

SPE TurboTrace System

Instructions Manual

FMS

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WARNINGS / CAUTIONS

The SPE must be used according to this manual, otherwise safety may be impaired.

Unplug all power cables from the mains outlet before servicing the SPE.

Unplug all power cables from the mains outlet before unplugging the vacuum pump from the SPE.

1. The SPE is flexible, yet highly sensitive instruments. Read this User's Manual before use.
2. Only adequately trained personnel should operate the system. A documented training program based on training received during the installation/training session from installation engineers is highly recommended
3. Do not shut off the system main power switch, or individual module power switches while the system is running.
4. Do not connect or disconnect connector (s) while the system power is on.
5. Do not remove or install module (s) while the system power is on.
6. Always, replace fuses with the same type and value to protect against fire hazard.
7. Always operate the system under specified electrical specifications.
8. Always wear protective eyewear and gloves when operating the system.
Do not use powdered gloves.
9. Always observe safe laboratory practices and rules when operating the system.
10. When handling solvents, samples and other chemicals, changing tubing, or operating the system, always observe good laboratory practices.

11. When using the system, follow generally accepted procedures for quality control and methods development.
12. When handling solvents changing columns/cartridges or other components, and during operation, always observe good laboratory practices. Know the physical and chemical properties of solvents and refer to the Material Safety Data Sheets for appropriate handling precautions.
13. Do not loosen fittings while the system is running.
14. To prevent the loss of samples, make sure sufficient solvent exists for the run.
15. Replace fraction/waste bottles in a timely fashion, to prevent spill over
16. Changes or modifications to this system without written consent from the manufacturer may void warranties.
17. Do not nick, kink, or bend sharply tubings. This may restrict flow or cause tubing to fail.
18. Do not touch any moving parts while the system power is on.
19. Do not attempt to reregulate the nitrogen pressure. This has to be done at the factory or by instructions from FMS service staff.

For technical help please contact:

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Specifications:

Pump Flow Rates	0.02 to 15.0 mL/min
Pressure sensor setting	0 to 30 psi
Vacuum pump.....	¼ HP, 29 HG, 4 pole-2 stage, 110VAC @ 2.7A
Power	120 VAC/ 60 Hz; or 230 VAC/50
Pneumatic requirements...	N2 at 20psi
Control.....	SPE control module processor

1. Installation

1.1 Unpacking and Inspection

Prior to opening the shipping containers, inspect it for damage or evidence of mishandling. If it has been damaged or mishandled, notify the manufacturer before opening the container. Once the container is opened, inspect the contents for damage. Any damage should be reported to the manufacturer immediately. Save the shipping container. Check the contents against the packing list.

1.2 Location/Environment

The preferred environment for the SPE is normal laboratory conditions. The area should be clean and contaminant free. If the instrument is not mounted on the SPE cart it should be located on a stable flat surface with surrounding space for ventilation and the necessary electrical and N2 connections.

1.3 Electrical Connections

Unpack the SPE and check the voltage setting on the Power Entry Module on the back of the SPE Power Supply module. Make certain the voltage setting agrees with the power to be supplied to the unit. A system which is connected to a 100-120VAC voltage source should have a voltage setting of “110VAC”, and a system connected to a 220-240VAC voltage source should have a voltage setting of “220VAC”.

If the voltage setting is correct, plug the SPE Control module into a properly grounded electrical outlet. Plug the SPE Vacuum pump power cable into the SPE Control module “Vacuum pump outlet”.

WARNING: Do not bypass the safety ground connection as a serious shock hazard could result.

If the SPE Control module does not have the correct voltage configuration, notify the manufacturer or your local distributor.

1.4 Other Connections

All necessary connections are made in the factory. However, a list of the connections are described below:

1.4.1 The 5 tubings coming out of the holes marked “S1” through “S5” will connect to the ports marked “Solvents” 1 through 5 respectively. These are the solvent ports.

1.4.2 The tubing coming out of the hole marked “F1” will connect to the port marked “FRC”. This is the fraction port.

1.4.3 The tubing coming out of the holes marked “W” will connect to the port marked “OW”. This is the organic waste port.

1.4.4 The tubing passing through the bubble detector marked “Sample Vacuum” will connect to the sample bottle. The tubing coming out of the holes marked “Sample pump” will connect to a different port on the sample bottle.

1.4.5 The rinse bottle -the port with a tubing- connects to the sample bottle & the other port will connect to “RNS” port on the SPE sample processing module.

1.4.6 Connect the vacuum pump tubing to one of the ports of the 1 gallon safety vacuum Bottle.

1.4.7 Connect the other port of the 1 gallon safety vacuum bottle to one of the ends of the
Tubing that goes through the “Vacuum pump bubble detector”.

1.4.8 Connect one of the ports of the 5 gallon vacuum bottle to the other end of the
Tubing that goes through the “Vacuum pump bubble detector”.

1.4.9 Connect the other ports of the 5 gallon vacuum bottle to the ports labeled “VAC” on
The SPE sample processing module.

2. Power up

SPE power up & set up

2.1.1 Turn the SPE control module power switch on

2.1.2 Turn the SPE sample processing module Valve and Pump power switches on.

2.1.3 Connect the Nitrogen tank (set at 20 PSI, & with a 1/4”NPT outlet) to the SPE sample processing module Nitrogen port located in the back of the module

3. Construction

The SPE plumbing and wetted parts are constructed from stainless steel, Teflon , Delrin, and polyethylene materials, making it compatible with most organic solvents and non organic chemicals.

The materials of construction make the SPE easy to clean. However, care must be taken to keep the SPE contaminant free. This is accomplished by running wash programs after every sample run.

The SPE is constructed of modules.

3.2 Modules & connections

3.2.1 SPE Control Module:

The SPE control module controls all operations of the SPE system directly or indirectly.

The SPE control module supplies all the power to the SPE system modules.

It also controls & supplies power to the SPE vacuum pump.

Refer to the SPE-Turbo software instruction manual for a complete description of the control module software.

NOTE: The SPE features a bubble detector for the vacuum pump. This is for safety. In case of liquid passing through the tubing between the 5 gallon vacuum bottle & the 1 gallon safety vacuum bottle the bubble detector will stop the vacuum pump.

This would alert the user to empty the 5 gallon vacuum bottle. If this is not done liquid will eventually fill the safety vacuum bottle & get into the vacuum pump causing damage.

The user should pay attention to the 5 gallon vacuum bottle & dispose of the liquid in a timely manner & not wait for the bubble detector to stop the pump.

3.2.2 SPE Sample Processing Module

The SPE positive displacement pump receives start/stop signals from the SPE control module.

It is used to pump solvents during cartridge conditioning and, solvent exchange and elution.

It is also used to load low volume samples.

The SPE Sample Processing module receives PIO signals from the SPE control module to control all valves & bubble detectors.

The SPE sample processing module contains the main plumbing, sample and solvent valves, Rinse and fraction valves, Nitrogen and column selection valves, mechanical pressure gauge, sample bubble detectors, positive displacement pump, pressure transducer, & its mechanical pressure gauge.

It sends processed bubble detector signals back to the control module which in turn processes the signals to close the relevant sample valve(s).

It also sends pressure transducer signals to the control module, which in case of an over-pressure event will halt all system operation.

NOTE: Pulling air through the SPE cartridge may result in the loss of some compounds of interest. To prevent this, bubble detectors are integrated in the SPE design, which cause sample valves to close upon the detection of air in the sample line.

4. Operation

The SPE (Solid Phase Extraction) system is used to do extraction of different analytes from a wide variety of aqueous samples; such as drinking water, waste water, environmental, etc.

It uses a vacuum pump to load relatively high volume samples, and a positive displacement pump to deliver solvents.

The SPE uses nitrogen to rinse sample bottles as well as to dry the cartridges before elution and pushing the fractions out of the cartridges after elution.

The SPE cartridges are at first conditioned with solvent. The samples are then loaded onto the cartridges simultaneously.

NOTE: Samples are never loaded completely all at the same time. Although the samples are loaded simultaneously, because of slight mechanical variations, they finish loading at slightly different times. When one sample is completely loaded onto its cartridge, the corresponding

bubble detector detects air in the sample tubing & causes the sample valve to close, thereby preventing air being pulled through the cartridge. As each sample is totally loaded onto its cartridge, its valve will close. This process will continue, until all samples are loaded.

After all samples are loaded onto the SPE cartridge/disk, the sample bottles are rinsed with solvent. The rinse solvent is then loaded onto the cartridge.

A next typical step would be to dry the cartridges by pushing nitrogen through them. This will prepare the cartridges for the elution steps. The fractions are then eluted using solvents.

4.1 How to do extraction on the SPE:

4.1.1 Turn the SPE system on.

4.1.2 Take the SPE cartridge out of its sealed pack. Insert one SPE cartridge end cap into the cartridge, and push firmly all the way in to make a good seal. Snap on the insert caps.

4.1.3 Snap the cartridge/end cap assembly on the SPE sample processing module. Connect the inlet & outlet tubings to the cartridge/end cap assembly. Repeat this for the other cartridges.

4.1.4 Place the solvent bottles on the left side of the SPE and insert the solvent tubings coming off the side into the appropriate solvent bottle.

Note: Appropriate solvents are chosen according to the application method.

4.1.5 Confirm that step 2.2 of this manual (SPE power-up & set up) has been performed.

4.1.6 Confirm that the rinse bottle contains the desired rinse solvent and capped tightly.

4.1.7 Confirm that all sample bottles contain sample and capped.

4.1.8 Label the fraction vessels.

4.1.9 Place the fraction tubing coming off the right side in the fraction vessel, and cap.

4.1.10 Open the SPE extraction program.

4.1.11 Click on “ALL” to execute the program.

4.2 Nitrogen supply:

A nitrogen tank/generator set at 20PSI is connected to the rear of the SPE sample processing modules using the nitrogen tubing assembly supplied with the SPE.

The “Rinse N2 valve” is downstream from the pressure regulator which is set at 8-10PSI. When open it will pressurize the rinse bottle, pushing the rinse solvent out to the sample bottle. Sample bottles are rinsed simultaneously.

The “Dry cartridge N2 valve” is downstream from the pressure regulator which is set at 10PSI. Cartridges are dried simultaneously.

Appendix A: Switches, etc.

1. The Main Power Switch: located on the front side of the Control Module.
2. Valves power switch: located on the front left side of the sample processing module control box on top.

This is the power switch for the individual sample processing module only.

3. Pump control switches, etc.
 - 3.a Pump power switch:

located on the front right side of the sample processing module control box on top.

This is the power switch for the individual sample processing module only.

- 4.b Pump pressure reset switch:

Located on the front side of the sample processing module, above the pump.

This switch is used to reset the system after an overpressure problem has been resolved, press the reset switch to reset the system.

- 4.c Pump motor enable toggle switch:

Located on the front side of the sample processing module, above the reset switch.

This switch is used to enable/disable the individual pumps.

When the switch is toggled up the pump is enabled, and when it is in the middle or down state the pump is disabled.

4.d Pump pressure transducer:

Located on the front side of the sample processing module and above the pump.

The pressure transducer halts system operation in case of an overpressure event.

NOTE: FMS Systems are shipped with the maximum set pressure set at 30 PSI.

4.e Positive displacement pump:

The pump-heads used in the SPE Systems are positive displacement piston pump-heads. The wetted parts are PTFE Teflon. The pump-head fluid displacement is in direct proportion to the stroke length.

Appendix B: Indicator LED'S:

1. Fuse and voltage indicator LED'S:

2.a Voltage indicator LED'S are green and indicate the presence of the required voltages inside the particular module. (The LED being "ON" indicates the presence of the specific voltage).

2.b Fuse indicator LED'S are yellow and when "on" indicate that the particular fuse is good at present.

The fuse indicator LED'S correspond to the silk-screened fuse holder in the rear of the particular module.

