

Biotage® SPE Dry 96 and Biotage® SPE Dry 96 Dual

User Manual



Biotage[®] SPE Dry 96 and Biotage[®] SPE Dry 96 Dual User Manual

CONTENTS

- 1** Introduction
- 2** System Precautions and Warranty
 - 2 General Precautions
 - 2 New System Inspection
 - 2 Warranty and Liability
- 3** Installation
 - 3 Connecting the Gas Supply
 - 3 Connecting the Electrical Supply
- 4** Operation
 - 4 Plate Clearance and Adjusting Plate
 - 4 Adjusting Gas Flow Rate
 - 4 Temperature Control
- 5** Method Development
 - 5 Starting Guidelines
 - 5 Thermally Labile Samples
 - 5 Solvent Evaporation Times
 - 5 Needle Depth
- 6** Maintenance
 - 6 The System
 - 6 Suggested Wash Procedure for the Needles
 - 7 Needle Replacement
- 8** Troubleshooting
- 9** Specifications

Introduction

Biotage® SPE Dry 96 and Biotage® SPE Dry 96 Dual from Biotage are sample concentrator systems designed to greatly enhance the speed of sample dry down in deep and shallow 96-well and 384-well collection plates. The systems utilize heated gas to accelerate the evaporation of typical lab solvents by up to 5 times or more, depending upon the application. Often this eliminates the bottleneck associated with the concentration step in high throughput sample screening and sample processing using 96-well and 384-well collection plates.

The systems deliver heated gas, typically nitrogen, from needle assemblies located on the upper and lower heads of the systems. The needle assemblies are easily removed from the head units for cleaning, repair, or replacement. When concentrating samples, collection plates are placed on the adjustable lower needle assembly and then raised to the upper needle assembly via the sliding arm. The collection plate may be raised to any height or distance from the upper needle assembly allowing the user to develop methods utilizing a variety of plates and sample volumes. Gas temperatures from both needle assemblies are fully user-adjustable.

For operation, the systems require a gas supply and a standard 110 VAC (US and Japan) or 220 VAC (UK and Europe) power outlet. The system's compact size accommodates use under any hood or micro-ventilation system.

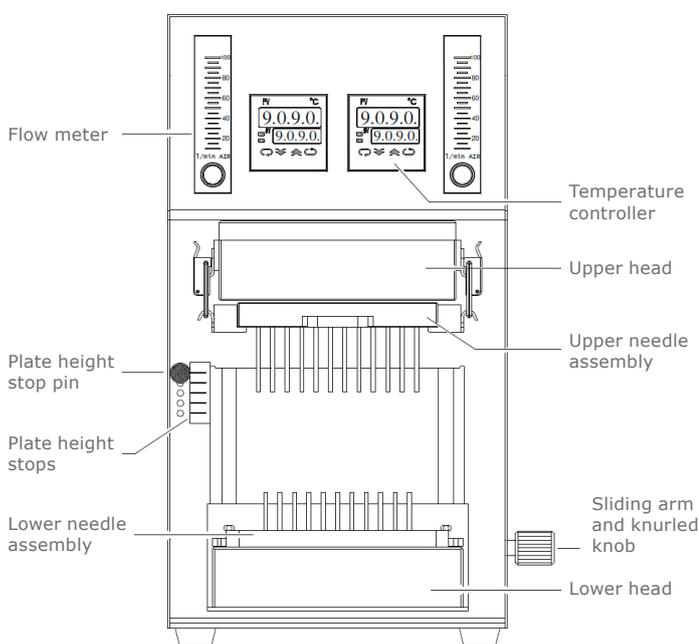


Figure 1. The front of SPE Dry 96.

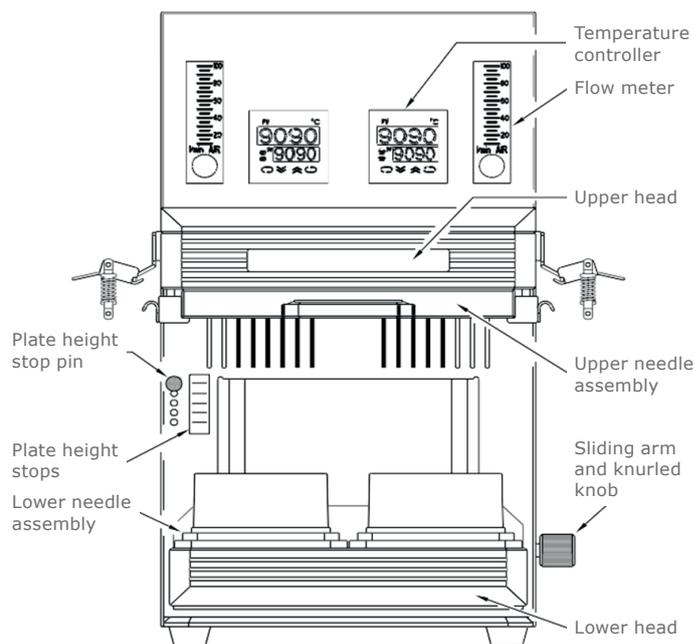


Figure 2. The front of SPE Dry 96 Dual.

System Precautions and Warranty

PLEASE READ ENTIRE MANUAL BEFORE OPERATING YOUR SYSTEM

General Precautions

- » The system requires a standard 110 or 220 VAC power outlet.
- » The system is designed to operate with a steady flow and pressure of compressed air or nitrogen gas. The use of any other gas has not been tested by the manufacturer and is not recommended.
- » The system should be used under a hood, micro-ventilation, or other appropriately ventilated location to protect against evaporated solvent and gas accumulation.
- » The maximum inlet gas pressure of the system is 65 psi. Do not exceed 65 psi.
- » The system will allow flow rates up to 60 L/min (SPE Dry 96) or 90 L/min (SPE Dry 96 Dual). Do not operate above the maximum flow rate as this may cause system damage and result in injury to the operator.
- » The system will operate at temperatures ranging from ambient to 60°C at the upper head, and ambient to 80°C at the lower head. The temperature is determined by the operator's setting of the digital temperature controllers. Do not attempt to use the system outside of these guidelines.
- » The system has a fully adjustable lower head that moves vertically to accommodate most plate depths and solvent volumes. For large volume assays where many plates of the same size and volume will be processed, utilize the plate height stops (located on the left front side of the system) to avoid plate-to-plate sample contamination and damage to the needles.

New System Inspection

When unpacking your system, inspect the system for visible damage that may have occurred in shipping such as scratches or dents in the casing, bent needles, damaged gauges, etc. If you notice any damage to the system, contact Biotage immediately. DO NOT PLUG IN OR TURN ON THE SYSTEM.

The package should include the system, a power cord, two hose clamps, an air hose connection, and the user manual. Please contact Biotage for immediate replacement if any of these items are missing.

Warranty and Liability

See the “Biotage Terms & Conditions of Sale” document at www.biotage.com.

Installation

THE SYSTEM IS USER INSTALLED

For routine operation, place the system in a well-ventilated and easily accessible area.

Connecting the Gas Supply

The gas supply is attached to the system via a hose fitting located on the lower rear panel of the system. Attach one end of a suitable length of 1/4" I.D. hose to the fitting and the other end to the pressure regulator of your gas supply. Use the two hose clamps provided. Do not turn on the gas supply until you have completed the set-up and have read this manual in its entirety.

The gas supply hose should be pressure rated to at least 80 psi for safety.

Adjust the inlet gas supply to 50 psi (SPE Dry 96) or 60 psi (SPE Dry 96 Dual).

A steady gas supply, in volume and pressure, will give you the best results by minimizing fluctuations in temperature and volume through the needles.

The system requires at least 25 L/min of gas flow in order to operate the heating units. These heaters are set to shut off automatically below 25 L/min.

While the use of an in-line filter (moisture or particle) helps avoid sample contamination, they tend to be restrictive of the gas flow. If you choose to use one, be sure to use high flow rate filters.

Connecting the Electrical Supply

Insert the power cord into the power inlet on the lower rear panel of the system prior to plugging the cord into the 220 or 110 VAC power outlet. The power cord inlet also houses the electrical breaker fuse. The system's power switch is located on the lower left side near the rear of the SPE Dry 96 system or the lower rear near the left side of the SPE Dry 96 Dual system; see Figure 3 and Figure 4.

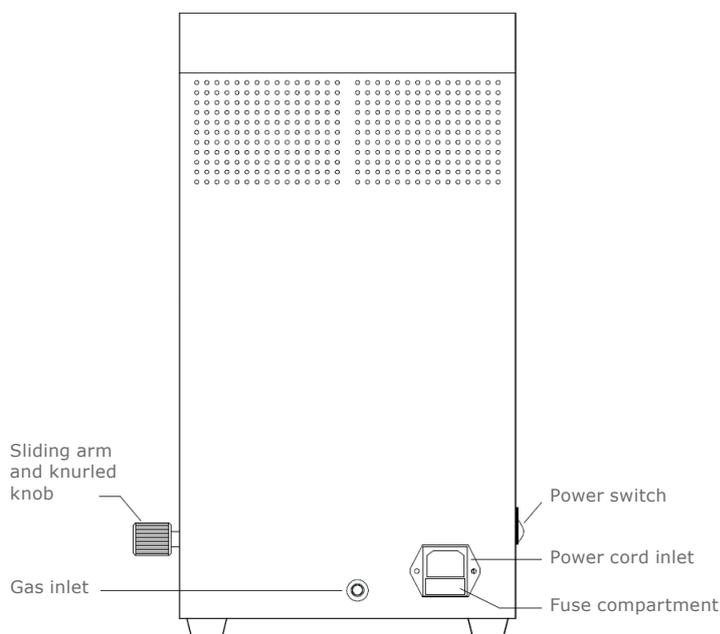


Figure 3. The rear of SPE Dry 96.

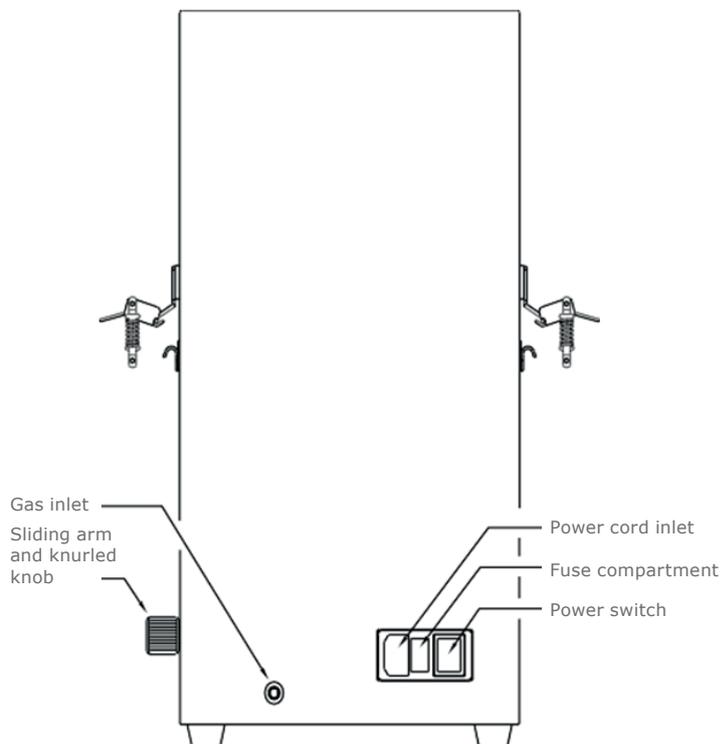


Figure 4. The rear of SPE Dry 96 Dual.

Operation

Once you have attached the gas supply and power cord as described in “Installation” on page 3, the system is ready for operation. Please take precautions when operating this system, including the use of safety glasses, as consistent with safe laboratory practice.

Plate Clearance and Adjusting Plate

Place the collection plate or plates (when using SPE Dry 96 Dual) on the lower head of the system, making sure that it is/they are properly seated in the recessed area. The needle assembly is reversible for deep or shallow well plates. Choose the side that best fits your plate's well height. Loosen the knurled knob, located on the right side of the system, and raise the collection plate or plates into the needles with the sliding arm to the appropriate depth. Set the depth of the needles 3 to 4 mm above the top of the sample. When the appropriate plate height is reached, lock the plate in position by tightening the knurled knob.

For large volume assays where many plates of the same size and volume will be processed, utilize the plate height stops (located on the left front side of the system) to avoid plate-to-plate sample contamination and damage to the needles. Simply move the plate height stop pin to the location that approximates the ideal plate height as determined above. Subsequent plates can be raised until the stop is reached, and then locked into position to maintain the appropriate plate height.

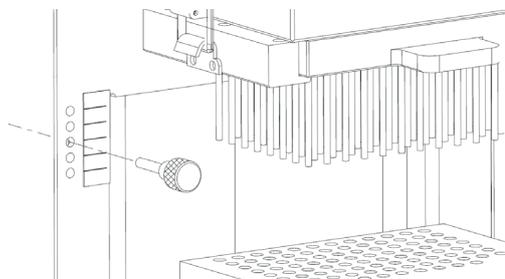


Figure 5. The plate height stop pin.

Adjusting Gas Flow Rate

Before applying inlet gas pressure, turn the flow meter knobs clockwise until they stop to ensure that the flow meters are closed. Set the pressure regulator on the inlet gas supply to 50 psi (SPE Dry 96) or 60 psi (SPE Dry 96 Dual). Slowly open the knobs on the flow meters by turning them counterclockwise. The flow meter bubbles will rise and then level off. The gas flow rate is determined by placing the middle of the flow meter bubble adjacent to the desired flow rate value. **Remember to turn on the gas flow before turning on the system power switch.**

Adjust the gas flow to the desired rate for your method. A good starting point for the flow rate of the upper needle assembly is 50 L/min (SPE Dry 96) or 80 L/min (SPE Dry 96 Dual) and 25 L/min for the lower needle assembly. Optimum drying results can usually be obtained by maintaining the 25 L/min flow rate for the lower needle assembly. This allows the lower assembly to be heated while redirecting the majority of the airflow across the sample via the upper needle assembly.

Temperature Control

Turn the power switch on at the lower left side near the rear of the SPE Dry 96 system or the lower rear near the left side of the SPE Dry 96 Dual system. The temperature controllers will illuminate, the system will perform a short self-diagnostic, and within a few seconds the lower value will indicate the user set point and the upper value will indicate the temperature of the gas exiting the needles. Choose the desired operating temperature by pressing the up or down arrows. Allow approximately 15 minutes for the system to equilibrate before beginning sample processing.

The small *Control* indicator on the face of the temperature controller is factory set and calibrated. The *Control* indicator shows when power is being supplied to the heating elements. The small *Alarm* indicator has been deactivated, as its function is not required for the operation of the system. Therefore, please disregard the *Alarm* indicator.

The circular arrow keys on the temperature controllers are used to calibrate the system and change internal electronic settings. These keys have been deactivated on the keypad to avoid accidental changes of these settings.

All systems are factory set and calibrated for temperature and flow rate. If there is a suspected problem with these functions, please contact Biotage® 1-Point Support™ for service.

Note: The small red indicator light on the upper right face of the system should not be illuminated. This light indicates that internal diagnostic systems have shutdown the system due to an overtemp with the heaters. If this situation is encountered, turn off the power switch and let the system cool down. Then turn the power switch back on to reset the temperature controllers.

Method Development

Method development is application dependant and specific to your individual needs. However, some general starting points and guidelines may help accelerate the process. Methanol is a typical solvent and nitrogen is the typical gas used.

Consider the following parameters when developing methods on the system:

- » Gas temperature
- » System gas flow
- » Composition of sample
- » Volume of sample

Note: As long as the inlet gas pressure (25 to 50 psi for SPE Dry 96 or 25 to 60 psi for SPE Dry Dual) and compressed tank volume (>10 gal.) are sufficient, they have a negligible effect on method development and ruggedness of the resultant method.

Starting Guidelines

A good starting point is to set:

- » Inlet gas pressure at 50 psi (SPE Dry 96) or 60 psi (SPE Dry 96 Dual).
- » Flow rate of the upper needle assembly to 50 L/min (SPE Dry 96) or 80 L/min (SPE Dry 96 Dual) and 25 L/min for the lower needle assembly.
- » Upper head temperature at 50°C for aqueous/solvent based analytes and 35°C for biological samples.
- » Lower head temperature equal to 20°C higher than the upper head temperature.
- » Raise plate so that sample is ~4 mm below needles.
- » Lock plate into position and note the time.

As a reference, a 500 µL sample of methanol should take about 11 minutes (SPE Dry 96) or 15 minutes (SPE Dry 96 Dual) to reach dryness at 20% relative humidity.

Based on your needs and sample type, you may adjust the parameters accordingly. Since sample composition and volume are not usually negotiable, you will probably be adjusting temperature and system gas flow to vary your methods. If you are working with biological samples, you may be further restricted by the fact that too much heat may alter your sample.

Thermally Labile Samples

It is important to note that when using nitrogen, it emerges from the needles at a lower temperature than ambient air temperature. In fact, the higher the flow rate, the colder the nitrogen will become. For this reason, unheated gas can be well below the ambient temperature of the lab.

Therefore, even a 30 to 35°C temperature setting can "heat" the gas and dramatically improve concentration times without risking damage to thermally labile samples.

Solvent Evaporation Times

See Table 1 below.

Needle Depth

The distance from the top of the sample to the needles is only important when establishing the evaporation point. "Following" the sample down with the needles as it evaporates offers little benefit in time savings.

Solution	Ratio (%)	Volume (µL)	Flow Rate SPE Dry/SPE Dry Dual (L/min)	Temperature (°C)	Evaporation Time SPE Dry/SPE Dry Dual (minutes)
Water	100	200	50/80	60	20/22
Water	100	500	50/50	60	44/58
Methanol	100	200	50/90	40	5/7
Methanol	100	200	50/90	55	4/5
Methanol	100	500	50/90	55	10/11
Methanol/Water	50:50	200	50/90	55	13/14
Methanol/Water	50:50	500	50/90	55	30/38

Table 1. Solvent evaporation times.

Maintenance

The System

Maintaining the cleanliness of your work area and of your system will help ensure that your system operates efficiently. Simply wipe down the system regularly with a clean cloth lightly dampened with a mild solvent or cleanser.

Inspect the system regularly for worn components and replace them immediately. The gas line and hose clamps should be inspected prior to each use. Confirm that they are in good condition to prevent the hose from bursting or blowing off the system.

Removing, inspecting, and cleaning the needle assemblies should be part of a regular maintenance program. To remove the upper needle assembly, simply depress the latches located on each side of the head and the needle assembly will slide straight out for easy cleaning.

Inspect and lubricate the lower head sliding mechanism regularly with system-grade lubricant.

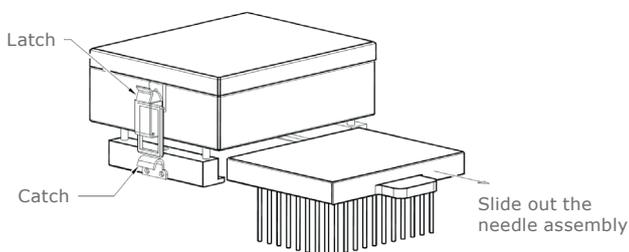


Figure 6. The upper needle assembly of the SPE Dry 96 system.

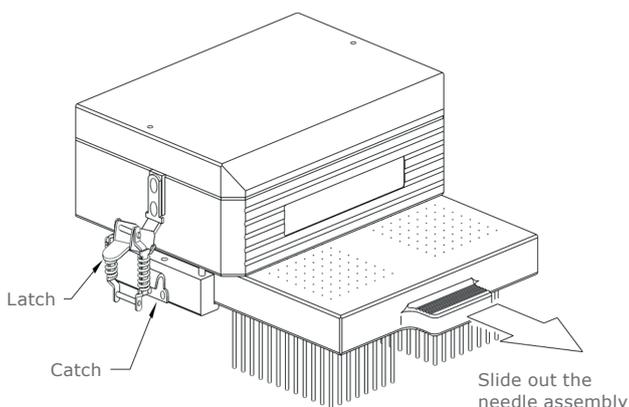


Figure 7. The upper needle assembly of the SPE Dry 96 Dual system.

Suggested Wash Procedure for the Needles

The needles are 304 stainless steel and the head assembly is constructed of acetal-copolymer. It is highly recommended that an appropriate daily cleaning procedure be devised so that the needle assemblies do not become contaminated or attacked by harsh solvent.

There are a number of ways to clean the needle assemblies. The two most common methods are submersion and sonication.

Submersion

1. Submerge the needles in 60% methanol/40% deionized water for a few minutes with unheated gas flowing slowly through the needle assembly. Agitation from the bubbles will usually clean and lift off what may be left from the previous sample as contamination carry-over.
2. Rinse with 100% methanol.
3. Repeat as necessary for heavily contaminated needles.
4. Remove the cleaning reagent and allow gas to flow (unheated) until dry.

Sonication

1. Remove the head by depressing the latches located on each side of the head; see Figure 6 and Figure 7.
2. Fill the sonicator with 60% methanol/40% deionized water.
3. Position the needle assembly in the sonicator as shown in Figure 8.

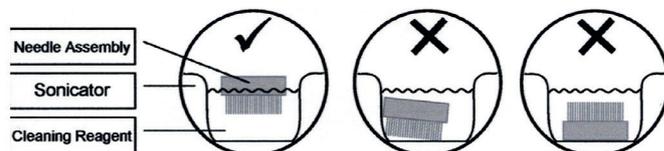


Figure 8. The correct position of the needle assembly in the sonicator.

4. Sonicate the needle assembly for 30 minutes. This provides the highest level of protection against sample carry-over.
5. Rinse with 100% methanol.
6. Allow head to air dry. Alternatively, it may be placed back onto the system and dried utilizing unheated gas.

Needle Replacement

1. Remove the bad needle with long nose pliers.
2. Insert needle into the housing of the needle replacement tool (P/N SD-9606); see Figure 9.



Figure 9. Inserting the needle into the needle replacement tool.

3. Position the needle perpendicular to the needle head assembly; see Figure 10.

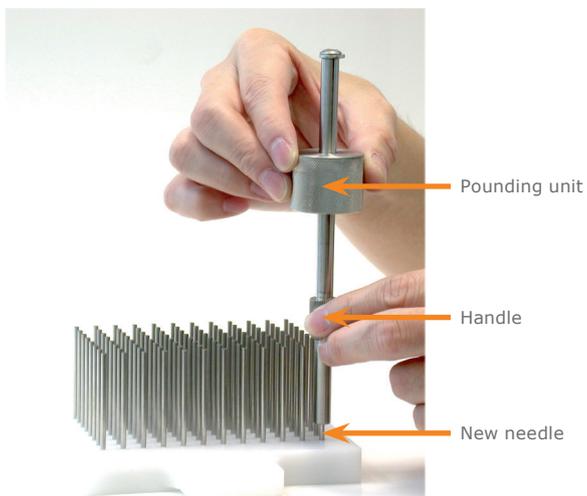


Figure 10. Inserting the new needle into the needle assembly.

4. Drive the needle into the needle assembly with the pounding unit, until the housing of the needle replacement tool reaches the surface of the needle assembly completely.
5. Remove the needle replacement tool

Troubleshooting

Temperature controllers do not illuminate when power switch is turned on:

- » Check electrical power connections to the system.
- » Check the electrical fuse.

Temperature controllers illuminate, but the gas is not heating:

- » Check to ensure that the inlet gas supply is between 25 and 50 psi (SPE Dry 96) or 25 and 60 psi (SPE Dry 96 Dual).
- » Check to ensure that the system flow rate is greater than 25 L/min.
- » Check that the gas temperature is set above ambient.

Temperature controllers do not illuminate, but power switch indicator is on:

- » The heating units may be overheated. Turn off power and let the system cool off for 10 minutes, ensure proper airflow, then re-start. If problem continues, please contact Biotage 1-Point Support.

No gas emits from the needles:

- » Check that the inlet gas supply pressure is set between 15 and 50 psi (SPE Dry 96) or 15 and 60 psi (SPE Dry 96 Dual).
- » Check that the gas flow is set correctly.
- » Ensure that the needle assembly is seated and locked down properly.
- » Check for leaks at the hose inlet and in the supply hose.
- » Visually inspect needle assemblies to ensure they are not plugged.

Certain wells do not dry down:

- » Visually inspect that the needles are not blocked; see the Maintenance section on page 6.
- » Check that the needles are not bent or damaged.
- » Inlet and/or operating pressure may be too low. For more uniform drying, a higher inlet line pressure (above 20 psi) and flow rate is optimum.

Difficult lower head movement:

- » Visually inspect all of the sliding mechanisms for obstructions.
- » Ensure that the sliding guides are clean and lubricated.
- » Loosen the sliding arm knurled knob 1/4 to 1/2 turn further (counterclockwise).

Difficult to reach upper head flow rate of 80 L/min (only applicable for SPE Dry 96 Dual):

- » Reduce lower head flow rate to system minimum of 25 L/min.

Specifications

Power Supply:	110 or 220 VAC, 50/60 Hz
Power Consumption:	405 W nominal
Fuse Rating:	5A fast blow
Dimensions (W X H X D):	SPE Dry 96: 9.52" x 15.72" x 12.05" (242 mm x 400 mm x 306 mm) SPE Dry 96 Dual: 10.0" x 15.5" x 15.0" (254 mm x 394 mm x 381 mm)
Weight:	SPE Dry 96: 25 lbs (11.36 kg) SPE Dry 96 Dual: 31 lbs (13.9 kg)
Inlet Gas Connection:	1/4" NPT
Inlet Gas Pressure:	Minimum 15 psi, maximum 65 psi
Minimum Operating Flow Rate:	25 L/min
Maximum Operating Flow Rate:	SPE Dry 96: 60 L/min SPE Dry 96 Dual: 90 L/min
Maximum Operating Gas Temperature:	60°C (upper head) 80°C (lower head)

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