

NEXERA UHPLC:

Bringing the Power of AI
to Analytical Laboratories

The Growing Impact of ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is all around us. Every day, we see new uses emerge to ***help make everyday tasks more efficient and solve problems across multiple industries.*** From digital personal assistants like Alexa to self-driving trucks to automated manufacturing facilities, AI technologies are changing the way we live, work and do business. And now, this new technology can also help analytical scientists maximize the accuracy and repeatability of their LC analysis.



Introducing the new Nexera UHPLC series from Shimadzu. The Nexera series combines AI and Internet of Things (IoT) enhancements to set new industry standards in intelligence, efficiency and design.



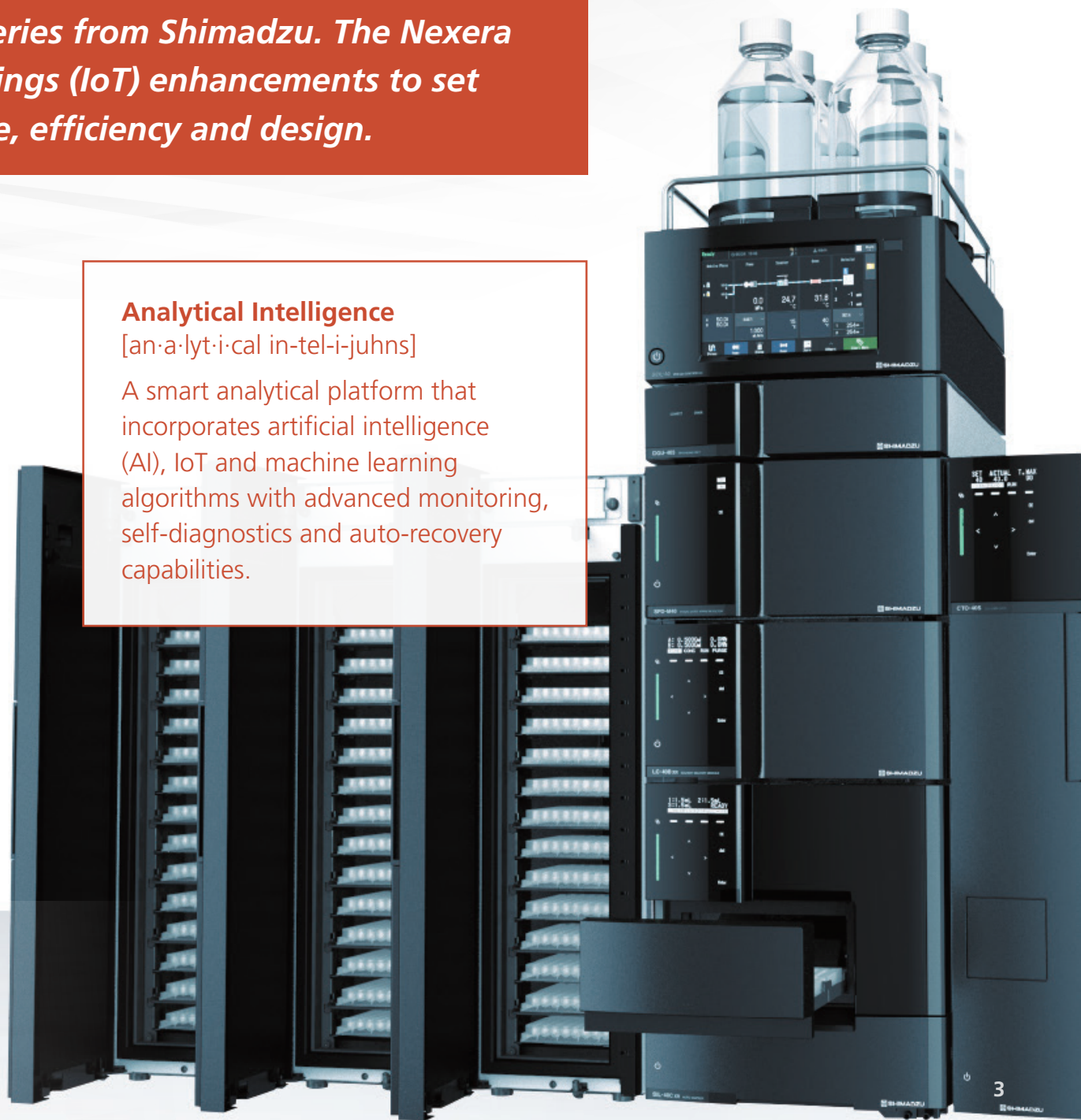
ANALYTICAL INTELLIGENCE

Using new and exciting technologies to help you increase throughput, improve accuracy and protect valuable columns, Shimadzu is delivering what you need for continued success. Not just artificial intelligence—**Analytical Intelligence**.

The Nexera provides the data you need to ensure fast, reliable results. What makes the system so powerful is its ability to extract insights from all instrumentation within your lab, rather than monitoring just one instrument. Nexera's **Analytical Intelligence** engine is able to detect and resolve critical issues automatically, providing a new level of UHPLC performance.

Analytical Intelligence [an·a·lyt·i·cal in·tel·i·juhns]

A smart analytical platform that incorporates artificial intelligence (AI), IoT and machine learning algorithms with advanced monitoring, self-diagnostics and auto-recovery capabilities.



The image shows a Shimadzu LCMS-8050 HPLC system. On the left, a sample tray holds several clear vials. Below it is the main control unit with a digital display showing a chromatogram. To the right is the detector unit, labeled 'SHIMADZU' and 'LCMS-8050'. The background is a blurred laboratory setting with large windows.

Intelligent System Start-Up

System suitability testing (SST) plays an integral role in your chromatographic methods. That's why your lab runs this test before batch analysis to make sure that every component of the UHPLC system meets performance criteria.

When done manually, this SST process involves testing the column efficiency, peak tailing and resolution as well as injecting replicates to ensure consistent system performance. It's time-consuming and has the potential for error and incorrect pass or fail results. That's why automating SSTs can make a huge difference in ***maximizing the uptime of your instruments.***

**One
Click**

The System Suitability Test (SST) is easy to select

AUTOMATIC PROCESSES

Power OFF

**Power ON at a
specific time**

**Intelligent
Startup**

ANALYSIS RUNNING

**STANDBY STATUS
(Power off)**

AUTOMATIC SST

SST: Auto-purge

→ Standard injection

→ Result evaluation

System Suitability Settings

☒ System Suitability Test

☐ Output test file
☒ Output CSV file
☒ Output to display
☒ Output to printer

Pass String:
Fail String:

☐ Show grid on LHM reports

Output Statistic:
☒ Average ☒ Standard Deviation
☒ SD ☒ Max
☒ %RSD

Output summary data:
☒ Output text file
☐ Output CSV file
☐ Output sample name

Detector A:

Compound Name:

	Parameters	Lower Limit	Upper Limit	%RSD	Format
1					

System Suitability Report

PC Name: PAVLOVA.LT19
Method File Name: Sample_IC_EN - Demo_SysStat_Method1.m
Processed by: System Administrator
Data Reported: 1/16/2003 9:36:35 AM (-0500)

Summary Result: Fail

<Sample Information>

Dist	Sample Name	Sample ID	Date Acquired
Data File Name			
1	STD	1	1/16/2003 8:26:02 AM (-0500)
Sample_IC_EN - System1 - Demo_Data-001.kd			
2	STD	2	1/16/2003 8:36:53 AM (-0500)
Sample_IC_EN - System1 - Demo_Data-002.kd			
3	STD	3	1/16/2003 8:47:40 AM (-0500)
Sample_IC_EN - System1 - Demo_Data-003.kd			
4	UNK	1001	1/16/2003 8:58:29 AM (-0500)
Sample_IC_EN - System1 - Demo_Data-004.kd			
5	UNK	1002	1/16/2003 9:09:08 AM (-0500)
Sample_IC_EN - System1 - Demo_Data-005.kd			
6	UNK	1003	1/16/2003 9:19:47 AM (-0500)
Sample_IC_EN - System1 - Demo_Data-006.kd			
7	UNK	1004	1/16/2003 9:30:28 AM (-0500)
Sample_IC_EN - System1 - Demo_Data-007.kd			

SST Passed → New Batch Started

SST Failed → Standby

The Nexera UHPLC series is designed to perform Auto-Diagnostic and Auto-Recovery without operator intervention. The system can be set to start at a certain time, so that it can complete auto-purge, equilibrium and baseline checks before analysis begins.

At startup, the Nexera system automatically runs an SST. If the system is operating at optimal performance, it will start the batch analysis. If the system is not suitable for analysis, the system will go into standby mode to save energy consumption and notify you. This intelligent system startup eliminates manual steps, reducing the potential for error, improving consistency and decreasing turnaround times. That means you get enhanced workflows and the productivity gains you need.

Advanced Real-Time Mobile Phase Monitoring

Making sure you have sufficient mobile phase in the system—before batch analysis—is critical to keeping your lab running smoothly. If you run out of mobile phase mid-batch, you have to stop the batch and take corrective action, resulting in costly workflow delays and potential loss of samples.

To overcome this challenge, Shimadzu's Nexera UHPLC series enables **real-time monitoring** of mobile phase levels to **ensure maximum uptime**. The instrument monitors solvents gravimetrically and notifies lab personnel if there isn't enough mobile phase to complete the batch run. Levels for mobile phase or autosampler rinse solution may be monitored in up to twelve containers.

The containers can also be checked remotely from a smart device (PC/iOS/Android). If the mobile phase is running low, the system will notify you before starting the batch. This can make a big difference in how you conduct the analysis. You can respond quickly in order to minimize the risk of downtime and wasted samples.

STEPS FOR RESOLVING INSUFFICIENT MOBILE PHASE

- 1 Stop the batch
- 2 Replenish the mobile phase
- 3 Purge-prime mobile phase lines
- 4 Test the chromatography
- 5 Rerun wasted samples



Auto-Diagnostic/Auto-Recovery from Flow Anomalies

Failing check valves and trapped air bubbles can cause flow anomalies in HPLC, greatly affecting chromatographic results. These anomalies can cause shifting retention times, wandering baselines, pump loss-of-prime, irregular peak shapes, and increased column back pressure among other issues. Of course, this affects the ability to detect trace quantities of analytes and limits the accuracy and repeatability of the results.

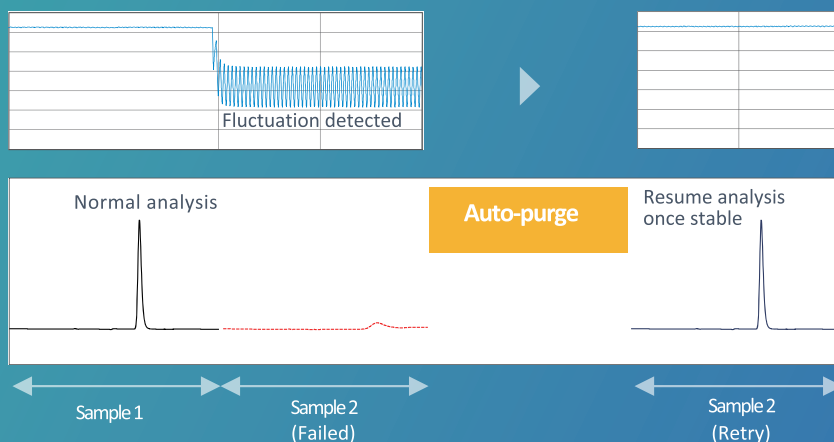
To **ensure maximum accuracy and repeatability**, the Nexera UHPLC series enables rapid, reliable detection of many flow anomalies. It then takes automated steps to attempt to correct the problem and recover to a workable condition.

Here's how it works. When the **Analytical Intelligence** engine in the Nexera system detects an unusual fluctuation, it pauses the batch, applies a corrective purge and restarts the run—all automatically. Without this feature, you waste valuable time and resources on evaluating results and manually purging and repriming the system.

Consistency is key to minimizing variation in results and achieving reproducibility. With the Nexera, you get repeatable results that you can trust.

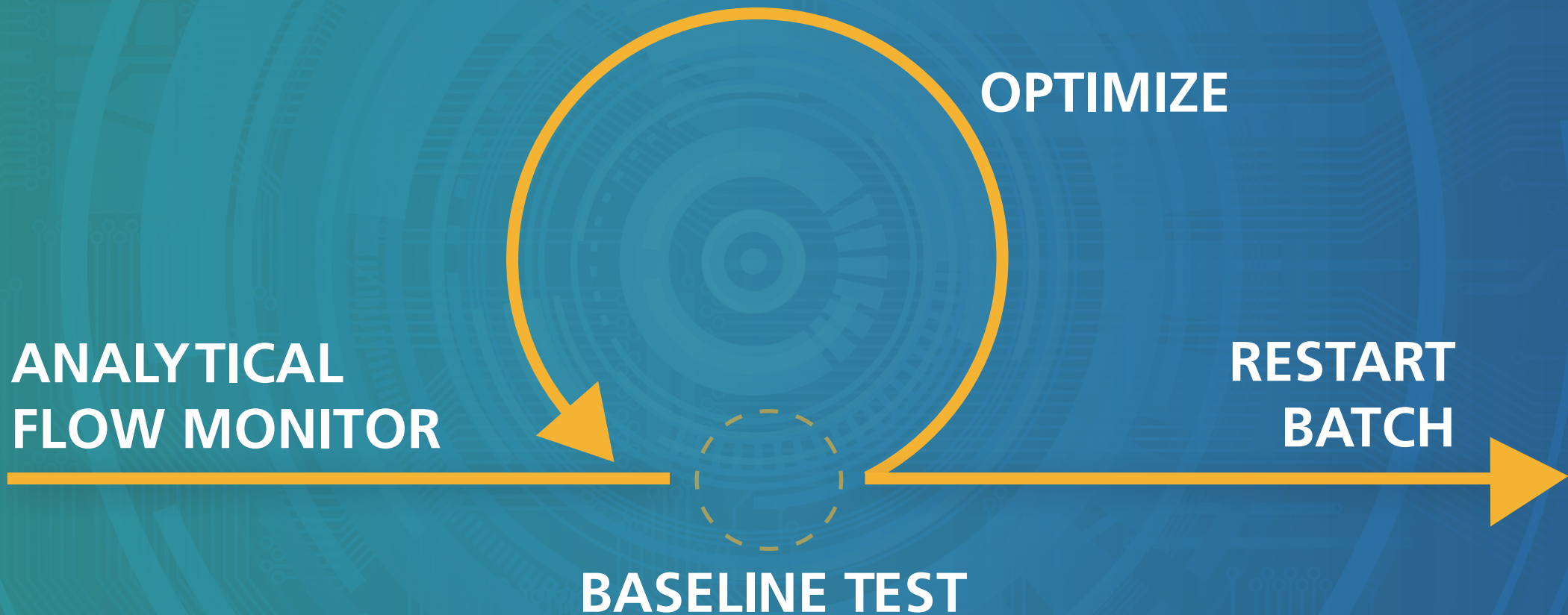
AUTO-DIAGNOSTIC AND RECOVERY

Pressure



Auto-Diagnostic / Auto-Recovery = Maximum Uptime

The Nexera has the ability to monitor baseline changes and pressure fluctuations. If it detects an unusual fluctuation, it automatically pauses the batch, purges the flow path, and re-injects the sample once recovery is confirmed.





Intelligently Monitor Consumables Usage

Up until now, scientists have had no reliable way of keeping track of the wear and tear on internal parts and the status of components inside their LC systems. Because of this, they may not realize that a component needs to be replaced until peaks start to drift. Or they may not notice a worn seal until it causes a leak.

The Nexera UHPLC series promises to change the way you track consumables usage. It **automatically monitors shared consumables** across instruments in your lab through a single intuitive system. The Nexera keeps track of consumables usage by part number and sends email alerts when it's time for a replacement.

With the Nexera UHPLC, you finally have the **Analytical Intelligence** you need to keep your instruments running at peak performance. Early warnings for part replacements enable you to stay ahead of the biggest threats to equipment downtime. You can also check the operating status, errors and information about consumables—wherever you are. That means you spend **more time doing analysis** and **less time worrying** about maintenance and changing parts.

EMAIL NOTIFICATIONS

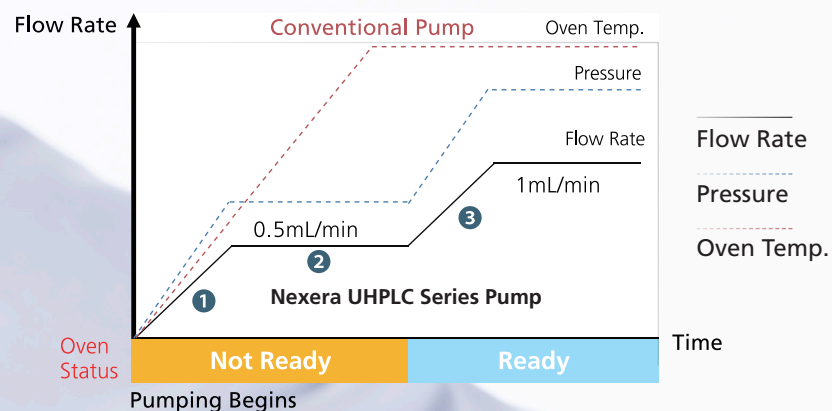
- Are sent **one month** before the replacement date,
- and when exceeding the recommended **usage time**

Smart Flow Control Protects Columns

UHPLC columns can be damaged by sudden pump starts as well as extreme gradient changes. This is especially true with polymeric packings. That's why the Nexera UHPLC series delivers the highest level of column protection by providing a new approach to flow control.

The Nexera automatically uses Smart Flow Control to **increase the flow rate gradually** to the set point. This unique feature helps extend the life of your columns and keeps your system running efficiently.

SMART FLOW CONTROL PROTECTS COLUMNS



- 1 The flow rate is gradually increased up to half of the set value.
- 2 The flow rate is kept constant until the oven is ready.
- 3 The flow rate is gradually increased up to the set value.





Conclusion

The power of AI - **Analytical Intelligence** - has the potential to dramatically improve the overall performance of your lab. Using Shimadzu's Nexera UHPLC series, you can deliver new analytical insights, drive operational efficiencies and increase equipment uptime.



To learn more about AI solutions from Shimadzu, visit
www.shimadzu.eu/nexera-series

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