

DSPC systems

The missing link in your laboratory!

SPE-03 | 8-Channel System



The #1 choice for PFAS in water, environment & food

A compact and efficient workhorse for semi-volatile pollutants in water, food, soil and oil samples.

Modified Methods

ISO 21675

EPA Method 537.1

EPA Method 533

- ▶ CLEAN
- ▶ COMPACT
- ▶ PERFORMANT
- ▶ REPEATABLE

— FULLY —
AUTOMATED • PARALLEL • VALIDATED

8 samples processed simultaneously from start to finish. Used by government, commercial and research labs.

ABOUT PROMOCHROM

PromoChrom Technologies focuses on the development of sample preparation solutions for trace analysis. Our highly versatile systems have helped customers automate even the most challenging sample extraction processes.

Since **2005**, PromoChrom has developed the SPE-01 and SPE-03 cleanup stations, SPE-04 online/offline SPE's, LC-04 online SPE, RT-01 sample purifier and SPE-06 mini SPE. Each of the instruments targeted specific applications.

In **2017**, "**Two-tier online SPE**" was invented by PromoChrom which uses a second SPE column for online SPE. This method significantly increased the detection sensitivity and mitigated column compatibility and clogging issues commonly found in online SPE systems.

By **2019**, the SPE-03 is widely used by government and private labs for PFAS extraction from drinking water. The system was proven to achieve clean background, high recovery and good repeatability. A new model of SPE-03 was released in September.

In **2011**, PromoChrom developed the **flow-path-integration** technique for liquid handling. It combines various switching valves into one liquid handling module. This simplified the structure of our instruments considerably, making the instruments more affordable and reliable.

In **2018**, we added the **automated bottle rinsing** function and **minimal-Teflon** option to the SPE-03 to tackle **PFAS** extraction in drinking water.

Today, we continue to look for more opportunities and breakthroughs in laboratory process automation.



Proudly Canadian and supporting the local industry

Products built and tested at our Richmond and Surrey locations



SMALL BUT VERSATILE

Imagine an 8-channel system so compact in size, you can easily fit 2 or 3 in a standard fume hood. It performs the most challenging SPE procedures, with every step in parallel. Accelerate your water, food, fuel and biological testing with this helper.



- parallel operation • positive pressure system • minimal-teflon option • 0.5 - 4000mL sample loading • sample bottle rinsing • SPE cartridge conditioning/washing/elution • SPE cartridge blockage detection • nitrogen dry • air purge • solvent mixing • programmable wait • system cleaning • 2 fractions per sample • 2 waste channels
- 1/3/6 mL SPE cartridges • 5" touch interface • up to 100 methods • customizable



Water & Soil

PFAS
PAHs
EPHs
Pesticides
Drugs

Food & Feed

Mycotoxins
Food additives
Pesticides
Drugs

Biochemical fluids

Drugs
Metabolites
Hormones

Oil & Fuel

Additives
Oxidized components
Polar compounds

and more...



Wide-mouth

Narrow-mouth

60mL - 1000mL

HDPE/PP

Plastic Bottles

Common HDPE and PP bottles can be loaded up-side down using the MOD-004 sample bottle rack. This enables automated sample bottle rinsing and allows maximum sample transfer.



Glass Bottles

250mL to 1L glass sample bottles can also be mounted using the MOD-004 sample bottle rack to achieve automated sample bottle rinsing and maximum sample transfer

GL45 cap

250mL - 1000mL

Custom caps

Test tubes

Centrifuge tubes

Up to 4L bottles

Other containers

Open Mouth Containers

Smaller sample containers such as 50 mL centrifuge tubes and large volume sample bottles can be loaded using sample extension tubing that comes with the SPE-03.



FEATURES

Fast. Easy. Versatile.

8-CHANNEL SYSTEM

The SPE-03 processes 8 samples up to 4L in parallel. All samples start and finish at the same time. Our patented multi-channel valve has separate flow paths for each sample to remove cross-contamination.

SPE CARTRIDGE

Compatible with 1/3/6mL SPE cartridges without the need for extra adapters. Custom adapters can be made for other sizes.



FRACTION COLLECTION

The default fraction collection tray comes with 1 row for 15mL tubes and 1 row for 50mL tubes. Customizations available for sizes between 1.5mL to 50mL.



AUTOMATIC BOTTLE RINSE

Using the MOD-004 sample bottle rack with spray adapters, the SPE-03 can rinse the sample bottles and then add the rinsate back to the SPE columns to improve recovery. This feature can also be used for cleaning all the fluid lines after each sample batch.



TOUCH SCREEN INTERFACE

The SPE-03 comes equipped with a resistive touch screen interface that works even under wet conditions. There is no need for an external computer. Sample selection and method editing can be intuitively performed in just a few steps. When running, the screen highlights the current step being run and displays its processed volume.

| Action | Inlet 1 | Inlet 2 (ratio) | Flow | Volume |
|-------------|-----------|-----------------|------|--------|
| Elute | Solvent 1 | - | 5 | 3.0 |
| Add Sample | Sample | - | 10 | 20.0 |
| Rinse W | Solvent 2 | Solvent 3 (20%) | 20 | 20.0 |
| Air-Purge W | Air | - | 10 | 2.5 |
| Collect 1 | Solvent 2 | Solvent 3 (20%) | 5 | 10.0 |
| Air-Purge 1 | Air | - | 10 | 2.5 |
| Clean | Solvent 2 | Solvent 3 (20%) | 5 | 20.0 |

Samples: 1 to 8, Method: test_run_2, Volume: 10.0 mL

■ POSITIVE PRESSURE

The SPE-03 system uses positive pressure to achieve controlled flow rates when delivering samples and solvents. Liquids are much less likely to build-up in SPE cartridges than vacuum-based systems.

■ NITROGEN DRYING

Nitrogen drying of sorbent material can be programmed into the methods. This step can be time-controlled or until the user wishes to resume.

■ 2 WASTE OUTLETS

Sample and solvent waste can be separated on the system for labs that require special treatment of organic, halogenic or acidic waste. This also prevents waste bottles from filling up too quickly.

■ SOLVENT MIXING

Two solvents can be mixed at specified ratios to enable gradient elution.

■ COLUMN BLOCKAGE DETECTION AND SMART HANDLING

The system can detect the blockage of SPE columns and reduce the flow rate accordingly. If blockage continues, an alarm will sound and the instrument will pause for the user to step in.

■ ADJUSTABLE DISPLAY

The touch screen display can be tilted up to 30 degrees, allowing the system to be conveniently operated while standing or sitting.

■ EASY TO CLEAN

Our patented valve technology greatly simplifies and shortens fluid lines in the system. This makes cleaning easy and reduces solvent usage. Simply run your customizable cleaning method between sample batches.

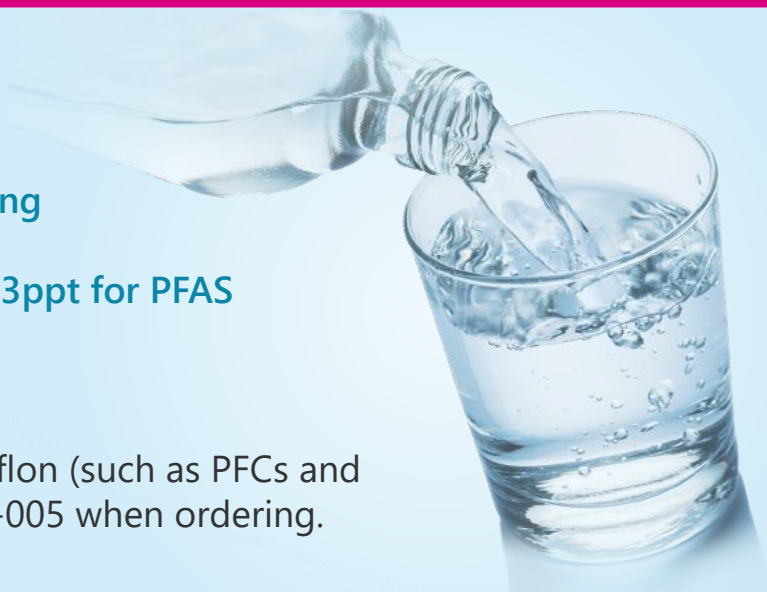
MOD-005

MINIMAL-TEFLON OPTION

- All material tested for background
- Non-PTFE solvent and sample tubing
- Used by labs with MRL as low as 0.3ppt for PFAS

A widely tested and proven solution

for applications that are sensitive to Teflon (such as PFCs and PFAS in drinking water). Request MOD-005 when ordering.



WORKING PRINCIPLE

Patented Valve Design to Achieve Complex Liquid Handling

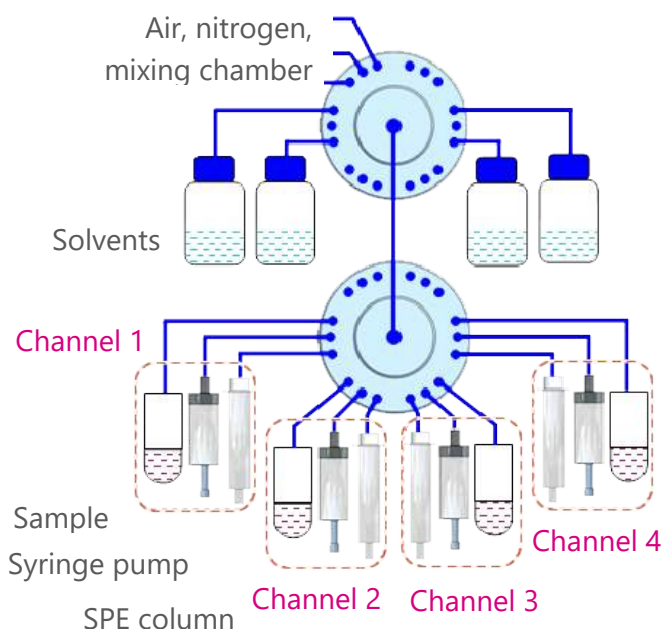
PromoChrom's multi-functional valve shown below is based on our flow-path-integration technique. The function of one such valve is equivalent to several normal stream selection valves and isolation valves.

With 1 stream selection valve and an 8-channel distribution valve, the SPE-03 can provide isolated flow paths for 8 samples, choose from 6 solvents, blow air and nitrogen and perform solvent mixing.

See diagram below for a 4-channel example.



8-Channel Valve



Reduced Number of Valves

This design has replaced the conventional method of using one stream selection valve and one isolation valve per channel. Not only does it save space and reduce complexity, there is also more room for other functionalities.



Valves in Conventional Systems

Design Benefits

■ Low Maintenance Requirement

With much fewer parts in operation, very little maintenance and part replacement is required.

■ Small Footprint

The SPE-03 is only 34 x 34 x 45 cm in size and can easily fit on crowded lab benches and inside fume hoods.

■ Low Carry-Over

Shorter and reduced number of fluid lines makes the system easy to clean after each sample run.

APPLICATION EXAMPLE

ISO 21675 and EPA Method 537.1

Being one of the few automated SPE systems that can follow ISO 21675 as well as EPA method 537.1 and provide clean background, the SPE-03 has become a popular choice for extracting Per- and polyfluoroalkyl substances (PFAS) from drinking water.

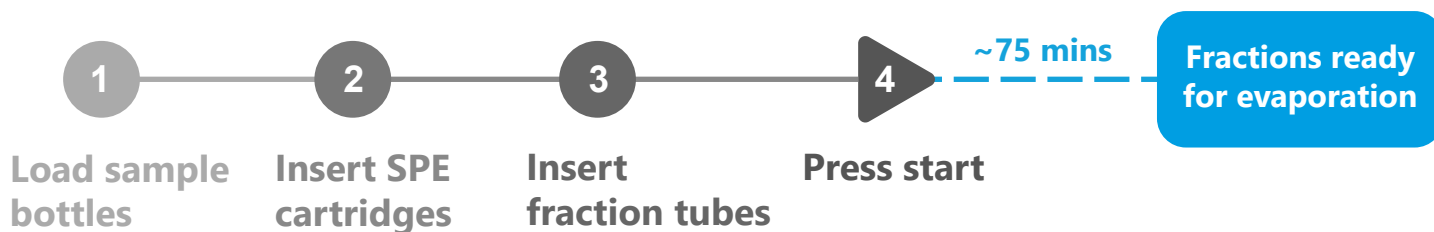


The following summarizes a typical SPE-03 setup for EPA Method 537.1. LC-MS grade methanol is connected as Solvent 1 and reagent water is connected as Solvent 2. Waste 1 and Waste 2 are used for aqueous and organic waste respectively. Fractions are collected into fraction 1.

Steps Programmed on SPE-03

| Action | Inlet 1 | Flow | Volume | Description |
|--------------|------------|----------|--------|-----------------------------------------------------|
| Elute W2 | Solvent 1 | 10mL/min | 15mL | Pre-condition with 15mL of MeOH at 10mL/min |
| Elute W1 | Solvent 2 | 10mL/min | 18mL | Pre-condition with 18mL of H2O at 10mL/min |
| Elute W1 | Solvent 2 | 10mL/min | 5mL | Add 5mL of H2O to SPE cartridge |
| Add Samp W1 | Sample | 10mL/min | 250mL | Load 250mL of sample at 10mL/min |
| Rinse W1 | Solvent 2 | 15mL/min | 7.5mL | Rinse bottles with 7.5mL H2O and deliver rinsate |
| Rinse W1 | Solvent 2 | 15mL/min | 7.5mL | Rinse bottles with 7.5mL H2O and deliver rinsate |
| Air-Purge W1 | Air | 10mL/min | 5mL | Purge lines with 5mL air to remove excess H2O |
| Blow N2 | Time Based | | 5mins | Blow Nitrogen for 5mins |
| Rinse 1 | Solvent 1 | 5mL/min | 4mL | Rinse bottles with 4mL MeOH and elute to fraction 1 |
| Rinse 1 | Solvent 1 | 5mL/min | 4mL | Rinse bottles with 4mL MeOH and elute to fraction 1 |
| Collect 1 | Sample | 5mL/min | 5mL | Collect remaining MeOH into fraction 1 |

Operator Involvement



After pushing start, the SPE-03 automates the entire SPE process, which takes about 75 minutes to finish 8 samples. A customizable cleaning method is run between sample batches. The cleaning process including setup usually takes less than 10 minutes to complete.

APPLICATION EXAMPLE

Results & Discussion

Below are one of our customers' Initial Demonstration of Capability (IDC) and Minimum Reporting Level (MRL) confirmation results. IDC was performed on one batch of 4 x 50ppt LFBs. MRL was performed on 7 x 2ppt LFBs over the span of 3 days. Tables show the mean recovery and RSD for all 18 compounds.

IDC - 4 x 50ppt LFBs

Requirements: Mean < $\pm 30\%$, RSD < 20%

| Compound | %Recovery | %RSD |
|----------------|-----------|-------|
| PFBS | 84 | 5.16 |
| PFHxA | 93 | 7.81 |
| HFPO-DA (GenX) | 95 | 6.59 |
| PFHpA | 104 | 8.71 |
| PFHxS | 99 | 1.81 |
| ADONA | 101 | 4.92 |
| PFOA | 104 | 5.60 |
| PFOS | 95 | 3.98 |
| PFNA | 105 | 4.73 |
| 9CI-PF3ONS | 96 | 1.88 |
| PFDA | 96 | 8.48 |
| NMeFOSAA | 101 | 3.93 |
| PFUnA | 96 | 6.78 |
| NEtFOSAA | 101 | 1.26 |
| 11CI-PF3OUdS | 86 | 1.84 |
| PFDoA | 87 | 4.83 |
| PFTTrDA | 89 | 7.81 |
| PFTA | 85 | 10.11 |

MRL - 7 x 2ppt LFBs

Requirements: Mean \pm HR_{PIR} < $\pm 50\%$

| Compound | %Recovery | %RSD |
|----------------|-----------|-------|
| PFBS | 100 | 5.69 |
| PFHxA | 101 | 4.77 |
| HFPO-DA (GenX) | 97 | 5.14 |
| PFHpA | 111 | 5.02 |
| PFHxS | 104 | 3.79 |
| ADONA | 101 | 5.92 |
| PFOA | 112 | 8.08 |
| PFOS | 102 | 2.24 |
| PFNA | 105 | 7.59 |
| 9CI-PF3ONS | 96 | 2.95 |
| PFDA | 96 | 8.52 |
| NMeFOSAA | 98 | 5.56 |
| PFUnA | 100 | 5.47 |
| NEtFOSAA | 103 | 4.21 |
| 11CI-PF3OUdS | 95 | 6.38 |
| PFDoA | 95 | 12.66 |
| PFTTrDA | 95 | 11.45 |
| PFTA | 92 | 5.99 |

The accuracy and precision of the SPE-03 is well within method requirements. The system reliably performs the same extraction process each time which eliminates significant sources of human error.

Good Recovery on Field Samples

The SPE-03 has also shown good recovery for samples with complex matrices. Better surrogate recovery of well water samples was seen after switching from the vacuum manifold to the SPE-03. The improvement is attributed to the controlled flow rate of our positive-pressure system.

Low Background Contamination and Carry Over

The minimal-Teflon option keeps background interference well below the tightest limits. Most of our customers have 1ppt and 2ppt MRLs, some even low as 0.3ppt. Carry over was validated at multiple customer sites by running a batch of high spikes (100ppt to 180ppt) followed by blanks, with a quick cleaning method in between. The cleaning method was effective in reducing any carry over to < 1/3MRL.

SPECIFICATIONS

SPE-03

| | |
|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No. of samples | 8 in parallel |
| No. of fractions | 2 |
| No. of waste channels | 2 |
| No. of solvents | 6 * |
| Sample volume | 0.5 - 4000 mL |
| Fraction volume | up to 50 mL |
| SPE cartridge size | 1/3/6 mL * |
| Flow rate | 0.5 - 65 mL/min |
| Fluid delivery | Positive pressure |
| Display | 5" resistive touch |
| No. of methods | 100 |
| Method actions | Cartridge pre-condition Cartridge wash Add Sample Elution Sample bottle rinsing Sample line cleaning Air purge Solvent mixing Nitrogen dry Pause |
| Dimensions | 34 cm x 34 cm x 45 cm |
| Weight | 13 kg |
| Power | 1.5A @ 24V |

* Can be customized

Accessories

MOD 004

Sample bottle rack for up to 1L bottles.
Enables sample bottle rinsing.
Comes in 2 racks, 4 bottles per rack



Leakproof Sample Containers

Pre-cleaned PP and
HDPE bottles from
C&G containers



SPE Cartridges

C18, C8, SAX, SCX, WAX, WCX, PSA,
and more

Customizations

MOD-005 Minimal-Teflon Option

Replaces all PTFE moving parts
Replaces PTFE solvent and sample lines

MOD-004 Sample bottle rack

Can be customized for any bottles up
to 1L. Simply send us your bottles

Fraction rack

Default rack holds 1 row of 15 mL and
1 row of 50mL centrifuge tubes.
Customizable for containers up to 50mL

SPE Cartridge adapters

Cartridges other than 1/3/6 mL sizes
can have custom adapters

| Part No. | Description |
|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| SPE-03 | 8-channel SPE-03, 24V power supply, touch screen stylus pen, solvent bottle adapters, sample extension tubing and user manual |
| MOD-004 | Sample bottle rack with spray adapters and tubing. Comes with 2 racks, 4 positions each. Specify sample bottle volume and cap dimensions when ordering. |
| MOD-005 | Minimal-Teflon option for PFAS analysis. |
| SPE Cartridges | Refer to www.dspsystems.eu for part numbers |
| Sample Bottles | Refer to www.dspsystems.eu for part numbers |