecting chlorhexidine



Chromatogram after injecting a blank sample (mobile phase)

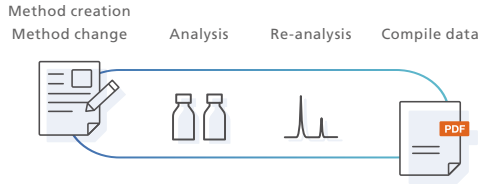
Data management

Compliant with ER/ES Guidelines and Data Integrity

LabSolutions has a variety of functions to ensure compliance with FDA 21 CFR Part 11 and Japanese Ministry of Health, Labour and Welfare guidelines on electronic records and electronic signatures. In some cases, data integrity can be exploited due to the manipulation or replacement of data. LabSolutions includes functions that address and support data integrity.

Centralized Management of Data and User Information

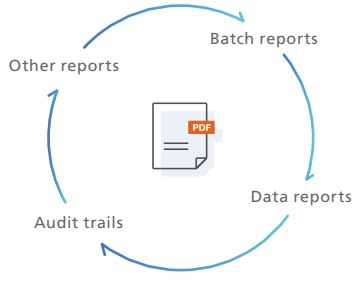
Data and user information are managed on a database with restrictions on data file deletion and a version number management function that ensures safe storage. Furthermore, fine-grained division of operational restrictions allows optimum user management based on role, such as system administrator, analysis operator, etc. LabSolutions records the access status of the system, changes to data and methods, operations performed during analysis and re-analysis, changes to system settings, etc.



An “audit trail” that records all operations

Review Operation Logs with Ease Report Set

A report set function compiles analytical conditions or analytical results/conditions for sets of analysis (batch analysis) and also compiles operation logs from start to completion of analysis. The report set function automatically collects information, prevents the accumulation of arbitrary reports and prevents operational errors.



Seamless Integration of Testing and Analysis Activities

LabSolutions i-QLinks™ can create test plans and test items, incorporate results from tests performed on HPLC systems and other analytical instruments, automatically create test reports based on test results from all kinds of analytical instruments and manage the progress status of quality testing.

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First Edition: November 2020 3655-05013-PDFNS