SPE DRY™ 96 DUAL
SAMPLE CONCENTRATOR SYSTEM

OPERATING MANUAL

Biotage

CONTENTS

PLEASE READ ENTIRE MANUAL BEFORE OPERATING YOUR INSTRUMENT

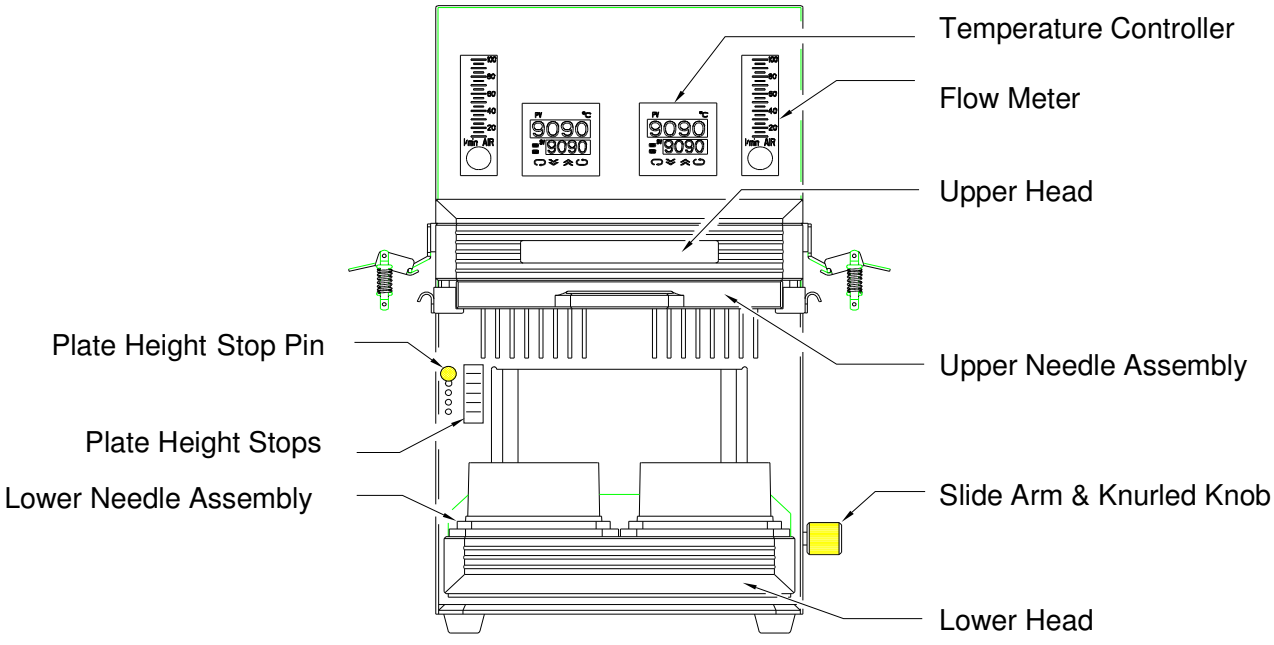
I. INTRODUCTION

The SPE Dry™ 96 Dual sample concentrator system from Argonaut Technologies is designed to greatly enhance the speed of sample dry down in deep and shallow well collection plates. The SPE Dry 96 Dual utilizes 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 SPE Dry 96 Dual delivers heated gas, typically nitrogen, from needle assemblies located on the upper and lower heads of the instrument. 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 handle. The sample 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 SPE Dry 96 Dual requires a gas supply and a standard 110V (US and Japan) or 220V (UK and Europe) power outlet. The unit's compact size accommodates use under any hood or micro-ventilation system.

SPE Dry 96 Dual



II. SYSTEM PRECAUTIONS

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General Precautions

The SPE Dry 96 Dual requires a standard 110/120V or 220V AC power outlet.

The SPE Dry 96 Dual 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 SPE Dry 96 Dual 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 SPE Dry 96 Dual is 60psi. Do not exceed 60psi.

The SPE Dry 96 Dual will allow flow rates up to 100 Liters Per Minute (LPM). Do not operate above 100 LPM as this may cause instrument damage and result in injury to the operator.

The SPE Dry 96 Dual 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 SPE Dry 96 Dual outside of these guidelines.

The SPE Dry 96 Dual has a fully adjustable lower plate 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 unit) to avoid plate-to-plate sample contamination and damage to the needles.

New Unit Inspection

When unpacking your SPE Dry 96 Dual, inspect the unit 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 unit, contact Argonaut Technologies immediately. DO NOT PLUG IN OR TURN ON THE SYSTEM.

The package should include the SPE Dry 96 Dual, a power cord, an air hose connection and the operating manual. Please contact Argonaut Technologies for immediate replacement if any of these items are missing.

III. INSTALLATION

THE SYSTEM IS USER INSTALLED.

For routine operation, place the SPE Dry 96 Dual in a well-ventilated and easily accessible area.

Connecting the Gas Supply

The gas supply is attached to the SPE Dry 96 Dual via a hose fitting located on the lower back panel of the instrument. Attach one end of a suitable length of ¼" I.D. hose to the fitting and the other end to the pressure regulator of your gas supply. 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 80psi for safety.

Adjust the inlet gas supply to 60psi.

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

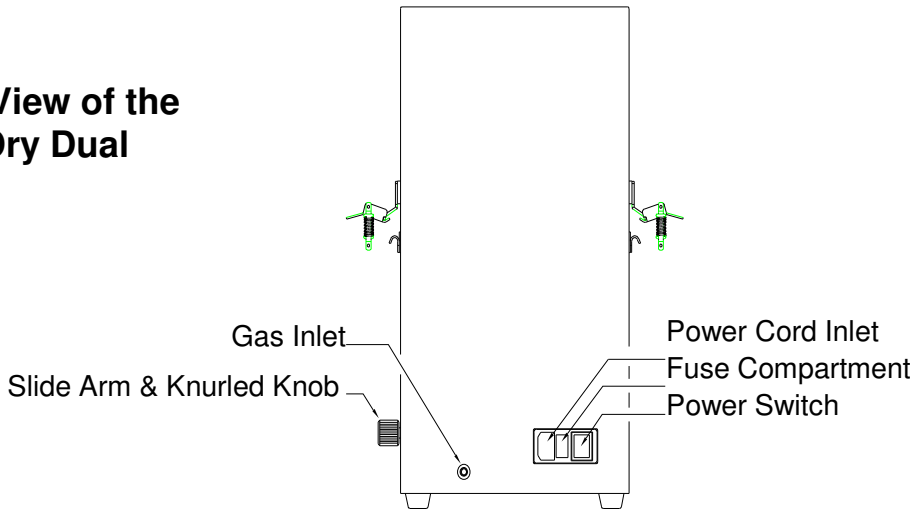
The SPE Dry 96 Dual requires at least 25 LPM of gas flow in order to operate the heating units. These heaters are set to shut off automatically below 25 LPM.

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 back panel of the SPE Dry 96 Dual prior to plugging the cord into the 110V or 220V AC power outlet. The power cord inlet also houses the electrical breaker fuse. The system's power switch is located on the rear left side of the unit.

Rear View of the SPE Dry Dual



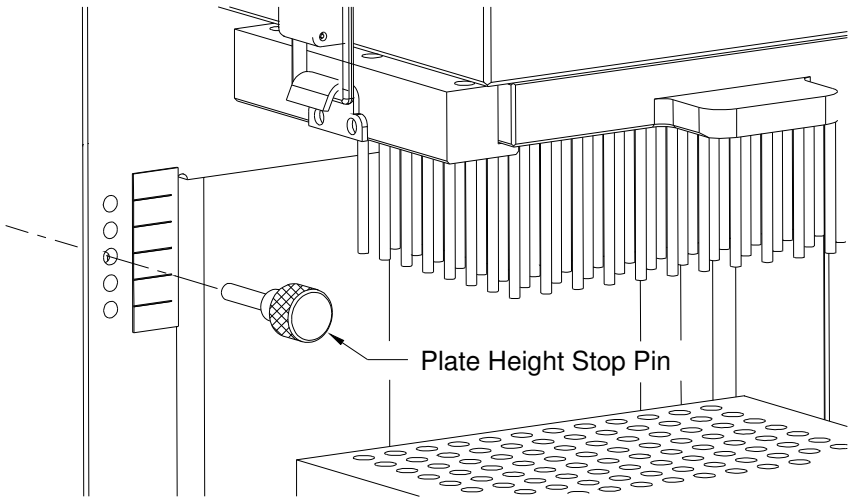
IV. OPERATION

Once you have attached the gas supply and power cord as described in Part III of this operating manual, the SPE Dry 96 Dual is ready for operation. Please take precautions when operating this instrument, including the use of safety glasses, as consistent with safe laboratory practice.

Plate Clearance and Adjusting Plate

Place the collection plates on the lower head of the instrument, making sure 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 unit, and raise the collection plates into the needles with the sliding arm to the appropriate depth. Set the depth of the needles 3-4 mm above the top of the samples. 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 unit) 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.



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 60 psi. Slowly open the knobs on the flow meters by turning 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 instrument 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 80 LPM and 25 LPM for the lower needle assembly. Optimum drying results can usually be obtained by maintaining the 25 LPM 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 back of the instrument. The temperature controllers will illuminate, the instrument 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 instrument to equilibrate before beginning sample processing.

The small red indicator light on the upper right face of the instrument should not be illuminated. This light indicates that internal diagnostic systems have turned off the heaters due to insufficient gas flow across the heater elements. If this situation is encountered, turn off the power switch and adjust the airflow until the proper flow rate is attained. Then turn the power switch back on to reset the temperature controllers. The circular arrow keys on the temperature controllers are used to calibrate the instrument and change internal electronic settings. These keys have been deactivated on the keypad to avoid accidental changes of these settings. 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 on the temperature controllers, since their function is not required for the operation of the SPE Dry 96 Dual. Therefore, please disregard the *Alarm* indicator.

All units are factory set and calibrated for temperature and flow rate. If there is a suspected problem with these functions, please contact Argonaut Technologies for service.

V. 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 SPE Dry 96 Dual:

- Gas Temperature
- System Gas Flow
- Composition of Sample
- Volume of Sample

Note: As long as the inlet gas pressure (25-60 psi) 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
- Flow rate of the upper needle assembly to 80 LPM and 25 LPM 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 15 minutes 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 30-35°C temperature setting can "heat" the gas and dramatically improve concentration times without risking damage to thermally labile samples.

SPE Dry 96 Solvent Evaporation Times

Solution	Ratio (%)	Volume (µL)	Flow rate (LPM)	Temperature (°C)	Evaporation Time (min)
Water	100	200	80	60	22
Water	100	500	50	60	58
Methanol	100	200	90	40	7
Methanol	100	200	90	55	5
Methanol	100	500	90	55	11
Methanol / Water	50 : 50	200	90	55	14
Methanol / Water	50 : 50	500	90	55	38

VI. MAINTENANCE

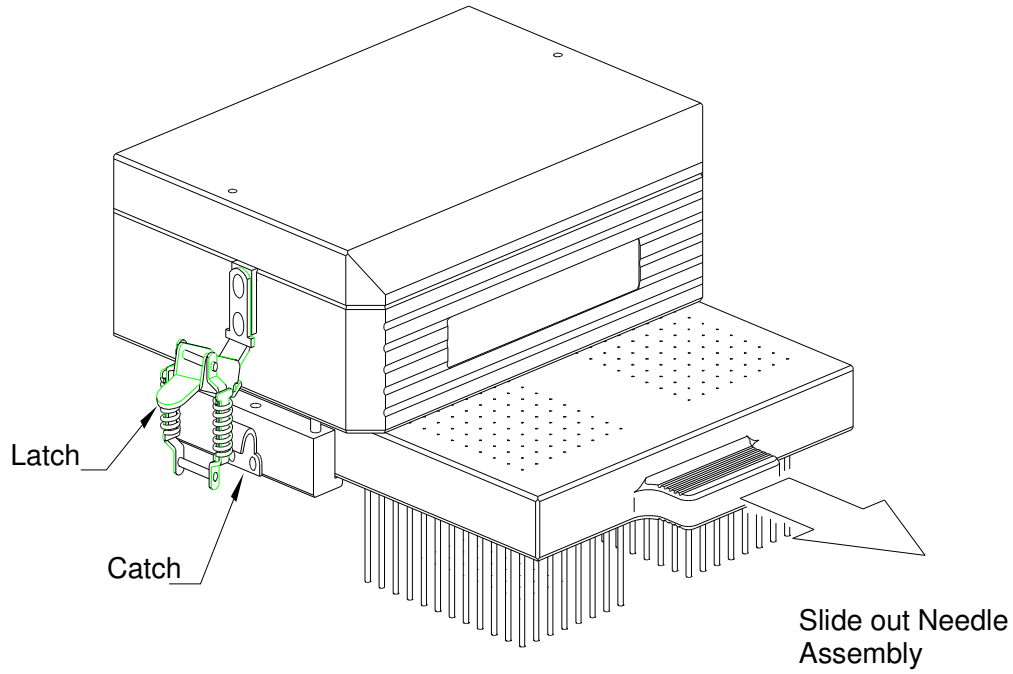
The Instrument

Maintaining the cleanliness of your work area and of your SPE Dry 96 Dual will help ensure that your SPE Dry 96 Dual operates efficiently. Simply wipe down the unit regularly with a clean cloth moistened with a mild solvent or cleanser.

Inspect the instrument 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.

Upper Head Needle Assembly



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

Suggested Wash Procedure for the SPE-Dry Needles

The needles are 316 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.

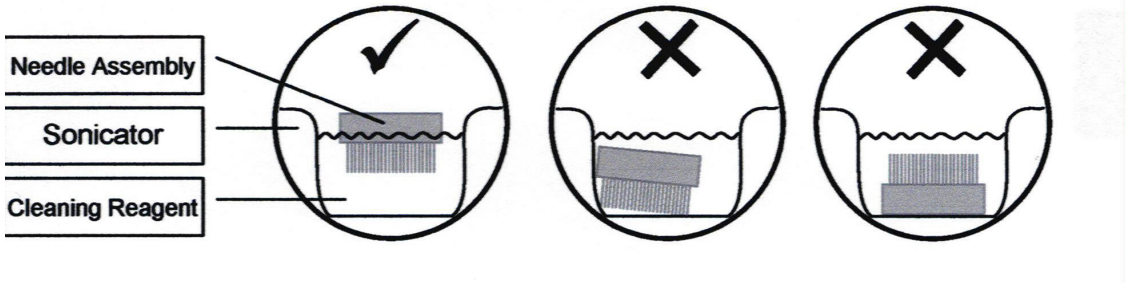
There are a number of ways to clean the needle assemblies. The two most common methods are submersion and sonication.

Submersion:

- Submerse 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.
- Rinse with 100% methanol.
- Repeat as necessary for heavily contaminated needles.
- Remove from the cleaning reagent and allow gas to flow (unheated) until dry.

Sonication:

- Remove the head as instructed above (see page 10).
- Fill the sonicator with 60% MeOH / 40% deionized water.
- Position the Needle Assembly in the sonicator as shown below.



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

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.

Needle Replacement

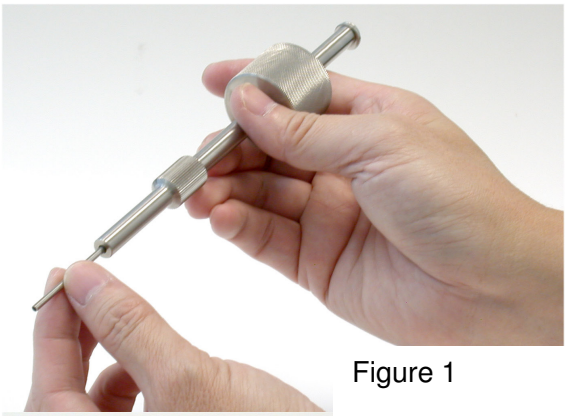
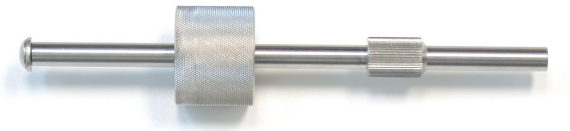


Figure 1



Needle Replacement Tool
P/N SD-9606

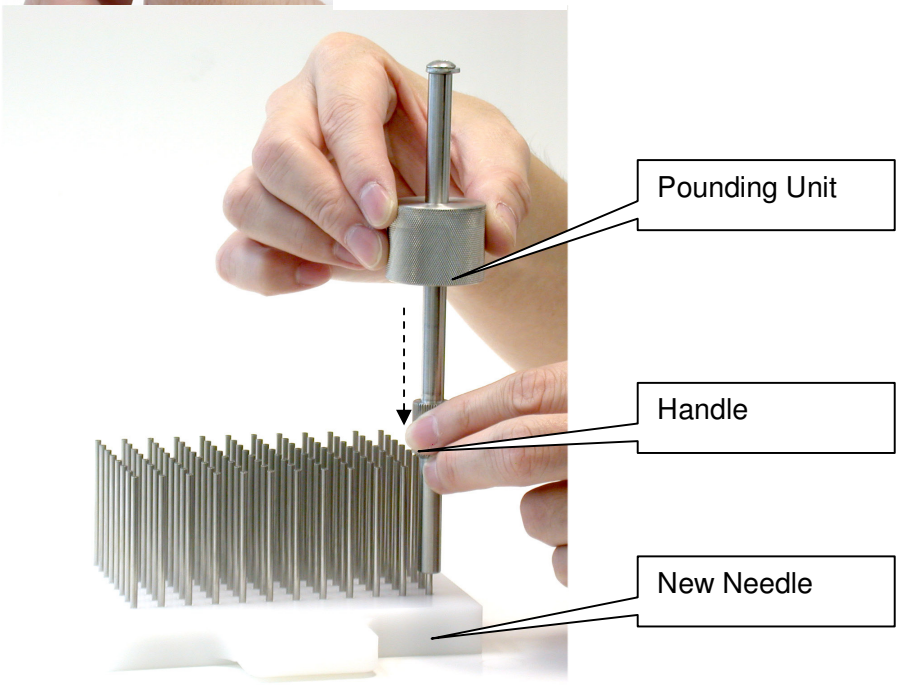


Figure 2

1. Remove the bad needle with Long Nose Pliers
2. Insert needle into the housing of Needle Replacement Tool (Figure 1)
3. Position the needle perpendicular to Needle Head Assembly. (Figure 2)
4. Drive the needle into the head assembly with the pounding unit, until the housing of Needle Replacement tool reaches the surface of needle assembly completely.

5. Remove Replacement Tool

VII. TROUBLESHOOTING

Temperature controls do not illuminate when power switch is turned on.

- Check electrical power connections to the unit.
- Check the electrical fuse.

Temperature controls illuminate, but the gas is not heating.

- Check to ensure that the inlet gas supply is between 25-50 psi.
- Check to ensure that the instrument flow rate is greater than 25 LPM.
- Check that the gas temperature is set above ambient.

Temperature controls 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, contact Argonaut Technologies.

No gas emits from the needles.

- Check that the inlet gas supply pressure is set between 15-60 psi.
- Check that the gas flow is set correctly.
- Make sure 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 Maintenance Section).
- 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 a ¼ - ½ turn further (counterclockwise).

Difficult to reach upper head flow rate of 80 LPM.

- Reduce lower head flow rate to instrument minimum of 25 LPM.

VIII. SPECIFICATIONS

Power Supply:	USA and Japan: 110/120V AC, 50/60 Hz UK and Europe: 220V AC, 50/60 Hz
Power Consumption:	405 W Nominal
Fuse Rating:	5A Fast Blow
Dimensions: Inches (mm)	10.00” W x 15.50” H x 15.00” D (254 mm W x 394 mm H x 381 mm D)
Weight: Lbs (Kg)	31 lbs (13.9 Kg)
Inlet Gas connection:	¼” NPT
Inlet Gas Pressure:	Minimum 15 psi, Maximum 60 psi
Minimum Operating Flow Rate:	25 Liters Per Minute (LPM)
Maximum Operating Flow Rate:	100 Liters Per Minute (LPM)
Maximum Operating Gas Temperature:	60°C (Upper Head) 80°C (Lower Head)

IX. WARRANTY

(a) The Seller warranties hardware products against defects in materials and workmanship based on the specific warranty period and terms specified in the product quotation.

(b) The Seller warrants that the software media, if any, on which the program is distributed and the related documentation will be free from defects in materials and workmanship for ninety (90) days from the date of shipment.

(c) Seller makes and buyer receives no other warranty, expressed or implied, and all warranties of merchantability, fitness for a particular purpose, non-infringement, and any other statutory warranty are expressly excluded. Neither party shall have any liability with respect to its obligations under this agreement for consequential, exemplary, or incidental damages even if it has been advised of the possibility of such damages.

(d) Consumable products or the like are only warranted to conform to the quantity and content stated on the label at the time.

Exclusions

This warranty covers normal use. Preventive maintenance is not included. Seller does not warrant and will not be held responsible for loss or damages resulting from a cause other than defects in material or workmanship, including damage or loss caused by;

(i) Neglect, accident, servicing or modification by anyone other than a qualified Service Engineer or appointed party

(ii) Any natural disaster, including earthquake, lightning, flood, or fire.

(iii) Electrical surges or use of improper power sources.

(iv) Non-conformance to recommended instrument operation procedure.

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