

SPE-01 Solid Phase Extraction System

For Automatic Cleanup of Food and Environmental Samples

About PromoChrom

PromoChrom Technologies focuses on the development of sample preparation solutions for trace analysis. Since year 2005, PromoChrom has developed SPE-01 cleanup station, SPE-03 cleanup station, SPE-04 online/offline SPE, LC-04SP valve system and SPE-06 mini SPE. Each of these instruments target specific applications. SPE-01 has been used for cleanup in analysis of pesticide residues and extractable petroleum pollutants in soil. SPE-03 has been used for water quality monitoring. LC-04SP has been used to build multi-dimensional HPLC.

In 2011, PromoChrom developed flow-path-integration technique for liquid handling. The technique is based off ideas from integrated circuit and lab on a chip manufacturing. It combines various switching valves into one liquid handling module. This approach simplified the structure of our instruments considerably, making the instruments more affordable and more reliable.

SPE-01 solid phase extraction system is designed for automatic sample cleanup in analysis of food and environmental samples. It can be used for pesticide residue and drug residue analysis in food samples and for analysis of pollutants in soil samples. SPE-01 can automatically fulfill all the necessary actions for solid phase extraction and column chromatographic cleanup, such as conditioning of columns, sample loading, washing, solvent mixing and fraction collection. By providing constant flow rate and well controlled elution procedures, SPE-01 helps to improve quality and efficiency of trace analysis and release chemists from tedious sample preparation routines.

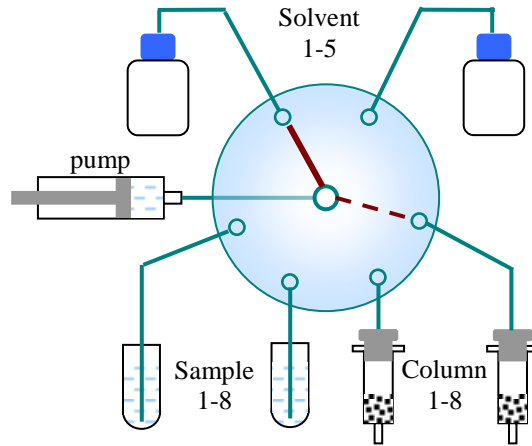
SPE-01 provides 2 configurations to fit the sample throughput needs:
SPE-01-01 handles 12 samples one by one (single channel design),
SPE-01-02 processes 12 samples in groups of 4 (4 channel design).



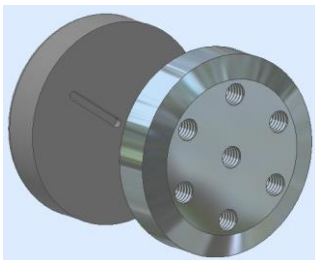
1. Working principle of SPE-01

The following diagram illustrates the working principle of SPE-01-01

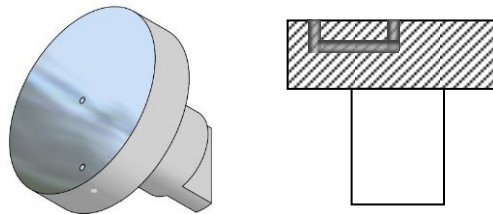
SPE-01-01 uses a stream selection valve and a syringe pump to transfer elution solvents or sample liquid to the SPE columns. Although all the samples share the same syringe pump and the valve, cross contamination is avoided as the flow path in the valve and the syringe pump are continuously washed during the elution procedures. Besides, the instrument has built in clean procedures to wash the tubing for samples and the flow path automatically, to make sure all the sample contacting surface is fully cleaned.



The flow path in the valve is specially designed so that the sample liquid has minimum contact with the stator surface when the valve is turning. This feature is very helpful for avoiding contamination of sticky compounds (such as benzopyrene) on the surface of the stator.

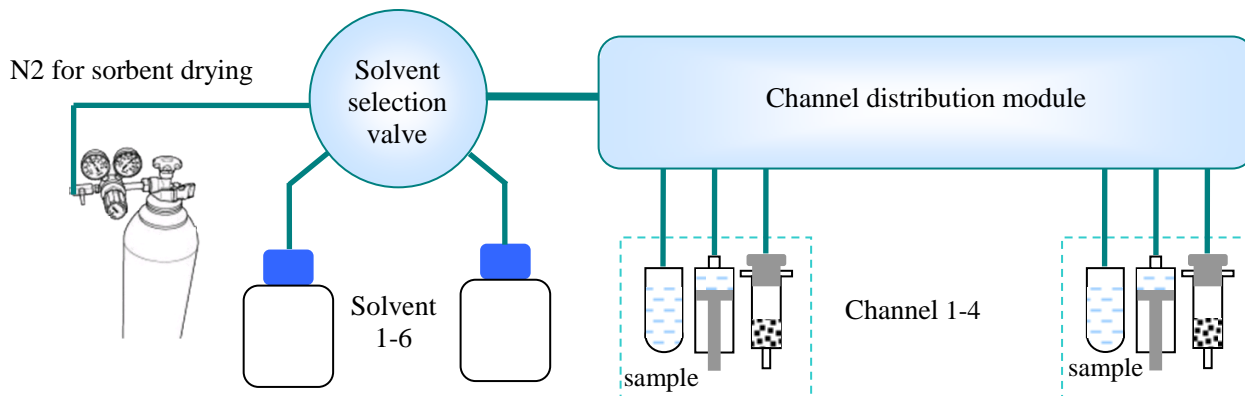


flow path in a Conventional selection valve



Flow path for the valve used in SPE-01-01

As shown in the below diagram, the major components of SPE-01-02 are a stream selection valve and a channel distribution module. Each channel is arranged closely and each sample has isolated flow path, removing possibilities of cross contamination.

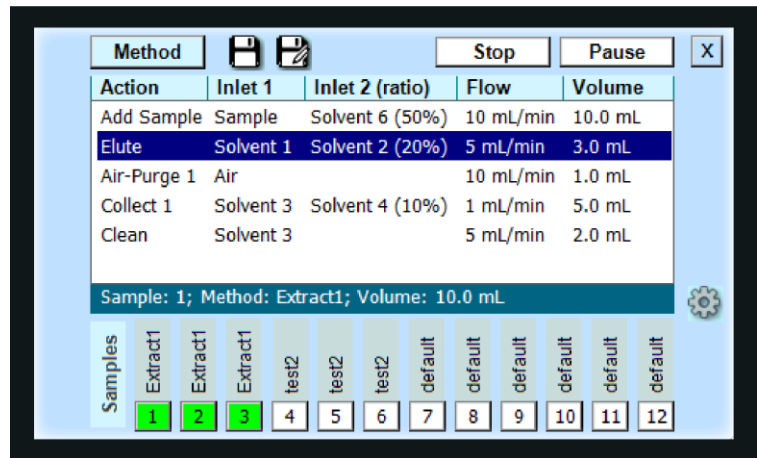


2. Features

2.1 Easy operation

SPE-01 uses built-in methods. They can be easily edited with the touch interface. Below is a typical routine operation procedure:

- Place sample tubes and add samples
- Install columns and collection tray
- Select method for each sample
- Select samples to run
- Press the start/stop button.



The screen indicates samples 1 to 3 are being processed using method “Extract1”. The system is currently running the elution step of sample 1 and the progress is 10.0mL from the previous step.

The instrument will process each selected sample automatically based on their respective methods.

2.2 Column blockage detection and smart handling

The system can detect the blockage of SPE column and reduce the flow rate accordingly. If blockage is still occurring, the instrument will pause to wait for human attendance.

2.3 Small footprint and simple structure due to flow path integration technique

Normal automated SPE instruments involves many switching valves and complex tubing connections. A multi-channel SPE is normally heavy and large in size. The tubing connection is also complex, making maintenance difficult.

Thanks to the flow-path-integration technique, the weight and dimension of SPE-01 are around half of other multi channel SPE instruments. The weight of a SPE-01-II is only 12 kg.

2.4 Adaption of various SPE columns

SPE-01 adopts an innovative general purpose adapter to deal with variations in diameter of SPE columns. The adapters can be easily adjusted when different type columns are used.



2.5 Automatic washing of sample tubing

To prevent cross contamination, function for cleaning of sample tubing is built into the methods. After loading

sample then tubing will be washed automatically using solvent. It is followed by air purge to remove leftover solvents. As the wash direction is opposite to the loading direction, the small particles accumulated on sample filters are effectively removed. This function is also integrated into the methods, thus it is not necessary to wash the tubing separately after the extraction.

3. Specifications

	SPE-01-01	SPE-01-02
Sample capacity	12 per batch (sequential mode)	12 per batch (parallel groups of 4)
Volume of sample	0.5 to 50 mL	0.5 to 50 mL
Material of wetted parts	Teflon, 316 stainless steel, Pyrex glass	Teflon, 316 stainless steel, Pyrex glass
System control	Microcontroller with keypad data entry	Microcontroller with keypad data entry
Method	Permanent storage >100 methods on instrument	Permanent storage >100 methods on instrument
Method functions	Pre-condition, load sample, elution with 5 solvents, solvent mixing, washing of sample line, fraction collection.	Pre-condition, load sample, elution with 5 solvents, solvent mixing, washing of sample line, air purge, drying with nitrogen, fraction collection.
Pump flow rate	0.5 to 85 mL/min	0.5 to 85 mL/min
Pressure limit of pump	6 bar	6 bar
Pump reproducibility (C.V.%)	<1.5	<1.5
Power consumption	< 1.0 A at 24 VDC	< 1.5 A at 24 VDC
Weight (Kg)	11.5	12.5
Dimension (cm)	34 x 34 x 45 (width x depth x height)	34 x 34 x 45 (width x depth x height)

4. Order information

Part No.	Description
SPE-01-01	Includes SPE-01-01 mainframe, 24V power supply, and user manual.
SPE-01-02	Includes SPE-01-02 mainframe, 24V power supply, and user manual.
MOD-005	Extend sample volume to 2000 mL



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