

VisionHT™ Media Platform

Sub-2- μm Particle Technology Delivers Speed on Any System

Today's laboratories are under greater demand to analyze more samples in less time. To help meet this demand, major product advances have been made to decrease analysis time and increase HPLC throughput. HPLC system advances have greatly reduced the influence of extra column volumes and have extended the range of flow rates and pressure capabilities. In response to this, VisionHT™ versatile media platform is combined with a wide range of column formats, which can help boost speed from any system.

The use of smaller particles offers two main improvements to the chromatographic separation—increased resolution and speed. Resolution is directly proportional to the square root of column efficiency, therefore the higher the efficiency, the narrower the peaks and the greater the resolution between them. Increased speed comes from higher mobile phase flow rates that can be used without loss in efficiency, and higher flow rates mean faster analysis times.

Understanding the type of system currently in use for high throughput separations and then matching the right column configuration is critical to achieving the best high throughput separation. Here we outline the three types of systems currently in use today for high throughput and the recommended HPLC column format for use with each system.

Converting Methods From Traditional Column Formats to High Throughput Columns

Convert Between Standard HPLC and VisionHT™ Columns

	Flow Rate
Standard HPLC (4.6mm)	1.0X
VisionHT™ (2.0mm)	0.2X

When adjusting between standard LC conditions to VisionHT™ columns convert flow rates accordingly and then increase flow rate for faster analysis.

Convert Between Standard HPLC and Rocket™ Columns

	Flow Rate
Standard Analytical (4.6mm)	1.0X
Rocket™ Column (7.0mm)	2.3X

Use this conversion of flow rate to transfer methods between Rocket™ column or VisionHT™ columns. Backpressure on standard LC systems should be considered.

System Type 1: Ultra High-Pressure LC System (>10,000psig pressure limitation)



Examples: Agilent 1200, Agilent 1290, Waters® Acquity®, Thermo Accela™, Jasco XLC.

Speed from Ultra High-Pressure Systems

Representing the latest in LC instrumentation technology, ultra high-pressure systems theoretically have the potential to deliver the fastest separations. They have minimal system volume and offer a pressure limit upwards of 18,000psig. This allows the use of columns with sub-2 μm particles and 2–10 times traditional flow rates. Sub-2 μm particles extend the working range of acceptable mobile phase linear velocities without sacrificing efficiency. Therefore, you can push flow rates and still get equal or better performance.

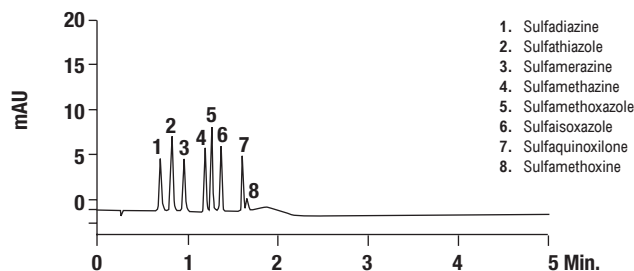
Suggested Column Format

UHPLC column formats are designed for microbore and ultra high-pressure LC systems that have small system volumes to limit peak broadening from sample diffusion. Packing VisionHT™ highly efficient 1.5 μm phases in these UHPLC formats yield taller peaks and increase sensitivity. This UHPLC column hardware incorporates a low dead volume design to minimize sample diffusion, as well as maintain peak integrity and efficiency. 12,000psig high-pressure stability allows fast flow rates, potentially decreasing run times 10 fold.

System Type 1: UHPLC

Recommended Column Format:	UHPLC
Length:	20, 30, 50, 100, 150mm
i.d.:	1.0 and 2.0mm

Fast Sulfamides on a UHPLC System



Column: VisionHT™ C18-Polar, UHPLC
Mobile Phase: A: 0.1% Formic Acid, B: Methanol
Detector: UV at 280nm
Temperature: Ambient

System Type 2: Low Volume, High Throughput (Alternate Fast) LC System (<10,000psig Pressure Limitation)



Examples: Shimadzu® Prominence® UFLC, Hitachi® Ultra, Dionex®/LC Packings UltiMate®, Thermo Surveyor® Plus

Speed from Low-Volume HTP LC Systems

These systems concentrate on reducing the cycle time between injections thus allowing more injections per time frame. Typically they employ high-speed gradient pumps, fast autosamplers and a quick detector sampling rates. They are not pressure rated to the extremes of ultra high-pressure systems, but the low system volume allows for short columns of narrow i.d.

Suggested Column Format

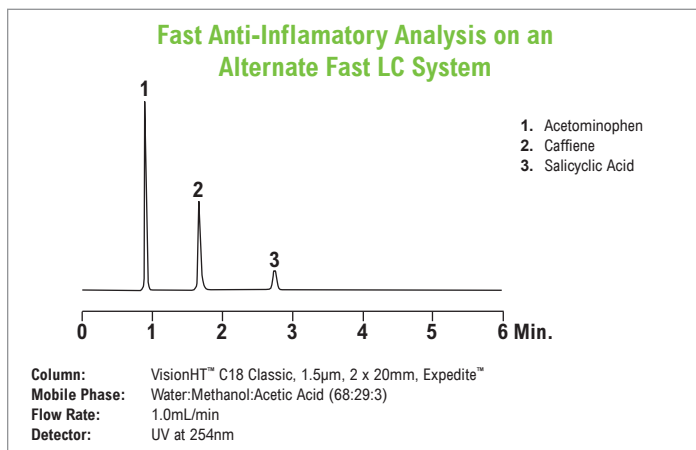
Expedite™ and UHPLC column formats are designed for microbore high throughput LC systems that have small system volumes. These formats incorporate a low dead volume design so that sample bands do not diffuse within the column hardware, maintaining peak integrity and efficiency. Expedite™ columns are packed with highly efficient VisionHT™ 1.5µm or 3µm media. Very short column lengths minimize backpressure and reduce analysis times. Though not as fast as ultra high-pressure LC systems, these systems and columns balance both speed and backpressure.

System Type 2: Alternate Fast Low Volume LC

Recommended Column Format:	Expedite™
Length:	10, 20mm
i.d.:	2, 4.6mm

System Type 2: Alternate Fast Low Volume LC

Recommended Column Format:	UHPLC
Length:	20, 30, 50, 100, 150mm
i.d.:	1, 2mm



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System Type 3: Traditional LC System (<5000psig Pressure Limitation)



Examples: Agilent 1100, Waters® Alliance®, Thermo Surveyor®, Dionex®/LC Packings Ultimate®, Shimadzu® Prominence®, Hitachi® LaChrom®

Speed from Traditional LC Systems

To get speed from a traditional LC system, you need to consider the 5000psig pressure limitation, and the typically “large” 2mL system volume. High throughput columns on this system need to deliver a highly efficient separation typically achieved with a small particle packing ($\leq 3\mu\text{m}$), but without the high backpressures. The “large” system volume also needs to be balanced with an equally large column volume or the separation will be plagued with extra-column effects.

Suggested Column Format

Rocket™ column formats provide low backpressure and fast analysis times while preserving column efficiency. VisionHT™ 1.5µm and 3µm media can be packed in this Rocket™ format for use on standard HPLC systems with backpressure limits less than 5000psig. The 7mm i.d. allows a faster flow rate that “sweeps” the extra system volume faster and reduce peak broadening. This larger diameter also means a larger column volume to system volume ratio to minimize the efficiency loss from extra system volume. This benefit is more pronounced over 2.1 and 1mm i.d. columns that have a smaller ratio than 4.6mm i.d. columns and require much lower flow rates for acceptable backpressures. Low flow rates allow more time for sample diffusion within the standard HPLC’s system volume to further degrade the column’s efficiency.

System Type 3: Traditional LC System

Recommended Column Format:	Rocket™
Length:	33 or 53mm
i.d.:	7mm
Packings:	Any 1.5µm or 3µm media

