

Where **Engineering**  
Meets **Application**

# Core | **Catalogue**

2022 v1.4

**SCIMED**<sup>™</sup>  
 Core Separations

# 14. Core | ESS Extraction Screening System

The ESS (Extraction Screening System) is aimed at users wanting to screen multiple supercritical conditions to optimise their process. It can also be used to prepare samples for HPLC or GC analysis, for instance in food safety and pesticide analysis. Utilising 8 extraction vessels (10mL, 25mL or 50mL) the ESS can be programmed to screen a variety of conditions automatically collecting each extract into separate collection bottles. Capable of generating pressures on up to 10,000 psi (689 bar) and 100 °C this versatile system is suitable for even the most demanding extractions.

## Applications

• Environmental

• Food

• Pharmaceuticals

• Consumer Products

• Polymers



## Extraction Screening

Optimising an extraction, when using CO<sub>2</sub> as a supercritical fluid can be time consuming when exploring both the effect of varying the pressure and temperature on the yield and purity. This optimisation can be greatly improved using the ESS which can be programmed with up to 8 individual conditions to help quickly screen for the best results.

## Sample Preparation

Preparing samples for analysis is key for ensuring results are both repeatable and reproducible. Correct sample preparation also helps to improve sensitivity and prolongs column life by removing unwanted contaminants that may interfere with the analysis. The ESS can be used with either CO<sub>2</sub>, CO<sub>2</sub> and a modifier or just pure solvent to effectively prepare any solid sample ready for analysis. Samples can be prepared in duplicate using the dual vessel arrangement. Every 2 vessels are in one of the 4 heated zones ensuring each dual pair is heated to the sample temperature. This makes the ESS the ideal choice for sample preparation capable of opening under a wide variety of conditions.

## PLE (Pressurised Liquid Extraction)

PLE also known as accelerated solvent extraction (ASE) and pressurised solvent extraction (PSE) uses both high pressure and temperature liquids to improve liquid solid extraction process. High pressures and temperatures act to improve solvation promoting mass transfer through high sample penetration increasing extraction efficiency.

The ESS implements dual fluid delivery system allowing both the induction of CO<sub>2</sub>, CO<sub>2</sub> + solvent or just solvent into the 8 extraction vessels.

## SFE (Supercritical Fluid Extraction)

Like PLE, Supercritical fluid extraction (SFE) using CO<sub>2</sub> is a technique to extract material from a solid matrix. Higher pressures are required compared to PLE to effectively extract compounds from solids. CO<sub>2</sub> in its critical phase behaves like a non-polar, lipophilic solvent that has the benefit of being cheap, renewable and leaves the extracted residue solvent free once the CO<sub>2</sub> returns to its gas state.

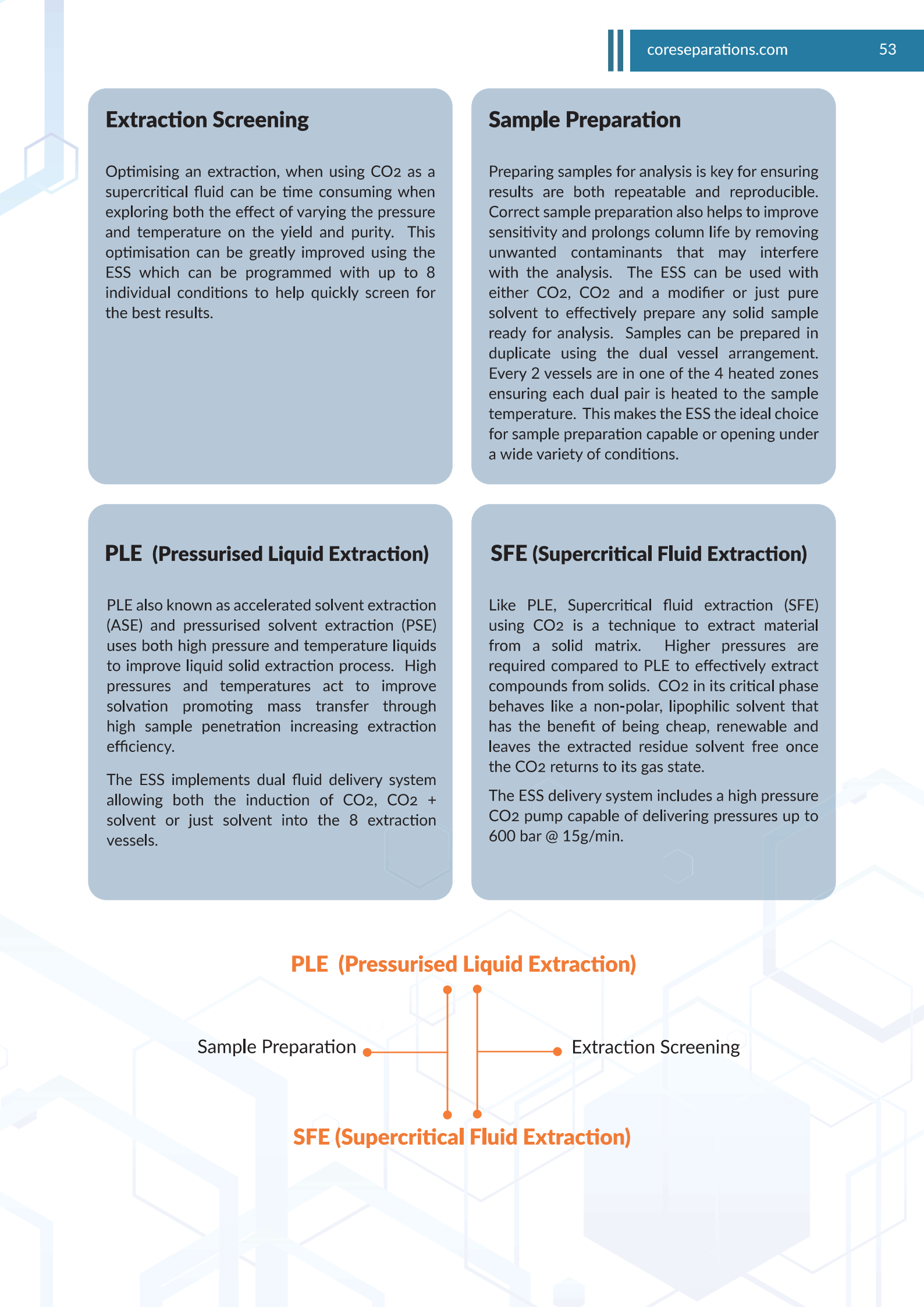
The ESS delivery system includes a high pressure CO<sub>2</sub> pump capable of delivering pressures up to 600 bar @ 15g/min.

## PLE (Pressurised Liquid Extraction)

Sample Preparation

Extraction Screening

## SFE (Supercritical Fluid Extraction)



# The ESS

The ESS is a fully automated extraction system, consisting of 8 extraction vessels, 8 collection vessels and a fluid delivery system capable of delivering 15g/min of CO<sub>2</sub> and 10mL/min solvent at pressures up to 689 bar. The system includes multiple heater zones allowing the CO<sub>2</sub> and solvent to be pre-heated before entering the extraction vessels, 4 heated zones for the vessels and a heater located after the ABPR to help vaporise the CO<sub>2</sub>. The CO<sub>2</sub> pump has an independent flow meter to both measure and control the incoming CO<sub>2</sub> and 16 pneumatically actuated valves to control which vessel is selected from the method.

## Vessel sizes available

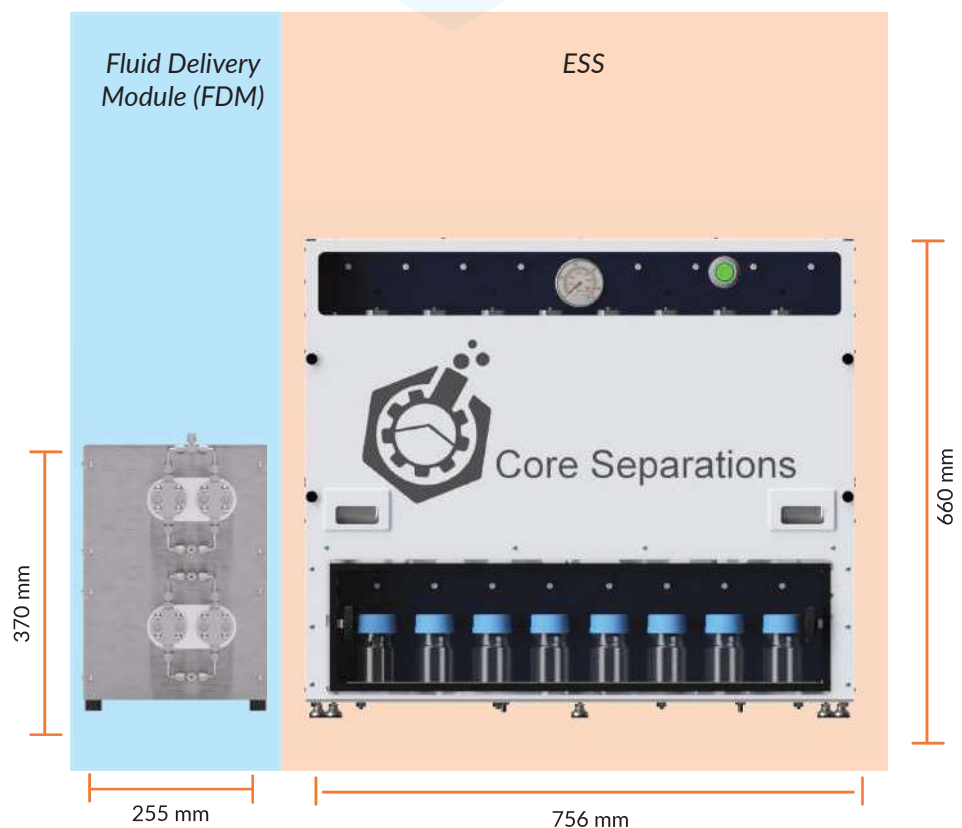
EV10 | EV25 | EV50

### Extraction

|                          |                      |
|--------------------------|----------------------|
| Number of Extractors     | 8                    |
| Extractor volume         | 10mL<br>25mL<br>50mL |
| CO <sub>2</sub> flowrate | 15g/min              |
| Co-solvent               |                      |
| Flowrate                 | 10mL/min             |
| Max pressure             | 600 bar              |
| Max temperature          | 100°C                |

### Separation

|                      |       |
|----------------------|-------|
| Number of Collectors | 8     |
| Capacity             | 100mL |



## Specification



### Power requirements

200-240 V (13A)



### Pneumatic Air Pressure (bar/psi)

6.9 bar / 100 psi, 1/4" compression inlet



### CO<sub>2</sub> Inlet

55 bar, 1/4" compression inlet



### Vent Line

3/8" compression inlet



### Weight

100 kg (depending on options)



### Chiller

Required



### PC & Monitor

Minimum of 1.5 GHz, 16 GB RAM, 250 GB storage, Ethernet port for control panel, wired or wireless connection for Internet connectivity. Google Chrome browser. Monitor 21" minimum with 1920 x 1080 pixels resolution

## SFX Software



Dashboard visualisation of key processing parameters



Manual control of key components within the SFX system in real time using APC to accurately control the pressure



Recipe menu allows you to automate a variety of conditions including flow rates, temperatures and pressures over a defined time limit.



Real time data logging and visualisation via Grafana Dashboard



Programmable warning and alarm limits to alert the user that the system conditions are approaching the cut off safety limits.



SQL database logs all the alarms and user activity to aid in fault detection and diagnosis.



When dealing with high pressure systems, pressure control is key. Standard control is accomplished using proportional, integral and derivative control (PID). Unsatisfied with the standard level of control, Core Separations developed APC (Advanced Pressure Control). This multilevel PID control achieves superior operational management while maintaining rapid pressure build up.



### Automated Extraction

Extractions run sequentially over the 8 positions controlled by the SFX software. Automated valving allow for unattended operation.



### Independent Conditions

System runs sequential through the 8 vessel positions allowing the user to define different pressures for each vessel, The temperature is controlled through 4 heater zones allowing for each vessel pair to be controlled to the same temperature.



### Automated Collection

Each vessel is paired with a collection position allowing each individual extraction to be isolated and collected in its own bottle.

### Certification

