

# Prep SFC System

SFC-4000 Series



**JASCO**

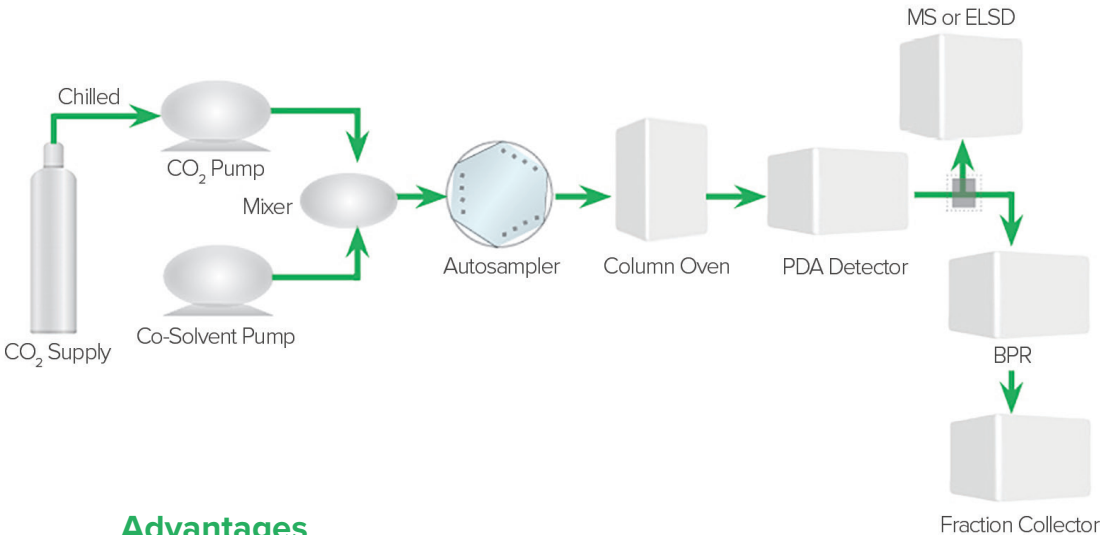
Performance  
Innovation  
Reliability

The SFC-4000 Preparative systems can be used for purifications using 10mm, 20mm or 30mm ID columns. The flexible configuration can be easily changed to suit a basic single column/single detector system or a multi-column/multi-detector system. Fraction collection options range from simple time-based 6 or 8 fractions to sophisticated threshold based open-bed fraction collection for up to 80 fractions. System control provides simple acquisition of chromatograms, automated data analysis, manual and automated fraction collection and a method scouting module for fast solvent and column screening.

# Prep SFC Advantage

Preparative Supercritical Fluid Chromatography uses supercritical CO<sub>2</sub> with a co-solvent, typically an alcohol, for chiral or achiral purifications. The intrinsic low viscosity and high diffusivity of supercritical CO<sub>2</sub> means that preparative SFC provides faster and more efficient purification compared to traditional Preparative HPLC.

Faster flow rates lead to shorter purification times while still providing excellent resolution. When CO<sub>2</sub> enters atmospheric conditions during fraction collection, it turns into a gas expanding at a 500:1 rate and is vented out of the system. The user is then left with their sample dissolved in a small amount of co-solvent.

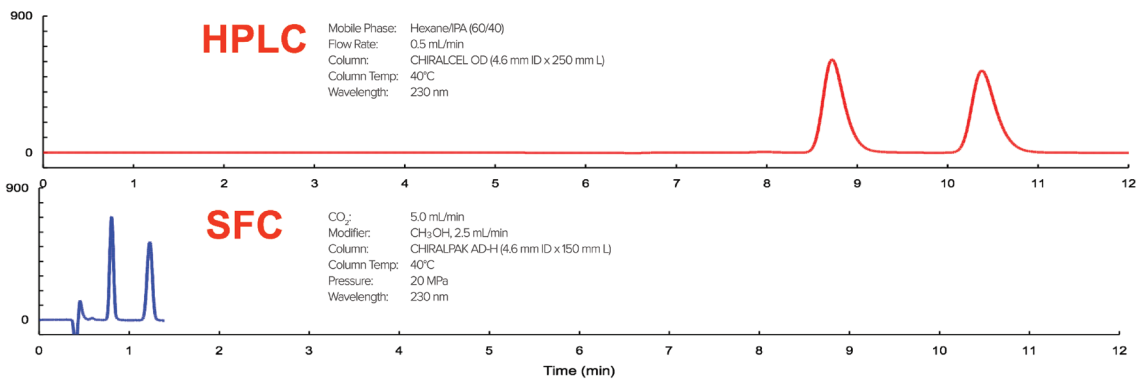


### Advantages

- 1. Faster analysis times
- 2. Higher selectivity with longer and smaller particle columns
- 3. Reduction in total solvent consumption
- 4. More environmentally-friendly solvents
  - a. CO<sub>2</sub> replaces hexane or heptane
  - b. Alcohols typically used as co-solvents
- 5. Longer column lifetimes
- 6. Orthogonal to HPLC methods
- 7. Easy removal of mobile phase after preparative fractionation
- 8. Reduction in waste disposal

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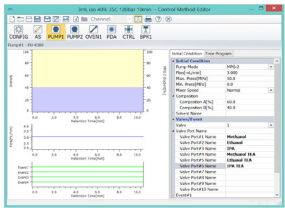


# Hybrid SFC

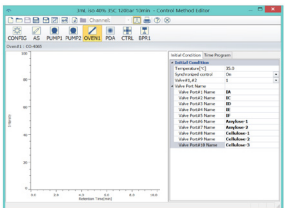


System	Column ID	CO <sub>2</sub> Flow Rate	Injection Capacity / 1 Day
Analytical	3mm, 4.6mm	0.5 - 7mL	Analytical
Hybrid	4.6mm, 10mm	0.5 - 14mL	Analytical to 100mg
Semi-Preparative	10mm, 20mm	5 - 40mL	100mg to 10 grams
Preparative	10mm, 20mm, 30mm	10 - 150mL	Up to 50 grams

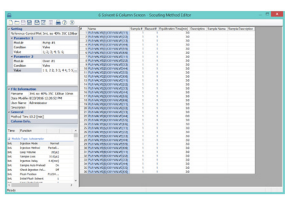
The hybrid SFC system combines both analytical method development and small scale purification into one system. This system offers flow rates from 0.5 to 20mL/min for 4.6mm and 10mm columns. After the best solvent-column combination is determined, optimization of the separation is performed prior to scale-up to the semi-prep column. The hybrid system offers open-bed fraction collection based on time, threshold or slope from up to 4 different detector signals including UV, CD and/or MS. The unique micro-cyclone separators provide simple open-bed collection with the gas-liquid separation occur in the fraction vial for maximum recovery of greater than 95%. A flexible fraction layout allows collection in a range of fraction vessels including 40mL or 100mL tubes, or larger Duran bottles (100mL, 250mL or 500mL) depending on the fraction volume.



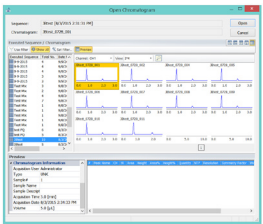
**Solvent Selection**  
Solvent selection valve, built into the co-solvent pump (Options 1, 6 or 10). Solvents can be named in the method and are saved with the data.



**Column Selection**  
Column selection valve, built into the column ovens (Options 1, 6 or 10). Columns can be named in the method and are saved with the data.



**Method Scouting**  
The method scouting module includes a workflow for building a simple sequence to screen up to 10 solvents and 10 columns without having to develop a method for each separation. At the end of a method scouting the optimal separation can be selected and a method is created ready for use.



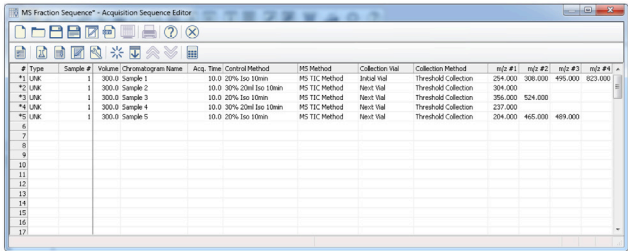
**Chromatogram Selection**  
Up to 48 chromatograms can be previewed and compared together in a single view to identify and select the optimal combination of solvent and column for the separation.

# Semi-Preparative SFC



System	Column ID	CO <sub>2</sub> Flow Rate	Injection Capacity / 1 Day
Analytical	3mm, 4.6mm	0.5 - 7mL	Analytical
Hybrid	4.6mm, 10mm	0.5 - 14mL	Analytical to 100mg
Semi-Preparative	10mm, 20mm	5 - 40mL	100mg to 10 grams
Preparative	10mm, 20mm, 30mm	10 - 150mL	Up to 50 grams

The semi-prep SFC has capacity for larger scale purification, but can still be used for analytical scale method development. The system is optimized for 10mm and 20mm ID columns. Optional column selection valves for up to 20 columns eliminate the need to remove and replace columns when scaling up from analytical to semi-prep. The open-bed fraction collector can be triggered on time, threshold or slope based on signals from up to 4 different detectors signals including UV, CD and/or MS. The new macro cyclone separators provide simple gas-liquid separation in the fraction bottle for unmatched fraction recoveries typically greater than 95%.



**Fraction Collection Sequence**  
The open-bed fraction collector is used with a fraction collection sequence, with fractions triggered based on a specific mass or masses for multiple sample peaks with different masses.



# Preparative SFC

# Preparative SFC-MS



The patent pending macro-cyclone separator allows for simple open-bed Prep SFC.

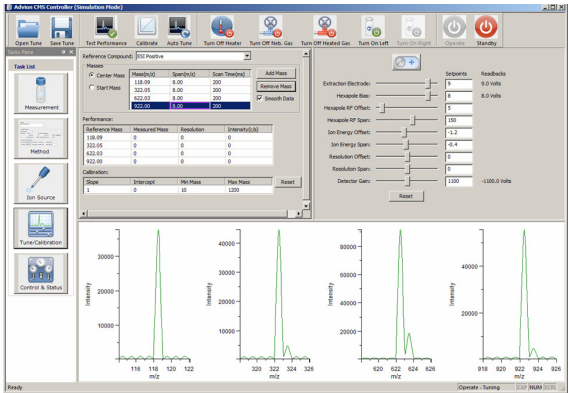
System	Column ID	CO <sub>2</sub> Flow Rate	Injection Capacity / 1 Day
Analytical	3mm, 4.6mm	0.5 - 7mL	Analytical
Hybrid	4.6mm, 10mm	0.5 - 14mL	Analytical to 100mg
Semi-Preparative	10mm, 20mm	5 - 40mL	100mg to 10 grams
Preparative	10mm, 20mm, 30mm	10 - 150mL	Up to 50 grams

The preparative SFC system is used for large scale purification using columns with IDs of 10mm, 20mm and 30mm. The system can be used for multiple sample library purification or individual component large-scale purification, with sample injection either using a preparative autosampler or syringe based large volume injector. Fraction collection can be triggered based on time, threshold or slope from up to 4 different detector signals including UV, CD and/or MS. The flexible fraction layout includes open-bed fraction collection for a larger number of fractions for multiple samples or valve based with up to 8 fractions for repeated injections producing large fraction volumes.

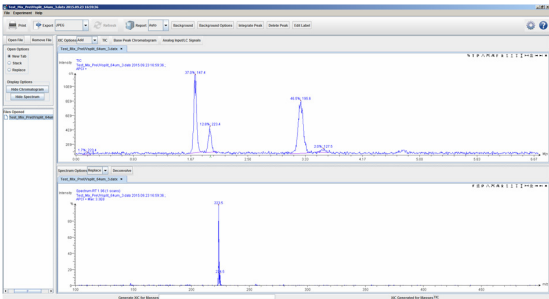
- The SFC-4000-MS combines all of the advantages of SFC with the selectivity and sensitivity of a mass spectrometer.
- The CMS single quadrapole mass-spectrometer is a perfect complement to SFC. As CO<sub>2</sub> passes out from the BPR it depressurizes and expands to a gas at a rate of 1:500, which assists with the nebulization at the ion source.
  - Multiple source options include; ESI, APCI and ASAP, with positive/negative ion mode switching for the high range detection of M/Z up to 2000 AMU.
  - The ChromNAV-MS add-in program includes full control and acquisition of the CMS, with auto-calibration and auto-tuning for easy optimization.



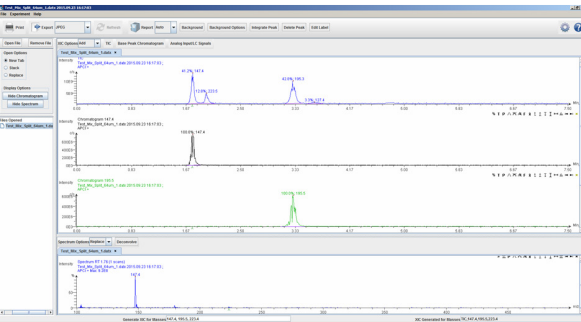
**Control**  
Auto-Tuning and Performance Checks can be made easily and routinely.



**Data**  
ChromNAV-MS system control with convenient access to all MS data.

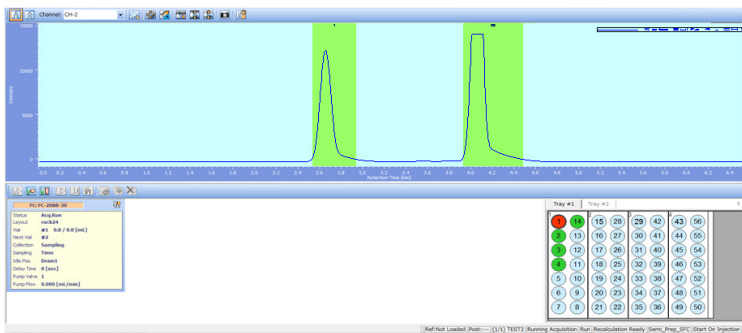


Explore the MS spectra, and extract ion chromatograms with just a few clicks.



# Open-Bed Preparative SFC-MS

# Fraction Collection

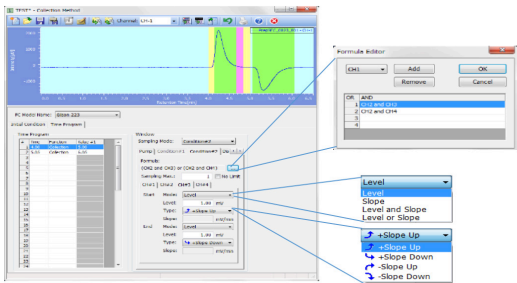


Open-Bed Recoveries			
Isocratic 35%	Theoretical Amount	Sample Recovered	% Recovery
Ketoprofen	19.60mg	18.12mg	92.4%
Sulfamethazine	40.48mg	39.24mg	96.2%
Gradient 5-50%	Theoretical Amount	Sample Recovered	% Recovery
Ketoprofen	20.32mg	19.62mg	96.5%
Sulfamethazine	42.09mg	41.60mg	99.0%



### Make-Up Pump

A fraction make-up pump adds extra solvent just prior to the back pressure regulator to increase fraction recovery and solubility, especially with low co-solvent percentages.



### Fraction Simulation

For simple setup of the fractionation conditions, a graphical simulation of previously run chromatograms is used to define and review collection conditions.



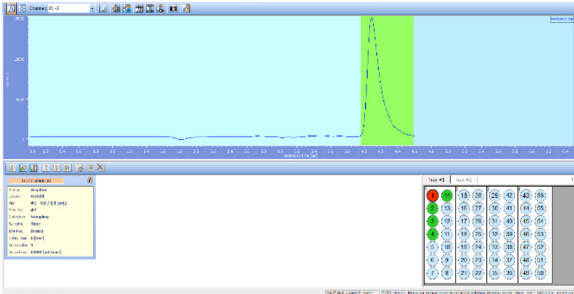
### Macro-Cyclone

The patent pending macro-cyclone separator directs the gas-liquid separation to occur in the fraction vial. This simplifies the gas-liquid separation process, but still provides recoveries greater than 90%

#	Type	Sample #	Volume	Chromatogram Name	Acq. Time	Collection Method	MS Method	Collection Val	Collection Method	MS #1	MS #2	MS #3	MS #4
1	1	1	300.0	Sample 1	10.0	20% Iso 10min	MS TIC Method	Initial Val	Threshold Collection	254,000	309,000	495,000	652,000
2	1	2	300.0	Sample 2	10.0	20% 20min Iso 10min	MS TIC Method	Next Val	Threshold Collection	304,000			
3	1	3	300.0	Sample 3	10.0	20% Iso 10min	MS TIC Method	Next Val	Threshold Collection	286,000	324,000		
4	1	4	300.0	Sample 4	10.0	20% 20min Iso 10min	MS TIC Method	Next Val	Threshold Collection	237,000			
5	1	5	300.0	Sample 5	10.0	20% Iso 10min	MS TIC Method	Next Val	Threshold Collection	204,000	405,000	469,000	

### Sequence

Entering the m/z of the compound for collection makes for simple sequence and method building.



### Fraction Collection

During both manual and automated fraction collection, the fraction vials in the sample tray are shown as the fraction location.



### High Recovery

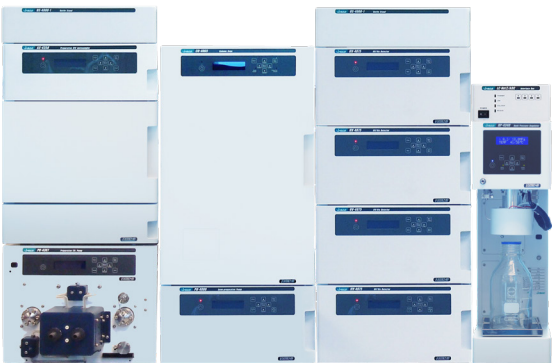
The patent pending micro-cyclone separators provide simple gas-liquid separation in the fraction vial typically yielding better than 95% recoveries.

# Related Products



## Analytical SFC

The analytical SFC system provides the first step in the scale up process, determining the optimized separation conditions. Numerous detection options are available including UV, PDA and fluorescence. The method development add-on provides multiple solvents and columns for automated separation optimization.



## Parallel SFC

The parallel SFC offers the highest throughput in column and solvent screening for chiral and achiral method development. With simultaneous analysis on 5 columns, the system provides 5 times the throughput of a traditional SFC. Up to 10 columns and 10 solvents cover a wide range of solvent-column combinations for rapid optimization.



## SFC-MS

The SFC-MS system combines the analytical SFC system with the selectivity and sensitivity of MS. Combining the method development kit with the identification ability of the MS provides the ultimate SFC-MS for method optimization.



## Supercritical Fluid Extraction

The supercritical fluid extraction product line offers analytical, semi-prep and preparative scale SFE systems. Various vessel options for solids or liquids are available along with method development options for multiple vessels and fraction collection.

# Specifications

	SFC System	Hybrid SFC	Semi-Prep SFC	Preparative SFC
Pump	CO <sub>2</sub> Flow rate	0.5 - 20mL/min	5 - 50mL/min	10 - 150mL/min
	Co-Solvent Flow rate	0.5 - 20mL/min	5 - 50mL/min	10 - 150mL/min
	Flow rate accuracy	±1% or ± 10µl/min	±1% or ± 50µl/min	±2% or ± 200µl/min
	Flow rate precision	0.05% RSD	0.1% RSD	2% RSD
	Solvent selection	Up to 10 solvents		
Autosampler	Injection range	1 - 1000µL	1uL - 10mL (AS), Up to 20mL (LVI)	
	Number of samples	180 (2mL vials), 135 (4mL vials),	135 (4mL), 40 (20mL), 32 (27mL)	
	Injection accuracy	± 0.1% or less		
	Injection precision	0.25% RSD or less		1.0% RSD or less
	Carryover	0.01% or less		0.05% or less
	Optional Temperature Control	4 - 40°C		
Column Oven	Temperature range	Ambient -15°C - 90°C		
	Column selection	up to at least 10 columns	up to 6 columns	
Back Pressure Regulator	Maximum Pressure	500 bar		
	Fraction Collection	Open-Bed		Open-Bed or Valve
Fraction Collector	Fractions	Up 112 (40mL) 12 (250 mL), 8 (500mL)		Up to 35 (200mL) 8 (250mL, 500mL, 1L, 2L)

UV-Visible and Circular Dichroism	UV-4070	UV-4075	CD-4095
Wavelength Range	190 - 900 nm	190 - 600 nm	220 - 460 nm
Noise Level	± 0.2 x 10 <sup>-6</sup> AU (at specified conditions)		0.04 mdeg (at specified conditions)
Drift	± 1 x 10 <sup>-4</sup> AU/h (at specified conditions) At constant room temperature		0.1 mdeg/h (at specified conditions) At constant room temperature
Data Output	100 Hz		
Flow Cell	Temperature controlled, tapered, path length 10 mm (Hybrid), 1 mm (Semi-Preparative, Preparative)		Tapered cell, path length 20 mm (Hybrid), 1 mm (Semi-Preparative, Preparative)

Photo Diode Array	MD-4010	MD-4015
Wavelength Range	190 - 900 nm	200 - 600 nm
PDA Elements	1024 ch	512 ch
Slit Width	1, 4, 8 nm	4 nm
Data Acquisition Rate	100 spectra/sec	
Flow Cell	Path length 10 mm (Hybrid), 1 mm (Semi-Preparative, Preparative)	

Mass Spectrometer	CMS-S	CMS-L
Ion Source	ESI, APCI & ASAP	
Mass Range	Up to 1200 m/z	Up to 2000 m/z
Polarity	Positive and Negative switching in same analysis	
Sensitivity	100pg reserpine (FIA – 5µL injection at 100µL/min S/N 100:1 (RMS) with SIM	
Acquisition Rate	10,000 m/z units/sec	
Accuracy	0.1 m/z units	
Stability	0.1 m/z over a 12 hour period (18-24°C operating temperature)	



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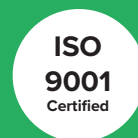
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