

# Supercritical Fluid Extraction

SFE-4000 Series



**JASCO**

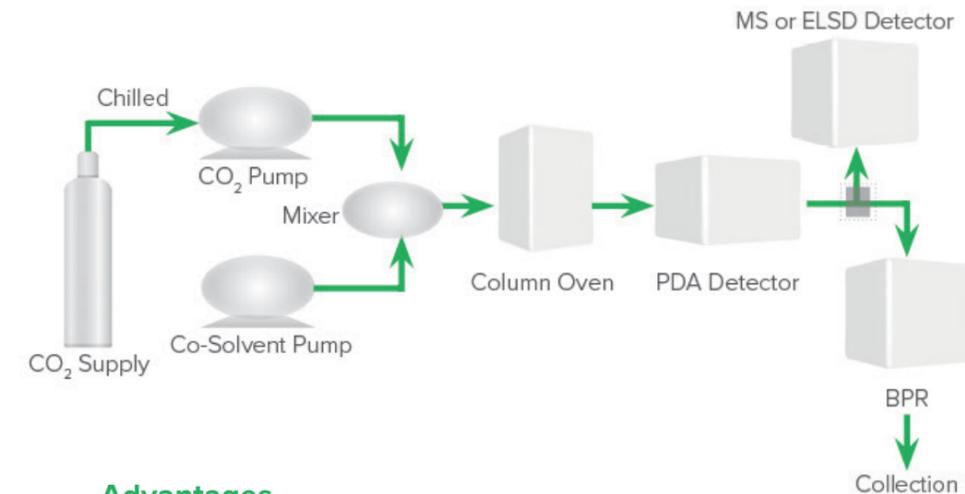
Performance  
Innovation  
Reliability

Supercritical Fluid Extraction (SFE) is a selective technique that extracts compounds from semi-solid to solid matrices and isolates the analyte(s) of interest by utilizing supercritical CO<sub>2</sub> as the primary constituent in the extraction fluid. The intrinsic low viscosity and high diffusivity of supercritical CO<sub>2</sub> produces extracts with superior purity and yield, while having lower operating costs compared to traditional hydrocarbon-based solvent extraction systems.

## SFE Advantage

Supercritical Fluid Extraction employs a supercritical fluid, most commonly CO<sub>2</sub>, as the A mobile phase solvent for the extraction. The intrinsic low viscosity and high diffusivity of supercritical CO<sub>2</sub> has rendered SFE a faster extraction and higher efficiency technique when compared to traditional liquid extraction. This provides faster flow rates and thus faster extraction times without the requirement for a higher

pressure system. The addition of a co-solvent to the CO<sub>2</sub> flow can help tune the strength further. The extraction oven can offer temperatures up to 90°C. Lastly after the extraction vessel is the back pressure regulator, which provides the back pressure requirement to keep the CO<sub>2</sub> supercritical, and is an integral part of the performance of the extraction.



### Advantages

1. **Selectivity** CO<sub>2</sub> polarity varies greatly depending upon the pressure it is exposed to. This makes CO<sub>2</sub> a tunable solvent which allows the user to find the precise conditions for extraction of the compounds of interest while leaving unwanted compounds behind. This inherent trait of CO<sub>2</sub> greatly reduces the need for post extraction cleanup that would be necessary with most solvent extractions.
2. **No Residual Solvents** Given the gaseous state of CO<sub>2</sub> at atmospheric conditions, the resulting extract does not require the long rotovap time needed to dry solvent extracted analytes.
3. **Faster** Given the high diffusivity and low viscosity of CO<sub>2</sub> in its supercritical state, the extractions typically take a fraction of the time compared to solvent extractions.
4. **Higher Yield** Due to increased temperature and pressure, supercritical CO<sub>2</sub> can penetrate many matrices that solvents cannot, thereby allowing for greater surface area contact which in turn increases yield.
5. **Low Operating Cost** Cost Per Extraction is significantly lower as the cost of CO<sub>2</sub> is much lower than the equivalent amount of solvent.
6. **Environmentally Friendly**

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When compared to Soxhlet extractions, supercritical fluid extractions have proven to be capable of providing extractions up to 25 times faster with equivalent recovery while using up to 30 times less solvent.

# Analytical & Hybrid SFE

# Semi-Prep & Preparative SFE

## Analytical SFE

The analytical CO<sub>2</sub> pump offers built-in Peltier cooling to maintain a stable CO<sub>2</sub> flow yielding excellent extraction time reproducibility. Automatic, built-in shut-off valves close the CO<sub>2</sub> inlet and outlet and isolate the pumps for quick and simple priming when not pumping.

The system can be configured for CO<sub>2</sub> only or 1-10 co-solvents, 1-10 extraction vessels for the vessel volumes listed above and 1, 6, 12 or 54 fractions.

System	Extraction Vessel	CO <sub>2</sub> Flow Rate
Analytical	1mL, 5mL, 10mL	0.5 - 10mL

## Hybrid SFE

The hybrid CO<sub>2</sub> pump offers a flow range from 0.5 to 20mL/min covering both analytical 10mL vessels up to semi-prep 100mL vessels. Automatic, built-in shut-off valves close the CO<sub>2</sub> inlet and outlet and isolate the pumps for quick and simple priming when not pumping.

The system can be configured for CO<sub>2</sub> only or 1-10 co-solvents, 1-10 extraction vessels for the vessel volumes listed above and 1, 6, 12 or 54 fractions.

System	Extraction Vessel	CO <sub>2</sub> Flow Rate
Hybrid	10mL, 50mL, 100mL	0.5 - 20mL

## Semi-Prep SFE

The semi-prep CO<sub>2</sub> pump offers a flow range from 5 to 40mL/min covering 50mL vessels up to 200mL vessels. Automatic, built-in shut-off valves close the CO<sub>2</sub> inlet and outlet and isolate the pumps for quick and simple priming when not pumping.

The system can be configured for CO<sub>2</sub> only or 1-10 co-solvents, 1-10 extraction vessels for the vessel volumes listed above and 1, 6, 12 or 54 fractions.

System	Extraction Vessel	CO <sub>2</sub> Flow Rate
Semi-Preparative	50mL, 100mL, 200mL	0.5 - 40mL

## Preparative SFE

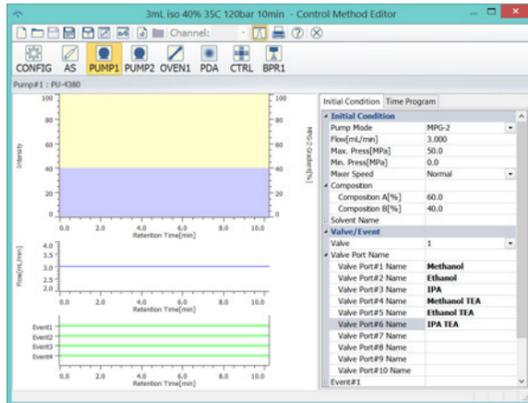
The Prep CO<sub>2</sub> pump offers a flow range from 10 to 150mL/min covering 500mL vessels up to 2L vessels. Automatic, built-in shut-off valves close the CO<sub>2</sub> inlet and outlet and isolate the pumps for quick and simple priming when not pumping.

The system can be configured for CO<sub>2</sub> only or 1-10 co-solvents, 1-10 extraction vessels for the vessel volumes listed above and 1, 6, 12 or 54 fractions.

System	Extraction Vessel	CO <sub>2</sub> Flow Rate
Preparative	500mL, 1L, 2L	10 - 150mL



# Options



## Solvent and Vessel Selection

1, 6 or 10 built-in solvent and/or vessel selection valves are available for the co-solvent pump and extraction oven. Solvents and vessels can easily be named and appear in a report.



## ChromNAV Software

Control up to four systems simultaneously with automated extraction method development and fraction collection. The LC-Net II/ADC is the hardware interface between your PC and the system components. Flow rate, pressure and temperatures are monitored and stored for each extraction and report styles are completely customizable.



## Fraction Collection and Makeup

The patent pending micro-cyclone separators provide simple gas-liquid separation in the fraction vial yielding 70% higher fraction recovery than without. This is the standard option for all SFE systems providing unmatched recovery efficiency greater than 90% and simple post collection fraction processing. In addition, an additional make-up pump can be added prior to the back pressure regulator to reduce fraction precipitation.



## Extraction Vessels

There are a variety of extraction vessels with designs specific for solids and liquids with a wide range of volumes.

# Specifications

Supercritical Extraction System		
Pump Section	CO <sub>2</sub> Flow Rates	0.5 - 10mL/min, 0.5 - 20mL/min, 5 - 50mL/min, 10 - 150mL/min
	CO <sub>2</sub> Inlet Supply Pressure	55 - 90 bar
	CO <sub>2</sub> Chiller	Operating at -10°C for optimal CO <sub>2</sub> density
	Built-In Shut-Off Valves	Automatically controlled by pump and software
	Protection	Built-in shut off valves protect the CO <sub>2</sub> pump
	Co-Solvent Flow Rates	0.5 - 7mL/min, 0.5 - 14mL/min, 5 - 40mL/min, 10 - 150mL/min
	Built-In Number of Co-Solvents Option	6 or 10 with automated software control
Oven Section	Pump Pressure Range	60 - 500 bar
	Extraction Oven Temperature	Ambient 15 - 90°C
	Heating Rate	Approximately 5°C/min
	Built-In Number of Extraction Vessels Options	10 extraction vessels
	Vessel Pressure	Up to 345 bar
Back Pressure and Fraction Section	Vessel Options	1mL, 10mL, 50mL (other volume vessels are custom made)
	Back Pressure Range	60 - 500 bar
	Pressure Control	± 2 bar or less for excellent extraction reproducibility
	Fraction Heater	For increased fraction recoveries
System	Fraction Options	Waste and 1, 6, 12, or 54 fractions
	Control	Front panel and complete software control
	Extraction Process Control	Process setup for complete automation in the software
	PC	Windows PC with flat panel monitor
	Power	110 - 220V, 50 to 60 Hz



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