Modular Pumps

Increased capability and versatility for preparative chromatography

Empower-based purification system with the 2707 Autosampler, 2535 Quaternary Gradient Module and the 2489 UV/Visible Detector.

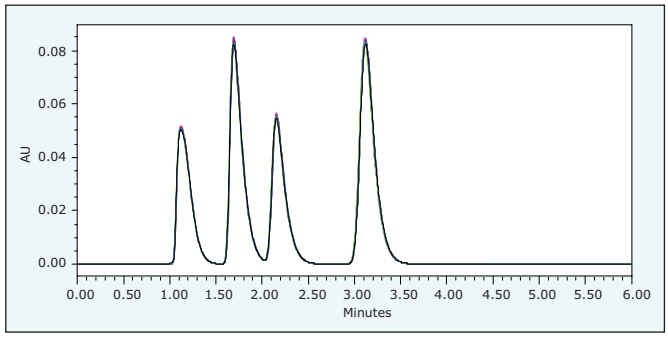
FLEXIBLE AND SCALABLE

The new series of Waters® innovative preparative pump technologies provide extraordinary performance and convenience for benchtop purification of microgram to multigram sample loads. As your lab's productivity demands increase, so do your expectations for reliability, performance, and flexibility of your solvent delivery system. The full range of Binary and Quaternary Gradient Modules have been designed to meet all of your purification needs.

The modules can be easily configured to perform a variety of purification protocols covering a wide range of sample matrices including organic synthetics, natural products, peptides, and proteins. Exceptional flow rates provide you with the precision and accuracy you require, delivering the chromatographic reproducibility that you need to fully automate all your laboratory's processes. With exceptional solvent blending, automated solvent management, and pulse-free delivery, Waters solvent delivery systems can meet even your most sensitive application challenges.

QUATERNARY GRADIENT MODULES

Waters Quaternary Gradient Modules (QGM) are low-pressure mixing quaternary gradient pumps that serve as a solvent delivery device for a variety of purification systems. Available in three flow rate ranges: 0.5 to 50.0 mL/min, 0.5 to 150.0 mL/min, and 4.0 to 300.0 mL/min; the modules simplify mobile phase delivery management by accurately and precisely mixing user-programmed eluent compositions. Choose from three software options: MassLynx,® Empower,® or stand-alone console software, to conform to what is already being used in your laboratory.



Overlay of consecutive injections performed on the 2535 QGM, at 1 mL/min demonstrates the reproducibility that ensures accurate purification of consecutive samples and time based collections.

Display Table of Retention Time % RSD

Injection #	Peak 1	Peak 2	Peak 3	Peak 4
1	1.121	1.693	2.154	3.121
2	1.124	1.697	2.159	3.122
3	1.118	1.689	2.150	3.112
4	1.122	1.694	2.156	3.122
5	1.121	1.693	2.153	3.115
6	1.122	1.696	2.158	3.122
Std Dev	0.002	0.003	0.003	0.004
% RSD	0.17	0.17	0.16	0.14

Isocratic separations with online blending of methanol and water illustrate the outstanding reproducibility of the 2535 QGM.

BINARY GRADIENT MODULES

Waters Binary Gradient Modules (BGM) incorporate extremely efficient preparative flow rates with greatly reduced system volumes, capable of providing equivalent performance in both analytical and preparative modes.

1525EF HPLC Pump

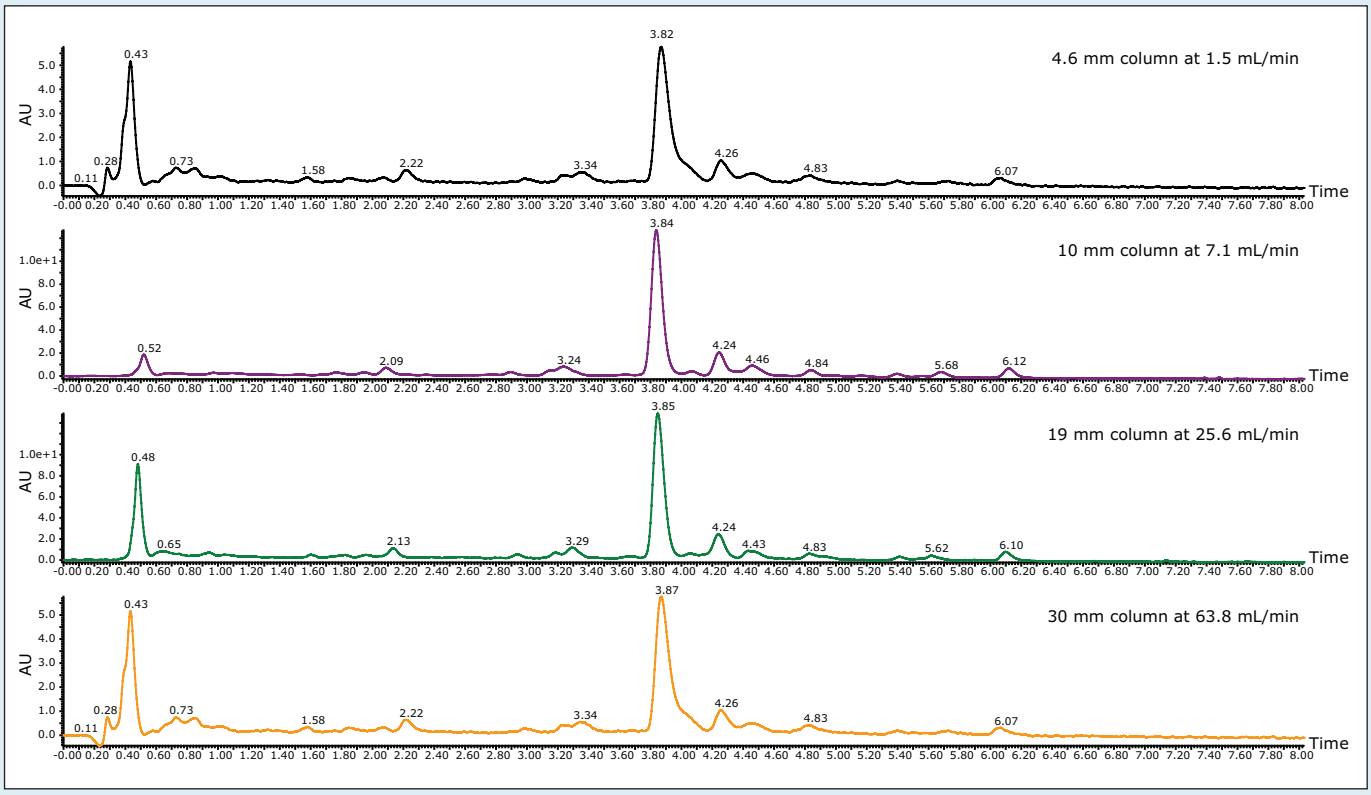
The 1525EF HPLC Pump is a high-pressure mixing binary gradient pump that is utilized in many semi-preparative configurations. Its exceptional flow rate provides you with precision and accuracy, delivering the chromatographic reproducibility your lab requires.

- 225 µL pump heads deliver up to 22.5 mL/min
- Optional FlexInject Manual Dual Injector Module for both analytical and semi-preparative injections
- For semi-preparative applications: 10 to 30 mm I.D. column separations
- Maximum operating pressure: 6000 psi up to 22.5 mL/min

2545 BGM

The 2545 BGM is a high-pressure mixing binary gradient pump that serves as the primary solvent delivery device for the Waters AutoPurification™ System. The 2545 BGM provides consistently smooth, pulse-free solvent flow for both analytical and preparative scale flow rates under MassLynx Software control with the FractionLynx™ Application Manager.

- Built on Waters proven high-pressure gradient mixing technology
- Maintained pumping performance and flow rate range
- 0.5 to 150.0 mL/min
- Self priming from solvent container on floor
- Optional leak sensor



The broad flow rate range available with the 2545 BGM enables method development optimization on an analytical scale followed by preparative scale purifications, with no system modifications. Scaled flow rates and injection volumes were calculated using the Waters OBD™ Calculator.*

* For more information, refer to Waters application note *Analytical HPLC to Preparative HPLC: Scale-up Techniques Using a Natural Product Extract* (720003120EN).

2535 QGM

- Flow rate range from 0.5 to 50.0 mL/min, with separate flow paths for analytical and preparative capability
- Programmable four-solvent selection
- Self priming from solvent container on floor
- Inlet manifold valve for large volume sample loading
- Maximum operating pressure: 6000 psi

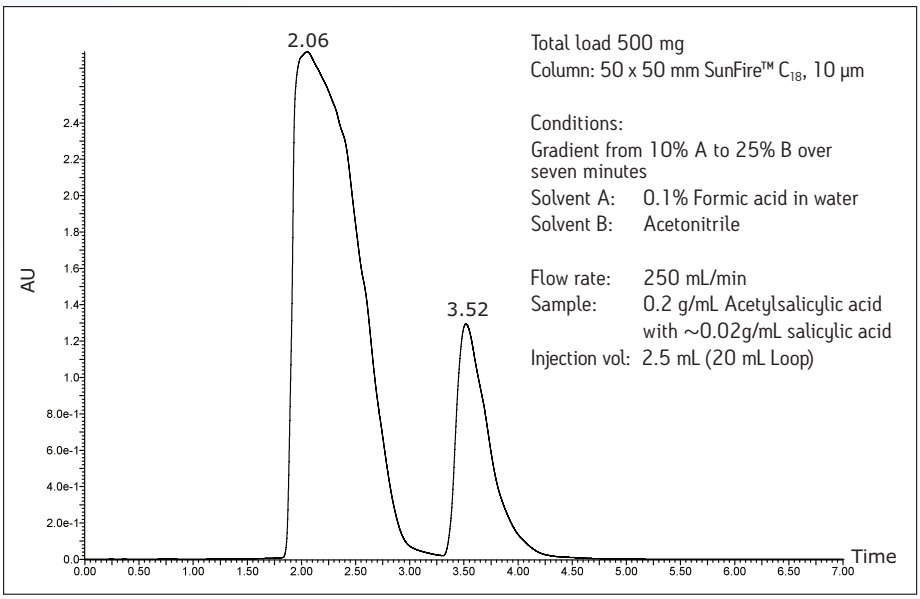
2545 QGM

- Flow rate range from 0.5 to 150.0 mL/min
- Programmable four-solvent selection
- Self priming from solvent container on floor
- Inlet manifold valve for large volume sample loading
- Maximum operating pressure: 6000 psi up to 100 mL/min, and 5000 psi at 150 mL/min

2555 QGM

- Flow rate range from 4 to 300 mL/min
- Programmable four-solvent selection
- Self priming from solvent container on floor
- Inlet manifold valve for large volume sample loading
- Maximum operating pressure: 3000 psi up to 200 mL/min, up to 2500 psi at 300 mL/min

The 2545 QGM with a manual inlet valve for loading large volume samples.



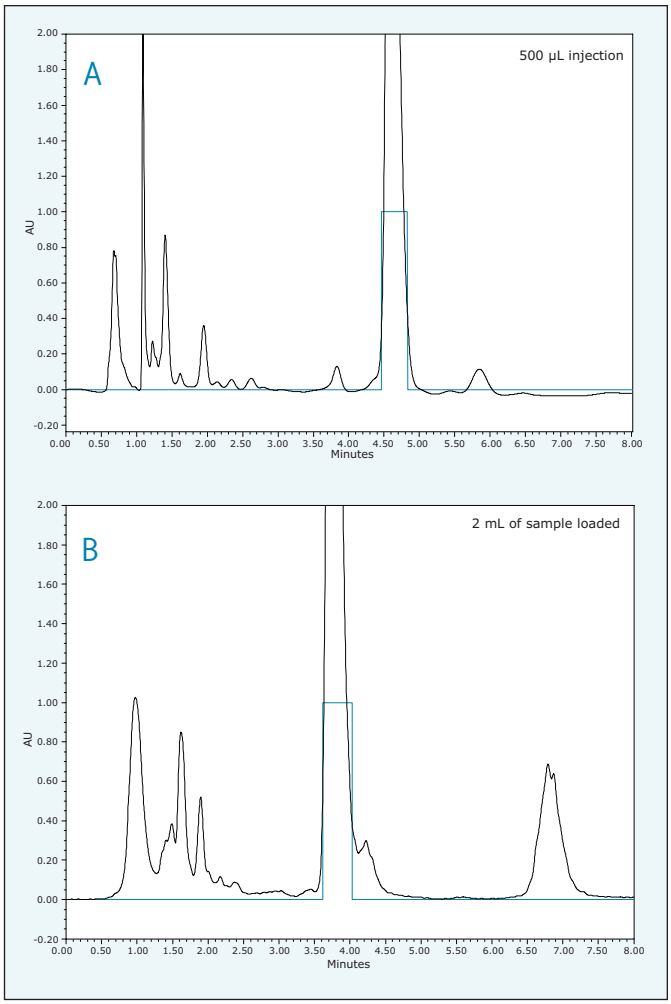
This preparative separation of a pharmaceutical sample demonstrates the ability of the 2555 QGM to quickly and accurately resolve a large volume sample load.

Versatile injection capability

Solvent delivery systems can provide access to both analytical and preparative scale injectors, with the Waters FlexInject Manual Dual Injector Module mounted on the side of the unit, or the standalone prep chromatography rack which can be located beside the pump.

To maximize the performance of the combination pump and dual mode injector for both analytical and preparative flow rates, the optical flow cells of the Waters 2489 TUV Detector and the 2998 PDA Detector are available in different formats. A dual inlet, analytical and preparative flow cell, and a semi-prep flow cell are available for both detectors. A variable pathlength flow cell is available for the 2489 TUV Detector for high flow, large concentration sample purifications.

For sample volumes that are too large for conventional injectors, the QGMs include a manual, large volume inlet manifold. In addition, automated, repetitive injections of sample solutions may be introduced to the column through one of the four solvent lines, a function that can be programmed through the instrument method.

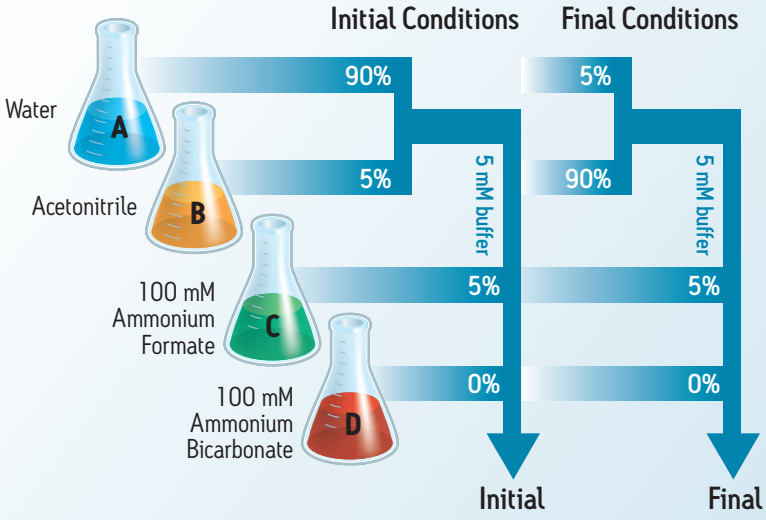


*The separation of kudzu root extract using the 2707 Sample Manager (A). Very large injection volumes can be achieved by delivering sample through a solvent line from the 2545 QGM (B) defined by the instrument method.**

*For more information, refer to Waters application note: *A Modular Preparative HPLC System for the Isolation of Puerarin from Kudzu Root Extracts* (720003797EN).

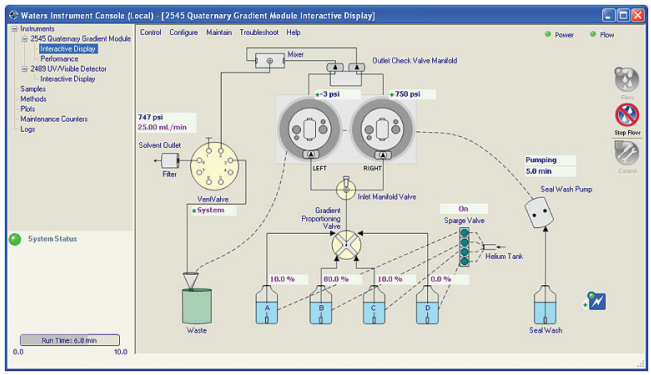
AUTOMATED SOLVENT MANAGEMENT

Auto•Blend™ Technology enables you to generate gradients automatically without having to manually alter the buffer concentration, giving you the freedom of using up to four solvents simultaneously. Auto•Blend programming technology improves uptime, since no premixing of mobile phases is required. You can build both column cleanup and system flushing into your methods. In addition to method development, Auto•Blend simplifies maintenance by offering straightforward eluent management, increasing the flexibility and efficiency of your laboratory.



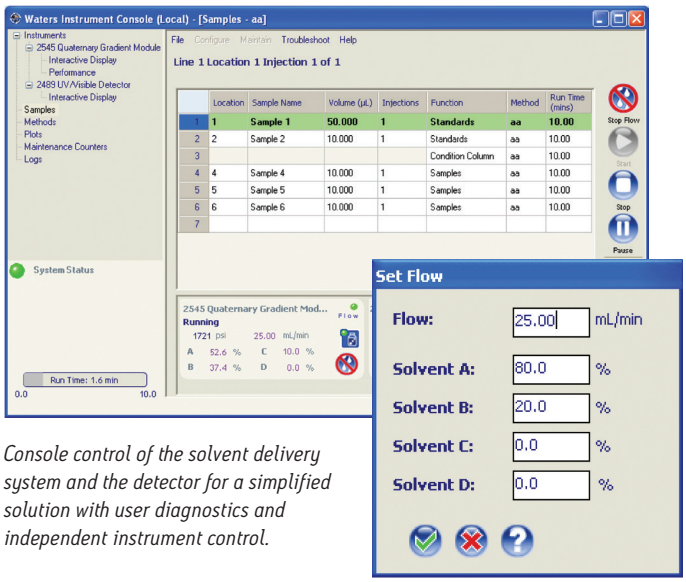
SOFTWARE CONTROL

Integrated system monitoring and diagnostic software provided with the instrument enables operators to monitor several key parameters including solvent usage, system pressure, and gradient composition. Interactive control capabilities provide unique diagnostic tools with visual indicators allowing for easy troubleshooting and visualization of both the pump and the UV detectors' current status.



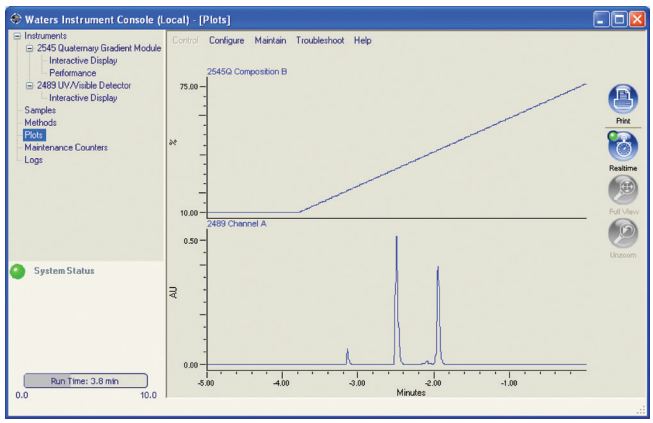
The instrument console provides an interactive diagnostic tool for easy visualization of the overall pump status.

For CDS independent control of both the QGM and the 2489 TUV Detector, the instrument console provides complete access to method creation and a sample list format for system use with software independent injectors and collectors.



Console control of the solvent delivery system and the detector for a simplified solution with user diagnostics and independent instrument control.

With several data channels to choose from, users can easily configure the system to monitor the data channels they require; such as gradient composition, flow rate, and detector absorbance.



Channel A and organic composition change are monitored, and the information collected, which can then be reported in a simple JPEG or BMP format.

Fully integrated control of Waters Quaternary Gradient Modules (QGMs) with autosamplers, detectors, and fraction collectors is available through Empower Software, our industry-leading chromatography data software (CDS) platform, or MassLynx Software.

The Waters FlexInject Manual Dual Injector Module is available with any of the Waters preparative pumps, and provides easy access to both analytical and preparative scale injections.

BUILD A PREPARATIVE CHROMATOGRAPHY SYSTEM TO MATCH YOUR NEEDS, WORKLOAD, AND BUDGET

Choose from a variety of high performance components to configure a preparative chromatography system that's right for your lab. Whether your application requires low or high pressure mixing, low or high flow rates, manual or automated injection and collection, you can choose the exact level of functionality and capacity that your application requires. And since Waters' purification systems are upgradable, you don't have to worry about your investment as your workload increases.

Sample Load	Column I.D.	Fluid Handling Unit	Max Flow Rate
µg – mg	3.9 – 7.8 mm	1525 Binary HPLC Pump*	10 mL/min
µg –10s mg	3.9 – 19 mm	1525 Binary HPLC Pump* and EF Kit	22.5 mL/min
mg –10s mg	3.9 – 50 mm	2535 Quaternary Gradient Module	50 mL/min
m – g	4.6 – 50 mm	2545 Binary Gradient Module*	150 mL/min
m – g	4.6 – 50 mm	2545 Quaternary Gradient Module	150 mL/min
mg – 10s g	7.8 – 75 mm	2555 Quaternary Gradient Module	300 mL/min

* High pressure mixing

Choose a solvent delivery system based on the amount of material you will be loading on the column and the size of the column.

ORDERING INFORMATION

Quaternary Gradient Modules	
2535 QGM – Flow rate range 0.5–50.0 mL/min	176001739
2545 QGM – Flow rate range 0.5–150.0 mL/min	176001736
2555 QGM – Flow rate range 4.0–300.0 mL/min	176001741

Prep Chromatography Rack	205000619

Binary Gradient Modules	
1525 Binary Gradient Pump 0–10 mL/min	186001525
1525 EF Upgrade Kit, for flow rate to 22.5 mL/min	205000324
2545 BGM – Flow rate range 0.5–150.0 mL/min	186025450

2545 BGM.

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