PrepStar™ SD-1

VERSATILE SOLVENT DELIVERY FOR EASY PURIFICATION BY HPLC

To achieve high quality HPLC separations, solvent flow rates must be accurate and reproducible. With its software controlled, twin piston design, the PrepStar SD-1 Solvent Delivery Module meets these exacting requirements, time after time. A pressure transducer in each pump head provides instant flow and pressure feedback to the motors, to maximize flow reproducibility. The dual motor, high resolution drives ensure supremely accurate solvent delivery and the pulse free pump design extends column life. An easy change of pump heads gives flow rates from 0.01 to 800 mL/min, up to 6,000 psi, so that the SD-1 is ideal for use with analytical and preparative systems, providing seamless scale-up that is simple to achieve and economical in operation.

Key Benefits

▶ **Reduced operating costs.** Virtually pulse free flow extends column lifetime by saving expensive preparative columns from the constant pressure pulse effects typical of other large piston and diaphragm pumps. Pump heads are easily removed for maintenance or upgrade to minimize downtime.

▶ **Better reproducibility.** Unique microprocessor controlled, rapid twin drive and parallel pump heads, with high speed chamber pressure feedback, completely compensate for refill and solvent compression effects. The result is an accurate and reproducible flow rate.

▶ **Maximum versatility.** Dual interchangeable pump heads provide a pumping capacity from 0.01 to 800 mL/min at pressures up to 6,000 psi for high performance purifications under isocratic and gradient flow conditions.

▶ **Ease of operation.** The SD-1 is designed with scale-up in mind so that moving from analytical to preparative methods is quick and easy. The unique design allows an accurate gradient to be generated at any flow rate from 0.01 to 200 mL/min without any change of pump heads.

Agilent Technologies

PrepStar SD-1 is unmatched in its range of capabilities. It is the first true high performance bench top solvent delivery system for preparative HPLC. SD-1 delivers the maximum efficiency from small particle preparative HPLC columns when media are packed in bench top Load & Lock™ Dynamic / Static "Locked" Axial Compression or other columns.

This solvent delivery system is ideal for the analysis and purification of peptides and small active pharmaceutical ingredients where gradient accuracy and reproducibility are key to success. The SD-1 delivers better gradient accuracy over a larger flow rate range than any other pump available today, making it the preferred system for chromatography specialists world wide.

Virtually Pulse Free Solvent Flow

Through software control of the independent drives, the SD-1 pump generates a virtually pulse free flow and performs much like a syringe pump. Without external hydromechanical pulse dampers, the very low pulsation level helps preserve columns, extending their usefulness. The SD-1 pump also uses high pressure mixing for gradient applications. With its highly accurate, virtually pulse free flow, a small 1.2 mL dynamic mixer is sufficient for most applications up to 200 mL/min. This minimizes total system dead volume to 1.5 mL or less for preparative and analytical applications – an important requirement for a scale-up system with gradient applications.

Wide Range of Flow Rates

The innovative SD-1 pump features cutting edge capabilities including high-pressure, virtually pulse free flow with a wide range of flow rates. For most analytical and preparative applications, the configuration of choice is the SD-1 with 200 mL/min heads for best accuracy from 0.01 to 200 mL/min. Alternatively, a flow range to 800 mL/min is easily achieved by simply changing the pump head, for isocratic and binary gradients. When you want high-performance and high-throughput, the versatile SD-1 pump fits all your needs.

Accurate Flow Technology

The SD-1 advanced dual-piston hydraulic design uses two pump heads, each driven by high precision stepper motors that are independently controlled by the pump software. During the delivery stroke, one head delivers solvent with nanoliter precision. Solvent delivery smoothly switches from one head to the other as one piston slows down and the other speeds up. The pumps' software coordinates these movements while continually monitoring the pressure to prevent pulsation. As the solvent delivery switches from head to head, one head prepares to deliver by refilling and pre-pressurizing the solvent to just below the pressure in the other head. As a result, neither small bubbles nor changes in solvent compressibility affect accuracy. In this way, the unique SD-1 solvent delivery system sets a very high standard in flow accuracy for analytical and preparative separations (up to 6 in (150 mm) ID with 800 mL heads) (Figure 1).
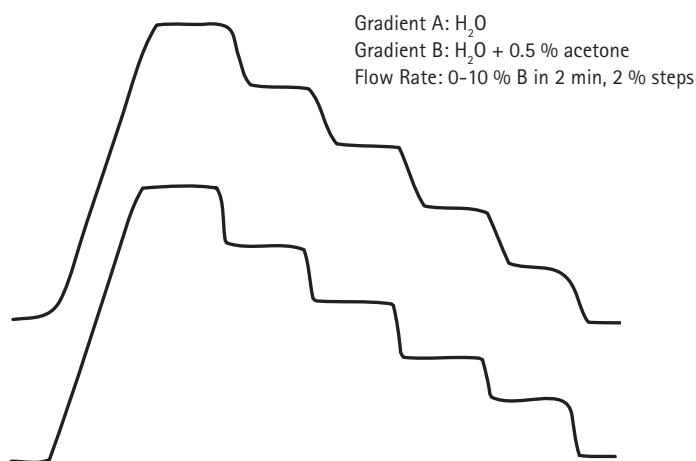

Gradient A: H_2O
Gradient B: H_2O + 0.5 % acetone
Flow Rate: 0–10 % B in 2 min, 2 % steps

Figure 1. Proportioning accuracy of a binary SD-1 system at 1 mL/min (top) and 200 mL/min (bottom), equipped with 200 mL/min heads.

State Of The Art Flow Precision

The PrepStar SD-1 system makes it significantly easier and less costly to purify material by preparative HPLC. The preparative method can be quickly and inexpensively optimized on a small diameter column. Once you are satisfied with the method, turn the valve to divert the flow to a preparative column packed with identical material, select a new flow rate, and instantly scale even the most difficult gradient separations up to the preparative level. Only the accuracy of a SD-1 pump produces a scaled-up preparative chromatogram with retention time similarities of 99.7 % over its entire flow rate range. With a high pressure capability of 6,000 psi, SD-1 is ideal for scaling up from small particle columns (see Figure 3).
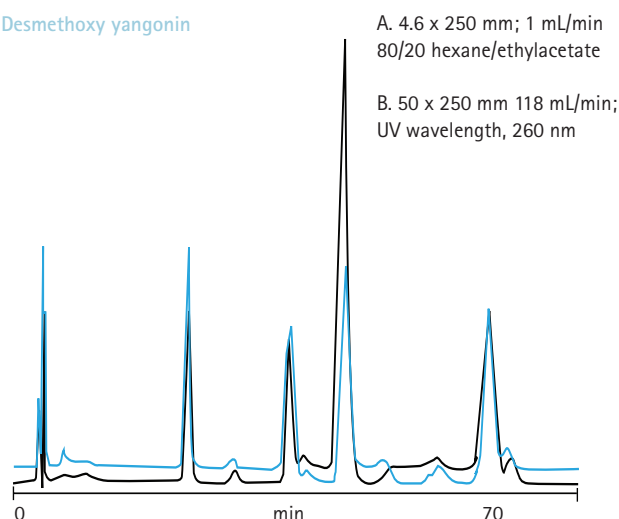
PrepStar SD-1

Desmethoxy yangonin

A. 4.6 x 250 mm; 1 mL/min
80/20 hexane/ethylacetate

B. 50 x 250 mm 118 mL/min;
UV wavelength, 260 nm

Figure 2. Scale-up performance of the SD-1 demonstrated on an extract of kava-kava.

Excellent Run–To–Run Reproducibility

Unprecedented preparative reproducibility simplifies process validation, and a complete validation package is available. You can be confident that the first separation run will be indistinguishable from the last. With its highly reproducible flows, SD-1 is well suited to time-based fraction collection programs because it increases recoveries of purified material and improves throughput.

Maximum Pressure vs Flow Rate

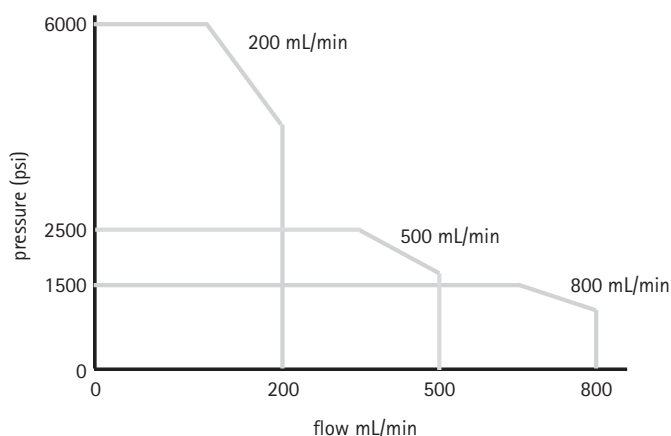Figure 3 shows the maximum pressure/flow curve for the 200, 500 and 800 mL/min flow heads.

Figure 3. Maximum pressure/flow curve for the 200, 500 and 800 mL/min flow heads.

The **PrepStar SD-1 pump with 200 mL/min heads works** well at both high and low flow rates. Figure 4 reveals the excellent flow rate linearity at low and high flow rates.

$y = -7.632e^{-2} + 5.2538x$
$R^2 = 1.000$

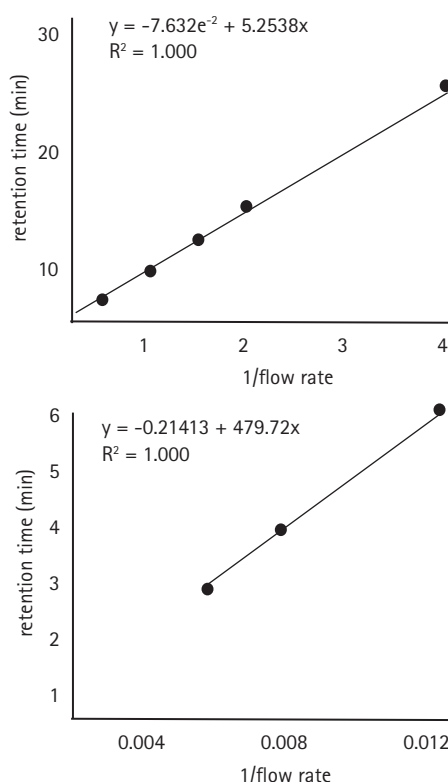$y = -0.21413 + 479.72x$
$R^2 = 1.000$

Figure 4. PrepStar SD-1 pump with 200 mL/min heads fitted reveals the excellent flow rate linearity at low and high flow rates.

Complete Computer Management

Whether your interest is in analytical to prep or prep to process, SD-1 can be fully computer controlled. LC ReSponder™ software is best suited to process applications, with Galaxie™ software being ideal for analytical to prep methods. Whichever you chose, you can be confident of having one platform and one solution, giving you options for Title 21 CFR Part 11 compliance and IQ/OQ documentation as part of the package.

LC ReSponder

LC ReSponder provides total system control and operational documentation of sample injection, solvent selection, gradient formation and fraction collection. You can monitor all process parameters on a single screen, making use of a single software package from discovery to production.

Galaxie

The Galaxie chromatography data system provides a unified interface for all LC and GC instruments. A single Galaxie method contains several functions including instrument control, data acquisition, display, processing and reporting. Direct linear scale-up is possible with Galaxie.

PrepStar SD-1

Technical Data

Item	200 mL Pump Heads	500 mL Pump Heads	800 mL Pump Heads
Max Flow (mL/min)	200 (200)[1]	500 (500)	800 (800)
Flow range (mL/min)	0.01 – 200 (1.0 – 200)	0.02 – 500 (1.0 – 500)	0.02 – 800 (1.0 - 800)
Accuracy (%)	0.3	0.3	0.3
Precision (%)	±0.1	±0.1	±0.1
Flow Noise (%)	<0.3	<0.3	<0.3
Max Pressure Ti (psi)	6,000	2,500	1,500
Display	backlit LCD, 4 lines, 160 characters		
Pressure Display	psi, bar or MPa (user selectable)		
Pressure Limits	high, low (user adjustable)		
Contacts Out	6, rated for 24 V DC, 1 A		
Contacts In	5 (stop, hold, transfer, inject and mark)		
Analag Out	1 x 12-bit, 0 to 10 V		
Analog In	2 x 18-bit, –0.5 to 2.5 V		
Auxiliary Power Out	1 x 5 V DC, 47 ohm resistor		
Liquid Contact	fluorocarbons, UHMW polyethylene, PEEK, sapphire, titanium, TZP ziroconia		
Washing Section	standard on all heads		
Operating Temperature	4 to 40 °C		
Power	100 – 130/200 – 260 V, 50/60 Hz		
Dimensions	40.6 cm (16 in) wide x 26.7 cm (10.5 in) high x 55.9 cm (22 in) deep		
Weight	34 kg (75 lb)		

[1] () in combination with LC ReSponder

Ordering Information

	Max Flow Rate (mL/min)	Part Number
PrepStar SD-1 drive module	–	R007105050
Pump head	200	R007105064
Pump head	500	R007105066
Pump head	800	R007105065

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